R&S®CMW-KM5xx/-KS5xx
LTE UE Firmware Applications
User Manual

1173.9628.02 ─ 24

Test & Measurement

User Manual

ROHDE&SCHWARZ

This user manual describes the following R&S®CMW options:

- R&S®CMW-KS170 (Alerting network support, generic signaling)
- R&S®CMW-KM500 (LTE FDD R8, TX measurement, uplink)
- R&S®CMW-KM502 (LTE FDD R10 UL CA, TX measurement, uplink)
- R&S®CMW-KM550 (LTE TDD R8, TX measurement, uplink)
- R&S®CMW-KM552 (LTE TDD R10 UL CA, TX measurement, uplink)
- R&S®CMW-KM012 (TX measurement, multi-evaluation list mode)
- R&S®CMW-KS500 (LTE FDD R8, SISO, basic signaling)
- R&S®CMW-KS502 (LTE FDD R10, CA, basic signaling)
- R&S®CMW-KS504 (LTE FDD R12, basic signaling)
- R&S®CMW-KS510 (LTE R8, SISO, advanced signaling)
- R&S®CMW-KS512 (LTE R10, CA, advanced signaling)
- R&S®CMW-KS520 (LTE MIMO 2x2, generic signaling)
- R&S®CMW-KS521 (LTE MIMO 4x2, generic signaling)
- R&S®CMW-KS522 (LTE MIMO 8x2, generic signaling)
- R&S®CMW-KS525 (LTE user-defined bands, generic signaling)
- R&S®CMW-KS550 (LTE TDD R8, SISO, basic signaling)
- R&S®CMW-KS552 (LTE TDD R10, CA, basic signaling)
- R&S®CMW-KS554 (LTE TDD R12, basic signaling)
- R&S®CMW-KS590 (LTE MTC, generic signaling)
- R&S®CMW-KE100 (Basic fading support: AWGN generator)
- R&S®CMW-KE500 (LTE fading profiles TS 36.521, excerpts)
- R&S®CMW-KE501 (LTE fading profiles MIMO 4x2 from TS 36.521 B2.3)
- R&S®CMW-KE502 (LTE fading profiles MIMO 8x2 from TS 36.521 B2)

Mühldorfstr. 15, 81671 München, Germany
Phone: +49 89 41 29 - 0
Fax: +49 89 41 29 12 164
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com

The following abbreviations are used throughout this manual: R&S®CMW is abbreviated as R&S CMW.

Contents

1 Preface....................9

1.1 Documentation Overview....................9

1.2 R&S CMW Models....................10

1.3 How to Read Firmware Application Chapters....................10

1.3.1 General Description....................11

1.3.2 Application Sheets....................11

1.3.3 GUI Reference....................11

1.3.4 Programming Examples....................11

1.3.5 Command Reference....................12

2 LTE Signaling....................13

2.1 What's New in This Revision....................14

2.2 General Description....................14

2.2.1 Scenarios....................15

2.2.2 Test Setups....................17

2.2.3 Initiating Signaling Tests....................25

2.2.4 Carrier Aggregation....................26

2.2.5 External Fading....................28

2.2.6 Internal Fading....................29

2.2.7 Data Tests and Voice over LTE....................30

2.2.8 Audio Tests and Speech Quality Tests....................31

2.2.9 Connection States....................31

2.2.10 Handover....................35

2.2.11 Physical DL Channels and Signals....................37

2.2.12 MIMO and Beamforming....................42

2.2.13 Scheduling Type RMC....................47

2.2.14 User-Defined Channels....................59

2.2.15 CQI Channels....................62

2.2.16 Semi-Persistent Scheduling (SPS)....................66

2.2.17 Operating Bands....................67

2.2.18 Trigger Signals....................70

2.2.19 Relative Power Control Tests....................71

2.2.20 Extended BLER Measurement....74

2.2.21 RLC Throughput Measurement....86

2.3 Application Sheets....88

2.3.1 Combined Signal Path Measurements....88

2.3.2 LTE IP-Based Data Tests....92

2.3.3 VoLTE Call Setup and Audio Tests....96

2.4 GUI Reference....107

2.4.1 Main View....108

2.4.2 Signaling Control....120

2.4.3 Using the Shortcut Softkeys....125

2.4.4 General Settings....127

2.4.5 I/Q Settings....130

2.4.6 RF Settings....131

2.4.7 Internal Fading....138

2.4.8 Downlink Power Levels....143

2.4.9 Uplink Power Control....147

2.4.10 Physical Cell Setup....154

2.4.11 Network Settings....162

2.4.12 Connection Configuration....174

2.4.13 TTI-Based Channel Configuration....208

2.4.14 CQI Reporting....217

2.4.15 UE Measurement Report Settings....220

2.4.16 Messaging (SMS) Parameters....222

2.4.17 Messaging (CBS) Parameters....227

2.4.18 Shortcut Configuration....230

2.4.19 Message Monitoring Settings....231

2.4.20 BLER Measurement Configuration....232

2.4.21 RLC Throughput Measurement Configuration....236

2.4.22 Annex: UE Capabilities....239

2.5 Programming....262

2.5.1 General Configuration....262

2.5.2 BLER Tests....294

2.5.3 RLC Throughput Tests....298

2.6 Command Reference..299
2.6.1 Conventions and General Information..300
2.6.2 General Settings..306
2.6.3 Connection Control and States..309
2.6.4 Event Log..323
2.6.5 UE Measurement Report Contents..324
2.6.6 UE Capabilities..332
2.6.7 UE Info..376
2.6.8 Routing Settings..379
2.6.9 Internal Fading..415
2.6.10 Downlink Power Levels..425
2.6.11 Uplink Power Control..432
2.6.12 Physical Cell Setup..445
2.6.13 Network Settings..455
2.6.14 Connection Configuration..479
2.6.15 CQI Reporting Settings..564
2.6.16 UE Measurement Report Settings..567
2.6.17 Messaging (SMS)..570
2.6.18 Messaging (CBS)..578
2.6.19 Message Monitoring Settings..584
2.6.20 BLER Measurement..585
2.6.21 RLC Throughput Measurement..605
2.7 List of Commands..611

3 LTE Multi-Evaluation Measurement..629
3.1 What's New in This Revision..629
3.2 General Description..630
3.2.1 LTE TX Tests..630
3.2.2 LTE RX Tests..636
3.2.3 List Mode..637
3.2.4 LTE UL Signal Properties..643
3.2.5 Limit Settings and Conformance Requirements..647
3.2.6 Measurement Results..657
3.3 GUI Reference..678

3.3.1 Measurement Control....678
3.3.2 Accessing Parameters and Settings....679
3.3.3 Signal Routing and Analyzer Settings....679
3.3.4 Carrier Aggregation Settings....683
3.3.5 Measurement Control Settings....687
3.3.6 Trigger Settings....703
3.3.7 Limit Settings....706
3.3.8 Shortcut Configuration....706
3.3.9 Additional Softkeys and Hotkeys....707
3.3.10 Measurement Results....709
3.4 Programming....710
3.4.1 General Examples....711
3.4.2 Using LTE List Mode....718
3.5 Command Reference....724
3.5.1 Conventions and General Information....725
3.5.2 General Measurement Settings....731
3.5.3 Multi-Evaluation Measurement Commands....741
3.5.4 Combined Signal Path Commands....883
3.6 List of Commands....885
4 LTE PRACH Measurement....899
4.1 What's New in This Revision....899
4.2 General Description....899
4.2.1 Test Setup....899
4.2.2 How to Measure an Uplink PRACH Signal....900
4.2.3 Defining the Scope of the Measurement....900
4.2.4 Parallel Signaling and Measurement....902
4.2.5 Trigger Modes....902
4.2.6 Calculation of Modulation Results....903
4.2.7 LTE PRACH UL Signal Properties....904
4.2.8 Limit Settings and Conformance Requirements....906
4.2.9 Measurement Results....908
4.3 GUI Reference....917
4.3.1 Measurement Control....917

4.3.2 Parameters and Settings....917

4.3.3 Measurement Results....928

4.4 Programming....930

4.4.1 Key Features....930

4.4.2 Specifying General and Common Measurement Settings....930

4.4.3 Specifying Required PRACH Settings....931

4.4.4 Specifying Measurement-Specific Settings....931

4.4.5 Configuring the Trigger System....932

4.4.6 Specifying Limits....932

4.4.7 Performing Single-Shot Measurements....933

4.4.8 Single-Shot and Continuous Measurements....934

4.5 Command Reference....934

4.5.1 Conventions and General Information....935

4.5.2 General Measurement Settings....939

4.5.3 PRACH Measurement Commands....939

4.5.4 Combined Signal Path Commands....968

4.6 List of Commands....969

5 LTE SRS Measurement....972

5.1 What's New in This Revision....972

5.2 General Description....972

5.2.1 Test Setup....972

5.2.2 How to Measure an Uplink SRS Signal....973

5.2.3 Parallel Signaling and Measurement....973

5.2.4 Trigger Modes....974

5.2.5 Limit Settings and Conformance Requirements....974

5.2.6 Measurement Results....975

5.3 GUI Reference....978

5.3.1 Measurement Control....978

5.3.2 Parameters and Settings....979

5.3.3 Measurement Results....984

5.4 Programming....985

5.4.1 Key Features....986

5.4.2 Specifying General and Common Measurement Settings....986

5.4.3 Specifying Measurement-Specific Settings....................987
5.4.4 Configuring the Trigger System....................987
5.4.5 Specifying Limits....................987
5.4.6 Performing Single-Shot Measurements....................987
5.4.7 Single-Shot and Continuous Measurements....................988
5.5 Command Reference....................989
5.5.1 Conventions and General Information....................989
5.5.2 General Measurement Settings....................993
5.5.3 SRS Measurement Commands....................993
5.5.4 Combined Signal Path Commands....................1003
5.6 List of Commands....................1003
Index....................1005

1 Preface

- Documentation Overview....9
- R&S CMW Models....10
- How to Read Firmware Application Chapters....10

1.1 Documentation Overview

This section provides an overview of the R&S CMW user documentation. Most documents are available in PDF format. You can download them from the CMW customer web.

The CMW customer web is a section of GLORIS, the global Rohde & Schwarz information system, see https://extranet.rohde-schwarz.com. A registration is required.

Getting started manual / quick start guide

Depending on the instrument model, there is either a getting started manual or a quick start guide.

The document introduces the R&S CMW and describes how to set up and start working with the product.

Online help

The online help is embedded in the software. It offers quick, context-sensitive access to the information needed for operation and programming.

If you perform a software update, the corresponding part of the online help is also updated.

User manual

The user manual provides the same information as the online help. The manual is split into several PDF files:

- The base unit manual describes the base software and common features of the firmware applications. It also describes basic principles for manual operation and remote control. The manual includes the contents of the getting started manual / quick start guide.
- Additional documents, like this one, describe the firmware applications, including the graphical user interface of each application and the remote control commands.

Features & functions

The features & functions documents list the available software options and the related features, settings and measurement results.

Basic safety instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

Data sheet and brochure

The data sheet contains the technical specifications of the R&S CMW.

The brochure provides an overview of the instrument and deals with the specific characteristics.

Release notes and open source acknowledgment (OSA)

The release notes list new features, improvements and known issues per software version and installation package.

The open source acknowledgment provides verbatim license texts of the used open source software.

Application notes, application cards, white papers, etc.

These documents deal with special applications or background information on particular topics, see www.rohde-schwarz.com/appnotes.

1.2 R&S CMW Models

The R&S CMW software supports several instrument models. Depending on the model, only a subset of the software packages and software options is allowed.

To check whether this document is relevant for your instrument model and which software options are supported, refer to the preface of your model-specific base unit manual. The PDF filename of this manual starts with CMW<Model>_UserManual, for example CMW500_UserManual.

1.3 How to Read Firmware Application Chapters

Each firmware application is described in a separate chapter. These chapters can be read independently of each other. However, they are all organized as follows:

1. General description
2. Application sheets (optional)
3. GUI reference
4. Programming examples
5. Command reference

The chapters "System Overview" and "Remote Control" in the R&S CMW base unit manual provide additional important information independent of the individual firmware applications. The most important parts are referenced by the firmware application descriptions.

1.3.1 General Description

This section provides a general description of the firmware application, independent of a specific operation mode (manual or remote control). It gives a high-level introduction to the capabilities of the firmware application. Background information related to the network standard is given as far as it is directly related to administrable parameters. For measurement applications, a detailed description of measurement results and a description of configurable limits is given, including the relation to conformance requirements defined in network standard specifications.

1.3.2 Application Sheets

This optional section provides short application examples for select issues and related background information.

1.3.3 GUI Reference

The GUI reference describes the manual operation of the firmware application via the graphical user interface (GUI).

The description of a configuration dialog usually starts with a screenshot presenting the preset values of the parameters (sometimes preset values are modified to enable hidden parts of a dialog). Below the screenshot all shown parameters are described. For each single parameter, a link to the corresponding command description in the command reference is provided. Ranges for numeric parameters and reset values are given there.

For measurement results, links to the corresponding command descriptions are provided (commands to retrieve the results). The measurement results are described in detail in the general description chapter.

1.3.4 Programming Examples

The programming examples show how to control and configure the firmware application via a remote-control program and how to retrieve measurement results. The examples consist of comprehensive command sequences. You can check just a single command of a sequence to get an example for the syntax of this single command. But you can also consider an entire sequence showing the commands in the context of a command script, under consideration of dependencies and required orders of the commands.

The command sequences are written with the intention to list most commands of the firmware application. They do not show the fastest way for a given configuration task. The fastest way would use many reset values and omit the corresponding commands.

The examples are referenced by the command descriptions of the command reference.

1.3.5 Command Reference

The command reference provides information on the remote commands of the firmware application. The commands are grouped according to their function.

Each command description indicates the syntax of the command header and of the parameters. For input parameters the allowed ranges, reset values and default units are listed, for returned values the expected ranges and default units. Most commands have a command form and a query form. Exceptions are marked by "Setting only", "Query only" or "Event". Furthermore, a link to the programming examples is provided and the first software version supporting the command is indicated.

2 LTE Signaling

The LTE signaling firmware application emulates an E-UTRAN cell and communicates with the UE under test. The UE can synchronize to the downlink signal and attach to the PS domain. A connection can be set up (3GPP-compliant RMC or user-defined channel).

Two basic signaling options are available: R&S CMW-KS500 for R8 FDD signals and R&S CMW-KS550 for R8 TDD signals. At least one of these basic options is required to use the signaling application. Both basic options support only configurations with a single antenna (SISO).

The basic functionality can be enhanced via the following options:

- R&S CMW-KS502 adds support of DL carrier aggregation for FDD signals.
  R&S CMW-KS552 adds support of DL carrier aggregation for TDD signals.
- R&S CMW-KS504 adds R12 features for FDD signals.
  R&S CMW-KS554 adds R12 features for TDD signals.
- R&S CMW-KS510 provides advanced parameter settings for R8.
- R&S CMW-KS512 provides advanced parameter settings for R10, including UL carrier aggregation.
- R&S CMW-KS520 adds support of DL MIMO 2x2 and SIMO 1x2.
  R&S CMW-KS521 is required for DL MIMO 4x2 (prerequisite R&S CMW-KS520).
  R&S CMW-KS522 is required for DL MIMO 8x2 (prerequisite R&S CMW-KS521).
- R&S CMW-KS525 adds a user-defined operating band and special bands.
- R&S CMW-KS590 is required for machine-type communication (MTC).
- R&S CMW-KE100 and R&S CMW-KE500 enable internal fading.
  R&S CMW-KE501 is required for MIMO 4x2 fading (prereq. R&S CMW-KE500).
  R&S CMW-KE502 is required for MIMO 8x2 fading (prereq. R&S CMW-KE501).
- R&S CMW-KS170 is required for cell broadcast services for alerting networks

Tests can be performed using the LTE multi-evaluation measurement, the PRACH measurement or the SRS measurement (all included in the options R&S CMW-KM500 and R&S CMW-KM550).

Data transfer tests can be performed using the data application unit (DAU, option R&S CMW-B450x and R&S CMW-KM050). The DAU also provides an IMS server for voice over IMS and SMS over IMS. Audio tests can be performed using the audio board plus a speech codec (R&S CMW-B400B and R&S CMW-B405A).

The "LTE signaling" application provides additional measurements. For details refer to:

- Chapter 2.3.1, "Combined Signal Path Measurements", on page 88
- Chapter 2.2.19, "Relative Power Control Tests", on page 71
- Chapter 2.3.2, "LTE IP-Based Data Tests", on page 92
- Chapter 2.2.20, "Extended BLER Measurement", on page 74
- Chapter 2.2.21, "RLC Throughput Measurement", on page 86

2.1 What's New in This Revision

This revision describes version 3.5.50 and later of the LTE signaling application. Compared to version 3.5.40, it provides the following new features and changes:

- SRVCC handover of voice connection to GSM (up to now only to WCDMA), see Handover
- CSAT using periodic SCell muting, see CSAT / SCell Muting Settings
- Multi-cluster allocation for DL, user-defined channels and "Follow WB ..." scheduling, see Number and Position of RBs (DL)
- For "Follow WB ..." scheduling, subframes not scheduled according to 3GPP can be enabled, see Scheduled CQI
- For "Follow WB CQI ..." scheduling plus TDD, separate mapping tables for special subframes, see MCS@CQI Table / CQI-MCS Mapping
- UE capability report enhanced with R11 and R12 entries, see RF UE Capabilities
- Many new reject causes, see Attach Reject Cause, TAU Reject Cause
- CBS enhancement: user-defined message ID, see ID
- SMS enhancements:
  - Outgoing messages can be read from files, see Outgoing Message Handling
  - Incoming messages are stored in files and can be displayed, see Select File
- Even if joint UL power control is mandatory for CA, you can use different closed loop target powers for PCC and SCC, see Closed Loop Target Power
- Power offset P_A configurable even if antenna port 7 or 8 is used. Only for signaling, not for power calculation. See PDSCH.
- Command for query of supported scenarios, see `CATalog:LTE:SIGN<i>:SCENario?`
- UL BLER result "DTX", see Result Overview
- Configurable feedback method for UL HARQ, see DCI-0 / PHICH
- No special option required anymore for the settings Protocol Identifier and User Data Header

2.2 General Description

The following sections describe how to use the R&S CMW for LTE signaling tests and provide background information.

- Scenarios 15
- Test Setups 17
- Initiating Signaling Tests 25
- Carrier Aggregation 26
- External Fading 28
- Internal Fading 29
- Data Tests and Voice over LTE 30
- Audio Tests and Speech Quality Tests 31

- Connection States....31
- Handover....35
- Physical DL Channels and Signals....37
- MIMO and Beamforming....42
- Scheduling Type RMC....47
- User-Defined Channels....59
- CQI Channels....62
- Semi-Persistent Scheduling (SPS)....66
- Operating Bands....67
- Trigger Signals....70
- Relative Power Control Tests....71
- Extended BLER Measurement....74
- RLC Throughput Measurement....86

2.2.1 Scenarios

The scenario selection is the first setting to be done for test configuration.

The LTE signaling application provides different scenarios for tests with or without MIMO, fading and carrier aggregation (CA). The number of component carriers (CC) is also selected via the scenario (one PCC + n SCC). Selecting a scenario hides/shows parts of the GUI as required by the scenario.

The following table lists all available scenarios with a short explanation. The subsequent tables list the prerequisites for each scenario.

Table 2-1: Scenario overview

Scenario name	Explanation
"1 Cell - 1 RF Out"	Basic LTE cell (no MIMO, no fading, no CA)
"1 Cell - 2 RF Out"	MIMO nx2 (no fading, no CA)
"1 Cell - 4 RF Out"	MIMO 4x2 and external RF fading (no I/Q fading, no CA)
"2CC CA - 2 RF Out"	DL CA with two CC (no MIMO, no fading)
"2CC CA - 4 RF Out"	DL CA with two CC and MIMO nx2 (no fading)
"3CC CA - 3 RF Out"	DL CA with three CC (no MIMO, no fading)
"3CC CA - PCC MIMO - 4 RF Out"	DL CA with three CC and PCC MIMO nx2 (no SCC MIMO, no fading)
"3CC CA - SCC1 MIMO - 4 RF Out"	DL CA with three CC and SCC1 MIMO nx2 (no PCC/SCC2 MIMO, no fading)
"3CC CA - 6 RF Out"	DL CA with three CC and MIMO nx2 (no fading)
"4CC CA - 4 RF Out"	DL CA with four CC (no MIMO, no fading)
"4CC CA - 8 RF Out"	DL CA with four CC and MIMO nx2 (no fading)
"1 Cell - Fading - 1 RF Out"	Fading variants of the scenarios. Supported are internal extended fading and external fading.
"2CC CA - Fading - 2 RF Out"	
"1 Cell - Fading - 2 RF Out"	Fading variants of the scenarios. Up to two DL TX antennas per carrier, internal extended fading and external fading are supported. For more antennas, internal standard fading is supported.
"2CC CA - Fading - 4 RF Out"	

Scenario name	Explanation
"3CC CA - Fading - 6 RF Out"	
"4CC CA - Fading - 8 RF Out"	
"1 Cell - Fading - MIMO4x2 - 2 RF Out"	MIMO 4x2 and internal extended fading or external fading (no CA)
"1 Cell - IQ Out, RF In"	RF uplink as for "1 Cell - 1 RF Out", baseband downlink via the I/Q board. Allows you for example to insert an R&S SMU200A into the downlink path.
For all DL CA scenarios, you can also enable UL CA with two component carriers. External fading can for example be added via a connected R&S SMW200A. MIMO means always DL MIMO, not UL MIMO The additional "Distributed" scenarios "2CC CA - 4 RF Out - Distributed" and "2CC CA - Fading - 4 RF Out - Distributed" are only for backward compatibility. Do not use them any longer.	

Which scenarios are offered for selection, depends on the available software and hardware options. The following table lists all scenarios and the required options.

Additional hints:

- Single-CMW setups
  A "1" in column "CMW" means, that the required hardware fits into a single instrument. So these scenarios are available on a single-CMW setup, if the required options are equipped.
  The scenarios can also be used with a multi-CMW setup.
- Multi-CMW setups
  A higher number in column "CMW" means that you need a multi-CMW setup with at least the indicated number of instruments. The required hardware does not fit into one instrument.
  The instruments are controlled by an R&S CMWC. The test software including the LTE signaling application is installed and executed on the R&S CMWC.
  The options can be distributed over several instruments. But the signaling unit, TX and I/Q board for each input or output path must be in the same instrument. For one path, you cannot use for example an SUW of one instrument plus the I/Q board of another instrument.
  The SW licenses are pooled in the R&S CMWC, so it does not matter where they are installed.

Table 2-2: Required hardware and software options

	CMW	SUW	TX	I/Q board1)	Software options2)
"1 Cell - 1 RF Out"	1	1	1	-	-
"1 Cell - 2 RF Out"	1	1	2	-	KS520
"1 Cell - 4 RF Out"	1	2	4	-	KS520, KS521
"2CC CA - 2 RF Out"	1	2	2	-	KS502/KS552
"2CC CA - 4 RF Out"	1	2	4	-	KS502/KS552, KS520
"3CC CA - 3 RF Out"	1	3	3	-	KS502/KS552, KS512
"3CC CA - PCC MIMO - 4 RF Out"	1	3	4	-	KS502/KS552, KS512, KS520

	CMW	SUW	TX	I/Q board[1)]	Software options[2)]
"3CC CA - SCC1 MIMO - 4 RF Out"	1	3	4	-	KS502/KS552, KS512, KS520
"3CC CA - 6 RF Out"	2	3	6	-	KS502/KS552, KS512, KS520
"4CC CA - 4 RF Out"	1	4	4	-	KS502/KS552, KS512
"4CC CA - 8 RF Out"	2	4	8	-	KS502/KS552, KS512, KS520
"1 Cell - Fading - 1 RF Out, External"	1	1	1	1 (A or F)	KS510
"1 Cell - Fading - 1 RF Out, Internal"	1	1	1	1 (F)	KS510, KE100, KE500
"1 Cell - Fading - 2 RF Out, External"	1	1	2	1 (A or F)	KS510, KS520
"1 Cell - Fading - 2 RF Out, Internal"	1	1	2	1 (F)	KS510, KS520, KE100, KE500
"1 Cell - Fading - MIMO4x2 - 2 RF Out, Ext."	1	2	2	2 (A or F)	KS510, KS520, KS521
"1 Cell - Fading - MIMO4x2 - 2 RF Out, Int."	1	2	2	2 (F)	KS510, KS520, KS521, KE100, KE500, KE501
"2CC CA - Fading - 2 RF Out, External"	1	2	2	2 (A or F)	KS502/KS552, KS512
"2CC CA - Fading - 2 RF Out, Internal"	1	2	2	2 (F)	KS502/KS552, KS512, KE100, KE500
"2CC CA - Fading - 4 RF Out, External"	1	2	4	2 (A or F)	KS502/KS552, KS512, KS520
"2CC CA - Fading - 4 RF Out, Internal"	1	2	4	2 (F)	KS502/KS552, KS512, KE100, KE500, KS520
"3CC CA - Fading - 6 RF Out, External"	2	3	6	3 (A or F)	KS502/KS552, KS512, KS520
"3CC CA - Fading - 6 RF Out, Internal"	2	3	6	3 (F)	KS502/KS552, KS512, KE100, KE500, KS520
"4CC CA - Fading - 8 RF Out, External"	2	4	8	4 (A or F)	KS502/KS552, KS512, KS520
"4CC CA - Fading - 8 RF Out, Internal"	2	4	8	4 (F)	KS502/KS552, KS512, KE100, KE500, KS520
"1 Cell - IQ Out, RF In"	1	1	-	2 (A or F)	-

[1)] This column indicates the number of required I/Q boards and in brackets the board type. The first board of an instrument is R&S CMW-B510x, the second board R&S CMW-B520x. "x" can be "A" (no internal fading) or "F" with internal fading.

[2)] All listed options are R&S CMW-... options. Example: KS510 means R&S CMW-KS510. All scenarios require KS500 for FDD and KS550 for TDD in addition to the listed options. KS502/KS552 means KS502 for FDD or KS552 for TDD.

For further reference:

- Chapter 2.2.2, "Test Setups", on page 17
- Chapter 2.2.4, "Carrier Aggregation", on page 26
- Chapter 2.2.5, "External Fading", on page 28
- Chapter 2.2.6, "Internal Fading", on page 29
  Chapter 2.4.7.1, "Fading Simulator", on page 138 (extended vs. standard fading)
- Chapter 2.2.12, "MIMO and Beamforming", on page 42
- "Scenario" on page 128 (scenario selection)

2.2.2 Test Setups

The following sections provide an overview of typical test setups for the individual scenarios.

2.2.2.1 Test Setup for Scenario 1 Cell - 1 RF Out

The basic test setup for a "1 Cell - 1 RF Out" scenario uses a bidirectional RF connection between the tester and the device under test (DUT). It carries both the downlink and the uplink signal:

- The R&S CMW transmits the downlink signal to which the DUT can synchronize to perform an attach. The downlink signal is used to transfer signaling messages and user data to the DUT.
- The DUT transmits an uplink signal that the R&S CMW can receive, decode and analyze.

For this setup, the DUT is connected to one of the bidirectional RF COM connectors at the front panel of the R&S CMW. No additional cabling and no external trigger are needed. The input level ranges of all RF COM connectors are identical.

See also: "RF Connectors" in the R&S CMW base unit manual, chapter "Getting Started"

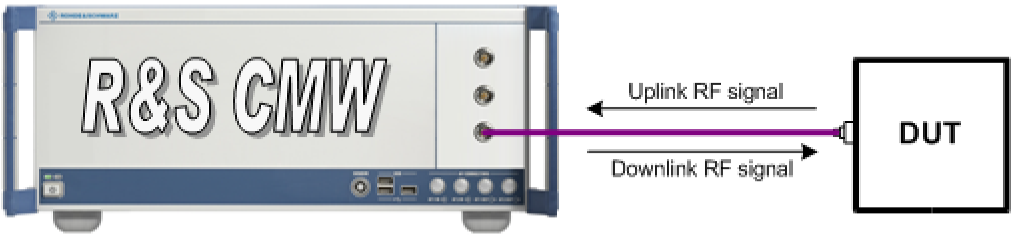


Figure 2-1: Test setup for "1 Cell - 1 RF Out"

2.2.2.2 Test Setup for Scenario 1 Cell - 2 RF Out

The scenario "1 Cell - 2 RF Out" is used for setups with two UE RX antennas (SIMO 1x2, MIMO nx2 and beamforming). A test setup for this scenario involves one uplink and two downlink signals at the UE side. Typically, one bidirectional connection carries one uplink and one downlink signal. An additional connection carries the second downlink signal. The two downlink signals must be transmitted via different TX modules and different RF connectors, which implies that the instrument must support at least two TX paths. You can use for example RF 1 COM for the bidirectional connection and RF 3 COM for the second downlink connection.

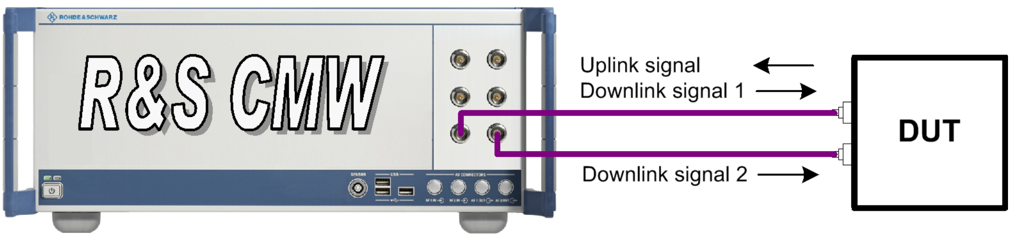


Figure 2-2: Test setup for "1 Cell - 2 RF Out"

Using several signaling applications in parallel

Depending on the installed hardware and software options, you can run several signaling application instances in parallel.

Example: Assume an instrument with two signaling unit wideband (SUW), one signaling unit universal (SUU), four TX paths and four RX paths.

This instrument allows you to run for example:

- Two LTE signaling instances using the "1 Cell - 2 RF Out" scenario, or
- Two LTE signaling instances using the "1 Cell - 1 RF Out" scenario, plus one instance of an SUU signaling application (e.g. GSM / CDMA2000)
- One LTE signaling instance using the "1 Cell - 2 RF Out" scenario, plus one instance of an SUW signaling application (e.g. WCDMA)
- One LTE signaling instance using a carrier aggregation scenario with or without MIMO

The LTE and WCDMA signaling applications both use the SUW. An SUW can only be used by one instance at a time.

2.2.2.3 Test Setup for Scenario 1 Cell - 4 RF Out

The scenario "1 Cell - 4 RF Out" is used for MIMO 4x2 setups, where the four TX antenna signals must be available at the RF connectors. Typically, an external RF fader is inserted into the downlink connection and one bidirectional connection carries one uplink and one downlink signal. Three additional connections carry the other downlink signals.

All downlink signals must be transmitted via different TX modules and different RF connectors. This requirement implies that the instrument must support four TX paths and must be equipped with two signaling units.

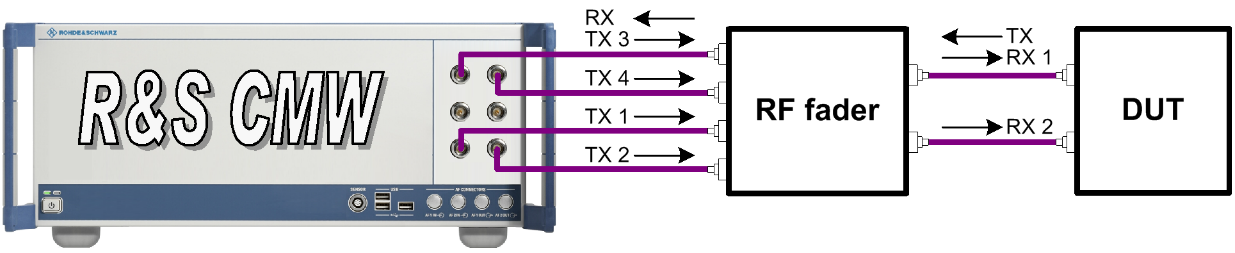


Figure 2-3: Test setup for "1 Cell - 4 RF Out"

2.2.2.4 Test Setup for CA Scenarios (Single CMW)

The carrier aggregation (CA) scenarios allow you to establish a Release-10 connection with several component carriers. A carrier can be a primary component carrier (PCC) or a secondary component carrier (SCC).

Independent of the scenario, there is always one UL PCC and one DL PCC. For a CA scenario, there is at least one additional DL SCC. If you enable UL carrier aggregation, there is one additional UL SCC.

Depending on the scenario, a downlink carrier can have one output path (SISO) or two output paths (for example MIMO nx2). In total, up to four output paths are supported.

Each output path must use a different TX module and each input path a different RX module. The output paths of a carrier must use different RF connectors.

With an advanced frontend, you can route two paths to the same connector. This feature allows you to choose the optimum test setup depending on the number of antenna connectors of your UE. There is no need for external combiners.

The following example setup is suitable for CA with four downlinks and a UE with only two antenna connectors. There are two PCC downlinks (MIMO), two SCC downlinks (one MIMO SCC or two SISO SCCs), one PCC uplink and one SCC uplink.

RF 1 COM is used for the uplinks, the first PCC downlink and the first SCC downlink. RF 3 COM is used for the second PCC downlink and the second SCC downlink.

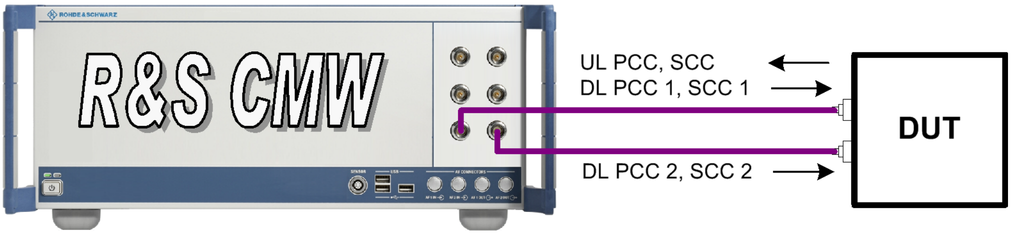


Figure 2-4: Test setup for CA, four DL, two UL, two DUT antenna connectors

For a UE with four antenna connectors, the following test setup could be used instead. Each downlink signal is now routed to a different connector.

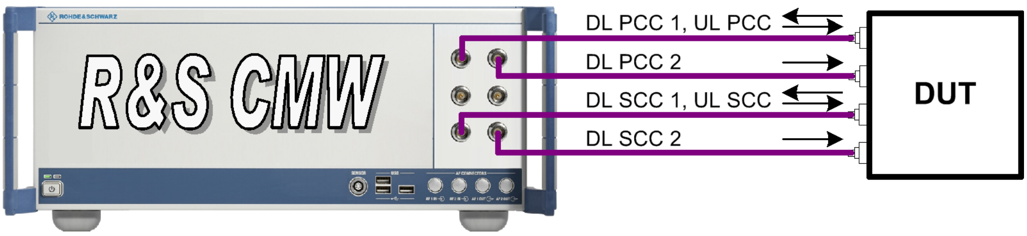


Figure 2-5: Test setup for CA, four DL, two UL, four DUT antenna connectors

For CA with one uplink and two downlinks, you could for example use only RF 1 COM (uplink, PCC downlink and SCC downlink). Or you could use RF 1 COM (uplink and PCC downlink) and RF 3 COM (SCC downlink).

2.2.2.5 Test Setup for CA Scenarios (Multi-CMW)

Some carrier aggregation scenarios require a multi-CMW test setup, comprising one R&S CMWC plus several R&S CMW.

The instruments are connected to each other via their rear panels. This rear panel cabling is identical for all multi-CMW test setups. For details, refer to the R&S CMWC documentation.

The required RF cabling depends on the scenario and on the RF antenna configuration of the DUT.

The following RF cabling example is suitable for DL CA with four carriers plus MIMO nx2 (eight downlinks) and a UE with only two antenna connectors. One antenna is used for the first downlink of each carrier and for the uplinks (UL CA with two carriers). The second antenna is used for the second downlink of each carrier.

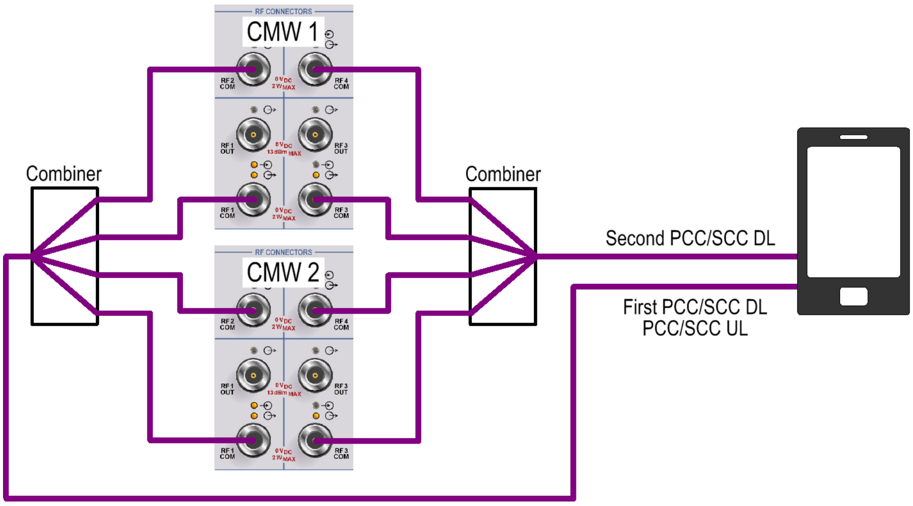


Figure 2-6: Multi-CMW test setup, four CC, MIMO, two DUT antenna connectors

As an external combiner, you can for example use the R&S CMW-Z24. It provides two 4-way combiners. For the given example, you would connect the R&S CMW-Z24 as follows:

- Connect the first DUT antenna (UL + first DL) to the port AC.
- Connect the second DUT antenna (second DL) to the port BC.
- Connect RF 1 COM and RF 2 COM of both R&S CMW to the ports A1 to A4, in any order.

- Connect RF 3 COM and RF 4 COM of both R&S CMW to the ports B1 to B4, in any order.

When configuring the RF settings, consider that the external combiner increases the external attenuation.

2.2.2.6 Test Setup for Scenario 1 Cell - IQ Out, RF In

For the scenario "1 Cell - IQ Out, RF In", the uplink RF signal is routed via an RF COM connector on the front panel. The downlink digital I/Q signal is routed via a DIG IQ OUT connector on the rear panel. This connector is only available if an I/Q board is installed (option R&S CMW-B510x/-B520x). Additional instruments can be inserted into the downlink path to manipulate the downlink signal.

A typical use case is to insert an R&S SMU200A into the downlink path to superimpose fading on the downlink signal. The following figure provides an overview of this setup. In this example, the R&S SMU200A is synchronized to a 10-MHz reference signal provided by the R&S CMW. It is also possible to synchronize the R&S CMW to the R&S SMU200A.

The following figure shows a possible rear panel cabling using the first I/Q board (DIG IQ 1 to 4).

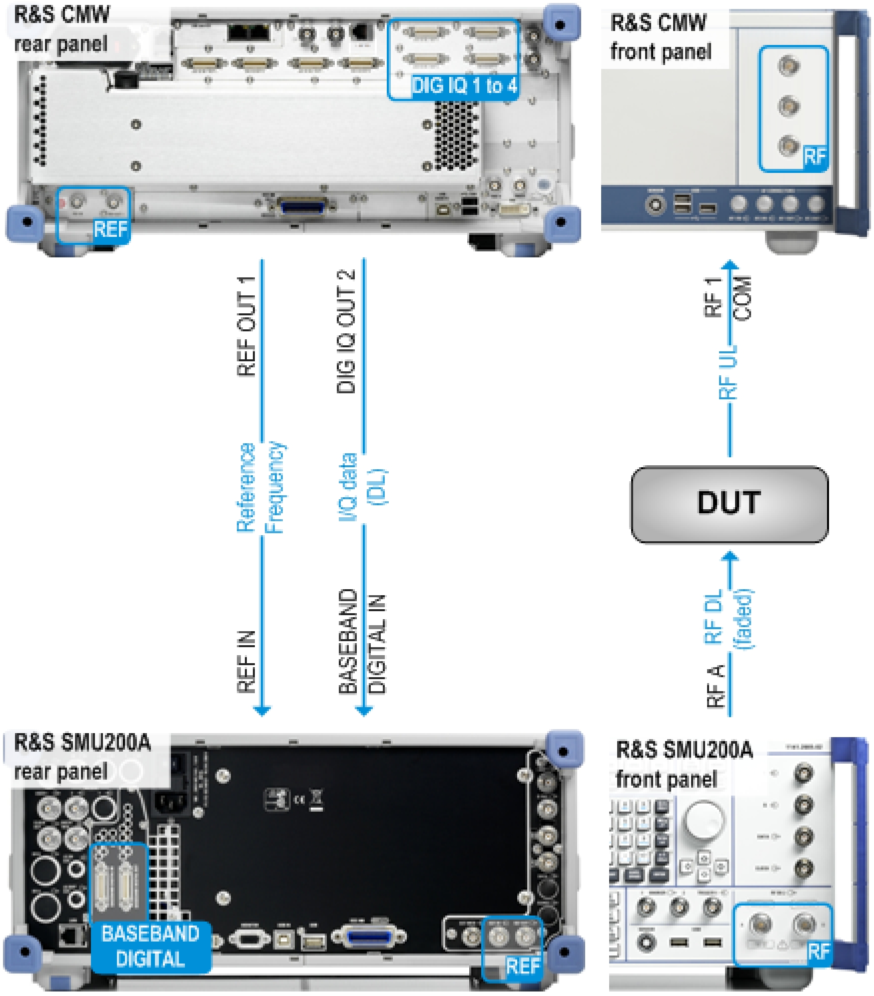


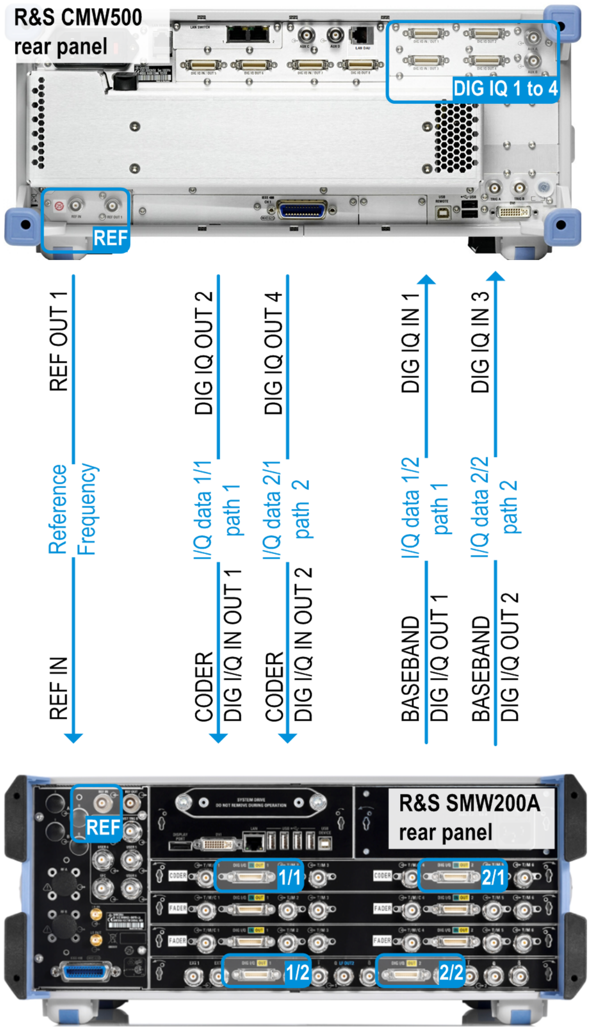
Figure 2-7: Test setup for scenario "1 Cell - IQ Out, RF In" (example)

2.2.2.7 Test Setup for External Fading Scenarios

To superimpose fading on the baseband signal, you can integrate an external fader (e.g. R&S SMW200A) into a test setup. The external fader must be connected to the digital I/Q interface of the R&S CMW. At least one I/Q board must be installed at the R&S CMW for that purpose (option R&S CMW-B510x/-B520x).

All connections between R&S CMW and R&S SMW200A are established via the rear panels of the instruments.

The following figure shows a setup with two downlink paths using the first I/Q board (DIG IQ 1 to 4).



For a setup with only one downlink path, you need only two of the four I/Q data connections.

For MIMO 4x2 fading, you must connect two I/Q boards.

The RF connections between R&S CMW and DUT must be established in the same way as without external fading.

2.2.2.8 Test Setup for Internal Fading Scenarios

For internal fading scenarios, the test setup is the same as for the corresponding scenario without fading.

2.2.3 Initiating Signaling Tests

The required settings vary depending on the measurement to be performed. However, the following general procedure is applicable to most measurements.

1. Connect your UE to the R&S CMW (see Chapter 2.2.2, "Test Setups", on page 17).
2. Open the "LTE signaling" firmware application.
3. Configure the signaling application according to your test case.
   You can modify the most important settings directly in the main view. The "Config" hotkey provides access to the configuration dialog box.
4. To turn on the DL signal, press ON | OFF. Alternatively, right-click the "LTE Signaling" softkey and click ON.
   Wait until the "LTE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
5. Switch on the UE.

   The UE synchronizes to the DL signal and attaches. Note the connection states displayed in the main view.
6. If there is no RRC connection, set up a connection.
   You can keep the RRC connection after the attach. See "Keep RRC Connection" on page 179.
   You can set up a connection at the UE or use the hotkeys of the signaling application. See Chapter 2.4.2, "Signaling Control", on page 120.
7. To switch to the measurement application, press the "LTE TX Meas" or "LTE Ext BLER" softkey. The LTE extended BLER measurement is part of the "LTE Signaling" firmware application. The LTE TX measurements are available as option R&S CMW-KM500/-KM550.
8. Configure and start the measurement.

If the UE fails to attach

Check the following R&S CMW settings:

- The "Duplex Mode" must be supported by the UE.
- The "Frequency" of the generated DL signal must be within the frequency band supported by the UE.
- The "Downlink Power Levels", especially the "RS EPRE" must be sufficient so that the UE under test can receive the DL signal.
- The "Uplink Power Control" settings must be appropriate so that the UL signal is strong enough to be received and decoded by the R&S CMW.
- The UE capabilities must be in accordance with the security settings in the "Network" section of the configuration dialog.
  The attach procedure can fail if authentication or security is disabled but the UE expects/requires an authentication or security procedure. It can also fail if authenti-

cation or security is enabled but not supported by the UE or the secret key does not match.
An appropriate USIM can be obtained from Rohde & Schwarz (R&S CMW-Z04, stock no. 1207.9901.02).

- Some UEs need a DL signal without padding bits for attach. You can disable downlink padding in the "Connection" section of the configuration dialog.

If the measurement does not start

If the measurement does not start at all while the signaling application generates a downlink signal, verify that the combined signal path scenario is selected in the measurement.

2.2.4 Carrier Aggregation

Carrier aggregation (CA) is an LTE-Advanced Release 10 feature. It aggregates several component carriers to reach a higher bandwidth. Each single component carrier is compliant with Release 8.

The signaling application supports the aggregation of up to four downlink carriers and of two uplink carriers. With four 20 MHz carriers, you can reach a total bandwidth of 80 MHz.

The aggregated carriers can be located in the same operating band or in different operating bands. They can use a continuous spectrum or there can be gaps between the carriers. So all kinds of carrier aggregation are supported: intra-band contiguous CA, intra-band non-contiguous CA and inter-band CA.

Most settings can be configured independently per carrier, for example the carrier frequency, bandwidth, power, scheduling type and related channel settings.

According to 3GPP, a connection setup with carrier aggregation is a two-step procedure. In the first step, a Release 8 single carrier connection is set up. The used carrier is called primary component carrier (PCC). In the second step, one or more additional carriers are added, called secondary component carrier (SCC). The individual SCCs are distinguished via a number (SCC1, SCC2, ...).

Access procedures like cell search, cell selection and initial random access are only performed on the PCC, not on the SCCs. The SCCs are added, deleted or modified using an "RRC Connection Reconfiguration" message.

Options required for carrier aggregation:

- R&S CMW-KS502 for FDD carrier aggregation
- R&S CMW-KS552 for TDD carrier aggregation
- R&S CMW-KS512 for aggregation of more than two carriers, uplink carrier aggregation and advanced carrier aggregation settings
- One signaling unit and one RF path per component carrier (one TX module per DL carrier / one RX module per UL carrier)
  With MIMO nx2, two TX modules per DL component carrier

- For carrier aggregation with MIMO: MIMO software options as for MIMO without carrier aggregation

2.2.4.1 Setting Up a Connection with Carrier Aggregation

Proceed as follows:

1. Connect your UE to the R&S CMW (see Chapter 2.2.2.4, "Test Setup for CA Scenarios (Single CMW)", on page 19).
2. Select a scenario with carrier aggregation.
3. Configure the SCC activation mode as desired. See "SCC Activation Mode" on page 129.
4. If you want to use uplink carrier aggregation, enable the uplink of one SCC. See "Use UL" on page 129.
5. If you want to use contiguous uplink carrier aggregation:
   a) Select the PCC channel bandwidth and the SCC channel bandwidth.
   b) Specify the PCC band and channel / center frequency.
   c) Select whether the SCC center uplink frequency is lower or higher than the PCC center uplink frequency:
   Specify any SCC uplink frequency above or below the PCC uplink frequency.
   d) Enable "Intraband Contiguous to PCC" on page 129.
   An algorithm adjusts the SCC uplink center frequency, so that the spacing between SCC and PCC is correct, as defined in 3GPP TS 36.101, section 5.7.1A.
   For combined signal path measurements, the checkbox tells the multi-evaluation measurement whether the UL signal uses contiguous carrier aggregation or not.
6. Configure the RF settings of all carriers. The channels of the carriers must not overlap.
7. Configure any other signaling application settings as desired, for example DL power, cell setup and connection settings.
   If you change the physical cell ID or the E-UTRAN cell identifier, set a different value for each carrier.
   If you want to add an SCC in packet-switched state "Attached", enable the connection setting "Keep RRC Connection".
8. To turn on the primary cell signal, press ON | OFF. Alternatively, right-click the "LTE Signaling" softkey and click ON.
   Wait until the "LTE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
9. Switch on the UE.

   The UE synchronizes to the DL signal and attaches. Note the packet-switched state in the main view and wait until it equals "Attached".

10. If the RRC state is "Idle", press the "Connect" hotkey to set up an RRC connection on the PCC.
    Note the RRC state displayed in the main view. Wait until it equals "Connected".
11. Depending on the configured SCC activation mode, the SCCs are already active, or you can now activate them via hotkeys.
    All hotkeys are related to a single SCC. On the "PCC" tab, the hotkeys affect SCC1. On an SCC tab, the hotkeys affect the corresponding SCC.
    - Mode "Auto":
      An automatism adds and activates the SCCs upon RRC connection establishment.
    - Mode "Semiautomatic":
      Press the "Activate MAC" hotkey to add and activate an SCC.
    - Mode "Manual":
      To add and activate an SCC, press the hotkey "SCC On", then "SCC add RRC", then "SCC activate MAC".

    Note the SCC state displayed in the main view. After successful SCC activation, the state is "MAC Activated".

2.2.5 External Fading

An external fading scenario allows you to route the downlink baseband signal to an R&S SMW200A that superimposes fading on the signal and routes it back. Thus fading can be added to the downlink signal.

Configuring and activating fading

1. Connect the DUT and the external fader (e.g. R&S SMW200A) to the R&S CMW (see Chapter 2.2.2.7, "Test Setup for External Fading Scenarios", on page 23).
2. Configure the signaling application according to your test case.
   Especially select an external fading scenario. And configure the downlink settings.
3. In the configuration tree, section "IQ Settings > IQ Out", note the "Baseband PEP" and the "Crest Factor".
4. Configure the external fader, especially the following settings:

   Reference oscillator settings:
   - "Source" = "External"
   - "External Reference Frequency" = 10 MHz

   Baseband input settings for all used connectors:
   - "Sample Rate" = "User-Defined", 100 MHz
   - "Baseband Input Level": Enter the crest factor and the PEP displayed in step 3.

   Digital I/Q output settings for all used connectors:
   - "Sample Rate" = "User-Defined", 100 MHz
   - "Set Level Via" = "PEP"
   - "PEP" = PEP value displayed in step 3

5. In the external fader, activate fading.
   Note the signal level. If you add noise to the signal, note the signal level without noise.
6. Configure the I/Q input of the R&S CMW:
   In the configuration tree, section "IQ Settings > IQ In > Baseband Level", enter the signal level noted in the previous step.
7. Turn on the downlink signal at the signaling application.
8. Set up a connection.

   The configuration is now complete. Fading is active.
   A reconfiguration of the settings at the external fader during an active connection to the DUT can result in the loss of the connection or in erroneous measurement results.
   After a reconfiguration of the baseband input settings of the external fader, turn the downlink signal at the signaling application off and on again.

2.2.6 Internal Fading

Testing under realistic air interface conditions is important in order to verify the receiver performance and the correct operation of the protocol stack implementation. For example, block error rates, throughput performance and correct operation of layer 1 procedures like hybrid automatic repeat request (HARQ) retransmission can be evaluated.

The internal fading module comes with a fading simulator and AWGN generator that can be selectively enabled. It manipulates the generated downlink I/Q data stream to emulate typical signal conditions at the receiver.

The following options are required to use the internal fading simulator in LTE:

- Fader I/Q board R&S CMW-B510F and/or R&S CMW-B520F (depends on scenario)
- Option R&S CMW-KS510 "LTE R8, SISO, advanced signaling" for scenarios without carrier aggregation
  Option R&S CMW-KS512 "LTE R10, CA, advanced signaling" for scenarios with carrier aggregation
- Option R&S CMW-KE100 "Basic fading support: AWGN generator"
- Option R&S CMW-KE500 "LTE fading profiles TS 36.521, excerpts"
- Option R&S CMW-KE501 "LTE fading profiles MIMO 4x2 from TS 36.521 B2.3" for MIMO 4x2 / 8x2
- Option R&S CMW-KE502 "LTE fading profiles MIMO 8x2 from TS 36.521 B2" for MIMO 8x2

2.2.6.1 Fading Simulator

Multi-path fading is an effect which occurs in real world situations. A signal sent from the base station follows the direct line of sight and/or takes routes with reflections. The phase-shifted signals sum up at the receiving antenna. If the receiver is moving, there are also frequency-shifted signals.

The internal fading simulator supports multipath propagation conditions defined in annex B.2 of 3GPP TS 36.101.

A faded signal has a higher crest factor than an unfaded one. To avoid distortion, the baseband signal must be attenuated before entering the fading module. The necessary attenuation (insertion loss) depends on the selected fading profile.

In LTE signaling, the insertion loss at the baseband level can be calculated automatically or set manually. It is automatically compensated on the HF level. The compensation implies a shift of the allowed DL power range to the same extent, but in opposite direction.

2.2.6.2 AWGN Generator

Additional white Gaussian noise (AWGN) is typically modeled in receiver tests, because it can lead to a decrease of throughput. The quality of the received signal is affected by the ratio of the signal power to the surrounding traffic noise level (signal to noise ratio). The modulated signals from neighbor cells simply appear as noise. This effect is simulated by adding AWGN to the signal.

The internal fading module supports AWGN insertion with configurable bandwidth and signal to noise ratio. Insertion loss at the baseband level is calculated and compensated automatically at the HF.

AWGN insertion via the signaling unit is disabled for fading scenarios (see "AWGN" on page 147).

2.2.7 Data Tests and Voice over LTE

The LTE signaling application provides a test mode, using only layer 1 and 2 of the protocol stack. And it provides a data application mode that supports also layer 3.

To use the data application mode, you need the following options in addition to the "LTE signaling" application:

- Data application unit (DAU, R&S CMW-B450x, mandatory)
- IPv4 enabler (R&S CMW-KA100, mandatory)
  IPv6 enabler (R&S CMW-KA150, optional)
- DAU measurements (R&S CMW-KM050, optional)
- IMS server (R&S CMW-KAA20, optional)
- Installed DAU software package

If there is no space left for installation of a DAU in your instrument, you can install all these options in another R&S CMW and access the external DAU via LAN. For such a setup, you need also R&S CMW-KA120, both on the instrument hosting the external DAU and on the instrument where the LTE signaling application is running.

In data application mode, you can perform IP-based data tests using the DAU measurements or you can perform an RLC throughput measurement. You can also use the IMS server provided by the DAU to set up a voice over LTE (VoLTE) call.

For further reference:

- Chapter 2.2.21, "RLC Throughput Measurement", on page 86
- Chapter 2.3.2, "LTE IP-Based Data Tests", on page 92
  This application sheet describes how to set up an LTE connection in data application mode and provides some examples for IP-based data tests.
- Chapter 2.3.3, "VoLTE Call Setup and Audio Tests", on page 96
  This application sheet describes how to set up a VoLTE call and how to perform basic audio tests for the established call.
- Data application unit documentation
- "External DAU" on page 178

2.2.8 Audio Tests and Speech Quality Tests

You can connect the LTE signaling application to the speech codec of an installed audio board. This connection allows you, to feed an audio signal into an RF connection to the UE or to extract an audio signal from the RF connection for audio measurements. You can for example connect the R&S UPV to the audio board of the R&S CMW and perform a speech quality analysis.

To set up a voice over LTE connection, you need the DAU, see Chapter 2.2.7, "Data Tests and Voice over LTE", on page 30.

To connect the LTE signaling application to the speech codec, you need the following options in addition to the "LTE signaling" application:

- Audio board, R&S CMW-B400B
- Speech codec, R&S CMW-B405A
- Installed audio software package

For further reference:

- Chapter 2.3.3, "VoLTE Call Setup and Audio Tests", on page 96
  This application sheet describes how to set up a VoLTE call and how to perform basic audio tests for the established call.
- "Audio Measurements" documentation

2.2.9 Connection States

An LTE connection is always a packet-switched connection. There can be several carriers in each direction (carrier aggregation).

A connection setup with carrier aggregation is a two-step procedure. In the first step, a Release 8 single carrier connection is set up. The used carrier is called primary component carrier (PCC). In the second step, the additional carriers are added, called secondary component carrier (SCC1, SCC2, ...).

The related connection states are described in the following sections. For a connection without carrier aggregation, only the packet-switched states are relevant.

2.2.9.1 Packet-Switched States

The main connection states related to the primary packet-switched connection are described in the following table. They are related to the PCC downlink and uplink connection. The states are displayed in the main view as "Packet Switched" (PS) state.

PS state	Description
"(Cell) Off"	No downlink signal transmission
"(Cell) On"	The R&S CMW emulates an E-UTRAN cell, transmitting an LTE signal to which the UE can synchronize. After synchronization, the UE can initiate an attach towards the instrument.
"Attached"	Synchronization and attach have been performed. A default bearer has been established. Depending on parameter Keep RRC Connection, a radio resource control (RRC) connection is still established or has been released. To send or receive SMS messages, to start an inter-RAT handover or to establish an SCC connection, an established RRC connection is required.
"Connection Established"	A dedicated bearer has been set up. An RRC connection has been established (during attach or during connect). User data can be exchanged via shared channels. The R&S CMW can vary connection parameters, perform transmitter and receiver tests, or initiate a handover.

State transitions can be initiated by the instrument or by the UE. The following figure provides an overview.

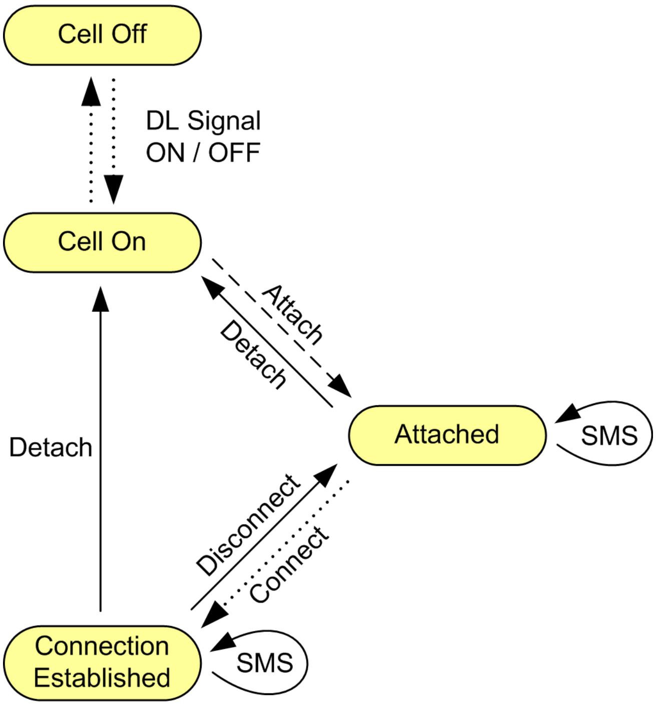


Figure 2-8: PS state transitions

Dotted line = Action initiated by instrument
Dashed line = Action initiated by UE
Solid line = Action initiated by UE or instrument

In addition to the main states shown in the table and the figure the instrument indicates the following transitory states:

- **"Signaling in Progress"**
  Displayed e.g. during attach or when the channel changes for an established connection.
- **"Connection in Progress"**
  Displayed during connection setup.
- **"Sending Message"**
  Displayed while an SMS message is sent to the MS.
- **"Receiving Message"**
  Displayed while an SMS message is received from the MS. To check the received message, see Chapter 2.4.16.2, "Incoming SMS", on page 226.
- **"Incoming Handover in Progress"**
  Displayed while a handover is received (not for handover within signaling application).
- **"Outgoing Handover in Progress"**
  Displayed while a handover to another signaling application / instrument is performed.
- **"Disconnect in Progress"**

Additional transitions and handover

The transitions in Figure 2-8 are not complete. The "Off" state can be reached from any state by turning off the cell signal. Moreover, incidents like an alerting timeout or a loss of the radio link cause additional transitions.

A handover within the signaling application can be performed in the "Connection Established" state. An inter-RAT / inter-instrument redirection can also be performed in the "Attached" state (established RRC connection required).

2.2.9.2 SCC States

The state of each secondary component carrier (SCC) is displayed in the main view and described in the following table. An SCC can be used in downlink direction only, or in downlink plus uplink direction.

SCC state	Description
"(SCC) Off"	No downlink signal transmission via the SCC frequency
"(SCC) On"	An SCC downlink signal is transmitted, including synchronization signals, reference signal and system information. The UE is not yet informed about the SCC and ignores it. Prerequisite: Packet-switched state at least "Cell On"
"RRC Added"	An "RRC Connection Reconfiguration" message has been sent to the UE via the PCC. The UE has acknowledged this message. In this state, the UE is informed about the presence of the SCC and knows important SCC properties like the carrier frequency. Prerequisite: RRC connection established on the PCC (packet-switched state "Attached" or "Connection Established", depending on parameter Keep RRC Connection)
"MAC Activated"	The SCC has been activated via a MAC message, sent to the UE via the PCC. The UE has acknowledged this message. After SCC activation, the SCC scheduling is started. The scheduling information is sent to the UE via the PDCCH of the SCC (cross-carrier scheduling is not used).

You can set up the SCC automatically, semiautomatically or manually:

- Manual activation means that you initiate each state transition step separately.
- Semiautomatic activation means that you initiate the complete SCC setup. So one action initiates all transitions from "SCC Off" to "MAC Activated".
- Automatic activation means that the RRC connection establishment triggers also the setup of the SCC. Depending on "Keep RRC Connection", the SCC setup is done with the attach or later on.

The following figure shows the transitions between the SCC states.

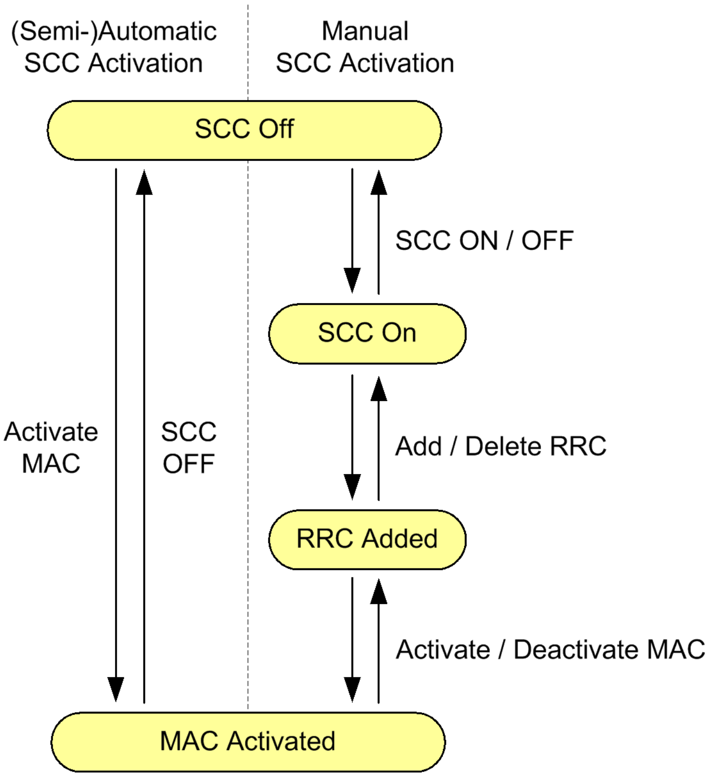


Figure 2-9: SCC state transitions

For selection of the mode, see "SCC Activation Mode" on page 129.

Additional transitions

The transitions in Figure 2-9 are not complete. The "SCC Off" state can be reached at any time by releasing the RRC connection, for example by turning off the PCC cell signal. Incidents like a loss of the radio link also cause transitions.

2.2.10 Handover

The LTE signaling application supports a handover within the signaling application, to another signaling application or to an external instrument.

The following handover mechanisms are supported:

- Handover:
  The R&S CMW performs an RRC connection reconfiguration. The reconfiguration message includes inter-RAT mobility control information.
  This mechanism allows you to perform a connected-mode handover to a WCDMA or GSM signaling application. Option R&S CMW-KS510 is required.
  After handover completion, the UE has been detached in the LTE signaling application. In the target signaling application, a new connection has been established.
- Blind handover:

The R&S CMW performs an RRC connection reconfiguration. The reconfiguration message includes intra-RAT mobility control information.
This mechanism is relevant for a handover within the signaling application. You can change the operating band and the channel, but not the cell bandwidth.

- Redirection:
  The R&S CMW performs an RRC connection release with redirection information.
  This mechanism is relevant for a handover within the signaling application and for a handover to another signaling application or another instrument.
  For a handover within the signaling application, it is possible to change the operating band, the channel and the cell bandwidth. A new connection with the changed parameters is established.
  A handover to another signaling application or instrument results in a new registration of the UE at the handover destination. No new connection is set up.
- Mobile-terminating circuit-switched fallback:
  The R&S CMW informs the UE via a CS service notification about an incoming mobile-terminating call. The UE answers with an extended service request with circuit-switched fallback (CSFB) response. Then the R&S CMW performs an RRC connection release with redirection information. The UE sends a paging response to the handover destination and a new CS connection is established by the target signaling application.
  This mechanism is only supported for handover to another signaling application. Supported technologies are for example GSM, WCDMA and TD-SCDMA. The target signaling application can be at the same instrument or at another R&S CMW.
  Option R&S CMW-KS510 is required.

For a handover to another instrument, there is no communication at all between the two instruments and no cabling between the two instruments is required. The UE must be connected to both instruments, e.g. via an external combiner.

How to perform a handover

1. For a handover within the signaling application, configure the easy mode as desired. See "Easy Mode" on page 175.
2. In the LTE signaling application, establish a connection to the UE.
3. Press the hotkey "Inter/Intra-RAT". A configuration dialog box opens.
4. Configure the settings in the dialog:
   a) Select the handover target - either the LTE signaling application or another signaling application or "No Connection" for an external instrument.
   b) Select a handover mechanism.
   c) Configure the destination parameters. For a handover to an external instrument, the parameters must reflect the actual configuration of the external instrument.
   d) If you have selected another signaling application as target, the LTE signaling application automatically activates the target cell (switches on the downlink signal).
   Wait until the cell icon includes "RDY" to indicate that the handover target is ready to receive the handover.

See also "Troubleshooting" on page 37

5. Press the button "Execute".

   You can monitor the process in the "Event Log" area of the main view of the signaling applications.

If you want to reconfigure only one parameter of the LTE signaling application, you can change it directly, without using the "Inter/Intra-RAT" hotkey. Simply modify the channel or the operating band or the cell bandwidth during an established connection. The R&S CMW then initiates a redirection procedure to reconfigure the parameter.

Troubleshooting

If you get an error message, stating that blind handover is not supported, this message indicates that the handover source and target must use different RF paths. Otherwise, they cannot be active in parallel.

In that case, configure different RX/TX modules ("Converter" setting) for the handover source and target. Keep in mind that several RF paths can be used by the LTE signaling application, for example for MIMO or carrier aggregation.

Whether a blind handover is supported depends on the target RAT and on the used handover mechanism.

2.2.11 Physical DL Channels and Signals

This section provides an overview of the LTE downlink radio resources, physical channels and physical signals.

See also Chapter 2.2.17, "Operating Bands", on page 67.

● Resources in Time and Frequency Domain....................37
● Physical Channel Overview....................41
● Physical Signal Overview....................41

2.2.11.1 Resources in Time and Frequency Domain

The DL radio resources in an LTE system are divided into time-frequency units called resource elements. In the time domain, a resource element corresponds to one OFDM symbol. In the frequency domain, it corresponds to one subcarrier (see next figure).

For the mapping of physical channels to resources, the resource elements are grouped into resource blocks (RB). Each RB consists of 12 consecutive subcarriers (180 kHz) and six or seven consecutive OFDM symbols (0.5 ms).

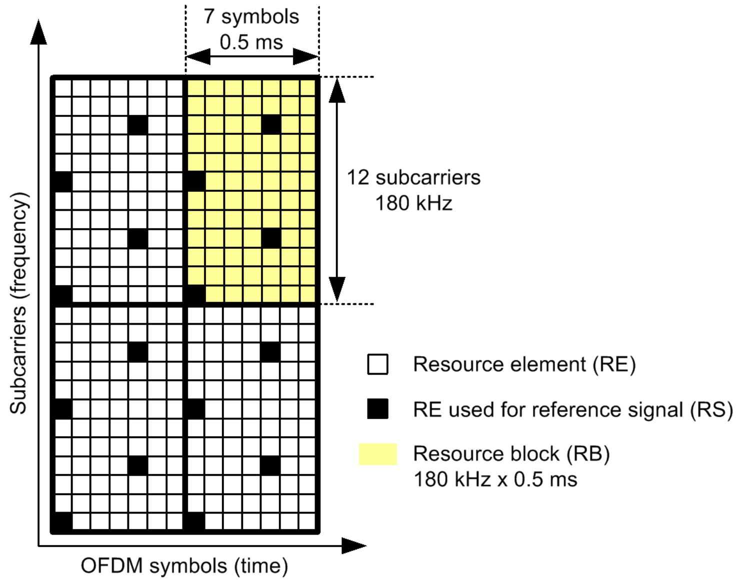


Figure 2-10: Resource element grid (7 OFDM symbols per RB, 1 TX antenna)

The positions of resource elements carrying reference signals (pilots) are standardized and depend on the number of transmit antennas. The preceding figure applies to single-antenna configurations. If more than one transmit antenna is used, each antenna uses different resource elements for reference signals. These resource elements are reserved for one antenna and not used at all by the other antennas. The following figure shows the resource element grid for a two transmit antenna configuration, used e.g. for MIMO 2x2.

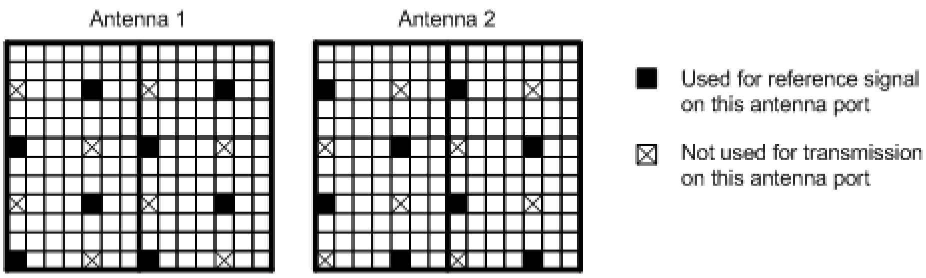


Figure 2-11: Resource element grids for two TX antennas

The smallest resource unit that can be assigned to a UE consists of two resource blocks (180 kHz, 1 ms). The assignment of resources to a UE can vary in time and frequency domain (see next figure).

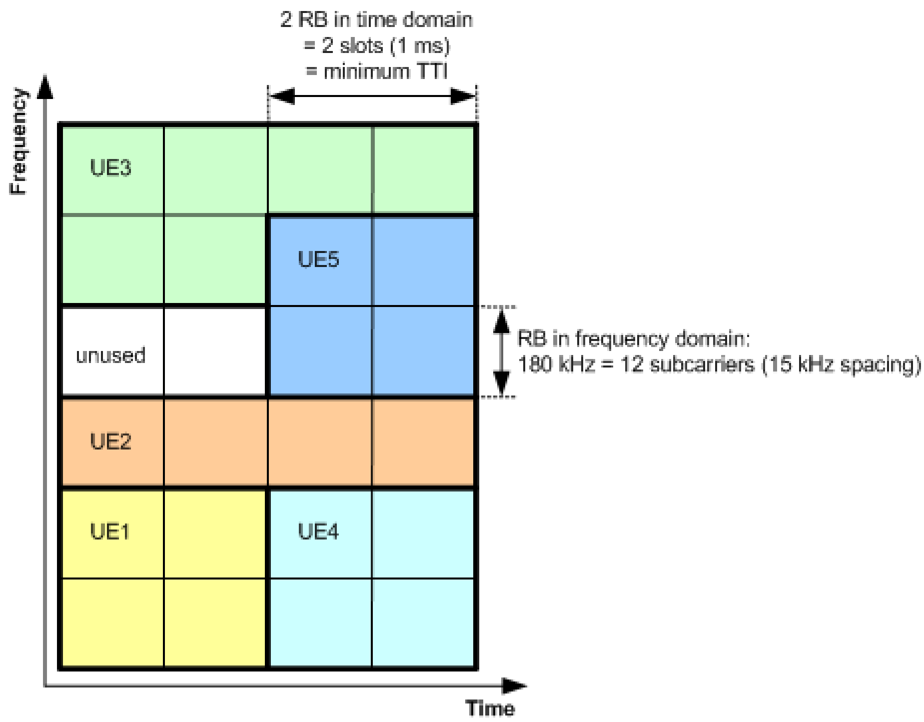


Figure 2-12: Assignment of resource blocks (RB) to UEs

In the time domain, the additional units radio frame, subframe and slot (containing the OFDM symbols) are defined. A guard time called cyclic prefix (CP) is added to each OFDM symbol. Depending on the duration of the guard time, it is either called normal CP or extended CP and the slot contains either seven or six OFDM symbols.

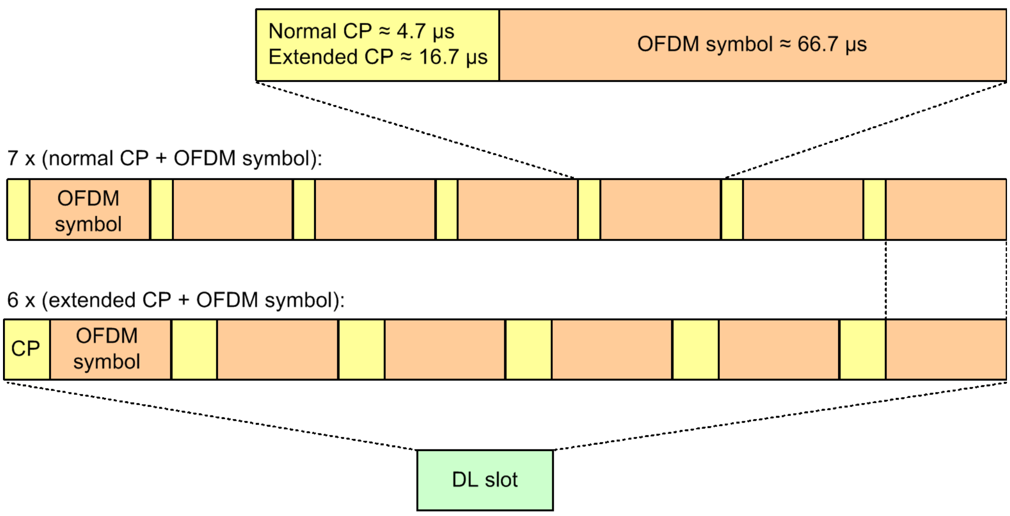


Figure 2-13: LTE DL slot structure

The radio frame structure depends on the duplex mode. An FDD DL radio frame contains 20 DL slots, grouped into 10 subframes.

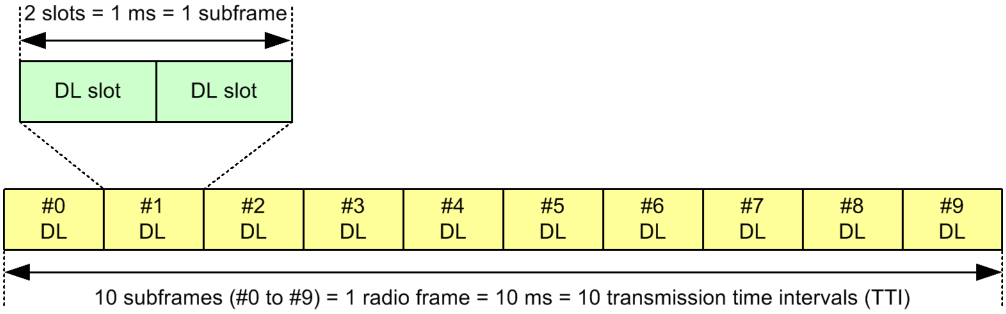


Figure 2-14: LTE DL frame structure for FDD

A TDD radio frame is also divided into 10 subframes. But for TDD three subframe types are defined: DL subframe (two DL slots), UL subframe (two UL slots) and special subframe. A special subframe contains the fields DwPTS, GP and UpPTS. 3GPP defines several possible special subframe configurations, resulting in different lengths of these fields, see 3GPP TS 36.211, table 4.2-1. The total length of a special subframe equals 1 ms (same length for all subframe types).

The type of subframe number 0, 1, 2 and 5 is fixed. The type of the other subframes depends on the used UL-DL configuration, see Table 2-3.

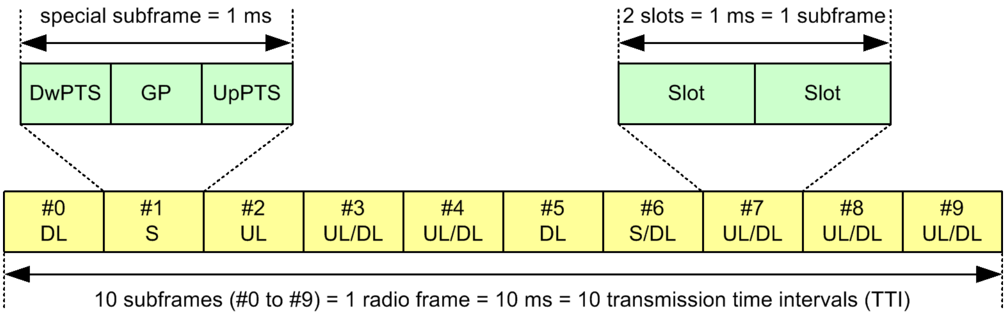


Figure 2-15: LTE DL frame structure for TDD

Table 2-3: Uplink-downlink configuration 0 to 6

	Subframe number									
Configuration	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	D	S	U	U	U	D	S	U	U	U
1	D	S	U	U	D	D	S	U	U	D
2	D	S	U	D	D	D	S	U	D	D
3	D	S	U	U	U	D	D	D	D	D
4	D	S	U	U	D	D	D	D	D	D
5	D	S	U	D	D	D	D	D	D	D
6	D	S	U	U	U	D	S	U	U	D
D = downlink, U = uplink, S = special subframe										

2.2.11.2 Physical Channel Overview

A downlink physical channel corresponds to a set of resource elements carrying information originating from higher layers. Physical channels can be either broadcast channels or shared channels. Dedicated channels are not used for LTE.

Broadcast channels carry messages that are not directed at a particular UE; they are point-to-multipoint channels. Shared channels are shared by several UEs. At a given time, a shared channel is assigned to one UE only, but the assignment can change within a few timeslots.

An overview of the physical channels of the generated downlink signal is given in the following table.

Table 2-4: Channel overview

Physical DL channel	Purpose / type / modulation scheme
Physical broadcast channel (PBCH)	Provides physical layer information of the cell to be read during cell search, e.g. system bandwidth, number of transmit antennas, reference signal transmit power Broadcast; QPSK
Physical control format indicator channel (PCFICH)	Carries information about PDCCH format (number of OFDM symbols in the beginning of a subframe used for PDCCH) Broadcast; QPSK
Physical hybrid ARQ indicator channel (PHICH)	Carries ACK/NACK indicators for uplink packets Shared; QPSK
Physical downlink control channel (PDCCH)	Carries UE-specific control information, i.e. scheduling information or UL power control commands Shared; QPSK
Physical downlink shared channel (PDSCH)	Carries user data Shared; QPSK, 16-QAM, 64-QAM or 256-QAM

2.2.11.3 Physical Signal Overview

A downlink physical signal corresponds to a set of resource elements carrying information originating from the physical layer. Two types of downlink physical signals are available: Reference signals and synchronization signals.

Table 2-5: Signal overview

Physical DL signal	Purpose / transmission modes / antenna ports
Cell-specific reference signal (C-RS)	For demodulation and channel quality feedback calculation Available for all transmission modes Up to TM 7 port 0, TM 8/9 ports 0 and 1
UE-specific reference signal (UE-RS)	For demodulation of signals with beamforming (BF), TM 7 to 9 TM 7 port 5 TM 8/9 single-layer BF port 8 TM 8/9 dual-layer BF ports 7 and 8

Physical DL signal	Purpose / transmission modes / antenna ports
Channel state information reference signal (CSI-RS)	For channel quality feedback calculation, TM 9 Ports configurable: 15 / 15-16 / 15-18 / 15-22
Primary synchronization signal (PSS) Secondary synchronization signal (SSS)	Acquisition of cell timing and cell identity during cell search

For more details about reference signals, see 3GPP TS 36.211, section 6.10.

2.2.12 MIMO and Beamforming

Multiple input multiple output (MIMO) systems are essential for the LTE downlink to achieve the specified throughput and spectral efficiency requirements. The term MIMO refers to the use of multiple antennas at transmitter side (input to radio channel) and receiver side (output of radio channel). As a special MIMO technique, beamforming improves the transmission to users at the cell edges via directional downlink transmission.

Different gains can be achieved via MIMO depending on the used transmission scheme. The "LTE signaling" application supports the following transmission schemes:

- **Spatial multiplexing**
  Spatial multiplexing uses at least two transmit antennas and two receive antennas. Different data streams are transmitted simultaneously on the same resource blocks. The data streams can belong to one single user (SU-MIMO) or to different users (MU-MIMO). While SU-MIMO increases the data rate of one user, MU-MIMO increases the overall capacity.
  Spatial multiplexing requires precoding at the transmitter side. Two types of spatial multiplexing are defined, using different mechanisms for selection of the precoding matrix. For closed loop (CL) spatial multiplexing, the UE estimates the radio channel, determines the optimum matrix and proposes this precoding matrix by reporting a PMI value to the eNodeB. With open loop (OL) spatial multiplexing, the eNodeB selects a matrix without UE feedback.
  The "LTE signaling" application supports open-loop and closed-loop spatial multiplexing for a single user.
- **Transmit diversity**
  Transmit diversity uses several antennas transmitting essentially the same stream of data. This mechanism increases the signal to noise ratio at the receiver side and thus the robustness of data transmission, especially in fading scenarios.
- **Receive diversity (SIMO)**
  Receive diversity uses several antennas at the receiver side to receive the same data stream. Like transmit diversity, this mechanism increases the signal to noise ratio.
- **Beamforming**
  Beamforming uses multiple antennas. It controls the direction of the wavefront by weighting the magnitude and phase of the individual antenna signals. Beamforming makes it possible, to provide better coverage to specific areas along the cell edges.

The UE-specific reference signals and the data transmission use the same antenna weightings and antenna ports (see Table 2-5). For the cell-specific reference signals and the CSI reference signals, there is no beamforming.

For transmission schemes without beamforming, the number of used antennas is denoted as "TxR", with T transmit antennas and R receive antennas. The "LTE signaling" application supports the following antenna configurations for the LTE downlink:

- SISO 1x1
- SIMO 1x2 (requires R&S CMW-KS520)
- MIMO 2x2 (requires R&S CMW-KS520)
- MIMO 4x2 (requires R&S CMW-KS520 and -KS521)
- MIMO 8x2 (requires R&S CMW-KS520, -KS521 and -KS522)

For MIMO configuration, you must set the parameters "Scenario" and "Transmission Mode" (see "Scenario" on page 128 and Chapter 2.4.12.2, "General MIMO Settings", on page 180).

For some transmission modes, several DCI formats, antenna configurations, precoding matrix indices or transmission schemes are supported, so that you must also configure the corresponding settings. The following table provides an overview of the possible parameter combinations and the resulting transmission scheme.

For more information about the transmission modes and DCI formats, see 3GPP TS 36.213, section 7.1.

Table 2-6: Transmission scheme overview

Scenario[1]	TM[1]	DCI format	Antennas/ beamf.	PMI[1,3]	Transmission scheme
"1 Cell...1 RF Out" "1 Cell - IQ Out, RF In" "<n>CC...", SISO carrier	1	1, 1A	1x1	-	SISO
	7	1	1x1	-	Single-layer beamforming (port 5)
"1 Cell - 2 RF Out" "1 Cell - Fading - 2 RF Out" "<n>CC...", MIMO mx2 carrier	1	1, 1A	1x2	-	SIMO
	2	1, 1A	2x2, 4x2	-	Transmit diversity
	3	1A[5]	2x2, 4x2	-	Transmit diversity
		2A			OL spatial multiplexing
	4	2	2x2	0, 1	CL spatial multiplexing[4]
			4x2	0 to 15	
	6	1B	2x2	0 to 3	CL spatial multiplexing, single layer
			4x2	0 to 15	
	7	1	1x2	-	Single-layer beamforming (port 5)
	8	2B	1x2, 2x2	0 to 3	Single-layer beamforming (port 8)
				1, 2	Dual-layer beamforming (ports 7, 8)
	9	2C	2x2	0, 1, 2, 3, random[6]	Single-layer beamforming (port 8)

Scenario[1]	TM[1]	DCI format	Antennas/ beamf.	PMI[1,3]	Transmission scheme
				0, 1, 2, random[7]	Dual-layer beamforming (ports 7, 8)
			4x2	0 to 15	Single-layer beamforming (port 8) Dual-layer beamforming (ports 7, 8)
			8x2	2x 0 to 15	
"1 Cell - Fading - MIMO4x2 - 2 RF Out" "1 Cell - 4 RF Out"[2]	2	1, 1A	4x2	-	Transmit diversity
	3	1A[5]	4x2	-	Transmit diversity
		2A	4x2	-	OL spatial multiplexing
	4	2	4x2	0 to 15	CL spatial multiplexing[4]
	6	1B	4x2	0 to 15	CL spatial multiplexing, single layer
	9	2C	4x2	0 to 15	Single-layer beamforming (port 8) Dual-layer beamforming (ports 7, 8)

1) TM = transmission mode, PMI = precoding matrix indicator, CC = component carrier, CA = carrier aggregation

2) Output before radio channel, for example for external RF fading

3) Depending on the scheduling type, the used PMI value is configured statically or it follows the PMI value reported by the UE

4) Depending on the scheduling type, the transmission scheme is configured statically or it follows the RI value reported by the UE. In the latter case, the scheme can change to transmit diversity.

5) For scheduling type "Follow WB CQI-RI", only DCI format 2A is supported.

6) For the "Follow..." scheduling types, random is not allowed.

7) For the "Follow..." scheduling types, 0 and random are not allowed.

2.2.12.1 Radio Channel Coefficients for MIMO

A MIMO 2x2 configuration uses two transmit antennas (TX) and two receive antennas (RX). An ideal radio channel would provide isolated connections between pairs of antennas, so that each RX antenna receives only the signal of one TX antenna.

In practice, an ideal radio channel is not possible. A real radio channel couples the sent signals, so that the RX antennas always receive a combination of the TX antenna signals. The following figure shows a radio channel for MIMO 2x2, assuming that there is only one signal path between each TX and RX antenna.

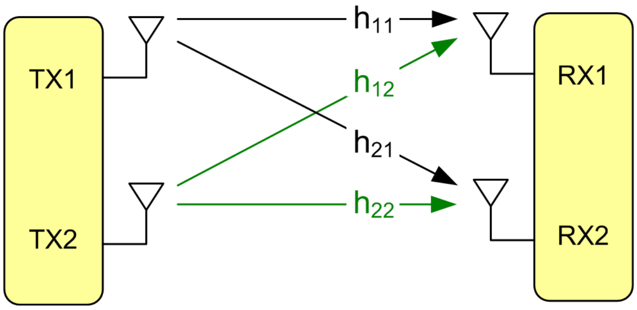


Figure 2-16: Radio channel for MIMO 2x2, TM 2 to 6

The channel amplitude and phase responses for the individual transmission paths can be characterized by the complex coefficients h_{11} to h_{22}.

The indices for TM 2 to 6 specify the receiver first (h_{ab} for receiver a / transmitter b). For other transmission modes, the indices specify the transmitter first (h_{ab} for transmitter a / receiver b).

In a test setup with the R&S CMW and a UE, the radio channel is typically located within the instrument. Each RF output connector is connected directly to one UE antenna connector.

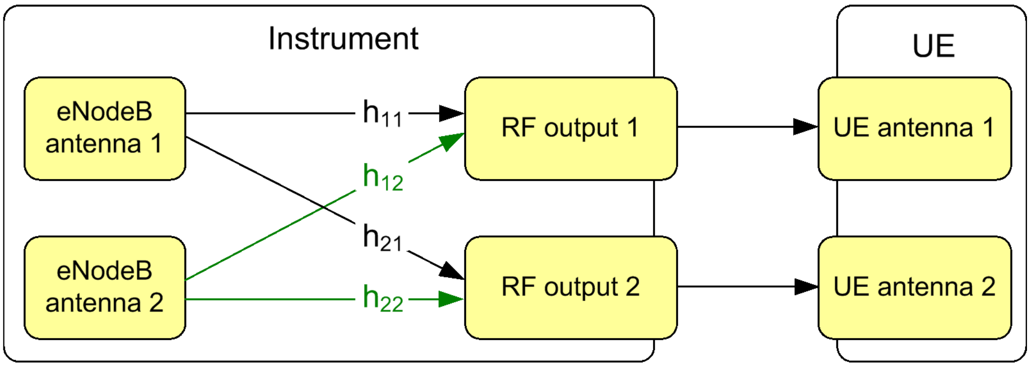


Figure 2-17: "Radio channel" in a test setup, MIMO 2x2, TM 2 to 6

For fading scenarios, the coefficients are determined dynamically. For scenarios without fading, you can configure static channel coefficients. See for example Chapter 2.4.12.3, "MIMO Channel Model TM 2 to TM 6", on page 182.

A MIMO 4x2 configuration uses four TX and two RX antennas. So the setup is as follows:

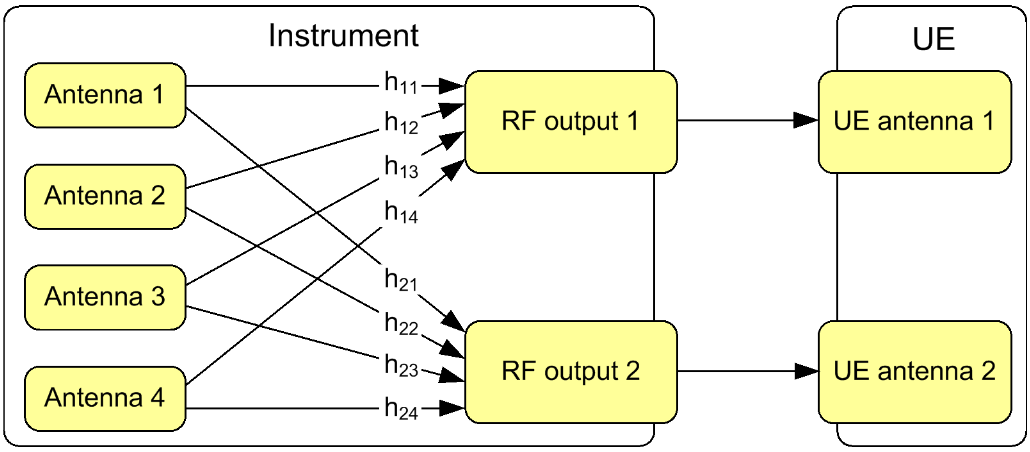


Figure 2-18: "Radio channel" in a test setup, MIMO 4x2, TM 2 to 6

For MIMO 4x2 with external RF fading, use the scenario "1 Cell - 4 RF Out". This scenario provides the four antenna signals at four different RF connectors.

The principles described here for MIMO 2x2 and MIMO 4x2 apply also to the other MIMO modes. A MIMO axb configuration uses a TX antennas, b RF output paths and b RX antennas.

2.2.12.2 Beamforming Matrix

For transmission schemes with beamforming, beamforming is applied to antenna ports with UE-specific signals. For cell-specific signals, there is no beamforming.

The used ports depend on the transmission scheme and on the number of beamforming layers. In general, the antenna ports 0 and 1 can be used by a transmission scheme for cell-specific signals. The antenna ports 5, 7 and higher can be used for UE-specific signals.

The coefficients of a beamforming matrix are similar to the coefficients of a channel matrix. They are complex coefficients, have a magnitude and a phase and define an amplitude response and a phase response.

For TM 8, there is a beamforming matrix and a channel matrix. They are independent and can have different coefficients. Without fading, you can configure both matrices.

The following example visualizes the matrices for TM 8 with dual-layer beamforming.

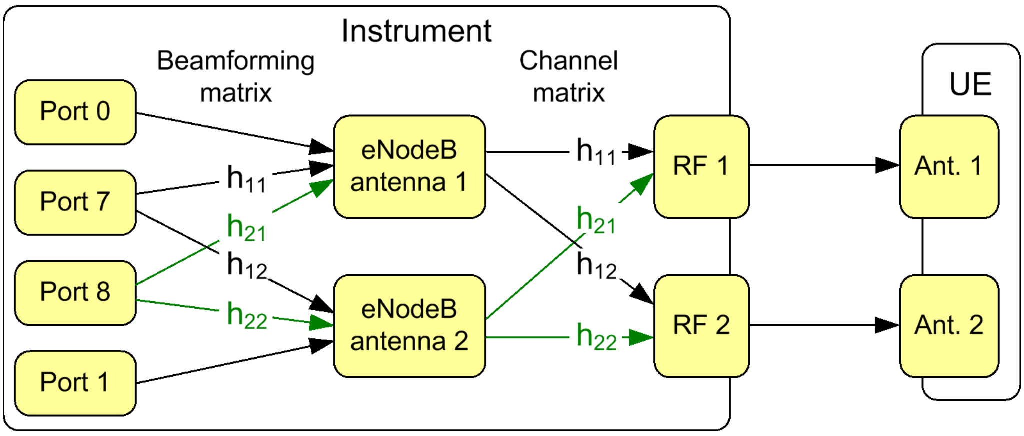


Figure 2-19: Beamforming and channel matrices, 2x2, transmission mode 8

For TM 7, there is only a beamforming matrix. The following example shows a 1x2 matrix for TM 7 with single-layer beamforming. Port 0 is in this example mapped to only one RF output. You can also map it to both RF outputs.

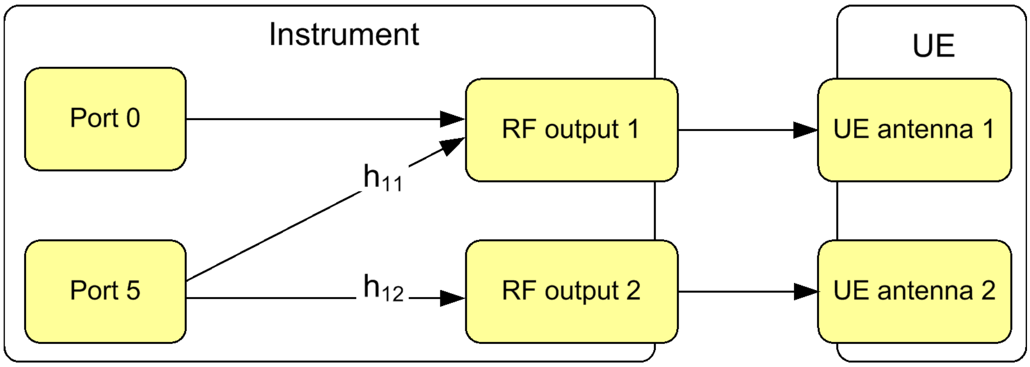


Figure 2-20: Beamforming matrix, 1x2, transmission mode 7

For transmission mode 9, you do not configure a beamforming matrix. Instead, you define the beamforming via the number of TX antennas and one or two precoding matrix indices.

2.2.13 Scheduling Type RMC

Reference measurement channels (RMC) as defined in 3GPP TS 36.521 are required for various transmitter and receiver conformance tests.

An RMC can be defined via the following set of parameters:

- Channel bandwidth
- Number of allocated resource blocks (RB)
- Position of the first allocated RB
- Modulation type
- Transport block size index (TBS index)

The parameter combinations supported by the R&S CMW are listed in the following sections. Many other parameters are indirectly determined by these parameters. Refer to 3GPP TS 36.521 for detailed tables. Some of these parameters are also displayed at the GUI for information.

In addition to the 3GPP-compliant combinations, the tables list also the configurable combinations without RB allocation ("Allocated RBs" = 0).

If you want to force the UE to use the PUCCH instead of the PUSCH, set the number of UL resource blocks to 0. Thus the UE is not allowed to use the PUSCH and must use the PUCCH to send ACK/NACKs.

- UL RMCs, Contiguous Allocation....48
- UL RMCs, Multi-Cluster....52
- DL RMCs, One TX Antenna (TM 1)....52
- DL RMCs, Multiple TX Antennas (TM 2 to 6)....54
- DL RMCs, Transmission Mode 7....56
- DL RMCs, Transmission Mode 8....57
- DL RMCs, Transmission Mode 9....58

2.2.13.1 UL RMCs, Contiguous Allocation

This section lists the supported parameter sets for UL RMCs with contiguous RB allocation (resource allocation type 0).

For allowed RB positions, see "Position of first RB, contiguous allocation" on page 49.

Table 2-7: UL RMCs for FDD and TDD, contiguous

Bandwidth	Allocated RBs	TBS idx (QPSK)	TBS idx (16-QAM)
1.4 MHz to 20 MHz	0	0	-
	1	5	19
	2	6	19
	3	6	19
	4	6	19
	5	5	19
	6	6	19
3 MHz to 20 MHz	8	6	19
	9	5	19
	10	5	19
	12	6	19
	15	6 for 3 MHz, else 5	14
5 MHz to 20 MHz	16	5	14
	18	6	14
	20	5	11
	24	6	11
	25	5	11
10 MHz to 20 MHz	27	6	10
	30	5	19
	32	5	19
	36	6	19
	40	6	19
	45	5	19
	48	5	19
	50	6	19
15 MHz to 20 MHz	54	5	19
	60	4	18
	64	4	18

Bandwidth	Allocated RBs	TBS idx (QPSK)	TBS idx (16-QAM)
	72	4	14
	75	3	14
20 MHz	80	3	14
	81	3	14
	90	2	12
	96	2	12
	100	2	11

Position of first RB, contiguous allocation

Two start positions are always allowed:

- Low: lower end of channel bandwidth, starting with first RB
- High: upper end of channel bandwidth, up to last RB

If the number of allocated RBs equals one, an additional position is allowed:

- Middle: RB located in the middle of the channel bandwidth
  The position is calculated as the smallest integer number ≥ N_{RB} / 2, with N_{RB} being the number of RBs in a full RB allocation.

Additional special start positions are allowed if certain conditions are fulfilled. The special start positions are listed in the following tables. Column "Conditions" lists the operating band and the network signaled value for which the special start positions are supported. Column "3GPP tables" indicates in which table of 3GPP TS 36.521 the start positions are defined.

Table 2-8: Special start positions, UL RMCs for FDD, contiguous

Conditions	3GPP tables	Bandwidth	Alloc. RBs	Modulation	Position first RB
Band 1 NS_05	6.2.4.4.1-3 6.6.3.3.4.1-1	15 MHz	1	QPSK	8, 66
			16	QPSK	8, 51
			30	QPSK	8, 37
			48	QPSK	8, 19
		20 MHz	1	QPSK	24, 75
			18	QPSK	24, 58
			24	QPSK	24, 52
			48	QPSK	24, 28
Band 13 NS_07	6.2.4.4.1-5 6.6.2.2.4.1-3 6.6.3.3.4.1-2	10 MHz	2	QPSK	48
			6	QPSK	13, 43
			12	QPSK	13, 19
			16	QPSK, 16-QAM	19
			20	QPSK	13

Conditions	3GPP tables	Bandwidth	Alloc. RBs	Modulation	Position first RB
			30	QPSK, 16-QAM	19
			36	16-QAM	13
Band 26 NS_12	6.2.4.4.1-10	1.4 MHz	1, 5	QPSK	1
		3 MHz	4, 10	QPSK	4
		5 MHz	8, 15	QPSK	7
		10 MHz	18	QPSK	16
		15 MHz	30	QPSK	31
Band 26 NS_13	6.2.4.4.1-11	5 MHz	15	QPSK	7
Band 26 NS_14	6.2.4.4.1-12	10 MHz	25	QPSK	1
		15 MHz	50	QPSK	15
Band 26 NS_15	6.2.4.4.1-13	3 MHz	6	QPSK	7
			12	QPSK	1
		5 MHz	6	QPSK	14
			16	QPSK	9
		10 MHz	1	QPSK	10, 39
			20	QPSK	3, 25
			36	QPSK	1
		15 MHz	18	QPSK	36, 44
			25	QPSK	1
			60	QPSK	2
Band 27 NS_16	6.2.4.4.1-14	3 MHz	12	QPSK	1
		5 MHz	12, 18, 20	QPSK	2
		10 MHz	1	QPSK	10
			27, 32	QPSK	15
			40	QPSK	1
Band 20	7.3.3-2	15 MHz	20	QPSK	11
		20 MHz	20	QPSK	16
Band 31	7.3.3-2	3 MHz	5	QPSK	9
		5 MHz	5	QPSK	10
Band 12	7.3A.1.3-0b	1.4 MHz	2	QPSK	middle
		3 MHz	5	QPSK	middle
		5 MHz	8	QPSK	middle
		10 MHz	16	QPSK	middle

Conditions	3GPP tables	Bandwidth	Alloc. RBs	Modulation	Position first RB
Band 17	7.3A.1.3-0b	5 MHz	8	QPSK	middle
		10 MHz	16	QPSK	middle
Band 1 CA_NS_01	6.2.4A.1.4.1-1 6.6.3.3A.1.4.1-1	15 MHz	45	QPSK	7
		20 MHz	64	QPSK	24
Band 1 CA_NS_02	6.2.4A.1.4.1-2 6.6.3.3A.1.4.1-2	15 MHz	1	QPSK	54
		20 MHz	1	QPSK	21, 83
Band 1 CA_NS_03	6.2.4A.1.4.1-3 6.6.3.3A.1.4.1-3	15 MHz	1	QPSK	21, 44
		20 MHz	1	QPSK	63, 70
Band 2	7.xA.4.4.1-1 7.x.xA.4.4.1-1	20 MHz	16	QPSK	57
Band 3	7.xA.4.4.1-1 7.x.xA.4.4.1-1	20 MHz	16	QPSK	50
Band 25	7.xA.4.4.1-1 7.x.xA.4.4.1-1	10 MHz	10	QPSK	33
		20 MHz	12	QPSK	62

Table 2-9: Special start positions, UL RMCs for TDD, contiguous

Conditions	3GPP tables	Bandwidth	Alloc. RBs	Modulation	Position first RB
Band 41 NS_04	6.2.4.4.1-2	10 MHz	24	QPSK, 16-QAM	13
			36	QPSK	13
			12	QPSK	37
			1	QPSK	49
		15 MHz	36	QPSK, 16-QAM	19
			50	QPSK	19
			18	QPSK	56
			1	QPSK	74
		20 MHz	50	QPSK, 16-QAM	25
			75	QPSK	25
			25	QPSK	75
			1	QPSK	99
Band 41 CA_NS_04	6.2.4A.1.4.1-4 6.6.2.2A.1.4.1-1	15 MHz	10	QPSK	20
			20	16-QAM	15
		20 MHz	10	QPSK	20, 25
			15	16-QAM	40
			20	16-QAM	30

Conditions	3GPP tables	Bandwidth	Alloc. RBs	Modulation	Position first RB
Band 39 CA_NS_07	6.2.4A.1.4.1-7 6.6.3.3A.1.4.1-6	15 MHz	40	QPSK	20
		20 MHz	1	QPSK	1
			10, 30	QPSK	30
			40	QPSK	20

2.2.13.2 UL RMCs, Multi-Cluster

The following table lists the supported parameter sets for UL RMCs with multi-cluster RB allocation (resource allocation type 1).

The allocated resource blocks are divided into two clusters. Within each cluster, the RB allocation is contiguous. The number of allocated resource blocks and the position of the first allocated resource block are specified per cluster.

Multi-cluster RMCs are not yet defined in 3GPP TS 36.521, but there is an approved proposal. Option R&S CMW-KS510/-KS512 is required (without CA/with CA).

Table 2-10: UL RMCs for FDD and TDD, multi-cluster

Bandwidth	Alloc. RBs Cluster 1	First RB Cluster 1	Alloc. RBs Cluster 2	First RB Cluster 2	Modulation	TBS index
5 MHz	2	0	1	24	16-QAM	11
			18	6	16-QAM	11
	18	0	2	22	16-QAM	11
10 MHz	3	0	2	48	16-QAM	11
			42	6	16-QAM	11
	42	0	3	45	16-QAM	11
15 MHz	4	0	60	12	16-QAM	11
	8	0	7	68	16-QAM	11
	60	0	4	68	16-QAM	11
20 MHz	4	0	4	96	16-QAM	11
			92	8	16-QAM	11
	92	0	4	96	16-QAM	11

2.2.13.3 DL RMCs, One TX Antenna (TM 1)

The following table lists the supported parameter sets for downlink RMCs when only one TX antenna is used in the downlink.

The resource blocks allocated in the DL are contiguous. The position of the first allocated RB is indicated as follows:

- L: lower end of channel bandwidth, starting with first RB

- H: upper end of channel bandwidth, up to last RB
- 5, 10, 23, 35, 48: special start positions for 3GPP TS 36.521, table C.2-2.

For 256-QAM, option R&S CMW-KS504/-KS554 is required.

Table 2-11: DL RMCs, single TX antenna

Bandwidth	Allocated RBs	Position first RB	Modulation	TBS index
1.4 MHz	0	L, H	QPSK	0
	3	L, H	QPSK	1
	6	L, H	QPSK	4
			16-QAM	12
			64-QAM	21
			256-QAM	29
3 MHz	0	L, H	QPSK	0
	1	L, H	16-QAM	13
	4	L, H	QPSK	5
	6	L, H, 5	16-QAM	12
	15	L, H	QPSK	5
			64-QAM	23
			256-QAM	31
5 MHz	0	L, H	QPSK	0
	6	L, H, 10	16-QAM	12
	8	L, H	QPSK	5
	16	L, H	64-QAM	25*
	18	L, H	64-QAM	23
	25	L, H	QPSK	5
			16-QAM	13
			64-QAM	23
			256-QAM	30
10 MHz	0	L, H	QPSK	0
	1	L, H	16-QAM	14
	6	L, H, 23	16-QAM	12
	16	L, H	QPSK	5
			64-QAM	25*
	17	L, H	64-QAM	24
	50	L, H	QPSK	5
			16-QAM	14

Bandwidth	Allocated RBs	Position first RB	Modulation	TBS index
			64-QAM	24
			256-QAM	32
15 MHz	0	L, H	QPSK	0
	6	L, H, 35	16-QAM	12
	16	L, H	64-QAM	25*
	17	L, H	64-QAM	24
	25	L, H	QPSK	5
	75	L, H	QPSK	5
			64-QAM	25
			256-QAM	32
20 MHz	0	L, H	QPSK	0
	1	L, H	16-QAM	14
	6	L, H, 48	16-QAM	12
	16	L, H	64-QAM	25*
	17	L, H	64-QAM	24
	30	L, H	QPSK	5
	83	L, H	64-QAM	24
	100	L, H	QPSK	5
			64-QAM	24
			256-QAM	32

*) The entries with a * in the last column have been removed from 3GPP TS 36.521, but are still supported for FDD for backward compatibility reasons. They are not supported for TDD.

2.2.13.4 DL RMCs, Multiple TX Antennas (TM 2 to 6)

For multiple TX antennas (e.g. MIMO 2x2), 3GPP has not yet specified DL RMCs for all channel bandwidths. For that reason, the R&S CMW supports also some RMCs only specified for single-antenna configurations. All supported parameter combinations are listed in the following tables.

The allocated resource blocks are contiguous and at the low or high end of the channel bandwidth.

Table 2-12: DL RMCs for FDD, multiple TX antennas

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	QPSK	0
	6	QPSK	4

Bandwidth	Allocated RBs	Modulation	TBS index
3 MHz	0	QPSK	0
	15	QPSK	5
5 MHz	0	QPSK	0
	25	QPSK	5
		16-QAM	12
10 MHz	0	QPSK	0
	40	16-QAM	13
	50	QPSK	5
		16-QAM	13
		64-QAM	18
15 MHz	0	QPSK	0
	75	QPSK	5
20 MHz	0	QPSK	0
	100	16-QAM	13

Some TDD RMCs defined by 3GPP have the same channel bandwidth, number of RBs, modulation type and TBS index. The additional parameter "Version" is introduced to distinguish between these RMCs. The RMCs are defined in 3GPP TS 36.521, table A.3.4.2.1-1.

Table 2-13: DL RMCs for TDD, multiple TX antennas

Bandwidth	Allocated RBs	Modulation	TBS index	Version
1.4 MHz	0	QPSK	0	-
	6	QPSK	4	-
3 MHz	0	QPSK	0	-
	15	QPSK	5	-
5 MHz	0	QPSK	0	-
	25	16-QAM	12	-
10 MHz	0	QPSK	0	-
	40	16-QAM	13	-
	50	QPSK	5	-
		16-QAM	13	0: R.11 1: R.11-1
		64-QAM	18	-
15 MHz	0	QPSK	0	-
	75	QPSK	5	-

Bandwidth	Allocated RBs	Modulation	TBS index	Version
20 MHz	0	QPSK	0	-
	100	16-QAM	13	0: R.30 1: R.30-1

2.2.13.5 DL RMCs, Transmission Mode 7

The following tables list the supported parameter sets for downlink RMCs when transmission mode 7 is used.

The TDD RMCs for 5 MHz and 10 MHz bandwidth are defined in 3GPP TS 36.521, table A.3.4.3.1-1. For the other bandwidths and FDD, 3GPP has not yet specified DL RMCs for TM 7, but the listed parameter combinations are supported.

The listed allocated resource blocks are contiguous and at the low or high end of the channel bandwidth. In subframe 0, a non-contiguous RB allocation is applied (not indicated in the tables).

Table 2-14: DL RMCs for FDD, TM 7

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	16-QAM	0
	6	16-QAM	13
3 MHz	0	16-QAM	0
	15	16-QAM	13
5 MHz	0	16-QAM	0
	25	16-QAM	12
10 MHz	0	16-QAM	0
	50	16-QAM	13
15 MHz	0	16-QAM	0
	75	16-QAM	13
20 MHz	0	16-QAM	0
	100	16-QAM	13

Table 2-15: DL RMCs for TDD, TM 7

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	16-QAM	0
	6	16-QAM	13
3 MHz	0	16-QAM	0
	15	16-QAM	13
5 MHz	0	16-QAM	0

Bandwidth	Allocated RBs	Modulation	TBS index
	25	16-QAM	12
10 MHz	0	QPSK	0
	1	16-QAM	13
	18	64-QAM	23
	50	QPSK	5
		16-QAM	13
		64-QAM	23
15 MHz	0	16-QAM	0
	75	16-QAM	13
20 MHz	0	16-QAM	0
	100	16-QAM	13

2.2.13.6 DL RMCs, Transmission Mode 8

The following tables list the supported parameter sets for downlink RMCs when transmission mode 8 is used.

The TDD RMCs for 5 MHz and 10 MHz bandwidth are defined in 3GPP TS 36.521, table A.3.4.3.2-1. For the other bandwidths and FDD, 3GPP has not yet specified DL RMCs for TM 8, but the listed parameter combinations are supported.

The listed allocated resource blocks are contiguous and at the low or high end of the channel bandwidth. In FDD subframe 0 and TDD subframe 0, 1 and 6, a non-contiguous RB allocation is applied (not indicated in the tables).

Table 2-16: DL RMCs for FDD, TM 8

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	16-QAM	0
	6	16-QAM	12
3 MHz	0	16-QAM	0
	15	16-QAM	12
5 MHz	0	16-QAM	0
	25	16-QAM	12
10 MHz	0	16-QAM	0
	50	16-QAM	12
15 MHz	0	16-QAM	0
	75	16-QAM	12
20 MHz	0	16-QAM	0
	100	16-QAM	12

Table 2-17: DL RMCs for TDD, TM 8

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	16-QAM	0
	6	16-QAM	12
3 MHz	0	16-QAM	0
	15	16-QAM	12
5 MHz	0	16-QAM	0
	25	16-QAM	12
10 MHz	0	QPSK	0
	18	64-QAM	22
	50	QPSK	4
		16-QAM	12
		64-QAM	17
			22
15 MHz	0	16-QAM	0
	75	16-QAM	12
20 MHz	0	16-QAM	0
	100	16-QAM	12

2.2.13.7 DL RMCs, Transmission Mode 9

The following tables list the supported parameter sets for downlink RMCs when transmission mode 9 is used.

The RMCs for 10 MHz bandwidth are defined in 3GPP TS 36.521, table A.3.3.3.1-1, A.3.3.3.2-1, A.3.4.3.3-1, A.3.4.3.4-1 and A.3.4.3.5-1. For the other bandwidths, 3GPP has not yet specified DL RMCs for TM 9, but the listed parameter combinations are supported.

The listed allocated resource blocks are contiguous and at the low or high end of the channel bandwidth. In FDD subframe 0 and TDD subframe 0, 1 and 6, a non-contiguous RB allocation is applied (not indicated in the tables).

Table 2-18: DL RMCs for FDD, TM 9

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	16-QAM	0
	6	16-QAM	12
3 MHz	0	16-QAM	0
	15	16-QAM	12
5 MHz	0	16-QAM	0

Bandwidth	Allocated RBs	Modulation	TBS index
	25	16-QAM	12
10 MHz	0	16-QAM	0
	50	QPSK	4
			7
		16-QAM	12
15 MHz	0	16-QAM	0
	75	16-QAM	12
20 MHz	0	16-QAM	0
	100	16-QAM	12

Table 2-19: DL RMCs for TDD, TM 9

Bandwidth	Allocated RBs	Modulation	TBS index
1.4 MHz	0	16-QAM	0
	6	16-QAM	12
3 MHz	0	16-QAM	0
	15	16-QAM	12
5 MHz	0	16-QAM	0
	25	16-QAM	12
10 MHz	0	QPSK	0
	50	QPSK	4
			7
		16-QAM	12
15 MHz	0	16-QAM	0
	75	16-QAM	12
20 MHz	0	16-QAM	0
	100	16-QAM	12

2.2.14 User-Defined Channels

In addition to RMCs required by conformance tests, the signaling application supports flexibly configurable user-defined channels (option R&S CMW-KS510 required).

User-defined channels are specified via a set of parameters:

- Channel bandwidth
- Number and position of resource blocks (RB)
- Modulation type

- Transport block size index

The supported modulation types are independent of the allocated RBs. For each modulation type, a range of transport block size indices is available.

Two modes are available. One mode allows you to configure UL and DL channels globally, for all subframes. The other mode supports individual settings for each subframe (TTI) of a radio frame (all parameters except channel bandwidth configurable per TTI).

Force PUCCH
If you want to force the UE to use the PUCCH instead of the PUSCH, set the number of resource blocks to 0. Thus the UE is not allowed to use the PUSCH and must use the PUCCH to send ACK/NACKs.

2.2.14.1 Number and Position of RBs (DL)

In the downlink, the used resource allocation type depends on the DCI format:

- Allocation type 2 for DCI formats 1A and 1B
- Allocation type 0 for DCI formats 1, 2, 2A, 2B and 2C

The allowed DCI formats depend on the selected transmission mode, see Table 2-6.

Resource allocation type 2

With resource allocation type 2, the allocated resource blocks are contiguous. You can configure the number of RBs and the position of the first RB.

The number of allocated DL RBs is restricted by an upper limit. Any number of RBs between 0 and this upper limit can be allocated. The maximum number of RBs depends on the channel bandwidth and is listed in Table 2-20. The position of the first allocated RB is freely selectable within the channel bandwidth. Thus allowed positions are 0 to <Maximum no of RBs> - 1.

Resource allocation type 0

With resource allocation type 0, the maximum number of RBs is divided into resource block groups (RBG) with a certain size (see 3GPP TS 36.213, section 7.1.6.1). The RBG size depends on the maximum number of RBs and thus on the channel bandwidth. If the maximum number of RBs is not a multiple of the RBG size, the last RBG is smaller than the other RBGs.

With resource allocation type 0, you can only allocate entire RBGs. You can freely select the allocated RBGs (multi-cluster allocation - only for global configuration, not TTI-based). Or you can allocate a contiguous sequence of RBGs by selecting the start RB and the number of allocated RBs.

The following tables provide an overview of the resource block groups.

Table 2-20: RBG parameters

Channel bandwidth	Maximum no. of RBs	RBG size	Size of last RBG	No. of RBGs	Allowed start RB
1.4 MHz	6	1	1	6	0, 1, 2, 3, 4, 5
3 MHz	15	2	1	8	0, 2, 4, 6, 8, 10, 12, 14
5 MHz	25	2	1	13	0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
10 MHz	50	3	2	17	0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48
15 MHz	75	4	3	19	0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72
20 MHz	100	4	4	25	0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96

Table 2-21: Example: Allowed contiguous allocations, 3 MHz channel bandwidth

Start RB	0	2	4	6	8	10	12	14
No of RBs	2, 4, ..., 14, 15	2, 4, ..., 12, 13	2, 4, ..., 10, 11	2, 4, ..., 8, 9	2, 4, 6, 7	2, 4, 5	2, 3	1

2.2.14.2 Number and Position of RBs (UL)

In the uplink, the total number of allocated RBs is restricted by the following formula, specified in 3GPP TS 36.211. For multi-cluster RB allocation, it applies to the sum of both clusters:

$N_{RB} = 2^i \times 3^j \times 5^k$, with i, j, k being non-negative integer values

Example: For a channel bandwidth of 3 MHz, the following values are allowed in the uplink: 0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15. Not allowed are 7, 11, 13 and 14.

The other rules depend on the selected resource allocation type as described in the following.

Contiguous RB allocation, allocation type 0

This resource allocation type is defined in 3GPP TS 36.213 section 8.1.1.

The position of the first allocated RB is freely selectable within the channel bandwidth. The number of resource blocks is restricted by the maximum number of RBs, depending on the channel bandwidth, in the same way as for the downlink.

You can also allocate no resource blocks at all (N_{RB} = 0). As a result, the UE is not allowed to use the PUSCH and must use the PUCCH instead, e.g. to send ACK/NACK messages.

Resource allocation type 0 is supported for global and TTI-based channel configuration.

Multi-cluster RB allocation, allocation type 1

This resource allocation type is defined in 3GPP TS 36.213 section 8.1.2

The allocated resource blocks are divided into two clusters. Within each cluster, the RB allocation is contiguous. The number of allocated resource blocks and the position of the first allocated resource block are configured per cluster.

Only entire resource block groups (RBG) can be allocated. This restriction affects both the number of RBs that can be allocated per cluster and the allowed positions for the first RB of each cluster. For details, see Table 2-20.

There must be at least one unused RBG between the two clusters. Allocating no RBs to a cluster is not allowed.

Resource allocation type 1 is only supported for global channel configuration. With carrier aggregation, option R&S CMW-KS512 is required.

2.2.14.3 Supported Transport Block Size Indices

The allowed transport block size indices depend on the modulation type.

The DL ranges depend also on whether 256-QAM is used in at least one TTI or not.

The TBS index ranges are listed in the following table.

Table 2-22: Range of transport block size index depending on modulation type

	QPSK	16-QAM	64-QAM	256-QAM
TBS indices for UL, 64-QAM not allowed	0 to 10	10 to 26	n.a.	n.a.
TBS indices for DL, 256-QAM not used	0 to 9	9 to 15	15 to 26	25, 27 to 33
TBS indices for DL, 256-QAM used	0, 2, 4, 6, 8	10 to 15	16 to 24	25, 27 to 33

For DL 256-QAM, option R&S CMW-KS504/-KS554 is required.

2.2.15 CQI Channels

The CQI reporting tests specified in chapter 9 of 3GPP TS 36.521 require downlink signals with a specific CQI index value. For some tests, the CQI index value must be static (for example reported median CQI value plus or minus one). For other tests, the CQI index value must follow the wideband CQI value reported by the UE.

The LTE signaling application provides the following scheduling types for CQI tests:

- Fixed CQI
- Follow wideband CQI
- Follow wideband PMI
- Follow wideband PMI-RI
- Follow wideband CQI-RI
- Follow wideband CQI-PMI-RI

The downlink channel for the individual scheduling types is described in the following sections.

The uplink channel is identical to a user-defined TTI-based uplink channel, see Chapter 2.2.14, "User-Defined Channels", on page 59.

2.2.15.1 Fixed CQI Channels

This scheduling type is supported for the transmission modes 1 to 9. Option R&S CMW-KS510 is required.

The downlink channel is configured via a set of parameters:

- Channel bandwidth
- Number of allocated resource blocks (RB)
- Position of the first allocated RB
- CQI index
- 256-QAM usage

All parameters except the channel bandwidth and the 256-QAM usage can be configured individually for each downlink subframe (TTI) of a radio frame.

The allocated resource blocks are contiguous and the position of the first RB can be configured. The configuration rules are the same as for TTI-based user-defined downlink channels, see Chapter 2.2.14.1, "Number and Position of RBs (DL)", on page 60.

The CQI index determines the channel code rate. The code rate is defined as the number of downlink information bits (including CRC bits) divided by the number of physical channel bits on the PDSCH. The relation is defined in 3GPP TS 36.213, table 7.2.3-1 (without 256-QAM) and table 7.2.3-2 (with 256-QAM).

Table 2-23: CQI indices without 256-QAM

CQI index	Modulation scheme	Target code rate
1	QPSK	0.07617
2		0.11719
3		0.18848
4		0.30078
5		0.43848
6		0.58789
7	16-QAM	0.36914
8		0.47852
9		0.60156
10	64-QAM	0.45508
11		0.55371
12		0.65039
13		0.75391

CQI index	Modulation scheme	Target code rate
14		0.85254
15		0.92578

Table 2-24: CQI indices with 256-QAM

CQI index	Modulation scheme	Target code rate
1	QPSK	0.07617
2		0.18848
3		0.43848
4	16-QAM	0.36914
5		0.47852
6		0.60156
7	64-QAM	0.45508
8		0.55371
9		0.65039
10		0.75391
11		0.85254
12	256-QAM	0.69434
13		0.77832
14		0.86426
15		0.92578

The modulation scheme is selected automatically according to the table. Indirectly, the table also determines the transport block size. The transport block size is selected automatically so that the resulting effective channel code rate approaches the listed target code rate as far as possible. Thus the transport block size depends on the CQI index and on the number of allocated RBs.

2.2.15.2 Follow WB CQI Channels

This scheduling type is supported for the transmission modes 1 to 9. Option R&S CMW-KS510 is required.

The downlink signal reacts to the reported CQI index value. That means, the MCS index value used for the downlink depends on the previous wideband CQI value reported by the UE.

The dependency between CQI and MCS is configured via a mapping table. The table assigns an MCS index value (0 to 28) to each possible reported wideband CQI index value (1 to 15).

The reported PMI and RI values have no effect on the downlink signal.

In addition to the mapping table, you can configure the following downlink settings:

- Channel bandwidth
- Number and position of resource blocks (RB)
- 256-QAM usage

All downlink settings are configured globally, not per TTI. The rules for configuration of the allocated RBs are the same as for user-defined downlink channels (global configuration, not TTI-based), see Chapter 2.2.14.1, "Number and Position of RBs (DL)", on page 60.

Not scheduled subframes

By default, some subframes are not scheduled, as defined in 3GPP TS 36.521, table C3.2-4:

- FDD: Subframes 0 and 5 are not scheduled.
- TDD: Subframes 0, 5, 6 and special subframes are not scheduled.

You can override this behavior and individually enable also these subframes.

2.2.15.3 Follow WB PMI and PMI-RI Channels

The scheduling type "Follow WB PMI" is supported for the transmission modes 4, 6, 8 and 9. The scheduling type "Follow WB PMI-RI" is supported for the transmission modes 4, 8 and 9. Option R&S CMW-KS510/-KS512 is required (without CA/with CA).

The PMI value used for the downlink signal follows the reported PMI value. The reported CQI value has no effect on the downlink signal.

For scheduling type "Follow WB PMI-RI", the reported rank indicator (RI) value determines the transmission scheme:

- Transmission mode 4:
  RI=1: transmit diversity
  RI=2: spatial multiplexing
- Transmission mode 8:
  RI=1: single-layer beamforming (port 8)
  RI=2: dual-layer beamforming (ports 7 and 8)
- Transmission mode 9:
  RI=1: single-layer beamforming (port 8)
  RI=2: dual-layer beamforming (ports 7 and 8)

The downlink signal settings are similar to the settings for user-defined downlink channels (global configuration, not TTI-based), see Chapter 2.2.14, "User-Defined Channels", on page 59.

Not scheduled subframes

By default, some subframes are not scheduled, as defined in 3GPP TS 36.521, table C3.2-3:

- FDD: Subframe 5 is not scheduled.
- TDD: Subframe 5 and special subframes are not scheduled.

You can override this behavior and individually enable also these subframes.

2.2.15.4 Follow WB CQI-RI and CQI-PMI-RI Channels

The scheduling type "Follow WB CQI-RI" is supported for the transmission mode 3. Scheduling type "Follow WB CQI-PMI-RI" is supported for the transmission modes 4, 8 and 9. Option R&S CMW-KS510/-KS512 is required (without CA/with CA).

The downlink signal reacts to the reported values.

The reported CQI index value determines the MCS index value used for the downlink. The dependency between CQI and MCS is configured via a mapping table, as for "Follow wideband CQI". The resource block settings are also similar to the "Follow wideband CQI" settings.

The reported rank indicator (RI) value determines the used transmission scheme, in the same way as for "Follow WB PMI-RI".

For scheduling type "Follow WB CQI-PMI-RI", the used PMI value follows the reported PMI value.

Not scheduled subframes

By default, some subframes are not scheduled, as defined in 3GPP TS 36.521, table C3.2-4:

- FDD: Subframes 0 and 5 are not scheduled.
- TDD: Subframes 0, 5, 6 and special subframes are not scheduled.

You can override this behavior and individually enable also these subframes.

2.2.16 Semi-Persistent Scheduling (SPS)

Applications like voice over LTE require constant but few radio resources. Voice data is sent in small packets that are transmitted in regular intervals.

For such applications, semi-persistent scheduling (SPS) can be used instead of dynamic scheduling. SPS reduces the control channel overhead on the PDCCH, so that a cell can handle more voice calls in parallel. With SPS, the UE gets a semi-persistent grant. The grant allows the UE to use every n^{th} subframe until further notice.

The LTE signaling application supports SPS in transmission mode 1 and 2, uplink and downlink.

The configuration of the resource block allocation is similar to the configuration for a user-defined channel (global configuration, not TTI-based), see Chapter 2.2.14, "User-Defined Channels", on page 59. The rules for the allowed number of RBs and position of the first RB are identical. Exceptions: For SPS, setting the number of RBs to 0 is not allowed. Multi-cluster allocation is not supported.

In contrast to user-defined channels, SPS does not support 64-QAM modulation. The maximum transport block size index is 14, see following table.

Table 2-25: Range of transport block size index depending on modulation type

Modulation type	QPSK	16-QAM	64-QAM
Indices for uplink channels	0 to 10	10 to 14	not supported
Indices for downlink channels	0 to 9	9 to 14	not supported

The configured resource block allocation is granted every n^{th} subframe, where n is configurable from 10 to 640.

If the UE does not use the granted uplink resources for transmission, the allocation expires after some unused subframes (implicit release). In that case, a new grant is sent automatically to the UE.

SPS is only supported for the PCC, not for SCCs. HARQ cannot be combined with SPS. Connected DRX is supported, but without UL dynamic scheduling.

2.2.17 Operating Bands

The carrier frequencies for LTE signals are defined in 3GPP TS 36.101. Each operating band contains carrier frequencies identified by channel numbers (EARFCN, E-UTRA absolute radio frequency channel number). The assignment between channel numbers N and carrier center frequencies F is defined as:

$N = 10 \text{ x } (F - F_{Offset})/\text{MHz} + N_{Offset}$

The tables in this section provide an overview of all supported FDD and TDD operating bands. For each band, they list F_{Offset}, N_{Offset}, channel numbers N and carrier center frequencies F.

The table for FDD uplink signals lists also the separation between uplink carrier frequency and downlink carrier frequency (frequency pair for one UE in FDD mode).

In addition to the 3GPP defined bands listed in the tables, a user-defined operating band is supported (option R&S CMW-KS525 required). It uses a 100-kHz channel raster like the 3GPP defined bands. The frequency range and the channel number range are configurable for uplink and downlink. For configuration, see "Band Definition" on page 136.

Table 2-26: Operating bands for FDD uplink signals

Band	$F_{Offset, UL}$ **/ MHz**	$N_{Offset, UL}$	**Channel** N_{UL}	F_{UL} **/ MHz**	$(F_{DL}-F_{UL})$ **/ MHz**
1	1920	18000	18000 to 18599	1920 to 1979.9	190
2	1850	18600	18600 to 19199	1850 to 1909.9	80
3	1710	19200	19200 to 19949	1710 to 1784.9	95
4	1710	19950	19950 to 20399	1710 to 1754.9	400
5	824	20400	20400 to 20649	824 to 848.9	45
6	830	20650	20650 to 20749	830 to 839.9	45
7	2500	20750	20750 to 21449	2500 to 2569.9	120
8	880	21450	21450 to 21799	880 to 914.9	45

Band	$F_{Offset, UL}$ / MHz	$N_{Offset, UL}$	Channel N_{UL}	F_{UL} / MHz	$(F_{DL}-F_{UL})$ / MHz
9	1749.9	21800	21800 to 22149	1749.9 to 1784.8	95
10	1710	22150	22150 to 22749	1710 to 1769.9	400
11	1427.9	22750	22750 to 22949	1427.9 to 1447.8	48
12	699	23010	23010 to 23179	699 to 715.9	30
13	777	23180	23180 to 23279	777 to 786.9	-31
14	788	23280	23280 to 23379	788 to 797.9	-30
15	1900	23380	23380 to 23579	1900 to 1919.9	700
16	2010	23580	23580 to 23729	2010 to 2024.9	575
17	704	23730	23730 to 23849	704 to 715.9	30
18	815	23850	23850 to 23999	815 to 829.9	45
19	830	24000	24000 to 24149	830 to 844.9	45
20	832	24150	24150 to 24449	832 to 861.9	-41
21	1447.9	24450	24450 to 24599	1447.9 to 1462.8	48
22	3410	24600	24600 to 25499	3410 to 3499.9	100
23	2000	25500	25500 to 25699	2000 to 2019.9	180
24	1626.5	25700	25700 to 26039	1626.5 to 1660.4	-101.5
25	1850	26040	26040 to 26689	1850 to 1914.9	80
26	814	26690	26690 to 27039	814 to 848.9	45
27	807	27040	27040 to 27209	807 to 823.9	45
28	703	27210	27210 to 27659	703 to 747.9	55
30	2305	27660	27660 to 27759	2305 to 2314.9	45
31	452.5	27760	27760 to 27809	452.5 to 457.4	10
65	1920	131072	131072 to 131971	1920 to 2009.9	190
66	1710	131972	131972 to 132671	1710 to 1779.9	400

Table 2-27: Operating bands for FDD downlink signals

Band	$F_{Offset, DL}$ / MHz	$N_{Offset, DL}$	Channel N_{DL}	F_{DL} / MHz
1	2110	0	0 to 599	2110 to 2169.9
2	1930	600	600 to 1199	1930 to 1989.9
3	1805	1200	1200 to 1949	1805 to 1879.9
4	2110	1950	1950 to 2399	2110 to 2154.9
5	869	2400	2400 to 2649	869 to 893.9
6	875	2650	2650 to 2749	875 to 884.9
7	2620	2750	2750 to 3449	2620 to 2689.9

Band	$F_{Offset, DL}$ / MHz	$N_{Offset, DL}$	Channel N_{DL}	F_{DL} / MHz
8	925	3450	3450 to 3799	925 to 959.9
9	1844.9	3800	3800 to 4149	1844.9 to 1879.8
10	2110	4150	4150 to 4749	2110 to 2169.9
11	1475.9	4750	4750 to 4949	1475.9 to 1495.8
12	729	5010	5010 to 5179	729 to 745.9
13	746	5180	5180 to 5279	746 to 755.9
14	758	5280	5280 to 5379	758 to 767.9
15	2600	5380	5380 to 5579	2600 to 2619.9
16	2585	5580	5580 to 5729	2585 to 2599.9
17	734	5730	5730 to 5849	734 to 745.9
18	860	5850	5850 to 5999	860 to 874.9
19	875	6000	6000 to 6149	875 to 889.9
20	791	6150	6150 to 6449	791 to 820.9
21	1495.9	6450	6450 to 6599	1495.9 to 1510.8
22	3510	6600	6600 to 7499	3510 to 3599.9
23	2180	7500	7500 to 7699	2180 to 2199.9
24	1525	7700	7700 to 8039	1525 to 1558.9
25	1930	8040	8040 to 8689	1930 to 1994.9
26	859	8690	8690 to 9039	859 to 893.9
27	852	9040	9040 to 9209	852 to 868.9
28	758	9210	9210 to 9659	758 to 802.9
29[1)]	717	9660	9660 to 9769	717 to 727.9
30	2350	9770	9770 to 9869	2350 to 2359.9
31	462.5	9870	9870 to 9919	462.5 to 467.4
32[1)]	1452	9920	9920 to 10359	1452 to 1495.9
65	2110	65536	65536 to 66435	2110 to 2199.9
66	2110	66436	66436 to 67135 67136 to 67335[1)]	2110 to 2179.9 2180 to 2199.9[1)]
67[1)]	738	67336	67336 to 67535	738 to 757.9
252[2)]	5159.8	255242	255242 to 256046	5159.8 to 5240.2
255[2)]	5744.8	261092	261092 to 261896	5744.8 to 5825.2

1) SCC DL only, not allowed for PCC and UL

2) SCC DL only, not allowed for PCC and UL, option R&S CMW-KS525 required

Table 2-28: Operating bands for TDD signals

Band	F_{Offset} / MHz	N_{Offset}	Channel N	F / MHz
33	1900	36000	36000 to 36199	1900 to 1919.9
34	2010	36200	36200 to 36349	2010 to 2024.9
35	1850	36350	36350 to 36949	1850 to 1909.9
36	1930	36950	36950 to 37549	1930 to 1989.9
37	1910	37550	37550 to 37749	1910 to 1929.9
38	2570	37750	37750 to 38249	2570 to 2619.9
39	1880	38250	38250 to 38649	1880 to 1919.9
40	2300	38650	38650 to 39649	2300 to 2399.9
41	2496	39650	39650 to 41589	2496 to 2689.9
42	3400	41590	41590 to 43589	3400 to 3599.9
43	3600	43590	43590 to 45589	3600 to 3799.9
44	703	45590	45590 to 46589	703 to 802.9
45	1447	46590	46590 to 46789	1447 to 1466.9
46	5150	46790	46790 to 54539	5150 to 5924.9

2.2.18 Trigger Signals

The LTE signaling application provides trigger signals that can be used by other R&S CMW applications to synchronize to the generated LTE downlink signal.

To address the trigger signals in remote commands, use the following strings, with <i> replaced by the instance number of the signaling application and <n> replaced by the SCC number:

- "LTE Sig<i>: FrameTrigger" (for PCC)
- "LTE Sig<i>: FrameTrigger SCC<n>"
- "LTE Sig<i>: PRACH Trigger"
- "LTE Sig<i>: TPC Trigger" (for PCC)
- "LTE Sig<i>: TPC Trigger SCC<n>"

Frame trigger

Trigger event at the beginning of each uplink radio frame. If an SCC uplink is configured, there are separate trigger signals for the PCC and the SCC.

This signal can be used to trigger LTE multi-evaluation measurements (option R&S CMW-KM500 / -KM550).

PRACH trigger

Trigger event for each received PRACH preamble. When a preamble has been successfully received and detected by the "LTE Signaling" application, a trigger signal is generated. It is aligned to the beginning of the fourth subframe after the subframe in which the preamble has started. The following figure illustrates this timing for preamble format 3.

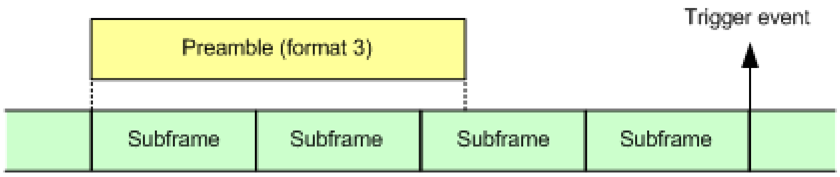


Figure 2-21: PRACH trigger timing

The PRACH trigger signal can be used to trigger LTE "PRACH" measurements (option R&S CMW-KM500 / -KM550). When the measurement receives a trigger event, it evaluates already measured data to provide results for the preamble.

TPC trigger

Trigger event generated when a single TPC pattern is executed ("Single Pattern" or "User-defined Single Pattern" or "Flexible UL Power"). If an SCC uplink is configured, there are separate trigger signals for the PCC and the SCC.

This signal can be used to trigger a single shot power measurement using the LTE multi-evaluation measurement (option R&S CMW-KM500 / -KM550).

2.2.19 Relative Power Control Tests

Uplink power control tests with relative commands are specified in 3GPP TS 36.521, section 6.3.5.2 "Power Control Relative power tolerance". The first two subtests require special TPC power control patterns combined with a dynamic resource block allocation. Such patterns are provided by the signaling application and are described in this section.

The basic test procedure specified by 3GPP for both subtests is as follows:

1. Command the UE to the initial target power, depending on the carrier frequency.
2. Configure the initial RB allocation, depending on the duplex mode and the channel bandwidth.
3. Send the TPC pattern.
4. Measure the resulting power steps. In parallel, change the resource block allocation.

For subtest 1, the test has to be performed three times, with the ramping up TPC patterns A, B and C. All three patterns consist of +1 dB commands over 40 active uplink subframes. Within each pattern, there is one RB allocation change. The change depends on the channel bandwidth. The position of the change within the pattern differs for pattern A, B and C.

Subtest 2 is similar, with ramping down TPC patterns instead of ramping up patterns.

The following figure shows the ramping up TPC pattern A for FDD as an example. The RB allocation change is located after the first radio frame (10 subframes).

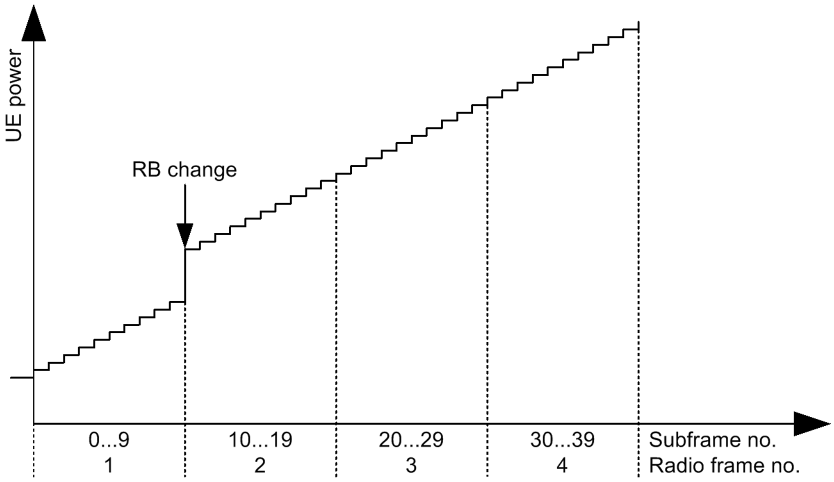


Figure 2-22: Ramping up pattern A for FDD

The 3GPP specification allows us to interrupt the power ramping. The interruptions must be whole numbers of radio frames without power change (0 dB commands). The R&S CMW inserts such interruptions to reconfigure the input path according to the changing expected nominal power.

Thus the measured UE power diagram with TPC pattern A for FDD looks typically as follows.

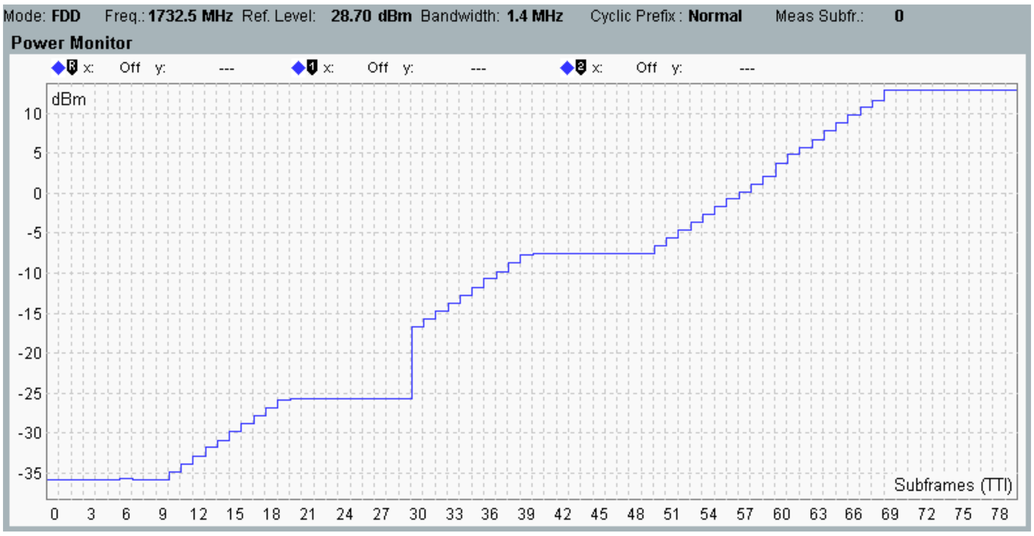


Figure 2-23: Power measurement with ramping up pattern A for FDD

Explanation of the diagram:

- Frame 1: constant initial target power
- Frame 2: ramping up
- Frame 3: constant power for input path configuration

- End of frame 3: change of RB allocation
  In this example, the channel bandwidth is 1.4 MHz. Thus the allocation changes from 1 RB to 6 RB (8.78 dB power step expected).
- Frame 4: ramping up
- Frame 5: constant power for input path configuration
- Frame 6 and 7: ramping up

To perform a relative power control test

You need the LTE signaling application and the LTE measurement application (option R&S CMW-KM500/550, LTE FDD/TDD R8, TX measurement).

1. Set up an RMC connection with the desired duplex mode and cell bandwidth.
   Note that the test procedure adapts the expected nominal power automatically.
   You do not need to set a specific value.
2. Switch to the LTE multi-evaluation measurement:
   In the signaling application, press the "LTE TX Meas" softkey.

   The measurement application is opened and the combined signal path scenario is selected.
3. In the measurement, select the TPC trigger signal provided by the signaling application:
   Press the softkey "Trigger" followed by the hotkey "Trigger Source".
   Select "LTE Sig<n>: TPC Trigger".
4. Ensure that the number of measured subframes is sufficient (e.g. 80):
   Press the softkey "Multi Evaluation" followed by the hotkey "Measurement Subframes" and set "No. of Subframes".
5. Start the measurement. Ignore an indicated trigger timeout.
6. Configure and execute the TPC pattern:
   a) Press the "Signaling Parameter" softkey followed by the "TPC" hotkey.
   b) Set "Active TPC Setup" to "3GPP Relative Power Control".
   c) Set "3GPP..." > "Pattern" to the desired ramping pattern (A, B or C up or down).
   d) Press "Execute".

   The TPC pattern is executed. The initial RB allocation and the RB change are configured automatically. The expected nominal power is also configured automatically. After completion of the TPC pattern, the RB allocation is reset to the allocation used before TPC pattern execution.
   To check the measurement results, open the "Power Monitor" view.
7. To repeat the measurement with another pattern:
   a) Select the pattern.
   b) Press the "Execute" button again.

2.2.20 Extended BLER Measurement

The extended BLER measurement is installed together with the LTE signaling application. To access the measurement, press the softkey "LTE RX Meas" in the LTE signaling main view. Then select the tab "Extended BLER".

The measurement sends data to the UE via PDSCH subframes. It evaluates the positive acknowledgments (ACK) and negative acknowledgments (NACK) returned by the UE to determine the block error ratio (BLER) and the throughput. The CQI indices reported by the UE are also evaluated.

With enabled HARQ / CQI reporting, the HARQ retransmissions, reported PMI values and rank indicators are also evaluated. For the uplink, the results of a cyclic redundancy check (CRC) are provided.

The measurement is especially suitable to assess the characteristics and the performance of the UE receiver at low RF power levels.

The LTE standard does not request the implementation of test loops at the UE. Bit error rate (BER) measurements are therefore no issue for LTE.

2.2.20.1 Performing a BLER Measurement

To measure the downlink BLER, you must set up a connection and transfer data via the downlink. In test mode, activate downlink padding to transfer data (see "Downlink MAC Padding" on page 180). In data application mode, transfer data for example via FTP.

If you want to measure the throughput, activate downlink padding also in data application mode.

If you want to set up a downlink signal with a specific CQI index value, use a "CQI" scheduling type.

When you start the measurement, the R&S CMW sends data to the UE via PDSCH subframes and requests the UE to confirm the correct reception. The UE confirms each received subframe with an ACK or NACK via the PUSCH. The R&S CMW calculates the DL BLER from the received ACKs and NACKs. It determines the CQI, PMI and RI results from the corresponding reported values. For the uplink, the R&S CMW performs a CRC check and calculates the UL BLER from the results of the check

For transmission schemes using several downlink streams, the ACKs, NACKs and CQI indices reported for the streams are evaluated separately.

Note: As the transmit time interval for LTE equals one subframe, a subframe corresponds to one transport block.

It is possible to insert block errors into the downlink data (send wrong CRC value). For configuration, see "Downlink MAC Error Insertion" on page 180.

Active neighbor cell measurements cause an increased number of NACKs. So it is recommended to disable neighbor cell measurements for BLER evaluation, see Neighbor Cell Settings.

Reduced PDCCH resources can also result in an increased number of NACKs. So it is recommended to disable "Reduced PDCCH", see PDCCH.

For configuration of CQI, PMI and RI reporting, see CQI Reporting.

For configuration of DL HARQ settings, see DL HARQ.

Confidence BLER measurements

In a normal BLER measurement, typically a fixed number of subframes is transmitted, leading to a fixed test time. The idea behind confidence BLER measurements is to apply probability theory and predict a range for the BLER at an early stage of the measurement. The measurement is stopped if the probability of the UE to pass or fail the receiver quality test is large enough (early pass or early fail decision).

Confidence BLER measurements can reduce test times considerably, especially if the BLER of a receiver is very low or very high. They are specified in annex G of 3GPP TS 36.521 as "Statistical Testing". Option R&S CMW-KS510/-KS512 (without CA/with CA) is required for confidence BLER measurements.

To perform a confidence BLER measurement, configure especially the following measurement settings (see also Chapter 2.4.20.3, "Settings", on page 233):

- Set "Stop Condition" to "Confidence Level"
- Select the "Error Ratio Calculation" according to the test case
- Configure the "Minimum Test Time" according to the test case
- Select a "Limit Error Rate"
  Depending on this selection, the pass/fail decision is made according to the rules specified in 3GPP TS 36.521 annex G.2 or annex G.4.
- For tests with carrier aggregation, select the "Over All Stop Decision"

2.2.20.2 Result Overview

The results of the "Extended BLER" measurement are displayed in several different views on the "Extended BLER" tab. The result overview provides a summary of the most important results of the detailed result views.

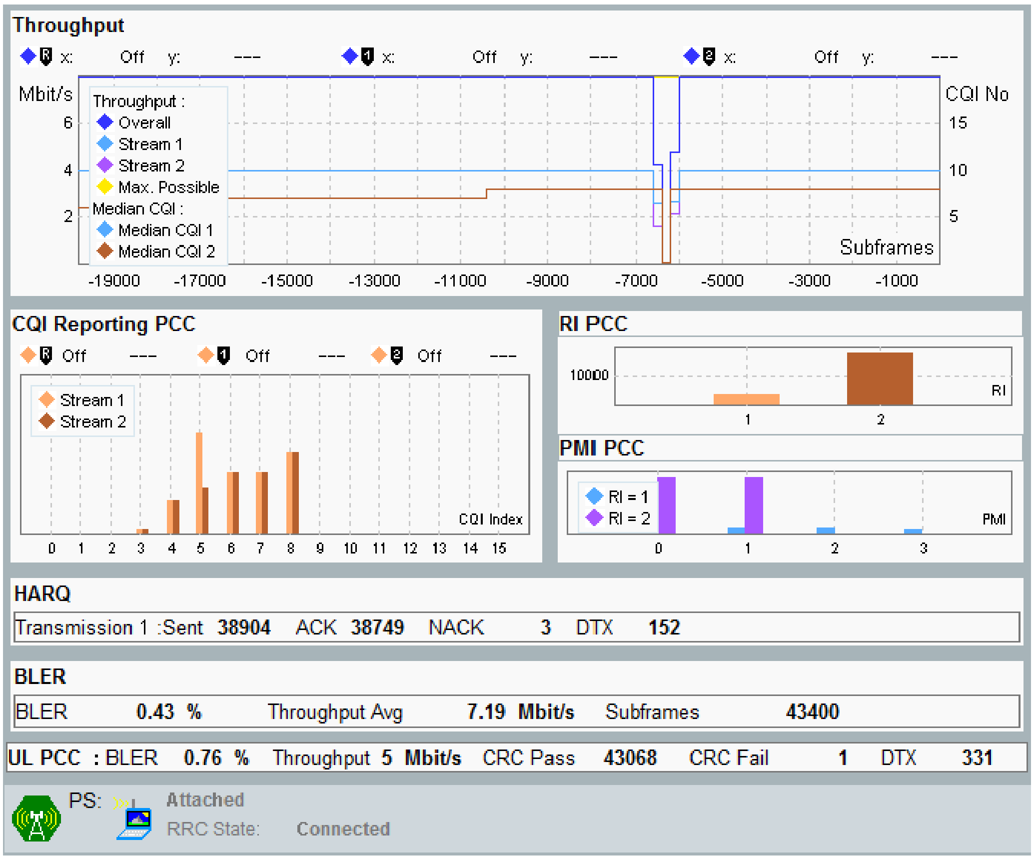


Figure 2-24: Result overview

You can enlarge one of the diagrams in the overview and show a detailed view with additional measurement results, see Chapter 2.2.20.9, "Selecting and Modifying Views", on page 85. The individual results are described in the "Detailed Views" sections.

For the following "UL PCC" / "UL SCCn" BLER results, there is no "Detailed View". Option R&S CMW-KS510 is required for these results. They are displayed per uplink component carrier.

- **"BLER"**:
  Block error ratio, percentage of received uplink subframes with failed CRC check.
  The following formula is used:
  BLER = CRC fail / (CRC pass + CRC fail)
- **"Throughput"**:
  Throughput calculated from the "CRC Pass / Fail" results and the maximum possible uplink throughput. The following formula is used:
  *Throughput = CRC pass / (CRC pass + CRC fail) * max possible throughput*
  The uplink throughput indicates the average uplink throughput since the start of the measurement.
  The maximum possible throughput is calculated from the UL settings. It is displayed for example in the signaling application main view.
- **"CRC Pass / Fail"**:

Number of uplink subframes with passed / failed CRC check, received since the start of the measurement.

- **"DTX"**:
  Number of scheduled uplink subframes skipped by the UE.
  The result is calculated from the number of expected uplink subframes and the number of received uplink subframes (CRC pass / fail results). For some configurations, the number of expected subframes is unknown and NCAP is displayed as result (for example for CDRX or scheduling type SPS).

2.2.20.3 Detailed View: BLER

The "BLER" view provides a table of downlink BLER and throughput results. The table contains always an overall result section at the top (results over all streams of one carrier). For configurations with several downlink streams, it provides the results also per downlink stream.

For carrier aggregation scenarios, the results for the individual component carriers are presented on different tabs. The overall results for the sum of all component carriers are provided in the "Throughput" view.

The BLER view shows also common settings of the "LTE signaling" application, see Chapter 2.4.1.6, "Settings", on page 116.

The following figure shows the results of two measurements. On the left, you see the results of a measurement without stop condition and two downlink streams. On the right, you see the results of a confidence BLER measurement with one downlink stream.

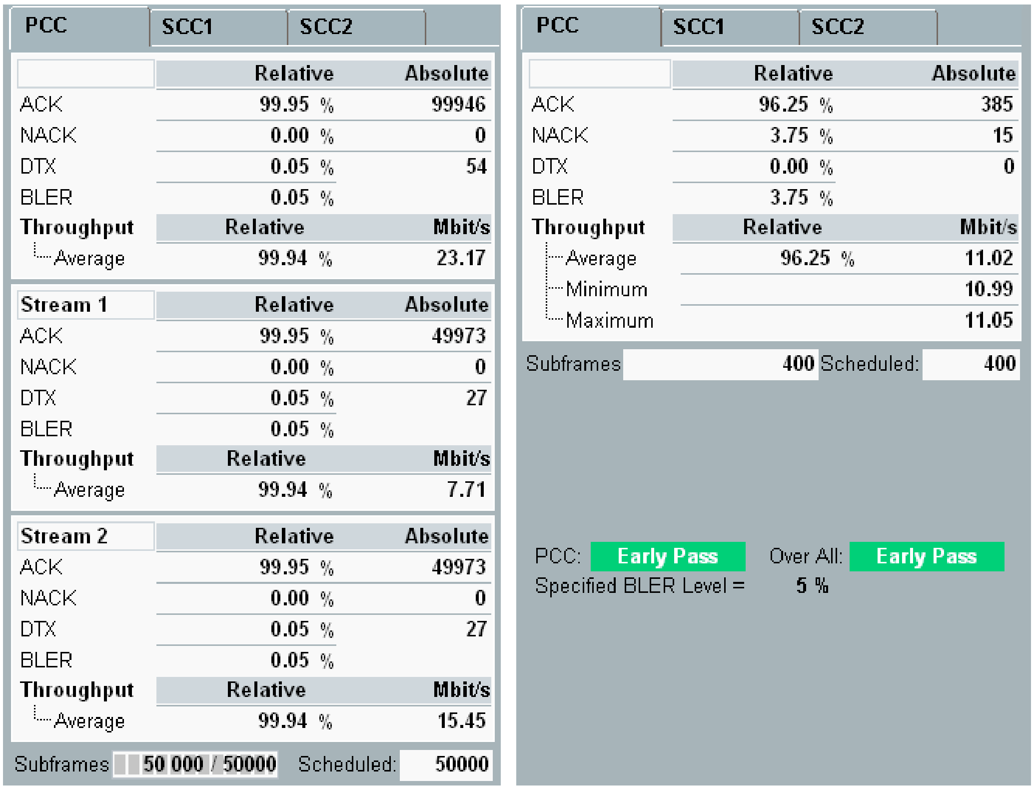


Figure 2-25: BLER view results (two streams normal measurement / one stream confidence BLER)

Result tables

- **"ACK / NACK / DTX"**:
  Number of acknowledgments and negative acknowledgments received via the PUSCH since the start of the measurement. No answer at all (no ACK, no NACK) is counted as DTX.
  The results are presented as absolute number and as percentage relative to the number of sent scheduled subframes.
- **"BLER"**:
  Block error ratio, percentage of sent scheduled subframes for which no acknowledgment has been received. The formula used to calculate the BLER is configurable, see "Error Ratio Calculation" on page 235. By default the following formula is used:
  BLER = (NACK + DTX) / (ACK + NACK + DTX)
- **"Throughput"**:
  Throughput calculated from the number of acknowledged transport blocks (number of received ACK multiplied with bits per transport block, divided by the time).
  The throughput is calculated for each 200 processed subframes. From the resulting throughput values, the instrument determines the average value and the minimum and maximum values.
  The "Relative" average throughput indicates the average throughput as percentage of the maximum possible throughput, i.e. of the throughput that would be reached with ACK = 100%.

It is recommended to always activate downlink padding for throughput measurements, even in data application mode. Otherwise, the throughput results can be hard to interpret.

Confidence BLER results

- **"PCC or SCC Pass/Fail"**:
  When a pass/fail decision has been made for the carrier, one of the following result values is displayed:
  – "Early Pass" / "Early Fail":
    An early pass or early fail limit was exceeded and an early decision has been made.
  – "Pass" / "Fail":
    The configured minimum test time is larger than the early decision table. The pass/fail decision has been made using the test limit.

  The pass/fail decision is always based on the overall BLER results of the carrier, independent of the number of downlink streams.
  When a pass/fail result is displayed for a carrier, the measurement can continue to derive the pass/fail result for another carrier and the overall pass/fail result.
- **"Over All Pass/Fail"**:
  For measurements with carrier aggregation, an overall pass/fail result is derived from the PCC/SCC pass/fail results.
  The meaning of the overall result depends on the configured "Over All Stop Decision". For the stop decision "PCC only", the overall result equals the PCC result. For the stop decision "SCC<n> only", the overall result equals the SCC<n> result.
  For the "All Carrier, ..." stop decisions, the overall result has the following meaning:
  – "Early Fail": at least one carrier "Early Fail"
  – "Fail": no carrier "Early Fail", at least one carrier "Fail"
  – "Early Pass": all carriers "Early Pass"
  – "Pass": at least one carrier "Pass", no "Fail", no "Early Fail"
- **"Specified BLER Level"**:
  Indicates the currently configured "Limit Error Rate".

For "Subframes" and "Scheduled", see Chapter 2.2.20.8, "Common View Elements", on page 85.

2.2.20.4 Detailed View: Throughput

The "Throughput" view provides a graphical presentation of downlink throughput and median CQI results for the previous measurement cycle. The X-axis indicates the processed subframes, with the last processed subframe labeled 0, the previously processed subframe labeled -1, and so on. The diagram displays one result value per 200 processed subframes.

The BLER, throughput and median CQI results below the diagram are related to the entire measurement duration. They are also provided in the "BLER" or "CQI Reporting" views. For details, refer to the descriptions of these views.

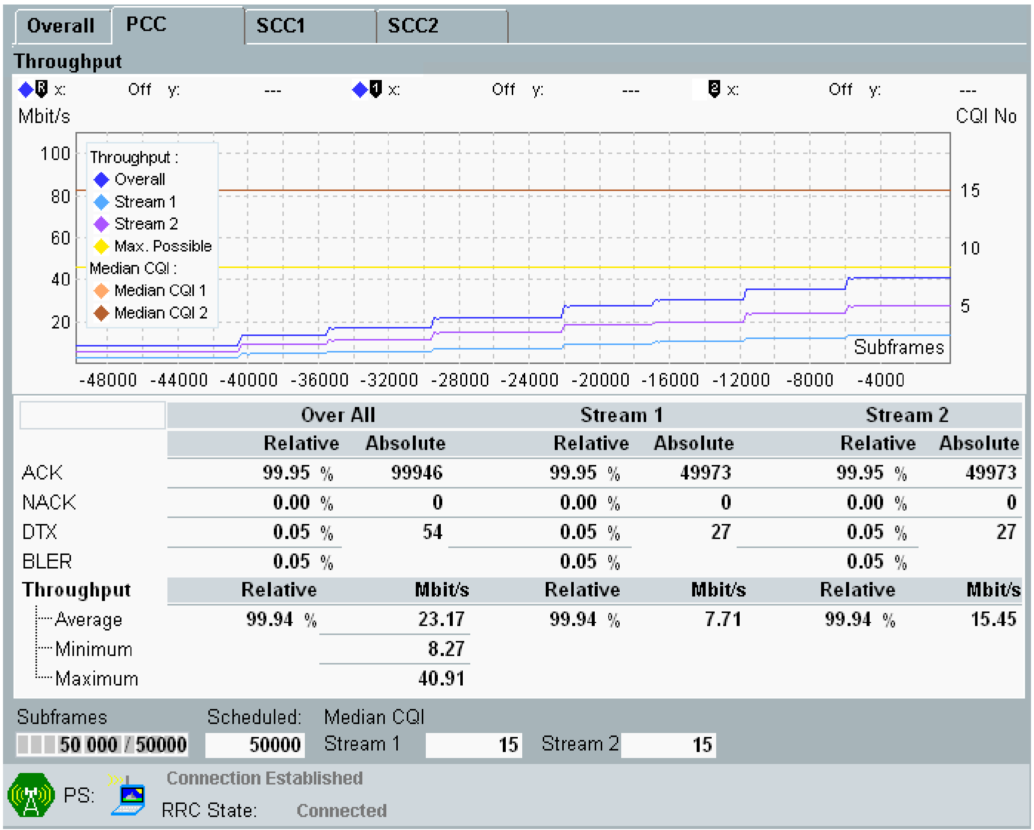


Figure 2-26: Throughput view (two streams)

For carrier aggregation scenarios, the "Throughput" view presents the results on several tabs. The "PCC" and "SCC<n>" tabs provide the results for the PCC downlink and for the SCC downlinks. The results for the sum of all PCC plus SCC downlink streams are provided on the "Overall" tab.

2.2.20.5 Detailed View: CQI Reporting

The main focus of the "CQI Reporting" view is on evaluation of the CQI index values reported by the UE. This view is only available if CQI reporting is enabled in the signaling application (see "Enable CQI Reporting" on page 218).

If the UE reports CQI values per stream (for example for TM 4 or TM 9), all results are displayed per stream as in the following figure. Otherwise, the results are displayed as "Stream 1" results.

For carrier aggregation scenarios, the results for the individual component carriers are presented on different tabs. If you want to evaluate CQI reports for several carriers, ensure that the configured "CQI/PMI Config Index" of the carriers is compatible, see "CQI/PMI Config Index" on page 219.

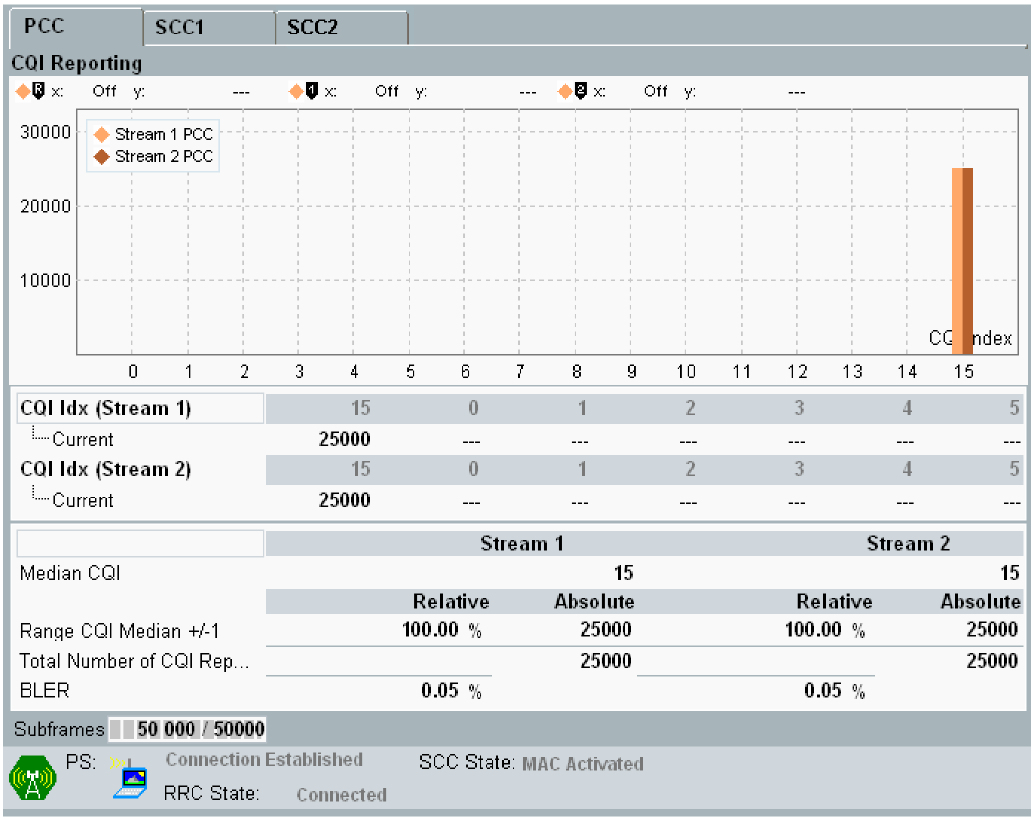


Figure 2-27: CQI Reporting view (two streams)

The bar graph shows how often the CQI indices 0 to 15 have been reported by the UE since the measurement has been started. The table directly below the bar graph provides the index value and the height of the seven highest bars in the diagram.

The table at the bottom provides the following additional information:

- **"Median CQI"**: median of the CQI values reported by the UE
  Add the bars of one stream from left to right. The median CQI value is the index value where the sum reaches/crosses 50% of the total sum. This definition of the median value is specified in 3GPP TS 36.521, section 9.
- **"Range CQI Median +/-1"**: evaluation of three adjacent bars, from median CQI - 1 to median CQI + 1
  The absolute value indicates the sum of the three bars. The relative value indicates the percentage of the absolute value relative to the sum of all bars of the stream.
- **"Total Number of CQI Reports"**: total number of received CQI index values (sum of all bars per stream)
- **"BLER"**: relative BLER result per stream, as shown in the "BLER" view

For "Subframes", see Chapter 2.2.20.8, "Common View Elements", on page 85.

2.2.20.6 Detailed View: PMI - RI

The "PMI - RI" view provides a statistical evaluation of the precoding matrix indicator (PMI) values and rank indicator (RI) values reported by the UE.

This view is only available if CQI reporting is enabled in the signaling application, see "Enable CQI Reporting" on page 218.

Whether PMI and/or RI reports are sent by the UE depends on the transmission mode. For TM 8 and 9, you must explicitly request reports from the UE, see "Enable PMI/RI Reporting (TM 8, 9)" on page 218.

For carrier aggregation scenarios, the results for the individual component carriers are presented on different tabs. If you want to evaluate PMI reports for several carriers, ensure that the configured "CQI/PMI Config Index" of the carriers is compatible, see "CQI/PMI Config Index" on page 219.

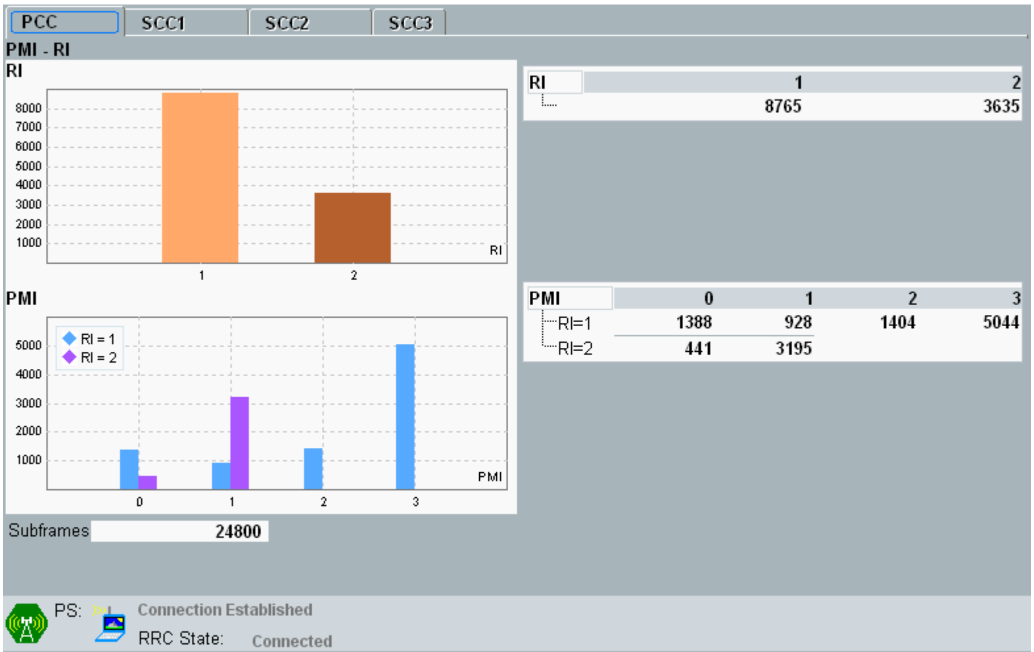


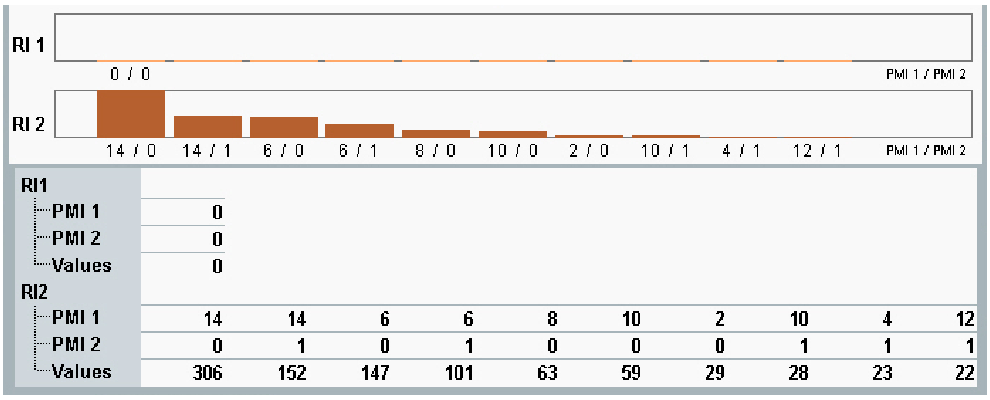
Figure 2-28: PMI - RI view (TM 4, 2 antennas)

The bar graphs show how often specific values have been reported by the UE since the measurement has been started. The tables provide the same information as the bar graphs.

The upper bar graph shows how often the individual RI values have been reported (one bar per RI value).

The lower bar graph shows how often specific PMI - RI combinations have been reported. It provides separate bars for all possible combinations. The possible PMI values depend on the number of DL TX antennas, for TM 9 on the number of CSI-RS antenna ports:

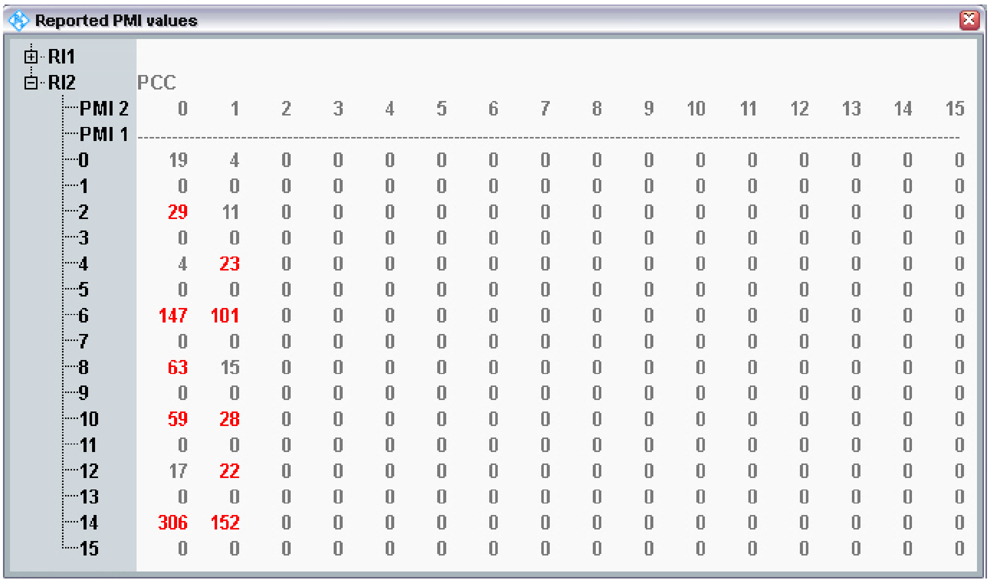
- Two antennas / two CSI-RS ports: PMI = 0 to 3 for RI = 1, PMI = 0 to 1 for RI = 2
- Four antennas / four CSI-RS ports: PMI = 0 to 15
- Eight CSI-RS ports: two PMI values are reported, PMI = 0 to 15
  The view shows results for the most frequently reported PMI value combinations (up to 10 combinations).



RI1										
PMI 1	0									
PMI 2	0									
Values	0									
RI2										
PMI 1	14	14	6	6	8	10	2	10	4	12
PMI 2	0	1	0	1	0	0	0	1	1	1
Values	306	152	147	101	63	59	29	28	23	22

Figure 2-29: Lower part for eight CSI-RS ports

To display result tables for all possible RI - PMI 1 - PMI 2 combinations, press the softkey - hotkey combination "Display > PMI 1 x PMI 2 Results".



PMI 2 / PMI 1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	19	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	29	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	4	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	147	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	63	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	59	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	17	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	306	152	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 2-30: Complete tables, RI - PMI 1 - PMI 2 combinations

The highlighted values in the complete tables are also displayed in the bar graphs.

For "Subframes", see Chapter 2.2.20.8, "Common View Elements", on page 85.

2.2.20.7 Detailed View: HARQ

The "HARQ" view provides an overview of all downlink subframe transmissions performed since the measurement was started.

If you cannot access the view, check whether HARQ is enabled, see Chapter 2.4.12.7, "Miscellaneous Connection Settings Part 2", on page 190.

For carrier aggregation scenarios, the results for the individual component carriers are presented on different tabs.

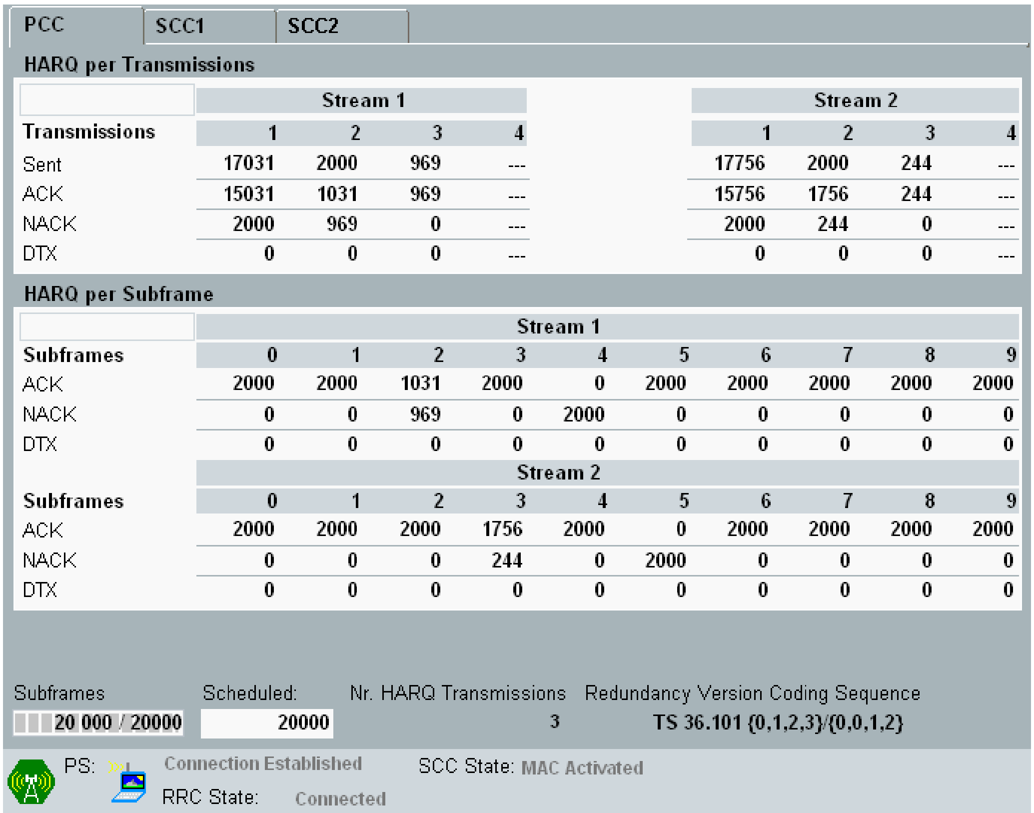


Figure 2-31: HARQ view (two streams, absolute results)

The view displays two types of tables for each downlink stream:

- The "HARQ per Transmissions" table lists the initial transmissions and all retransmissions. Column 1 indicates the initial transmissions (first redundancy version), column 2 the first retransmission (second redundancy version), column 3 the second retransmission (third redundancy version), and so on.
  For each transmission type, the number of sent subframes, received ACK, received NACK and DTX is displayed.
- The "HARQ per Subframe" table lists the ACK, NACK and DTX received in the individual subframes of the radio frame. So column 0 indicates the ACK/NACK/DTX received in the first subframe of a radio frame, column 9 the ACK/NACK/DTX received in the last subframe of a radio frame.

You can display all results in the tables as absolute numbers or as percentages. To toggle the presentation, use the softkey > hotkey combination "Display" > "Absolute / Relative".

A relative "Sent" value indicates the percentage of the absolute "Sent" value relative to the total number of sent subframes (sum of the table row). A relative ACK, NACK or DTX value indicates the percentage of the absolute value, relative to the sum of the absolute ACK, NACK and DTX values in the table column.

At the bottom of the view, some HARQ settings are displayed for information, in addition to the view-independent GUI elements. For a description, see "DL HARQ" on page 197.

2.2.20.8 Common View Elements

Each view displays at least one of the following elements to indicate the progress of the measurement:

- **"Subframes"**:
  This value indicates the number of already processed subframes. For single-shot measurements with fixed length, also the total number of subframes to be processed is displayed.
  For FDD, all downlink subframes are counted, scheduled subframes and subframes without allocated resource blocks. For TDD, special subframes and uplink subframes are also counted.
  A scheduled downlink subframe that is sent via several downlink streams in parallel is counted as one subframe.
- **"Scheduled"**:
  Displays the number of already measured subframes (scheduled downlink subframes). This number equals the sum of the absolute values for ACK, NACK and DTX for one downlink stream.

  Examples for a single-shot measurement with fixed length:
  – FDD: You set the no. of subframes to 10000, schedule every fifth subframe and use two downlink streams. Thus 2000 subframes are scheduled. The UE is expected to send 2000 responses per stream, 4000 in total. At the end of the measurement, the parameter "Subframes" displays 10000/10000 and the parameter "Scheduled" displays 2000.
  – TDD: You set the no. of subframes to 10000. You use UL/DL configuration 1 and transfer downlink data via subframe 0, 1, 4, 6 and 9 (subframe 5 not scheduled, subframe 2, 3, 7, 8 = uplink). Thus five of ten subframes are used for downlink data transfer and 5000 of 10000 subframes are scheduled. At the end of the measurement, the parameter "Subframes" displays 10000/10000 and the parameter "Scheduled" displays 5000.

2.2.20.9 Selecting and Modifying Views

Use the "Display" hotkeys to select the views and to change the appearance and contents of the views. Depending on the selected view, the following "Display" hotkeys are available at the bottom of the GUI:

Table 2-29: "Display" hotkeys

Hotkey	Description
"Select View ..."	Switch to a certain detailed view or to the overview. Alternatively, select a diagram in the overview and press ENTER or the rotary knob.
"Select Trace ..."	Select the trace types to be displayed in the view.
"X Scale... / Y Scale..."	Modify the ranges of the X-axis and the Y-axis.
"Absolute | Relative"	Toggles between display of absolute and relative results in the HARQ detailed view.

2.2.20.10 Using Markers

The "Marker" softkey displays the following hotkeys at the bottom of the GUI:

Hotkey	Description
"Ref. Marker"	Enable or disable the reference marker and select the marker position. If several traces can be displayed, a trace can also be selected.
"Marker 1/2"	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker). Depending on the trace mode, a trace can also be selected.
"Select Trace Mode"	Define whether markers 1 and 2 are set to the same trace as the reference marker (collective) or to selectable individual traces.

See also: "Markers" in the R&S CMW base unit manual, chapter "System Overview"

2.2.21 RLC Throughput Measurement

The RLC throughput measurement is installed together with the "LTE Signaling" application. To access the measurement, press the softkey "LTE RX Meas" in the LTE signaling main view. Then select the tab "RLC Throughput".

The RLC throughput measurement evaluates the total data throughput in the downlink and in the uplink.

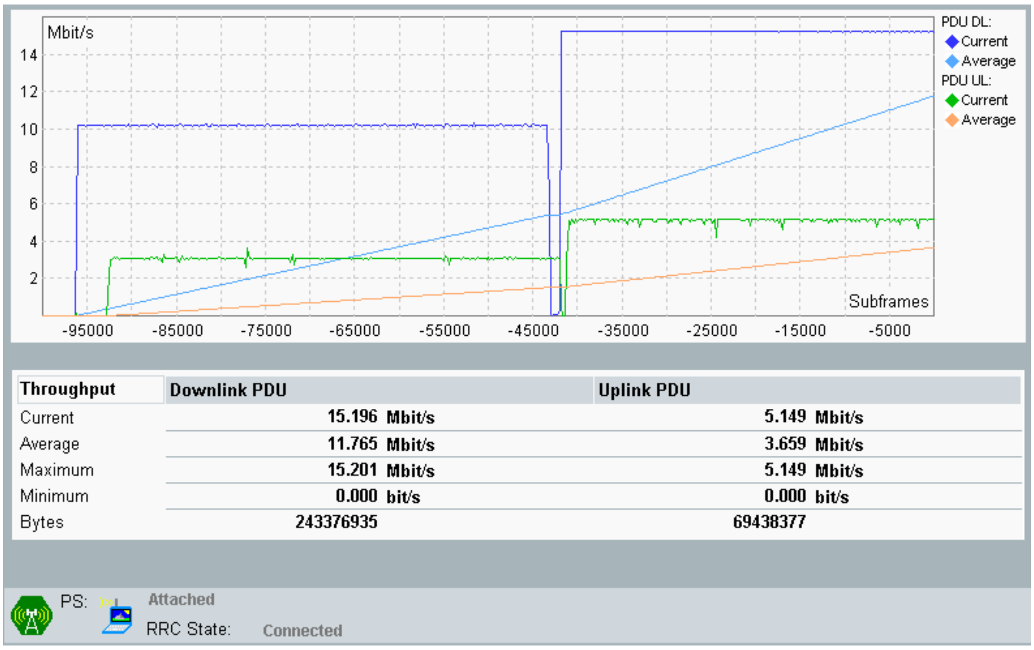
2.2.21.1 Performing RLC Throughput Measurements

To measure the RLC throughput, you must set up a connection in data application mode and generate IP traffic.

1. Set up a connection as described in Chapter 2.3.2, "LTE IP-Based Data Tests", on page 92.
   The required options are also listed there.
2. Use the data application unit (DAU) to generate IP traffic in the measured direction (uplink and/or downlink). You can for example start an iperf measurement. Or you can transfer data via FTP.
   For details, refer to the DAU documentation.
3. Start the RLC throughput measurement and evaluate the results.

2.2.21.2 Measurement Results

All results of the measurement are shown on the "RLC Throughput" tab. The results are described below.



Throughput	Downlink PDU	Uplink PDU
Current	15.196 Mbit/s	5.149 Mbit/s
Average	11.765 Mbit/s	3.659 Mbit/s
Maximum	15.201 Mbit/s	5.149 Mbit/s
Minimum	0.000 bit/s	0.000 bit/s
Bytes	243376935	69438377

Figure 2-32: RLC throughput tab

Diagram

The diagram provides a graphical presentation of the data throughput results for the previous measurement cycle. The X-axis indicates the processed subframes, with the last processed subframe labeled 0, the previously processed subframe labeled -1, and so on.

The diagram displays one result value per "Update Interval". The number of subframes per interval is configurable. The number of subframes per measurement cycle is also configurable ("Window Size", number of subframes on the X-axis).

You can enable/disable the display of the individual traces via the softkey - hotkey combination "Display > Select Trace".

Table

The throughput table indicates statistical throughput results for downlink and uplink.

The "Bytes" value indicates the number of bytes that the R&S CMW has transmitted (DL) or received (UL) since the measurement was started.

Statistical Results

The statistical values are calculated as follows:

- **"Current"**: value obtained in the last update interval
- **"Average"**: average of all "Current" values within the last measurement cycle (window size)
- **"Minimum", "Maximum"**: largest or smallest "Current" value since the start of the measurement

2.3 Application Sheets

Application sheets describe short application examples for select issues and provide related background information. The following application sheets are related to the "LTE Signaling" firmware application.

- Combined Signal Path Measurements......88
- LTE IP-Based Data Tests......92
- VoLTE Call Setup and Audio Tests......96

2.3.1 Combined Signal Path Measurements

This application sheet describes how to establish a connection to an LTE user equipment (UE) and perform TX measurements on the received uplink signal using the LTE multi-evaluation measurement. For SRS and PRACH measurements, see Chapter 2.3.1.5, "SRS and PRACH Measurements", on page 91.

Sequencer tool R&S CMWrun

The automated test capabilities of R&S CMWrun make many measurement tasks easier. Option R&S CMW-KT055 provides configurable LTE test modules and test plans for R&S CMWrun.

2.3.1.1 Options and Equipment Required

An LTE combined signal path measurement requires the following equipment:

- R&S CMW with software version ≥ V1.0.15.20. The latest software version is recommended.
  This application sheet describes software version V3.2.10.
- For FDD tests:
  – Option R&S CMW-KS500, LTE FDD R8, basic signaling
  – Option R&S CMW-KM500, LTE FDD R8, TX measurement
- For TDD tests:
  – Option R&S CMW-KS550, LTE TDD R8, basic signaling
  – Option R&S CMW-KM550, LTE TDD R8, TX measurement

The following sections describe a combined signal path measurement for FDD. A combined signal path measurement for TDD is performed in the same way, using the R&S CMW-Kx550 options instead of the R&S CMW-Kx500 options.

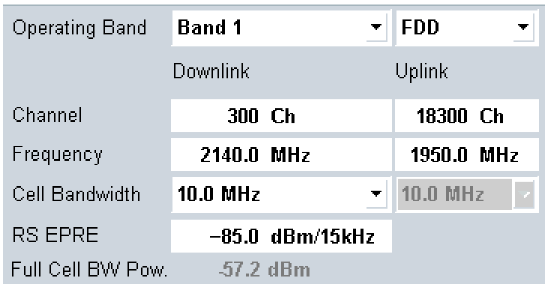
2.3.1.2 Setting Up a Connection

An established connection to the UE is a prerequisite for many signaling tests, including the combined signal path measurement described in this application sheet. The following example uses a single downlink stream. For MIMO tests, additional cabling and related configuration of routing settings are required.

To set up a connection,

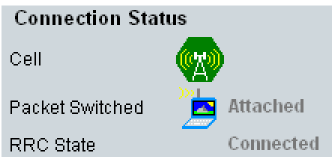
1. Reset your R&S CMW to ensure a definite instrument state.
2. Connect your UE to the RF 1 COM connector.
3. Open the "LTE Signaling" application, e.g. from the task bar (press "TASKS" to open the task bar).
   If the application is not present in the task bar, enable it in the "Generator/Signaling Controller" dialog (press "SIGNAL GEN" to open the dialog).
4. In the main view of the signaling application, adjust the RF settings to the capabilities of your UE.

   Configure especially the duplex mode (FDD / TDD), the band, the channel and the cell bandwidth. The "RS EPRE" must be sufficient so that the UE under test can receive the DL signal.

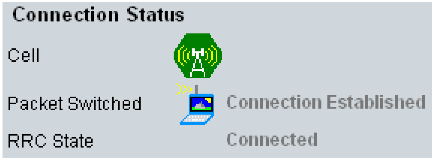
5. Press the "Config" hotkey to open the configuration dialog.
6. In section "RF Settings", select a bidirectional RF connector for input and output. This example uses RF 1 COM.
   If necessary, also adjust the "External Attenuation" settings.
7. Close the configuration dialog.
8. To turn on the DL signal, press ON | OFF and wait until the "LTE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
9. Switch on the UE.

   The UE synchronizes to the DL signal and attaches. A default bearer is established.
   Note the connection states displayed in the main view and wait until the attach procedure is complete.
   By default, the RRC connection is kept after the attach is complete.

10. The default bearer and the established RRC connection are sufficient for many tests.
    If you want to set up a dedicated bearer, press the "Connect" hotkey.

Note the connection states displayed in the main view and wait until the connection has been established.



Attach failure

If the attach procedure fails, check whether the UE capabilities are in accordance with the security settings in the "Network" section of the configuration dialog.

If your UE needs a DL signal without padding bits for attach, disable downlink padding in the "Connection" section of the configuration dialog.

You can check the power settings in the configuration dialog sections "Downlink Power Levels" and "Uplink Power Control".

2.3.1.3 Analyzing the UL Signal from the UE

While an established connection is available, the UL signals from the UE can be monitored using the LTE multi-evaluation measurement (included in option R&S CMW-KM500).

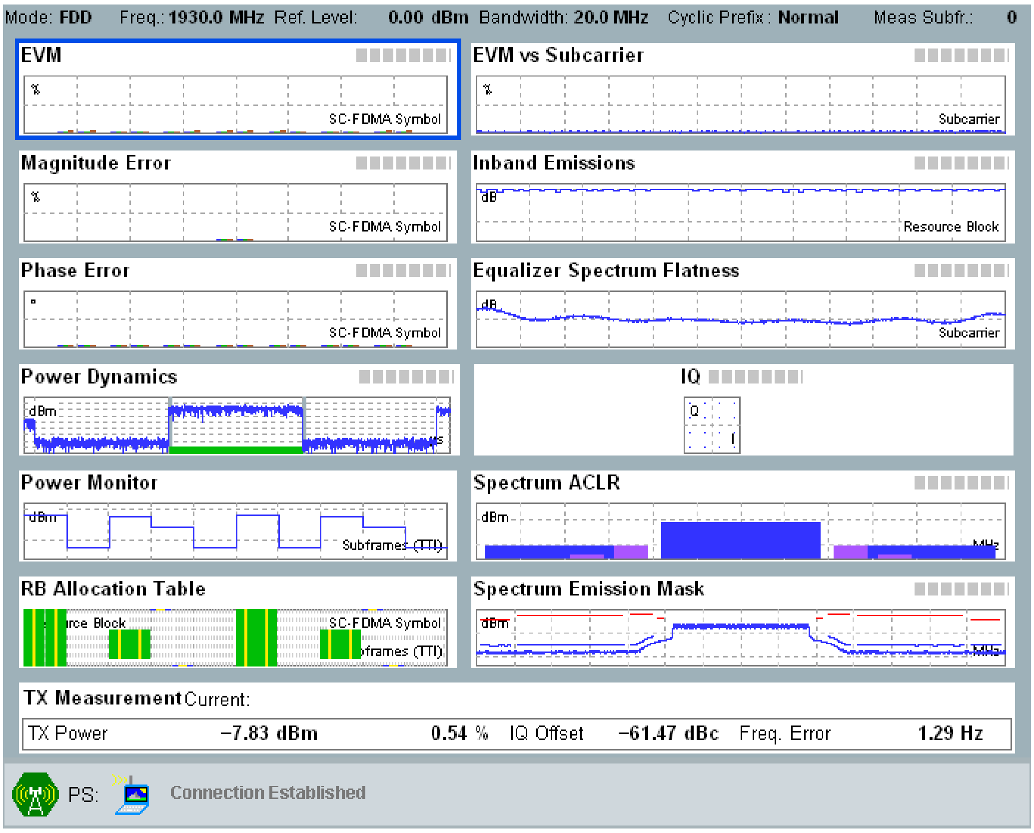
To ensure compatible measurement settings, the measurement must be coupled to the LTE signaling application. For this purpose, the measurement provides a combined signal path scenario. With this scenario, the measurement application uses the most important settings of the signaling application, for example the RF settings.

Proceed as follows:

1. Use the "LTE TX Meas" softkey to switch to the multi-evaluation measurement.

   The measurement application is opened and the combined signal path scenario is selected automatically. Furthermore the frame trigger signal provided by the "LTE Signaling" application is selected as trigger source.

2. Press "ON | OFF" to start the measurement.
   The main view provides an overview of the measurement results.



To enlarge a diagram, perform one of the following actions:

- Double-click it using a connected mouse.
- Select it by turning the rotary knob and open it by pressing the rotary knob.

2.3.1.4 Possible Extensions

While the connection is established, you can vary LTE signaling settings and observe the behavior of the UE under test using the LTE multi-evaluation measurement. You can for example configure the signaling application to send transmit power control (TPC) commands to the UE and observe the resulting uplink power in the measurement dialogs. Or you can modify the channel configuration for the uplink and observe the result in the "RB Allocation Table".

2.3.1.5 SRS and PRACH Measurements

In addition to the LTE multi-evaluation measurement, option R&S CMW-KM500 provides also an SRS measurement and a PRACH measurement.

The proceeding for a combined signal path SRS measurement is similar to the proceeding for a multi-evaluation measurement. Before switching on the downlink signal, you must enable SRS in section "Physical Cell Setup" of the signaling application. As a result, the UE will send an SRS signal after connection setup. The other steps are similar.

For PRACH measurements, you do not establish a connection. Configure the PRACH settings in section "Physical Cell Setup" of the signaling application. Activate "No Response to Preambles" and set "Power Ramping Step" to 0 dB.

When you have configured all required settings, switch on the downlink signal and the UE. The UE sends random access preambles which are not answered by the instrument. Use the PRACH measurement to measure these preambles.

2.3.2 LTE IP-Based Data Tests

This application sheet provides examples for testing LTE data transfer over IP, using the LTE signaling application and the data application unit (DAU). It describes how to prepare the measurements, how to measure the network latency using ping and how to measure the downlink throughput for data transfer via UDP/IP.

2.3.2.1 Options and Equipment Required

The described tests require the following equipment:

- R&S CMW with software version ≥ V2.0.20. The latest software version is recommended.
  This application sheet describes software version V3.2.60.
- One of the options:
  – R&S CMW-KS500, LTE FDD R8, basic signaling
  – R&S CMW-KS550, LTE TDD R8, basic signaling
- Option R&S CMW-KM050, data application measurements (requires hardware R&S CMW-B450x, data application unit)
- Option R&S CMW-KA100, enabling of IP-Data interface for IPv4

2.3.2.2 Preparing the Tests

For test preparation, you need to configure the signaling application, set up a connection and configure the measurement.

Proceed as follows:

1. Set up a connection.
   For the general connection setup procedure, see Chapter 2.3.1.2, "Setting Up a Connection", on page 88.
   For IP-based data tests, insert the following step after opening the configuration dialog:
   a) In section "Connection", set parameter "Connection Type" to "Data Application".
      This step enables the support of protocol stack layer 3 in the signaling application.

2. In the main view of the signaling application, note the IPv4 address assigned to the UE during attach. You need this information in the following sections.
   If you have connected your UE to a PC with Windows operating system, you can also retrieve the IP address information via the PC. Open a command shell at the PC and type `IPconfig`.
3. Open the "Data Application Measurements", e.g. from the task bar (press "TASKS" to open the task bar).
   If the application is not present in the task bar, enable it in the "Measurement Controller" dialog (press "MEASURE" to open the dialog).
4. At the top of the GUI, select the LTE signaling application (parameter "Select RAN").

   The expected maximum throughput resulting from the current signaling settings is displayed to the right for information.

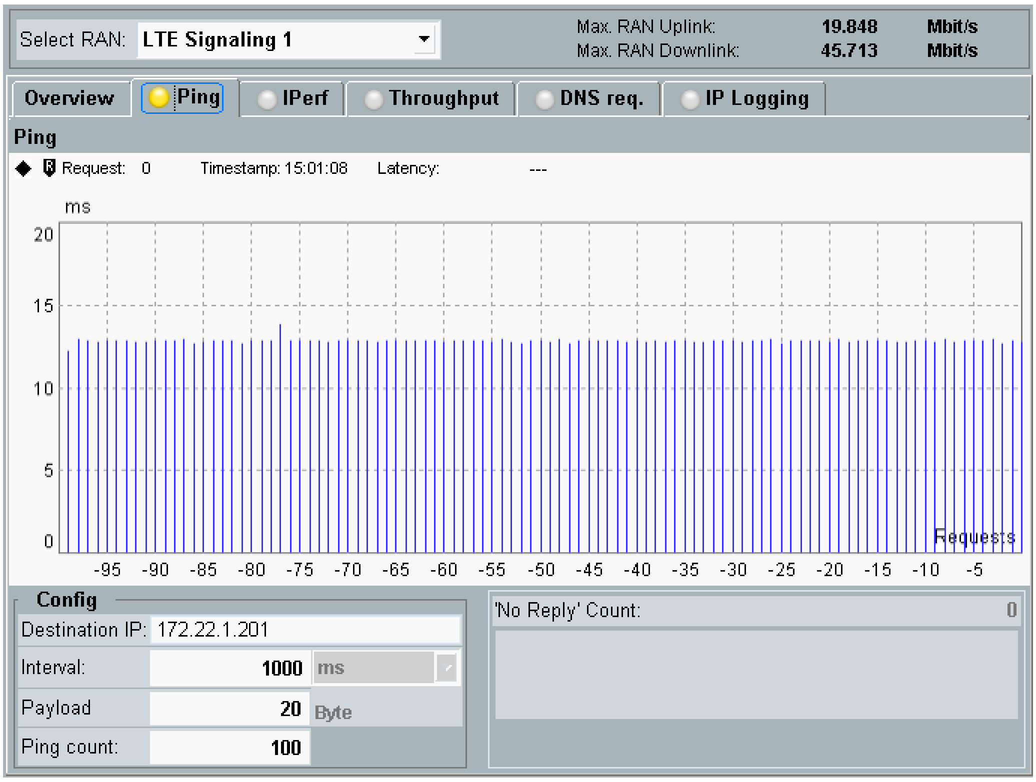
2.3.2.3 Measuring the Latency with Ping

After completed test preparation, you can ping your UE and evaluate the reported round-trip latency.

Proceed as follows:

1. Select the "Ping" tab.
2. For parameter "Destination IP", enter the IP address of the UE.
3. Press ON | OFF.

   The measurement starts and the "Ping" softkey indicates the "RUN" state.
   The graph shows the measured round-trip latency for each executed ping request.

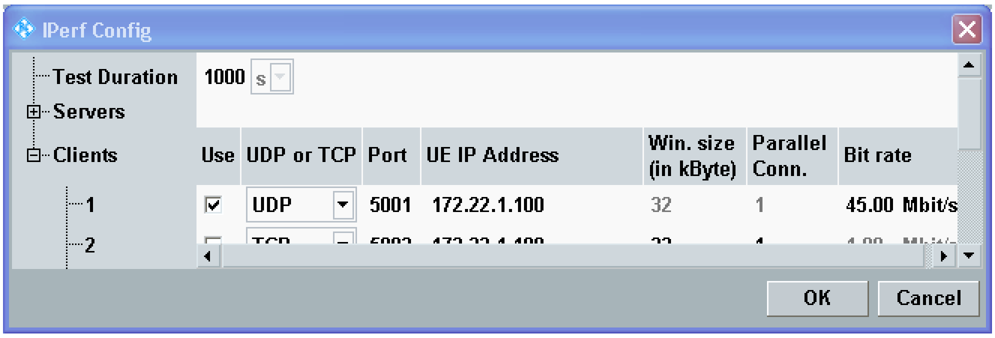


2.3.2.4 Measuring the Throughput with Iperf

The following steps describe how to measure the downlink throughput for data transfer via UDP/IP. As a prerequisite, the iperf tool must be installed on the UE, or on a PC connected to the UE. A compatible program version can be downloaded from the web pages provided by the DAU. Refer to the DAU documentation for details.

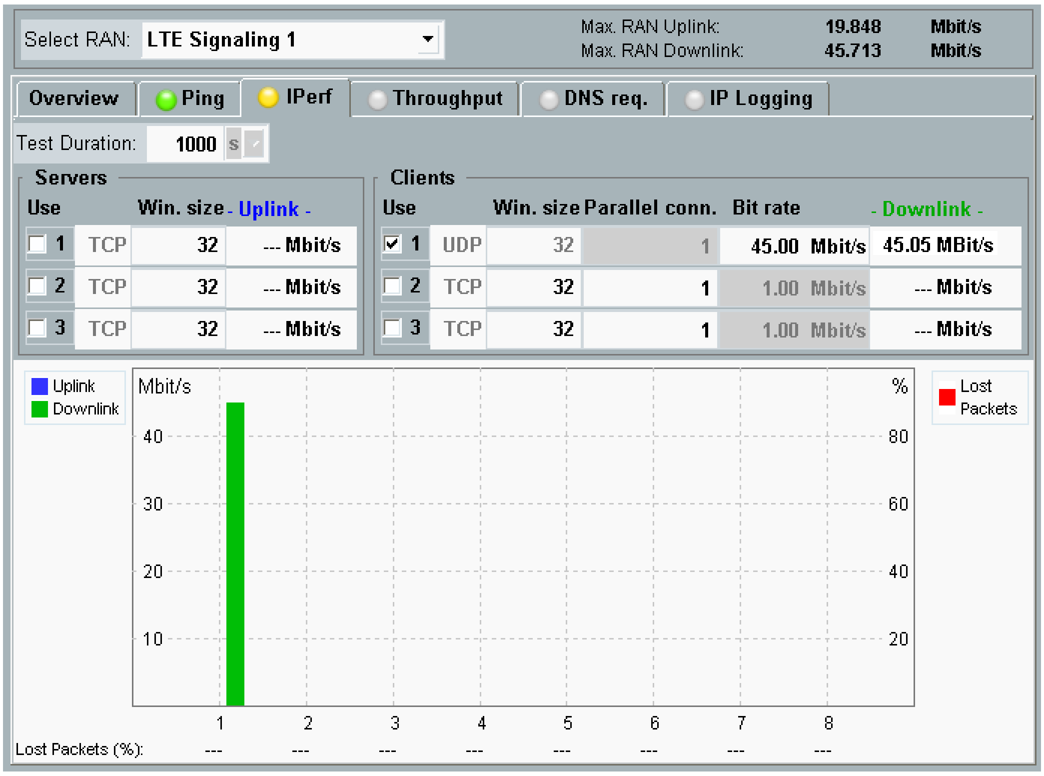
Proceed as follows:

1. Select the "IPerf" tab.
2. Press "Config..." to open the configuration dialog.
3. In section "Servers", disable all entries (column "Use").
4. In section "Clients" configure the first entry:
   a) Enable the entry.
   b) Select "UDP".
   c) Note the port. You need it in a later step.
   d) Enter the IP address of the UE (see Preparing the Tests).
   e) Configure a bit rate compatible to the expected maximum downlink bit rate displayed at the top of the iperf view as "Max. Downlink".



5. Press OK to close the configuration dialog.
6. Press ON | OFF.

   The application starts and the "Iperf" softkey indicates the "RUN" state.
   The R&S CMW sends data packets to the UE, using the downlink bit rate indicated in the last column and the graphic.
7. Configure the iperf tool at UE side so that it listens to the UDP port configured for the used client entry.
8. Start the iperf tool at UE side. Compare the bit rates received at the UE with the sent bit rates at the R&S CMW.



2.3.2.5 Possible Extensions

While the connection is established, you can vary "LTE Signaling" settings and "Data Application Measurements" settings and observe the impact on the measurement results. You can for example modify the downlink power levels, the downlink channel configuration and the sent bit rate. You can also set up a MIMO configuration (option required, see below) and perform LTE end-to-end data tests with MIMO.

The applications can be enhanced for example by the following options:

- Option R&S CMW-KS510 provides advanced parameter settings for "LTE Signaling"
- Option R&S CMW-KS520 adds support of MIMO 2x2 in the downlink
- Option R&S CMW-KS521 adds support of MIMO 4x2 in the downlink
- Option R&S CMW-KS522 adds support of MIMO 8x2 in the downlink
- Option R&S CMW-KA150 adds support of IPv6
- Option R&S CMW-KAA20 provides an IMS server

2.3.3 VoLTE Call Setup and Audio Tests

This application sheet describes how to set up a voice over LTE (VoLTE) call, using the LTE signaling application and the IMS server of the data application unit (DAU).

For the established VoLTE call, basic audio tests are performed with the R&S CMW audio board. For speech quality tests with a connected R&S UPV, the R&S CMW configuration and the test setup are described.

2.3.3.1 Required Equipment

The following equipment is required to set up a voice over LTE call and to perform audio tests with the R&S CMW:

- R&S CMW
- Hardware options:
  – Signaling unit wideband, R&S CMW-B300x
  – Audio board, R&S CMW-B400B
    Speech codec, R&S CMW-B405A
  – Option carrier, R&S CMW-B660A
    Ethernet switch, R&S CMW-B661A
    Data application unit, R&S CMW-B450x
- RF cable, for connection of a UE antenna port to an RF COM port
- Audio cables between the UE microphone / speaker and the AF OUT / IN ports

  Alternatives at UE side:
  – UE headset jack or UE microphone/speaker jacks
  – Microphone at UE speaker plus speaker at UE microphone
    Use a high-quality microphone and speaker designed for that purpose, for example an artificial head.

- Software options:
  – LTE R8, SISO, basic signaling, R&S CMW-KS500 (FDD) or -KS550 (TDD)
  – IPv4 enabler, R&S CMW-KA100, for IPv6 also R&S CMW-KA150
  – IMS basic service, R&S CMW-KAA20
- Software and minimum software versions:
  – Base software ≥ V3.2.40
  – LTE signaling ≥ V3.2.70
  – Audio measurements ≥ V3.2.10
  – Data application software ≥ V3.2.30

  The described step-by-step procedures apply to the base software V3.5.110, LTE V3.5.50, DAU V3.5.50, audio V3.5.20.

For a functional test of the audio transmission, a handset is required (option R&S CMW-Z50, only for Chapter 2.3.3.3, "Checking the Audio Transmission", on page 102).

To perform a speech quality analysis, the following additional equipment is required (only for Chapter 2.3.3.5, "Testing the Speech Quality with an R&S UPV", on page 105):

- Audio analyzer R&S UPV with relevant software options
- Audio cables for the following connections:
  – R&S UPV, generator output – UE, microphone input
  – UE, speaker output – R&S UPV, analyzer input
  – R&S UPV, generator output – R&S CMW, AF IN
  – R&S CMW, AF OUT – R&S UPV, analyzer input

  For details, refer to the R&S UPV documentation.

2.3.3.2 Setting Up a VoLTE Call

The following sections describe in detail how to set up a voice over LTE call. We use the default scenario, a standard SISO LTE cell. And we use the default RF connector, RF 1 COM.

The following sections are based on each other. Execute them in the given order:

- Connecting the UE and initializing the R&S CMW
- Configuring and starting the IMS server of the R&S CMW
- Configuring and switching on the LTE cell
- Attaching the UE to the cell and registering it to the IMS server
- Initiating a voice over LTE call

Connecting the UE and initializing the R&S CMW

The instrument is already running. The UE is switched off.

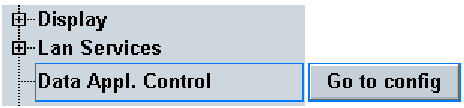
1. Connect your UE to the RF 1 COM port of the instrument.
2. Press RESET and perform a global preset.

3. Enable the applications:
   a) Press SIGNAL GEN.
      The "Generator/Signaling Controller" dialog box opens.
   b) Enable "LTE Signaling 1".
   c) Press MEASURE.
      The "Measurement Controller" dialog box opens.
   d) Enable "Audio Measurements 1".
   e) Enable "Data Appl. Measurement 1".
      If this entry is not available, you can skip this step. The presence of the entry depends on the presence of option R&S CMW-KM050.

The task bar at the bottom contains now hotkeys for access to the LTE signaling application, the audio measurements and - optionally - to the data application measurements. To show or hide the task bar, press TASKS.

Configuring and starting the IMS server

1. Open the "Data Application Control" dialog box.
   a) Alternative 1, with R&S CMW-KM050:
      On the task bar, press "Data Meas 1". The "Data Application Measurement" view opens.
      Press the "Configure Services" softkey.
   b) Alternative 2, without R&S CMW-KM050:
      Press SETUP. The "Setup" dialog box opens.
      In the "System" section > "Data Appl. Control", press the "Go to config" button.

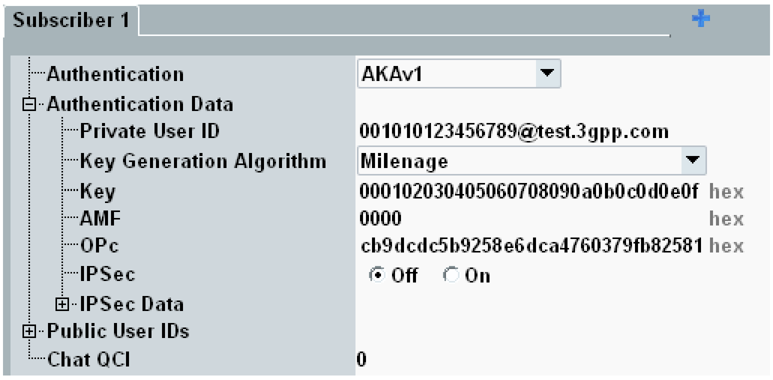


   The "Data Application Control" dialog box opens.

2. Select the "IMS" tab.

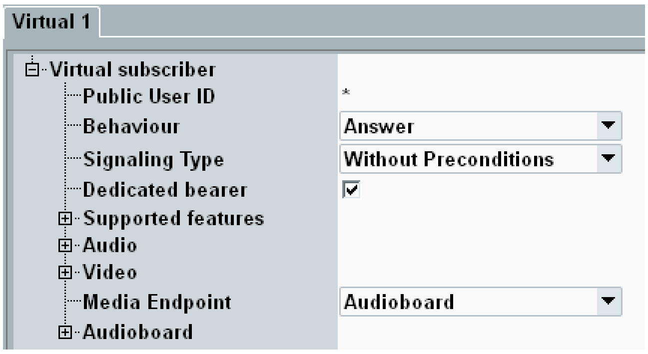
3. Press the "Subscriber" hotkey.
   A dialog box opens. Configure "Subscriber 1" as follows:
   a) Enter the private user ID of your mobile.
   b) Configure the authentication settings compatible to your mobile.

c) Enter all public user IDs of your mobile.



d) Press "Apply" and then "Close".

4. Press the "Virtual Subscriber" hotkey.
   A dialog box opens. Configure "Virtual 1" as follows:
   a) Set the "Signaling Type" compatible to your mobile (call setup with or without SIP preconditions).
   b) Enable the "Dedicated Bearer" checkbox.
   c) Configure the "Audio" and "Video" codec settings compatible to your mobile.
   d) Set "Media Endpoint" to "Audioboard".



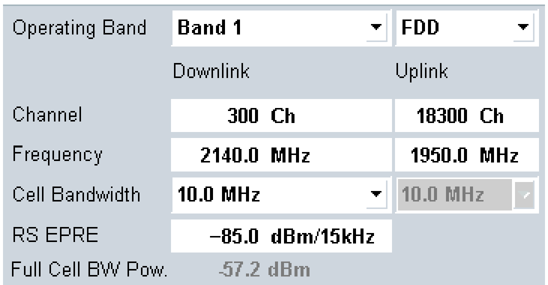
   e) Press "Apply" and then "Close".

5. Press ON | OFF.
   The IMS service is started. Wait until the "IMS" softkey displays the state "ON".

Configuring and switching on the LTE cell

1. On the task bar, press "LTE Signaling 1".
   The "LTE Signaling" view opens.
2. Adjust the RF settings to the capabilities of your UE.

Configure especially the duplex mode (FDD / TDD), the band, the channel number and the cell bandwidth. The "RS EPRE" must be sufficient so that the UE can receive the DL signal.

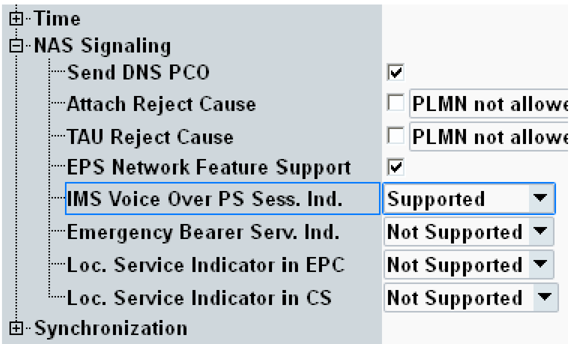


3. Press the "Config" hotkey.

   The LTE signaling configuration dialog box opens.

4. In section "Network" > "NAS Signaling":

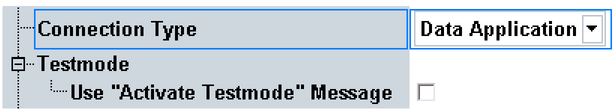
   a) Enable "EPS Network Feature Support".
   b) Set "IMS Voice Over PS Sess. Ind." to "Supported".



5. Configure the remaining "Network" settings compatible to your UE, especially the sections "NAS Signaling", "Identity" and "Security Settings".

6. In section "Connection", set "Connection Type" to "Data Application".

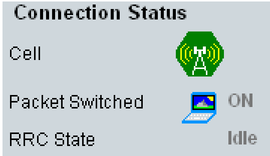
7. Disable "Use 'Activate Testmode' Message"



8. Close the dialog box.

9. Press ON | OFF.

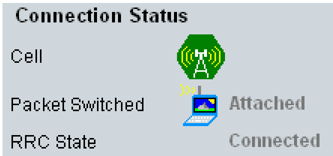
   The LTE cell signal is switched on. Note the displayed connection states and wait until the process is complete.



Attaching and registering the UE

1. Switch on the UE.

   The UE synchronizes to the LTE cell signal and attaches. A default bearer is established.
   Note the displayed connection states and wait until the attach procedure is complete and the RRC connection is established.

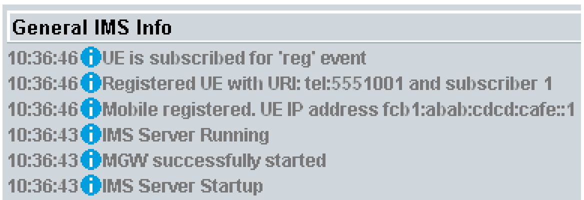
2. Open the "Data Application Control" dialog box.

   a) Task bar > "Data Meas 1" > "Configure Services" softkey, or
   b) SETUP > "Go to config" button

   The "Data Application Control" dialog box opens.

3. After attaching to the LTE cell, the UE registers to the IMS server.

   Check the successful registration in the "General IMS Info" area on the IMS tab.

Initiating a mobile-originating VoLTE call

Perform the following steps or set up a mobile-terminating call, see "Initiating a mobile-terminating VoLTE call" on page 102.

► Dial an arbitrary number (public user ID) at the UE.

The call is accepted by virtual subscriber 1 of the IMS server.
A new line is added to the "Events" area. After call setup completion, the status in that line equals "Established".

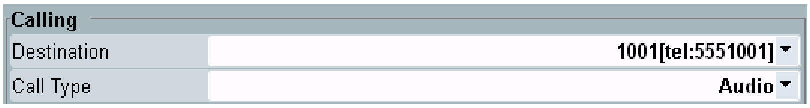
In the LTE signaling application, a dedicated bearer has been set up.

Initiating a mobile-terminating VoLTE call

Perform the following steps or set up a mobile-originating call, see "Initiating a mobile-originating VoLTE call" on page 101.

1. Press the "Virtual Subscriber" hotkey.
   A dialog box opens.
2. Press the button.

   The mobile-terminating call settings are displayed.
3. Configure the following call settings:
   a) Select the "Destination" that you want to call.
   b) Select the "Call Type".



   All other call settings are copies of already configured settings.
4. Press the "Call" button.

   The dialog box is closed.
   The mobile is alerted.
   A new line is added to the "Events" area. The status in that line equals "Ringing".
5. Accept the call at the mobile.

   The status in the "Events" area changes to "Established".

   In the LTE signaling application, a dedicated bearer has been set up.

2.3.3.3 Checking the Audio Transmission

This section describes a simple functional check of the audio transmission in uplink and downlink direction. You need the handset R&S CMW-Z50 for this check.

1. Connect the handset to AF 1 IN and AF 1 OUT.
2. Open the "Audio Measurement 1" view:
   On the task bar, press "Audio Measurement 1".
3. At the top, select the scenario "External Analog Speech Analysis".
4. For "Controlled by", select "DAU IMS Server".
5. Press the "Input Level" hotkey. Enter 0.05 V.
6. Press the "Output Level" hotkey. Enter 1 V.

7. To check the downlink direction, speak into the handset microphone and listen to the UE speaker. The speech must be audible at the UE speaker after a small delay.
8. To check the uplink direction, speak into the UE microphone and listen to the handset speaker. The speech must be audible at the handset speaker after a small delay.
9. Disconnect the handset.

2.3.3.4 Performing Basic Audio Tests

This section describes how to perform audio tests for an established VoLTE connection. As audio test signal, a single tone is used. The tests analyze mainly the harmonic distortions and noise of an audio signal.

The tests are performed in two steps. The first step is a speaker test, the second step a microphone test. You can perform speaker- and microphone tests with a stand-alone R&S CMW. No additional test instruments are required.

Performing a speaker test

The digital generator of the audio board feeds a 1000 Hz audio tone to the speech encoder. The tone is transmitted to the UE via the already established VoLTE connection. The UE demodulates and decodes the signal and feeds the resulting audio signal to its speaker.

The analog measurement of the audio board analyzes the audio signal of the speaker.

If the UE has a speaker jack, headphones jack or headset jack, connect it directly to the AF 1 IN port. Alternatively, you can use a microphone and connect it to AF 1 IN. You could for example use the microphone of an artificial head, designed for this purpose.

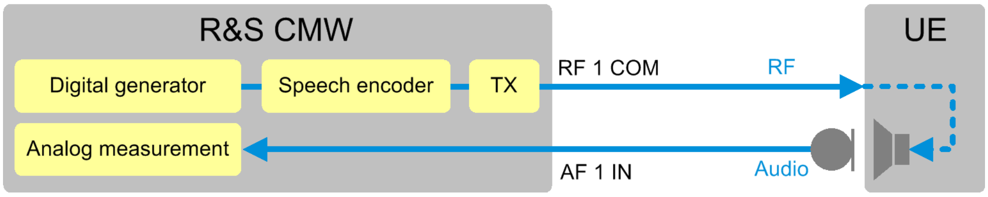


Figure 2-33: Test setup for a speaker test

To prepare and execute the speaker test, proceed as follows:

1. Open the "Audio Measurement 1" view:
   On the task bar, press "Audio Measurement 1".
2. At the top, select the scenario "Microphone- and Speakertest".
3. Connect the UE speaker to AF 1 IN.
4. Select the "Digital Generator" softkey and press ON | OFF.

   The generator is started.

5. Wait until the softkey indicates the "ON" state.

   A 1000 Hz tone is generated, fed to the speech encoder and transmitted to the UE via the VoLTE connection.

6. Select the "Analog Meas" softkey and press ON | OFF.

   The measurement is started.

7. Wait until the softkey indicates the "RUN" state.

8. Evaluate the measurement results, for example the total harmonic distortion (THD) and the signal to noise ratio (SNR) of the audio signal.

Analog Measurement

	CUR	AVG	EXT	STD
THD [%]	0.1121	0.1095	0.1371	0.0037
THD [dB]	-59.01	-59.21	-57.26	0.28
THD + N [%]	0.4402	0.4465	0.4639	0.0051
SINAD [dB]	47.13	47.00	46.67	0.10
SNR [dB]	47.42	47.27	46.97	0.11
DC Level [V]	0.000	0.000	0.000	0.000
Frequency [Hz]	1000.0	1003.3	1095.5	12.3
Weighted Level, RMS [V]	0.0872	0.0873	0.0880	0.0002
Bandpass Level, RMS [V]	0.0872	0.0873	0.0880	0.0002

9. Stop the generator and the measurement:

   a) Select the "Analog Meas" softkey and press ON | OFF.
   b) Select the "Digital Generator" softkey and press ON | OFF.

Performing a microphone test

In the following test, the analog generator of the audio board feeds a 1000 Hz audio tone to the microphone of the UE.

The UE encodes the audio signal and modulates the RF signal. It transmits the RF signal via the already established VoLTE connection to the R&S CMW.

The R&S CMW demodulates and decodes the signal. The digital audio measurement of the audio board analyzes the resulting audio signal.

If the UE has a microphone jack or a headset jack, connect it directly to the AF 1 OUT port. Alternatively, you can use a speaker and connect it to AF 1 OUT. You could for example use the speaker of an artificial head.

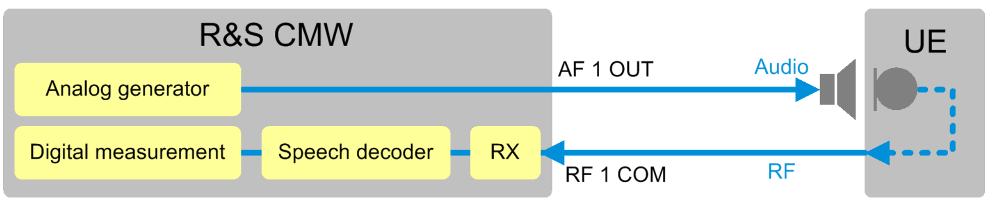


Figure 2-34: Test setup for a microphone test

To prepare and execute the microphone test, proceed as follows:

1. Connect the UE microphone to AF 1 OUT.

2. Select the "Digital Meas" tab.
3. Press the "Analog Generator" softkey.
4. Press the "Level" hotkey. Enter a value compatible to the microphone input of your UE, for example 100 mV.
5. Press ON | OFF.

   The generator is started.
6. Wait until the softkey indicates the "ON" state.

   A 1000 Hz tone is generated and fed to the UE microphone.
7. Select the "Digital Meas" softkey and press ON | OFF.

   The measurement is started.
8. Wait until the softkey indicates the "RUN" state.
9. Evaluate the measurement results, for example the total harmonic distortion (THD) and the signal to noise ratio (SNR) of the audio signal.

Digital Measurement

	CUR	AVG	EXT	STD
THD [%]	0.2841	0.2956	25.6570	0.0588
THD [dB]	-50.92	-50.75	-11.82	1.76
THD + N [%]	2.5354	2.7075	24.9839	0.1183
SINAD [dB]	31.92	31.36	12.05	0.38
SNR [dB]	31.66	31.08	11.42	0.39
Weighted Level, RMS [FS]	0.0610	0.0595	1.0000	0.0024
Bandpass Level, RMS [FS]	0.0602	0.0586	0.9887	0.0025

10. Stop the generator and the measurement:
    a) Select the "Analog Meas" softkey and press ON | OFF.
    b) Select the "Digital Generator" softkey and press ON | OFF.

2.3.3.5 Testing the Speech Quality with an R&S UPV

To measure the speech quality of a VoLTE connection, add an audio analyzer to your test setup. The following example uses an R&S UPV.

The test setup shown in the following figure is similar to the combination of the microphone test setup and the speaker test setup. But the audio generators and measurements are now located in the R&S UPV, not in the R&S CMW. The RF connection / VoLTE connection is the same as for the preceding tests.

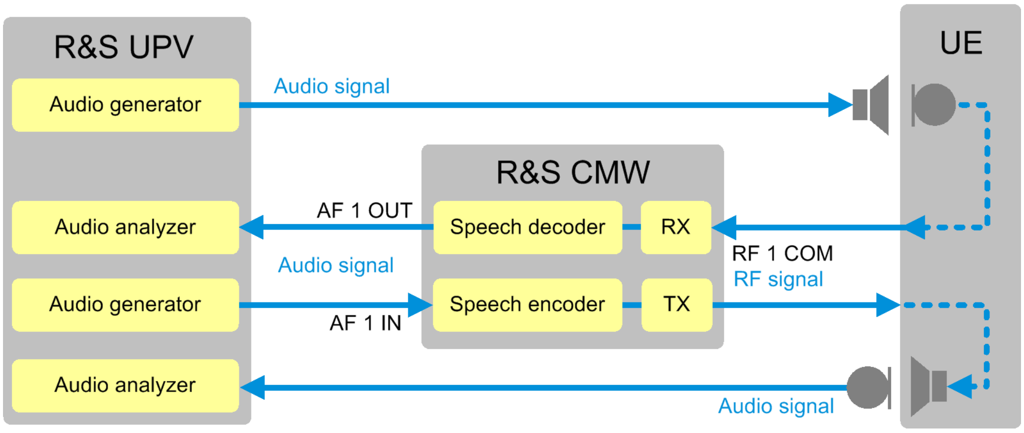


Figure 2-35: Test setup for external speech analysis

A generator of the R&S UPV feeds an audio signal to the microphone of the UE. The UE encodes the audio signal and modulates the RF uplink signal. It transmits the RF signal via the VoLTE connection to the R&S CMW. The R&S CMW demodulates and decodes the signal. It routes the resulting audio signal via the AF 1 OUT port to an audio analyzer of the R&S UPV.

A generator of the R&S UPV feeds an audio signal via the AF 1 IN port to the speech encoder of the audio board. The test signal is transmitted via the VoLTE connection to the UE. The UE demodulates and decodes the signal and feeds the resulting audio signal to its speaker. An analyzer of the R&S UPV measures the audio signal of the speaker.

If the UE has microphone and speaker jacks or a headset jack, connect the UE via an audio cable to the R&S UPV. Alternatively, you can position a microphone at the UE speaker and a speaker at the UE microphone and connect them to the R&S UPV. Use a high-quality microphone and speaker designed for that purpose, for example an artificial head.

Performing a speech quality test

The following sequence describes the configuration steps required at the R&S CMW. The R&S UPV configuration is out of the scope of this document.

1. Set up the VoLTE connection as described in the previous sections.
2. Set up the two audio connections between the R&S UPV and the UE and the two audio connections between the R&S UPV and the R&S CMW.
3. Configure the audio settings of the R&S CMW:
   a) At the top of the "Audio Measurement 1" view, select the scenario "External Analog Speech Analysis".
   b) Press the "Config" hotkey to open the audio configuration dialog box.
   c) Configure the input level compatible to the R&S UPV generator output.
   d) Configure the output level compatible to the R&S UPV analyzer input.
   Check whether a calibration procedure of the R&S UPV requires specific level settings.

4. Configure the R&S UPV. Calibrate it, if necessary.
5. Start the R&S UPV generators and analyzers.

For more information about speech quality tests with an R&S UPV, refer to the following documents:

- Application note "1MA204", "Voice over LTE (VoLTE) Speech Quality Measurements"
- Application note "1GA62", "Test Automation Tool for POLQA® and PESQ® Speech Quality Tests"

These documents are available for download at http://www.rohde-schwarz.com.

The R&S CMWrun provides test modules for automated speech quality tests with the R&S CMW and the R&S UPV.

2.3.3.6 Possible Extensions

While you perform audio tests or speech quality tests, you can vary connection parameters and study the effect on the audio quality.

With option R&S CMW-KM050, you can use the data application unit to add network impairments to the downlink VoLTE connection. Thus you can simulate challenges of real IP networks and test the effect on the speech quality.

Configurable network impairments are for example:

- Packet delay, static or with jitter distribution
- Packet loss and packet corruption
- Reordering and duplication of packets

2.4 GUI Reference

The following sections provide detailed reference information on the parameters of the LTE signaling application. Most parameters can be configured via a single configuration dialog. Additional dialogs allow you to configure the measurements included in the signaling application.

Many of the signaling parameters are available in a subset of connection states only. Temporarily unavailable parameters are grayed out in the configuration dialogs; hotkeys appear and disappear dynamically, depending on the connection state.

The screenshots in this chapter show the GUI with all available options installed. Depending on the installed options, some parameters are not configurable (display the default value) or are not visible at all. The required options are stated.

The GUI reference is structured as follows.

- Main View..108
- Signaling Control..120
- Using the Shortcut Softkeys..125
- General Settings.. 127
- I/Q Settings.. 130
- RF Settings.. 131
- Internal Fading... 138
- Downlink Power Levels..143
- Uplink Power Control... 147
- Physical Cell Setup.. 154
- Network Settings..162
- Connection Configuration..174
- TTI-Based Channel Configuration..208
- CQI Reporting..217
- UE Measurement Report Settings... 220
- Messaging (SMS) Parameters..222
- Messaging (CBS) Parameters.. 227
- Shortcut Configuration.. 230
- Message Monitoring Settings..231
- BLER Measurement Configuration... 232
- RLC Throughput Measurement Configuration...236
- Annex: UE Capabilities... 239

2.4.1 Main View

The main view of the signaling application shows status information and information derived from the uplink signal to the left and the most important settings to the right. All settings in this view can also be accessed via the configuration dialog.

For a description of available hotkeys, refer to Chapter 2.4.2, "Signaling Control", on page 120.

For the shortcut softkeys, refer to Chapter 2.4.3, "Using the Shortcut Softkeys", on page 125.

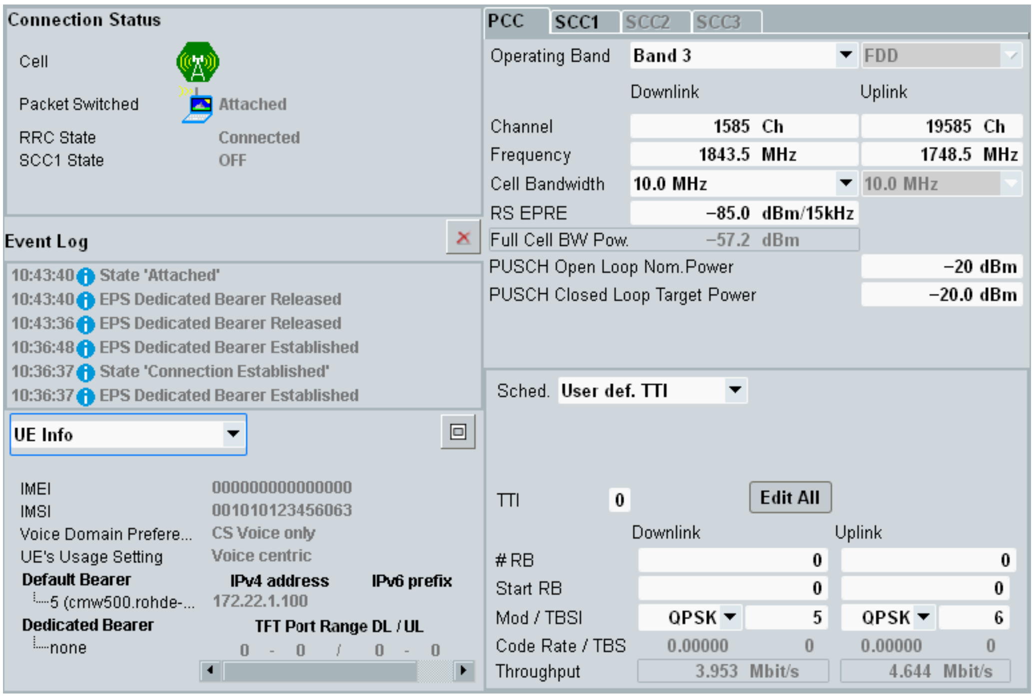


Figure 2-36: LTE signaling main view

For descriptions of the individual areas of the view, refer to the subsections.

- Connection Status...109
- Event Log...110
- UE Measurement Report.. 111
- UE Capabilities...113
- UE Info.. 114
- Settings... 116
- SPS Configuration..118

2.4.1.1 Connection Status

The connection status area displays the following information.

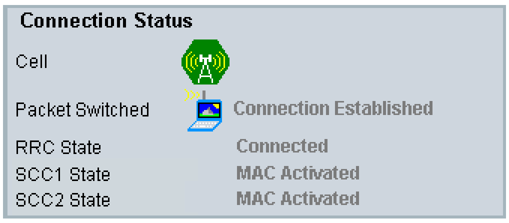


Figure 2-37: Connection status area of the main view

For background information about the displayed states, see Chapter 2.2.9, "Connection States", on page 31.

For control of the states, see Chapter 2.4.2, "Signaling Control", on page 120.

Cell

Displays the current state (or state transition) of the downlink signal generator.

Remote command:
SOURce:LTE:SIGN<i>:CELL:STATe

Packet Switched

Displays the current state or state transition of the primary packet-switched connection (uplink and PCC downlink).

Remote command:
FETCh:LTE:SIGN<i>:PSWitched:STATe?

RRC State

Indicates whether a PCC RRC connection is established ("Connected") or not ("Idle").

Remote command:
SENSe:LTE:SIGN<i>:RRCState?

SCC<n> State

Displays the current state of the secondary component carrier (SCC) number <n>.
Only visible for carrier aggregation scenarios.

Remote command:
FETCh:LTE:SIGN<i>:SCC<c>:STATe?

2.4.1.2 Event Log

The event log area reports events and errors like PS connection state changes, RRC connection establishment/release, SCC state changes and authentication failure.

The button to the right clears the displayed event entries.

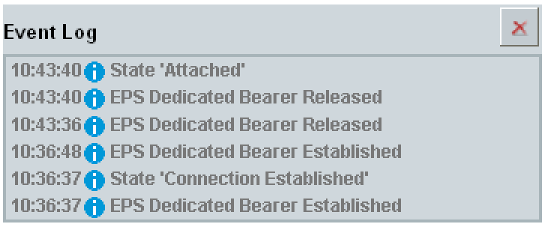


Figure 2-38: Event log area of the main view

Event log entries

Each entry consists of a timestamp, an icon indicating the category of the event and a short text describing the event.

Meaning of the category icons: = information, warning and error

Remote command:
SENSe:LTE:SIGN<i>:ELOG:LAST?
SENSe:LTE:SIGN<i>:ELOG:ALL?
CLEan:LTE:SIGN<i>:ELOG

2.4.1.3 UE Measurement Report

To display the measurement report information, select "UE Measurement Report" in the field below the event log area.

The displayed information is retrieved from "measurement reports" provided by the connected UE. The individual report values are defined in 3GPP TS 36.133.

To enable/disable measurement reports, use the checkbox.

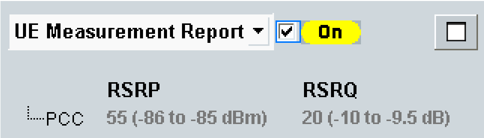


Figure 2-39: Measurement report in the main view

The minimized default presentation shows all measurement report values for the serving LTE cell.

To show also neighbor cell measurement results, press the button to the right. It maximizes the area vertically.

To maximize the area also horizontally, press the button again.

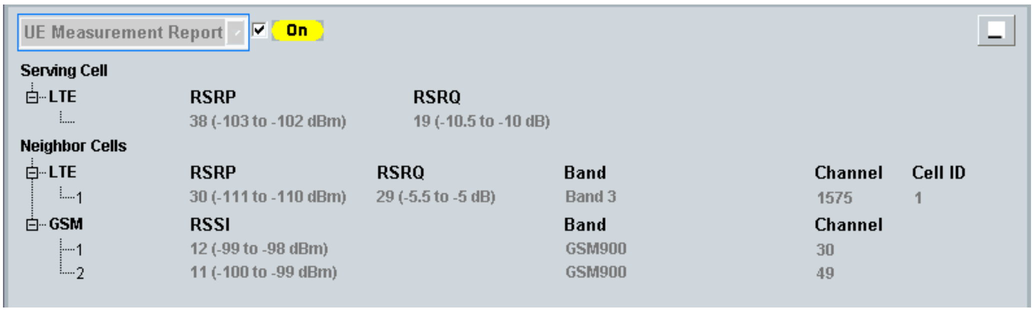


Figure 2-40: Maximized report area

Neighbor cell measurements are by default disabled and can be enabled separately for each neighbor cell, see Chapter 2.4.11.1, "Neighbor Cell Settings", on page 162. Option R&S CMW-KS510 is required.

The measurement results displayed in the maximized report area are described in the following. Configured neighbor cell settings are also displayed (band, channel, ...).

LTE Serving Cell > RSRP 112
LTE Serving Cell > RSRQ 112
LTE Neighbor Cells > RSRP, RSRQ 112
GSM > RSSI 112
WCDMA > RSCP, EcNO 113
CDMA2000 / 1xEV-DO > pilot Pn Phase, pilot Strength 113
TD-SCDMA > RSCP 113

LTE Serving Cell > RSRP
The reference signal received power (RSRP) denotes the average power of the resource elements carrying cell-specific reference signals.

The measurement report displays the reported dimensionless value and in brackets the corresponding measured value range. For carrier aggregation scenarios, the information is displayed per carrier.

Remote command:
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP:RANGe?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl:RANGe?
Plus corresponding PCC commands.

LTE Serving Cell > RSRQ
The reference signal received quality (RSRQ) is calculated as *RSRQ = N×RSRP / (E-UTRA carrier RSSI)*. N is the number of resource blocks in the measurement bandwidth. The "E-UTRA carrier RSSI" denotes the average of the total received power (including interferers, and so on), observed in OFDM symbols containing reference symbols for antenna port 0.

The measurement report displays the reported dimensionless value and in brackets the corresponding measured value range. For carrier aggregation scenarios, the information is displayed per carrier.

Remote command:
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ:RANGe?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl:RANGe?
Plus corresponding PCC commands.

LTE Neighbor Cells > RSRP, RSRQ
The RSRP and RSRQ reported for LTE neighbor cells is displayed in the same way as the values for the serving cell.

Remote command:
SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>?
SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>:RANGe?

GSM > RSSI
The received signal strength indicator (RSSI) denotes the received wideband power within the GSM channel bandwidth, measured on a GSM BCCH carrier.

The measurement report displays the reported dimensionless value and in brackets the corresponding measured value range.

Remote command:
SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>?
SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>:RANGe?

WCDMA > RSCP, EcNO
The received signal code power (RSCP) denotes the received power on one code, measured on the primary CPICH of the neighbor WCDMA cell.

The Ec/No denotes the ratio of the received energy per PN chip for the primary CPICH to the total received power spectral density in the WCDMA band.

The measurement report displays the reported dimensionless values and in brackets the corresponding measured value range.

Remote command:
`SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>?`
`SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>:RANGe?`

CDMA2000 / 1xEV-DO > pilot Pn Phase, pilot Strength
The pilot PN phase indicates the arrival time of a pilot, measured relative to the time reference of the UE in units of PN chips. For details refer to 3GPP2 C.S0005, section 2.6.6.2.4.

The pilot strength denotes the ratio of the received pilot energy per chip to the total received power spectral density in the signal bandwidth of the forward channel.

For reporting, the ratio is converted into a dB value, multiplied with -2 and truncated, so that a positive integer value is reported (0 to 63):

*Reported pilot strength value = INT (-2 * 10 log_{10}(pilot energy / total power))*

For more details refer to 3GPP2 C.S0005, section 2.6.6.2.2 and section 2.7.2.3.2.5.

Remote command:
`SENSe:LTE:SIGN<i>:UEReport:NCELl:CDMA:CELL<no>?`
`SENSe:LTE:SIGN<i>:UEReport:NCELl:EVDO:CELL<no>?`

TD-SCDMA > RSCP
The received signal code power (RSCP) denotes the received power, measured on the P-CCPCH of the neighbor TD-SCDMA cell.

The measurement report displays the reported dimensionless values and in brackets the corresponding measured value range.

Remote command:
`SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>?`
`SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>:RANGe?`

2.4.1.4 UE Capabilities

To display the most important UE capabilities, select "UE Capabilities" in the field below the event log area.

Figure 2-41: UE capabilities in the main view

The displayed information comprises the following extracts from the UE capability report:

- General UE capability information
- RF UE capabilities

To maximize the UE capabilities area and display all capability information, press the button to the right.

The UE capabilities characterize the radio access capabilities of the UE. This information is received from the UE during registration. The radio access capabilities are specified in 3GPP TS 36.331.

For a description of the provided capability information, see Chapter 2.4.22, "Annex: UE Capabilities", on page 239.

2.4.1.5 UE Info

To display UE-related information for an attached UE, select "UE Info" in the field below the event log area.

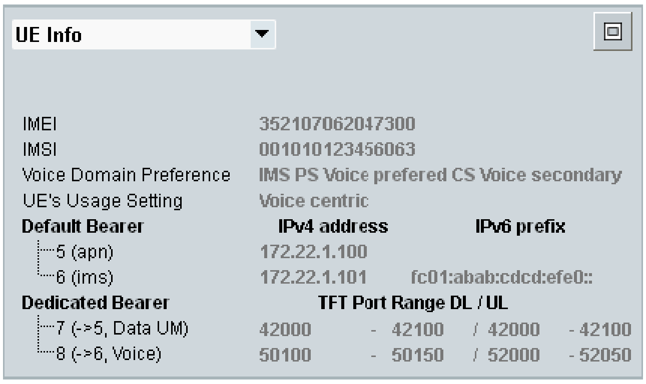


Figure 2-42: UE info area of the main view

IMEI

International mobile equipment identity (IMEI) received from the UE. The IMEI is only known if NAS security is enabled.

Remote command:

`SENSe:LTE:SIGN<i>:UESinfo:IMEI?`

IMSI
International mobile subscriber identity (IMSI) received from the UE.

Remote command:
SENSe:LTE:SIGN<i>:UESinfo:IMSI?

Voice Domain Preference
The voice domain preference received from the UE indicates whether the UE uses the CS domain or the IMS for voice calls.

CS domain means that a circuit-switched fallback is performed and the voice call is established via GERAN or UTRAN.

IMS means that the voice call is established as voice over IMS call, via E-UTRAN.

The following preference values are possible:
- "CS voice only"
- "IMS PS voice only"
- "CS voice preferred, IMS PS voice as secondary"
- "IMS PS voice preferred, CS voice as secondary"

Remote command:
SENSe:LTE:SIGN<i>:UESinfo:VDPReference?

UE's Usage Setting
The usage setting received from the UE determines the behavior of the UE, if voice services are not possible in the current E-UTRAN cell.

Example: The UE has the voice domain preference "IMS PS Voice only", but the cell does not offer IMS services.

"Voice centric"	The UE leaves the cell to ensure the support of voice services. It disables the E-UTRAN capability and performs a reselection to GERAN or UTRAN.
"Data centric"	The UE stays in the cell even if voice services are not possible.

Remote command:
SENSe:LTE:SIGN<i>:UESinfo:UEUSage?

Default Bearer
List of all established default bearers, one line per bearer.

Each line contains the following information:
- Default bearer ID, composed as follows: *<EPS default bearer ID> (<APN>)*
  Example: "5 (cmw500.rohde.schwarz.com)" means default bearer 5, with access point name "cmw500.rohde.schwarz.com"
- IPv4 address assigned to the UE for this bearer
- IPv6 prefix assigned to the UE for this bearer

Remote command:
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:IPV<n>?

Dedicated Bearer
List of all established dedicated bearers, one line per bearer.

Each line contains the following information:
- Dedicated bearer ID, composed as follows:

<EPS dedicated bearer ID> (-> <EPS default bearer ID>, <profile>)
Example: "6 (->5, Voice)" means dedicated bearer 6, mapped to default bearer 5, using dedicated bearer profile "Voice"
For calls set up by the IMS, the <profile> indicates the call type ("IMS Voice" or "IMS Video") and the initial digits of the call ID.

- TFT port range assigned to the dedicated bearer downlink / uplink
  This information is not displayed for calls setup by the IMS.

Remote command:
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer?
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer:SEParate?

2.4.1.6 Settings

The main view provides the most important settings for fast access.

For carrier aggregation scenarios, the settings for the individual component carriers are provided on separate tabs.

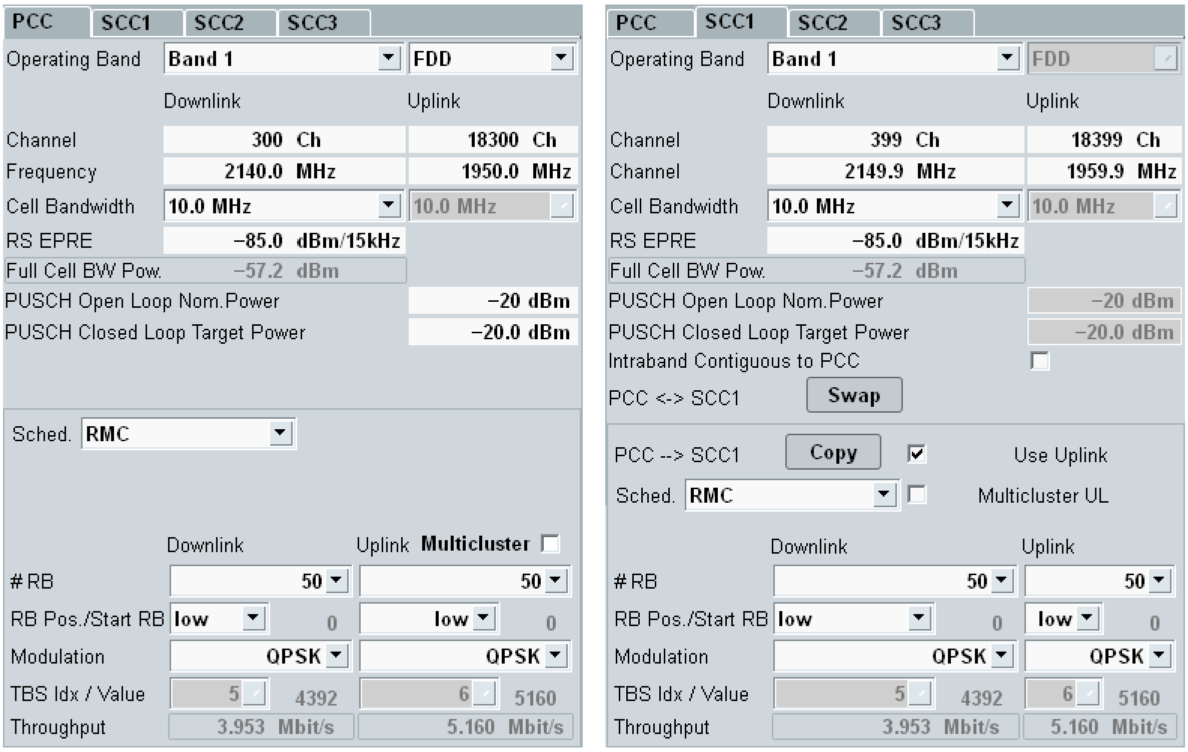


Figure 2-43: Settings in the main view, PCC and SCC1

Upper Part

The upper part contains the following settings:

- Duplex mode
  See Chapter 2.4.4, "General Settings", on page 127
- RF frequency settings
  See Chapter 2.4.6.2, "RF Frequency", on page 134
- Cell bandwidths

See Chapter 2.4.10, "Physical Cell Setup", on page 154
- Most important DL power parameters (RS EPRE, full cell BW power)
  See Chapter 2.4.8, "Downlink Power Levels", on page 143
- Most important UL power parameters
  See Chapter 2.4.9, "Uplink Power Control", on page 147
- Intra-band contiguous SCC configuration
  See "Intraband Contiguous to PCC" on page 129

Swap (button) ← Upper Part

The "Swap" button is only available on SCC tabs. It exchanges PCC settings with the settings of one SCC.

The following settings are exchanged:
- Operating band, channel number and frequency
- Cell bandwidth
- Active scheduling with all related settings (RB configuration, modulation etc.)
  Only the active scheduling settings for the active cell bandwidth are written to the other carrier. The settings related to inactive scheduling types or inactive cell bandwidths are not swapped.

Example 1 – operating band and channel number, with SCC UL:
- Before swap
  – PCC: band 3, channel DL 1500 / UL 19500
  – SCC1: band 20, channel DL 6300 / UL 24300
- After swap
  – PCC: band 20, channel DL 6300 / UL 24300
  – SCC1: band 3, channel DL 1500 / UL 19500

Example 2 – cell BW, scheduling type and #RB, no SCC UL:
- Before swap
  – PCC: 10 MHz, RMC, DL 50 RB, UL 40 RB
  – SCC1: 5 MHz, user-defined channel, 22 RB
  – PCC inactive settings for 5 MHz, user-defined channel: DL 15 RB, UL 18 RB
- After swap
  – PCC: 5 MHz, user-defined channel, DL 22 RB, UL 18 RB
  – SCC1: 10 MHz, RMC, 50 RB
  – PCC inactive settings for 10 MHz, RMC: DL 50 RB, UL 40 RB
  – SCC1 inactive settings for 5 MHz, user-defined channel: 22 RB

If you perform a swap for an established connection, all connection states after the swap equal the states before the swap. Either redirection or blind handover is used for the swap, see "Operating Band Change, Frequency Change" on page 195.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SEXecute`

Lower Part

The lower part contains scheduling-type specific settings:
- RMC:
  The settings are the same as in the configuration tree, see Chapter 2.4.12.9, "RMC Connection Settings", on page 202.
- User-defined channels:

The settings are the same as in the configuration tree, see Chapter 2.4.12.10, "User-Defined Channel Configuration", on page 205.
- User-defined TTI-based / fixed CQI:
  You can configure the settings of a selected subframe (TTI) directly. Alternatively, press the button "Edit All" to open a dialog box where you can edit the settings of all subframes.
  For a parameter description, see Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208.
- Follow WB CQI / PMI / PMI-RI / CQI-RI / CQI-PMI-RI:
  You can configure the settings of a selected uplink subframe directly. The downlink settings apply to all subframes.
  For additional settings, press the button "Edit All". It opens a dialog box where you can edit the settings of all uplink and downlink subframes.
  For a parameter description, see Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208.
- SPS:
  See Chapter 2.4.1.7, "SPS Configuration", on page 118

If a transmission scheme using several data streams is active, the parameter "MIMO DL Stream" allows you to switch between the settings of the downlink streams. The parameter is disabled if all streams use the same set of settings.

Copy (button) ← Lower Part

The "Copy" button is only available on SCC tabs. It copies PCC settings to an SCC.

The following settings are copied:
- Cell bandwidth
- Active scheduling with all related settings (RB configuration, modulation etc.)

The copy operation is only possible, if the PCC settings and the SCC settings are compatible. Examples for incompatibilities:
- The active scenario is not symmetric for the carriers. Example: The scenario allows MIMO for the PCC but not for the SCC.
- The PCC scheduling type is not supported for the SCC (for example SPS).
- The resource allocation type is two for the PCC and zero for the SCC.
- The PCC scheduling type equals RMC. The PCC uses transmission mode 1 and the SCC uses another transmission mode (or vice versa).

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:CEXecute`

2.4.1.7 SPS Configuration

Most semi-persistent scheduling settings are configurable in the main view.

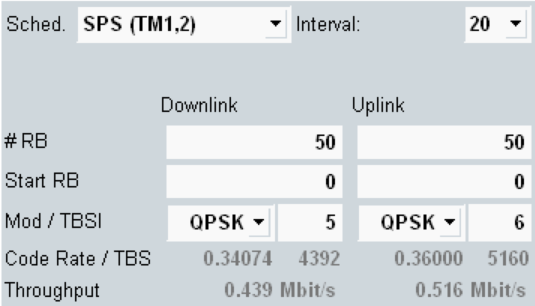


Figure 2-44: SPS settings

To configure SPS, proceed as follows:

1. Select the duplex mode and the cell bandwidth in the upper part of the main view.
2. Select the scheduling type SPS.
3. Select the subframe interval.
4. Select the number of allocated resource blocks (RB), the position of the first RB and the modulation type.
5. Select the transport block size index.

For valid parameter combinations and background information, see Chapter 2.2.16, "Semi-Persistent Scheduling (SPS)", on page 66.

The channel settings can be changed in all main connection states including "Connection Established".

The parameters are described in the following. Option R&S CMW-KS510 is required.

Sched. 119
Interval 119
RB ... TBSI /TBS 120
Code Rate 120
Throughput 120

Sched.

Selects the scheduling type, see "UE Transmit Antenna Selection" on page 191.

Interval

Configures the subframe periodicity n. The UE is granted the configured RB allocation in every n^{th} subframe.

For TDD, only multiples of radio frames are allowed. For that reason, the selected value is internally rounded down to a multiple of 10. Example: 128 selected means 120.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:SINTerval`

 # RB ... TBSI /TBS

"# RB" selects the number of allocated resource blocks.

"Start RB" specifies the number of the first allocated resource block. This parameter allows you to shift the allocated RBs within the cell bandwidth.

"Mod" selects the modulation type. The setting influences the allowed transport block size indices.

"TBSI" selects the transport block size index. "TBS" displays the resulting transport block size in bits.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL

Code Rate

Effective channel code rate, i.e. the number of information bits (including CRC bits) divided by the number of physical channel bits on PDSCH/PUSCH.

Remote command:

SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL:CRATe:ALL?

Throughput

Expected maximum throughput in Mbit/s (averaged over one frame).

Remote command:

SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?

2.4.2 Signaling Control

The individual connection states are controlled via the ON | OFF key, via hotkeys and via the UE.

The available hotkeys depend on the current connection state. All possible hotkeys are described in the following.

For background information, refer to Chapter 2.2.9, "Connection States", on page 31.

ON | OFF (key) / LTE Signaling (softkey)

To turn the DL signal transmission on or off, use the ON | OFF key or right-click the softkey. The current state is shown by the softkey. The signal transmission can be switched off any time, independent of the current connection state. A yellow hour glass symbol indicates that the signaling generator is turned on or off.

The state "RDY" means that the signaling application is ready to receive an inter-RAT handover from another signaling application (e.g. from WCDMA). This state is initiated by the application acting as source of the handover.

Remote command:
SOURce:LTE:SIGN<i>:CELL:STATe
SOURce:LTE:SIGN<i>:CELL:STATe:ALL?

Connection control hotkeys

Any interaction with a UE requires an LTE downlink signal (cell). If the signal is available (state ON, no hour glass), connection control hotkeys can be present in the hotkey bar.

The available hotkeys depend on the current packet-switched state, RRC state, SCC state, connection type and selected component carrier tab. For SCC activation, there are several possible modes, influencing the available SCC hotkeys, see "SCC Activation Mode" on page 129.

To access hotkeys for a specific component carrier, select the corresponding tab. Example: For hotkey "SCC2 On", select the tab "SCC2". Via the "PCC" tab, you can access hotkeys for the PCC and for the SCC1.

The possible hotkeys are listed in the following table.

Hotkey	Description
"Connect"	See "Connect (hotkey)" on page 121
"Disconnect"	Release a dedicated bearer connection in test mode.
"Detach"	Send a detach request to the UE and detach the UE (independent of UE reaction to the request).
"Send SMS"	Send an SMS message to the UE.
"Inter/Intra-RAT"	See "Inter/Intra-RAT (hotkey)" on page 123
"SCC<n> On"	Switch on the SCC<n> DL signal.
"SCC<n> Off"	Switch off the SCC<n> DL signal.
"SCC<n> add RRC" "SCC<n> delete RRC"	Add/delete SCC<n> RRC connection.
"SCC<n> activate MAC" "SCC<n> deactivate MAC"	Activate/deactivate MAC for the SCC<n>.

Remote command:
CALL:LTE:SIGN<i>:PSWitched:ACTion
FETCh:LTE:SIGN<i>:PSWitched:STATe?
CALL:LTE:SIGN<i>:SCC<c>:ACTion
FETCh:LTE:SIGN<i>:SCC<c>:STATe?

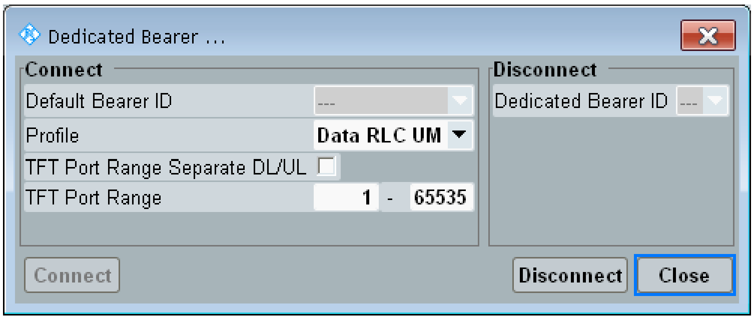
Connect (hotkey)

The UE must attach to make the "Connect" hotkey available.

The effect of the hotkey depends on the parameter Connection Type:

- "Testmode": The hotkey sets up a single dedicated bearer with predefined default settings.
- "Data Application": The hotkey opens a dialog box for configuration, connection and release of multiple dedicated bearers.

Option R&S CMW-KS510 is required. Without this option, a single dedicated bearer with predefined default settings is set up.



The dialog box is described in the following.

Connect ← Connect (hotkey)

Use the "Connect" section of the dialog box to configure a dedicated bearer. Then press the "Connect" button to establish the bearer with the configured settings.

"Default Bearer ID" selects the default bearer, to which the dedicated bearer is to be mapped. For more details about the ID, see "Default Bearer" on page 115.

"Profile" selects a dedicated bearer profile. The profiles contain optimum bearer settings for voice calls, video calls and data connections with high throughput in RLC acknowledged or unacknowledged mode. The most important bearer settings are listed in Table 2-30.

"TFT Port Range" selects the destination ports for which traffic is to be routed to the dedicated bearer. If you set up several dedicated bearers, the port ranges of the bearers must not overlap.

By default, the configured TFT port range is used for the uplink and for the downlink. If you want to configure different ranges for the uplink and the downlink, enable "TFT Port Range Separate DL/UL".

In total, up to eight bearers can be established in parallel (default plus dedicated bearers).

Table 2-30: Bearer settings depending on the "Profile"

	Voice	Video	Data AM	Data UM
QCI	1	2	6	6
PDCP "discardTimer"	50ms	50ms	infinity	infinity
"pdcp-SN-size" (RLC UM)	len7bits	len7bits	-	len12bits
RLC mode (RLC AM/UM)	UM	UM	AM	UM
"sn-FieldLength" (RLC UM)	size5	size5	-	size10
"t-Reordering" (RLC UM, AM)	10ms	10ms	20ms	20ms
"t-StatusProhibit" (RLC AM)	-	-	5ms	-
"t-PollRetransmit" (RLC AM)	-	-	60ms	-
"pollPDU" (RLC AM)	-	-	p32	-

	Voice	Video	Data AM	Data UM
"pollByte" (RLC AM)	-	-	250kB	-
"maxRetxThreshold" (RLC AM)	-	-	t16	-

Remote command:
CATalog:LTE:SIGN<i>:CONNection:DEFBearer?
PREPare:LTE:SIGN<i>:CONNection:DEDBearer
PREPare:LTE:SIGN<i>:CONNection:DEDBearer:SEParate
CALL:LTE:SIGN<i>:PSWitched:ACTion

Disconnect ← Connect (hotkey)

Use the "Disconnect" section of the dialog box to release an established dedicated bearer.

Select the bearer via the "Dedicated Bearer ID" list. Then press the "Disconnect" button.

For more details about the ID, see "Dedicated Bearer" on page 115.

Remote command:
CATalog:LTE:SIGN<i>:CONNection:DEDBearer?
CONFigure:LTE:SIGN<i>:CONNection:DEDBearer
CALL:LTE:SIGN<i>:PSWitched:ACTion

Inter/Intra-RAT (hotkey)

The hotkey opens a dialog box for selection and configuration of the handover destination and initiation of the handover.

The LTE signaling application supports a handover within the signaling application, e.g. to another operating band, and a handover to another instrument or to another signaling application.

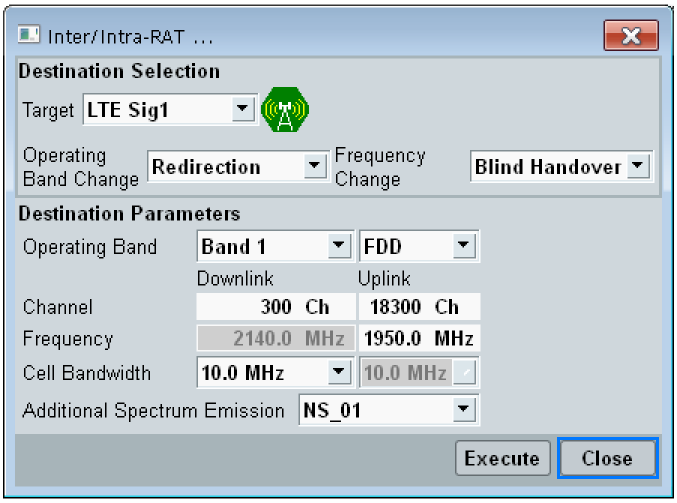


Figure 2-45: Intra-RAT handover

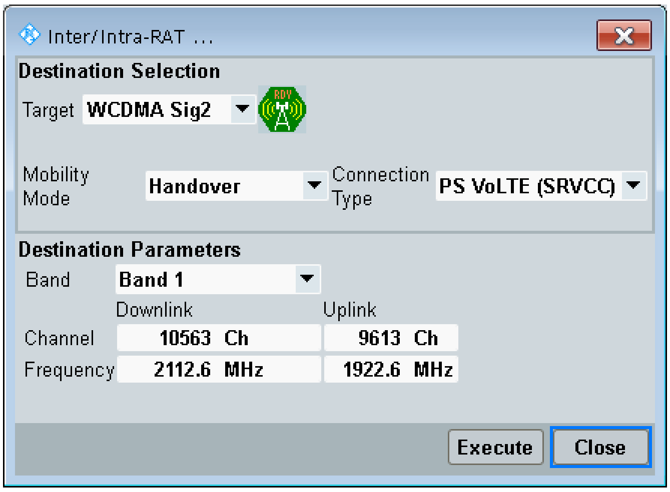


Figure 2-46: Handover of VoLTE call to WCDMA

For a detailed step-by-step description of a handover, see "How to perform a handover" on page 36.

Target ← Inter/Intra-RAT (hotkey)
This parameter selects the handover destination. For a handover to another instrument, select "No Connection" as target.

The cell icon indicates the cell state of the currently selected destination. When you select another signaling application, e.g. "WCDMA Sig1", the destination cell is switched on automatically and the target cell state changes to RDY (ready for the handover).

Remote command:
`PREPare:LTE:SIGN<i>:HANDover:CATalog:DESTination?`
`PREPare:LTE:SIGN<i>:HANDover:DESTination`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:DESTination`

Mobility Mode, Operating Band Change, Frequency Change ← Inter/Intra-RAT (hotkey)
These parameters select the mechanism to be used.

The parameter "Mobility Mode" is displayed for a handover to another LTE signaling instance or to another signaling application, for example to GSM or WCDMA.

The parameters "Operating Band Change" and "Frequency Change" are displayed for a handover within the signaling application.

Circuit-switched fallback requires option R&S CMW-KS510.

For a description of the mobility modes, see Chapter 2.2.10, "Handover", on page 35.

Remote command:
`PREPare:LTE:SIGN<i>:HANDover:MMODe`
`CONFigure:LTE:SIGN<i>:CONNection:OBCHange`
`CONFigure:LTE:SIGN<i>:CONNection:FCHange`

Connection Type ← Inter/Intra-RAT (hotkey)
This setting is only relevant for the handover of a VoLTE call to another signaling application.

It selects the call type to be set up at the destination. Option R&S CMW-KS510 is required.

"PS VoLTE (SRVCC)" A voice call is established. The VoLTE call is handed over seamlessly via SRVCC.

"PS Data (End2End)" An end-to-end packet data connection via the DAU is established.

Remote command:
`PREPare:LTE:SIGN<i>:HANDover:CTYPe`

Destination Parameters ← Inter/Intra-RAT (hotkey)
The "Destination Parameters" display current settings of the selected signaling application target, typically operating band and channels. You can modify these settings before starting the handover.

For a handover to another instrument, the "External Destination Parameters" are displayed instead (radio access technology and typically operating band and channel). Configure them according to the actual configuration of the other instrument. There is no communication between the two instruments, so the settings at both instruments must match.

The commands listed here are relevant for handover within the LTE signaling application and for handover to another instrument.

For a handover to another signaling application in the same instrument, use the commands provided by the signaling application target. There are no special handover commands for this purpose.

Remote command:
`PREPare:LTE:SIGN<i>:HANDover`
`PREPare:LTE:SIGN<i>:HANDover:ENHanced`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:CDMA`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:EVDO`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:GSM`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:LTE`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:TDSCdma`
`PREPare:LTE:SIGN<i>:HANDover:EXTernal:WCDMa`

Execute ← Inter/Intra-RAT (hotkey)
To initiate a handover with the configured settings, press the "Execute" button.

Remote command:
`CALL:LTE:SIGN<i>:PSWitched:ACTion`

2.4.3 Using the Shortcut Softkeys

When using the LTE signaling application and an LTE measurement in parallel, use a shortcut softkey to switch to the measurement.

Using one of these softkeys, ensures that the measurement is configured compatible to the settings of the signaling application. When you use the softkey to switch to a TX measurement, the combined signal path scenario is activated automatically in the measurement.

Consequences:

- The measurement and the signaling application can be used in parallel, i.e. both DL signal transmission and measurement can be switched on.
- The signaling RF settings are also used for the measurement.
- Some measurement control settings are configured compatible with the signaling settings.
- A suitable trigger signal provided by the signaling application is selected as trigger source for the measurement.

If the softkey label equals "Go to...", the softkey opens a dialog box with a list of all available measurements. If the softkey label indicates a measurement name instead of "Go to...", this measurement has been assigned to the softkey as fixed target, see Chapter 2.4.18, "Shortcut Configuration", on page 230.

Three shortcut softkeys are available and can be set to different fixed targets.

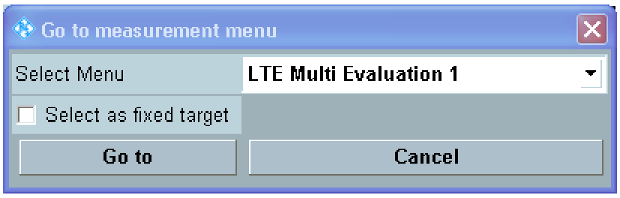


Figure 2-47: Dialog box opened by "Go to..." softkey

Select Menu
Selects the target measurement you want to switch to.

Select as fixed target
Sets the selected measurement as fixed target of the softkey. The softkey label indicates the measurement name and switches directly to the selected target without opening the dialog box.

When the dialog box has been disabled, you can still change the target measurement or re-enable the dialog box using the configuration menu, see Chapter 2.4.18, "Shortcut Configuration", on page 230.

Go to / Cancel
Press the "Go to" button to switch to the selected measurement or "Cancel" to abort.

2.4.4 General Settings

The general settings are at the top of the configuration dialog. Configure them according to your test scenario, before configuring any other settings.

The general settings reflect basic decisions: FDD or TDD signal, use MIMO / fading / carrier aggregation or not.

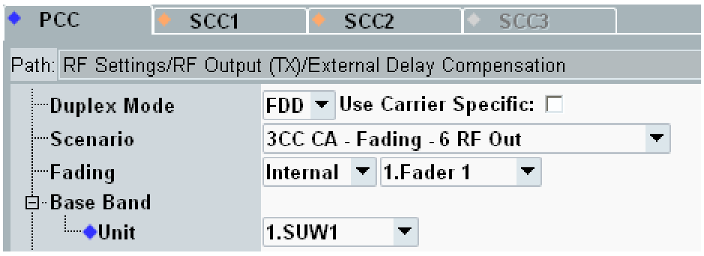


Figure 2-48: Top of configuration dialog (PCC)

The configuration dialog contains one tab per component carrier:

- "PCC" tab: This tab is always active, independent of the selected scenario. The settings are either PCC-specific (marked by ◆), or they apply to the PCC and to the SCCs (if SCC tabs are active).
- "SCC<n>" tab: The tabs are active or inactive depending on the selected scenario. The settings are either SCC-specific (marked by ◆), or they apply to the PCC and to the SCC. In the latter case, changing the setting on one tab changes it also on the other tab. Most settings marked by ◆ are configurable per SCC. So different values can be set on the individual SCC tabs.

If a setting is individually configurable for PCC and SCC, two remote control commands are listed for the setting: one `[:PCC]` command and one `:SCC` command. If the SCC command has a suffix (:SCC<c>), the setting is individually configurable for each SCC.

The SCC tab contains a subset of the settings present on the PCC tab. For that reason, most screenshots in the following sections show the settings on the PCC tab.

The general section on the SCC tab contains additional parameters that are not present on the PCC tab:

Figure 2-49: Additional settings on SCC tab

The general settings are described in the following.

Duplex Mode...128
Scenario..128
Fading...128
Base Band Unit...128

SCC Activation Mode... 129
Use UL.. 129
Intraband Contiguous to PCC... 129

Duplex Mode
Selects the duplex mode of the LTE signal: FDD or TDD.

If you enable "Use Carrier Specific", you can configure the duplex mode per component carrier.

Option R&S CMW-KS500 required for FDD, R&S CMW-KS550 required for TDD.

Remote command:
`CONFigure:LTE:SIGN<i>[:PCC]:DMODe`
`CONFigure:LTE:SIGN<i>:SCC<c>:DMODe`
`CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific`

Scenario
Different test scenarios require different sets of parameters. Selecting a scenario hides/shows parts of the GUI as required by the scenario.

The active scenario determines for example whether MIMO and fading are used or not. It determines also the number of component carriers.

Scenario names:
- "1 Cell" means no carrier aggregation.
  "<n>CC CA" means carrier aggregation with <n> component carriers.
- Fading support is indicated by "- Fading -" in the scenario name.
- "<n> RF Out" indicates the number of used TX modules and thus the number of configurable RF output paths.

The individual scenarios are only offered for selection, if the required software and hardware options are available.

For details, see Chapter 2.2.1, "Scenarios", on page 15.

Remote command:
For each scenario, there is at least one `ROUTe:LTE:SIGN<i>:SCENario:...` command. For fading scenarios, there are several commands for the individual fading types.
All scenario commands are listed in Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379.

Fading
This parameter is displayed for the fading scenarios. It selects between fading via an external fader and fading via an internal fader I/Q board. Whether external fading is allowed depends on the antenna configuration.

For internal fading with a single I/Q board, you can select the I/Q board to be used.

Remote command:
Configured via the scenario selection command, see Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379

Base Band Unit
Selects the signaling unit to be used for a carrier. This setting is especially useful for multi-CMW setups, to control which carrier is available at which instrument.

Remote command:
Configured via the scenario selection command, see Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379

SCC Activation Mode
This setting is only displayed on the SCC tabs. It configures the activation mode of the SCCs for carrier aggregation scenarios. The setting applies to all SCCs (same value on all SCC tabs).

Option R&S CMW-KS512 is required for the modes "Manual" and "Semiautomatic".

See also Chapter 2.2.9.2, "SCC States", on page 34.

"Auto"	The SCC is activated automatically, so that the state "MAC Activated" is reached. If the PCC RRC connection is kept after the attach (Keep RRC Connection), the SCC activation is done at UE attach. If the PCC RRC connection is not kept after the attach, the SCC activation is done with the next RRC connection establishment.
"Semiautomatic"	Initiate the SCC activation manually. As a result, all state transitions required to reach the state "MAC Activated" are performed. This mode is useful if you want to establish first a PCC connection and add the SCC connection later on after some tests.
"Manual"	Initiate each state transition step separately. There are three steps from "SCC Off" via "SCC On" and "RRC Added" to "MAC Activated". This mode is useful for debugging of the UE. From each state, you can go back to the previous state or continue to the next state. For example from state "RRC Added", you can go to "MAC Activated" or to "SCC On".

Remote command:
`CONFigure:LTE:SIGN<i>:SCC:AMODe`

Use UL
This setting is only displayed on the SCC tabs. It activates the uplink for the SCC.

You can activate the uplink of maximum one SCC, resulting in uplink carrier aggregation with two carriers (PCC plus one SCC).

Option R&S CMW-KS512 is required for UL carrier aggregation.

Remote command:
`CONFigure:LTE:SIGN<i>:SCC<c>:UUL`

Intraband Contiguous to PCC
This setting is only displayed on an SCC tab with enabled uplink. It adjusts the SCC uplink frequency so that the SCC is located next to the PCC, according to the rules for intraband contiguous uplink carrier aggregation.

You can select whether the SCC frequency is lower or higher than the PCC frequency: Before enabling the checkbox, specify any SCC uplink frequency above or below the PCC uplink frequency.

For combined signal path measurements, this checkbox tells the multi-evaluation measurement whether the UL signal uses contiguous carrier aggregation or not.

Remote command:
CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE

2.4.5 I/Q Settings

The parameters in this section configure the I/Q output paths and/or the I/Q input paths. The settings are relevant for external fading scenarios and for the "I/Q out - RF in" scenario. Only for these scenarios, the section is present.

Depending on the scenario, the section configures only one I/Q output path or one, two or four pairs of input and output paths. For carrier aggregation scenarios, you can configure the settings per component carrier.

If you use the scenario "I/Q out - RF in", specify the external delay of the test setup in the setup dialog. This setting allows the "LTE Signaling" application to compensate a time delay in the output path.

See also: "Digital IQ" in the R&S CMW base unit manual, chapter "Basic Instrument Functions"

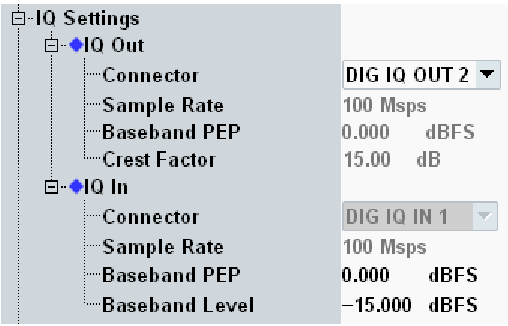


Figure 2-50: I/Q settings (1 Cell - Fading - 1 RF Out, external fading)

Connector (Out / In).. 130
Sample Rate (Out / In).. 130
Baseband PEP (Out / In)..131
Crest Factor (Out).. 131
Baseband Level (In).. 131

Connector (Out / In)
Select the output connector. The input connector depends on the output connector and is displayed for information.

The DIG IQ connectors are on the rear panel (if an I/Q board is installed).

Remote command:
Configured via the scenario selection command, see Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379

Sample Rate (Out / In)
The used sample rate is displayed for information. The value is fixed.

Configure the connected instrument accordingly (baseband input settings and digital I/Q output settings).

Remote command:
`SENSe:LTE:SIGN<i>:IQOut[:PCC]:PATH<n>?`
`SENSe:LTE:SIGN<i>:IQOut:SCC<c>:PATH<n>?`

Baseband PEP (Out / In)
Indicates the peak envelope power of the baseband signal as dB value relative to full scale. "Full scale" in this case corresponds to the maximum representable amplitude of the I/Q samples.

Use the displayed output PEP value to configure the baseband input of the connected instrument.

Configure the input PEP so that it matches the baseband output of the connected instrument.

Remote command:
`SENSe:LTE:SIGN<i>:IQOut[:PCC]:PATH<n>?`
`CONFigure:LTE:SIGN<i>:IQIN[:PCC]:PATH<n>`
`SENSe:LTE:SIGN<i>:IQOut:SCC<c>:PATH<n>?`
`CONFigure:LTE:SIGN<i>:IQIN:SCC<c>:PATH<n>`

Crest Factor (Out)
Indicates the crest factor of the baseband signal, i.e. the ratio of peak to average baseband power. The average power is calculated for time intervals with active downlink traffic channel timeslots only.

Use the displayed crest factor value to configure the baseband input of the connected instrument.

Remote command:
`SENSe:LTE:SIGN<i>:IQOut[:PCC]:PATH<n>?`
`SENSe:LTE:SIGN<i>:IQOut:SCC<c>:PATH<n>?`

Baseband Level (In)
Indicates the nominal RMS level of the baseband signal during a call (connection established).

Configure the baseband level so that it matches the baseband output of the connected instrument.

Remote command:
`CONFigure:LTE:SIGN<i>:IQIN[:PCC]:PATH<n>`
`CONFigure:LTE:SIGN<i>:IQIN:SCC<c>:PATH<n>`

2.4.6 RF Settings

The parameters in this section configure the RF input and output paths.

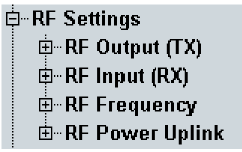


Figure 2-51: RF settings (1 Cell - 1 RF Out)

For descriptions of the parameters, refer to the subsections.

- RF Signal Routing....................132
- RF Frequency....................134
- Expected Uplink Power....................137

2.4.6.1 RF Signal Routing

This section configures the RF input path and/or the RF output paths. Most parameters are configurable per path.

The number of configurable input and output paths depends mainly on the selected scenario.

For carrier aggregation scenarios, you can configure the settings per component carrier (except "External Delay Compensation").

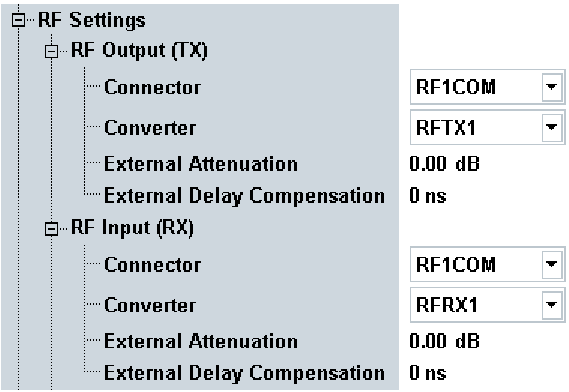


Figure 2-52: RF path settings (1 Cell - 1 RF Out)

RF Output (TX)....................132
└ Connector, Converter....................133
└ External Attenuation....................133
└ External Delay Compensation....................133
RF Input (RX)....................133
└ Connector, Converter....................133
└ External Attenuation....................133
└ External Delay Compensation....................134

RF Output (TX)

The following parameters configure the RF output paths of the R&S CMW.

Connector, Converter ← RF Output (TX)
Selects the output paths for the generated RF signals, that means the output connector and the TX module for each downlink path.

Depending on your hardware configuration, there are dependencies between both parameters.

Remote command:
Configured via the scenario selection command, see Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379

External Attenuation ← RF Output (TX)
Defines the value of an external attenuation (or gain, if the value is negative) in the output path. With an external attenuation of x dB, the power of the generated signal is increased by x dB. The actual generated levels are equal to the displayed values plus the external attenuation.

If a correction table for frequency-dependent attenuation is active for the chosen connector, the table name and a button are displayed. Press the button to display the table entries.

You can configure the external attenuation per output path.

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:OUTPut<n>`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:OUTPut<n>`

External Delay Compensation ← RF Output (TX)
Defines the value of an external time delay in the output path. A delay can for example be caused by a long optical fiber cable or by an additional instrument in the output path.

As a result, the downlink signal is sent earlier, so that the downlink signal arrives at the UE without delay.

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings:EDC:OUTPut`

RF Input (RX)
The following parameters configure the RF input path of the R&S CMW.

Connector, Converter ← RF Input (RX)
Selects the input path for the measured RF signal, i.e. the input connector and the RX module to be used.

Remote command:
Configured via the scenario selection command, see Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379.
For configuration of SCC uplinks, see `CONFigure:LTE:SIGN<i>:SCC<c>:UUL` on page 307.

External Attenuation ← RF Input (RX)
Defines the value of an external attenuation (or gain, if the value is negative) in the input path. The power readings of the R&S CMW are corrected by the external attenuation value.

The external attenuation value is also used in the calculation of the maximum input power that the R&S CMW can measure.

If a correction table for frequency-dependent attenuation is active for the chosen connector, then the table name and a button are displayed. Press the button to display the table entries.

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut`

External Delay Compensation ← RF Input (RX)
Defines the value of an external time delay in the input path, for example caused by a long optical fiber cable.

The signaling application uses this information to compensate for the delay and to synchronize the uplink and the downlink despite the delay.

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings:EDC:INPut`

2.4.6.2 RF Frequency

This section configures the operating band and the channel/frequency for uplink and downlink.

The uplink settings configure the center frequency of the RF analyzer. The downlink settings configure the carrier center frequency of the generated LTE signal.

If option R&S CMW-KS525 is available, a user-defined band can be specified and used.

For carrier aggregation scenarios, you can configure the settings per component carrier.

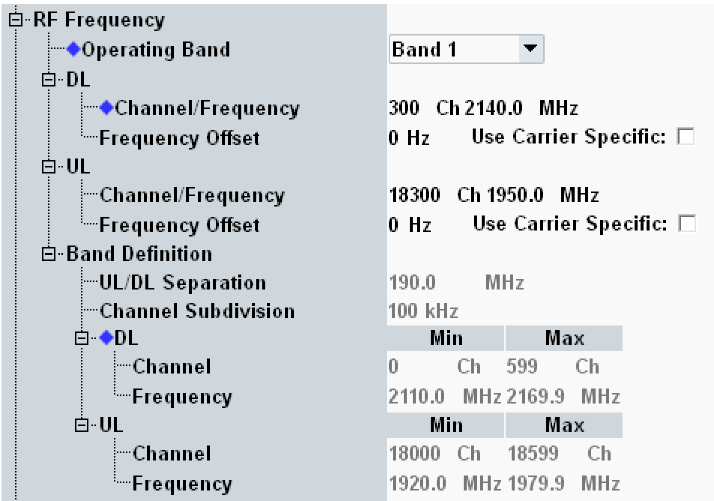


Figure 2-53: Frequency settings

Operating Band, Channel, Frequency....135
Frequency Offset....135
Band Definition....136
└ UL/DL Separation....136
└ Channel Subdivision....136
└ Band Indicator....136
└ DL Channel, Frequency....136
└ UL Channel, Frequency....136

Operating Band, Channel, Frequency

To specify the DL and UL frequencies, select an operating band first, then enter a valid channel number or frequency for UL or DL. The related frequency or channel number and the parameters for the other direction are calculated automatically.

For carrier aggregation, select different DL channels for the carriers. The channels must not overlap and can be located in the same band or in different bands.

The relation between operating band, carrier frequencies and channel numbers is defined by 3GPP (see Chapter 2.2.17, "Operating Bands", on page 67). You can define an additional band if option R&S CMW-KS525 is available, see "Band Definition" on page 136.

You can change the operating band and the channels in all main connection states. In state "Connection Established" you can either change one parameter directly or you can perform a handover to reconfigure several parameters, see Chapter 2.2.10, "Handover", on page 35.

Remote command:

```
CONFigure:LTE:SIGN<i>[:PCC]:BAND
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:DL
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL
CONFigure:LTE:SIGN<i>:SCC<c>:BAND
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:DL
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL
CONFigure:LTE:SIGN<i>:RFSettings:ALL:BWCHannel
```

Frequency Offset

You can specify positive or negative offsets to be added to the carrier center frequencies. This setting is useful for example if the UE has a frequency offset relative to the channels defined by 3GPP.

To configure different PCC and SCC settings for carrier aggregation scenarios, enable "Use Carrier Specific".

Remote command:

```
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL:UCSPecific
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:DL
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL
```

Band Definition
Displays the definition of the selected operating band. Operating band "User-Defined" can be edited.

Option R&S CMW-KS525 is required for user-defined bands.

UL/DL Separation ← Band Definition
F_{DL} - F_{UL}, for TDD usually the same frequency is used in UL and DL, but different frequencies can be configured for user-defined bands.

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:UDSeparation`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:UDSeparation`

Channel Subdivision ← Band Definition
Displays the spacing between center frequencies of two adjacent channels, always 100 kHz - also for user-defined bands.

Band Indicator ← Band Definition
Frequency band indicator identifying a user-defined band in signaling messages. The value is sent to the UE via broadcast in system information block 1. It is also used in handover messages.

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:BINDicator`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:BINDicator`

DL Channel, Frequency ← Band Definition
For user-defined PCC or SCC channels, you can edit the minimum DL channel number, the maximum DL channel number and the minimum DL center frequency.

The maximum DL center frequency is calculated automatically according to the "Channel Subdivision".

Remote command:
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MINimum`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MAXimum`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MINimum`
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MAXimum?`
Plus corresponding PCC commands.

UL Channel, Frequency ← Band Definition
For user-defined PCC channels, you can edit the minimum UL channel number and thus the relation between DL and UL channel numbers.

The other UL settings are calculated automatically according to the DL settings and the "UL/DL Separation".

Remote command:
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MINimum
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MAXimum?
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MINimum?
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MAXimum?
Plus corresponding PCC commands.

2.4.6.3 Expected Uplink Power

The following parameters configure the expected uplink power.

With UL carrier aggregation, you can configure the settings per component carrier.

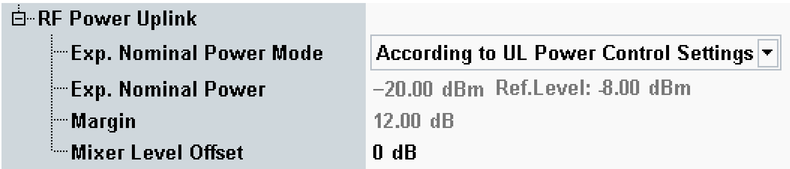


Figure 2-54: RF uplink power settings

Exp. Nominal Power..., Margin

These parameters configure the expected UL power. Two modes are available:

- "According to UL Power Control Settings"
  The UL power is calculated automatically from the UL power control settings. The resulting expected nominal power is displayed for information. The displayed reference level is calculated as:
  Reference Level = Expected Nominal Power + 12 dB Margin
  For UL power control settings, see Chapter 2.4.9, "Uplink Power Control", on page 147.
- "Manual"
  In manual mode, the expected nominal power and a margin can be defined manually. The displayed reference level is calculated as:
  Reference Level = Expected Nominal Power + Margin

The margin is used to account for the known variations (crest factor) of the RF input signal power.

Note: The actual input power at the connectors must be within the level range of the selected RF input connector; refer to the data sheet. If all power settings are configured correctly, the actual power equals the "Reference Level" minus the "External Attenuation (Input)" value.

The parameters can be changed in all main connection states including "Connection Established".

Remote command:
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower

CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin
Plus corresponding PCC commands.

Mixer Level Offset

Varies the input level of the mixer in the analyzer path. A negative offset reduces the mixer input level. A positive offset increases the level. Optimize the mixer input level according to the properties of the uplink signal.

Mixer level offset	Advantages	Possible shortcomings
< 0 dB	Suppression of distortion (e.g. of the intermodulation products generated in the mixer)	Lower dynamic range (due to smaller signal-to-noise ratio)
> 0 dB	High signal-to-noise ratio, higher dynamic range	Risk of intermodulation, smaller overdrive reserve

Remote command:
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset

2.4.7 Internal Fading

This branch of the configuration tree is only visible, if a fading scenario is selected and the fading source is set to "Internal".

For general prerequisites/required options and background information, see Chapter 2.2.6, "Internal Fading", on page 29.

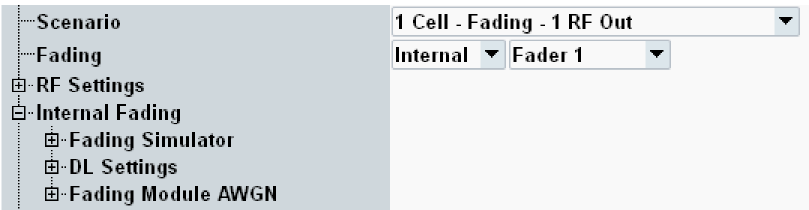


Figure 2-55: Internal fading settings

2.4.7.1 Fading Simulator

The node "Fading Simulator" enables and sets up the fading simulator. For background information, see Chapter 2.2.6.1, "Fading Simulator", on page 29.

There are two variants of the node. The extended fading variant provides more fading settings than the standard fading variant.

Figure 2-56: Fading simulator settings, standard fading

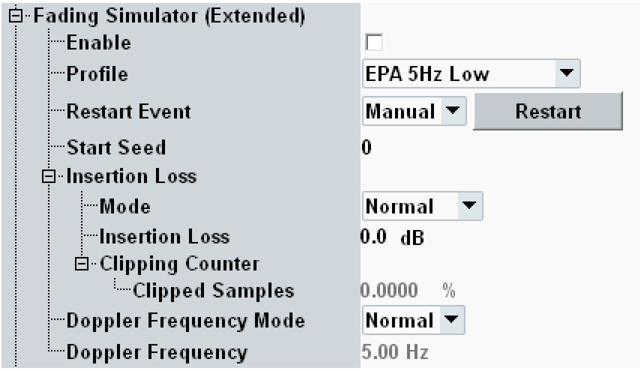


Figure 2-57: Fading simulator settings, extended fading

For most scenarios, extended fading is available. Standard fading applies to some scenarios, if more than two DL TX antennas are used per carrier. See also Table 2-1.

For carrier aggregation scenarios, you can configure all settings per component carrier.

Enable.. 139
Profile.. 139
Restart Event.. 140
Start Seed.. 140
Insertion Loss.. 140
Doppler Frequency Mode, Doppler Frequency.. 141

Enable

Enables/disables the fading simulator.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:ENABle
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ENABle
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:ENABle
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ENABle

Profile

Selects a propagation condition profile.

The following profiles are available for extended fading:

- Delay profiles for low, medium and high delay spread environments:
  – "Extended pedestrian A" model (EPA), maximum Doppler frequency 5 Hz
  – "Extended vehicular A" model (EVA), maximum Doppler frequency 5 Hz, 70 Hz or 200 Hz
  – "Extended typical urban" model (ETU), maximum Doppler frequency 30 Hz, 70 Hz or 300 Hz

  All profiles are available with low, medium and high correlation level, relevant for MIMO scenarios.
  The delay profiles are defined in 3GPP TS 36.101, annex B.2.
- High-speed train (HST) scenario defined in 3GPP TS 36.101, annex B.3
- Multi-path profile used for CQI tests with parameter specifications of 3GPP TS 36.521-1, section 9.3 "CQI Reporting under fading conditions"

For standard fading, a subset is available: EPA and EVA with maximum Doppler frequency 5 Hz - low, medium and high correlation level.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:PROFile
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:PROFile
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:PROFile
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:PROFile

Restart Event

The scenario "1 Cell - Fading - MIMO4x2 - 2 RF Out" supports only the mode "Trigger". The other scenarios support only the modes "Auto" and "Manual".

"Auto"	Fading starts automatically with the downlink signal.
"Manual"	Fading is started and restarted manually. A "Restart" button is displayed.
"Trigger"	Fading starts automatically. The two I/Q boards are synchronized via an internal trigger signal.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart:MODE
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart:MODE
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart

Start Seed

Sets the start seed for the pseudo-random fading algorithm. This setting ensures reproducible fading conditions.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:GLOBal:SEED
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:GLOBal:SEED

Insertion Loss

The insertion loss is the attenuation at the fader input. It can be calculated automatically or you can define it manually.

"Normal"	The insertion loss is calculated automatically, based on the currently selected Profile.
"User"	Specify the insertion loss value. A lower insertion loss allows for a higher downlink power but can result in clipping. You can use the displayed information "Clipped Samples" to find the lowest insertion loss value for which no clipping occurs. For scenarios with several output paths, the information is displayed per path.

Remote command:
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:MODE
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:LOSS
SENSe:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:CSAMples<n>?
Plus corresponding PCC commands.

Doppler Frequency Mode, Doppler Frequency
The maximum Doppler frequency can be calculated automatically or you can define it manually.

"Normal" The maximum Doppler frequency is calculated automatically, based on the currently selected Profile.

"User" Specify the maximum Doppler frequency.

Remote command:
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift:MODE`
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift:MODE`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift`

2.4.7.2 DL Settings

This branch displays noise power values, calculated from the downlink power, the cell bandwidth and the fading module AWGN settings.

For carrier aggregation scenarios, this information is available per component carrier.

The reference point for the power values is the RF output connector.

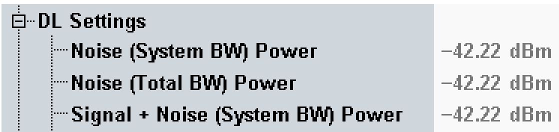


Figure 2-58: Noise information

Noise (System BW) Power
Displays the noise power on the downlink channel, i.e. within the cell bandwidth.

Remote command:
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe?`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe?`

Noise (Total BW) Power
Displays the total noise power, within and outside of the cell bandwidth.

The total noise power is irrelevant for 3GPP test cases. They specify the SNR or the noise power within the cell bandwidth. The total noise power is only displayed for compatibility reasons with Rohde & Schwarz signal generators.

Remote command:
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe:TOTal?`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe:TOTal?`

Signal + Noise (System BW) Power
Displays the total power (signal + noise) on the downlink channel, i.e. within the cell bandwidth.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:SUM?
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:SUM?

2.4.7.3 Fading Module AWGN

The following parameters enable and configure the AWGN insertion on the fading module. For background information, see Chapter 2.2.6.2, "AWGN Generator", on page 30.

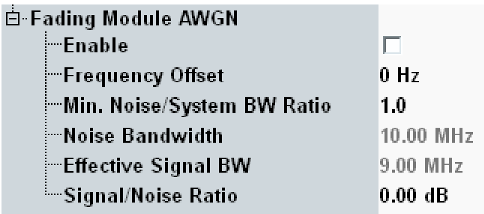


Figure 2-59: AWGN settings

For carrier aggregation scenarios, you can configure the settings per component carrier.

If you combine contiguous carrier aggregation with AWGN, we recommend the following AWGN settings:

- Enable AWGN for one carrier only.
- Configure the frequency offset to shift the noise center frequency to the center frequency of the aggregated bandwidth.
- Increase the "Min. Noise/System BW Ratio" so that the noise bandwidth equals the aggregated bandwidth.

These settings avoid undesired effects due to overlapping noise bandwidths of adjacent carriers.

Enable
Enables/disables AWGN insertion via the fading module.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:ENABle
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:ENABle

Frequency Offset
Shifts the center frequency of the noise bandwidth relative to the carrier center frequency.

Remote command:
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:FOFFset
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:FOFFset

Min. Noise/System BW Ratio
Configures the minimum ratio between the noise bandwidth and the cell bandwidth.

Remote command:
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:RATio`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:RATio`

Noise Bandwidth
Displays the actual noise bandwidth, resulting from the "Min. Noise/System BW Ratio" and the cell bandwidth.

Remote command:
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:NOISe?`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:NOISe?`

Effective Signal BW
Displays the part of the cell bandwidth that is dedicated to the downlink subcarriers.

Signal/Noise Ratio
Specifies the signal to noise ratio.

Remote command:
`CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:SNRatio`
`CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:SNRatio`

2.4.8 Downlink Power Levels

This section defines power levels of physical downlink channels and physical downlink signals.

The parameters in this section can be changed in all main connection states including "Connection Established".

For carrier aggregation scenarios, you can configure the settings per component carrier.

For background information, see also Chapter 2.2.11, "Physical DL Channels and Signals", on page 37.

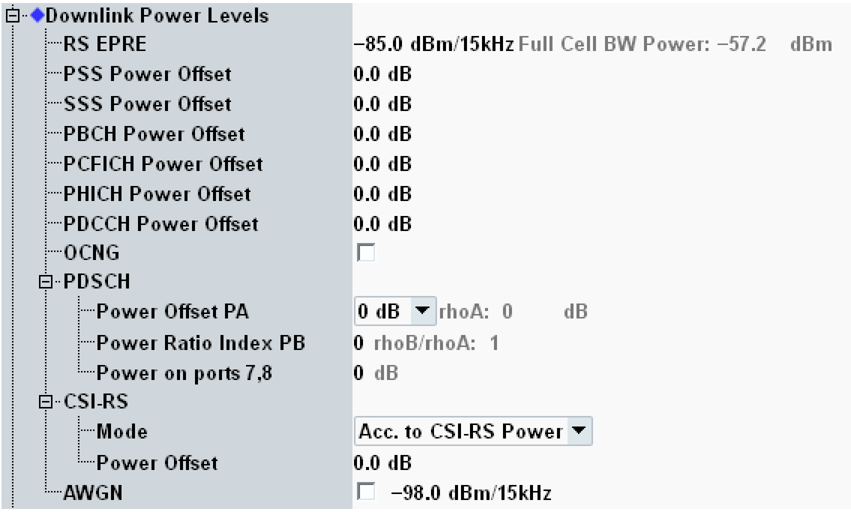


Figure 2-60: DL power levels

The reference point for all power settings in this section (except AWGN) is the simulated eNodeB antenna. For scenarios with several RF output paths per component carrier, there is a simulated radio channel between the eNodeB antennas and the RF output connectors. The power at each single connector can be lower than the power at the eNodeB antenna.

RS EPRE.. 144
PSS Power Offset.. 145
SSS Power Offset.. 145
PBCH Power Offset.. 145
PCFICH Power Offset... 145
PHICH Power Offset... 145
PDCCH Power Offset... 145
OCNG.. 145
PDSCH.. 146
CSI-RS.. 146
AWGN.. 147

RS EPRE

Defines the energy per resource element (EPRE) of the cell-specific reference signal (C-RS). The RS EPRE corresponds to the DL power averaged over all resource elements carrying cell-specific reference signals within one subcarrier (15 kHz).

The "Full Cell BW Power" resulting from the RS EPRE is also displayed. It is calculated assuming that the full DL cell bandwidth is used (all subcarriers) and all power offsets equal 0 dB.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:RSEPre:LEVel`
`SENSe:LTE:SIGN<i>:DL[:PCC]:FCPower?`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:RSEPre:LEVel`
`SENSe:LTE:SIGN<i>:DL:SCC<c>:FCPower?`

PSS Power Offset
Power level of a primary synchronization signal (PSS) resource element relative to the RS EPRE.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:PSS:POFFset`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:PSS:POFFset`

SSS Power Offset
Power level of a secondary synchronization signal (SSS) resource element relative to the RS EPRE.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:SSS:POFFset`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:SSS:POFFset`

PBCH Power Offset
Power level of a physical broadcast channel (PBCH) resource element relative to the RS EPRE.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:PBCH:POFFset`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:PBCH:POFFset`

PCFICH Power Offset
Power level of a physical control format indicator channel (PCFICH) resource element relative to the RS EPRE.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:PCFich:POFFset`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:PCFich:POFFset`

PHICH Power Offset
Power level of a physical hybrid ARQ indicator channel (PHICH) resource element relative to the RS EPRE.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:PHICh:POFFset`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:PHICh:POFFset`

PDCCH Power Offset
Power level of a physical downlink control channel (PDCCH) resource element relative to the RS EPRE.

Remote command:
`CONFigure:LTE:SIGN<i>:DL[:PCC]:PDCCh:POFFset`
`CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDCCh:POFFset`

OCNG
Enables or disables the OFDMA channel noise generator (OCNG).

When the OCNG is enabled, it uses all not allocated resource blocks (RB) of the cell bandwidth, so that the full cell bandwidth is used. Example: if for a bandwidth of 10 MHz only 16 RBs are used by the RMC, the remaining 34 RBs are used by the OCNG.

The power level of the OCNG is chosen automatically so that the displayed "Full Cell BW Power" is reached. Thus the overall DL power is constant in each transmission time interval.

Remote command:
CONFigure:LTE:SIGN<i>:DL[:PCC]:OCNG
CONFigure:LTE:SIGN<i>:DL:SCC<c>:OCNG

PDSCH

These parameters define the power level of the physical downlink shared channel (PDSCH).

The relevant settings depend on the transmission mode:
- For transmission modes using antenna port 7 and/or 8, the configured antenna port power and the configured power ratio index are used. The power offset P_A is configurable, but it is only signaled to the UE. It is not used for downlink power calculation.
- For transmission modes not using these antenna ports, the configured power offset P_A and the configured power ratio index are used.

According to 3GPP TS 36.213, the power level of a PDSCH resource element relative to the RS EPRE is denoted by:
- ρ_A ("rhoA") if no RS resource elements are transmitted simultaneously on other subcarriers
- ρ_B ("rhoB") if RS resource elements are transmitted simultaneously on other subcarriers

The power offset P_A and the power ratio index P_B are related to these ratios as follows:
- $P_A = \rho_A$
- P_B = 0, 1, 2, 3 corresponds to ρ_B/ρ_A =
  – 1, 4/5, 3/5, 2/5 for single TX antenna configurations;
  – 5/4, 1, 3/4, 1/2 for multiple TX antenna configurations.

The displayed ratios "rhoA" and "rhoB" are calculated from the configured settings.

Remote command:
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:PA
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:RINDex
CONFigure:LTE:SIGN<i>:DL[:PCC]:POWer:PORTs
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:PA
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:RINDex
CONFigure:LTE:SIGN<i>:DL:SCC<c>:POWer:PORTs

CSI-RS

These parameters define the CSI-RS power offset for TM 9.

"Acc. to CSI-RS Power"	The used power offset matches the signaled value. The parameter "Power Offset" is ignored. For configuration of the signaled value, see "CSI-RS Power" on page 188.
"Manual"	The used power offset is configured via the parameter "Power Offset". The setting is independent from the signaled power offset.

Remote command:
CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:MODE
CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:POFFset
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:MODE
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:POFFset

AWGN
Total level of the additional white Gaussian noise (AWGN) interferer in dBm/15 kHz (the spectral density integrated across one subcarrier). If enabled, the AWGN signal is added to the DL LTE signal for the entire cell bandwidth.

For fading scenarios, this parameter is disabled, so that AWGN cannot be added by the signaling unit. Instead AWGN can be added by the fader (external or internal).

The reference point for this power setting is the RF output connector.

Option R&S CMW-KS510 required.

Remote command:
CONFigure:LTE:SIGN<i>:DL[:PCC]:AWGN
CONFigure:LTE:SIGN<i>:DL:SCC<c>:AWGN

2.4.9 Uplink Power Control

This section defines parameters related to the control of the UE uplink power by the instrument.

2.4.9.1 General Power Control Parameters

At the highest level of the "Uplink Power Control" node, some general power control settings are available.

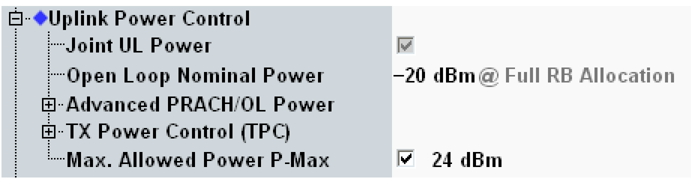


Figure 2-61: UL power control settings, highest level

Joint UL Power
This parameter is only available, if an SCC uplink is enabled.

Depending on the PCC and SCC uplink configuration, you can control the power of the two uplinks only together, so that both uplinks always have the same power. In that case, the parameter is enabled and grayed out. Example: intraband contiguous configuration.

If the parameter is not grayed out, you can choose whether you want to control the two uplinks together or independently. The carrier center frequencies are wide apart in that case.

With enabled joint power control, most uplink power control settings are only configurable via the PCC tab. On the SCC tab, these settings are grayed-out.

Remote command:
`CONFigure:LTE:SIGN<i>:UL[:PCC]:JUPower`

Max. allowed Power P-Max
Specifies the maximum allowed output power for the UE in the cell. The UE output power must not exceed this value. And it must not exceed the maximum power value resulting from the UE power class.

If the checkbox is enabled, the configured value is signaled to the UE within the system information. If it is disabled, the parameter has no effect.

Remote command:
`CONFigure:LTE:SIGN<i>:UL[:PCC]:PMAX`
`CONFigure:LTE:SIGN<i>:UL:SCC<c>:PMAX`

2.4.9.2 PRACH and Initial PUSCH Power

The following parameters configure the PRACH power and the initial PUSCH power.

By default, the basic settings apply (see Figure 2-62). Only the "Open Loop Nominal Power" is configurable. The advanced settings are not configurable and the grayed-out values indicate the used basic settings.

If you enable the advanced settings, the grayed-out values become configurable. Instead, the "Open Loop Nominal Power" parameter is disabled.

For carrier aggregation scenarios, you can configure the settings per uplink, if joint UL power control is disabled.

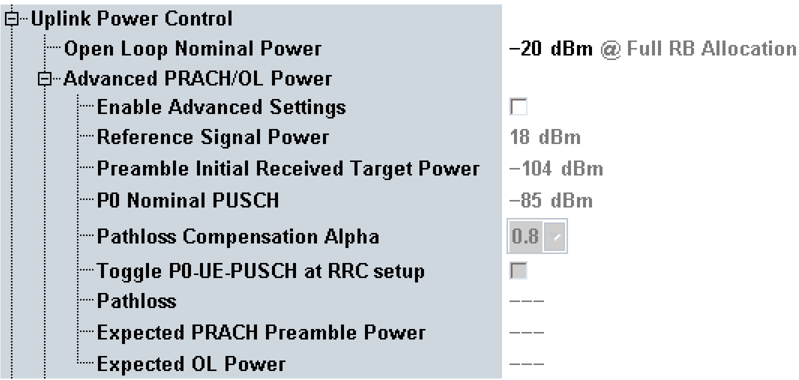


Figure 2-62: OL and PRACH power control

Open Loop Nominal Power...149
Enable Advanced Settings..149
Reference Signal Power..149
Preamble Initial Received Target Power...149
P0 Nominal PUSCH..150
Pathloss Compensation Alpha..150
Toggle P0-UE-PUSCH at RRC Setup...150

Pathloss.. 151
Expected PRACH Preamble Power...151
Expected OL Power... 151

Open Loop Nominal Power

Defines a cell-specific nominal power value for full resource block allocation in the UL (entire channel bandwidth used). From this value, the cell-specific nominal power value related to one resource block is determined and sent to all UEs via broadcast.

The UE uses this value for calculation of the average power of an SC-FDMA symbol in which the PUSCH is transmitted. The calculation is described in 3GPP TS 36.213 (see $P_{O\_NOMINAL\_PUSCH}$).

This power control procedure is performed during connection setup. Afterwards the power remains constant until changed by TPC commands.

The parameter is only relevant and configurable if the "Advanced PRACH/OL Power" settings are disabled.

Remote command:

`CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:OLNPower`
`CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:OLNPower`

Enable Advanced Settings

Enables configuration of the advanced parameters.

If disabled, the following parameters are grayed out and display the used basic settings.

Remote command:

`CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:EASettings`
`CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:EASettings`

Reference Signal Power

Specifies the parameter "referenceSignalPower", signaled to the UE as PDSCH configuration parameter (see 3GPP TS 36.331, section 6.3.2).

The value is used by the UE to determine the pathloss, see 3GPP TS 36.213 section 5.1.1.1.

Remote command:

`CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:ADVanced`
`SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:BASic?`
`CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:ADVanced`
`SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:BASic?`

Preamble Initial Received Target Power

Specifies the parameter "preambleInitialReceivedTargetPower", signaled to the UE as common RACH parameter (see 3GPP TS 36.331, section 6.3.2).

In 3GPP TS 36.213, section 5.1.1.1 this parameter is called P_{O_PRE}.

The value is used by the UE for example to calculate the power of the first preamble.

Remote command:

`CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:ADVanced`
`SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:BASic?`

CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:ADVanced
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:BASic?

P0 Nominal PUSCH

Specifies the parameter "p0-NominalPUSCH", signaled to the UE as uplink power control parameter (see 3GPP TS 36.331, section 6.3.2).

In 3GPP TS 36.213, section 5.1.1.1 this parameter is called $P_{O\_NOMINAL\_PUSCH}$.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:ADVanced
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:BASic?
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:ADVanced
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:BASic?

Pathloss Compensation Alpha

Specifies the parameter "alpha", signaled to the UE as uplink power control parameter (see 3GPP TS 36.331, section 6.3.2).

In 3GPP TS 36.213, section 5.1.1.1 this parameter is called α.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:ADVanced
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:BASic?
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:ADVanced
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:BASic?

Toggle P0-UE-PUSCH at RRC Setup

With enabled toggling, the following P0-UE-PUSCH values are set during RRC connection setup:

- RRC connection setup message (SRB1): P0-UE-PUSCH = 1 dB
- RRC connection reconfiguration message (SRB2+DRB): P0-UE-PUSCH = 0 dB

P0-UE-PUSCH toggling is required for some 3GPP conformance tests, for example 3GPP TS 36.521, section 6.3.5.1 "Power Control Absolute power tolerance", table 6.3.5.1.4.3-4.

The toggling initiates a "TPC accumulation reset" at the UE ($f_c(i)$ is set to 0, see 3GPP TS 36.213, section 5.1.1.1).

Note: Toggling deletes a PRACH ramp-up procedure. Disable toggling if a PRACH ramp-up procedure is required for decoding of the UE signal. Otherwise, the RRC connection setup fails.

Note: Use toggling only if the external attenuation is compensated accurately. Otherwise, do not use toggling, for example for over-the-air tests with fluctuating external attenuation.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:ADVanced
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:BASic?
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:ADVanced
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:BASic?

Pathloss

Displays the pathloss resulting from the "Reference Signal Power" on page 149 and the "RS EPRE" on page 144.

Remote command:

`SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PATHloss?`

`SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PATHloss?`

Expected PRACH Preamble Power

Displays the expected power of the first preamble.

The value depends on the "preambleInitialReceivedTargetPower" ("Preamble Initial Received Target Power" on page 149) and on the preamble format resulting from the configuration index ("Configuration Index" on page 160).

For details, see 3GPP TS 36.321 section 5.1.

Remote command:

`SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EPPPower?`

`SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EPPPower?`

Expected OL Power

Displays the expected initial PUSCH power. Most of the advanced power settings influence this value.

You can use the displayed values to verify your configuration: With a correct configuration, the expected PRACH power is not larger than the expected OL power. It is also not very much lower. Otherwise the PRACH cannot be detected and the attach procedure fails.

Remote command:

`SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EOPower?`

`SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EOPower?`

2.4.9.3 TX Power Control (TPC)

This section configures settings for UL power control via TPC commands.

For carrier aggregation scenarios, you can configure the settings per uplink, if joint UL power control is disabled.

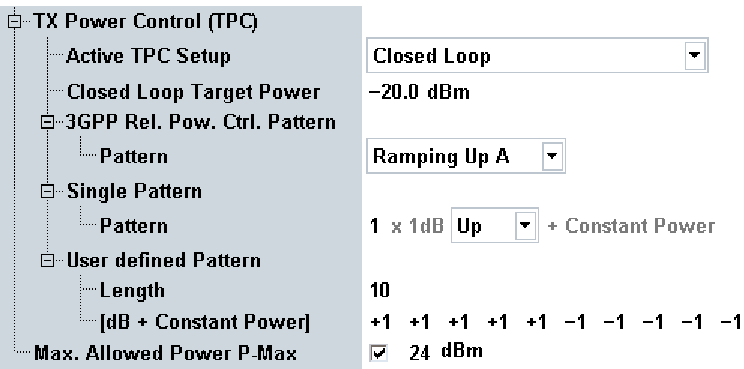


Figure 2-63: TPC power control

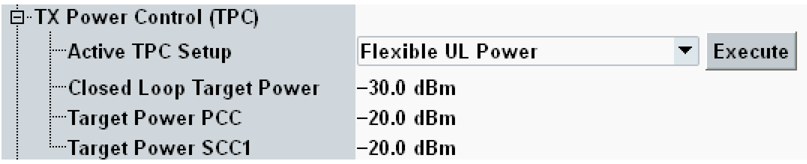
Active TPC Setup....152
Target Power PCC / SCC....153
3GPP Rel. Pow. Ctrl. Pattern....153
Closed Loop Target Power....153
Single Pattern....154
User-Defined Pattern....154

Active TPC Setup
Selects the TPC setup to be executed. All setups use relative (accumulative) TPC commands and are only executed when a connection has been established. During connection setup, 0-dB commands are sent.

The string "Adjusted" behind a node of settings indicates that the currently selected setup is further configured by this node.

- **"Min Power", "Max Power", "Constant Power"**
  The UE is commanded to maximum power, to minimum power or is ordered to keep the UL power constant.
  If one of these setups is selected, it is executed automatically without additional user action.
- **"3GPP Relative Power Control"**
  Ramping up or down test pattern according to 3GPP TS 36.521, section 6.3.5.2.
  Select the test pattern via "3GPP Rel. Pow. Ctrl. Pattern" and start the pattern via the "Execute" button.
  For details about the test pattern, see Relative Power Control Tests.
  This TPC setup is not allowed if "Joint UL Power" is enabled.
- **"Single Pattern", "User-defined Single Pattern"**
  A configurable TPC pattern is sent to the UE when the "Execute" button is pressed. Before and after execution of the pattern, the power is kept constant.
  A single pattern contains only one type of TPC command while a user-defined single pattern allows you to combine different TPC commands.
- **"User-defined Continuous Pattern"**
  A configurable user-defined TPC pattern is sent to the UE continuously. If this setup is selected, it is executed automatically without additional user action.
  While this setup is selected, the relevant parameter for pattern configuration is marked by the string "Adjusted".
- **"Alternating +1, -1, ..."**
  An alternating TPC pattern of plus and minus 1-dB commands is sent to the UE continuously. If this setup is selected, it is executed automatically without additional user action.
- **"Closed Loop"**
  The UE is commanded to the configured target power. Plus 1-dB or minus 1-dB commands are sent until the difference between the measured UL power and the target power is less than 1 dB. Afterwards, the power is kept constant (0-dB commands).
  This setup is executed automatically without additional user action. Even the measurement of the uplink power is performed automatically in the background. No additional measurement application is needed.
- **"Flexible UL Power"**
  This setup is only available for uplink carrier aggregation, if "Joint UL Power" is grayed-out. The setup configures different PCC and SCC uplink powers for some

seconds. The duration is long enough for a measurement, but short enough to prevent a synchronization error. A synchronization error can nevertheless occur if you decrease the "Out of Sync" timeout value in the network settings.
The following parameters are related to this TPC setup.



When you select this TPC setup, the UE is commanded to the closed loop target power. If you press the "Execute" button, the UE is commanded to the PCC and SCC target powers. After some seconds, it is commanded back to the closed loop target power.
For a combined signal path measurement while the two powers are different, configure your measurement as single-shot measurement with a small statistic count. Use the TPC trigger (SCC) to start the measurement.

Depending on the current configuration, some values are grayed out. The reason is displayed in that case, for example active PUCCH scheduling (number of RBs = 0) or active HARQ. TPC setups for which skipping a bit is no problem, are always available (for example max power or closed loop, in contrast to single or alternating pattern).

If you change the configuration so that the currently active setup is no longer allowed (for example activate HARQ), the TPC setup is corrected automatically and a notice is displayed.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SET
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:PEXecute
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SET
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:PEXecute

Target Power PCC / SCC
Defines the target powers for the TPC setup "Flexible UL Power".

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:TPOWer
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:TPOWer

3GPP Rel. Pow. Ctrl. Pattern
Selects the pattern to be executed for the TPC setup "3GPP Relative Power Control". The available up and down patterns are defined in 3GPP TS 36.521, section 6.3.5.2. See also Relative Power Control Tests.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:RPControl
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:RPControl

Closed Loop Target Power
Defines the target power for the TPC setup "Closed Loop". The target power applies to PUCCH and PUSCH.

For uplink carrier aggregation with grayed-out "Joint UL Power", the additional SCC setting "Offset to PCC" is displayed. It shifts the SCC target power relative to the PCC target power.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:CLTPower
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower:OFFSet

Single Pattern
Defines a pattern for the TPC setup "Single Pattern". The pattern consists of up to 35 up (+1 dB) or down (-1 dB) commands.

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SINGle
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SINGle

User-Defined Pattern
Defines a pattern for the TPC setups "User-defined Single Pattern" and "User-defined Continuous Pattern". The pattern consists of up to 20 TPC commands (-1 / 0 / +1 / +3 dB).

Remote command:
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:UDPattern
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:UDPattern

2.4.10 Physical Cell Setup

This section defines physical layer attributes of the simulated cell.

For background information, see also Chapter 2.2.11, "Physical DL Channels and Signals", on page 37.

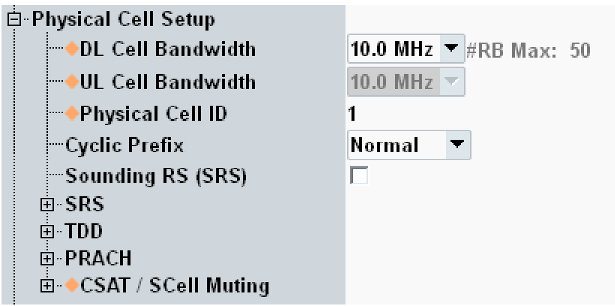


Figure 2-64: Cell setup parameters

- General Cell Setup Settings....155
- SRS Settings....156
- TDD Settings....158
- PRACH Settings....159
- CSAT / SCell Muting Settings....161

2.4.10.1 General Cell Setup Settings

This section describes the following settings at the highest level of the node "Physical Cell Setup".

DL / UL Cell Bandwidth....155
Physical Cell ID....155
Cyclic Prefix....155

DL / UL Cell Bandwidth

Define the DL and UL cell bandwidths, also called channel bandwidth by 3GPP. In the current release, the two values are identical.

The resulting maximum number of DL resource blocks is indicated for information. It is smaller than the DL bandwidth divided by 180 kHz, because some space at the channel borders must not be occupied by resource blocks. 3GPP defines the relation as follows:

Channel bandwidth / MHz	1.4	3	5	10	15	20
Maximum no of RBs	6	15	25	50	75	100

You can change the cell bandwidth in all main connection states. In state "Connection Established" you can either change it directly or you can perform a handover to reconfigure several parameters, see Chapter 2.2.10, "Handover", on page 35.

For carrier aggregation scenarios, you can configure different DL cell bandwidths for the carriers.

Remote command:

```
CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL
CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL
CONFigure:LTE:SIGN<i>:RFSettings:ALL:BWCHannel
```

Physical Cell ID

The cell ID is used for generation of the physical synchronization signals. During cell search, the UE determines the cell ID from the primary and secondary synchronization signal.

The physical cell ID can be set independent of the E-UTRAN cell identifier sent to the UE via broadcast (see "E-UTRAN Cell Identifier" on page 167).

If you use carrier aggregation, configure different values for the component carriers.

Remote command:

```
CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID
```

Cyclic Prefix

Defines whether a normal or extended cyclic prefix (CP) is used.

An extended cyclic prefix cannot be combined with the transmission mode 8 (combination not foreseen by 3GPP).

Option R&S CMW-KS510 is required for extended CP.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:CPRefix

2.4.10.2 SRS Settings

The following cell settings are related to sounding RS (SRS). You can enable SRS and configure SRS parameters to be signaled to the UE.

Uplink SRS signals can be measured using the "LTE SRS" measurement included in option R&S CMW-KM500/-KM550.

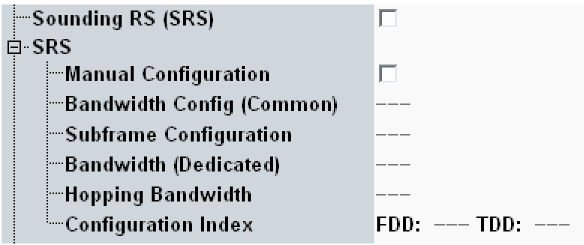


Figure 2-65: SRS settings

Sounding RS (SRS)..156
SRS..156
└ Manual Configuration..156
└ Bandwidth Config (Common)..157
└ Subframe Configuration..157
└ Bandwidth (Dedicated)..157
└ Hopping Bandwidth..157
└ Configuration Index..157

Sounding RS (SRS)
Enables support of SRS. The information that the cell supports SRS is then broadcasted to the UE. During connection setup, the UE is requested to send a sounding reference signal.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle

SRS
This section configures SRS parameters signaled to the UE. Their values can be set automatically or manually.

Option R&S CMW-KS510 is required.

Manual Configuration ← SRS
With disabled "Manual Configuration", the following values are used:
- "srs-BandwidthConfig": 7
- "srs-SubframeConfig": 3 for FDD, 0 for TDD
- "srs-Bandwidth": 3
- "srs-HoppingBandwidth": 3
- "srs-ConfigIndex": 7 for FDD, 0 for TDD

With enabled "Manual Configuration", the signaled values are configured manually via the following parameters.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable

Bandwidth Config (Common) ← SRS
Configures the parameter "srs-BandwidthConfig" manually.

This cell-specific value influences the mapping to physical resources. The meaning of the individual values is specified in 3GPP TS 36.211, section 5.5.3.2.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:BWConfig

Subframe Configuration ← SRS
Configures the parameter "srs-SubframeConfig" manually.

The value determines the cell-specific SRS timing. The meaning of the individual values is specified in 3GPP TS 36.211, section 5.5.3.3.

At time instances with cell-specific SRS but without UE-specific SRS, the UE sends a "blank SRS symbol" (and another UE sends an SRS symbol).

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:SFConfig

Bandwidth (Dedicated) ← SRS
Configures the parameter "srs-Bandwidth" manually.

This UE-specific value influences the mapping to physical resources. The meaning of the individual values is specified in 3GPP TS 36.211, section 5.5.3.2.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:DBANdwidth

Hopping Bandwidth ← SRS
Configures the parameter "srs-HoppingBandwidth" manually.

The value determines the frequency hopping for periodic SRS transmission. The meaning of the individual values is specified in 3GPP TS 36.211, section 5.5.3.2.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:HBANdwidth

Configuration Index ← SRS
Configures the parameter "srs-ConfigIndex" manually.

The value determines the UE-specific SRS timing. The meaning of the individual values is specified in 3GPP TS 36.213, section 8.2.

At time instances with configured UE-specific SRS, the UE sends an SRS symbol. Other UEs in the cell send a "blank SRS symbol".

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:FDD
CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:TDD

2.4.10.3 TDD Settings

The following parameters configure TDD-specific settings, not relevant for FDD.

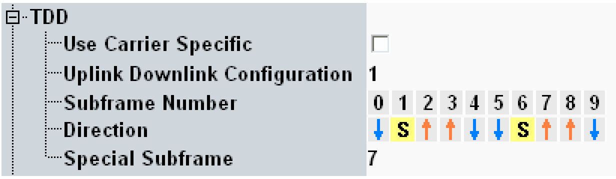


Figure 2-66: TDD settings

Use Carrier Specific... 158
Uplink Downlink Configuration.. 158
Special Subframe... 158

Use Carrier Specific

Selects whether the UL/DL configuration and the special subframe configuration can be configured individually per component carrier or whether the same settings apply to all carriers.

Option R&S CMW-KS512 is required for carrier-specific configuration.

Remote command:

`CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific`

Uplink Downlink Configuration

Selects the uplink-downlink configuration of a TDD signal, see Table 2-3. Each configuration defines a combination of uplink subframes, downlink subframes and special subframes within a radio frame.

If duplex mode TDD is active, the radio frame structure is displayed for information (lines "Subframe Number" and "Direction").

If a ☹ is displayed for a special subframe, it indicates that there is no PDSCH transmission in the DwPTS. This state depends for example on the special subframe configuration and on the cyclic prefix.

Option R&S CMW-KS510 and R&S CMW-KS550 are required.

Remote command:

`CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL`

`CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL`

Special Subframe

Configuration of the special subframes of a TDD signal, as defined in 3GPP TS 36.211, chapter 4, "Frame Structure". Each configuration defines the inner structure of a special subframe, i.e. the lengths of DwPTS, GP and UpPTS.

Value 8 and 9 can only be used with normal cyclic prefix.

Option R&S CMW-KS550 is required. R&S CMW-KS512 is required for value 7 combined with extended cyclic prefix and for value 9.

Remote command:
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe

2.4.10.4 PRACH Settings

The following parameters configure settings related to the random access procedure.

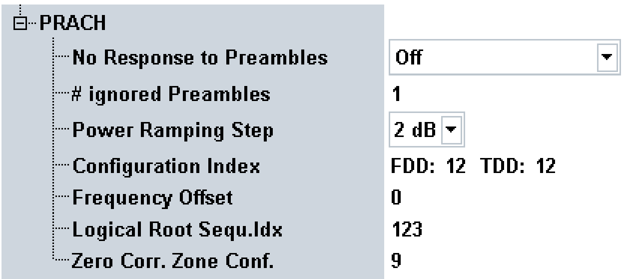


Figure 2-67: PRACH settings

No Response to Preambles, # Ignored Preambles 159
Power Ramping Step 159
Configuration Index 160
Frequency Offset 160
Logical Root Sequ.Idx 160
Zero Corr. Zone Conf. 160

No Response to Preambles, # Ignored Preambles

By default the signaling application responds to received preambles, so that the UE can perform an attach. Alternatively received preambles can be ignored (no response), so that the UE continues to send preambles and PRACH measurements can be performed (included in R&S CMW-KM500/-KM550).

"Off"	The signaling application responds to received preambles.
"On"	Any received preambles are ignored by the signaling application (no response).
"# Ignored Preambles"	The number of preambles to be ignored by the signaling application is configured via parameter "# Ignored Preambles". Subsequent preambles are answered. This value can only be selected if parameter "Power Ramping Step" is set to 0 dB.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:PRACh:NRPReambles
CONFigure:LTE:SIGN<i>:CELL:PRACh:NIPRach

Power Ramping Step

Specifies the transmit power difference between two consecutive preambles. This value is broadcasted to the UE.

If you set the step size to 0 dB, the preamble power is kept constant by the UE. Thus you can use a constant expected nominal power setting during a PRACH measurement.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PRSTep`

Configuration Index
Sets the PRACH configuration index. It defines the preamble format and other PRACH signal properties, e.g. which resources in the time domain are allowed for transmission of preambles. This value is broadcasted to the UE.

There are separate settings for FDD and TDD (if both R&S CMW-KS500 and R&S CMW-KS550 are available). The values allowed for TDD depend on the UL-DL configuration as listed in the command description.

For details see 3GPP TS 36.211, section 5.7.1 "Time and frequency structure".

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD`
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD`

Frequency Offset
The frequency offset is used by the UE to calculate the location of the six preamble resource blocks (RB) within the channel bandwidth. The value is broadcasted to the UE.

For details see "prach-FrequencyOffset" in 3GPP TS 36.211, section 5.7.1 "Time and frequency structure".

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset`

Logical Root Sequ.Idx
Specifies the logical root sequence index to be used by the UE for generation of the preamble sequence. The value is broadcasted to the UE as RACH_ROOT_SEQUENCE.

For details see 3GPP TS 36.211, section 5.7.2 "Preamble sequence generation".

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex`

Zero Corr. Zone Conf.
The zero correlation zone config determines which N_{CS} value of an N_{CS} set has to be used by the UE for generation of the preamble sequence. The value is broadcasted to the UE.

For details, see "zeroCorrelationZoneConfig" in 3GPP TS 36.211, section 5.7.2 "Preamble sequence generation".

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig`

2.4.10.5 CSAT / SCell Muting Settings

Carrier-sensing adaptive transmission (CSAT) is defined by the LTE-U Forum for the SCC DL in unlicensed bands. With CSAT, the DL transmission is adapted depending on how busy the channel is. Furthermore, regular signal OFF periods allow others to use the channel.

In an OFF period, the SCC DL (SCell) transmits nothing, not even reference or synchronization signals. In an ON period, it transmits reference signals and user data or the MIB or an LTE-U discovery signal (LDS).

To simulate an SCC DL signal with CSAT, the signaling application supports LDS transmission and SCell muting with alternating ON and OFF periods. You can configure the ON and OFF duration and the periodicity of the LDS transmission. Option R&S CMW-KS525 is required.

You can use the feature for any bands, not only for unlicensed bands. The supported ON and OFF durations are more flexible than defined by the LTE-U Forum. The MIB is transmitted with a fixed periodicity of 160 ms.

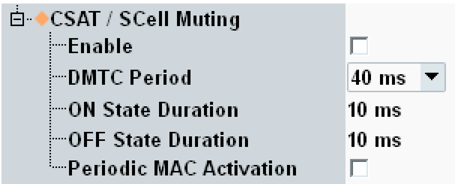


Figure 2-68: CSAT settings

Enable 161
DMTC Period 161
ON State Duration / OFF State Duration 161
Periodic MAC Activation 162

Enable

Enables CSAT and SCell muting.

Remote command:

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:ENABle

DMTC Period

The signaling application transmits an LTE-U discovery signal (LDS) with the configured periodicity. The information is signaled to the UE in the R12 DRS DMTC IE.

Remote command:

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:DMTCperiod

ON State Duration / OFF State Duration

The SCC DL signal is alternating ON and OFF. The settings define the duration of the ON and OFF periods.

The actual ON state duration can be greater than configured, if an LDS or MIB transmission occurs in a subframe immediately after the configured ON period.

To ensure a DL signal during ON periods, you can for example use MAC padding, see "Downlink MAC Padding" on page 180.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:ONSDuration
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:OFFSduration

Periodic MAC Activation
Enable the checkbox if you want to activate / deactivate the MAC for each ON / OFF period. With disabled checkbox, the MAC is kept enabled.

With enabled checkbox, the signaling application sends an activate message eight subframes before the start of each ON period. It sends a deactivate message eight subframes before the start of each OFF period.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:PMAC

2.4.11 Network Settings

The "Network" settings configure parameters of the simulated radio network.

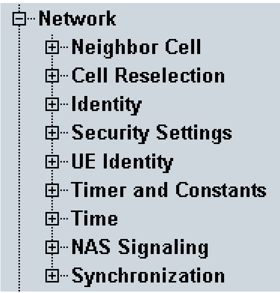


Figure 2-69: Network settings

For parameter descriptions, refer to the subsections.

- Neighbor Cell Settings....................162
- Cell Reselection....................165
- Identity Settings....................166
- Security Settings....................167
- UE Identity....................169
- Timer and Constants....................169
- Time....................170
- NAS Signaling Settings....................171
- Synchronization....................173

2.4.11.1 Neighbor Cell Settings

This section defines neighbor cell information to be broadcasted to the UE. For each radio access technology, you can define a reselection threshold and several neighbor cell entries. The signaling messages for broadcast of neighbor cell information are defined in 3GPP TS 36.331.

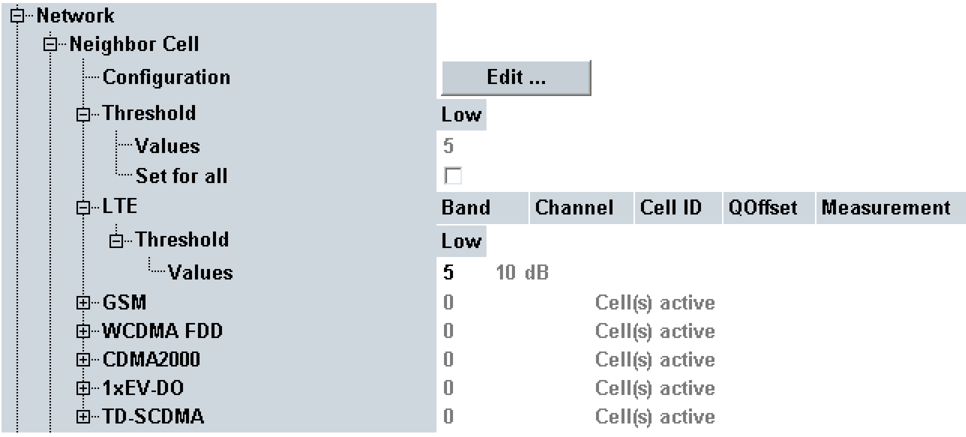


Figure 2-70: Neighbor cell settings

To configure the neighbor cell entries, press the "Edit" button. The configuration dialog contains one tab per technology.

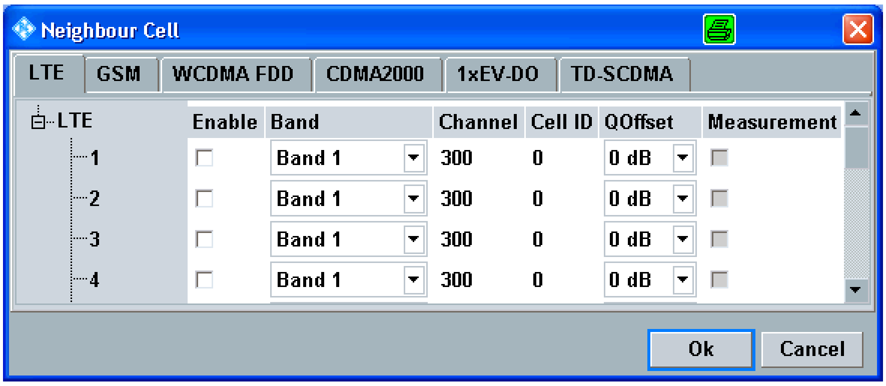


Figure 2-71: Neighbor cell list configuration dialog

Only the enabled entries are broadcasted.

The column "Measurement" is only configurable for enabled entries. It specifies whether measurement reports for the neighbor cell are requested from the UE. Received reports are displayed in the main view, see Chapter 2.4.1.3, "UE Measurement Report", on page 111. Option R&S CMW-KS510 is required for neighbor cell measurements.

The individual neighbor cell settings are described in the following.

Threshold...164
LTE...164
GSM...164
WCDMA FDD...164
CDMA2000, 1xEV-DO..165
TD-SCDMA...165

Threshold
The configured "Low" reselection threshold value is written into the system information block element "threshX-Low" defined in 3GPP TS 36.331. It corresponds to the parameter "$Thresh_{X, LowP}$" in 3GPP TS 36.304. The resulting threshold value in dB is displayed for information.

You can define an individual threshold per technology or a common threshold applicable to all technologies. To apply common thresholds, enable "Threshold > Set for all". To apply the individual thresholds, disable the parameter.

Remote command:
CONFigure:LTE:SIGN<i>:NCELl:ALL:THResholds:LOW
CONFigure:LTE:SIGN<i>:NCELl:LTE:THResholds:LOW
CONFigure:LTE:SIGN<i>:NCELl:GSM:THResholds:LOW
CONFigure:LTE:SIGN<i>:NCELl:WCDMa:THResholds:LOW
CONFigure:LTE:SIGN<i>:NCELl:CDMA:THResholds:LOW
CONFigure:LTE:SIGN<i>:NCELl:EVDO:THResholds:LOW
CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:THResholds:LOW

LTE
For an LTE (E-UTRA) neighbor cell entry, you can specify the operating band and downlink channel number, the physical layer cell ID and the "QOffset".

Parameter "QOffset" corresponds to the value "q-OffsetCell" in 3GPP TS 36.331, which equals "$Qoffset_{s,n}$" in 3GPP TS 36.304. It is used by the UE when evaluating candidates for cell reselection or triggering conditions for measurement reporting.

If the channel number of an entry and the currently used channel number are identical, the parameters are written into system information block 4 (intra-frequency cell reselection). Otherwise they are written into system information block 5 (inter-frequency cell reselection).

Reselection thresholds defined for LTE are only relevant for system information block 5.

The list supports up to 16 active neighbor cell entries. The active entries can use up to five different channel numbers. Active entries with the same channel number must have different cell IDs.

Remote command:
CONFigure:LTE:SIGN<i>:NCELl:LTE:CELL<n>

GSM
For a GSM (GERAN) neighbor cell entry, you can specify the operating band and the channel number used for the broadcast control channel (BCCH).

This information and the GSM reselection thresholds are written into system information block 7.

Remote command:
CONFigure:LTE:SIGN<i>:NCELl:GSM:CELL<n>

WCDMA FDD
For a WCDMA (UTRA FDD) neighbor cell entry, you can specify the operating band, the downlink channel number and the primary scrambling code of the cell.

The channel number and the WCDMA reselection thresholds are written into system information block 6.

Remote command:
CONFigure:LTE:SIGN<i>:NCELl:WCDMa:CELL<n>

CDMA2000, 1xEV-DO
For a CDMA2000 (1xRTT) or 1xEV-DO (HRPD) neighbor cell entry, you can specify the band class, the channel number and the physical cell ID which identifies the PN offset.

This information and the reselection thresholds, are written into system information block 8 - the CDMA2000 parameters into element "parameters1XRTT", the 1xEV-DO parameters into element "parametersHRPD".

Remote command:
CONFigure:LTE:SIGN<i>:NCELl:CDMA:CELL<n>
CONFigure:LTE:SIGN<i>:NCELl:EVDO:CELL<n>

TD-SCDMA
For a TD-SCDMA (UTRA TDD) neighbor cell entry, you can specify the operating band, the channel number and the cell parameter ID.

The channel number and the TD-SCDMA reselection thresholds are written into system information block 6.

Remote command:
CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:CELL<n>

2.4.11.2 Cell Reselection

The parameters in this section define cell reselection information to be transmitted in the system information blocks SIB1 and SIB3. For detailed information, refer to 3GPP TS 36.304 and 3GPP TS 36.331.

The section is only visible if R&S CMW-KS510 is available.

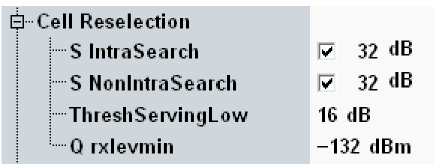


Figure 2-72: Settings for cell reselection

S IntraSearch
Threshold $S_{IntraSearch}$ for intra-frequency measurements.

The threshold is configured in dB. System information block 3 contains the configured value divided by 2. If the checkbox is disabled, the information element is omitted in SIB 3.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:INTRasearch

S NonIntraSearch
Threshold $S_{nonIntraSearch}$ for inter-frequency and inter-RAT measurements.

The threshold is configured in dB. System information block 3 contains the configured value divided by 2. If the checkbox is disabled, the information element is omitted in SIB 3.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:NINTrasearch

ThreshServingLow
Parameter "$Thresh_{Serving,Low}$", used by the UE for reselection towards a lower priority RAT/ frequency.

The threshold is configured in dB. System information block 3 contains the configured value divided by 2.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:RESelection:TSLow

Q rxlevmin
Minimum required received RSRP level in the cell in dBm ($Q_{rxlevmin}$).

The level is configured in dBm. System information block 1 contains the configured value divided by 2.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:RESelection:QUALity:RXLevmin

2.4.11.3 Identity Settings

This section configures identities of the simulated radio network. The values are transferred to the UE under test via broadcast.

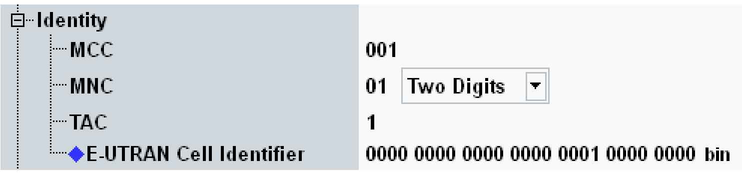


Figure 2-73: Network identity settings

MCC
Specifies the three-digit mobile country code (MCC).

Remote command:
CONFigure:LTE:SIGN<i>:CELL:MCC

MNC
Specifies the mobile network code (MNC). A two or three-digit MNC can be set.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:MNC
CONFigure:LTE:SIGN<i>:CELL:MNC:DIGits

TAC
Specifies the tracking area code (TAC).

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TAC

E-UTRAN Cell Identifier
Specifies the E-UTRAN cell identifier, unique within a PLMN. It is sent to the UE via broadcast and can be set independent of the physical cell ID (see "Physical Cell ID" on page 155).

If you use carrier aggregation, configure different values for the carriers.

Remote command:
CONFigure:LTE:SIGN<i>:CELL[:PCC]:CID:EUTRan
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CID:EUTRan

2.4.11.4 Security Settings

The "Security Settings" configure parameters related to the authentication procedure and other security procedures.

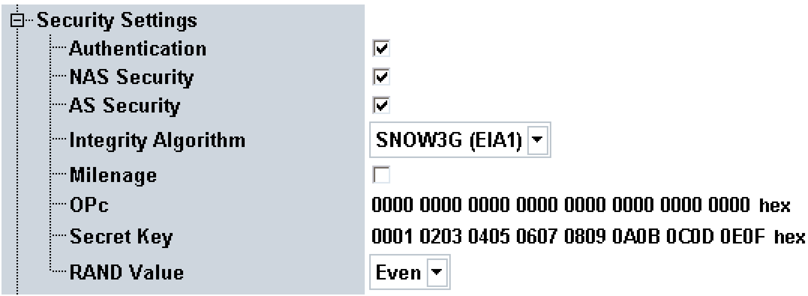


Figure 2-74: Security settings

Authentication.......167
NAS Security.......168
AS Security.......168
Integrity Algorithm.......168
Milenage.......168
OPc.......168
Secret Key.......168
RAND Value.......169

Authentication
Enables or disables authentication, to be performed during the attach procedure.
Authentication requires a test USIM. An appropriate 3GPP USIM can be obtained from Rohde & Schwarz (R&S CMW-Z04, stock no. 1207.9901.02).

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:AUTHenticat`

NAS Security

Enables or disables non-access stratum (NAS) security. With enabled NAS security, the UE uses integrity protection for NAS signaling. This setting is only relevant if authentication is enabled.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:NAS`

AS Security

Enables or disables access stratum (AS) security. With enabled AS security, the UE uses integrity protection for RRC signaling. This setting is only relevant if authentication is enabled.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:AS`

Integrity Algorithm

Selects an algorithm for integrity protection. NULL means that integrity protection is disabled. Use this setting for UEs which do not support the SNOW3G (EIA1) algorithm.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:IALGorithm`

Milenage

Enable this parameter to use a USIM with MILENAGE algorithm set.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:MILenage`

OPc

The key OP_c is used for authentication and integrity check procedures with the MILENAGE algorithm set (parameter "Milenage" enabled). The value is entered as 32-digit hexadecimal number.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:OPC`

Secret Key

The secret key K is used for the authentication procedure (including a possible integrity check). The value is entered as 32-digit hexadecimal number.

The integrity check fails unless the secret key is equal to the value stored on the test USIM of the UE. The test USIM R&S CMW-Z04 is compatible with the default setting of this parameter.

If authentication is switched off, the secret key is ignored.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:SECurity:SKEY`

RAND Value

The random number RAND is used for the authentication procedure (including a possible integrity check). This parameter selects whether an odd or even RAND value is used.

Remote command:

`CONFigure:LTE:SIGN<i>:CELL:SECurity:RVALue`

2.4.11.5 UE Identity

The "UE Identity" settings configure the default IMSI.

Figure 2-75: UE identity settings

Default IMSI

15-digit international mobile subscriber identity (IMSI)

Remote command:

`CONFigure:LTE:SIGN<i>:CELL:UEIDentity:IMSI`

2.4.11.6 Timer and Constants

The parameters in this section configure timers and counters.

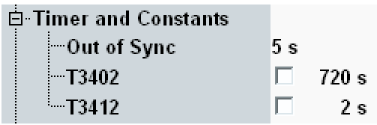


Figure 2-76: Timer settings

Out of Sync

The "Out of Sync" timer specifies the time after which the instrument, having waited for a signal from the connected UE, releases the connection. The timer is started when an uplink grant message is sent to the UE.

Remote command:

`CONFigure:LTE:SIGN<i>:CELL:TOUT:OSYNch`

T3402

Timer "T3402" controls reattempts for failed attach procedures and failed tracking area update procedures (after five attempts).

Remote command:

`CONFigure:LTE:SIGN<i>:CELL:TOUT:T<no>`

T3412

Timer "T3412" controls the initiation of a periodic tracking area update by the UE.

If the timer is disabled, no periodic tracking area update is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TOUT:T<no>

2.4.11.7 Time

The "Time" section allows you to send configurable date and time information to the UE. Thus you can update the date and time displayed by the mobile. In a real network, this service is typically used to send the current local time to the UE.

The section is only visible if R&S CMW-KS510 is available.

Figure 2-77: Time settings

Time Source
This parameter selects the date and time source that delivers the UTC date, the UTC time, the current daylight saving time offset and the time zone offset.

Option R&S CMW-KS510 is required.

"CMW Time"	Selects the current CMW (Windows) date and time as source.
"Date / Time"	Selects the other settings in this section as source.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce

Date / Time (UTC)
Defines the UTC date and time to be used if "Time Source" is set to "Date / Time".

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TIME:DATE
CONFigure:LTE:SIGN<i>:CELL:TIME:TIME

Daylight Saving Time
Specifies a daylight saving time (DST) offset to be used if "Time Source" is set to "Date / Time".

You can disable DST or enable it with an offset of +1 hour or +2 hours.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TIME:DSTime

Local Time Zone Offset
Defines the time zone offset to be used if "Time Source" is set to "Date / Time".

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TIME:LTZoffset

Send Time
Press "Now" to send the date and time information to the UE. This action is only possible if an RRC connection has been established.

"at Attach" selects whether the date and time information is sent to the UE during the attach procedure or not.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:TIME:SNOW
CONFigure:LTE:SIGN<i>:CELL:TIME:SATTach

2.4.11.8 NAS Signaling Settings

The parameters in this section configure settings related to NAS signaling messages, to be sent to the UE.

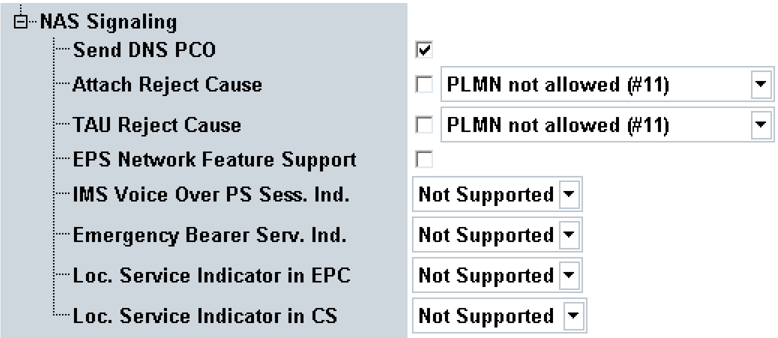


Figure 2-78: Reject cause settings

Send DNS PCO..171
Attach Reject Cause, TAU Reject Cause...171
EPS Network Feature Support..172
IMS Voice Over PS Session Indicator...172
Emergency Bearer Services Indicator...172
Location Service Indicator in EPC...172
Location Service Indicator in CS...172

Send DNS PCO
Enables or disables sending of a DNS IP address to the UE.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SDNSpco

Attach Reject Cause, TAU Reject Cause
If the checkboxes are enabled, the application rejects attach requests / tracking area update (TAU) requests from the UE. The reject message contains the selected reject cause.

The rejection causes are defined in 3GPP TS 24.301, section 9.9.3.9. The purpose of rejecting UE requests is to test the reaction of the UE: Does it repeat the request at all and if so, in which time intervals?

Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:RCAuse:ATTach`
`CONFigure:LTE:SIGN<i>:CELL:RCAuse:TAU`

EPS Network Feature Support
Enables or disables sending of the information element "EPS Network Feature Support" to the UE in the "attach accept" message.

The information element indicates the support of specific features by the network (see 3GPP TS 24.301, section 9.9.3.12A). The individual feature flags are configured via the following parameters.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:NAS:EPSNetwork`

IMS Voice Over PS Session Indicator
Configures bit 1 of the information element "EPS Network Feature Support".

The flag indicates whether voice over LTE (VoLTE) is supported, or a circuit-switched fallback (CSFB) is required for voice calls.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:NAS:IMSVops`

Emergency Bearer Services Indicator
Configures bit 2 of the information element "EPS Network Feature Support".

The flag indicates whether emergency bearer services are supported. Such bearers have a higher priority than ordinary bearers.

Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:NAS:EMCBs`

Location Service Indicator in EPC
Configures bit 3 of the information element "EPS Network Feature Support".

The flag indicates whether location services are supported by the LTE network (evolved packet core network).

Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CELL:NAS:EPCLcs`

Location Service Indicator in CS
Configures bit 4 and 5 of the information element "EPS Network Feature Support".

The flag indicates whether location services are supported by the CS domain or not or no information is available.

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CELL:NAS:CSLCs

2.4.11.9 Synchronization

The parameters in this section configure the synchronization to other signaling applications and the synchronization of PCC and SCC.

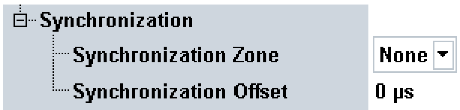


Figure 2-79: Synchronization settings

Synchronization Zone
Select the same synchronization zone in all signaling applications that you want to synchronize. "None" means that the application is not synchronized to other signaling applications.

The PCC and SCC of an LTE signaling application are always synchronized to each other, independent of this setting.

Synchronizing signaling applications means synchronizing the used system time. This feature is useful for example for evaluation of message logs, because the time stamps in the logs are synchronized.

Synchronizing two LTE signaling applications means also synchronizing the used system frame numbers.

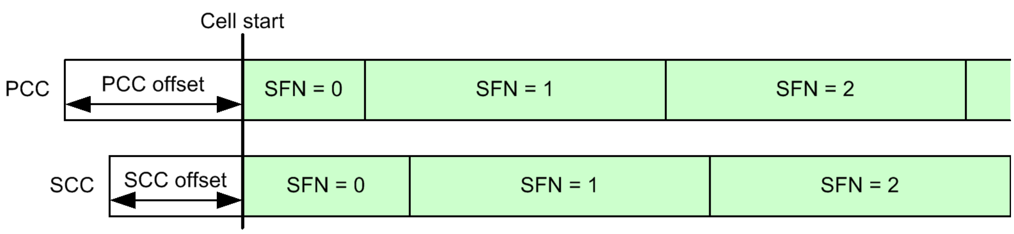
Remote command:
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:ZONE

Synchronization Offset
Configures the timing offset at cell start, relative to the time zone.

Without offset, the cell signal starts with system frame number 0 and a system time according to the time zone. With an offset, the cell starts with system frame number 0 plus the offset and a system time according to the time zone plus the offset.

Option R&S CMW-KS510 is required for the PCC setting. Option R&S CMW-KS512 is required for the SCC setting.

Setting different offsets for component carriers is required for example for performance requirement tests with carrier aggregation, see 3GPP TS 36.521 section "8.2.1.1.1_A".



Remote command:
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:OFFSet
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SYNC:OFFSet

2.4.12 Connection Configuration

This section defines parameters for the connection, for example the resource configuration to be allocated to the UE. Most parameters can be reconfigured for an established connection.

For parameter descriptions, refer to the subsections.

- Miscellaneous Connection Settings Part 1 174
- General MIMO Settings 180
- MIMO Channel Model TM 2 to TM 6 182
- MIMO Beamforming Settings TM 7 183
- MIMO Beamforming Settings TM 8 184
- MIMO TM 9 Settings 186
- Miscellaneous Connection Settings Part 2 190
- Connected DRX Connection Settings 199
- RMC Connection Settings 202
- User-Defined Channel Configuration 205
- User-Defined TTI-Based Channel Configuration 207
- CQI Channel Configuration 208

2.4.12.1 Miscellaneous Connection Settings Part 1

This section describes the following "Connection" settings.

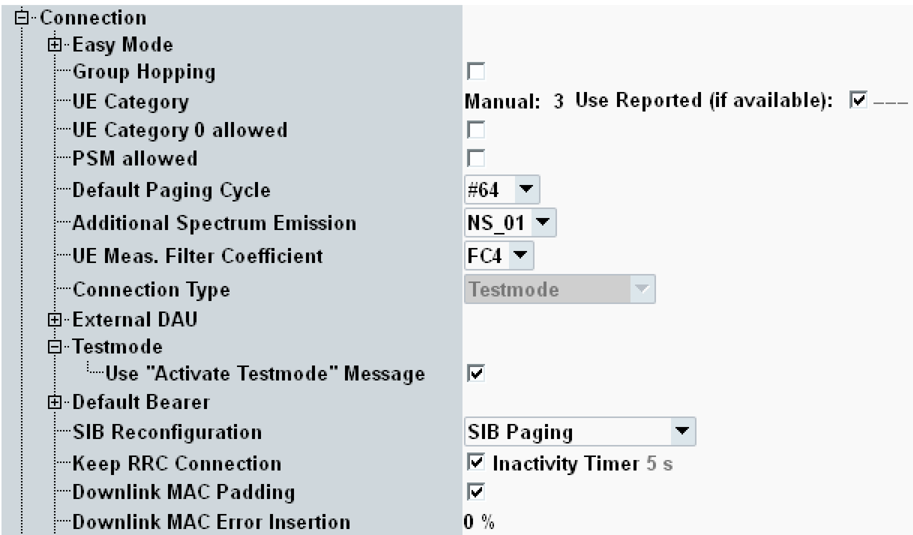


Figure 2-80: Connection configuration settings part 1

Easy Mode 175
└ Band/Frequency/BW Change 175

Group Hopping....176
UE Category....176
UE Category 0 Allowed....176
PSM Allowed....176
Default Paging Cycle....176
Additional Spectrum Emission....177
Add. Spectrum Emission Scell....177
UE Meas. Filter Coefficient....177
Connection Type....177
External DAU....178
└ Use external DAU....178
└ Network Segment, Subnet Node ID....178
Test Mode > Use "Activate Testmode" Message....178
Default Bearer....178
└ RLC Mode....179
└ IP Version....179
└ APN....179
└ QCI....179
SIB Reconfiguration....179
Keep RRC Connection....179
Downlink MAC Padding....180
Downlink MAC Error Insertion....180

Easy Mode

The easy mode is available for a redirection or a blind handover within the signaling application.

With disabled easy mode, such an action can fail. For example, because the power level or the number of scheduled resource blocks is too low for a reliable exchange of the required signaling messages.

With enabled easy mode, critical settings are set to optimum values directly before the redirection or handover, to eliminate possible failure causes. After completion of the procedure, the settings are restored to the previous values. The final settings are the same with or without easy mode.

With enabled easy mode, the following intermediate settings are configured:

- Full UL and DL resource block allocation in all subframes
- Suitable UL and DL power level
- Modulation type QPSK
- TBS index 5
- DCI format 1A
- No AWGN, no error insertion

Band/Frequency/BW Change ← Easy Mode

Specifies whether the easy mode is used if the band or the frequency or the cell bandwidth is changed.

Disable the easy mode if you want to test whether a redirection or a blind handover is successful under certain circumstances.

Enable the easy mode if you want to change settings reliably via a redirection or a blind handover.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:EASY:BFBW`

Group Hopping
Enables or disables group hopping, specified in 3GPP TS 36.211.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:GHOPping`

UE Category
The UE category to be used by the R&S CMW can be set manually. Alternatively, it can be set automatically according to the UE category reported by the UE in the capability report.

"Manual"	If you want to set the category of your UE manually, enter it here. A value not reflecting the capabilities of the UE results in problems when trying to reach high data rates.
"Use Reported (if available)"	If no reported value is available, the manually configured value is used. If a reported value is available, it is displayed for information. If the checkbox is enabled, the reported value is used. Otherwise the manually configured value is used.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:UECategory:MANual`
`CONFigure:LTE:SIGN<i>:CONNection:UECategory:REPorted`

UE Category 0 Allowed
Specifies whether category 0 UEs are allowed to access the cell. This information is sent to the UE via broadcast in system information block 1.

Enabling the checkbox is relevant for machine-type communication (MTC). Option R&S CMW-KS590 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:UECategory:CZALlowed`

PSM Allowed
Specifies whether a UE request for power-saving mode (PSM) is accepted or rejected. See also 3GPP TS 24.301 section 5.3.11 "Power saving mode".

Enabling the checkbox is relevant for machine-type communication (MTC). Option R&S CMW-KS590 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:PSMallowed`

Default Paging Cycle
Selects the cell-specific default paging cycle (32, 64, 128 or 256 radio frames). The value is signaled to the UE as "defaultPagingCycle" and used by the UE as input for the calculation of paging radio frame and subframe positions.

The R&S CMW considers the setting when sending paging messages.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:DPCYcle`

Additional Spectrum Emission
The selected value is signaled to the UE within a system information block. It determines which additional ACLR and spectrum emission requirements have to be met and whether additional maximum power reduction (A-MPR) is allowed. For details, see 3GPP TS 36.521-1.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:ASEMission`

Add. Spectrum Emission Scell
This setting is only displayed on an SCC tab with enabled uplink. The selected value is signaled to the UE and determines additional ACLR and spectrum emission requirements for the SCC uplink.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation`

UE Meas. Filter Coefficient
Some RRC messages to be sent to the UE for conformance tests contain an information element "filterCoefficient" = "fc4" or "fc8". This parameter selects the value to be sent.

The relevant value depends on the conformance test to be performed, see 3GPP TS 36.521 and 3GPP TS 36.508.

The "filterCoefficient" is used for uplink power control. Do not confuse it with "filterCoefficientRSRP" and "filterCoefficientRSRQ" for UE measurement reports, see "Filter Coefficient RSRP/RSRQ" on page 221.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:FCOefficient`

Connection Type
Configures the connection type to be applied at the R&S CMW.

"Testmode"	The test mode uses only layer 1 and 2 of the protocol stack. Layer 3 is not used. This mode is suitable for any signaling tests not involving the data application unit (DAU).
"Data Application"	The data application mode supports also layer 3, required for IP-based services. Select this mode for data application measurements with the DAU. See also Chapter 2.2.7, "Data Tests and Voice over LTE", on page 30 and Chapter 2.3.2, "LTE IP-Based Data Tests", on page 92. This value requires an installed DAU with option R&S CMW-KM050, or an external DAU.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CTYPe`

External DAU

Usually, the DAU is installed on the same R&S CMW as the LTE signaling application. If all expansion slots of this R&S CMW are occupied by other hardware options, a DAU installed on another R&S CMW can be used instead (external DAU).

Using an external DAU is only possible if the instrument where the LTE signaling application is running fulfills the following prerequisites:

- No DAU is installed
- Option R&S CMW-KA120 is available
- An Ethernet switch is installed (option R&S CMW-B660A plus -B661A)

Use external DAU ← External DAU

Enable the checkbox if you want to use an external DAU.

The two instruments must be connected via LAN. For details, refer to the DAU documentation.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:EDAU:ENABle

Network Segment, Subnet Node ID ← External DAU

Select the values of the instrument where the external DAU is installed. You can check the values in the "Setup" dialog > "Misc" > "IP Subnet Config".

The two instruments must use the same network segment and must have different node IDs.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:EDAU:NSEGment
CONFigure:LTE:SIGN<i>:CONNection:EDAU:NID

Test Mode > Use "Activate Testmode" Message

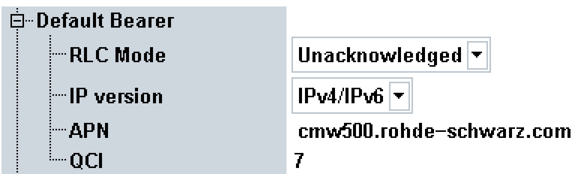
When enabled, an "ACTIVATE TEST MODE" message is sent to the UE. No loop mode is requested. Test modes are specified in 3GPP TS 36.509 and 36.508.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:TMODe

Default Bearer

The default bearer settings are applied to all default bearers.

For connection type "Testmode", the RLC mode is configurable and the other default bearer settings are fixed. For connection type "Data Application", the default bearer settings are configurable.



RLC Mode ← Default Bearer
Selects the RLC mode for downlink transmissions: unacknowledged mode (UM) or acknowledged mode (AM), see 3GPP TS 36.322.

Option R&S CMW-KS510 is required.

"UM"	There are no ARQ retransmissions on the RLC layer.
"AM"	There are ARQ retransmissions on the RLC layer.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:RLCMode`

IP Version ← Default Bearer
Allowed IP versions. With "IPv4 only" for example, IPv6 is not used, even if requested by the UE.

Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:IPVersion`

APN ← Default Bearer
Default access point name (APN), used if no APN is provided by the UE.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:APN`

QCI ← Default Bearer
Quality-of-service class identifier signaled to the UE. The values are specified in 3GPP TS 23.203.

Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:QCI`

SIB Reconfiguration
Selects a method for information of an attached UE about changes in the system information, resulting from modified parameters.

The UE is for example informed about changes of the following parameters: maximum allowed uplink power P-Max, neighbor cell information, PUSCH open loop nominal power, SRS enable/disable, PRACH configuration index and default paging cycle.

"RRC Reconfiguration"	An RRC reconfiguration message is sent to the UE, containing the system information values in a mobility control information element. This method is only used if an RRC connection is established. Without RRC connection, SIB paging is used.
"SIB Paging"	The UE is paged. This action triggers the UE to evaluate the broadcasted system information.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:SIBReconfig`

Keep RRC Connection
Selects whether the RRC connection is kept or released after attach.

"Enabled" The RRC connection established during attach is kept when the attach procedure is completed.
For a subsequent connection setup, the already established RRC connection is used. So the connection setup is faster. When the dedicated bearer is released via a disconnect, the RRC connection is still kept.

"Disabled"
- For "Connection Type" = "Testmode", the RRC connection established during attach is released immediately when the attach procedure is completed.
- For "Connection Type" = "Data Application", there is an additional setting "Inactivity Timer". The RRC connection established during attach is released when the attach procedure is completed and there has been no activity on the connection (no traffic) for the configured time.
  The inactivity timer requires option R&S CMW-KS510. Without this option, the RRC connection is released immediately when the attach procedure is completed.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:KRRC`
`CONFigure:LTE:SIGN<i>:CONNection:RITimer`

Downlink MAC Padding
Activates or deactivates downlink padding at the MAC layer.

When no data (signaling or user data) is available from higher layers, an allocated channel can be filled with padding bits (DL padding on). This scenario is foreseen in many conformance tests.

Switching off DL padding is useful e.g. if the UE has problems to attach because the DL signal contains padding bits.

If UL dynamic scheduling is enabled, MAC padding is disabled and grayed out.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:DLPadding`

Downlink MAC Error Insertion
Configures the rate of transport block errors to be inserted into the downlink data. This setting is useful for BLER measurements.

The parameter can be changed in all main connection states including "Connection Established".

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:DLEinsertion`

2.4.12.2 General MIMO Settings

This section describes general MIMO connection settings applicable to most transmission modes.

For background information, see Chapter 2.2.12, "MIMO and Beamforming", on page 42.

For carrier aggregation scenarios, you can configure all MIMO settings per component carrier.

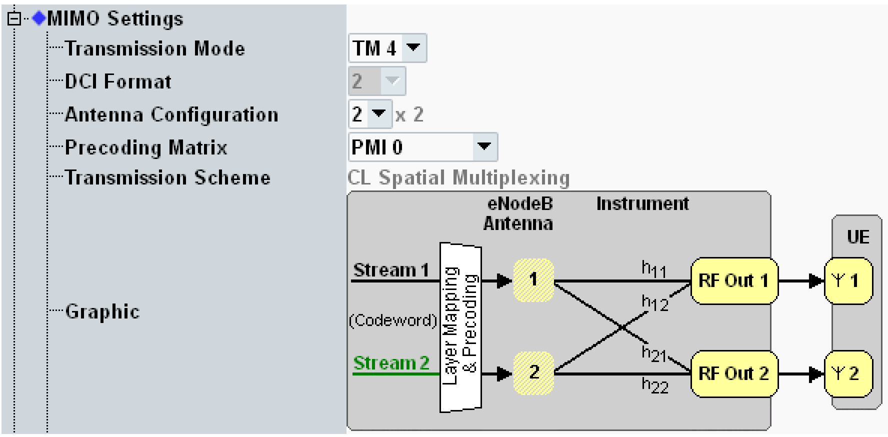


Figure 2-81: General MIMO settings, TM 4

Transmission Mode....181
DCI Format....181
Antenna Configuration....182
Precoding Matrix....182
Transmission Scheme....182

Transmission Mode

Selects the LTE transmission mode. The available values depend on the active scenario, see Table 2-6.

In the state "Connection Established", the parameter can be changed within the following groups: mode 1/7, mode 2/3/4/6/8/9.

The following combinations are not foreseen by 3GPP and are not allowed:

- Transmission mode 7 plus normal cyclic prefix, plus "number of PDCCH symbols" = 4
- Transmission mode 8 plus extended cyclic prefix

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TRANsmission`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TRANsmission`

DCI Format

Selects the downlink control information (DCI) format. The available values depend on the transmission mode. For most transmission modes, the DCI format is fixed.

For scheduling type "Follow WB CQI-RI", only DCI format 2A is supported. Changing the format to 1A modifies the scheduling type.

For 256-QAM, DCI format 1A is not supported.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DCIFormat`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DCIFormat`

Antenna Configuration
Selects the number of downlink TX antennas. The allowed values depend on the selected scenario and transmission mode. The setting is available for transmission mode 1 to 6.

The number of downlink RX antennas depends on the selected scenario and is displayed for information.

For MIMO 4x2, option R&S CMW-KS521 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:NENBantennas`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:NENBantennas`

Precoding Matrix
Selects the precoding matrix for transmission mode 4, 6 and 9. For TM 8, see "Precoding Matrix" on page 186.

Depending on the scheduling type, the downlink signal follows the reported PMI value. In that case, the configured PMI value is used as initial value until a PMI report has been received.

The meaning of the PMI values is defined in 3GPP TS 36.213, section 7.2.4.

With the setting "random PMI", the PMI value is selected randomly as defined in 3GPP TS 36.521, annex B.4.1 and B.4.2. The setting is available for transmission mode 9 with two TX antennas if no "Follow..." scheduling type is active.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PMATrix`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PMATrix`

Transmission Scheme
Displays the PDSCH transmission scheme resulting from the settings.

The displayed value does not reflect transmission scheme changes due to reported rank indicator values. TM 4 combined with follow RI and RI=1 results in transmit diversity.

Remote command:
`SENSe:LTE:SIGN<i>:CONNection[:PCC]:TSCHeme?`
`SENSe:LTE:SIGN<i>:CONNection:SCC<c>:TSCHeme?`

2.4.12.3 MIMO Channel Model TM 2 to TM 6

The channel model settings are displayed for transmission mode 2 to 6, if supported by the scenario. They are hidden for fading scenarios and for scenarios with RF output before the radio channel.

The matrix defines the radio channel coefficients, see Chapter 2.2.12.1, "Radio Channel Coefficients for MIMO", on page 44.

Each element of the matrix is a complex number, defined via its phase and its magnitude.

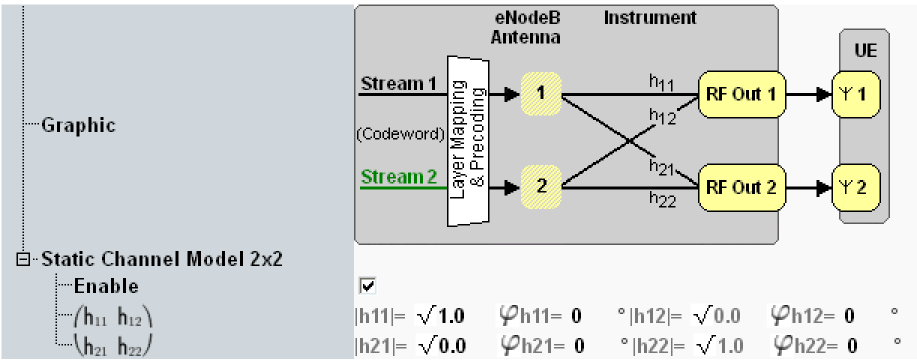


Figure 2-82: MIMO 2x2 channel model

The size of the matrix depends on the number of antennas.

2x2 channel model

You can configure the phase of each number and the square of the magnitude of h_{11} and h_{21}. The other magnitudes are adapted automatically.

If the model is disabled, there is no coupling between the signals of the eNodeB antennas. So each UE antenna receives only the signal of one eNodeB antenna.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:ENABle
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:ENABle
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel

4x2 channel model

You can configure the phase and the square of the magnitude of all coefficients. The sum of all magnitude squares within each line of the matrix must equal 1.

The sum is checked automatically. A correct sum is indicated by ☺, a wrong sum by ☹, followed by the sum. Configure all values of a line so that the sum equals 1, then press the "Apply" button.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:MIMO<Mimo>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:MIMO<Mimo>

2.4.12.4 MIMO Beamforming Settings TM 7

This section describes the node "Beamforming Model" for transmission mode 7.

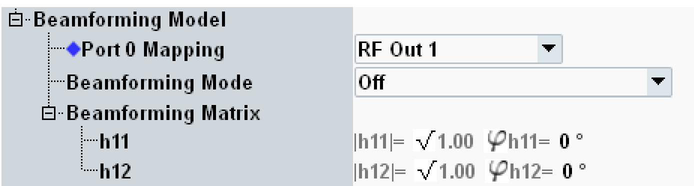


Figure 2-83: Beamforming settings for TM 7

Port 0 Mapping..184
Beamforming Mode...184
Beamforming Matrix..184

Port 0 Mapping

Selects the mapping of antenna port 0 to the RF output paths. This setting is available for TM 7 in scenarios with two RF output paths, without fading.

You can map port 0 to the first RF output path only. Or you can map it to both output paths.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PZERo:MAPPing`

`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PZERo:MAPPing`

Beamforming Mode

Enables or disables beamforming.

"Off"	Beamforming is disabled.
"On"	Beamforming is enabled. The configured beamforming matrix is used.
"TS 36.521 Beamforming Mode"	Beamforming is enabled. The beamforming matrix is selected randomly as defined in 3GPP TS 36.521, annex B.4.1 and B.4.2. Not allowed for 1x1 beamforming matrices and for "Follow..." scheduling types.
"Precoding Matrix"	Not allowed for TM 7

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MODE`

`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MODE`

Beamforming Matrix

This section defines the beamforming matrix for the beamforming mode "On".

The matrix characterizes the mapping of the UE-specific antenna port 5 to the transmit antennas, see Chapter 2.2.12.2, "Beamforming Matrix", on page 46.

Each element of the matrix is a complex number, defined via its phase and its magnitude. The size of the matrix is dynamic:

- 1x1 matrix (h_{11}) for scenarios with one RF output path
  You can configure the phase of the coefficient.
- 1x2 matrix (h_{11} and h_{21}) for scenarios with two RF output paths.
  You can configure the phase of both coefficients.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MATRix`

`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MATRix`

2.4.12.5 MIMO Beamforming Settings TM 8

This section describes the node "Beamforming Model" for transmission mode 8.

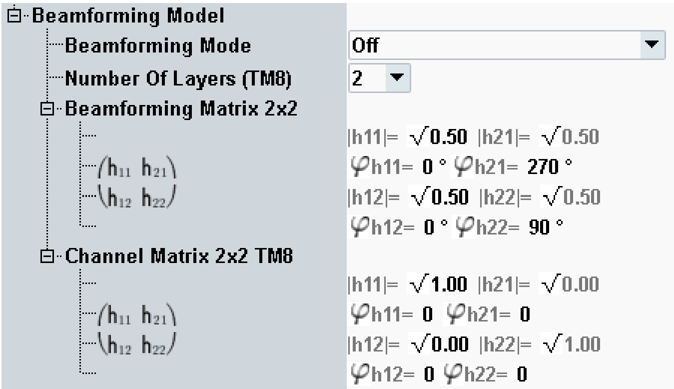


Figure 2-84: Beamforming settings for TM 8, 2 layers

Beamforming Mode 185
Number of Layers 185
Precoding Matrix 186
Beamforming Matrix 186
Channel Matrix 2x2 TM8 186

Beamforming Mode

Enables or disables beamforming.

"Off" — Beamforming is disabled.
Not allowed for TM 8 plus "Follow..." scheduling types.

"On" — Beamforming is enabled. The configured beamforming matrix is used.
Not allowed for TM 8 plus "Follow..." scheduling types

"TS 36.521 Beamforming Mode" — Beamforming is enabled. The beamforming matrix is selected randomly as defined in 3GPP TS 36.521, annex B.4.1 and B.4.2.
Not allowed for 1x1 beamforming matrices and for "Follow..." scheduling types.

"Precoding Matrix" — Beamforming is enabled. A precoding matrix is used as beamforming matrix.
The matrix is selected via the parameter "Precoding Matrix" on page 186. For "Follow...PMI..." scheduling types, the beamforming matrix is the precoding matrix corresponding to the PMI reported by the UE.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MODE`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MODE`

Number of Layers

You can select between one layer (single-layer beamforming) and two layers (dual-layer beamforming).

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:NOLayers`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:NOLayers`

Precoding Matrix

Selects a precoding matrix to be used as beamforming matrix. Only relevant for beamforming mode "Precoding Matrix".

The meaning of the PMI values is defined in 3GPP TS 36.213, section 7.2.4.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PMATrix`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PMATrix`

Beamforming Matrix

This section defines the beamforming matrix for the beamforming mode "On".

The matrix characterizes the mapping of the UE-specific antenna ports 7 and 8 to the transmit antennas, see Chapter 2.2.12.2, "Beamforming Matrix", on page 46.

Each element of the matrix is a complex number, defined via its phase and its magnitude. The size of the matrix is dynamic:

- 1x2 matrix (h_{11} and h_{21}) for single-layer beamforming.
  You can configure the phase of both coefficients.
- 2x2 matrix (h_{11} to h_{22}) for dual-layer beamforming.
  You can configure the phase of each coefficient and the square of the magnitude of h_{11} and h_{12}. The other magnitudes are adapted automatically.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MATRix`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MATRix`

Channel Matrix 2x2 TM8

The channel matrix is configurable for scenarios without fading. It defines the radio channel coefficients, see Chapter 2.2.12.1, "Radio Channel Coefficients for MIMO", on page 44.

Each element of the matrix is a complex number, defined via its phase and its magnitude.

You can configure the phase of each number and the square of the magnitude of h_{11} and h_{12}. The other magnitudes are adapted automatically.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<8>:CHMatrix`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<8>:CHMatrix`

2.4.12.6 MIMO TM 9 Settings

This section is displayed for transmission mode 9.

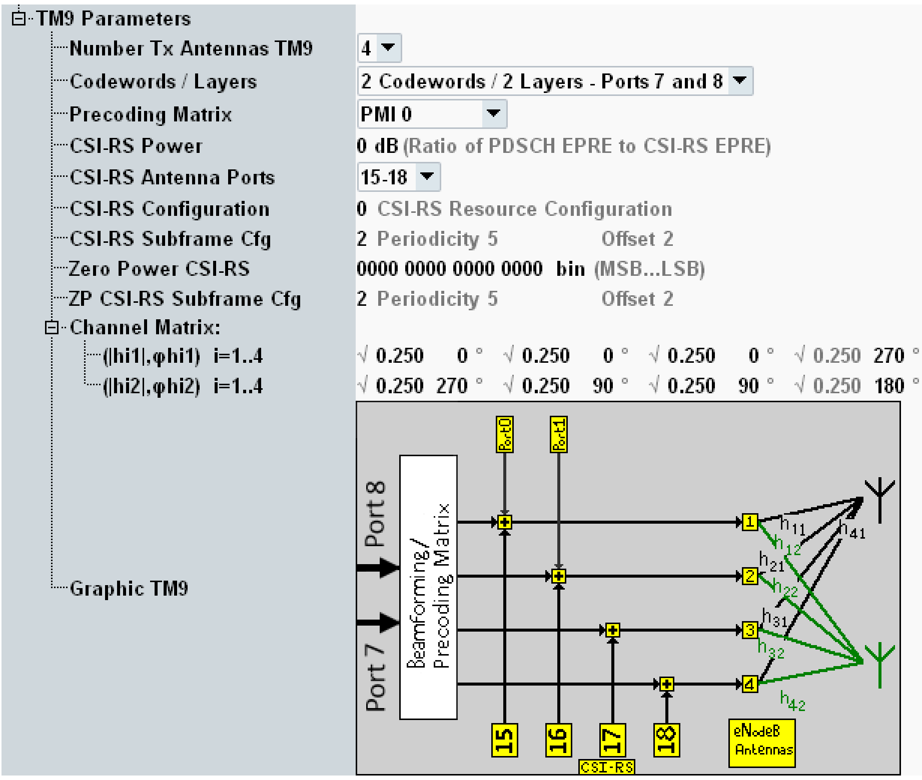


Figure 2-85: TM 9 settings, four TX antennas, four CSI-RS antenna ports

Number Tx Antennas TM 9 ... 187
Codewords / Layers ... 187
Precoding Matrix 2 ... 188
CSI-RS Power ... 188
CSI-RS Antenna Ports ... 188
CSI-RS Configuration ... 188
CSI-RS Subframe Cfg ... 189
Zero Power CSI-RS ... 189
ZP CSI-RS Subframe Cfg ... 189
Channel Matrix ... 189

Number Tx Antennas TM 9

Selects the number of downlink TX antennas. The allowed values depend on the selected scenario.

For four TX antennas, option R&S CMW-KS521 is required.

For eight TX antennas, option R&S CMW-KS522 is required.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:NTXantennas`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:NTXantennas`

Codewords / Layers

For MIMO nx2, you can select between one and two layers.

The used ports are fixed and indicated.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CODewords`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CODewords`

Precoding Matrix 2
For transmission mode 9 with 8 TX antennas, the precoding matrix is selected via two PMI values.

The parameter "Precoding Matrix" selects the first value, see "Precoding Matrix" on page 182. The additional parameter "Precoding Matrix 2" selects the second value.

The meaning of the PMI values is defined in 3GPP TS 36.213, section 7.2.4.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:PMATrix`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:PMATrix`

CSI-RS Power
Value P_c to be signaled to the UE. P_c is the assumed ratio of the RS EPRE to the CSI-RS EPRE. To increase the CSI-RS power, decrease the setting.

The used CSI-RS power offset can be different from the signaled value. For configuration of the used CSI-RS power offset, see "CSI-RS" on page 146.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:POWer`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:POWer`

CSI-RS Antenna Ports
Selects the antenna ports used for the CSI-RS. Select "None" to transmit no CSI-RS at all.

The number of CSI-RS antenna ports is limited by the number of TX antennas. If a scheduling type with follow PMI or follow RI is active, the number of CSI-RS antenna ports equals the number of TX antennas.

For four antenna ports, option R&S CMW-KS521 is required.

For eight antenna ports, option R&S CMW-KS522 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:APORts`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:APORts`

CSI-RS Configuration
Selects the CSI reference signal configuration, influencing which resource elements are used for CSI-RS within a subframe.

The allowed values depend on the duplex mode, the cyclic prefix and the number of CSI-RS antenna ports.

The values are specified in 3GPP TS 36.211, table 6.10.5.2-1 and table 6.10.5.2-2.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:RESource`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:RESource`

CSI-RS Subframe Cfg

The CSI-RS subframe configuration (I_{CSI-RS}) determines in which subframes the CSI-RS is transmitted.

The selected value determines the periodicity (T_{CSI-RS}) and the subframe offset (Δ_{CSI-RS}). Both values are displayed for information.

The mapping is defined in 3GPP TS 36.211, section 6.10.5.3.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:SUBFrame
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:SUBFrame

Zero Power CSI-RS

The 16-bit pattern is signaled to the UE and indicates for which CSI-RS configurations the UE must assume zero transmission power. In resource elements with zero transmission power, there is no downlink transmission at all - no CSI-RS and no PDSCH.

Bit value 1 means zero transmission power. For details, see 3GPP TS 36.211, section 6.10.5.2.

For FDD plus normal cyclic prefix, the last 6 bits are always 0. For FDD plus extended cyclic prefix, the last 8 bits are always 0.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:BITS
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:BITS

ZP CSI-RS Subframe Cfg

Selects the subframe configuration for zero power CSI-RS, similar as parameter "CSI-RS Subframe Cfg" for non-zero power CSI-RS.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:CSIRs:SUBFrame
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:CSIRs:SUBFrame

Channel Matrix

The matrix defines the radio channel coefficients, see Chapter 2.2.12.1, "Radio Channel Coefficients for MIMO", on page 44.

The size of the matrix depends on the number of TX antennas. Each element of the matrix is a complex number, defined via its phase and its magnitude.

You can configure the phase of each number. And you can configure the square of the magnitude of all but one number in each matrix line. The magnitude of the last number is adapted automatically, so that the sum of all magnitude squares within each line of the matrix equals 1.

The channel matrix settings are hidden for fading scenarios and for scenarios with RF output before the radio channel.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:TWO<line>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:FOUR<line>

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:
EIGHt<line>
Plus corresponding PCC commands.

2.4.12.7 Miscellaneous Connection Settings Part 2

This section describes the following "Connection" settings.

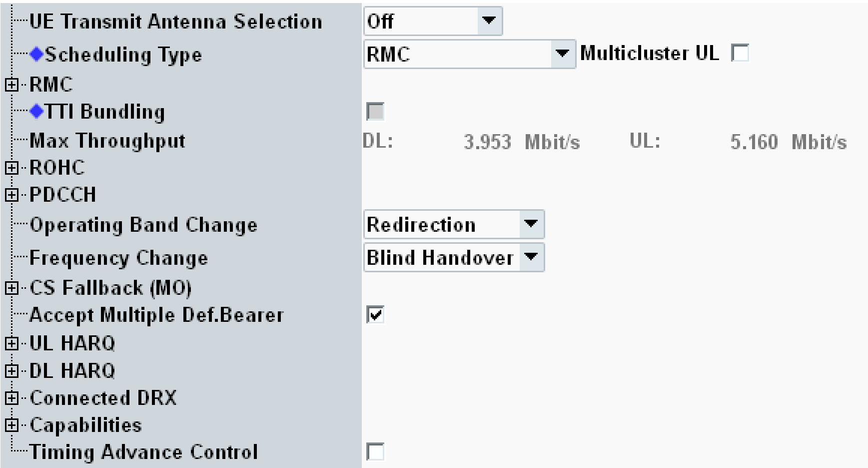


Figure 2-86: Connection configuration settings part 2

UE Transmit Antenna Selection..191
Scheduling Type..191
Multicluster UL..192
Multicluster DL..192
SPS TwoIntervalsConfig TDD..193
TTI Bundling..193
Max Throughput..193
ROHC..193
└ Enable Header Compression..194
└ Profile 194
PDCCH..194
└ PDCCH Symbol Config, #PDCCH Symbols..194
└ Aggr. Level DL/UL Config, Aggreg. Level 194
└ Reduced PDCCH..195
Operating Band Change, Frequency Change..195
CS Fallback (MO)..196
Accept Multiple Default Bearer..196
UL HARQ..196
└ UL HARQ..196
└ Number of HARQ Transmissions..197
└ DCI-0 / PHICH..197
maxHARQ-Tx..197
DL HARQ..197
└ DL HARQ..197
└ Number of HARQ Transmissions..198

└ Redundancy Version Coding Sequence, User-Defined Sequence..............198
Connected DRX...198
Capabilities...198
Timing Advance Control...199

UE Transmit Antenna Selection

Configures the parameter "ue-TransmitAntennaSelection" signaled to the UE, see 3GPP TS 36.213, section 8.7 "UE Transmit Antenna Selection".

You can disable UE antenna selection or allow open loop antenna selection. Closed loop antenna selection is not supported. For MIMO scenarios and for multi-cluster allocation, antenna selection is not allowed.

If you allow open loop antenna selection, the UE can change the used transmit antenna between TTIs. Connect the possible UE transmit antennas to the configured RF input connector via a combiner.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection:UETSelection`

Scheduling Type

Selects the channel type to be scheduled for the UE.

For carrier aggregation scenarios, you can configure this setting per component carrier.

"RMC"	The instrument allocates a 3GPP-compliant reference measurement channel. For configuration, see Chapter 2.4.12.9, "RMC Connection Settings", on page 202.
"User-defined Channels"	3GPP-compliant RMCs allow only specific combinations of cell bandwidth, number of allocated RBs, RB position and modulation type. User-defined channels provide more flexibility concerning the allowed combinations. For configuration, see Chapter 2.4.12.10, "User-Defined Channel Configuration", on page 205. Option R&S CMW-KS510 is required.
"User-defined TTI-Based"	Like "User-defined Channels", but settings can be configured individually per TTI (subframe). For configuration, see Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208. Option R&S CMW-KS510 is required.
"Fixed CQI"	Provides a downlink signal with CQI index and RB allocation configurable individually per TTI. The uplink signal is the same as for "User-defined TTI-Based". For configuration, see Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208. Option R&S CMW-KS510 is required.

"Follow ..." The "Follow..." scheduling types provide a downlink signal configured according to the values reported by the UE. The scheduling types are available depending on the transmission mode:

- Follow CQI (TM 1 to 9)
- Follow PMI (TM 4, 6, 8, 9)
- Follow CQI and RI (TM 3)
- Follow CQI, PMI and RI (TM 4, 8, 9)
- Follow PMI and RI (TM 4, 8, 9)

The uplink signal is the same as for "User-defined TTI-Based".
For configuration, see Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208.
Selecting these scheduling types also enables CQI reporting.
The "Follow..." scheduling types can only work correctly, if the UE sends the corresponding reports. For carrier aggregation, configure the CQI reporting settings, so that reports for the individual carriers arrive in different subframes. Otherwise, the "follow" mechanism does not work. See also Chapter 2.4.14, "CQI Reporting", on page 217.

"SPS" Semi-persistent scheduling (PCC only). A configured RB allocation is granted to the UE every n^{th} subframe.
Selecting this value disables HARQ and UL dynamic scheduling for connected DRX.
For configuration, see Chapter 2.4.1.7, "SPS Configuration", on page 118.
Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:STYPe`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:STYPe`

Multicluster UL

Enables multi-cluster allocation (resource allocation type 1) for RMC or user-defined channels. With disabled checkbox, contiguous allocation is used (resource allocation type 0).

Option R&S CMW-KS510/-KS512 is required (without CA/with CA).

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL`

Multicluster DL

You can enable DL multi-cluster allocation only for resource allocation type 0 (resource block groups) and only for the following scheduling types:

- User-defined channels (global definition, not TTI-based)
- All "Follow WB..." scheduling types

The related checkbox is displayed in the main view, if applicable.

Option R&S CMW-KS510/-KS512 is required (without CA/with CA).

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:DL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:DL`

SPS TwoIntervalsConfig TDD
Configures the parameter "twoIntervalsConfig", signaled to the UE for scheduling type SPS in TDD mode. The parameter is specified in 3GPP TS 36.321.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:TIConfig

TTI Bundling
Enables or disables TTI bundling for the uplink.

With TTI bundling, the UE sends the same data with different redundancy versions in four subsequent TTIs. TTI bundling is faster than HARQ. So TTI bundling makes sense if the channel quality is bad and the application is delay-sensitive, for example voice over LTE.

The following restrictions apply for TTI bundling:

- FDD:
  – User-defined scheduling (global, not TTI-based) or SPS
- TDD:
  – User-defined scheduling (global, not TTI-based)
  – UL/DL configuration = 0, 1 or 6
- UL RB configuration:
  – Number of RB ≤ 3
  – Modulation type QPSK
- No UL carrier aggregation

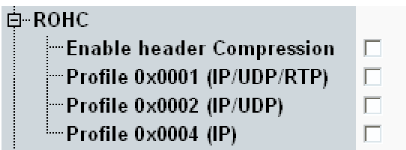
Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TTIBundling

Max Throughput
Displays the expected maximum throughput in Mbit/s (averaged over one frame). For the downlink, the value refers to the sum of all streams of a component carrier.

Remote command:
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?

ROHC



This node configures robust header compression (ROHC).

Header compression is relevant for the continuous transfer of small packets, for example for voice over LTE. Here, the uncompressed header is typically bigger than the payload. Header compression reduces the radio resources required for a voice call.

ROHC is specified in 3GPP TS 36.323 and the references stated therein.

Option R&S CMW-KS510 is required.

Enable Header Compression ← ROHC

Enables or disables ROHC. ROHC is only performed for dedicated bearers with bearer profile "Voice" or "Video", not for data connections.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection:ROHC:ENABle

Profile ... ← ROHC

Enables up to two header compression profiles. If more than one enabled profile is compatible to the used protocols, the most specific profile is used. If no profile is compatible, no compression is performed.

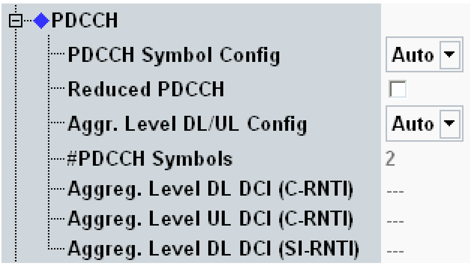
Example - profile 2 (IP/UDP) and 4 (IP) enabled:

- IP/UDP/RTP traffic: profile 2 used
- IP/TDP/... traffic: profile 4 used

Remote command:

CONFigure:LTE:SIGN<i>:CONNection:ROHC:PROFiles

PDCCH



This node configures the used PDCCH configuration. For carrier aggregation scenarios, the settings can be configured per component carrier.

PDCCH Symbol Config, #PDCCH Symbols ← PDCCH

Configures and displays the number of OFDM symbols used for the PDCCH per normal subframe.

The available values depend on the cell bandwidth as follows:

- 1.4 MHz: four symbols
- 3 MHz and 5 MHz: two or three symbols
- 10 MHz, 15 MHz and 20 MHz: one, two, three symbols or "Auto"
  "Auto" configures two or three symbols, depending on the scheduling type.

With enabled "Reduced PDCCH", the lowest allowed value is set automatically.

"#PDCCH Symbols" displays the number of OFDM symbols resulting from the settings.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:SYMBol
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:SYMBol
SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:PSYMbols?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:PSYMbols?

Aggr. Level DL/UL Config, Aggreg. Level ... ← PDCCH

There are three aggregation levels, for different types of DCI messages: DCI messages for DL with C-RNTI, for UL with C-RNTI and for DL with SI-RNTI.

The aggregation levels are displayed as numbers of control channel elements (CCE), see 3GPP TS 36.211, section 6.8.1.

"Aggr. Level DL/UL Config" configures the C-RNTI aggregation levels. The available values depend on the cell bandwidth as follows:

- 1.4 MHz: "Auto", 4/2, 1/1
- 3 MHz: "Auto", 4/4, 4/2
- 5 MHz: "Auto", 8/4, 4/4
- 10 MHz, 15 MHz and 20 MHz: "Auto"

Value <a>/<b> means <a> CCE for DL and <b> CCE for UL. The listed values depend only on the cell bandwidth. Which values are possible, depends also on other scheduling settings. If the selected value is not possible, a lower value is used automatically.

"Auto" configures the aggregation levels automatically, depending on the scheduling settings.

The "Aggreg. Level..." parameters display the used aggregation levels, resulting from the settings. Switch the cell signal on to see the values.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel`
`SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel?`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel`
`SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel?`

Reduced PDCCH ← PDCCH

Enable "Reduced PDCCH" to reduce the resources used for the PDCCH and to increase the resources available for the PDSCH. Thus you can influence the used coding rates and the PDSCH data rate.

This setting is a comfort function. You can achieve the same effect by setting low values for "PDCCH Symbol Config".

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:RPDCch`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:RPDCch`

Operating Band Change, Frequency Change

Select the mechanism to be used for inter-band handover and inter-frequency handover within the LTE signaling application.

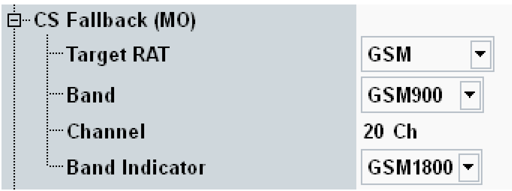
Either blind handover or redirection can be used, see Chapter 2.2.10, "Handover", on page 35.

The selected mechanism is also relevant for a swap of SCC and PCC settings during an established connection. If the cell bandwidth is changed by the swap, redirection is used. If the cell bandwidth is not changed but the band is changed, the setting "Operating Band Change" is used. If also the band is not changed but the frequency is changed, the setting "Frequency Change" is used.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:OBCHange`
`CONFigure:LTE:SIGN<i>:CONNection:FCHange`

CS Fallback (MO)

The following settings configure the feature circuit-switched fallback (CSFB) for mobile-originating calls.



A fallback for a mobile-originating voice call can be performed to a WCDMA cell, a GSM cell or a TD-SCDMA cell. If you select "None", requests for CS fallback are rejected.

Select the technology, specify the target band and the channel. For GSM, you can also set the band indicator for distinction of GSM 1800 and GSM 1900 bands.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:CSFB:DESTination
CONFigure:LTE:SIGN<i>:CONNection:CSFB:GSM
CONFigure:LTE:SIGN<i>:CONNection:CSFB:WCDMa
CONFigure:LTE:SIGN<i>:CONNection:CSFB:TDSCdma

Accept Multiple Default Bearer

Enables/disables accepting multiple default bearer requests.

- Disabled: Only the first default bearer request of a UE is accepted. Additional requests are rejected.
- Enabled: If the UE sends several default bearer requests, several bearers are established. For each bearer, a different IP address is assigned to the UE.

During the establishment of additional default bearers, do not modify any settings. So do not change parameters when the UE sends a default bearer request, until the event log indicates that the requested bearer has been established.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:AMDBearer

UL HARQ

The following parameters configure the HARQ procedure for uplink transmissions.

Option R&S CMW-KS510 is required.

UL HARQ ← UL HARQ

Enables or disables HARQ for uplink transmissions.

HARQ is disabled for TTI bundling and multi-cluster allocation. For the scheduling type SPS, HARQ is disabled and the node is hidden.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:ENABle

Number of HARQ Transmissions ← UL HARQ
Specifies the maximum number of uplink transmissions, including initial transmissions and retransmissions.

For TTI bundling, only the value 4 is supported.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:NHT`

DCI-0 / PHICH ← UL HARQ
Selects how the UE is informed about required retransmissions / successful UL transmissions.

"DCI-0 only" Retransmission is requested via the PDCCH, transporting a DCI 0 and a new data indicator (NDI) bit that is not toggled relative to the previous transmission.

"PHICH only" Retransmission is requested via the physical hybrid-ARQ indicator channel (PHICH), transporting a NACK.

"DCI-0 & PHICH" Combination of both methods.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:DPHich`

maxHARQ-Tx
For the scheduling type SPS, this parameter is available instead of the node "UL HARQ". The value is signaled to the UE. UL HARQ is disabled.

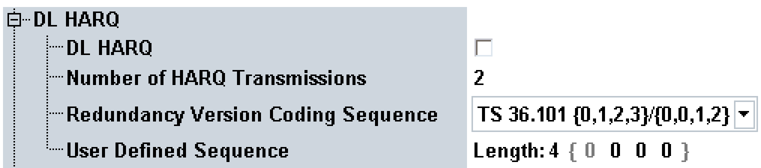
For TTI bundling, only the value 4 is supported.

Option R&S CMW-KS510 is required.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:MAXTx`

DL HARQ
The following parameters configure the HARQ procedure for downlink transmissions.

For scenarios without carrier aggregation, option R&S CMW-KS510 is required. For scenarios with carrier aggregation, R&S CMW-KS512 is required.



DL HARQ ← DL HARQ
Enables or disables HARQ for downlink transmissions.

HARQ is disabled for scheduling type SPS.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:ENABle`

Number of HARQ Transmissions ← DL HARQ
Specifies the maximum number of downlink transmissions, including initial transmissions and retransmissions.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:NHT

Redundancy Version Coding Sequence, User-Defined Sequence ← DL HARQ
The coding sequence defines the redundancy versions for repeated transmissions of a packet. The first value of the sequence is used for initial transmissions, the second value for the first retransmission, and so on.

If the sequence is shorter than the maximum allowed number of transmissions, it is used several times. Example: Four transmissions allowed and configured sequence {0, 2} results in the used sequence {0, 2, 0, 2}.

If the sequence is longer than the maximum allowed number of transmissions, the surplus values have no effect. Example: Two transmissions allowed and configured sequence {0, 1, 2, 3} results in the used sequence {0, 1}.

You can configure a user-defined sequence or use a sequence defined by 3GPP:
- **TS 36.101**: Depending on the modulation scheme, either the sequence {0, 1, 2, 3} or {0, 0, 1, 2} is used, as defined in 3GPP TS 36.101.
- **TS 36.104**: The sequence {0, 2, 3, 1} is used, as defined in 3GPP TS 36.104.
- **User-Defined**: The user-defined sequence is used. Define first the length of the sequence, then the sequence itself.

For details about the meaning of the individual redundancy versions, see "redundancy version number" in 3GPP TS 36.212.

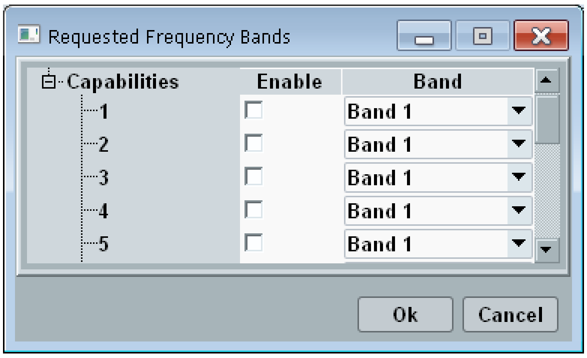
Remote command:
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:RVCSequence
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence:LENGth
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence

Connected DRX
See Chapter 2.4.12.8, "Connected DRX Connection Settings", on page 199

Capabilities

This node configures the information element "requestedFrequencyBands" of the "ueCapabilityEnquiry" message. The element contains a list of LTE operating bands for which the UE is requested to report its capabilities.

To configure the list of bands, press the "Edit" button.



You can enable up to 16 entries with different bands. The element "requestedFrequencyBands" is filled with all enabled entries, top-down.

Remote command:
CONFigure:LTE:SIGN<i>:UECapability:RFBands:ALL

Timing Advance Control
Enables the correction of a changing UL frame timing via timing advance commands, sent to the UE.

A drift of the UL frame timing can cause a call drop after some time. Enabling timing advance control corrects such a drift via correction commands sent to the UE.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:TAControl

2.4.12.8 Connected DRX Connection Settings

This section describes settings for discontinuous reception (DRX) of the UE during an established connection. If DRX is enabled, the UE monitors the PDCCH discontinuously and thus reduces battery consumption. The related signaling parameters are configurable and specified in 3GPP TS 36.321, section 5.7.

There are two types of DRX cycles. Long DRX cycles are mandatory while short DRX cycles are optional. Both types have a fixed length and start with a fixed "On" time during which the UE receiver is active. After the "On" time, there is an opportunity for DRX.

The following figure shows a typical example including short and long DRX cycles. The example starts with reception of a PDCCH during a long DRX cycle "On" time of two subframes. Due to this reception, the inactivity timer set to 40 subframes is started and the receiver stays on until the timer expires. In this example, no further PDCCH is received, so that the timer is not restarted.

After the timer is expired, four short DRX cycles are executed (short DRX cycle = 10 subframes, short cycle timer = 4 cycles). Finally, long DRX cycles are executed (long DRX cycle = 20 subframes).

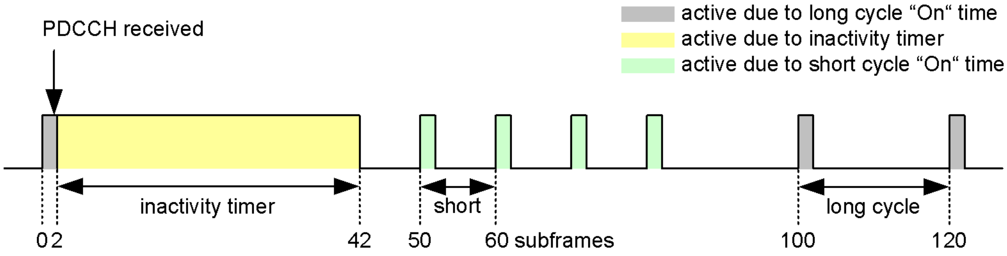


Figure 2-87: Example, short and long cycles after inactivity

Active MAC padding and uplink RB allocation cause PDCCH traffic and prevent DRX, see also "UL Dynamic Scheduling" on page 202.

The following settings are available (option R&S CMW-KS510 is required).

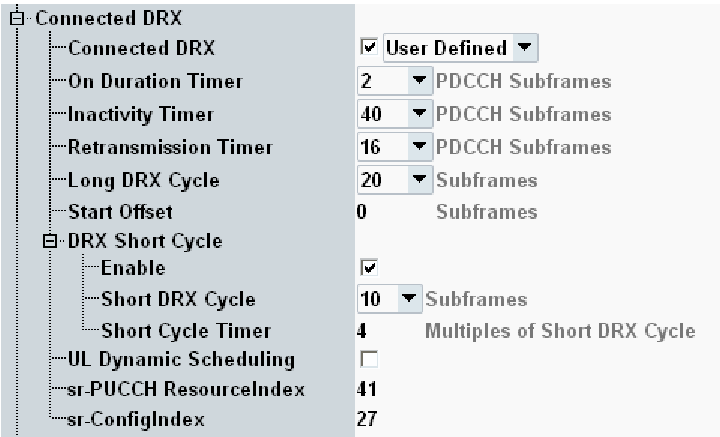


Figure 2-88: Connected DRX settings (values used in example)

The unit "PDCCH subframe" used in this context refers to subframes with PDCCH. For FDD, all subframes are PDCCH subframes. For TDD, only DL subframes and subframes with DwPTS are counted.

Connected DRX.. 200
On Duration Timer.. 201
Inactivity Timer.. 201
Retransmission Timer.. 201
Long DRX Cycle.. 201
Start Offset.. 201
DRX Short Cycle.. 201
└ Enable.. 201
└ Short DRX Cycle.. 201
└ Short Cycle Timer.. 202
UL Dynamic Scheduling.. 202
sr-PUCCH ResourceIndex.. 202
sr-ConfigIndex.. 202

Connected DRX

Enables or disables DRX and selects a set of DRX settings.

Option R&S CMW-KS510 is required.

"DRX_S"	Settings according to 3GPP TS 36.521-3, table H.3.6-1.
"DRX_L"	Settings according to 3GPP TS 36.521-3, table H.3.6-2.
"User-Defined"	You can configure all DRX settings.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:ENABle`

On Duration Timer
"On" time at the beginning of each short or long DRX cycle ("onDurationTimer").

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:ODTimer`

Inactivity Timer
"On" time after reception and decoding of a PDCCH for this UE ("drx-InactivityTimer").

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:ITIMer`

Retransmission Timer
"On" time if the UE expects a DL retransmission ("drx-RetransmissionTimer"). The timer expires early when the retransmission is received.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:RTIMer`

Long DRX Cycle
Duration of one long DRX cycle (longDRX-Cycle).

If short DRX cycles are enabled, the long DRX cycle duration is always a multiple of the short DRX cycle duration. Enabling short DRX cycles or modifying the short DRX cycle duration modifies also the long DRX cycle duration, so that it is compatible.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:LDCYcle`

Start Offset
Offset shifting all short and long DRX cycles ("drxStartOffset").

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:SOFFset`

DRX Short Cycle
The following settings configure optional short DRX cycles.

Enable ← DRX Short Cycle
Enables short DRX cycles.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCENable`

Short DRX Cycle ← DRX Short Cycle
Duration of one short DRX cycle (shortDRX-Cycle).

The long DRX cycle duration is always a multiple of the short DRX cycle duration and adapted automatically to this setting (if short cycles are enabled).

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SDCYcle

Short Cycle Timer ← DRX Short Cycle
Number of short DRX cycles to be processed ("drxShortCycleTimer"), for example after the inactivity timer has expired.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCTimer

UL Dynamic Scheduling
With uplink dynamic scheduling, the UE gets uplink grants only upon request. Furthermore, MAC padding is disabled automatically.

Enable dynamic scheduling to force DRX, but allow the UE to get an UL grant upon request.

If you want to force DRX without allowing any uplink grants, disable dynamic scheduling, set the number of UL RBs to zero and disable MAC padding.

If connected DRX is disabled, the "UL Dynamic Scheduling" parameter has no effect. For scheduling type SPS, "UL Dynamic Scheduling" is disabled.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:CDRX:UDSCheduling

sr-PUCCH ResourceIndex
Defines which PUCCH resource the UE must use for scheduling requests, see $n_{PUCCH,SRI}$ in 3GPP TS 36.213, section 10.1.5.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SRPRindex

sr-ConfigIndex
Defines how often and when the UE must send scheduling requests via the PUCCH. The effect of the individual SR configuration index values is specified in 3GPP TS 36.213, section 10.1.5.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SRCindex

2.4.12.9 RMC Connection Settings

The parameters in this section configure a 3GPP-conform reference measurement channel (RMC). The settings apply if UE Transmit Antenna Selection = "RMC".

To configure the RMC, proceed as follows (for UL and DL):

1. Select the cell bandwidth (see Chapter 2.4.10, "Physical Cell Setup", on page 154).
2. If you want to use multi-cluster UL, enable it.
3. Select the number and position of allocated resource blocks (RB).

For multi-cluster, configure first cluster 1, then cluster 2.

4. Select the modulation type.
5. If the transport block size index is configurable, select it.

For valid parameter combinations and background information, see Chapter 2.2.13, "Scheduling Type RMC", on page 47.

The RMC settings can be changed in all main connection states including "Connection Established".

For carrier aggregation scenarios, you can configure the settings per component carrier.

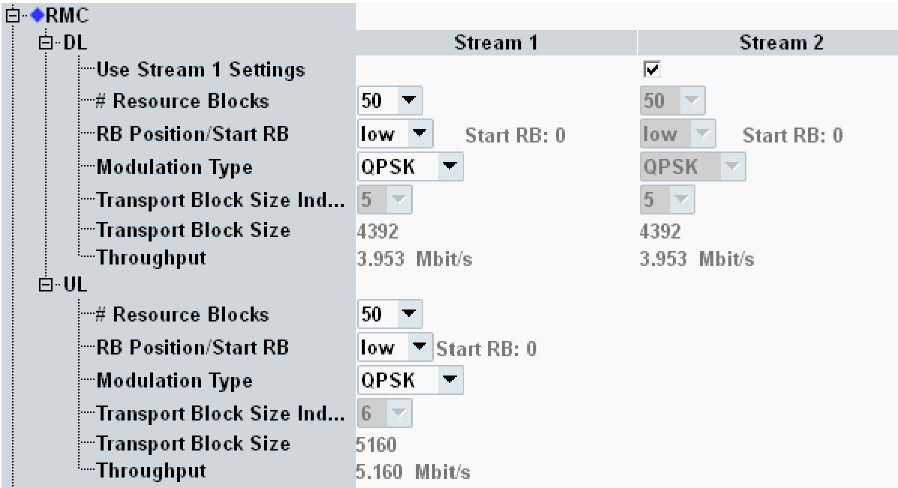


Figure 2-89: RMC connection settings

Use Stream 1 Settings......203
Resource Blocks......204
Version......204
RB Position/Start RB......204
Modulation Type......204
Transport Block Size Index......204
Transport Block Size......205
Throughput......205

Use Stream 1 Settings

This parameter is visible if the selected transmission scheme involves several downlink streams.

If you enable this parameter, all stream 1 settings are also applied to stream 2.

If you disable this parameter, you can configure some DL parameters individually per stream. Other parameters are configurable for stream 1 only and are applied automatically to stream 2.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DLEQual`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DLEQual`

 # Resource Blocks
Selects the number of allocated resource blocks. This parameter influences the allowed modulation types.

For multi-cluster allocation, this setting is configurable separately for cluster 1 and cluster 2.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:DL<s>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:UL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL
Plus corresponding PCC commands.

Version
Some TDD RMCs defined by 3GPP have the same channel bandwidth, number of RBs, modulation type and transport block size index. The parameter "Version" is introduced to distinguish between these RMCs.

For the meaning of the version values, see Chapter 2.2.13.4, "DL RMCs, Multiple TX Antennas (TM 2 to 6)", on page 54.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:VERSion:DL<s>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:VERSion:DL<s>

RB Position/Start RB
Selects the position of the first allocated resource block.

For multi-cluster allocation, this setting is configurable separately for cluster 1 and cluster 2.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:DL<s>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:UL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL
Plus corresponding PCC commands.

Modulation Type
Selects the modulation type. This parameter influences the transport block size index.

256-QAM requires option R&S CMW-KS504/-KS554.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:DL<s>
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:UL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:DL<s>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:UL

Transport Block Size Index
Displays or selects the transport block size index, depending on the modulation type.

For most RMCs, the TBS index can be determined from the other settings and is displayed for information.

Only for few RMCs, the combination of the other settings is ambiguous and you can also select a TBS index.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:UL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:UL`

Transport Block Size
Displays the transport block size in bits.

Remote command:
n/a

Throughput
Displays the expected maximum throughput in Mbit/s (averaged over one frame). The value is calculated per downlink and uplink stream.

Remote command:
`SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?`
`SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?`
`SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>:STReam<s>?`
`SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?`

2.4.12.10 User-Defined Channel Configuration

The parameters in this section configure the resource block configuration, modulation type and transport block size for DL and UL channels. The allowed combinations are more flexible than for 3GPP-compliant RMCs. Option R&S CMW-KS510 is required.

The settings apply if UE Transmit Antenna Selection = "User-Defined Channels".

To configure the channels, proceed as follows (for UL and DL):

1. Select the cell bandwidth (see Chapter 2.4.10, "Physical Cell Setup", on page 154).
2. If you want to use multi-cluster, enable it (see Chapter 2.4.12.7, "Miscellaneous Connection Settings Part 2", on page 190).
3. Configure the RB allocation.
   For UL multi-cluster, configure first cluster 1, then cluster 2.
   For DL multi-cluster, use the main view for configuration.
4. Select the modulation type.
5. Select the transport block size index.

For valid parameter combinations and background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

The channel settings can be changed in all main connection states including "Connection Established".

For carrier aggregation scenarios, you can configure the settings per component carrier.

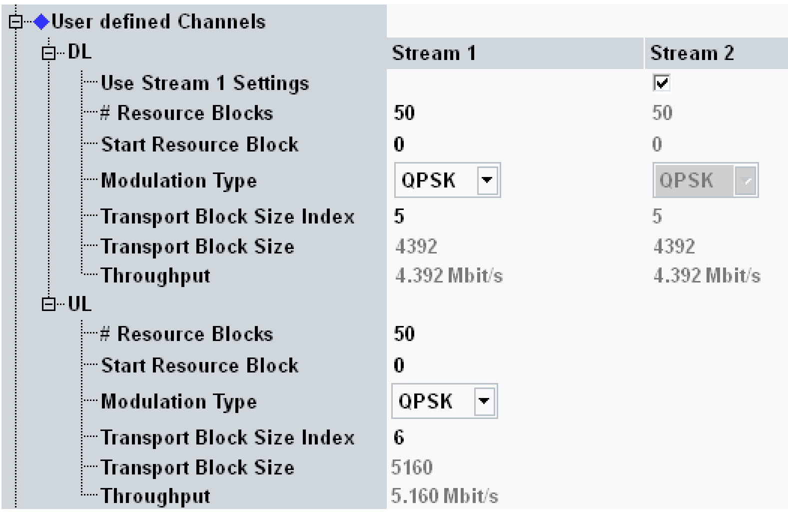


Figure 2-90: User-defined channel settings

Use Stream 1 Settings......206
Resource Blocks ... Transport Block Size......206
Throughput......207
Code Rate......207
DL multi-cluster allocation......207

Use Stream 1 Settings

This parameter is visible if the selected transmission scheme involves several downlink streams.

If you enable this parameter, all stream 1 settings are also applied to stream 2.

If you disable this parameter, you can configure some DL parameters individually per stream. Other parameters are configurable for stream 1 only and are applied automatically to stream 2.

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DLEQual`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DLEQual`

 # Resource Blocks ... Transport Block Size

"# Resource Blocks" selects the number of allocated resource blocks.

"Start Resource Block" specifies the number of the first allocated resource block. This parameter allows you to shift the allocated RBs within the cell bandwidth.

For UL multi-cluster allocation, the two resource block settings are configurable separately for cluster 1 and cluster 2.

"Modulation Type" selects the modulation type and influences the allowed transport block size indices. 256-QAM requires option R&S CMW-KS504/-KS554.

"Transport Block Size Index" selects TBS index. The resulting "Transport Block Size" in bits is displayed

Remote command:

`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL`

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL
Plus corresponding PCC commands.

Throughput
Displays the expected maximum throughput in Mbit/s (averaged over one frame). The value is calculated per downlink and uplink stream.

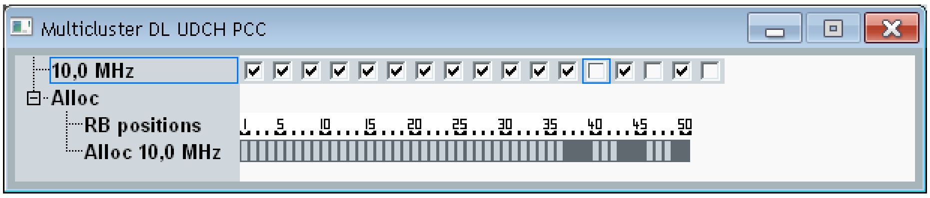
Remote command:
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>:STReam<s>?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?

Code Rate
Only displayed in the main view: Effective channel code rate, i.e. the number of information bits (including CRC bits) divided by the number of physical channel bits on PDSCH/PUSCH.

Remote command:
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s>:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL:CRATe:ALL?

DL multi-cluster allocation
To enable DL multi-cluster allocation, see "Multicluster DL" on page 192.

To configure the clusters, press the button "RB Clusters" in the main view. The following configuration window opens.



In this dialog box, you can enable or disable each individual RBG via the checkboxes.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:DL<s>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:DL<s>

2.4.12.11 User-Defined TTI-Based Channel Configuration

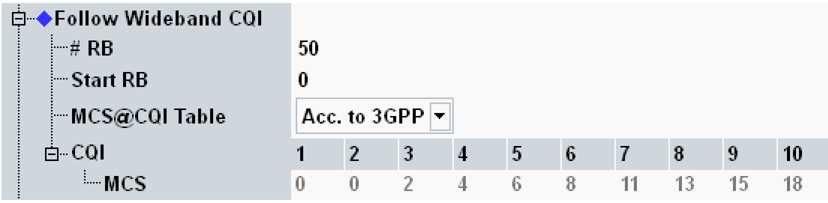
Parameters specific for scheduling type "User-defined TTI-Based" can only be configured from the main view, not from the configuration tree.

See Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208

2.4.12.12 CQI Channel Configuration

The configuration depends on the CQI scheduling type.

- "Fixed CQI", "Follow WB PMI" and "Follow WB PMI-RI":
  Uplink and downlink settings for these scheduling types can only be configured from the main view, not from the configuration tree.
- "Follow WB CQI", "Follow WB CQI-RI" and "Follow WB CQI-PMI-RI":
  The uplink settings can only be configured from the main view, not from the configuration tree. The downlink settings are also contained in the configuration tree:



For a description of all parameters, see Chapter 2.4.13, "TTI-Based Channel Configuration", on page 208.

2.4.13 TTI-Based Channel Configuration

This section describes the TTI-based channel configuration via a special dialog box.

Before you open the dialog box, select the duplex mode, the cell bandwidth and the scheduling type. Then open the dialog box via the button "Edit All" in the lower part of the main view. You cannot access the dialog box from the main configuration tree.

TTI-based channel configuration is available for the scheduling type "User-defined TTI-Based" and for all "CQI-PMI-RI" scheduling types ("Fixed CQI" and "Follow WB ...").

The dialog box contains several tabs, which are active or inactive, depending mainly on the scheduling type and the scenario.

The tabs contain settings at the top and a graphical presentation of the resulting resource block configuration at the bottom.

For valid parameter combinations and background information, refer to the following sections:

- Chapter 2.2.14, "User-Defined Channels", on page 59
- Chapter 2.2.15, "CQI Channels", on page 62

2.4.13.1 DL Stream Tabs and UL Tab

The DL stream tabs and the UL tab contain usually one column of settings for each subframe of a radio frame. For some transmission schemes, the DL stream tab contains only one column, applicable to all subframes.

For TDD, the UL tab presents only the UL subframes of a radio frame, while the DL tabs present both DL and special subframes. The special subframe settings configure the DwPTS field for data transfer in downlink direction. To modify the uplink-downlink configuration of the radio frame, see "Use Carrier Specific" on page 158. For UL-DL configuration 0, all UL subframes have the same settings.

The subframe number (0 to 9) and the subframe type are indicated in the column header. All columns must be configured top down (first "# RB", then "Start RB", then ...).

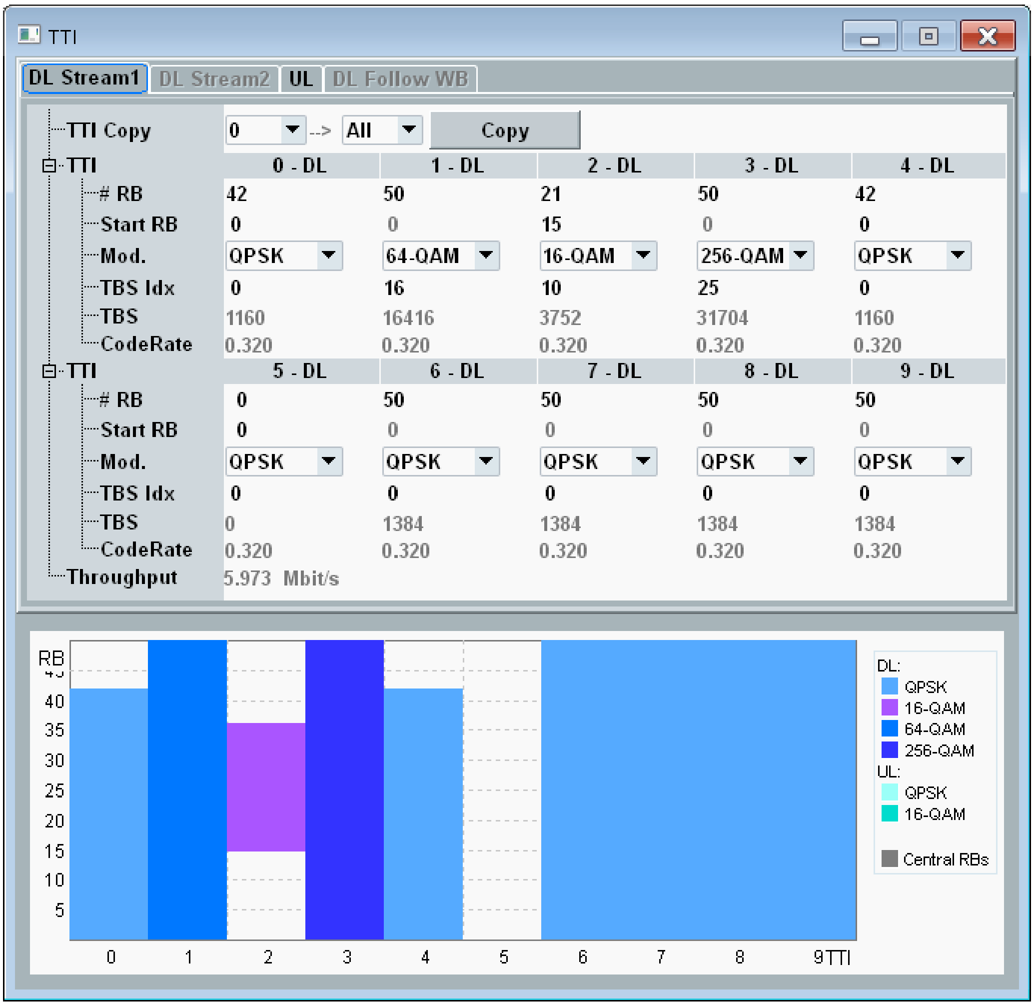


Figure 2-91: User-defined TTI-based configuration (PCC)

If the selected scenario involves several downlink streams, some DL parameters can be configured individually per stream. Other parameters are configurable for stream 1 only and are applied automatically to stream 2. If you enable parameter "Equal" in the main view, all stream 1 settings are also applied to stream 2 and the stream 2 tab is disabled.

For carrier aggregation scenarios, you can configure the settings per component carrier.

All parameters of the tabs are explained in the following.

TTI Copy....210
Use 256-QAM....210
#RB / Start RB....210
CQI Idx....210
Mod....210
TBS Idx....210
UL configuration commands....210
DL configuration commands....211
└ User-Defined TTI-Based....211
└ Fixed CQI....211
TBS....211
Code Rate....211
Throughput....211

TTI Copy

Allows you to copy the settings of a selected subframe to other subframes. The source and target subframes of the copy operation are identified via their number.

To perform a copy operation, select the number of the subframe to be copied, select the target subframes and press the "Copy" button.

Remote command:
n/a

Use 256-QAM

Selects a CQI definition table for "Fixed CQI". There is a table with 256-QAM and a table without 256-QAM, see Chapter 2.2.15.1, "Fixed CQI Channels", on page 63.

256-QAM requires option R&S CMW-KS504/-KS554.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:QAM<ModOrder>:DL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:QAM<ModOrder>:DL`

#RB / Start RB

Select the number of allocated resource blocks and specifies the number of the first allocated resource block.

CQI Idx.

Selects the CQI index for a downlink subframe. Only for scheduling type "Fixed CQI".

Mod.

Selects or displays the modulation type.

TBS Idx

Selects the transport block size index.

The allowed values depend on whether you select 256-QAM for at least one TTI or not, see Chapter 2.2.14.3, "Supported Transport Block Size Indices", on page 62.

UL configuration commands

The following commands configure the uplink parameters "#RB", "Start RB", "Mod." and "TBS Idx".

The settings apply to all scheduling types with TTI-based uplink configuration.

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL`
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:ALL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:ALL`

DL configuration commands
For downlink configuration, there are different commands per scheduling type and for PCC and SCC.

User-Defined TTI-Based ← DL configuration commands
The following commands configure the parameters "#RB", "Start RB", "Mod." and "TBS Idx" for the scheduling type "User-Defined TTI-Based".

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:ALL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:ALL`

Fixed CQI ← DL configuration commands
The following commands configure the parameters "#RB", "Start RB" and "CQI Idx" for the scheduling type "Fixed CQI".

Remote command:
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>:ALL`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>`
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>:ALL`

TBS
Displays the transport block size in bits.

Code Rate
Displays the effective channel code rate, i.e. the number of information bits (including CRC bits) divided by the number of physical channel bits on PDSCH/PUSCH.

Remote command:
`SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:CRATe:ALL?`
`SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:CRATe:ALL?`
`SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:CRATe:ALL?`
`SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:CRATe:ALL?`

Throughput
Displays the expected maximum throughput in Mbit/s (averaged over one frame). The value is calculated per downlink and uplink stream.

Remote command:
`SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?`
`SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?`

SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>:STReam<s>?

2.4.13.2 DL Follow WB Tab - CQI Variant

There are two variants of this tab. The CQI variant provides a mapping table and is active for the scheduling types "Follow WB CQI", "Follow WB CQI-RI" and "Follow WB CQI-PMI-RI".

Most settings are not configurable per TTI. They apply to all downlink subframes of the carrier. For carrier aggregation scenarios, you can configure the downlink settings per component carrier.

The expected maximum throughput displayed for example in the main view is calculated using the maximum MCS index value of the mapping table.

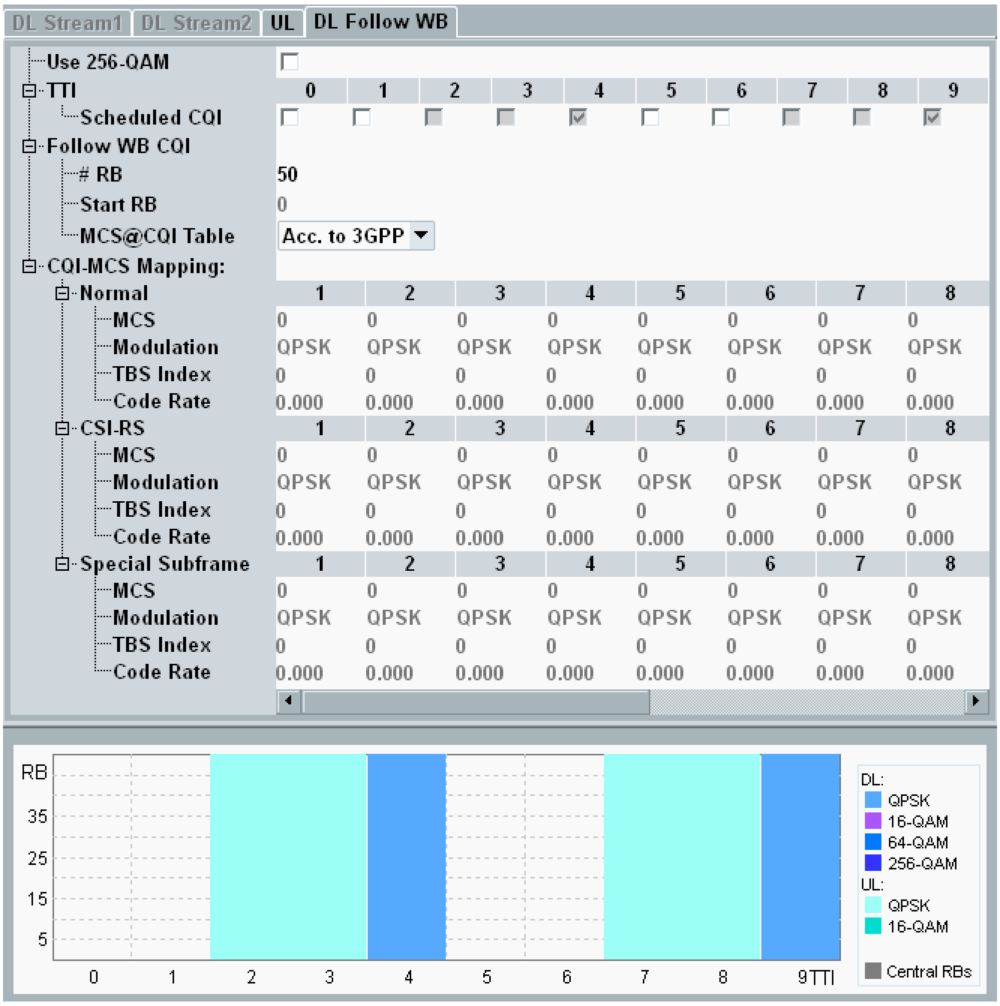


Figure 2-92: Follow WB CQI DL settings, TDD, UL-DL config 1, TM 9

Use 256-QAM...213
Scheduled CQI...213
#RB / Start RB..213

DL multi-cluster allocation.....213
MCS@CQI Table / CQI-MCS Mapping.....214
└ Follow WB CQI.....214
└ Follow WB CQI-RI.....215
└ Follow WB CQI-PMI-RI.....215

Use 256-QAM

There are two CQI and MCS definition tables in 3GPP TS 36.213, one table with 256-QAM and one table without 256-QAM. This setting selects which of the two tables is used.

256-QAM requires option R&S CMW-KS504/-KS554.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:QAM<ModOrder>:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:QAM<ModOrder>:DL

Scheduled CQI

According to 3GPP TS 36.521, some subframes must be inactive (not scheduled), depending on the duplex mode and the scheduling type, see Chapter 2.2.15, "CQI Channels", on page 62. The default behavior complies with the 3GPP definition.

The checked boxes indicate which subframes are scheduled. The configurable check-boxes allow you to activate additional DL subframes and special subframes.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:STTI
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:STTI
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:STTI
Plus corresponding PCC commands.

#RB / Start RB

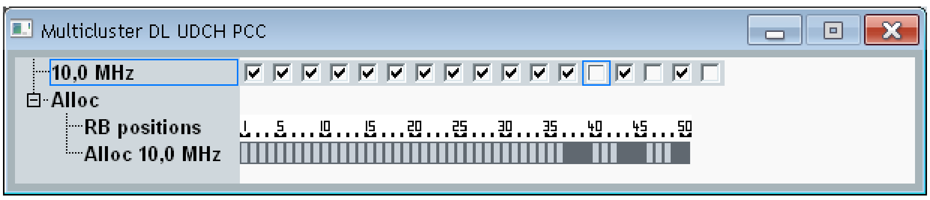
Select the number of allocated resource blocks and the number of the first allocated resource block.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL
Plus corresponding PCC commands.

DL multi-cluster allocation

To enable DL multi-cluster allocation, see "Multicluster DL" on page 192.

To configure the clusters, press the button "RB Clusters" in the main view. The following configuration window opens.



In this dialog box, you can enable or disable each individual RBG via the checkboxes.

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:MCLuster:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:MCLuster:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:MCLuster:DL
Plus corresponding PCC commands.

MCS@CQI Table / CQI-MCS Mapping
The mapping table assigns an MCS index value (0 to 28, with 256-QAM 0 to 27) to each possible reported wideband CQI index value (1 to 15). The MCS index value used for the downlink is dynamically determined according to this table, using the previous wideband CQI value reported by the UE.

The MCS index determines the modulation type and TBS index as defined in 3GPP TS 36.213, table 7.1.7.1-1 (without 256-QAM) and table 7.1.7.1-1A (with 256-QAM). Which of the two tables is used, is selected via the parameter "Use 256-QAM".

For TM 9, there are separate mapping tables for downlink subframes without CSI-RS ("Normal") and with CSI-RS.

For TDD, there is a separate mapping table for special subframes.

You can either use an automatic mapping table configuration or a user-defined mapping:

- **Acc. to 3GPP**: The mapping is defined automatically based on 3GPP specifications. The used CQI to MCS mapping is displayed for information.
- **User-Defined**: You can configure the CQI to MCS mapping manually.

In both cases, the resulting modulation types, TBS indices and code rates are displayed for information.

The displayed code rate applies to default DL subframes. If you enable additional subframes via "Scheduled CQI" on page 213, their code rate is slightly less than the displayed code rate.

Follow WB CQI ← MCS@CQI Table / CQI-MCS Mapping
The following commands apply to the scheduling type "Follow WB CQI".

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:UDEFined
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:UDEFined
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:UDEFined
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:DETermined?
Plus corresponding PCC commands.

Follow WB CQI-RI ← MCS@CQI Table / CQI-MCS Mapping

The following commands apply to the scheduling type "Follow WB CQI-RI".

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:UDEFined
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:UDEFined
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:DETermined?
Plus corresponding PCC commands.

Follow WB CQI-PMI-RI ← MCS@CQI Table / CQI-MCS Mapping

The following commands apply to the scheduling type "Follow WB CQI-PMI-RI".

Remote command:
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:UDEFined
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:UDEFined
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:UDEFined
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:DETermined?
Plus corresponding PCC commands.

2.4.13.3 DL Follow WB Tab - PMI Variant

There are two variants of this tab. The PMI variant is active for the scheduling types "Follow WB PMI" and "Follow WB PMI-RI".

Most settings are not configurable per TTI. They apply to all downlink subframes of the carrier. For carrier aggregation scenarios, you can configure the downlink settings per component carrier.

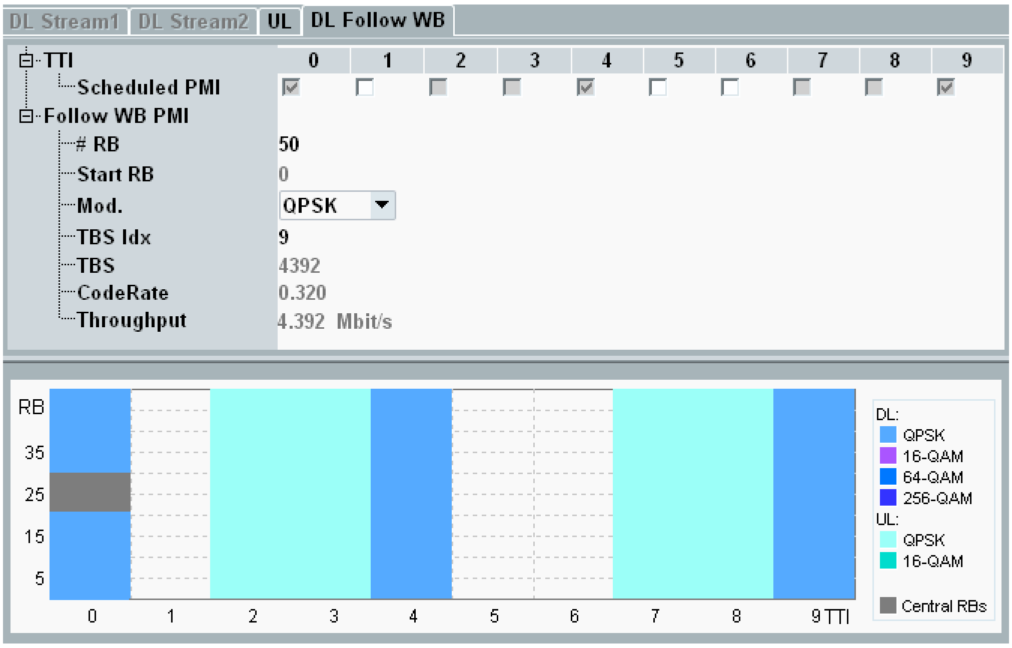


Figure 2-93: Follow WB PMI DL settings, TDD, UL-DL config 1

Scheduled CQI....216
#RB / Start RB....216
DL multi-cluster allocation....217
Mod. / TBS Idx....217
TBS....217
Code Rate....217
Throughput....217

Scheduled CQI

According to 3GPP TS 36.521, some subframes must be inactive (not scheduled), depending on the duplex mode and the scheduling type, see Chapter 2.2.15, "CQI Channels", on page 62. The default behavior complies with the 3GPP definition.

The checked boxes indicate which subframes are scheduled. The configurable checkboxes allow you to activate additional DL subframes and special subframes.

Remote command:

```
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL:STTI
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL:STTI
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL:STTI
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL:STTI
```

#RB / Start RB

Select the number of allocated resource blocks and the number of the first allocated resource block.

Remote command:

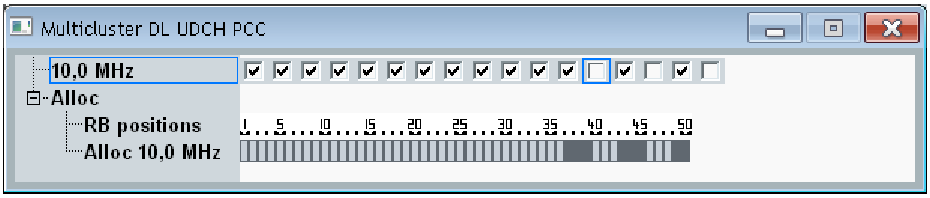
```
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL
```

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL

DL multi-cluster allocation

To enable DL multi-cluster allocation, see "Multicluster DL" on page 192.

To configure the clusters, press the button "RB Clusters" in the main view. The following configuration window opens.



In this dialog box, you can enable or disable each individual RBG via the checkboxes.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:MCLuster:DL
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:MCLuster:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:MCLuster:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:MCLuster:DL

Mod. / TBS Idx

Select or display the modulation type and the transport block size index.

Remote command:

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL

TBS

Displays the transport block size in bits.

Code Rate

See "Code Rate" on page 211

Throughput

See "Throughput" on page 211

2.4.14 CQI Reporting

The following parameters configure channel quality indication (CQI) reporting. The reporting procedures are specified in 3GPP TS 36.213, section 7.2.

For scenarios without carrier aggregation, option R&S CMW-KS510 is required. For scenarios with carrier aggregation, R&S CMW-KS512 is required.

Which reports are sent by the UE depends on the transmission mode. If you want to see CQI, PMI and RI reports, you can use for example transmission mode 4.

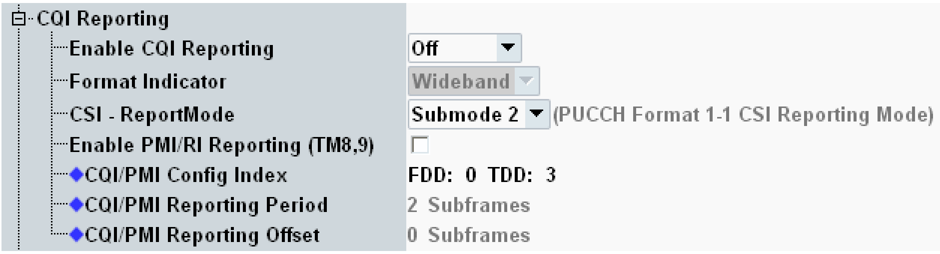


Figure 2-94: CQI reporting settings

Enable CQI Reporting....................218
Format Indicator....................218
CSI - Report Mode....................218
Enable PMI/RI Reporting (TM 8, 9)....................218
CQI/PMI Config Index....................219
CQI/PMI Reporting Period / Offset....................219
Configuration Hints....................219

Enable CQI Reporting

Enables periodic CQI reporting ("Periodic") or disables CQI reporting completely ("Off").

For the scheduling types "Follow...", periodic CQI reporting is enabled automatically.

Periodic CQI reporting is described in 3GPP TS 36.213, section 7.2.2.

Remote command:
CONFigure:LTE:SIGN<i>:CQIReporting:ENABle

Format Indicator

The current software version supports only wideband CQI reporting. Subband CQI reporting is not supported.

Remote command:
n/a

CSI - Report Mode

Configures the parameter "PUCCH_format1-1_CSI_reporting_mode", signaled to the UE.

The parameter is only relevant for transmission mode 9 with 8 CSI-RS antenna ports and wideband CQI reporting. See also 3GPP TS 36.213, section 7.2.2.

Remote command:
CONFigure:LTE:SIGN<i>:CQIReporting:CSIRmode

Enable PMI/RI Reporting (TM 8, 9)

In transmission mode 8 and 9, PMI and RI reports must be explicitly requested from the UE.

For the scheduling types "Follow...", PMI/RI reporting is enabled automatically.

"OFF" The UE does not report PMI and RI values.
For TM 9, reported CQI values are based on the cell-specific reference signal.

"ON" The UE reports also PMI and RI values (if reporting is enabled at all). For TM 9, reported values are based on the CSI reference signal. For PMI and RI reports, you must enable at least two CSI-RS antenna ports. For CQI reports, at least one antenna port is required. See "CSI-RS Antenna Ports" on page 188.

Remote command:
`CONFigure:LTE:SIGN<i>:CQIReporting:PRIReporting:ENABle`

CQI/PMI Config Index

Specifies the "cqi-pmi-ConfigIndex" ($I_{CQI/PMI}$) for FDD and TDD.

If you want to evaluate reports for several component carriers, you must configure compatible values, so that the carriers use different subframes for reporting. See "Configuration Hints" on page 219.

Remote command:
`CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex[:FDD]`
`CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex:TDD`
`CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex[:FDD]`
`CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex:TDD`

CQI/PMI Reporting Period / Offset

The displayed reporting period N_p and the reporting offset $N_{OFFSET,CQI}$ result from the configured "cqi-pmi-ConfigIndex" and the duplex mode. They are derived using the mapping tables 7.2.2-1A and 7.2.2-1C in 3GPP TS 36.213.

For carrier aggregation scenarios, the information is available per component carrier.

Remote command:
`SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:RPERiod?`
`SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:ROFFset?`
`SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:RPERiod?`
`SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:ROFFset?`

Configuration Hints

The eNodeB determines which subframes the UE can use for CQI, PMI and RI reporting, as specified in 3GPP TS 36.213, section 7.2.2.

The subframes for CQI and PMI reporting are determined by the parameter "cqi-pmi-ConfigIndex". This parameter is configurable. Via a mapping table, the "cqi-pmi-ConfigIndex" determines the reporting period N_p and the reporting offset $N_{OFFSET,CQI}$.

The subframes for RI reporting are determined by the parameters "M_{RI}" and "$N_{OFFSET,RI}$". The LTE signaling application uses "M_{RI}" = 1 and "$N_{OFFSET,RI}$" = -1.

Thus the subframes for RI reporting are located immediately before the subframes for CQI/PMI reporting.

If you want to evaluate reports for several component carriers, the carriers must use different subframes for reporting. The carrier configurations must not overlap. This rule is also important for scheduling types with a DL configuration that reacts to the reports, for example "Follow WB CQI".

Example, dual-carrier FDD, wrong configuration:

PCC: "cqi-pmi-ConfigIndex" = 3 means offset = 1, period = 5

SCC: "cqi-pmi-ConfigIndex" = 9 means offset = 2, period = 10

The following table shows the resulting configuration for two frames. There is a collision in subframe number 1, with CQI/PMI reporting for the PCC and RI reporting for the SCC.

Subframe no.	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
PCC	R	C				R	C				R	C				R	C			
SCC		R	C									R	C							
C = CQI/PMI reporting, R = RI reporting																				

Example, dual-carrier FDD, correct configuration:

PCC: "cqi-pmi-ConfigIndex" = 3 means offset = 1, period = 5

SCC: "cqi-pmi-ConfigIndex" = 5 means offset = 3, period = 5

The following table shows the resulting configuration. There is no collision.

Subframe no.	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
PCC	R	C				R	C				R	C				R	C			
SCC			R	C				R	C				R	C				R	C	
C = CQI/PMI reporting, R = RI reporting																				

2.4.15 UE Measurement Report Settings

This section configures the UE measurement report. The report is shown in the main signaling view, see Chapter 2.4.1.3, "UE Measurement Report", on page 111.

For enabling of neighbor cell measurements, see Chapter 2.4.11.1, "Neighbor Cell Settings", on page 162.

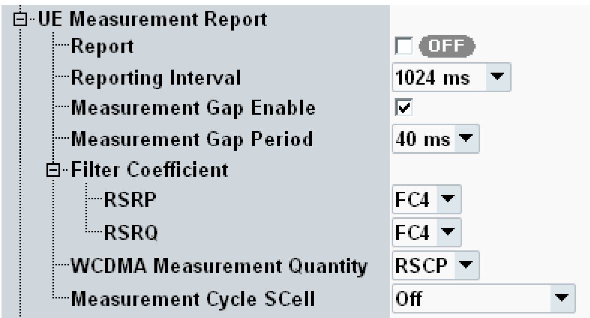


Figure 2-95: UE measurement report settings

Report ... 221
Reporting Interval ... 221
Measurement Gap Enable ... 221

Measurement Gap Period....221
Filter Coefficient RSRP/RSRQ....221
WCDMA Measurement Quantity....221
Measurement Cycle SCell....222

Report

Enables or disables the UE measurement report.

Configure the other settings before enabling this parameter.

Remote command:
`CONFigure:LTE:SIGN<i>:UEReport:ENABle`

Reporting Interval

Sets the interval between two consecutive measurement reports. Reduce the interval to check whether the UE can cope with a high repetition rate.

Remote command:
`CONFigure:LTE:SIGN<i>:UEReport:RINTerval`

Measurement Gap Enable

Enables or disables transmission gaps that can be used by the UE for neighbor cell measurements.

Measurement gaps occur only if at least one neighbor cell measurement is active.

Option R&S CMW-KS510 is required for neighbor cell measurements.

Remote command:
`CONFigure:LTE:SIGN<i>:UEReport:MGENable`

Measurement Gap Period

Specifies the periodicity of transmission gaps. A measurement gap of 6 ms can occur every 40 ms or every 80 ms.

Remote command:
`CONFigure:LTE:SIGN<i>:UEReport:MGPeriod`

Filter Coefficient RSRP/RSRQ

Selects the filter coefficients used by the UE to measure the reference signal received power (RSRP) and the reference signal received quality (RSRQ).

The values are signaled to the UE via the information elements "filterCoefficientRSRP" and "filterCoefficientRSRQ". Do not confuse these elements with the "filterCoefficient" for uplink power control, see "UE Meas. Filter Coefficient" on page 177.

Remote command:
`CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRP`
`CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRQ`

WCDMA Measurement Quantity

Selects whether the UE must determine the RSCP or the Ec/No during WCDMA neighbor cell measurements. The setting is signaled to the UE.

Option R&S CMW-KS510 is required for neighbor cell measurements.

Remote command:
CONFigure:LTE:SIGN<i>:UEReport:WMQuantity

Measurement Cycle SCell
Specifies how often the UE must measure the SCC in state "RRC Added". The setting is signaled to the UE as "measCycleSCell". The measurement period is calculated from the configured value. For details, see 3GPP TS 36.133, section 8.3.3.2.

"Off" means that parameter "measCycleSCell" is not signaled to the UE.

The setting is only visible for carrier aggregation scenarios.

Remote command:
CONFigure:LTE:SIGN<i>:UEReport:MCSCell

2.4.16 Messaging (SMS) Parameters

The "Messaging (SMS)" section configures parameters of the short message service (SMS). Sending a short message to the UE is triggered via hotkey, see "Connection control hotkeys" on page 121.

Figure 2-96: SMS parameters

2.4.16.1 Outgoing SMS

This section configures outgoing mobile-terminating short messages.

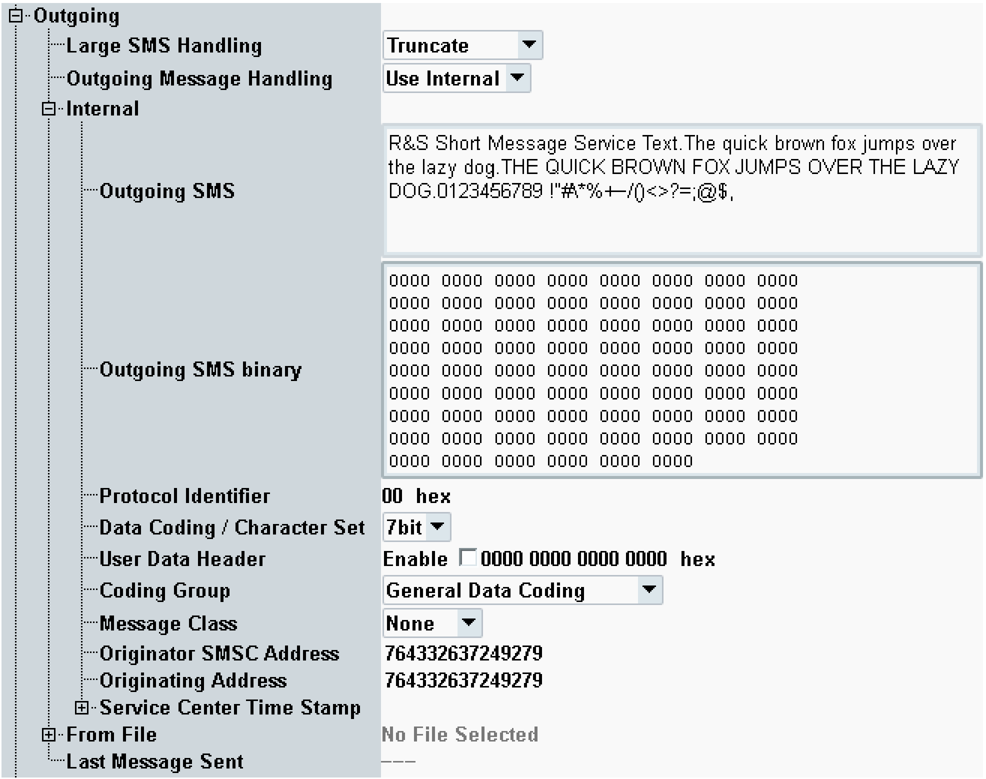


Figure 2-97: Outgoing SMS parameters

Large SMS Handling.....223
Outgoing Message Handling.....224
Outgoing SMS.....224
Outgoing SMS binary.....224
Protocol Identifier.....224
Data Coding / Character Set.....224
User Data Header.....224
Coding Group.....225
Message Class.....225
Originator SMSC Address.....225
Originating Address.....225
Service Center Time Stamp.....225
From File.....226
└ Select File.....226
└ Message Encoding, Message Text, Message Length.....226
Last Message Sent.....226

Large SMS Handling

Selects the handling of messages exceeding 160 characters.

"Truncate" The SMS is truncated to 160 characters, the rest is discarded.

"Multiple SMS" Up to five concatenated messages are sent, consisting in sum of up to 800 characters.

Remote command:
`CONFigure:LTE:SIGN<i>:SMS:OUTGoing:LHANdling`

Outgoing Message Handling
Selects whether the message text is defined via the GUI or read from a file.

"Use Internal" Use the message text configured via the GUI (Outgoing SMS or Outgoing SMS binary).

"From File" Read the text from the file selected via "From File" on page 226.

Remote command:
`CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MESHandling`

Outgoing SMS
Defines the message contents for outgoing 7-bit ASCII messages. Up to 800 characters are allowed.

This text is used for "Outgoing Message Handling" = "Use Internal" plus "Data Coding / Character Set" = "7bit".

Remote command:
`CONFigure:LTE:SIGN<i>:SMS:OUTGoing:INTernal`

Outgoing SMS binary
Defines the message contents for outgoing 8-bit binary messages. The contents are entered as hexadecimal numbers. Up to 1400 digits are allowed.

This text is used for "Outgoing Message Handling" = "Use Internal" plus "Data Coding / Character Set" = "8bit".

Remote command:
`CONFigure:LTE:SIGN<i>:SMS:OUTGoing:BINary`

Protocol Identifier
Specifies the TP protocol identifier (TP-PID) value to be sent. The meaning of the values is defined in 3GPP TS 23.040 chapter 9.2.3.9.

Remote command:
`CONFigure:LTE:SIGN<i>:SMS:OUTGoing:PIDentifier`

Data Coding / Character Set
Selects between the 7-bit ASCII message ("Outgoing SMS" on page 224) and the 8-bit binary message ("Outgoing SMS binary" on page 224).

Remote command:
`CONFigure:LTE:SIGN<i>:SMS:OUTGoing:DCODing`

User Data Header
To add a header to the TP user data field, enable the checkbox and configure the header via the hex value. The structure of the user data header is defined in 3GPP TS 23.040, section 9.2.3.24.

The hex value configures the following parts of the header:
- Information element identifier (IEI, one octet)
  Currently supported values: #H05, #H70 to #H7F

- Length of information element (IEIDL, one octet)
- Information element data (IED, 0 to n octets)

The signaling application sets the TP-UDHI automatically, according to the checkbox. With enabled checkbox, it sends the hex value to the UE and uses the correct number of fill bits in the header. It evaluates the IEIa and applies the correct message concatenation and header repetition.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:UDHeader

Coding Group
Selects the coding group to be indicated to the message recipient in the TP-Data-Coding-Scheme field. See also 3GPP TS 23.038.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:CGRoup

Message Class
Selects the message class to be indicated to the message recipient in the TP-Data-Coding-Scheme field. See also 3GPP TS 23.038.

"None" means that no message class is sent.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MCLass

Originator SMSC Address
Short message service center address, to be sent to the recipient.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OSADdress

Originating Address
Address of the originator of the SMS, to be sent to the recipient.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OADDress

Service Center Time Stamp

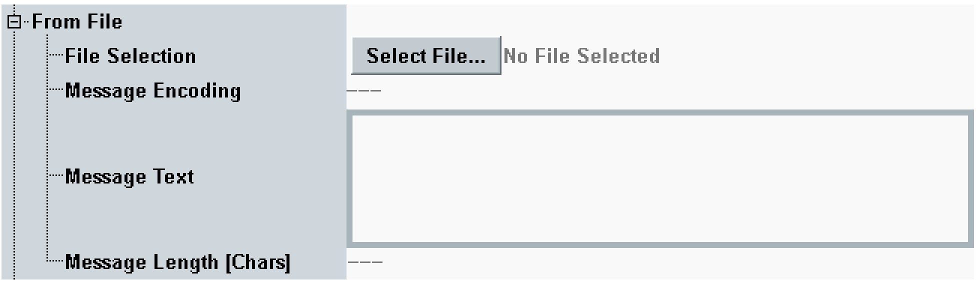
Service center time stamp, to be sent to the recipient.

You can configure the time stamp in two ways:
- Select the time source "CMW Time".
  The time stamp is set according to the current date and time of the operation system.
- Select the time source "Date / Time" and configure the time stamp value via the parameter "Date / Time".

Option R&S CMW-KS510 is required.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TSOurce
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:DATE
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TIME

From File



This node selects a file containing the message to be transmitted.

The file is used for Outgoing Message Handling = "From File".

Select File ← From File
Selects a file from the system drive folder
D:\Rohde-Schwarz\CMW\Data\SMS\LTE\Send or one of its subfolders. Store your message files there, using the file extension .sms.

The supported encodings are 7-bit ASCII, 8-bit binary and 16-bit unicode.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE

Message Encoding, Message Text, Message Length ← From File
Displays information about the message in the selected file.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE:INFO?

Last Message Sent
Indicates whether the last outgoing short message transfer was "Successful" or "Failed".

The displayed value is reset to the default value "---" whenever the cell is switched on and when a new transfer is initiated. A new session always starts with the default value.

Remote command:
SENSe:LTE:SIGN<i>:SMS:OUTGoing:INFO:LMSent?

2.4.16.2 Incoming SMS

This section displays information about incoming mobile-originating short messages.

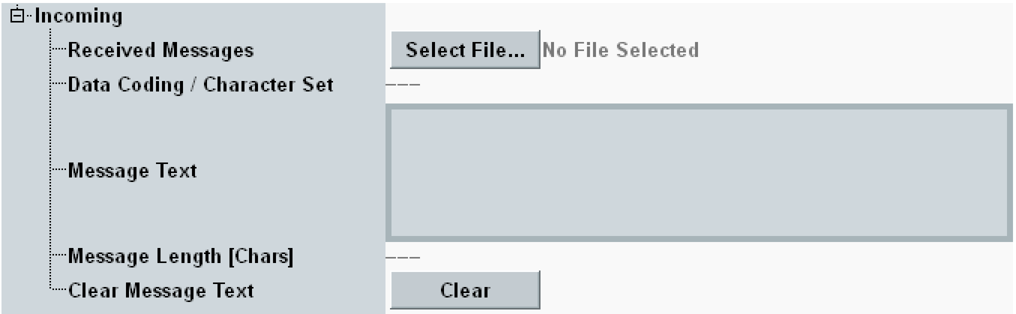


Figure 2-98: Incoming SMS parameters

Select File

Selects a file from the system drive folder D:\Rohde-Schwarz\CMW\Data\SMS\LTE\Received. Incoming messages are stored there with the file extension .sms.

Only messages received in the current session are available. The files are deleted during startup.

Remote command:
CONFigure:LTE:SIGN<i>:SMS:INComing:FILE
CONFigure:LTE:SIGN<i>:SMS:INComing:FILE:INFO?

Data Coding / Character Set

Indicates whether the last received message is a 7-bit ASCII message, an 8-bit binary message or a 16-bit unicode message.

Remote command:
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:DCODing?

Message Text / Message Length

Show the text and length of the last received SMS message.

Remote command:
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt?
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MLENgth?

Clear Message Text

The button resets all parameters related to a received message.

The message information is deleted. The "message read" flag is set to true.

Remote command:
SENSe:LTE:SIGN<i>:SMS:INFO:LRMessage:RFLag?
CLEan:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt

2.4.17 Messaging (CBS) Parameters

This section describes the cell broadcast service (CBS) settings.

The supported CBS messages can be divided into two categories:

- Commercial mobile alert system (CMAS) messages:
  Message types: presidential alert, extreme alert, severe alert and amber alert
  CMAS messages are transmitted via SIB 12.
  The term CMAS is used in 3GPP specifications. Other resources also use the newer name wireless emergency alerts (WEA).
- Earthquake and tsunami warning system (ETWS) messages:
  Message types: earthquake, tsunami, earthquake + tsunami
  ETWS messages are transmitted via SIB 10 and SIB 11.

Option R&S CMW-KS170 is required.

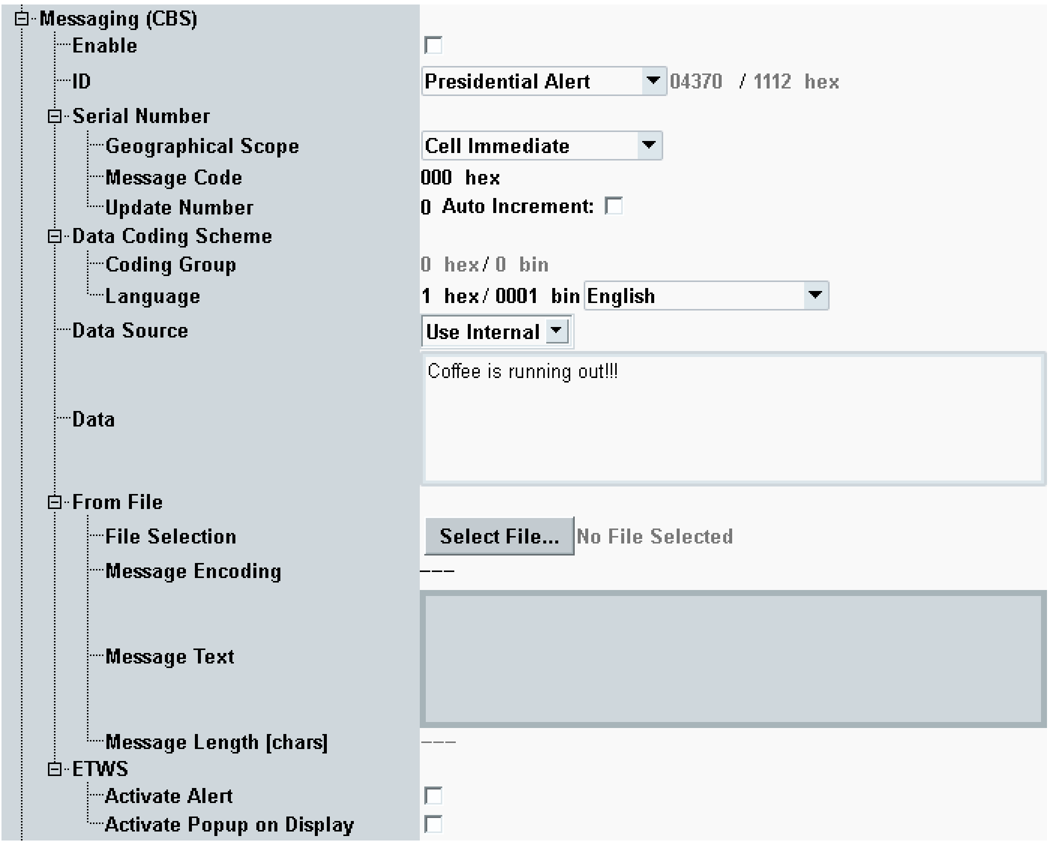


Figure 2-99: CBS settings

Enable....................229
ID....................229
Serial Number....................229
Data Coding Scheme....................229
Data Source....................229
Data....................230
From File....................230
└ Select File....................230
└ Message Encoding, Message Text, Message Length....................230
ETWS....................230

Enable

Enables the transmission of cell broadcast messages via system information messages.

Cell broadcast messages are transmitted if this checkbox is switched on and the cell is switched on.

Remote command:
`CONFigure:LTE:SIGN<i>:CBS:MESSage:ENABle`

ID

Select a message type. The resulting message ID is displayed for information as decimal and hexadecimal value.

The mapping between message type and message ID is defined in 3GPP TS 23.041, section 9.4.1.2.2.

For "User Defined...", you can enter a message ID.

Remote command:
`CONFigure:LTE:SIGN<i>:CBS:MESSage:ID`
`CONFigure:LTE:SIGN<i>:CBS:MESSage:IDTYpe`

Serial Number

Sets the serial number, see 3GPP TS 23.041, section 9.4.1.2.1.

The serial number identifies a specific cell broadcast message and consists of three parts:
- **Geographical scope**: message code validity area
- **Message code**: 10-bit number
- **Update number**: version of the message
  Enable "Auto Increment" to increase the number automatically when you change the message.

Remote command:
`CONFigure:LTE:SIGN<i>:CBS:MESSage:SERial`

Data Coding Scheme

Specifies the coding group and language of the message, see 3GPP TS 23.038, section 5.

The behavior depends on the configured data source:
- "Use Internal": "Coding Group" = 0, "Language" configurable
  You can select a language or enter its hexadecimal or binary code.
- "From File": "Coding Group" = 1, "Language" = 1 (UCS2)

Remote command:
`CONFigure:LTE:SIGN<i>:CBS:MESSage:CGRoup?`
`CONFigure:LTE:SIGN<i>:CBS:MESSage:LANGuage`

Data Source

Selects the source of the message text.

"Use Internal"	Configure the message via the parameter "Data" on page 230.
"From File"	Configure the message via the section "From File" on page 230.

Remote command:
CONFigure:LTE:SIGN<i>:CBS:MESSage:SOURce

Data
Defines the contents of a message for the data source "Use Internal".

Remote command:
CONFigure:LTE:SIGN<i>:CBS:MESSage:DATA

From File
Selects a file containing the message to be transmitted. The file is used if the configured data source equals "From File".

Select File... ← From File
Selects a file from the system drive folder
`D:\Rohde-Schwarz\CMW\Data\cbs\LTE\` or one of its subfolders. Store your message files there, using the file extension `.cbs`.

The current software version supports only 16-bit unicode (UTF16).

Remote command:
CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE

Message Encoding, Message Text, Message Length ← From File
Displays information about the message in the selected file.

Remote command:
CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE:INFO?

ETWS
Configures additional settings for the ETWS message types.

- "Activate Alert": The UE must activate an emergency user alert.
- "Activate Popup on Display": The UE must display a warning popup.

The related messages are defined in 3GPP TS 23.041, section 9.3.24.

Remote command:
CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:ALERt
CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:POPup

2.4.18 Shortcut Configuration

This section configures the three shortcut softkeys that provide a fast way to switch to selectable measurements.

See also Chapter 2.4.3, "Using the Shortcut Softkeys", on page 125

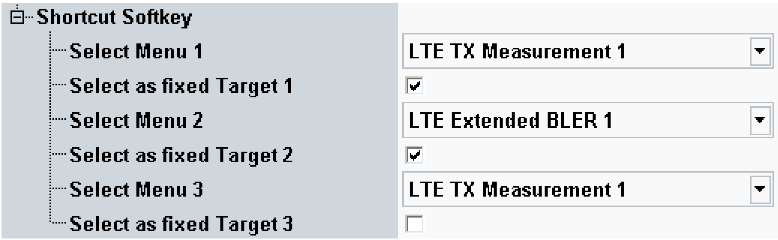


Figure 2-100: Shortcut configuration

Select Menu

Selects a measurement. The corresponding shortcut softkey opens a dialog presenting this measurement as default target or uses the measurement as fixed target.

Select as fixed Target

Configures and renames the corresponding shortcut softkey.

- **Enabled**: The softkey directly opens the measurement selected via Select Menu.
- **Disabled**: The softkey opens a dialog box for selection of the target measurement.

2.4.19 Message Monitoring Settings

Messages exchanged between the LTE signaling application and the UE can be monitored. For this purpose, the messages are sent to an external PC.

See also: "Logging" in the R&S CMW base unit manual, chapter "Basic Instrument Functions"

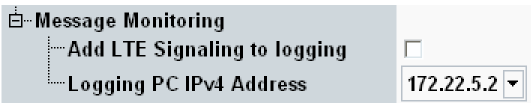


Figure 2-101: Message monitoring settings

Add LTE Signaling to logging

Enables or disables message monitoring for the LTE signaling application.

Remote command:

`CONFigure:LTE:SIGN<i>:MMONitor:ENABle`

Logging PC IPv4 Address

Selects the IP address to which the messages are sent for monitoring.

The address pool is configured globally, see "Setup" dialog, section "Logging".

Remote command:

`CONFigure:LTE:SIGN<i>:MMONitor:IPADdress`

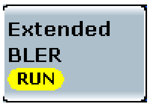
2.4.20 BLER Measurement Configuration

The "Extended BLER" measurement is included in the "LTE signaling" application. To access the measurement, press the softkey "LTE RX Meas" in the LTE signaling main view. Then select the tab "Extended BLER". The views and configuration dialogs of the tab are described in this section.

2.4.20.1 Measurement Control

To turn the measurement on or off, select the control softkey and press ON | OFF or RESTART | STOP. Alternatively, right-click the control softkey.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "System Overview"



Extended BLER (Softkey)
The softkey shows the current measurement state. Additional measurement substates can be retrieved via remote control.

Remote command:

```
INITiate:LTE:SIGN<i>:EBLer
STOP:LTE:SIGN<i>:EBLer
ABORt:LTE:SIGN<i>:EBLer
FETCh:LTE:SIGN<i>:EBLer:STATe?
FETCh:LTE:SIGN<i>:EBLer:STATe:ALL?
```

2.4.20.2 Measurement Views

The measurement provides BLER, throughput, HARQ and reported CQI results in several views. The BLER view shows also common settings of the "LTE signaling" application. Additional settings of the "LTE signaling" application can be accessed via the "Signaling Parameters" softkey and the related hotkeys.

To switch to the signaling application, press the "LTE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is active.

The following figure shows the result overview, providing access to the individual detailed result views.

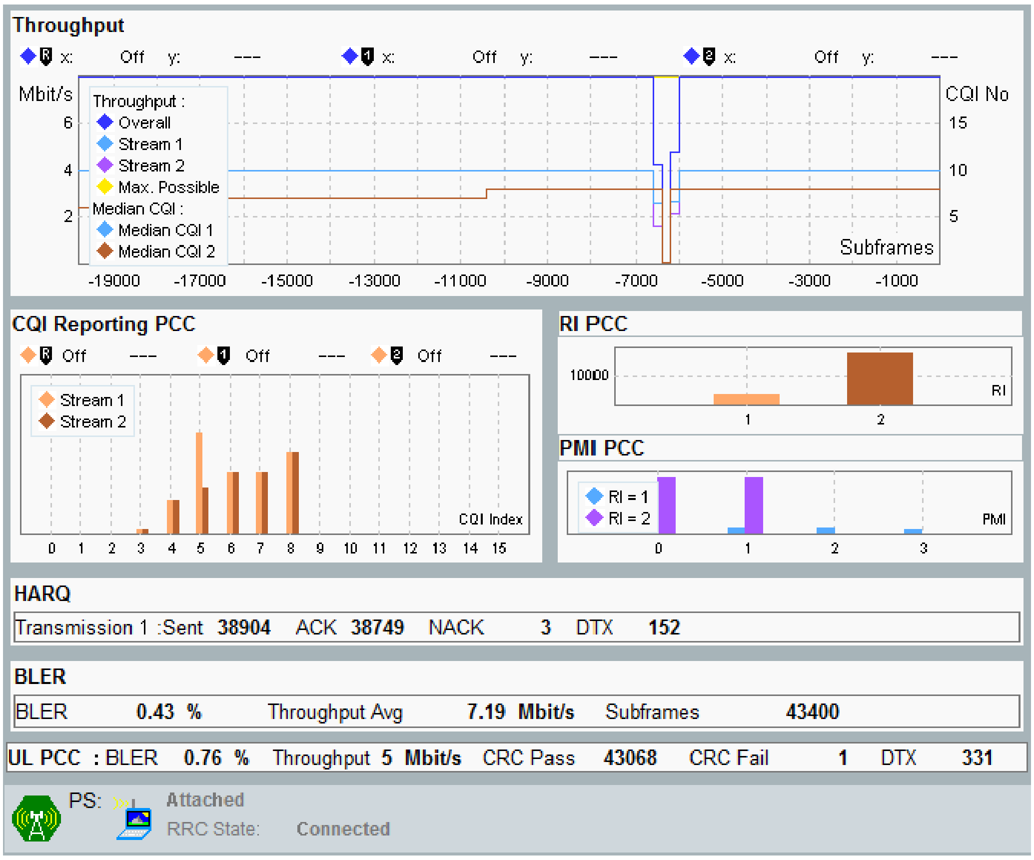


Figure 2-102: Extended BLER result overview

Results

For a detailed description of the individual views and results, see Chapter 2.2.20, "Extended BLER Measurement", on page 74.

For result retrieval commands, see Chapter 2.6.20.3, "Measurement Results", on page 590.

2.4.20.3 Settings

The "Extended BLER" parameters configure the scope of the measurement.

If you want to insert block errors into the downlink signal, see "Downlink MAC Error Insertion" on page 180.

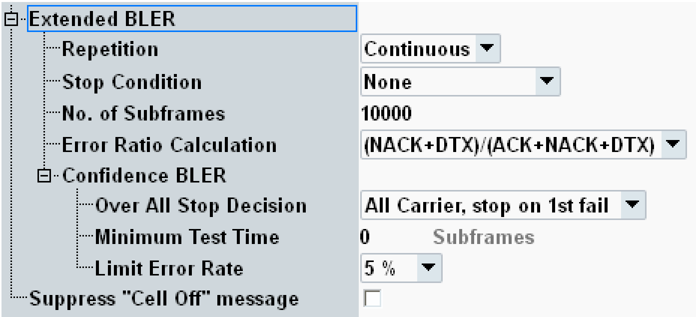


Figure 2-103: Extended BLER settings

Repetition....................234
Stop Condition....................234
No. of Subframes....................235
Error Ratio Calculation....................235
Confidence BLER....................235
└ Over All Stop Decision....................235
└ Minimum Test Time....................236
└ Limit Error Rate....................236
Suppress "Cell Off" Message....................236

Repetition

Defines how often the measurement is repeated.

"Continuous" The measurement is continued until it is explicitly terminated. The results are periodically updated.

"Single-Shot" The measurement stops automatically, depending on the configured "Stop Condition" either when the configured "No. of Subframes" has been processed or when a confidence BLER measurement result is available.

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:REPetition`

Stop Condition

Selects whether a BLER measurement without stop condition or a confidence BLER measurement with early decision concept is performed.

"None" The measurement is performed according to its "Repetition" mode and the specified "No. of Subframes". No confidence BLER result is determined.

"Confidence Level" A confidence BLER measurement is performed. The measurement stops when the configured "Minimum Test Time" has passed and a pass/fail decision has been made, so that a confidence BLER result (e.g. "Early Pass") is available. The "Repetition" is automatically set to "Single-Shot".
Option R&S CMW-KS510/-KS512 (without CA/with CA) is required.

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:SCONdition`

No. of Subframes
For measurements without stop condition, this parameter defines the number of subframes to be processed per measurement cycle (a single-shot measurement covers one measurement cycle).

For confidence BLER measurements, this parameter specifies only the length of the throughput result trace. It does not influence the duration of the measurement.

For FDD, all scheduled and unscheduled downlink subframes are considered. For TDD, all downlink, uplink and special subframes are considered.

A scheduled downlink subframe that is sent via several downlink streams in parallel is counted as one subframe.

For examples, see Chapter 2.2.20.8, "Common View Elements", on page 85.

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:SFRames`

Error Ratio Calculation
Selects the formula to be used for calculation of the BLER from the number of ACK, NACK and DTX. PDSCH decoding errors result in NACK while PDCCH decoding errors result in DTX.

3GPP TS 36.521 specifies which formula must be used for a certain performance test or CQI test.

The following formulae are available:
- *BLER = (NACK + DTX) / (ACK + NACK + DTX)*
- *BLER = DTX / (ACK + NACK + DTX)*
- *BLER = NACK / (ACK + NACK + DTX)*
- *BLER = NACK / (ACK + NACK)*

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:ERCalc`

Confidence BLER
The following parameters configure parameters only relevant for confidence BLER measurements.

Over All Stop Decision ← Confidence BLER
This setting configures the stop decision and the overall confidence BLER result calculation for measurements with carrier aggregation.

Depending on the selection, the measurement stops when the following condition is fulfilled:
- "PCC only": A result is available for the PCC.
- "SCC<n> only": A result is available for SCC number <n>.
- "All Carrier, stop on 1st fail": Results are available for all component carriers or at least one result equals "Fail" or "Early Fail".
- "All Carrier, wait for all CCs": Results are available for all component carriers.

Depending on the selection, the overall confidence BLER result is calculated as follows:
- "PCC only": Overall result = PCC result
- "SCC<n> only": Overall result = SCC<n> result
- "All Carrier, ...":

- If at least one result = "Early Fail": Overall result = "Early Fail"
- Else, if at least one result = "Fail": Overall result = "Fail"
- Else, if all results = "Early Pass": Overall result = "Early Pass"
- Else: Overall result = "Pass"

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:CONFidence:OASCondition`

Minimum Test Time ← Confidence BLER
Specifies the minimum test time of a confidence BLER measurement as number of processed subframes. During this time, no pass/fail decision is allowed.

Minimum test times are for example specified in 3GPP TS 36.521 annex G.4. They are necessary if the test conditions introduce fluctuations disturbing the statistical independence of the single bit error events (e.g. multipath fading). A minimum test time ensures that the fluctuations are averaged out.

For FDD, all scheduled and unscheduled downlink subframes are considered. For TDD, all downlink, uplink and special subframes are considered.

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:CONFidence:MTTime`

Limit Error Rate ← Confidence BLER
Selects the limit error ratio for a confidence BLER measurement. The selection determines for example the used pass/fail decision rules.

The minimum test time and the error ratio calculation formula are independent of this selection, so configure also these parameters as desired.

"0.1%, 1%"	Pass/fail decision according to 3GPP TS 36.521 annex G.4
"5%"	Pass/fail decision according to 3GPP TS 36.521 annex G.2

Remote command:
`CONFigure:LTE:SIGN<i>:EBLer:CONFidence:LERate`

Suppress "Cell Off" Message
If you press ON | OFF while the "LTE Signaling" softkey is selected and the cell signal is on, a warning can be displayed. It asks you whether you really want to switch off the cell signal.

The checkbox enables/disables the warning.

Remote command:
n/a

2.4.21 RLC Throughput Measurement Configuration

The "Extended BLER" measurement is included in the "LTE signaling" application. To access the measurement, press the softkey "LTE RX Meas" in the LTE signaling main view. Then select the tab "RLC Throughput". The tab is described in this section.

2.4.21.1 Measurement Control

To turn the measurement on or off, select the control softkey and press ON | OFF or RESTART | STOP. Alternatively, right-click the control softkey.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "System Overview"

RLC Throughput (Softkey)
The softkey shows the current measurement state. Additional measurement substates can be retrieved via remote control.

Remote command:
`INITiate:LTE:SIGN<i>:THRoughput`
`STOP:LTE:SIGN<i>:THRoughput`
`ABORt:LTE:SIGN<i>:THRoughput`
`FETCh:LTE:SIGN<i>:THRoughput:STATe?`
`FETCh:LTE:SIGN<i>:THRoughput:STATe:ALL?`

2.4.21.2 RLC Throughput Tab

The tab shows the measurement results in a diagram and a table. The connection status information displayed at the bottom is the same as in the LTE signaling main view.

The most important settings of the "LTE signaling" application can be accessed via the "Signaling Parameters" softkey and the related hotkeys.

To switch to the signaling application, press the "LTE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is active.

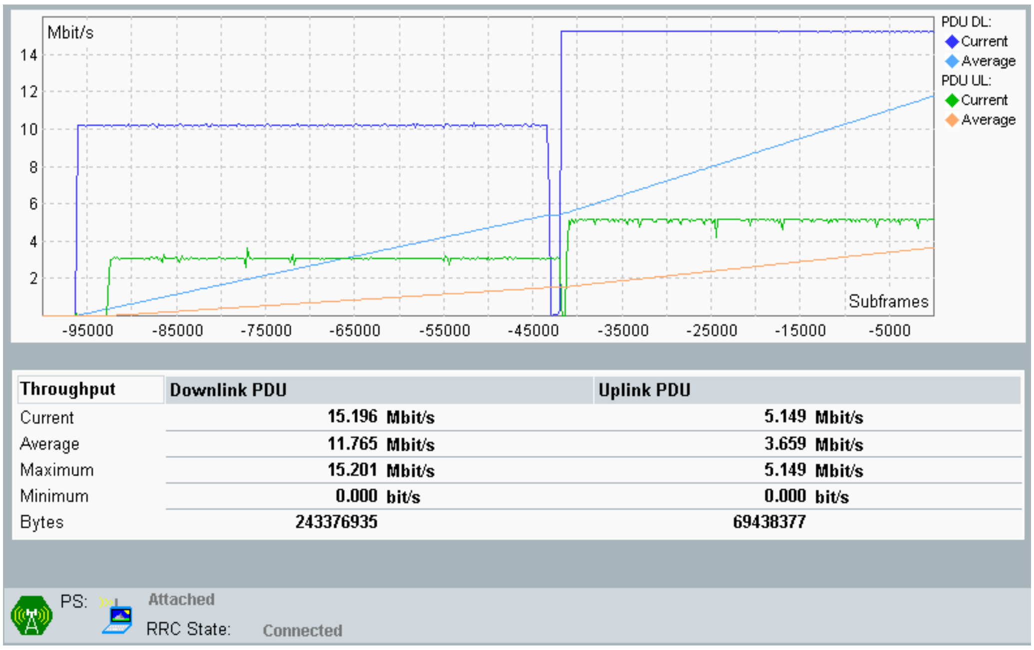


Figure 2-104: RLC throughput tab

Results

For a detailed description of the results, see Chapter 2.2.21.2, "Measurement Results", on page 86.

Remote command:

`FETCh:LTE:SIGN<i>:THRoughput?` etc.

`FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?` etc.

`FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?` etc.

2.4.21.3 Settings

The "RLC Throughput" parameters configure the scope of the measurement.

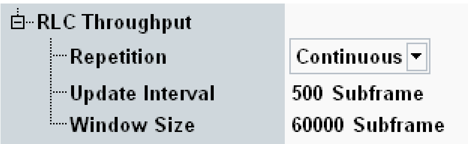


Figure 2-105: RLC throughput settings

Repetition....................238
Update Interval....................239
Window Size....................239

Repetition

Defines how often the measurement is repeated.

"Continuous" The measurement is continued until it is explicitly terminated. The results are periodically updated.

"Single-Shot" The measurement stops automatically when the configured "Window Size" has been processed.

Remote command:
`CONFigure:LTE:SIGN<i>:THRoughput:REPetition`

Update Interval
Number of subframes used to derive a single throughput result (multiple of 100 subframes).

Remote command:
`CONFigure:LTE:SIGN<i>:THRoughput:UPDate`

Window Size
Number of subframes on the X-axis of the throughput diagram.

The number of results in the diagram equals the window size divided by the update interval rounded down to the next integer value, plus one:

Number of results = integer (<Window Size> / <Update Interval>) + 1

The window size cannot be smaller than the update interval.

Remote command:
`CONFigure:LTE:SIGN<i>:THRoughput:WINDow`

2.4.22 Annex: UE Capabilities

This section describes the UE capability information displayed in the main view, if the UE capabilities area is maximized. See also Chapter 2.4.1.4, "UE Capabilities", on page 113.

All capability information is transmitted by the UE in the information element *UE-EUTRA-Capability* described in 3GPP TS 36.331.

For some parameters described in the following sections, three remote control commands are listed:

- First command:
  Queries the parameter in the upper part of the capability report. Features indicated as "supported" are supported for FDD and TDD.
- Command with additional `:FAUeeutra:` mnemonic:
  Queries the parameter in section "fdd Add UE-EUTRA Capabilities". Features indicated as "supported" are supported only for FDD, not for TDD.
- Command with additional `:TAUeeutra:` mnemonic:
  Queries the parameter in section "tdd Add UE-EUTRA Capabilities". Features indicated as "supported" are supported only for TDD, not for FDD.

2.4.22.1 General UE Capability Information

At the highest level, the report lists the following information.

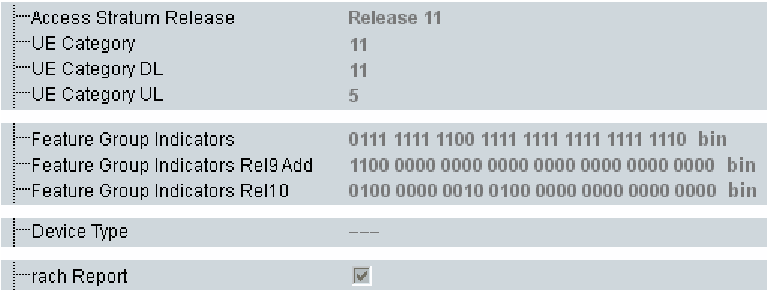


Figure 2-106: General UE capability information

Access Stratum Release....................240
UE Category....................240
Feature Group Indicators....................240
Feature Group Indicators Rel9 Add....................240
Feature Group Indicators Rel 10....................241
Device Type....................241
rach Report....................241

Access Stratum Release

Supported release of the E-UTRA layer one, two and three specifications.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:ASRelease?

UE Category

UE categories of the UE, defining several transport channel and physical channel parameters, for UL and DL (for details, see 3GPP TS 36.306).

Remote command:
SENSe:LTE:SIGN<i>:UECapability:UECategory?
SENSe:LTE:SIGN<i>:UECapability:UECategory:DL?
SENSe:LTE:SIGN<i>:UECapability:UECategory:UL?

Feature Group Indicators

32-bit value, containing one bit per feature group ("1" = supported, "0" = not supported).

The features assigned to the individual bits are listed in the annex of 3GPP TS 36.331, table B.1-1.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:FGINdicators?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators?

Feature Group Indicators Rel9 Add

32-bit value, containing one bit per feature group ("1" = supported, "0" = not supported).

The features assigned to the individual bits are listed in the annex of 3GPP TS 36.331, table B.1-1a.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RNADd?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RNADd?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RNADd?

Feature Group Indicators Rel 10
32-bit value, containing one bit per feature group ("1" = supported, "0" = not supported).

The features assigned to the individual bits are listed in the annex of 3GPP TS 36.331, table C.1-1.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RTEN?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RTEN?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RTEN?

Device Type
Indicates whether the UE benefits from NW-based battery consumption optimization:
- "noBenFromBatConsumpOpt" means that the UE does not benefit from the optimization.
- An empty field means that the UE does benefit from the optimization.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:DTYPe?

rach Report
Support of RACH report delivery.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:RREPort?

2.4.22.2 PDCP UE Capabilities

The following UE capability information indicates in which way the UE supports the packet data convergence protocol (PDCP) described in 3GPP TS 36.323.

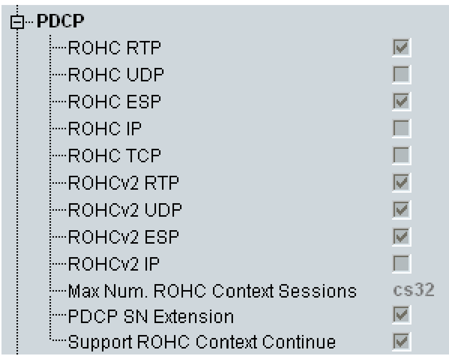


Figure 2-107: PDCP UE capabilities

ROHC RTP to ROHCv2 IP....242
Max Num ROHC Context Sessions....242
PDCP SN Extension....242
Support ROHC Context Continue....242

ROHC RTP to ROHCv2 IP

Support of the robust header compression profiles with the profile identifiers 0x0001 to 0x0004, 0x0006, 0x0101 to 0x0104.

Remote command:

`SENSe:LTE:SIGN<i>:UECapability:PDCP:SRPRofiles?`

Max Num ROHC Context Sessions

Maximum number of header compression context sessions supported by the UE.

Remote command:

`SENSe:LTE:SIGN<i>:UECapability:PDCP:MRCSessions?`

PDCP SN Extension

Support of 15-bit PDCP sequence numbers.

Remote command:

`SENSe:LTE:SIGN<i>:UECapability:PDCP:SNEXtension?`

Support ROHC Context Continue

Support of ROHC context continuation during handover.

Remote command:

`SENSe:LTE:SIGN<i>:UECapability:PDCP:SRCContinue?`

2.4.22.3 Physical Layer UE Capabilities, Part 1

This section indicates physical layer capabilities of the UE.

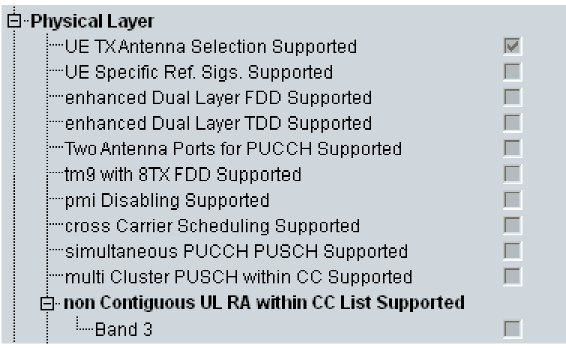


Figure 2-108: Physical layer UE capabilities

UE TX Antenna Selection Supported....243
UE-Specific Ref. Sigs. Supported....243
enhanced Dual layer FDD/TDD Supported....243
Two Antenna Ports for PUCCH Supported....243
tm9 with 8TX FDD Supported....243
pmi Disabling Supported....243

cross Carrier Scheduling Supported.. 244
simultaneous PUCCH PUSCH Supported.. 244
multi Cluster PUSCH within CC Supported...244
non Contiguous UL RA within CC List Supported..244

UE TX Antenna Selection Supported

Support of transmit antenna selection, see 3GPP TS 36.213.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:UTASupported?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:UTASupported?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:UTASupported?

UE-Specific Ref. Sigs. Supported

Support of PDSCH TM 7 for FDD.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:USRSsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:USRSsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:USRSsupport?

enhanced Dual layer FDD/TDD Supported

Support of enhanced dual layer (PDSCH TM 8) for FDD/TDD.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLFsupport?
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLTsupport?

Two Antenna Ports for PUCCH Supported

Support of transmit diversity for PUCCH formats 1/1a/1b/2/2a/2b and support of PUCCH format 3 / transmit diversity for PUCCH format 3.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TAPPsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TAPPsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TAPPsupport?

tm9 with 8TX FDD Supported

Support of PDSCH TM 9 with 8 CSI-RS ports for FDD.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TWEFsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TWEFsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TWEFsupport?

pmi Disabling Supported

Support of PMI disabling.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PDSupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:PDSupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:PDSupport?

cross Carrier Scheduling Supported
Support of cross-carrier scheduling for CA.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CCSSupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:CCSSupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:CCSSupport?

simultaneous PUCCH PUSCH Supported
UE baseband supports simultaneous transmission of PUCCH and PUSCH and is band agnostic.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:SPPSupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:SPPSupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:SPPSupport?

multi Cluster PUSCH within CC Supported
UE baseband supports multi-cluster PUSCH transmission within a component carrier (CC), and is band agnostic.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:MCPCsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:MCPCsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:MCPCsupport?

non Contiguous UL RA within CC List Supported
For each supported E-UTRA band: UE RF supports non-contiguous UL resource allocations within a CC.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:NURClist?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:NURClist?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:NURClist?

2.4.22.4 Physical Layer UE Capabilities, Part 2

This section indicates physical layer capabilities of the UE.

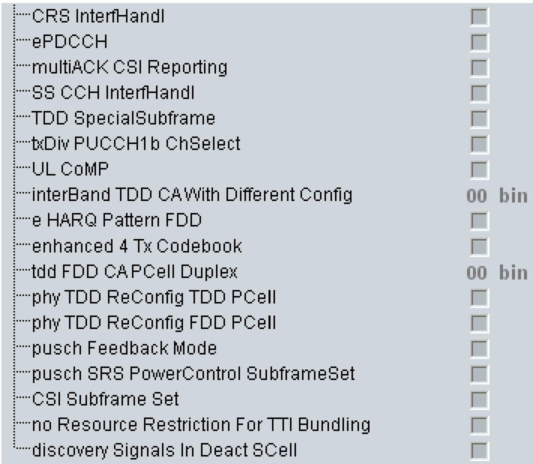


Figure 2-109: Physical layer UE capabilities

CRS InterfHandl......245
ePDCCH......245
multiACK CSI Reporting......245
SS CCH InterfHandl......246
TDD SpecialSubframe......246
txDiv PUCCH1b ChSelect......246
UL CoMP......246
interBand TDD CA With Different Config......246
e HARQ Pattern FDD......246
enhanced 4 Tx Codebook......246
tdd FDD CA PCell Duplex......246
phy TDD ReConfig TDD PCell......246
phy TDD ReConfig FDD PCell......247
pusch Feedback Mode......247
pusch SRS PowerControl SubframeSet......247
CSI Subframe Set......247
no Resource Restriction For TTI Bundling......247
discovery Signals In Deact SCell......247

CRS InterfHandl

Support of CRS interference handling.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:CIHandl?`

ePDCCH

Support of DCI reception via UE-specific search space on enhanced PDCCH.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:EPDCch?`

multiACK CSI Reporting

Support of multi-cell HARQ ACK, periodic CSI reporting and SR on PUCCH format 3.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:MACReporting?`

SS CCH InterfHandl
Support of synchronization signal and common channel interference handling.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:SCIHandl?`

TDD SpecialSubframe
Support of TDD special subframe as defined in 3GPP TS 36.211.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:TSSubframe?`

txDiv PUCCH1b ChSelect
Support of transmit diversity for PUCCH format 1b with channel selection.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:TDPChselect?`

UL CoMP
Support of UL coordinated multi-point operation.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:ULComp?`

interBand TDD CA With Different Config
Support of inter-band TDD CA with different UL/DL configuration combinations.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:ITCWithdiff?`

e HARQ Pattern FDD
Support of enhanced HARQ pattern for TTI bundling operation for FDD.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:EHPFdd?`

enhanced 4 Tx Codebook
Support of enhanced 4 TX codebook.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:EFTCodebook?`

tdd FDD CA PCell Duplex
Support of PCell in any supported band combination including at least one FDD band and at least one TDD band.

First bit: support of TDD PCell. Second bit: support of FDD PCell.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PLAYer:TFCPcelldplx?`

phy TDD ReConfig TDD PCell
Support of TDD UL/DL reconfiguration for TDD serving cell via monitoring PDCCH on a TDD PCell.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCTddpcell?

phy TDD ReConfig FDD PCell
Support of TDD UL/DL reconfiguration for TDD serving cell via monitoring PDCCH on an FDD PCell.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCFddpcell?

pusch Feedback Mode
Support of PUSCH feedback mode 3-2.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PFMode?

pusch SRS PowerControl SubframeSet
Support of subframe set dependent UL power control for PUSCH and SRS.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PSPSfset?

CSI Subframe Set
Support of R12 DL CSI subframe set configuration.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CSFSet?

no Resource Restriction For TTI Bundling
Support of TTI bundling without resource allocation restriction.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:NRRT?

discovery Signals In Deact SCell
Support of discovery signal detection for deactivated SCells.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:PLAYer:DSDCell?

2.4.22.5 RF UE Capabilities

This section indicates the supported E-UTRA operating bands and other RF capabilities.

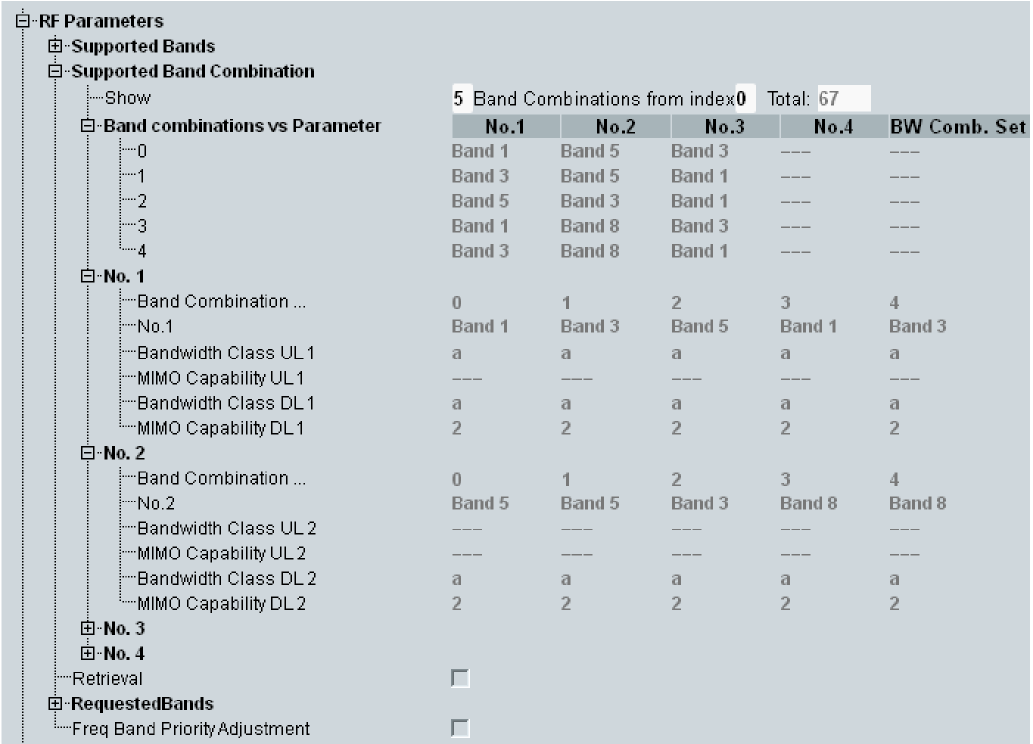


Figure 2-110: RF UE capabilities

Supported Bands.. 248
Supported Band Combination.. 248
Retrieval.. 249
Requested Bands.. 249
Freq Band Priority Adjustment.. 249

Supported Bands

The UE supports all listed operating bands.

Column "Half Duplex" indicates whether the UE supports only half duplex operation for the band.

Remote command:

`SENSe:LTE:SIGN<i>:UECapability:RF:SUPPorted?`

`SENSe:LTE:SIGN<i>:UECapability:RF:HDUPlex?`

Supported Band Combination

This section lists the band combinations supported by the UE for carrier aggregation. The band combinations are numbered from 0 to n.

The row "Show" selects which of the supported combinations are displayed. You can select the total number of shown combinations and the first shown combination. In the figure, five combinations are shown, starting with combination number 0. In total, the UE has reported 67 supported combinations.

The table "Band combinations vs Parameter" contains one row per band combination. The columns indicate the bands. Column "BW Comb. Set" indicates which bandwidth combination sets are supported for a band combination. The leftmost bit corresponds to set 0, the next bit to set 1, and so on. "0" means that the set is not supported. "1" means that the set is supported. The sets are specified in 3GPP TS 36.101, section 5.6A.1.

The lower tables contain one column per band combination. The rows indicate the following information for each band:

- Number of the band combination
- Band number
- Supported bandwidth classes for UL and DL
  The bandwidth classes are defined in 3GPP TS 36.101, section 5.6A.
- MIMO capability for each supported bandwidth class, UL and DL
  Indicates the number of supported layers for spatial multiplexing
  Example: bandwidth class = "abc", MIMO capability = "244" means 2 layers for class a, 4 layers for class b and c

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:BCSet?`
`SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>?`
`SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:UL?`
`SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:DL?`
`SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:UL?`
`SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:DL?`

Retrieval
Indicates whether the UE supports the reception of "requestedFrequencyBands".

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:RF:FBRetrieval?`

Requested Bands
Lists all frequency bands requested by E-UTRAN.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:RF:RBANds?`

Freq Band Priority Adjustment
Support of prioritization of frequency bands as requested by "freqBandIndicatorPriority-r12".

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:RF:FBPadjust?`

2.4.22.6 Measurement UE Capabilities

This section indicates the UE capabilities for channel measurements, for example on other operating bands or on other radio access technologies (RAT).

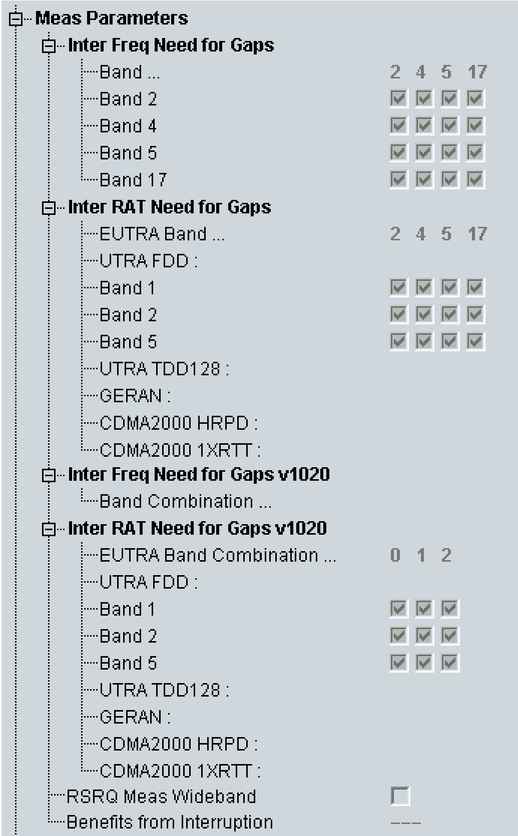


Figure 2-111: Measurement UE capabilities

Inter-Freq Need for Gaps....250
Inter-RAT Need for Gaps....251
Inter-Freq Need for Gaps v1020....251
Inter-RAT Need for Gaps v1020....251
RSRQ Meas Wideband....251
Benefits from Interruption....251

Inter-Freq Need for Gaps

Indicates the need for downlink measurement gaps when using a certain E-UTRA band and measuring a certain E-UTRA band. Each column corresponds to a specific used E-UTRA band, each row to a specific measured E-UTRA band.

Remote command:

`SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps?`

Inter-RAT Need for Gaps
Indicates the need for downlink measurement gaps when using a certain E-UTRA band and measuring on a supported band of another RAT. Each column corresponds to a specific used E-UTRA band, each row to a specific measured band of another RAT.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UFDD?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UTDD<n>?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:GERan?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CHRPd?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CXRTt?

Inter-Freq Need for Gaps v1020
Indicates the need for downlink measurement gaps when using a certain E-UTRA band combination for carrier aggregation and measuring a certain E-UTRA band. Each column corresponds to a specific used band combination, each row to a specific measured E-UTRA band.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps:V<number>?

Inter-RAT Need for Gaps v1020
Indicates the need for downlink measurement gaps when using a certain E-UTRA band combination for carrier aggregation and measuring on a supported band of another RAT. Each column corresponds to a specific used band combination, each row to a specific measured band of another RAT.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UFDD?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UTDD<n>?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:GERan?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CHRPd?
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CXRTt?

RSRQ Meas Wideband
Support of RSRQ measurements with wider bandwidth.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MEAS:RMWideband?

Benefits from Interruption
Indicates whether the UE power consumption can be reduced by allowing the UE to cause interruptions to serving cells. The information applies to measurements of deactivated SCell carriers for measurement cycles of less than 640 ms, as specified in 3GPP TS 36.133.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MEAS:BFINterrupt?

2.4.22.7 Inter-RAT UE Capabilities

This section indicates the inter-RAT handover capabilities of the UE.

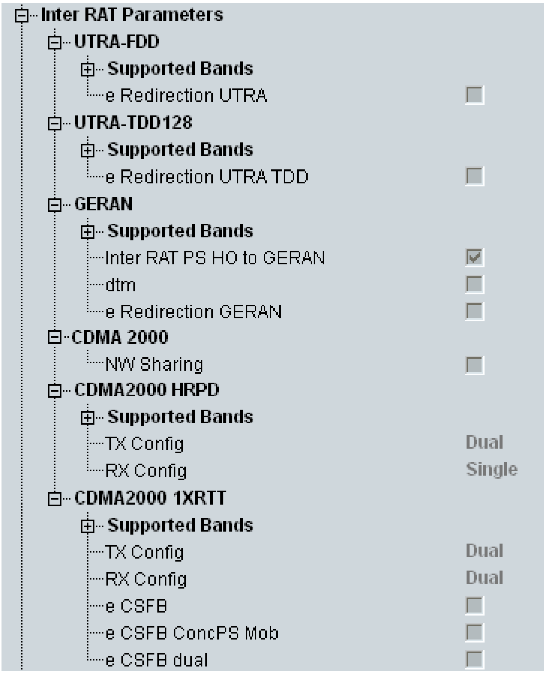


Figure 2-112: Inter-RAT handover UE capabilities

UTRA-FDD....253
└ Supported Bands....253
└ e Redirection UTRA....253
UTRA-TDD128....253
└ Supported Bands....253
└ e Redirection UTRA TDD....253
GERAN....253
└ Supported Bands....253
└ Inter-RAT PS HO to GERAN....253
└ dtm....254
└ e Redirection GERAN....254
CDMA2000 NW Sharing....254
CDMA2000 HRPD....254
└ Supported Bands....254
└ TX Config....254
└ RX Config....254
CDMA2000 1xRTT....254
└ Supported Bands....254
└ TX Config....255
└ RX Config....255
└ e CSFB....255
└ e CSFB ConcPS Mob....255
└ e CSFB dual....255

UTRA-FDD
This node contains capability information for handover to UTRA FDD.

Supported Bands ← UTRA-FDD
Lists the supported UTRA FDD operating bands. A handover to these bands is supported by the UE.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:SUPPorted?

e Redirection UTRA ← UTRA-FDD
Support of enhanced redirection to UTRA FDD, using system information provided upon redirection.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:EREDirection:UTRA?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTRA?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTRA?

UTRA-TDD128
This node contains capability information for handover to UTRA TDD with a chip rate of 1.28 Mcps.

Supported Bands ← UTRA-TDD128
Lists the supported UTRA TDD operating bands. A handover to these bands is supported by the UE.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:SUPPorted?

e Redirection UTRA TDD ← UTRA-TDD128
Support of enhanced redirection to UTRA TDD, using system information provided upon redirection.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:EREDirection:UTDD?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTDD?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTDD?

GERAN
This node contains capability information for handover to GERAN.

Supported Bands ← GERAN
Lists the supported GERAN operating bands.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:SUPPorted?

Inter-RAT PS HO to GERAN ← GERAN
Support of a handover to GERAN.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:PHGeran?

dtm ← GERAN
Support of the dual transfer mode (DTM) in GERAN.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:DTM?

e Redirection GERAN ← GERAN
Support of an enhanced redirection to GERAN, using system information provided upon redirection.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:EREDirection?

CDMA2000 NW Sharing
Support of network sharing for CDMA2000.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CDMA2000:NWSHaring?

CDMA2000 HRPD
This node contains capability information for handover to CDMA2000 HRPD.

Supported Bands ← CDMA2000 HRPD
Lists the supported HRPD band classes.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:SUPPorted?

TX Config ← CDMA2000 HRPD
Support of single/dual transmitter. Dual transmitter allows the UE to transmit simultaneously on E-UTRAN and HRPD.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:TCONfig?

RX Config ← CDMA2000 HRPD
Support of single/dual receiver. Dual receiver allows the UE to receive simultaneously on E-UTRAN and HRPD.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:RCONfig?

CDMA2000 1xRTT
This node contains capability information for handover to CDMA2000 1xRTT.

Supported Bands ← CDMA2000 1xRTT
Lists the supported 1xRTT band classes.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:SUPPorted?

TX Config ← CDMA2000 1xRTT
Support of single/dual transmitter. Dual transmitter allows the UE to transmit simultaneously on E-UTRAN and 1xRTT.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:TCONfig?

RX Config ← CDMA2000 1xRTT
Support of single/dual receiver. Dual receiver allows the UE to receive simultaneously on E-UTRAN and 1xRTT.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:RCONfig?

e CSFB ← CDMA2000 1xRTT
Support of enhanced CS fallback to CDMA2000 1xRTT.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECSFb?

e CSFB ConcPS Mob ← CDMA2000 1xRTT
Support of concurrent enhanced CS fallback to CDMA2000 1xRTT and handover/redirection to CDMA2000 HRPD.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECCMob?

e CSFB dual ← CDMA2000 1xRTT
Support of enhanced CS fallback to CDMA2000 1xRTT for dual Rx/Tx configuration.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECDual?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECDual?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECDual?

2.4.22.8 Other UE Capabilities

This section indicates the UE capabilities categorized by 3GPP as "other parameters".

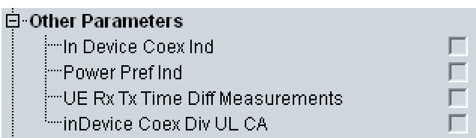


Figure 2-113: Other capabilities

In Device Coex Ind
Support of in-device coexistence indication and autonomous denial functionality.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:IDCindex?`

Power Pref Ind
Support of power preference indication.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:PPINdex?`

UE Rx Tx Time Diff Measurements
Support of RX-TX time difference measurements.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:URTTimediff?`

In Device Coex Div UL CA
Support of in-device coexistence indication for UL CA.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:DCIulca?`

2.4.22.9 MBMS UE Capabilities

This section indicates the UE capabilities for MBMS reception.

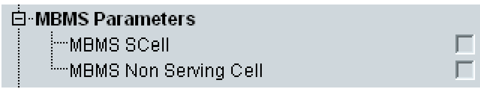


Figure 2-114: MBMS capabilities

MBMS SCell
Support of MBMS reception via an SCell.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:MBMS:SCELl?`

MBMS Non Serving Cell
Support of MBMS reception via a serving cell to be added.

Remote command:
`SENSe:LTE:SIGN<i>:UECapability:MBMS:NSCell?`

2.4.22.10 CSG Proximity Indication UE Capabilities

This section indicates the support of proximity indications by the UE.

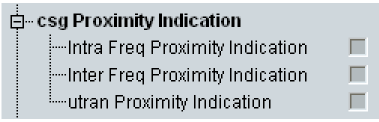


Figure 2-115: Proximity indication capabilities

Intra Freq Proximity Indication
Support of proximity indications for intra-frequency E-UTRAN CSG member cells.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTRa?

Inter Freq Proximity Indication
Support of proximity indications for inter-frequency E-UTRAN CSG member cells.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTer?

utran Proximity Indication
Support of proximity indications for UTRAN CSG member cells.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:CPINdication:UTRan?

2.4.22.11 Neighbor Cell SI-Acquisition UE Capabilities

This section indicates whether the UE supports system information requests for handover. When the UE receives such a request, it must use autonomous gaps to read and report the system information of neighbor cells.

Figure 2-116: SI-Acquisition capabilities

Intra Freq SI-Acquisition for HO
Support of system information acquisition for intra-frequency neighbor cells.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTRa?

Inter Freq SI-Acquisition for HO
Support of system information acquisition for inter-frequency neighbor cells.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTer?

utran SI-Acquisition for HO

Support of system information acquisition for UMTS neighbor cells.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:NCSacq:UTRan?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:UTRan?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:UTRan?

2.4.22.12 UE Based Network Performance Measurement UE Capabilities

This section indicates UE capabilities for UE-based network performance measurements.

Figure 2-117: Network performance measurement capabilities

logged Measurements Idle

Support of logged measurements in idle mode.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:LMIDle?

Standalone GNSS Location

Indicates whether the UE is equipped with a GNSS receiver or not.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:SGLocation?

Logged MBSFN Measurements

Support of logged MBSFN measurements in RRC idle and connected mode.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:LMMeas?

2.4.22.13 RLC UE Capabilities

This section indicates UE capabilities for RLC.

Figure 2-118: RLC capabilities

extended RLC LI Fields

Support of 15-bit RLC length indicator.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:ERLField?

2.4.22.14 WLAN IW UE Capabilities

This section indicates UE capabilities for WLAN interworking.

Figure 2-119: WLAN interworking capabilities

WLAN IW RAN Rules
Support of RAN-assisted WLAN interworking based on access network selection and traffic steering rules specified in 3GPP TS 36.304.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:WIW:WIRRules?

WLAN IW ANDSF Policies
Support of RAN-assisted WLAN interworking based on ANDSF policies specified in 3GPP TS 24.312.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:WIW:WIAPolicies?

2.4.22.15 DC UE Capabilities

This section indicates UE capabilities for dual connectivity.

Figure 2-120: Dual connectivity capabilities

DRB TypeSplit
Support of DRB type of split bearer.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSPlit?

DRB TypeSCG
Support of DRB type of SCG bearer.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSCg?

2.4.22.16 MAC UE Capabilities

This section indicates UE capabilities for the MAC layer.

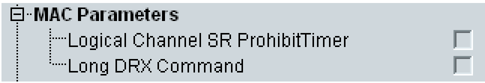


Figure 2-121: MAC capabilities

Logical Channel SR Prohibit Timer
Support of logical channel SR prohibit timer as specified in 3GPP TS 36.321.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MAC:LCSPtimer?

Long DRX Command
Support of long DRX command MAC control element as specified in 3GPP TS 36.321.

Remote command:
SENSe:LTE:SIGN<i>:UECapability:MAC:LDRXcommand?

2.4.22.17 FDD/TDD Additional E-UTRA UE Capabilities

The capability report sections "fdd-Add-UE-EUTRA-Capabilities" and "tdd-Add-UE-EUTRA-Capabilities" are only relevant for UEs that support both FDD and TDD.

In that case, the previous sections contain information that applies to FDD and TDD. Features that are indicated as supported are supported in both modes.

The additional section "fdd-Add-UE-EUTRA-Capabilities" contains a subset of the parameters described in the previous sections. If a feature is listed as supported, it means that this feature is only supported for FDD but not for TDD.

The additional section "tdd-Add-UE-EUTRA-Capabilities" contains the same subset of parameters. If a feature is listed as supported, it means that this feature is only supported for TDD but not for FDD.

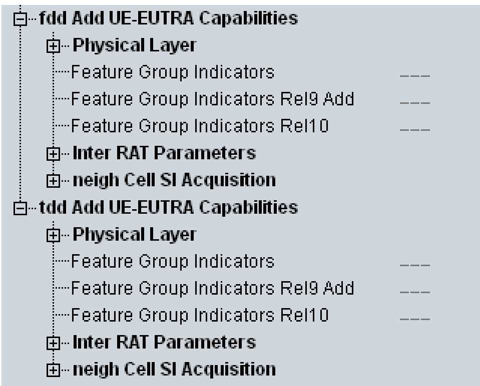


Figure 2-122: Additional FDD/TDD-only capabilities

For the description of the individual parameters, refer to the previous sections. The remote control commands for the additional sections are also referenced there.

2.4.22.18 SL UE Capabilities

This section indicates UE capabilities for sidelink communication.

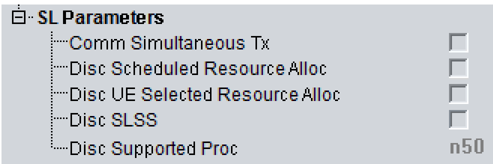


Figure 2-123: Sidelink capabilities

Comm Simultaneous Tx....................261
Disc Scheduled Resource Alloc....................261
Disc UE Selected Resource Alloc....................261
Disc SLSS....................261
Disc Supported Proc....................261

Comm Simultaneous Tx

Support of simultaneous transmission of EUTRA and sidelink communication on different carriers.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:SL:CSTX?

Disc Scheduled Resource Alloc

Support of transmission of discovery announcements based on network scheduled resource allocation.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:SL:DSRalloc?

Disc UE Selected Resource Alloc

Support of transmission of discovery announcements based on UE autonomous resource selection.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:SL:DUSRalloc?

Disc SLSS

Support of sidelink synchronization signal (SLSS) transmission and reception for sidelink discovery.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:SL:DSLSs?

Disc Supported Proc

Number of processes supported for sidelink discovery.

Remote command:

SENSe:LTE:SIGN<i>:UECapability:SL:DSPRoc?

2.5 Programming

The following sections provide programming examples for the LTE signaling application.

The examples contain SCPI commands supported by the R&S CMW and the following symbolic scripting commands:

- `// <comment>`:
  A <comment> ignored by the used programming tool
- `WHILE <query> <> <value>`:
  Waits until the <query> returns a certain <value>, e.g. a specific state is reached.
- `WAITKEY <message>`:
  Displays a dialog box with a <message> and waits until you close the box.

See also: "Remote Control" in the R&S CMW base unit manual

- General Configuration....262
- BLER Tests....294
- RLC Throughput Tests....298

2.5.1 General Configuration

The LTE signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:LTE:SIGN:...`
- After a `*RST`, the DL signal is switched off.
  To activate the DL signal, use `SOURce:LTE:SIGN:CELL:STATe ON`.
  Query the cell state using `SOURce:LTE:SIGN:CELL:STATe:ALL?`. The result `ON,ADJ` indicates that the DL signal is available.
- To initiate a connection setup, use `CALL:LTE:SIGN:PSWitched:ACTion CONNect`.
  To query the connection state, use `FETCh:LTE:SIGN:PSWitched:STATe?`.

2.5.1.1 Initialization

```
// *****************************************************************************
// Initial system-reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?
```

2.5.1.2 Selecting a Scenario

Each scenario is activated via a different `ROUTe` command. Some examples are given in this section.

Each of the following command blocks activates a scenario, selects the related signal paths and configures the related external attenuations. Execute only one command block.

```
// ******************************************************************************
// SISO, no CA, no fading
// ******************************************************************************
ROUTe:LTE:SIGN:SCENario:SCELl:FLEXible SUW1,RF2C,RX1,RF2C,TX1
CONFigure:LTE:SIGN:RFSettings:EATTenuation:OUTPut 2
CONFigure:LTE:SIGN:RFSettings:EATTenuation:INPut 2

// ******************************************************************************
// MIMO 4x2, no CA, internal fading
// ******************************************************************************
ROUTe:LTE:SIGN:SCEN:MTFading:FLEXible:INTernal SUW1,RF1C,RX1,RF1C,TX1,RF3C,TX2
CONFigure:LTE:SIGN:RFSettings:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:EATTenuation:INPut 2

// ******************************************************************************
// SISO, DL CA two carriers, external fading
// ******************************************************************************
ROUTe:LTE:SIGN:SCEN:CATF:FLEXible SUW1,RF1C,RX1,RF1C,TX1,IQ2O,SUW2,RF3C,TX2,IQ4O
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:OUTPut 2
CONFigure:LTE:SIGN:RFSettings:SCC:EATTenuation:OUTPut 2
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:INPut 2

// ******************************************************************************
// MIMO nx2, DL CA two carriers, internal fading
// ******************************************************************************
ROUTe:LTE:SIGN:SCENario:CAFF:FLEXible:INT
    SUW1,RF1C,RX1,RF1C,TX1,RF2C,TX3,SUW2,RF3C,TX2,RF4C,TX4
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:SCC:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:SCC:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:INPut 2

// ******************************************************************************
// DL CA three carriers, SCC1 MIMO nx2, PCC/SCC2 SISO, no fading
// ******************************************************************************
ROUTe:LTE:SIGN:SCENario:CCMS1:FLEXible
    SUW1,RF2C,RX3,RF2C,TX3,SUW2,RF1C,TX1,RF3C,TX2,SUW3,RF4C,TX4
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:SCC1:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:SCC1:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:SCC2:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:INPut 2

// ******************************************************************************
```

```
// MIMO nx2, DL CA four carriers, internal fading, UL CA
// ***************************************************************************
ROUTe:LTE:SIGN:SCENario:DHF:INTernal SUW11,R11C,RX11,R11C,TX11,R12C,TX13,
    SUW12,R13C,TX12,R14C,TX14,SUW21,R21C,TX21,R22C,TX23,SUW22,R23C,TX22,R24C,TX24
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:SCC1:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:SCC1:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:SCC2:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:SCC2:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:SCC3:EATTenuation:OUTPut1 2
CONFigure:LTE:SIGN:RFSettings:SCC3:EATTenuation:OUTPut2 2
CONFigure:LTE:SIGN:RFSettings:PCC:EATTenuation:INPut 2
CONFigure:LTE:SIGN:RFSettings:SCC1:EATTenuation:INPut 2
```

2.5.1.3 Specifying General Settings

```
// ***************************************************************************
// Select duplex mode FDD for all carriers and automatic SCC activation mode.
// Activate the uplink for SCC1.
// ***************************************************************************
CONFigure:LTE:SIGN:DMODe:UCSPecific OFF
CONFigure:LTE:SIGN:DMODe FDD
CONFigure:LTE:SIGN:SCC:AMODe AUTO
CONFigure:LTE:SIGN:SCC:UUL ON

// ***************************************************************************
// Define time delay to be compensated in output and input paths.
// ***************************************************************************
CONFigure:LTE:SIGN:RFSettings:EDC:OUTPut 5E-9
CONFigure:LTE:SIGN:RFSettings:EDC:INPut 5E-9

// ***************************************************************************
// Select manual expected nominal power mode and specify the expected power,
// the user margin and the mixer level offset for the PCC.
// Configure the SCC1.
// ***************************************************************************
CONFigure:LTE:SIGN:RFSettings:PCC:ENPMode MANual
CONFigure:LTE:SIGN:RFSettings:PCC:ENPower -25
CONFigure:LTE:SIGN:RFSettings:PCC:UMARgin 3
CONFigure:LTE:SIGN:RFSettings:PCC:MLOFfset 1

CONFigure:LTE:SIGN:RFSettings:SCC:ENPMode MANual
CONFigure:LTE:SIGN:RFSettings:SCC:ENPower -25
CONFigure:LTE:SIGN:RFSettings:SCC:UMARgin 3
CONFigure:LTE:SIGN:RFSettings:SCC:MLOFfset 1
```

2.5.1.4 Configuring Operating Bands and Channels

```
// **************************************************************************
// Specify PCC operating band plus DL channel number and query the
// automatically calculated UL channel number and the UL frequency in Hz.
// Configure PCC frequency offsets for DL and UL.
// Configure the SCC1.
// **************************************************************************
CONFigure:LTE:SIGN:PCC:BAND OB7
CONFigure:LTE:SIGN:RFSettings:PCC:CHANnel:DL 3000 ;UL?
CONFigure:LTE:SIGN:RFSettings:PCC:CHANnel:UL? Hz
CONFigure:LTE:SIGN:RFSettings:PCC:FOFFset:DL 100
CONFigure:LTE:SIGN:RFSettings:PCC:FOFFset:UL -200
CONFigure:LTE:SIGN:SCC:BAND OB7
CONFigure:LTE:SIGN:RFSettings:SCC:CHANnel:DL 3100 ;UL?
CONFigure:LTE:SIGN:RFSettings:SCC:CHANnel:UL? Hz
CONFigure:LTE:SIGN:RFSettings:PCC:FOFFset:DL:UCSPecific ON
CONFigure:LTE:SIGN:RFSettings:SCC:FOFFset:DL 200
CONFigure:LTE:SIGN:RFSettings:PCC:FOFFset:UL:UCSPecific ON
CONFigure:LTE:SIGN:RFSettings:SCC:FOFFset:UL -100

// **************************************************************************
// Configure the PCC user-defined band: UL/DL separation, band indicator,
// minimum DL frequency and channel numbers. Query resulting calculated settings.
// Configure the SCC1 user-defined band.
// **************************************************************************
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:UDSeparation 200E+6
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:BINDicator 3
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:FREQuency:DL:MINimum 1E+9
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:CHANnel:DL:MINimum 100
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:CHANnel:DL:MAXimum 999
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:CHANnel:UL:MINimum 18000
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:CHANnel:UL:MAXimum?
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:FREQuency:DL:MAXimum?
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:FREQuency:UL:MINimum?
CONFigure:LTE:SIGN:RFSettings:PCC:UDEFined:FREQuency:UL:MAXimum?

CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:UDSeparation 200E+6
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:BINDicator 4
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:FREQuency:DL:MINimum 3E+9
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:CHANnel:DL:MINimum 100
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:CHANnel:DL:MAXimum 999
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:CHANnel:UL:MINimum 18000
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:CHANnel:UL:MAXimum?
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:FREQuency:DL:MAXimum?
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:FREQuency:UL:MINimum?
CONFigure:LTE:SIGN:RFSettings:SCC:UDEFined:FREQuency:UL:MAXimum?
```

2.5.1.5 Configuring Internal Fading

The following commands configure the PCC. To configure the SCC number <n>, substitute :PCC: by :SCC<n>: (:SSC1:, :SCC2:, ...).

```
/ ****************************************************************************
// Configure standard fading for the PCC downlink:
// Enable it and select a fading profile.
// ****************************************************************************
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:STANDard:ENABle ON
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:STANDard:PROFile EP5Low

// ****************************************************************************
// Configure extended fading for the PCC downlink:
// Enable it, select a fading profile, start fading automatically,
// set start seed, calculate insertion loss automatically,
// specify max Doppler frequency.
// ****************************************************************************
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:ENABle ON
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:PROFile EP5Low
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:RESTart:MODE AUTO
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:GLOBal:SEED 0
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:ILOSs:MODE NORMal
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:DSHift:MODE USER
CONFigure:LTE:SIGN:FADing:PCC:FSIMulator:DSHift 6

// ****************************************************************************
// Configure AWGN insertion for the PCC downlink:
// Enable AWGN, no frequency offset, set min noise/system BW ratio,
// set signal to noise ratio and query calculated noise power.
// ****************************************************************************
CONFigure:LTE:SIGN:FADing:PCC:AWGN:ENABle ON
CONFigure:LTE:SIGN:FADing:PCC:AWGN:FOFFset 0
CONFigure:LTE:SIGN:FADing:PCC:AWGN:BWIDth:RATio 1
CONFigure:LTE:SIGN:FADing:PCC:AWGN:SNRatio 1
CONFigure:LTE:SIGN:FADing:PCC:POWer:NOISe?
```

2.5.1.6 Configuring DL Power Levels

The following commands configure the PCC. To configure the SCC number <n>, substitute :PCC: by :SCC<n>: (:SSC1:, :SCC2:, ...).

```
// ****************************************************************************
// Define the RS EPRE level and the power of the DL channels and signals
// relative to the RS EPRE level. Query full cell BW power.
// ****************************************************************************
CONFigure:LTE:SIGN:DL:PCC:RSEPre:LEVel -80
CONFigure:LTE:SIGN:DL:PCC:PSS:POFFset -3
CONFigure:LTE:SIGN:DL:PCC:SSS:POFFset -3
CONFigure:LTE:SIGN:DL:PCC:PBCH:POFFset 0
```

```
CONFigure:LTE:SIGN:DL:PCC:PCFich:POFFset 0
CONFigure:LTE:SIGN:DL:PCC:PHICh:POFFset 0
CONFigure:LTE:SIGN:DL:PCC:PDCCh:POFFset -3
SENSe:LTE:SIGN:DL:PCC:FCPower?

// *****************************************************************************
// Configure the used CSI-RS power offset manually,
// independent from the signaled power offset.
// *****************************************************************************
CONFigure:LTE:SIGN:DL:PCC:CSIRs:MODE MANual
CONFigure:LTE:SIGN:DL:PCC:CSIRs:POFFset -10

// *****************************************************************************
// Enable the OFDMA channel noise generator.
// *****************************************************************************
CONFigure:LTE:SIGN:DL:PCC:OCNG ON

// *****************************************************************************
// Define power offset, power ratio index and antenna port power
// for calculation of the PDSCH power level.
// *****************************************************************************
CONFigure:LTE:SIGN:DL:PCC:PDSCh:PA ZERO
CONFigure:LTE:SIGN:DL:PCC:POWer:PORTs 0
CONFigure:LTE:SIGN:DL:PCC:PDSCh:RINDex 1

// *****************************************************************************
// Define the AWGN power level (also activates the AWGN interferer).
// *****************************************************************************
CONFigure:LTE:SIGN:DL:PCC:AWGN -100
```

2.5.1.7 Configuring UL Power Control for Call Setup

```
// *****************************************************************************
// Enable joint UL power control.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:JUPower ON

// *****************************************************************************
// Define the open loop nominal power directly (basic UL power configuration).
// Query the resulting parameter values signaled to the UE.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:PUSCH:OLNPower -30
SENSe:LTE:SIGN:UL:PCC:APPower:RSPower:BASic?
SENSe:LTE:SIGN:UL:PCC:APPower:PIRPower:BASic?
SENSe:LTE:SIGN:UL:PCC:APPower:PNPusch:BASic?
SENSe:LTE:SIGN:UL:PCC:APPower:PCALpha:BASic?
SENSe:LTE:SIGN:UL:PCC:APPower:TPRRcsetup:BASic?

// *****************************************************************************
```

```
// Alternatively enable advanced UL power configuration,
// define the parameter values to be signaled to the UE and
// query values calculated from the parameters.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:APPower:EASettings ON
CONFigure:LTE:SIGN:UL:PCC:APPower:RSPower:ADVanced 15
CONFigure:LTE:SIGN:UL:PCC:APPower:PIRPower:ADVanced -100
CONFigure:LTE:SIGN:UL:PCC:APPower:PNPusch:ADVanced -81
CONFigure:LTE:SIGN:UL:PCC:APPower:PCALpha:ADVanced DOT7
CONFigure:LTE:SIGN:UL:PCC:APPower:TPRRcsetup:ADVanced OFF
SENSe:LTE:SIGN:UL:PCC:APPower:PATHloss?
SENSe:LTE:SIGN:UL:PCC:APPower:EPPPower?
SENSe:LTE:SIGN:UL:PCC:APPower:EOPower?

// *****************************************************************************
// Define maximum allowed UE power.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:PMAX 3
```

2.5.1.8 Configuring Physical Cell Setup

```
// *****************************************************************************
// Define channel bandwidth and physical cell ID for PCC and SCC1.
// Select cyclic prefix.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:BANDwidth:PCC:DL B100
CONFigure:LTE:SIGN:CELL:BANDwidth:SCC:DL B100
CONFigure:LTE:SIGN:CELL:PCC:PCID 10
CONFigure:LTE:SIGN:CELL:SCC:PCID 15
CONFigure:LTE:SIGN:CELL:CPRefix NORM

// *****************************************************************************
// Configure normal uplink signal (not SRS).
// Configure SRS settings for later use.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:SRS:ENABle OFF
CONFigure:LTE:SIGN:CELL:SRS:MCENable ON
CONFigure:LTE:SIGN:CELL:SRS:BWConfig 7
CONFigure:LTE:SIGN:CELL:SRS:SFConfig 3
CONFigure:LTE:SIGN:CELL:SRS:DBANdwidth 3
CONFigure:LTE:SIGN:CELL:SRS:HBANdwidth 3
CONFigure:LTE:SIGN:CELL:SRS:SCINdex:TDD 0
CONFigure:LTE:SIGN:CELL:SRS:SCINdex:FDD 7

// *****************************************************************************
// Select UL/DL config and special subframe config for PCC and SCC1.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:TDD:SPECific ON
CONFigure:LTE:SIGN:CELL:ULDL 1
```

```
CONFigure:LTE:SIGN:CELL:SCC1:ULDL 3
CONFigure:LTE:SIGN:CELL:SSUBframe 5
CONFigure:LTE:SIGN:CELL:SCC1:SSUBframe 7

// *****************************************************************************
// PRACH settings: answer preambles, set power step size,
// PRACH configuration index, frequency offset,
// logical root sequence index and zero correlation zone config.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:PRACh:NRPReambles OFF
CONFigure:LTE:SIGN:CELL:PRACh:PRSTep P4DB
CONFigure:LTE:SIGN:CELL:PRACh:PCINdex:FDD 15
CONFigure:LTE:SIGN:CELL:PRACh:PCINdex:TDD 15
CONFigure:LTE:SIGN:CELL:PRACh:PFOFfset 10
CONFigure:LTE:SIGN:CELL:PRACh:LRSindex 120
CONFigure:LTE:SIGN:CELL:PRACh:ZCZConfig 5

// *****************************************************************************
// CSAT settings: enable CSAT for SCC 1, LDS every 80 ms,
// ON/OFF 20 ms, periodic MAC activation.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:SCC1:CSAT:ENABle ON
CONFigure:LTE:SIGN:CELL:SCC1:CSAT:DMTCperiod M80
CONFigure:LTE:SIGN:CELL:SCC1:SCMuting:ONSDuration 20
CONFigure:LTE:SIGN:CELL:SCC1:SCMuting:OFFSduration 20
CONFigure:LTE:SIGN:CELL:SCC1:SCMuting:PMAC ON
```

2.5.1.9 Configuring Neighbor Cells and Reselection

```
// *****************************************************************************
// Specify 2 neighbor cell entries for LTE, GSM, WCDMA, CDMA2000,
// 1xEV-DO and TD-SCDMA.
// *****************************************************************************
CONFigure:LTE:SIGN:NCELl:LTE:CELL1 ON, OB1, 10, 1, ZERO, ON
CONFigure:LTE:SIGN:NCELl:LTE:CELL2 ON, OB2, 700, 3, P1, OFF
CONFigure:LTE:SIGN:NCELl:GSM:CELL1 ON, G09, 0, ON
CONFigure:LTE:SIGN:NCELl:GSM:CELL2 ON, G09, 124, OFF
CONFigure:LTE:SIGN:NCELl:WCDMa:CELL1 ON, OB1, 10562, #H10A, ON
CONFigure:LTE:SIGN:NCELl:WCDMa:CELL2 ON, OB2, 412, #H10B, OFF
CONFigure:LTE:SIGN:NCELl:CDMA:CELL1 ON, USC, 1, 5, ON
CONFigure:LTE:SIGN:NCELl:CDMA:CELL2 ON, USC, 799, 6, OFF
CONFigure:LTE:SIGN:NCELl:EVDO:CELL1 ON, USC, 1, 5, ON
CONFigure:LTE:SIGN:NCELl:EVDO:CELL2 ON, USC, 799, 6, OFF
CONFigure:LTE:SIGN:NCELl:TDSCdma:CELL1 ON, OB1, 9500, #H1, ON
CONFigure:LTE:SIGN:NCELl:TDSCdma:CELL2 ON, OB2, 10100, #H2, ON

// *****************************************************************************
// Specify neighbor cell reselection thresholds per technology.
// *****************************************************************************
```

```
CONFigure:LTE:SIGN:NCELl:LTE:THResholds:LOW 5
CONFigure:LTE:SIGN:NCELl:GSM:THResholds:LOW 5
CONFigure:LTE:SIGN:NCELl:WCDMa:THResholds:LOW 5
CONFigure:LTE:SIGN:NCELl:CDMA:THResholds:LOW 10
CONFigure:LTE:SIGN:NCELl:EVDO:THResholds:LOW 10
CONFigure:LTE:SIGN:NCELl:TDSCdma:THResholds:LOW 5

// *****************************************************************************
// Specify general reselection parameters for the cell.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:RESelection:SEARch:INTRasearch OFF
CONFigure:LTE:SIGN:CELL:RESelection:SEARch:NINTrasearch OFF
CONFigure:LTE:SIGN:CELL:RESelection:TSLow 14
CONFigure:LTE:SIGN:CELL:RESelection:QUALity:RXLevmin -130
```

2.5.1.10 Configuring Other Network Settings

```
// *****************************************************************************
// Specify MCC, 2-digit MNC and tracking area code.
// Configure E-UTRAN cell ID for PCC and SCC1.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:MCC 262
CONFigure:LTE:SIGN:CELL:MNC 30
CONFigure:LTE:SIGN:CELL:MNC:DIGits TWO
CONFigure:LTE:SIGN:CELL:TAC 1384
CONFigure:LTE:SIGN:CELL:PCC:CID:EUTRan #B10000010001000
CONFigure:LTE:SIGN:CELL:SCC:CID:EUTRan #B10000010001001

// *****************************************************************************
// Enable authentication, NAS security, AS security and milenage.
// Define integrity algorithm, OPc, secret key and RAND mode.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:SECurity:AUTHenticat ON
CONFigure:LTE:SIGN:CELL:SECurity:NAS ON
CONFigure:LTE:SIGN:CELL:SECurity:AS ON
CONFigure:LTE:SIGN:CELL:SECurity:MILenage ON
CONFigure:LTE:SIGN:CELL:SECurity:IALGorithm S3G
CONFigure:LTE:SIGN:CELL:SECurity:OPC #H000010B00091006000F00000A0005000
CONFigure:LTE:SIGN:CELL:SECurity:SKEY #H000102030405060708090A0B0C0D0E0F
CONFigure:LTE:SIGN:CELL:SECurity:RVALue EVEN

// *****************************************************************************
// Configure timers.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:TOUT:OSYNch 40
CONFigure:LTE:SIGN:CELL:TOUT:T3412 180

// *****************************************************************************
// Configure NAS signaling settings:
```

```
// Disable sending of a DNS IP address to the UE, configure reject causes,
// enable IE "EPS Network Feature Support" and configure its contents.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:SDNSpco OFF
CONFigure:LTE:SIGN:CELL:RCAuse:ATTach CONG22
CONFigure:LTE:SIGN:CELL:RCAuse:TAU TANA12
CONFigure:LTE:SIGN:CELL:NAS:EPSNetwork ON
CONFigure:LTE:SIGN:CELL:NAS:IMSVops NSUP
CONFigure:LTE:SIGN:CELL:NAS:EMCBs SUPP
CONFigure:LTE:SIGN:CELL:NAS:EPCLcs NSUP
CONFigure:LTE:SIGN:CELL:NAS:CSLCs NINF

// *****************************************************************************
// Synchronize the signaling application and the PCC to zone 1.
// Apply an offset of 30 µs to the SCC1.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:SYNC:ZONE 1
CONFigure:LTE:SIGN:CELL:PCC:SYNC:OFFSet 0
CONFigure:LTE:SIGN:CELL:SCC:SYNC:OFFSet 30E-6
```

2.5.1.11 Configuring General Connection Settings Part 1

```
// *****************************************************************************
// Enable the easy mode and group hopping. Configure the UE category manually.
// Allow UE category 0 and power saving mode. Select default paging cycle,
// additional spectrum emission requirements and filter coefficient.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:EASY:BFBW ON
CONFigure:LTE:SIGN:CONNection:GHOPping ON
CONFigure:LTE:SIGN:CONNection:UECategory:MANual 5
CONFigure:LTE:SIGN:CONNection:UECategory:REPorted OFF
CONFigure:LTE:SIGN:CONNection:UECategory:CZALlowed ON
CONFigure:LTE:SIGN:CONNection:PSMallowed ON
CONFigure:LTE:SIGN:CONNection:DPCYcle P128
CONFigure:LTE:SIGN:CONNection:ASEMission NS02
CONFigure:LTE:SIGN:CONNection:SCC:ASEMission:CAGGregation NS03
CONFigure:LTE:SIGN:CONNection:FCOefficient FC4

// *****************************************************************************
// Set connection type and request test mode.
// Query default bearer RLC mode, allowed IP versions, APN and QCI.
// Configure SIB reconfiguration. Disable keeping the RRC connection with a
// timeout of 20 s.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:CTYPe TEST
CONFigure:LTE:SIGN:CONNection:TMODe ON
CONFigure:LTE:SIGN:CONNection:RLCMode?
CONFigure:LTE:SIGN:CONNection:IPVersion?
CONFigure:LTE:SIGN:CONNection:APN?
```

```
CONFigure:LTE:SIGN:CONNection:QCI?
CONFigure:LTE:SIGN:CONNection:SIBReconfig RRCReconfig
CONFigure:LTE:SIGN:CONNection:KRRC OFF
CONFigure:LTE:SIGN:CONNection:RITimer 20

// *****************************************************************************
// Enable usage of external DAU and specify network segment and network ID
// of instrument with external DAU.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:EDAU:ENABle ON
CONFigure:LTE:SIGN:CONNection:EDAU:NSEGment A
CONFigure:LTE:SIGN:CONNection:EDAU:NID 5

// *****************************************************************************
// Activate DL padding and insert 10% transport block errors.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:DLPadding ON
CONFigure:LTE:SIGN:CONNection:DLEinsertion 10
```

2.5.1.12 Configuring General Connection Settings Part 2

```
// *****************************************************************************
// Disable UE TX antenna selection and TTI bundling,
// use redirection for intra-LTE handover,
// do not accept multiple default bearer requests,
// disable timing advance control.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:UETSelection OFF
CONFigure:LTE:SIGN:CONNection:TTIBundling OFF
CONFigure:LTE:SIGN:CONNection:OBCHange REDirection
CONFigure:LTE:SIGN:CONNection:FCHange REDirection
CONFigure:LTE:SIGN:CONNection:AMDBearer OFF
CONFigure:LTE:SIGN:CONNection:TAControl OFF

// *****************************************************************************
// Enable header compression with profile 2 and 4.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:ROHC:ENABle ON
CONFigure:LTE:SIGN:CONNection:ROHC:PROFiles OFF, ON, ON

// *****************************************************************************
// Set and query number of PDCCH symbols.
// Set PDCCH C-RNTI aggregation levels. Query all used aggregation levels.
// For PCC and SCC1.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:PDCCh:SYMBol P3
SENSe:LTE:SIGN:CONNection:PCC:PDCCh:PSYMbols?
CONFigure:LTE:SIGN:CONNection:PCC:PDCCh:ALEVel AUTO
SENSe:LTE:SIGN:CONNection:PCC:PDCCh:ALEVel?
```

```
CONFigure:LTE:SIGN:CONNection:SCC:PDCCh:SYMBol P3
SENSe:LTE:SIGN:CONNection:SCC:PDCCh:PSYMbols?
CONFigure:LTE:SIGN:CONNection:SCC:PDCCh:ALEVel AUTO
SENSe:LTE:SIGN:CONNection:SCC:PDCCh:ALEVel?

// *****************************************************************************
// Configure GSM, WCDMA and TD-SCDMA target for MO CSFB.
// Activate the GSM target.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:CSFB:GSM G09, 1000, G18
CONFigure:LTE:SIGN:CONNection:CSFB:WCDMa OB1, 10600
CONFigure:LTE:SIGN:CONNection:CSFB:TDSCdma OB1, 9500
CONFigure:LTE:SIGN:CONNection:CSFB:DESTination GSM

// *****************************************************************************
// Configure list of requested frequency bands for UE capability report.
// *****************************************************************************
CONFigure:LTE:SIGN:UECapability:RFBands:ALL ON,OB5,ON,OB6,OFF,OB1,OFF,OB1,
    OFF,OB1,ON,OB13,ON,OB14,OFF,OB1,OFF,OB1,OFF,OB1,OFF,OB1,OFF,OB1,OFF,
    OB1,OFF,OB1,OFF,OB1,OFF,OB1

// *****************************************************************************
// Select user-defined channels as scheduling type for PCC and SCC1.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe UDCH
CONFigure:LTE:SIGN:CONNection:SCC:STYPe UDCH
```

2.5.1.13 Configuring HARQ

```
// *****************************************************************************
// Configure HARQ for the uplink: enable HARQ, allow 4 transmissions,
// use DCI 0 and PHICH.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:HARQ:UL:ENABle ON
CONFigure:LTE:SIGN:CONNection:HARQ:UL:NHT 4
CONFigure:LTE:SIGN:CONNection:HARQ:UL:DPHich D0PHich

// *****************************************************************************
// Configure HARQ for the downlink: enable HARQ, allow 4 transmissions and
// specify user-defined redundancy version sequence.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:HARQ:DL:ENABle ON
CONFigure:LTE:SIGN:CONNection:HARQ:DL:NHT 4
CONFigure:LTE:SIGN:CONNection:HARQ:DL:RVCSequence UDEF
CONFigure:LTE:SIGN:CONNection:HARQ:DL:UDSequence:LENGth 4
CONFigure:LTE:SIGN:CONNection:HARQ:DL:UDSequence 0,0,2,3
```

2.5.1.14 Configuring MIMO Settings

The following commands configure the PCC. To configure the SCC number <n>, substitute `:PCC:` by `:SCC<n>:`.

```
// *****************************************************************************
// Select mode 4 (closed loop spatial multiplexing), DCI format 2 and
// two transmit antennas (MIMO 2x2). Query resulting transmission scheme.
// Select precoding matrix.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:TRANsmission TM4
CONFigure:LTE:SIGN:CONNection:PCC:DCIFormat D2
CONFigure:LTE:SIGN:CONNection:PCC:NENBantennas TWO
SENSe:LTE:SIGN:CONNection:PCC:TSCHeme?
CONFigure:LTE:SIGN:CONNection:PCC:PMATrix PMI1

// *****************************************************************************
// Enable and specify static channel model for MIMO 2x2.
// Specify static channel model for MIMO 4x2.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:SCHModel:ENABle ON
CONFigure:LTE:SIGN:CONNection:PCC:SCHModel 0.9,0,45,0.1,45,0
CONFigure:LTE:SIGN:CONNection:PCC:SCHModel:MIMO42 0.1,0,0.2,0,0.3,0,0.4,270,
    0.4,270,0.3,90,0.2,90,0.1,180

// *****************************************************************************
// Configure port 0 mapping for TM 7.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:PZERo:MAPPing R1R2

// *****************************************************************************
// Enable beamforming, configure dual-layer beamforming for TM 8. Configure
// the beamforming matrix and the channel matrix for TM 8.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:BEAMforming:MODE ON
CONFigure:LTE:SIGN:CONNection:PCC:BEAMforming:NOLayers L2
CONFigure:LTE:SIGN:CONNection:PCC:BEAMforming:MATRix 0,0,0.4,0.6,270,15
CONFigure:LTE:SIGN:CONNection:PCC:TM8:CHMatrix 0.9,45,0.1,45,0.9,0,0.1,0

// *****************************************************************************
// Configure parameters for TM 9:
// Select number of antennas, number of code words, second precoding matrix.
// Set signaled CSI-RS power, antenna ports, configuration and subframe configuration.
// Set zero power CSI-RS bitmap and subframe configuration.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:TM9:NTXantennas FOUR
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CODewords TWO
CONFigure:LTE:SIGN:CONNection:PCC:TM9:PMATrix PMI3

CONFigure:LTE:SIGN:CONNection:PCC:TM9:CSIRs:POWer 0
```

```
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CSIRs:APORts P1516
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CSIRs:RESource 11
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CSIRs:SUBFrame 8
CONFigure:LTE:SIGN:CONNection:PCC:TM9:ZP:BITS #B1010000000000000
CONFigure:LTE:SIGN:CONNection:PCC:TM9:ZP:CSIRs:SUBFrame 8

// *****************************************************************************
// Configure channel matrix for TM 9: 2x2, 4x2 and 8x2.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CMATrix:TWO1 0.9,0,45
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CMATrix:TWO2 0.1,45,0
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CMATrix:FOUR1 0.1,0,0.2,0,0.3,0,270
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CMATrix:FOUR2 0.4,270,0.3,90,0.2,90,180
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CMATrix:EIGHt1 0.05,15,0.05,30,0.1,15,0.1,
    30,0.15,15,0.15,30,0.2,15,30
CONFigure:LTE:SIGN:CONNection:PCC:TM9:CMATrix:EIGHt2 0.2,30,0.2,15,0.15,30,0.15,
    15,0.1,30,0.1,15,0.05,30,15
```

2.5.1.15 Configuring Connected DRX

```
// *****************************************************************************
// Enable connected DRX with user-defined settings and configure all settings.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:CDRX:ENABle UDEF
CONFigure:LTE:SIGN:CONNection:CDRX:ODTimer PSF3
CONFigure:LTE:SIGN:CONNection:CDRX:ITIMer PSF80
CONFigure:LTE:SIGN:CONNection:CDRX:RTIMer PSF8
CONFigure:LTE:SIGN:CONNection:CDRX:LDCYcle SF80
CONFigure:LTE:SIGN:CONNection:CDRX:SOFFset 10
CONFigure:LTE:SIGN:CONNection:CDRX:SCENable ON
CONFigure:LTE:SIGN:CONNection:CDRX:SDCYcle SF5
CONFigure:LTE:SIGN:CONNection:CDRX:SCTimer 5
CONFigure:LTE:SIGN:CONNection:CDRX:UDSCheduling ON

// *****************************************************************************
// Configure PUCCH resources for scheduling requests.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:SRPRindex 50
CONFigure:LTE:SIGN:CONNection:SRCindex 35
```

2.5.1.16 Configuring RMCs

The following commands configure the PCC. To configure the SCC number <n>, substitute `:PCC:` by `:SCC<n>:`.

```
// *****************************************************************************
// Define 3GPP-compliant RMCs with contiguous allocation:
// Select scheduling type, configure DL RMC with 50 RBs and 16-QAM modulation,
// UL RMC with 12 RBs and QPSK modulation. The transport block size index
```

```
// is selected automatically.
// Configure the upper end of the channel bandwidth as RB position (not really
// relevant for DL - the 50 RBs use the entire bandwidth).
// Select version 1 of ambiguous RMCs.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe RMC
CONFigure:LTE:SIGN:CONNection:PCC:MCLuster:UL OFF
CONFigure:LTE:SIGN:CONNection:PCC:RMC:DL N50,Q16,KEEP
CONFigure:LTE:SIGN:CONNection:PCC:RMC:RBPosition:DL HIGH
CONFigure:LTE:SIGN:CONNection:PCC:RMC:UL N12,QPSK,KEEP
CONFigure:LTE:SIGN:CONNection:PCC:RMC:RBPosition:UL HIGH
CONFigure:LTE:SIGN:CONNection:PCC:RMC:VERSion:DL 1

// *****************************************************************************
// Define the same RMC for the second MIMO downlink stream.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:RMC:DL2 N50,Q16,KEEP
CONFigure:LTE:SIGN:CONNection:PCC:RMC:RBPosition:DL2 HIGH
CONFigure:LTE:SIGN:CONNection:PCC:RMC:VERSion:DL2 1

// *****************************************************************************
// Instead of configuring the same settings for stream 1 and stream 2, you can
// apply the stream 1 settings to all streams and skip the "DL2" commands.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:DLEQual ON

// *****************************************************************************
// Configure an UL RMC with multi-cluster allocation instead of
// contiguous allocation.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:MCLuster:UL ON
CONFigure:LTE:SIGN:CONNection:PCC:RMC:MCLuster:UL N3,P0,N42,P6,Q16,T11
```

2.5.1.17 Configuring User-Defined Channels

```
// *****************************************************************************
// Specify user-defined channels: Select scheduling type,
// configure DL PCC channel with 15 RBs starting with RB number 12,
// 64-QAM modulation, TBS index 26. UL channel with 12 RBs starting with
// RB number 21, QPSK modulation, TBS index 19.
// Query the resulting maximum expected throughput and the code rate.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe UDCHannels
CONFigure:LTE:SIGN:CONNection:PCC:UDCHannels:DL1 15,12,Q64,26
CONFigure:LTE:SIGN:CONNection:PCC:UDCHannels:UL 12,21,QPSK,9
SENSe:LTE:SIGN:CONNection:ETHRoughput:UL:PCC?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:PCC:STReam1?
SENSe:LTE:SIGN:CONNection:PCC:UDCHannels:UL:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:PCC:UDCHannels:DL1:CRATe:ALL?
```

```
// *****************************************************************************
// Define the same user-defined channel for the second MIMO downlink stream.
// Query the resulting maximum expected throughput for that stream and for
// both PCC downlink streams together. Query the code rate.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:UDCHannels:DL2 15,12,Q64,26
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:PCC:STReam2?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:PCC?
SENSe:LTE:SIGN:CONNection:PCC:UDCHannels:DL2:CRATe:ALL?

// *****************************************************************************
// Configure the same user-defined channel for the SCC1.
// Query the code rates for the streams.
// Query the maximum expected throughput for each SCC1 stream, for the sum of
// the SCC1 DL streams and for the sum of all PCC and SCC DL streams.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:SCC:STYPe UDCHannels
CONFigure:LTE:SIGN:CONNection:SCC:UDCHannels:DL1 15,12,Q64,26
CONFigure:LTE:SIGN:CONNection:SCC:UDCHannels:DL2 15,12,Q64,26
CONFigure:LTE:SIGN:CONNection:SCC:UDCHannels:UL 12,21,QPSK,9
SENSe:LTE:SIGN:CONNection:SCC:UDCHannels:DL1:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:SCC:UDCHannels:DL2:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:SCC:UDCHannels:UL:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:ETHRoughput:UL:SCC?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:SCC:STReam1?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:SCC:STReam2?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:SCC?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:ALL?

// *****************************************************************************
// Instead of configuring the same settings for stream 1 and stream 2, you can
// apply the stream 1 settings to all streams and skip the "DL2" commands.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:DLEQual ON
CONFigure:LTE:SIGN:CONNection:SCC:DLEQual ON

// *****************************************************************************
// Configure a PCC user-defined channel with multi-cluster allocation instead of
// contiguous allocation.
// *****************************************************************************
CONF:LTE:SIGN:CONNection:PCC:MCLuster:UL ON
CONF:LTE:SIGN:CONNection:PCC:UDCHannels:MCLuster:UL 6,21,9,30,QPSK,9
CONF:LTE:SIGN:CONNection:PCC:MCLuster:DL ON
CONF:LTE:SIGN:CONNection:PCC:UDCHannels:MCLuster:DL #B11100011100011111,Q64,26
```

2.5.1.18 Configuring TTI-Based User-Defined Channels

The following commands configure the PCC. To configure the SCC number <n>, substitute `:PCC:` by `:SCC<n>:`.

```
// *****************************************************************************
// TTI-based user-defined channels: Select scheduling type,
// configure subframe number 3 and 4, UL and both PCC DL streams.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe UDTTibased
CONFigure:LTE:SIGN:CONNection:PCC:UDTTibased:UL 3,12,21,QPSK,9
CONFigure:LTE:SIGN:CONNection:PCC:UDTTibased:UL 4,12,21,QPSK,9
CONFigure:LTE:SIGN:CONNection:PCC:UDTTibased:DL1 3,15,12,Q64,26
CONFigure:LTE:SIGN:CONNection:PCC:UDTTibased:DL1 4,15,12,Q64,26
CONFigure:LTE:SIGN:CONNection:PCC:UDTTibased:DL2 3,15,12,Q64,26
CONFigure:LTE:SIGN:CONNection:PCC:UDTTibased:DL2 4,15,12,Q64,26

// *****************************************************************************
// TTI-based user-defined channels: configure all subframes for PCC DL stream 1
// decreasing number of RBs (50 to 3 for subframe 0 to 9),
// position approximately in middle of bandwidth (start RB = 0 to 24),
// all subframes use 64-QAM and TBS index 26.
// Configure the same settings for DL stream 2.
// Configure also the UL.
// Query the resulting code rates.
// *****************************************************************************
CONF:LTE:SIGN:CONN:PCC:UDTT:DL1:ALL 50,48,45,39,33,27,21,15,9,3,0,0,3,6,9,12,15,
18,21,24,Q64,Q64,Q64,Q64,Q64,Q64,Q64,Q64,Q64,Q64,26,26,26,26,26,26,26,26,26,26
CONF:LTE:SIGN:CONN:PCC:UDTT:DL2:ALL 50,48,45,39,33,27,21,15,9,3,0,0,3,6,9,12,15,
18,21,24,Q64,Q64,Q64,Q64,Q64,Q64,Q64,Q64,Q64,Q64,26,26,26,26,26,26,26,26,26,26
CONF:LTE:SIGN:CONN:PCC:UDTT:UL:ALL 50,45,40,36,30,24,18,12,8,3,0,2,5,7,10,13,16,
    19,21,24,Q16,Q16,Q16,Q16,Q16,Q16,Q16,Q16,Q16,Q16,19,19,19,19,19,19,19,19,19,19
SENSe:LTE:SIGN:CONNection:PCC:UDTTibased:DL1:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:PCC:UDTTibased:DL2:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:PCC:UDTTibased:UL:CRATe:ALL?

// *****************************************************************************
// Instead of configuring the same settings for stream 1 and stream 2, you can
// apply the stream 1 settings to all streams and skip the "DL2" commands.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:DLEQual ON
```

2.5.1.19 Configuring CQI DL Channels

The following commands configure the PCC. To configure the SCC number <n>, substitute `:PCC:` by `:SCC<n>:`.

```
// *****************************************************************************
// Use tables with 256-QAM.
// *****************************************************************************
```

```
CONFigure:LTE:SIGN:CONNection:PCC:QAM256:DL ON

// *****************************************************************************
// Fixed CQI downlink channels: Select scheduling type.
// Configure subframe number 3 and 4, both PCC DL streams.
// For uplink, see TTI-based user-defined channels.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe CQI, TTIBased
CONFigure:LTE:SIGN:CONNection:PCC:FCTTibased:DL1 3,15,12,10
CONFigure:LTE:SIGN:CONNection:PCC:FCTTibased:DL1 4,15,12,10
CONFigure:LTE:SIGN:CONNection:PCC:FCTTibased:DL2 3,15,12,10
CONFigure:LTE:SIGN:CONNection:PCC:FCTTibased:DL2 4,15,12,10

// *****************************************************************************
// Fixed CQI downlink channels - configure all subframes for PCC DL stream 1:
// decreasing number of RBs (50 to 3 for subframe 0 to 9),
// position approximately in middle of bandwidth (start RB = 0 to 24),
// CQI index from 15 to 6.
// Configure the same settings for DL stream 2.
// *****************************************************************************
CONF:LTE:SIGN:CONN:PCC:FCTT:DL1:ALL 50,48,45,39,33,27,21,15,9,3,0,0,3,6,9,12,15,
    18,21,24,15,14,13,12,11,10,9,8,7,6
CONF:LTE:SIGN:CONN:PCC:FCTT:DL2:ALL 50,48,45,39,33,27,21,15,9,3,0,0,3,6,9,12,15,
    18,21,24,15,14,13,12,11,10,9,8,7,6

// *****************************************************************************
// Instead of configuring the same settings for stream 1 and stream 2, you can
// apply the stream 1 settings to all streams and skip the "DL2" commands.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:DLEQual ON

// *****************************************************************************
// Follow WB CQI PCC downlink channels: Select scheduling type.
// Configure the global settings, including user-defined mapping tables.
// Contiguous RB allocation and alternatively multi-cluster DL allocation.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe CQI,FWB
CONFigure:LTE:SIGN:CONNection:PCC:FWBCqi:DL:STTI ON,ON,ON,ON,ON,OFF,ON,ON,ON,ON
CONFigure:LTE:SIGN:CONNection:PCC:FWBCqi:DL 50,0,UDEF    //or multi-cluster:
CONFigure:LTE:SIGN:CONNection:PCC:FWBCqi:MCLuster:DL #B10101101011010111,UDEF
CONF:LTE:SIGN:CONN:PCC:FWBC:DL:MCST:UDEF 0,1,2,3,6,7,9,13,14,16,19,22,24,27,27
CONF:LTE:SIGN:CONN:PCC:FWBCqi:DL:MCSTable:CSIRs:UDEFined
    0,1,3,5,7,10,12,14,17,19,21,22,24,25,25
CONF:LTE:SIGN:CONN:PCC:FWBCqi:DL:MCSTable:SSUBframe:UDEFined
    0,1,3,5,7,10,12,14,17,19,21,22,24,25,25

// *****************************************************************************
// Follow WB PMI PCC downlink channels: Select scheduling type.
// Configure the scheduling.
// Contiguous RB allocation and alternatively multi-cluster DL allocation.
```

```
// ******************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe CQI,FPMI ON,ON,ON,ON,ON,ON,ON,ON,ON,ON
CONFigure:LTE:SIGN:CONNection:PCC:FPMI:DL:STTI
CONFigure:LTE:SIGN:CONNection:PCC:FPMI:DL 50,0,Q16,11    //or multi-cluster:
CONFigure:LTE:SIGN:CONNection:PCC:FPMI:MCLuster:DL #B10101101011010111,Q16,11

// ******************************************************************************
// Follow WB PMI-RI PCC downlink channels: Select scheduling type.
// Configure the RB allocation.
// Contiguous RB allocation and alternatively multi-cluster DL allocation.
// ******************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe CQI,FPRI
CONFigure:LTE:SIGN:CONNection:PCC:FPRI:DL:STTI ON,ON,ON,ON,ON,ON,ON,ON,ON,ON
CONFigure:LTE:SIGN:CONNection:PCC:FPRI:DL 50,0,Q16,11    //or multi-cluster:
CONFigure:LTE:SIGN:CONNection:PCC:FPRI:MCLuster:DL #B10101101011010111,Q16,11

// ******************************************************************************
// Follow WB CQI-RI PCC downlink channels: Select scheduling type.
// Configure the global settings, including user-defined mapping tables.
// Contiguous RB allocation and alternatively multi-cluster DL allocation.
// ******************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe CQI,FCRI
CONFigure:LTE:SIGN:CONNection:PCC:FCRI:DL:STTI ON,ON,ON,ON,ON,OFF,ON,ON,ON,ON
CONFigure:LTE:SIGN:CONNection:PCC:FCRI:DL 50,0,UDEF    //or multi-cluster:
CONFigure:LTE:SIGN:CONNection:PCC:FCRI:MCLuster:DL #B10101101011010111,UDEF
CONF:LTE:SIGN:CONN:PCC:FCRI:DL:MCST:UDEF 0,1,2,3,6,7,9,13,14,16,19,22,24,27,28
CONF:LTE:SIGN:CONN:PCC:FCRI:DL:MCSTable:SSUBframe:UDEFined
    0,1,2,3,6,7,9,13,14,16,19,22,24,27,28

// ******************************************************************************
// Follow WB CQI-PMI-RI PCC downlink channels: Select scheduling type.
// Configure the global settings, including user-defined mapping tables.
// Contiguous RB allocation and alternatively multi-cluster DL allocation.
// ******************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe CQI,FCPRi
CONFigure:LTE:SIGN:CONNection:PCC:FCPRi:DL:STTI ON,ON,ON,ON,ON,OFF,ON,ON,ON,ON
CONFigure:LTE:SIGN:CONNection:PCC:FCPRi:DL 50,0,UDEF    //or multi-cluster:
CONFigure:LTE:SIGN:CONNection:PCC:FCPRi:MCLuster:DL #B10101101011010111,UDEF
CONF:LTE:SIGN:CONN:PCC:FCPRi:DL:MCST:UDEF 0,1,2,3,6,7,9,13,14,16,19,22,24,27,28
CONF:LTE:SIGN:CONN:PCC:FCPRi:DL:MCST:CSIRs:UDEFined
    0,1,3,5,7,10,12,14,17,19,21,22,24,25,25
CONF:LTE:SIGN:CONN:PCC:FCPRi:DL:MCST:SSUBframe:UDEFined
    0,1,2,3,6,7,9,13,14,16,19,22,24,27,28
```

2.5.1.20 Configuring SPS

```
// ******************************************************************************
// Select the scheduling type and configure twoIntervalsConfig for TDD.
// Configure the periodicity, DL RB allocation and UL RB allocation.
```

```
// Query the resulting code rates and expected throughput.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:STYPe SPS
CONFigure:LTE:SIGN:CONNection:PCC:SPS:TIConfig ON
CONFigure:LTE:SIGN:CONNection:PCC:SPS:SINTerval S20
CONFigure:LTE:SIGN:CONNection:PCC:SPS:DL 10,20,QPSK,9
CONFigure:LTE:SIGN:CONNection:PCC:SPS:UL 10,20,QPSK,9
SENSe:LTE:SIGN:CONNection:PCC:SPS:DL:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:PCC:SPS:UL:CRATe:ALL?
SENSe:LTE:SIGN:CONNection:ETHRoughput:DL:ALL?
SENSe:LTE:SIGN:CONNection:ETHRoughput:UL?
```

2.5.1.21 Configuring CQI Reporting

```
// *****************************************************************************
// Enable periodic CQI reporting, set the CSI reporting mode,
// enable PMI/RI reporting and set the cqi-pmi-ConfigIndex for PCC
// and SCC1, FDD and TDD. Query the reporting period and reporting offset
// resulting for the active duplex mode.
// *****************************************************************************
CONFigure:LTE:SIGN:CQIReporting:ENABle PER
CONFigure:LTE:SIGN:CQIReporting:CSIRmode S2
CONFigure:LTE:SIGN:CQIReporting:PRIReporting:ENABle ON
CONFigure:LTE:SIGN:CQIReporting:PCC:CINDex:FDD 17
CONFigure:LTE:SIGN:CQIReporting:SCC:CINDex:FDD 13
CONFigure:LTE:SIGN:CQIReporting:PCC:CINDex:TDD 17
CONFigure:LTE:SIGN:CQIReporting:SCC:CINDex:TDD 13
SENSe:LTE:SIGN:CQIReporting:PCC:RPERiod?
SENSe:LTE:SIGN:CQIReporting:PCC:ROFFset?
SENSe:LTE:SIGN:CQIReporting:SCC:RPERiod?
SENSe:LTE:SIGN:CQIReporting:SCC:ROFFset?
```

2.5.1.22 Configuring Measurement Reports

```
// *****************************************************************************
// Set reporting interval, enable measurement gaps, set gap period,
// filter coefficient RSRP, filter coefficient RSRQ, WCDMA measurement quantity
// and SCell measurement cycle. Enable measurement reports.
// *****************************************************************************
CONFigure:LTE:SIGN:UEReport:RINTerval I640
CONFigure:LTE:SIGN:UEReport:MGENable ON
CONFigure:LTE:SIGN:UEReport:MGPeriod G080
CONFigure:LTE:SIGN:UEReport:FCOefficient:RSRP FC4
CONFigure:LTE:SIGN:UEReport:FCOefficient:RSRQ FC4
CONFigure:LTE:SIGN:UEReport:WMQuantity ECNO
CONFigure:LTE:SIGN:UEReport:MCSCell SF640
CONFigure:LTE:SIGN:UEReport:ENABle ON
```

2.5.1.23 Configuring Message Monitoring

```
// *****************************************************************************
// Enable message monitoring for LTE, select address number 2 from the global
// logging PC address pool and query the corresponding IP address string.
// *****************************************************************************
CONFigure:LTE:SIGN:MMONitor:ENABle ON
CONFigure:LTE:SIGN:MMONitor:IPADdress IP2
CONFigure:LTE:SIGN:MMONitor:IPADdress?
```

2.5.1.24 Configuring the Cell Broadcast Service

```
// *****************************************************************************
// Set the message type. Query the resulting message ID and configure the
// serial number.
// *****************************************************************************
CONFigure:LTE:SIGN:CBS:MESSage:IDTYpe AAMB
CONFigure:LTE:SIGN:CBS:MESSage:ID?
CONFigure:LTE:SIGN:CBS:MESSage:SERial PLMN, 1, OFF, 0

// *****************************************************************************
// Select the data source, enter the message text, query the coding group and
// set the language.
// *****************************************************************************
CONFigure:LTE:SIGN:CBS:MESSage:SOURce INTernal
CONFigure:LTE:SIGN:CBS:MESSage:DATA "Warning! This is a test!"
CONFigure:LTE:SIGN:CBS:MESSage:CGRoup?
CONFigure:LTE:SIGN:CBS:MESSage:LANGuage 1,"English"

// *****************************************************************************
// Configure ETWS-specific settings.
// *****************************************************************************
CONFigure:LTE:SIGN:CBS:MESSage:ETWS:ALERt ON
CONFigure:LTE:SIGN:CBS:MESSage:ETWS:POPup ON

// *****************************************************************************
// Enable cell broadcast messages.
// *****************************************************************************
CONFigure:LTE:SIGN:CBS:MESSage:ENABle ON
```

2.5.1.25 Attaching the UE and Activating SCCs

```
// *****************************************************************************
// Connect the UE (switched off). Switch on the DL signal. Query the cell
// state until it equals ON,ADJ (DL signal available at RF connector).
// *****************************************************************************
WAITKEY >Ensure that the UE is connected to the instrument and switched off<
SOURce:LTE:SIGN:CELL:STATe ON
WHILE SOURce:LTE:SIGN:CELL:STATe:ALL? <> "ON,ADJ"
```

```
// *****************************************************************************
// Switch on the UE and wait until it is attached (connection state = ATT).
// *****************************************************************************
WAITKEY >Switch on the UE<
WHILE FETCh:LTE:SIGN:PSWitched:STATe? <> "ATT"

// *****************************************************************************
// Query the RRC connection state.
// *****************************************************************************
SENSe:LTE:SIGN:RRCState?

// *****************************************************************************
// Query the SCC1 state. The SCC connection is set up automatically after attach
// if: a carrier aggregation scenario is active, the SCC activation mode is
// "AUTO" and keep RRC connection is enabled.
// *****************************************************************************
FETCh:LTE:SIGN:SCC1:STATe?
```

2.5.1.26 Configuring the I/Q Settings

The following commands configure the PCC. To configure the SCC number <n>, substitute `:PCC:` by `:SCC<n>:`.

```
// *****************************************************************************
// Query the properties of the outgoing baseband signal, required to configure
// the baseband input of the connected instrument. Configure the baseband input
// according to the baseband output of the connected instrument.
// *****************************************************************************
SENSe:LTE:SIGN:IQOut:PCC:PATH1?
SENSe:LTE:SIGN:IQOut:PCC:PATH2?
CONFigure:LTE:SIGN:IQIN:PCC:PATH1 -30, -20
CONFigure:LTE:SIGN:IQIN:PCC:PATH2 -30, -20
```

2.5.1.27 Setting Up a Test Mode Connection

This section is only relevant for test mode connections, not for data application tests.

```
// *****************************************************************************
// Set up a mobile-terminated test mode connection.
// Query the connection state until it equals CEST (connection established).
// Query the IPv4 addresses assigned to the UE.
// *****************************************************************************
CALL:LTE:SIGN:PSWitched:ACTion CONNect
WHILE FETCh:LTE:SIGN:PSWitched:STATe? <> "CEST"
SENSe:LTE:SIGN:UESinfo:UEADdress:IPV4?
```

After the connection has been established, you can e.g.:

- Perform an LTE multi-evaluation measurement (option R&S CMW-KM500/-KM550)
- Perform a BLER measurement, see Chapter 2.5.2, "BLER Tests", on page 294

- Modify parameters, see Chapter 2.5.1.37, "Modifying Parameters for an Established Connection", on page 292

2.5.1.28 Connecting/Releasing Dedicated Bearers

This section is only relevant for data application tests, not for test mode connections.

```
// *****************************************************************************
// Query a list of established default bearers.
// Configure a dedicated bearer.
// Establish the dedicated bearer.
// *****************************************************************************
CATalog:LTE:SIGN:CONNection:DEFBearer?
PREPare:LTE:SIGN:CONN:DEDBearer "5 (cmw500.rohde-schwarz.com)", DRAM, 10, 20
CALL:LTE:SIGN:PSWitched:ACTion CONNect

// *****************************************************************************
// Query a list of established dedicated bearers.
// Select a dedicated bearer.
// Release the selected dedicated bearer.
// *****************************************************************************
CATalog:LTE:SIGN:CONNection:DEDBearer?
CONFigure:LTE:SIGN:CONNection:DEDBearer "6 (->5, DRAM)"
CALL:LTE:SIGN:PSWitched:ACTion DISConnect
```

2.5.1.29 Querying UE Measurement Report Contents

```
// *****************************************************************************
// Query UE measurement report values for the serving LTE cell and
// for the first neighbor cell of each technology, PCC and SCC1.
// *****************************************************************************
SENSe:LTE:SIGN:UEReport:PCC:SCELl?
SENSe:LTE:SIGN:UEReport:SCC:SCELl?
SENSe:LTE:SIGN:UEReport:PCC:SCELl:RANGe?
SENSe:LTE:SIGN:UEReport:SCC:SCELl:RANGe?
SENSe:LTE:SIGN:UEReport:NCELl:LTE:CELL1?
SENSe:LTE:SIGN:UEReport:NCELl:LTE:CELL1:RANGe?
SENSe:LTE:SIGN:UEReport:NCELl:GSM:CELL1?
SENSe:LTE:SIGN:UEReport:NCELl:GSM:CELL1:RANGe?
SENSe:LTE:SIGN:UEReport:NCELl:WCDMa:CELL1?
SENSe:LTE:SIGN:UEReport:NCELl:WCDMa:CELL1:RANGe?
SENSe:LTE:SIGN:UEReport:NCELl:CDMA:CELL1?
SENSe:LTE:SIGN:UEReport:NCELl:EVDO:CELL1?
SENSe:LTE:SIGN:UEReport:NCELl:TDSCdma:CELL1?
SENSe:LTE:SIGN:UEReport:NCELl:TDSCdma:CELL1:RANGe?
```

2.5.1.30 Querying UE Information

```
// *****************************************************************************
// Query all UE information results.
// *****************************************************************************
SENSe:LTE:SIGN:UESinfo:IMEI?
SENSe:LTE:SIGN:UESinfo:IMSI?
SENSe:LTE:SIGN:UESinfo:VDPReference?
SENSe:LTE:SIGN:UESinfo:UEUSage?
SENSe:LTE:SIGN:UESinfo:UEADdress:IPV4?
SENSe:LTE:SIGN:UESinfo:UEADdress:IPV6?
SENSe:LTE:SIGN:UESinfo:UEADdress:DEDBearer:SEParate?
```

2.5.1.31 Querying UE Capability Report Contents

```
// *****************************************************************************
// Query general UE capability information.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:ASRelease?
SENSe:LTE:SIGN:UECapability:UECategory?
SENSe:LTE:SIGN:UECapability:UECategory:UL?
SENSe:LTE:SIGN:UECapability:UECategory:DL?
SENSe:LTE:SIGN:UECapability:FGINdicators?
SENSe:LTE:SIGN:UECapability:FAUeeutra:FGINdicators?
SENSe:LTE:SIGN:UECapability:TAUeeutra:FGINdicators?
SENSe:LTE:SIGN:UECapability:FGINdicators:RNADd?
SENSe:LTE:SIGN:UECapability:FAUeeutra:FGINdicators:RNADd?
SENSe:LTE:SIGN:UECapability:TAUeeutra:FGINdicators:RNADd?
SENSe:LTE:SIGN:UECapability:FGINdicators:RTEN?
SENSe:LTE:SIGN:UECapability:FAUeeutra:FGINdicators:RTEN?
SENSe:LTE:SIGN:UECapability:TAUeeutra:FGINdicators:RTEN?
SENSe:LTE:SIGN:UECapability:DTYPe?
SENSe:LTE:SIGN:UECapability:RREPort?

// *****************************************************************************
// Query PDCP UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:PDCP:SRPRofiles?
SENSe:LTE:SIGN:UECapability:PDCP:MRCSessions?
SENSe:LTE:SIGN:UECapability:PDCP:SNEXtension?
SENSe:LTE:SIGN:UECapability:PDCP:SRCContinue?

// *****************************************************************************
// Query physical layer UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:PLAYer:UTASupported?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:UTASupported?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:UTASupported?
SENSe:LTE:SIGN:UECapability:PLAYer:USRSsupport?
```

```
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:USRSsupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:USRSsupport?
SENSe:LTE:SIGN:UECapability:PLAYer:EDLFsupport?
SENSe:LTE:SIGN:UECapability:PLAYer:EDLTsupport?
SENSe:LTE:SIGN:UECapability:PLAYer:TAPPsupport?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:TAPPsupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:TAPPsupport?
SENSe:LTE:SIGN:UECapability:PLAYer:TWEFsupport?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:TWEFsupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:TWEFsupport?
SENSe:LTE:SIGN:UECapability:PLAYer:PDSupport?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:PDSupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:PDSupport?
SENSe:LTE:SIGN:UECapability:PLAYer:CCSSupport?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:CCSSupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:CCSSupport?
SENSe:LTE:SIGN:UECapability:PLAYer:SPPSupport?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:SPPSupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:SPPSupport?
SENSe:LTE:SIGN:UECapability:PLAYer:MCPCsupport?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:MCPCsupport?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:MCPCsupport?
SENSe:LTE:SIGN:UECapability:PLAYer:NURClist?
SENSe:LTE:SIGN:UECapability:FAUeeutra:PLAYer:NURClist?
SENSe:LTE:SIGN:UECapability:TAUeeutra:PLAYer:NURClist?
SENSe:LTE:SIGN:UECapability:PLAYer:CIHandl?
SENSe:LTE:SIGN:UECapability:PLAYer:EPDCch?
SENSe:LTE:SIGN:UECapability:PLAYer:MACReporting?
SENSe:LTE:SIGN:UECapability:PLAYer:SCIHandl?
SENSe:LTE:SIGN:UECapability:PLAYer:TSSubframe?
SENSe:LTE:SIGN:UECapability:PLAYer:TDPChselect?
SENSe:LTE:SIGN:UECapability:PLAYer:ULComp?
SENSe:LTE:SIGN:UECapability:PLAYer:ITCWithdiff?
SENSe:LTE:SIGN:UECapability:PLAYer:EHPFdd?
SENSe:LTE:SIGN:UECapability:PLAYer:EFTCodebook?
SENSe:LTE:SIGN:UECapability:PLAYer:TFCPcelldplx?
SENSe:LTE:SIGN:UECapability:PLAYer:TRCTddpcell?
SENSe:LTE:SIGN:UECapability:PLAYer:TRCFddpcell?
SENSe:LTE:SIGN:UECapability:PLAYer:PFMode?
SENSe:LTE:SIGN:UECapability:PLAYer:PSPSfset?
SENSe:LTE:SIGN:UECapability:PLAYer:CSFSet?
SENSe:LTE:SIGN:UECapability:PLAYer:NRRT?
SENSe:LTE:SIGN:UECapability:PLAYer:DSDCell?

// *****************************************************************************
// Query RF UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:RF:SUPPorted?
SENSe:LTE:SIGN:UECapability:RF:HDUPlex?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:BCSet?
```

```
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa1?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa2?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa3?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa4?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa1:BCLass:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa2:BCLass:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa3:BCLass:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa4:BCLass:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa1:BCLass:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa2:BCLass:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa3:BCLass:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa4:BCLass:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa1:MCAPability:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa2:MCAPability:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa3:MCAPability:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa4:MCAPability:UL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa1:MCAPability:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa2:MCAPability:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa3:MCAPability:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1020:EUTRa4:MCAPability:DL?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1090:EUTRa1?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1090:EUTRa2?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1090:EUTRa3?
SENSe:LTE:SIGN:UECapability:RF:BCOMbination:V1090:EUTRa4?
SENSe:LTE:SIGN:UECapability:RF:FBRetrieval?
SENSe:LTE:SIGN:UECapability:RF:RBANds?
SENSe:LTE:SIGN:UECapability:RF:FBPadjust?

// *****************************************************************************
// Query measurement UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:MEAS:IFNGaps?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:UFDD?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:UTDD128?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:GERan?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:CHRPd?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:CXRTt?
SENSe:LTE:SIGN:UECapability:MEAS:IFNGaps:V1020?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:V1020:UFDD?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:V1020:UTDD128?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:V1020:GERan?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:V1020:CHRPd?
SENSe:LTE:SIGN:UECapability:MEAS:IRNGaps:V1020:CXRTt?
SENSe:LTE:SIGN:UECapability:MEAS:RMWideband?
SENSe:LTE:SIGN:UECapability:MEAS:BFINterrupt?

// *****************************************************************************
// Query inter-RAT UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:IRAT:UFDD:SUPPorted?
```

```
SENSe:LTE:SIGN:UECapability:IRAT:UFDD:EREDirection:UTRA?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:EREDirection:UTRA?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:EREDirection:UTRA?
SENSe:LTE:SIGN:UECapability:IRAT:UTDD128:SUPPorted?
SENSe:LTE:SIGN:UECapability:IRAT:UTDD128:EREDirection:UTDD?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:EREDirection:UTDD?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:EREDirection:UTDD?
SENSe:LTE:SIGN:UECapability:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN:UECapability:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN:UECapability:IRAT:GERan:DTM?
SENSe:LTE:SIGN:UECapability:IRAT:GERan:EREDirection?
SENSe:LTE:SIGN:UECapability:IRAT:CDMA2000:NWSHaring?
SENSe:LTE:SIGN:UECapability:IRAT:CHRPd:SUPPorted?
SENSe:LTE:SIGN:UECapability:IRAT:CHRPd:TCONfig?
SENSe:LTE:SIGN:UECapability:IRAT:CHRPd:RCONfig?
SENSe:LTE:SIGN:UECapability:IRAT:CXRTt:SUPPorted?
SENSe:LTE:SIGN:UECapability:IRAT:CXRTt:TCONfig?
SENSe:LTE:SIGN:UECapability:IRAT:CXRTt:RCONfig?
SENSe:LTE:SIGN:UECapability:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN:UECapability:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN:UECapability:IRAT:CXRTt:ECDual?
SENSe:LTE:SIGN:UECapability:FAUeeutra:IRAT:CXRTt:ECDual?
SENSe:LTE:SIGN:UECapability:TAUeeutra:IRAT:CXRTt:ECDual?

// *****************************************************************************
// Query other UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:IDCindex?
SENSe:LTE:SIGN:UECapability:PPINdex?
SENSe:LTE:SIGN:UECapability:URTTimediff?
SENSe:LTE:SIGN:UECapability:DCIulca?

// *****************************************************************************
// Query MBMS UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:MBMS:SCELl?
SENSe:LTE:SIGN:UECapability:MBMS:NSCell?

// *****************************************************************************
// Query CSG proximity indication UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:CPINdication:FREQuency:INTRa?
```

```
SENSe:LTE:SIGN:UECapability:CPINdication:FREQuency:INTer?
SENSe:LTE:SIGN:UECapability:CPINdication:UTRan?

// *****************************************************************************
// Query neighbor cell SI-acquisition UE capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN:UECapability:FAUeeutra:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN:UECapability:TAUeeutra:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN:UECapability:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN:UECapability:FAUeeutra:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN:UECapability:TAUeeutra:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN:UECapability:NCSacq:UTRan?
SENSe:LTE:SIGN:UECapability:FAUeeutra:NCSacq:UTRan?
SENSe:LTE:SIGN:UECapability:TAUeeutra:NCSacq:UTRan?

// *****************************************************************************
// Query UE-based network performance measurement capabilities.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:UBNPmeas:LMIDle?
SENSe:LTE:SIGN:UECapability:UBNPmeas:SGLocation?
SENSe:LTE:SIGN:UECapability:LMMeas?

// *****************************************************************************
// Query UE capabilities for RLC.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:ERLField?

// *****************************************************************************
// Query UE capabilities for WLAN interworking.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:WIW:WIRRules?
SENSe:LTE:SIGN:UECapability:WIW:WIAPolicies?

// *****************************************************************************
// Query UE capabilities for dual connectivity.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:DCParameters:DTSPlit?
SENSe:LTE:SIGN:UECapability:DCParameters:DTSCg?

// *****************************************************************************
// Query UE capabilities for MAC layer.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:MAC:LCSPtimer?
SENSe:LTE:SIGN:UECapability:MAC:LDRXcommand?

// *****************************************************************************
// Query UE capabilities for sidelink communication.
// *****************************************************************************
SENSe:LTE:SIGN:UECapability:SL:CSTX?
```

```
SENSe:LTE:SIGN:UECapability:SL:DSRalloc?
SENSe:LTE:SIGN:UECapability:SL:DUSRalloc?
SENSe:LTE:SIGN:UECapability:SL:DSLSs?
SENSe:LTE:SIGN:UECapability:SL:DSPRoc?
```

2.5.1.32 Performing an Intra-RAT Handover

```
// ******************************************************************************
// An intra-RAT handover is a handover within the LTE signaling application.
//
// Select the LTE signaling application as handover destination.
// Define the destination parameters: band 2, DL channel no. 910,
// 10 MHz cell bandwidth, additional requirement NS_03.
// Initiate the handover.
// ******************************************************************************
PREPare:LTE:SIGN:HANDover:DESTination "LTE Sig1"
PREPare:LTE:SIGN:HANDover OB2, 910, B100, NS03
CALL:LTE:SIGN:PSWitched:ACTion HANDover
```

2.5.1.33 Performing an Inter-RAT Handover

```
// ******************************************************************************
// An inter-RAT handover is a handover to another signaling application.
//
// Query a list of possible handover destinations (signaling applications).
// Select a handover destination from the list.
// Select the handover mechanism.
// Wait until the destination is ready to receive a handover.
// Initiate the handover.
//
// Destination parameters like operating band or channel can be changed using
// commands provided by the destination signaling application. Adjust these
// parameters before executing the following commands.
// ******************************************************************************
PREPare:LTE:SIGN:HANDover:CATalog:DESTination?
PREPare:LTE:SIGN:HANDover:DESTination "GSM Sig1"
PREPare:LTE:SIGN:HANDover:MMODe REDirection
WHILE SOURce:GSM:SIGN:CELL:STATe? <> "RFH"
CALL:LTE:SIGN:PSWitched:ACTion HANDover
```

2.5.1.34 Performing a Handover to Another Instrument

```
// ******************************************************************************
// Select handover to other instrument ("No Connection").
// Select target RAT (WCDMA) and configure the other destination settings.
// Initiate the handover.
// Prepare also the settings for other target RATs.
// ******************************************************************************
```

```
PREPare:LTE:SIGN:HANDover:DESTination "No Connection"
PREPare:LTE:SIGN:HANDover:EXTernal:DESTination WCDMa
PREPare:LTE:SIGN:HANDover:EXTernal:WCDMa OB1, 10565
CALL:LTE:SIGN:PSWitched:ACTion HANDover

PREPare:LTE:SIGN:HANDover:EXTernal:CDMA USC, 500
PREPare:LTE:SIGN:HANDover:EXTernal:EVDO USC, 500
PREPare:LTE:SIGN:HANDover:EXTernal:GSM G09, 55, G18
PREPare:LTE:SIGN:HANDover:EXTernal:LTE OB1, 300
PREPare:LTE:SIGN:HANDover:EXTernal:TDSCdma OB1, 10565
```

2.5.1.35 Sending / Receiving a Short Message

```
// *****************************************************************************
// Configure support of concatenated SMS.
// *****************************************************************************
CONFigure:LTE:SIGN:SMS:OUTGoing:LHANdling MSMS

// *****************************************************************************
// Configure outgoing messages directly:
// ASCII message text, binary message contents, TP-PID, data coding,
// user data header, coding group, message class,
// SC address, originating address, service center time stamp.
// Send the message and query whether the transmission was successful.
// *****************************************************************************
CONFigure:LTE:SIGN:SMS:OUTGoing:MESHandling INTernal
CONFigure:LTE:SIGN:SMS:OUTGoing:INTernal "Testing SMS 012!.#\*%+-/()<>?=;@$,"
CONFigure:LTE:SIGN:SMS:OUTGoing:BINary #H0125498fa3bc8d348
CONFigure:LTE:SIGN:SMS:OUTGoing:PIDentifier #H0
CONFigure:LTE:SIGN:SMS:OUTGoing:DCODing BIT7
CONFigure:LTE:SIGN:SMS:OUTGoing:UDHeader #H050415820000
CONFigure:LTE:SIGN:SMS:OUTGoing:CGRoup GDCoding
CONFigure:LTE:SIGN:SMS:OUTGoing:MCLass CL2
CONFigure:LTE:SIGN:SMS:OUTGoing:OSADdress '543221'
CONFigure:LTE:SIGN:SMS:OUTGoing:OADDress '3526735'
CONFigure:LTE:SIGN:SMS:OUTGoing:SCTStamp:TSOurce DATE
CONFigure:LTE:SIGN:SMS:OUTGoing:SCTStamp:DATE 15,5,2014
CONFigure:LTE:SIGN:SMS:OUTGoing:SCTStamp:TIME 14,40,50
CALL:LTE:SIGN:PSWitched:ACTion SMS; *OPC?
SENSe:LTE:SIGN:SMS:OUTGoing:INFO:LMSent?

// *****************************************************************************
// Reset parameters related to an already received short message.
// Wait until a message from the UE has been received.
// Query information about the received message: encoding, message content,
// message length, message segments.
// *****************************************************************************
CLEan:LTE:SIGN:SMS:INComing:INFO:MTEXt
WAITKEY >Send short message from UE<
```

```
WHILE SENSe:LTE:SIGN:SMS:INFO:LRMessage:RFLag? <> "OFF"
SENSe:LTE:SIGN:SMS:INComing:INFO:DCODing?
SENSe:LTE:SIGN:INComing:INFO:MTEXt?
SENSe:LTE:SIGN:SMS:INComing:INFO:MLENgth?
SENSe:LTE:SIGN:SMS:INComing:INFO:SEGMent?

// *****************************************************************************
// Configure outgoing messages via a file:
// Select message file and query file information.
// *****************************************************************************
CONFigure:LTE:SIGN:SMS:OUTGoing:MESHandling FILE
CONFigure:LTE:SIGN:SMS:OUTGoing:FILE "@USERDATA\sms\LTE\Send\myfile.sms"
CONFigure:LTE:SIGN:SMS:OUTGoing:FILE:INFO?

// *****************************************************************************
// Get information about an old received short message:
// Select a message file and query information about it.
// *****************************************************************************
CONFigure:LTE:SIGN:SMS:INComing:FILE "@USERDATA\sms\LTE\Received\rx_001.sms"
CONFigure:LTE:SIGN:SMS:INComing:FILE:INFO?
```

2.5.1.36 Sending Date and Time Information to the UE

```
// *****************************************************************************
// Select a time source and configure date, time, DST and time zone offset.
// Enable sending of the information during attach.
// Send the information to the UE now.
// *****************************************************************************
CONFigure:LTE:SIGN:CELL:TIME:TSOurce DATE
CONFigure:LTE:SIGN:CELL:TIME:DATE 24,10,2012
CONFigure:LTE:SIGN:CELL:TIME:TIME 12,40,30
CONFigure:LTE:SIGN:CELL:TIME:DSTime P1H
CONFigure:LTE:SIGN:CELL:TIME:LTZoffset 1
CONFigure:LTE:SIGN:CELL:TIME:SATTach ON
CONFigure:LTE:SIGN:CELL:TIME:SNOW
```

2.5.1.37 Modifying Parameters for an Established Connection

```
// *****************************************************************************
// Modify inserted transport block errors and additional spectrum emission
// requirements. Set PCC scheduling type to 3GPP-compliant RMC.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:DLEinsertion 20
CONFigure:LTE:SIGN:CONNection:ASEMission NS03
CONFigure:LTE:SIGN:CONNection:PCC:STYPe RMC

// *****************************************************************************
// Redefine the PCC RMCs: DL RMC with 50 RBs, 64-QAM modulation and
// transport block size index 5. UL RMC with 50 RBs, QPSK modulation and
```

```
// block size index 6.
// Position the resource blocks at the lower end of the channel bandwidth.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:PCC:RMC:DL N50,QPSK,T5
CONFigure:LTE:SIGN:CONNection:PCC:RMC:UL N50,QPSK,T6
CONFigure:LTE:SIGN:CONNection:PCC:RMC:RBPosition:DL LOW
CONFigure:LTE:SIGN:CONNection:PCC:RMC:RBPosition:UL LOW

// *****************************************************************************
// Modify the RS EPRE level for the PCC.
// *****************************************************************************
CONFigure:LTE:SIGN:DL:PCC:RSEPre:LEVel -83

// *****************************************************************************
// Command the UE to change the UL power of the PCC by +3 dB:
// Select single pattern as active TPC setup, define a single pattern of
// 3 steps UP, execute the pattern.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:SET SINGle
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:SINGle 3, UP
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:PEXecute

// *****************************************************************************
// Apply a continuous TPC command pattern of 5x -1 dB and 4x +1 dB:
// Define the pattern and select the active TPC setup.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:UDPattern 9,-1,-1,-1,-1,-1,1,1,1,1
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:SET UDContinuous

// *****************************************************************************
// Command the UE to a target power of -10 dBm.
// For the SCC, use a 3 dB higher power.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:CLTPower -10
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:SET CLOop
CONFigure:LTE:SIGN:UL:SCC:PUSCh:TPC:CLTPower:OFFSet 3

// *****************************************************************************
// Execute ramping up pattern B for a 3GPP relative power control test.
// *****************************************************************************
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:SET RPControl
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:RPControl RUB
CONFigure:LTE:SIGN:UL:PCC:PUSCh:TPC:PEXecute
```

2.5.2 BLER Tests

The BLER measurement provided by the LTE signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:LTE:SIGN:EBLer:...`
- After a `*RST`, the measurement is switched off.
  You can start the measurement using `INIT:LTE:SIGN:EBLer` and retrieve the results using `FETCh` commands.

The examples in this section focus on commands directly related to the BLER measurement. For general configuration of the signaling application and setting up the connection, refer to Chapter 2.5.1, "General Configuration", on page 262.

2.5.2.1 Configuring a BLER Measurement

```
// *****************************************************************************
// Activate DL padding.
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:DLPadding ON

// *****************************************************************************
// Configure a continuous BLER measurement without stop condition and
// 1000 subframes per measurement cycle. NACK and DTX contribute to the BLER.
// *****************************************************************************
CONFigure:LTE:SIGN:EBLer:SCONdition NONE
CONFigure:LTE:SIGN:EBLer:REPetition CONT
CONFigure:LTE:SIGN:EBLer:SFRames 1000
CONFigure:LTE:SIGN:EBLer:ERCalc ERC1

// *****************************************************************************
// Configure a confidence BLER measurement.
// The stop condition "Confidence Level" sets also the repetition.
// NACK and DTX contribute to the BLER, wait for all carriers,
// no minimum test time, ER limit 5%.
// *****************************************************************************
CONFigure:LTE:SIGN:EBLer:SCONdition CLEV
CONFigure:LTE:SIGN:EBLer:ERCalc ERC1
CONFigure:LTE:SIGN:EBLer:CONFidence:OASCondition ACWait
CONFigure:LTE:SIGN:EBLer:CONFidence:MTTime 0
CONFigure:LTE:SIGN:EBLer:CONFidence:LERate P050
```

2.5.2.2 Performing a Confidence BLER Measurement

```
// *****************************************************************************
// Start a confidence BLER measurement and return the pass/fail results
// for PCC and SCC1.
// *****************************************************************************
CONFigure:LTE:SIGN:EBLer:SCONdition CLEV
```

```
INIT:LTE:SIGN:EBLer
FETCh:LTE:SIGN:EBLer:PCC:CONFidence?
FETCh:LTE:SIGN:EBLer:SCC:CONFidence?
FETCh:LTE:SIGN:EBLer:ALL:CONFidence?
```

2.5.2.3 Performing a Continuous BLER Measurement

```
// *****************************************************************************
// Start a continuous BLER measurement.
// Wait until the measurement is really running.
// *****************************************************************************
CONFigure:LTE:SIGN:EBLer:REPetition CONT
CONFigure:LTE:SIGN:EBLer:SCONdition NONE
INIT:LTE:SIGN:EBLer
WHILE FETCh:LTE:SIGN:EBLer:STATe:ALL? <> "RUN","ADJ","ACT"

// *****************************************************************************
// Monitor intermediate BLER results for a SISO single carrier configuration,
// by sending the following commands periodically.
// *****************************************************************************
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:RELative?

// *****************************************************************************
// Monitor intermediate BLER results for a MIMO configuration with carrier
// aggregation and two carriers, by sending the following commands periodically.
// *****************************************************************************
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:RELative?
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:STReam1:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:STReam2:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:STReam1:RELative?
FETCh:INTermediate:LTE:SIGN:EBLer:PCC:STReam2:RELative?

FETCh:INTermediate:LTE:SIGN:EBLer:SCC:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:SCC:RELative?
FETCh:INTermediate:LTE:SIGN:EBLer:SCC:STReam1:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:SCC:STReam2:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:SCC:STReam1:RELative?
FETCh:INTermediate:LTE:SIGN:EBLer:SCC:STReam2:RELative?

// *****************************************************************************
// Alternatively monitor the sum of all PCC and SCC streams.
// *****************************************************************************
FETCh:INTermediate:LTE:SIGN:EBLer:ALL:ABSolute?
FETCh:INTermediate:LTE:SIGN:EBLer:ALL:RELative?
```

2.5.2.4 Performing a Single-Shot BLER Measurement

```
// *****************************************************************************
// Start a single-shot BLER measurement (one measurement cycle).
// *****************************************************************************
CONFigure:LTE:SIGN:EBLer:REPetition SING
CONFigure:LTE:SIGN:EBLer:SCONdition NONE
INIT:LTE:SIGN:EBLer

// *****************************************************************************
// Return BLER and throughput single results for a SISO single carrier
// configuration.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:ABSolute?
FETCh:LTE:SIGN:EBLer:RELative?

// *****************************************************************************
// Return BLER and throughput single results for a MIMO single carrier
// configuration:
// Overall absolute and relative results, absolute results for stream 1 and
// stream 2, relative results for stream 1 and stream 2.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:PCC:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:RELative?
FETCh:LTE:SIGN:EBLer:PCC:STReam1:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:STReam2:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:STReam1:RELative?
FETCh:LTE:SIGN:EBLer:PCC:STReam2:RELative?

// *****************************************************************************
// Return throughput traces for a MIMO configuration with CA and two carriers:
// Sum of all PCC plus SCC streams, sum of all PCC streams,
// sum of all SCC streams, throughput per stream.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:ALL?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:PCC?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:SCC?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:PCC:STReam1?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:PCC:STReam2?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:SCC:STReam1?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:SCC:STReam2?

// *****************************************************************************
// Return CQI single results for a MIMO configuration with PCC and SCC1.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:PCC:CQIReporting:STReam1?
FETCh:LTE:SIGN:EBLer:PCC:CQIReporting:STReam2?
FETCh:LTE:SIGN:EBLer:SCC:CQIReporting:STReam1?
FETCh:LTE:SIGN:EBLer:SCC:CQIReporting:STReam2?
```

```
// *****************************************************************************
// Return CQI bar graphs and median CQI traces for a MIMO configuration with
// carrier aggregation (PCC and SCC1).
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:TRACe:CQIReporting:PCC:STReam1?
FETCh:LTE:SIGN:EBLer:TRACe:CQIReporting:PCC:STReam2?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:PCC:MCQI:STReam1?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:PCC:MCQI:STReam2?

FETCh:LTE:SIGN:EBLer:TRACe:CQIReporting:SCC:STReam1?
FETCh:LTE:SIGN:EBLer:TRACe:CQIReporting:SCC:STReam2?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:SCC:MCQI:STReam1?
FETCh:LTE:SIGN:EBLer:TRACe:THRoughput:SCC:MCQI:STReam2?

// *****************************************************************************
// Return RI and PMI bar graphs for PCC and SCC1.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:PCC:RI?
FETCh:LTE:SIGN:EBLer:PCC:PMI:RI1?
FETCh:LTE:SIGN:EBLer:PCC:PMI:RI2?

FETCh:LTE:SIGN:EBLer:SCC:RI?
FETCh:LTE:SIGN:EBLer:SCC:PMI:RI1?
FETCh:LTE:SIGN:EBLer:SCC:PMI:RI2?

// *****************************************************************************
// Return uplink BLER results for PCC and SCC1.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:PCC:UPLink?
FETCh:LTE:SIGN:EBLer:SCC:UPLink?

// *****************************************************************************
// Return entire HARQ tables for a MIMO configuration with PCC and SCC1.
// *****************************************************************************
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam1:TRANsmission:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam1:TRANsmission:RELative?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam2:TRANsmission:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam2:TRANsmission:RELative?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam1:SUBFrame:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam1:SUBFrame:RELative?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam2:SUBFrame:ABSolute?
FETCh:LTE:SIGN:EBLer:PCC:HARQ:STReam2:SUBFrame:RELative?

FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam1:TRANsmission:ABSolute?
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam1:TRANsmission:RELative?
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam2:TRANsmission:ABSolute?
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam2:TRANsmission:RELative?
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam1:SUBFrame:ABSolute?
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam1:SUBFrame:RELative?
```

```
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam2:SUBFrame:ABSolute?
FETCh:LTE:SIGN:EBLer:SCC:HARQ:STReam2:SUBFrame:RELative?
```

2.5.3 RLC Throughput Tests

The RLC throughput measurement provided by the LTE signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:LTE:SIGN:THRoughput:...`
- After a `*RST`, the measurement is switched off.
  You can start the measurement using `INIT:LTE:SIGN:THRoughput` and retrieve the results using `FETCh:LTE:SIGN:THRoughput:...?`.

The examples in this section focus on commands directly related to the RLC throughput measurement. For general configuration of the signaling application, refer to Chapter 2.5.1, "General Configuration", on page 262.

2.5.3.1 Configuring an RLC Throughput Measurement

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Configure repetition mode, update interval and window size.
// *****************************************************************************
CONFigure:LTE:SIGN:THRoughput:REPetition SINGleshot
CONFigure:LTE:SIGN:THRoughput:UPDate 200
CONFigure:LTE:SIGN:THRoughput:WINDow 20000

// *****************************************************************************
// Select the data application mode
// *****************************************************************************
CONFigure:LTE:SIGN:CONNection:CTYPe DAPPlication
```

2.5.3.2 Setting Up a Data Connection

Proceed as follows:

1. Configure the other settings of the signaling application compatible to your UE.
2. Configure the data application unit (see DAU documentation).
3. Switch on the cell signal and attach the UE.
4. Set up a data connection.

5. Generate IP traffic, for example using the iperf measurement provided by the DAU.

2.5.3.3 Performing an RLC Throughput Measurement

```
// *****************************************************************************
// Start the measurement and return the contents of the result table.
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:LTE:SIGN:THRoughput
FETCh:LTE:SIGN:THRoughput?
FETCh:LTE:SIGN:THRoughput:STATe?

// *****************************************************************************
// Query the result traces.
// *****************************************************************************
FETCh:LTE:SIGN:THRoughput:TRACe:DL:PDU:CURRent?
FETCh:LTE:SIGN:THRoughput:TRACe:DL:PDU:AVERage?
FETCh:LTE:SIGN:THRoughput:TRACe:UL:PDU:CURRent?
FETCh:LTE:SIGN:THRoughput:TRACe:UL:PDU:AVERage?
```

2.6 Command Reference

The following sections provide detailed reference information on the remote control commands of the LTE signaling application.

- Conventions and General Information....................300
- General Settings....................306
- Connection Control and States....................309
- Event Log....................323
- UE Measurement Report Contents....................324
- UE Capabilities....................332
- UE Info....................376
- Routing Settings....................379
- Internal Fading....................415
- Downlink Power Levels....................425
- Uplink Power Control....................432
- Physical Cell Setup....................445
- Network Settings....................455
- Connection Configuration....................479
- CQI Reporting Settings....................564
- UE Measurement Report Settings....................567
- Messaging (SMS)....................570
- Messaging (CBS)....................578
- Message Monitoring Settings....................584
- BLER Measurement....................585
- RLC Throughput Measurement....................605

2.6.1 Conventions and General Information

The following sections describe the most important conventions and general information concerning the command reference.

2.6.1.1 SIGN<i>

`SIGN<i>` is used as abbreviation of `SIGNaling<instance>`. For better readability, only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The `<instance>` is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW base unit manual, chapter "Remote Control"

2.6.1.2 STReam<s> and DL<s>

Commands that contain a `STReam<s>` or a `DL<s>` mnemonic are related to a single downlink stream.

The suffix `<s>` selects the downlink stream and is only relevant for scenarios with MIMO. For SISO scenarios, you can omit the suffix.

2.6.1.3 PCC and SCC Commands

For carrier aggregation scenarios, many settings are configurable per carrier. The following command variants are relevant in this context:

- A `[:PCC]` command configures the PCC. The command can also be relevant for scenarios without carrier aggregation.
- An `:SCC<c>` command configures the SCC number <c>. For the SCC number 1, you can omit the suffix 1.
- An `:SCC` command configures the SCC number 1. Other SCCs cannot be configured via such a command.

2.6.1.4 Values for Signal Path Selection

When you select a scenario, you also select the signaling units and the signal paths to be used.

To select an RF path, you must specify an RF connector and a TX or RX module (converter).

To select an I/Q path, you must specify a DIG IQ connector, for some scenarios also an I/Q board.

Which connectors and modules can be specified in a command, depends on the installed hardware and the active subinstrument or instance <i>.

This section lists all values available for path selection. Depending on your configuration, only a subset is relevant for you. Virtual connector names are only relevant for setting commands. Queries return the physical connector names.

Additional information is available in the base software documentation. It describes typical instrument configurations with the allowed RF connector - TX/RX module combinations and the mapping of virtual connector names to physical connectors.

See also: "Signal Path Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Single-CMW setup

Selection values:

- Signaling unit:
  `SUW1 | SUW2 | SUW3 | SUW4`
- RX module:
  `RX1 | RX2 | RX3 | RX4`
- TX module:
  `TX1 | TX2 | TX3 | TX4`
- RX connector:
  `RF1C | RF2C | RF3C | RF4C | RFAC | RFBC`
  RF 1 COM to RF 4 COM plus virtual connector names
- TX connector:
  `RF1C | RF2C | RF3C | RF4C | RFAC | RFBC`
  `RF1O | RF3O | RFAO`
  RF 1 COM to RF 4 COM plus virtual connector names
  RF 1 OUT and RF 3 OUT plus virtual connector name
- I/Q output connector:
  `IQ2O | IQ4O | IQ6O | IQ8O`
  DIG IQ OUT 2 to 8
- Fader:
  `FAD1 | FAD2`
  I/Q board 1 with I/Q connectors 1 to 4, I/Q board 2 with I/Q connectors 5 to 8

Multi-CMW setup with R&S CMWC and several R&S CMW500

Selection values:

- Signaling unit:
  `SUW11 | SUW12 | SUW13 | SUW14 | SUW21 | SUW22 | SUW23 | SUW24`
  `SUW31 | SUW32 | SUW33 | SUW34 | SUW41 | SUW42 | SUW43 | SUW44`
  SUW<a><b>: CMW <a>, SUW <b>
  Example `SUW21`: SUW number 1 of CMW 2
- RX module:
  `RX11 | RX12 | RX13 | RX14 | RX21 | RX22 | RX23 | RX24`
  `RX31 | RX32 | RX33 | RX34 | RX41 | RX42 | RX43 | RX44`
  RX<a><b>: CMW <a>, RX <b>
  Example `RX24`: RX module 4 of CMW 2
- TX module:

TX11 | TX12 | TX13 | TX14 | TX21 | TX22 | TX23 | TX24
TX31 | TX32 | TX33 | TX34 | TX41 | TX42 | TX43 | TX44
TX<a><b>: CMW <a>, TX <b>
Example TX13: TX module 3 of CMW 1

- RX connector:
  R11C | R12C | R13C | R14C | R21C | R22C | R23C | R24C
  R31C | R32C | R33C | R34C | R41C | R42C | R43C | R44C
  R<a><b>C: CMW <a>, connector RF <b> COM
  Example R12C: RF 2 COM of CMW 1
- TX connector:
  R11C | R12C | R13C | R14C | R21C | R22C | R23C | R24C
  R31C | R32C | R33C | R34C | R41C | R42C | R43C | R44C
  R11O | R13O | R21O | R23O | R31O | R33O | R41O | R43O
  R<a><b>C: CMW <a>, connector RF <b> COM
  R<a><b>O: CMW <a>, connector RF <b> OUT
  Example R21O: RF 1 OUT of CMW 2
- I/Q output connector:
  I12O | I14O | I16O | I18O | I22O | I24O | I26O | I28O
  I32O | I34O | I36O | I38O | I42O | I44O | I46O | I48O
  I<a><b>O: CMW <a>, connector DIG IQ OUT <b>
  Example I24O: DIG IQ OUT 4 of CMW 2
- Fader:
  FAD11 | FAD12 | FAD21 | FAD22 | FAD31 | FAD32 | FAD41 | FAD42
  FAD<a>1: CMW <a>, I/Q board 1 with I/Q connectors 1 to 4
  FAD<a>2: CMW <a>, I/Q board 2 with I/Q connectors 5 to 8

For CMW 1, you can alternatively use the single-CMW selection values.

2.6.1.5 Keywords

Selected keywords used in the command description are described in the following.

- **Command usage**
  If the usage is not explicitly stated, the command allows you to set parameters and query parameters. Otherwise the command usage is stated as follows:
  – "Setting only": Command can only be used to set parameters.
  – "Query only": Command can only be used to query parameters.
  – "Event": Command initiates an event.
- **Parameter usage**
  The parameter usage is indicated by the keyword preceding the parameters:
  – "Parameters" are sent with a setting or query command and are returned as the result of a query
  – "Setting parameters" are only sent with a setting command
  – "Query parameters" are only sent with a query command (to refine the query)
  – "Return values" are only returned as the result of a query
- **Firmware/Software:**

Indicates the lowest software version supporting the command. Command enhancements in later software versions are also indicated. Indications of enhancements before V3.0.10 have been purged to improve the readability.

2.6.1.6 Reliability Indicator

The first value in the output arrays of `FETCh...?`, `READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 ("OK")**:
  Measurement values available, no error detected.
- **1 ("Measurement Timeout")**:
  The measurement has been stopped after the configured measurement timeout. Measurement results can be available. However, at least a part of the measurement provides only `INValid` results or has not completed the full statistic count.
- **2 ("Capture Buffer Overflow")**:
  The measurement configuration results in a capture length that exceeds the available memory.
- **3 ("Overdriven") / 4 ("Underdriven")**:
  The accuracy of measurement results can be impaired because the input signal level was too high / too low.
- **6 ("Trigger Timeout")**:
  The measurement could not be started or continued because no trigger event was detected.
- **7 ("Acquisition Error")**:
  The R&S CMW could not properly decode the RF input signal.
- **8 ("Sync Error")**:
  The R&S CMW could not synchronize to the RF input signal.
- **9 ("Uncal")**:
  Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 ("Reference Frequency Error")**:
  The instrument has been configured to use an external reference signal. But the reference oscillator could not be phase-locked to the external signal (for example signal level too low, frequency out of range or reference signal not available at all).
- **16 ("RF Not Available")**:
  The measurement could not be started because the configured RF input path was not active. This problem can occur for example if a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 ("RF Level not Settled") / 18 ("RF Frequency not Settled")**:

The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.

- **19 ("Call not Established")**:
  For measurements: The measurement could not be started because no signaling connection to the DUT was established.
  For DAU IMS service: Establishing a voice over IMS call failed.
- **20 ("Call Type not Usable")**:
  For measurements: The measurement could not be started because the established signaling connection had wrong properties.
  For DAU IMS service: The voice over IMS settings could not be applied.
- **21 ("Call Lost")**:
  For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
  For DAU IMS service: The voice over IMS call was lost.
- **23 ("Missing Option")**:
  The ARB file cannot be played by the GPRF generator due to a missing option.
- **24 ("Invalid RF Setting")**:
  The desired RF TX level or RF RX reference level could not be applied.
- **26 ("Resource Conflict")**:
  The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
  Stop the application that has allocated the conflicting resources and try again.
- **27 ("No Sensor Connected")**:
  The GPRF external power sensor measurement could not be started due to missing power sensor.
- **28 ("Unexpected Parameter Change")**:
  One or more measurement configuration parameters were changed while the measurement completed. The results were not obtained with these new parameter values. Repeat the measurement. This situation can only occur in remote single-shot mode.
- **30 ("File not Found")**:
  The specified file could not be found.
- **31 ("No DTM reply")**:
  The EUT did not reply to the direct test mode (DTM) command.
- **32 ("ACL Disconnected")**:
  The ACL connection has been disconnected or lost.
- **40 ("ARB File CRC Error")**:
  The cyclic redundancy check of the ARB file failed. The ARB file is corrupt and not reliable.
- **42 ("ARB Header Tag Invalid")**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 ("ARB Segment Overflow")**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 ("ARB File not Found")**:

The selected ARB file could not be found.

- **45 ("ARB Memory Overflow")**:
The ARB file length is greater than the available memory.
- **46 ("ARB Sample Rate out of Range)"**:
The clock rate of the ARB file is either too high or too low.
- **47 ("ARB Cycles out of Range")**:
The repetition mode equals "Single Shot" and the playback length is greater than 40 s. Reduce the playback length or set the repetition mode to "Continuous".
*<Length> = (<Cycles> * <Samples> + <Additional Samples>) / <Clock Rate>*
- **50 ("Startup Error")**:
The data application unit (DAU), a DAU service or a DAU measurement could not be started. Execute a DAU selftest.
- **51 ("No Reply")**:
The DAU has received no response, for example for a ping request.
- **52 ("Connection Error")**:
The DAU could not establish a connection to internal components. Restart the instrument.
- **53 ("Configuration Error")**:
The current DAU configuration is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 ("Filesystem Error")**:
The hard disk of the DAU is full or corrupt. Execute a DAU selftest.
- **60 ("Invalid RF-Connector Setting")**
The individual segments of a list mode measurement with R&S CMWS use different connector benches. All segments must use the same bench.
Check the "Info" dialog for the relevant segment numbers.
- **93 ("OCXO Oven Temperature too low")**:
The accuracy of measurement results can be impaired because the oven-controlled crystal oscillator has a too low temperature. After switching-on the instrument, the OCXO requires a warm-up phase to reach its operating temperature.
- **101 ("Firmware Error")**:
Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.

  If the error occurs again, consider the following hints:

  – Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.

  – If a software package (update) has not been properly installed, this failure is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".

  – Check for software updates correcting the error. Updates are for example provided in the CMW customer web on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, send a problem report including log files to Rohde & Schwarz.
- **102 ("Unidentified Error")**:

Indicates an error not covered by other reliability values. For troubleshooting, follow the steps described for "101 (Firmware Error)".

- **103 ("Parameter Error")**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.
  If you need assistance to localize the conflicting parameter settings, contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).
- **104 ("Not Functional")**:
  The application could not be started with the configured parameter set.

2.6.2 General Settings

The following commands select the duplex mode and the SCC activation mode and configure general SCC settings.

For scenarios, see Chapter 2.6.8.1, "Scenario Selection and Signal Routing", on page 379.

CONFigure:LTE:SIGN<i>[:PCC]:DMODe....306
CONFigure:LTE:SIGN<i>:SCC<c>:DMODe....306
CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific....307
CONFigure:LTE:SIGN<i>:SCC:AMODe....307
CONFigure:LTE:SIGN<i>:SCC<c>:UUL....307
CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE....308
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SEXecute....308
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:CEXecute....309

CONFigure:LTE:SIGN<i>[:PCC]:DMODe <Mode>
CONFigure:LTE:SIGN<i>:SCC<c>:DMODe <Mode>

Selects the duplex mode of the LTE signal: FDD or TDD.

See also `CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific` on page 307.

Suffix:

<c>	1..3

Parameters:

<Mode>	FDD | TDD
Example:	See Specifying General Settings
Firmware/Software:	V2.1.20, SCC command V3.5.10
Options:	R&S CMW-KS500/-KS550 for FDD/TDD
Manual operation:	See "Duplex Mode" on page 128

CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific <Enable>

Enables the carrier-specific duplex mode configuration.

- Enabled - The duplex mode is configured per carrier via:
  `CONFigure:LTE:SIGN<i>[:PCC]:DMODe`
  `CONFigure:LTE:SIGN<i>:SCC<c>:DMODe`
- Disabled - All carriers have the same duplex mode, configured via:
  `CONFigure:LTE:SIGN<i>[:PCC]:DMODe`

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Specifying General Settings

Firmware/Software: V3.5.10

Manual operation: See "Duplex Mode" on page 128

CONFigure:LTE:SIGN<i>:SCC:AMODe <Mode>

Selects the SCC activation mode. For manual triggering of a state transition, see `CALL:LTE:SIGN<i>:SCC<c>:ACTion`.

Parameters:

<Mode> AUTO | MANual | SEMiauto

AUTO
All SCCs are activated automatically at RRC connection establishment, so that the state "MAC Activated" is reached.

MANual
Each state transition step must be initiated separately for each SCC. So several actions are required to reach the state "MAC Activated".

SEMiauto
The activation must be initiated manually for each SCC. As a result, all state transitions required to reach the state "MAC Activated" are performed.

*RST: AUTO

Example: See Specifying General Settings

Firmware/Software: V3.2.50

Options: R&S CMW-KS512 for MANual and SEMiauto

Manual operation: See "SCC Activation Mode" on page 129

CONFigure:LTE:SIGN<i>:SCC<c>:UUL <UseUplink>[, <SCCRXConnector>, <SCCRXConverter>]

Activates the uplink for the SCC number <c> and optionally selects the signal path.

For possible connector and converter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Suffix:

<c>	1..3

Parameters:

<UseUplink>	OFF | ON *RST: OFF
<SCCRXConnector>	RF connector for the SCC input path
<SCCRXConverter>	RX module for the SCC input path
Example:	See Specifying General Settings
Firmware/Software:	V3.5.20
Options:	R&S CMW-KS512
Manual operation:	See "Use UL" on page 129

CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE <CAmode>

Configures the uplink carrier aggregation mode for the SCC number <c>. The setting is only relevant, if the uplink of the SCC number <c> is enabled.

Suffix:

<c>	1..3

Parameters:

<CAmode>	OFF | INTRaband **OFF**: non-contiguous aggregation **INTRaband**: contiguous aggregation *RST: OFF
Firmware/Software:	V3.5.20
Options:	R&S CMW-KS512
Manual operation:	See "Intraband Contiguous to PCC" on page 129

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SEXecute

Initiates a swap of settings between the PCC and the SCC number <c>.

Suffix:

<c>	1..3
Usage:	Event
Firmware/Software:	V3.2.60
Manual operation:	See "Swap (button)" on page 117

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:CEXecute

Copies PCC DL settings to the SCC number <c>.

Suffix:
<c> 1..3

Usage: Event

Firmware/Software: V3.2.82

Manual operation: See "Copy (button)" on page 118

2.6.3 Connection Control and States

The commands in the following sections control the connection to the UE and retrieve connection-related information.

- General Commands....309
- Connect/Disconnect Preparation....313
- Handover Preparation....315

2.6.3.1 General Commands

The following commands control the connection to the UE and retrieve connection-related information.

Preparation commands for `CALL:LTE:SIGN<i>:PSWitched:ACTion` are described in the subsequent sections.

SOURce:LTE:SIGN<i>:CELL:STATe....309
SOURce:LTE:SIGN<i>:CELL:STATe:ALL?....310
SENSe:LTE:SIGN<i>:RRCState?....310
CALL:LTE:SIGN<i>:PSWitched:ACTion....311
CALL:LTE:SIGN<i>:SCC<c>:ACTion....311
FETCh:LTE:SIGN<i>:PSWitched:STATe?....311
FETCh:LTE:SIGN<i>:SCC<c>:STATe?....312

SOURce:LTE:SIGN<i>:CELL:STATe <Control>

Turns the generator (the cell) on or off.

Setting parameters:
<Control> OFF | ON
Switch generator **ON** or **OFF**
*RST: OFF

Return values:

<GeneratorState>	OFF | PENDing | ON **OFF:** generator switched off **PEND:** generator switched on but no signal available yet **ON:** generator switched on, signal available *RST: OFF
Example:	See Attaching the UE and Activating SCCs
Firmware/Software:	V1.0.15.20
Manual operation:	See "Cell" on page 110

SOURce:LTE:SIGN<i>:CELL:STATe:ALL?

Returns detailed information about the "LTE Signaling" generator state.

Return values:

<MainState>	OFF | ON | RFHandover **OFF:** generator switched off **ON:** generator switched on **RFHandover:** ready to receive a handover from another signaling application
<SyncState>	PENDing | ADJusted **PENDing:** generator turned on (off) but signal not yet (still) available **ADJusted:** physical output signal corresponds to main generator state
Example:	See Attaching the UE and Activating SCCs
Usage:	Query only
Firmware/Software:	V1.0.15.20 V3.0.10: RFHandover added
Manual operation:	See "ON | OFF (key) / LTE Signaling (softkey)" on page 120

SENSe:LTE:SIGN<i>:RRCState?

Queries whether an RRC connection is established (connected) or not (idle).

Return values:

<State>	IDLE | CONNected
Example:	See Attaching the UE and Activating SCCs
Usage:	Query only
Firmware/Software:	V3.0.20
Manual operation:	See "RRC State" on page 110

CALL:LTE:SIGN<i>:PSWitched:ACTion <PSAction>

Controls the PS connection state. As a prerequisite, the DL signal must be switched on, see `SOURce:LTE:SIGN<i>:CELL:STATe`.

Setting parameters:

<PSAction> CONNect | DISConnect | SMS | DETach | HANDover

CONNect: Initiate a mobile-terminated connection setup
DISConnect: Release the connection
SMS: Send an SMS
DETach: Detach the UE
HANDover: Initiate a handover (within the LTE signaling application or to another signaling application)

Example: See Setting Up a Test Mode Connection

Usage: Event

Firmware/Software: V2.1.20
V3.0.10: added DETach and HANDover

Manual operation: See "Connection control hotkeys" on page 121

CALL:LTE:SIGN<i>:SCC<c>:ACTion <SCCAction>

Controls the state of the secondary component carrier (SCC) number <c>.

Suffix:

<c> 1..3

Setting parameters:

<SCCAction> **OFF:** Switch off SCC
ON: Switch on SCC
RRCadd: Add SCC RRC connection
MACactivate: Activate MAC for the SCC
MACDeactivat: Deactivate MAC for the SCC
RRCDelete: Delete SCC RRC connection

Usage: Event

Firmware/Software: V3.2.50

Manual operation: See "Connection control hotkeys" on page 121

FETCh:LTE:SIGN<i>:PSWitched:STATe?

Queries the PS connection state, see also Chapter 2.2.9.1, "Packet-Switched States", on page 32.

Return values:
<PS State> OFF | ON | ATTached | CESTablished | DISConnect | CONNecting | SIGNaling | SMESsage | RMESsage | IHANdover | OHANdover

OFF: signal off
ON: signal on
ATTached: UE attached
CESTablished: connection established
DISConnect: disconnect in progress
CONNecting: connection setup in progress
SIGNaling: signaling in progress
SMESsage: sending message
RMESsage: receiving message
IHANdover: incoming handover in progress
OHANdover: outgoing handover in progress

*RST: OFF

Example: See Setting Up a Test Mode Connection

Usage: Query only

Firmware/Software: V2.1.20
V3.0.10: added IHANdover, OHANdover

Manual operation: See "Packet Switched" on page 110

FETCh:LTE:SIGN<i>:SCC<c>:STATe?

Queries the state of the SCC number <c>, see also Chapter 2.2.9.2, "SCC States", on page 34.

Suffix:
<c> 1..3

Return values:
<SCC State> OFF | ON | RRCadded | MACactivated

OFF: SCC off
ON: SCC on
RRCadded: RRC added
MACactivated: MAC activated

Example: See Attaching the UE and Activating SCCs

Usage: Query only

Firmware/Software: V3.2.50

Manual operation: See "SCC<n> State" on page 110

2.6.3.2 Connect/Disconnect Preparation

The following commands configure the dedicated bearer settings as a preparation for a dedicated bearer connect or disconnect, initiated via `CALL:LTE:SIGN<i>:PSWitched:ACTion`.

The commands are only relevant for the connection type "Data Application". For the connection type "Testmode", no preparation is required.

CATalog:LTE:SIGN<i>:CONNection:DEFBearer?.. 313
CATalog:LTE:SIGN<i>:CONNection:DEDBearer?.. 313
PREPare:LTE:SIGN<i>:CONNection:DEDBearer.. 313
PREPare:LTE:SIGN<i>:CONNection:DEDBearer:SEParate... 314
CONFigure:LTE:SIGN<i>:CONNection:DEDBearer... 315

CATalog:LTE:SIGN<i>:CONNection:DEFBearer?

Queries a list of all established default bearers.

Return values:

<ID> Comma-separated list of bearer IDs as strings
String example: "5 (cmw500.rohde-schwarz.com)"

Example: See Connecting/Releasing Dedicated Bearers

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Connect" on page 122

CATalog:LTE:SIGN<i>:CONNection:DEDBearer?

Queries a list of all established dedicated bearers.

Return values:

<ID> Comma-separated list of bearer IDs as strings
String example: "6 (->5, Voice)"

Example: See Connecting/Releasing Dedicated Bearers

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Disconnect" on page 123

PREPare:LTE:SIGN<i>:CONNection:DEDBearer <DefBearerID>, <Profile>, <TFTportLow>, <TFTportHigh>

Configures dedicated bearer settings as a preparation for a bearer setup via `CALL:LTE:SIGN:PSWitched:ACTion CONNect`.

The same port range is used for the uplink and for the downlink.

Parameters:

<DefBearerID> Bearer ID string, selecting the default bearer, to which the dedicated bearer is mapped.
String example: "5 (cmw500.rohde-schwarz.com)"
To query a list of IDs for all established default bearers, see `CATalog:LTE:SIGN<i>:CONNection:DEFBearer?`.

<Profile> VOICe | VIDeo | DRAM | DRUM
Selects a dedicated bearer profile
VOICe: for voice connections
VIDeo: for video connections
DRAM: for data connections with RLC acknowledged mode
DRUM: for data connections with RLC unacknowledged mode
*RST: DRUM

<TFTportLow> Selects the lower end of the port range, for which traffic is routed to the dedicated bearer
Range: 1 to 65535
*RST: 1

<TFTportHigh> Selects the upper end of the port range
Range: 1 to 65535
*RST: 65535

Example: See Connecting/Releasing Dedicated Bearers

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Connect" on page 122

PREPare:LTE:SIGN<i>:CONNection:DEDBearer:SEParate <DefBearerID>, <Profile>, <TFTportLowDL>, <TFTportHighDL>, <TFTportLowUL>, <TFTportHighUL>

Configures dedicated bearer settings as a preparation for a bearer setup via `CALL:LTE:SIGN:PSWitched:ACTion CONNect`.

Different port ranges can be set for the uplink and for the downlink.

Parameters:

<DefBearerID> Bearer ID string, selecting the default bearer, to which the dedicated bearer is mapped.
String example: "5 (cmw500.rohde-schwarz.com)"
To query a list of IDs for all established default bearers, see `CATalog:LTE:SIGN<i>:CONNection:DEFBearer?`.

<Profile>	VOICe | VIDeo | DRAM | DRUM Selects a dedicated bearer profile **VOICe**: for voice connections **VIDeo**: for video connections **DRAM**: for data connections with RLC acknowledged mode **DRUM**: for data connections with RLC unacknowledged mode *RST: DRUM
<TFTportLowDL>	Selects the lower end of the port range for downlink traffic Range: 1 to 65535 *RST: 1
<TFTportHighDL>	Selects the upper end of the port range for downlink traffic Range: 1 to 65535 *RST: 65535
<TFTportLowUL>	Selects the lower end of the port range for uplink traffic Range: 1 to 65535 *RST: 1
<TFTportHighUL>	Selects the upper end of the port range for uplink traffic Range: 1 to 65535 *RST: 65535

Firmware/Software: V3.5.30

Options: R&S CMW-KS510

Manual operation: See "Connect" on page 122

CONFigure:LTE:SIGN<i>:CONNection:DEDBearer <ID>

Selects a dedicated bearer as a preparation for a bearer release via `CALL:LTE:SIGN:PSWitched:ACTion DISConnect`.

Parameters:

<ID>	Dedicated bearer ID as string String example: "6 (->5, Voice)" To query a list of IDs for all established dedicated bearers, see `CATalog:LTE:SIGN<i>:CONNection:DEDBearer?`.

Example: See Connecting/Releasing Dedicated Bearers

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Disconnect" on page 123

2.6.3.3 Handover Preparation

The following commands configure the handover settings as a preparation for a hand-over action, initiated via `CALL:LTE:SIGN<i>:PSWitched:ACTion`.

PREPare:LTE:SIGN<i>:HANDover:DESTination....316
PREPare:LTE:SIGN<i>:HANDover:CATalog:DESTination?....316
PREPare:LTE:SIGN<i>:HANDover:MMODe....316
PREPare:LTE:SIGN<i>:HANDover:CTYPe....317
PREPare:LTE:SIGN<i>:HANDover....317
PREPare:LTE:SIGN<i>:HANDover:ENHanced....318
PREPare:LTE:SIGN<i>:HANDover:EXTernal:DESTination....319
PREPare:LTE:SIGN<i>:HANDover:EXTernal:CDMA....319
PREPare:LTE:SIGN<i>:HANDover:EXTernal:EVDO....319
PREPare:LTE:SIGN<i>:HANDover:EXTernal:GSM....320
PREPare:LTE:SIGN<i>:HANDover:EXTernal:LTE....321
PREPare:LTE:SIGN<i>:HANDover:EXTernal:TDSCdma....321
PREPare:LTE:SIGN<i>:HANDover:EXTernal:WCDMa....322

PREPare:LTE:SIGN<i>:HANDover:DESTination <Destination>

Selects the handover destination. A complete list of all supported values can be displayed using `PREPare:LTE:SIGN<i>:HANDover:CATalog:DESTination?` on page 316.

Parameters:

<Destination> Destination as string

Example: See Performing an Inter-RAT Handover

Firmware/Software: V3.0.10

Manual operation: See "Target" on page 124

PREPare:LTE:SIGN<i>:HANDover:CATalog:DESTination?

Lists all handover destinations that can be selected using `PREPare:LTE:SIGN<i>:HANDover:DESTination`.

Return values:

<Destination> Comma-separated list of all supported destinations. Each destination is represented as a string.
"No Connection" means handover to another instrument.
The "...Sig..." strings refer to signaling applications at the same instrument.

Example: See Performing an Inter-RAT Handover

Usage: Query only

Firmware/Software: V3.0.10

Manual operation: See "Target" on page 124

PREPare:LTE:SIGN<i>:HANDover:MMODe <Mode>

Selects the mechanism to be used for handover to another signaling application.

Parameters:

<Mode> REDirection | MTCSfallback | HANDover

*RST: RED

Example: See Performing an Inter-RAT Handover

Firmware/Software: V3.2.50, V3.5.20 added HANDover

Options: R&S CMW-KS510 for MTCSfallback

Manual operation: See "Mobility Mode, Operating Band Change, Frequency Change" on page 124

PREPare:LTE:SIGN<i>:HANDover:CTYPe <Type>

Selects the call type to be set up at the destination, for handover of VoLTE calls.

Parameters:

<Type> PSData | PSVolte

PSData: End-to-end packet data connection
PSVolte: Voice call, handover with SRVCC

*RST: PSD

Firmware/Software: V3.5.40

Options: R&S CMW-KS510

Manual operation: See "Connection Type" on page 125

PREPare:LTE:SIGN<i>:HANDover <Band>, <DLChannel>, <DLBandwidth>, <AddSpecEmission>

Configures the destination parameters for an intra-RAT handover within the LTE signaling application.

The duplex mode of the destination is the same as the duplex mode of the source. For a handover with duplex mode change, see `PREPare:LTE:SIGN<i>:HANDover:ENHanced` on page 318.

Parameters:

<Band> FDD: UDEFined | OB1 | ... | OB28 | OB30 | OB31 | OB65 | OB66

TDD: UDEFined | OB33 | ... | OB46
Operating band of the handover destination

<DLChannel> DL channel number valid for the selected operating band. The related UL channel number is calculated and set automatically.
For channel numbers depending on operating bands, see Chapter 2.2.17, "Operating Bands", on page 67.

Range: depends on operating band

<DLBandwidth>	B014 | B030 | B050 | B100 | B150 | B200 DL cell/channel bandwidth (also used for UL) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz *RST: B100
<AddSpecEmission>	NS01 | ... | NS24 Value signaled to the UE as additional ACLR and spectrum emission requirement *RST: NS01
Example:	See Performing an Intra-RAT Handover
Firmware/Software:	V3.0.10, some bands added in later versions V3.2.70: NS16, NS17, NS18, NS20 V3.2.82: NS19, NS21, NS22, NS23, NS24
Options:	R&S CMW-KS525 for UDEFined
Manual operation:	See "Destination Parameters" on page 125

PREPare:LTE:SIGN<i>:HANDover:ENHanced <DuplexMode>, <Band>, <DLChannel>, <DLBandwidth>, <AddSpecEmission>

Configures the destination parameters for an intra-RAT handover within the LTE signaling application. The duplex mode of the destination is configurable.

Parameters:

<DuplexMode>	FDD | TDD Duplex mode of the handover destination
<Band>	FDD: UDEFined | OB1 | ... | OB28 | OB30 | OB31 | OB65 | OB66 TDD: UDEFined | OB33 | ... | OB46 Operating band of the handover destination
<DLChannel>	DL channel number valid for the selected operating band. The related UL channel number is calculated and set automatically. For channel numbers depending on operating bands, see Chapter 2.2.17, "Operating Bands", on page 67. Range: depends on operating band
<DLBandwidth>	B014 | B030 | B050 | B100 | B150 | B200 DL cell/channel bandwidth (also used for UL) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz *RST: B100
<AddSpecEmission>	NS01 | ... | NS24 Value signaled to the UE as additional ACLR and spectrum emission requirement *RST: NS01
Firmware/Software:	V3.5.10, some bands added in later versions
Options:	R&S CMW-KS525 for UDEFined

Manual operation: See "Destination Parameters" on page 125

PREPare:LTE:SIGN<i>:HANDover:EXTernal:DESTination <Destination>

Selects the target radio access technology for handover to another instrument.

Parameters:

<Destination> LTE | EVDO | CDMA | GSM | WCDMa | TDSCdma

*RST: LTE

Example: See Performing a Handover to Another Instrument

Firmware/Software: V3.0.20

Manual operation: See "Target" on page 124

PREPare:LTE:SIGN<i>:HANDover:EXTernal:CDMA <BandClass>, <DLChannel>
PREPare:LTE:SIGN<i>:HANDover:EXTernal:EVDO <BandClass>, <DLChannel>

Configures the destination parameters for handover to a CDMA2000 or 1xEV-DO destination at another instrument.

Parameters:

<BandClass> USC | KCEL | NAPC | TACS | JTAC | KPCS | N45T | IM2K | NA7C | B18M | NA8S | PA4M | PA8M | IEXT | USPC | AWS | U25B | U25F | NA9C | PS7C | LO7C

USC: BC 0, US cellular
KCEL: BC 0, Korean cellular
NAPC: BC 1, North American PCS
TACS: BC 2, TACS band
JTAC: BC 3, JTACS band
KPCS: BC 4, Korean PCS
N45T: BC 5, NMT-450
IM2K: BC 6, IMT-2000
NA7C: BC 7, upper 700 MHz
B18M: BC 8, 1800 MHz band
NA9C: BC 9, North American 900 MHz
NA8S: BC 10, secondary 800 MHz
PA4M: BC 11, European 400 MHz PAMR
PA8M: BC 12, 800 MHz PAMR
IEXT: BC 13, IMT-2000 2.5 GHz extension
USPC: BC 14, US PCS 1900 MHz
AWS: BC 15, AWS band
U25B: BC 16, US 2.5 GHz band
U25F: BC 17, US 2.5 GHz forward
PS7C: BC 18, public safety band 700 MHz
LO7C: BC 19, lower 700 MHz

*RST: USC

<DLChannel> Channel number

Range: depends on the band class, see table below
*RST: 283

Example: See Performing a Handover to Another Instrument

Firmware/Software: V3.0.20

Manual operation: See "Destination Parameters" on page 125

Table 2-31: Channel number range depending on band class

Band class	Channel number
USC, KCEL	1 to 799, 991 to 1323
NAPC, IM2K	0 to 1199
TACS	0 to 1000, 1329 to 2108
JTAC	1 to 799, 801 to 1039, 1041 to 1199, 1201 to 1600
KPCS	0 to 599
N45T	1 to 400, 472 to 871, 1039 to 1473, 1536 to 1715, 1792 to 2016
NA7C, PS7C	0 to 240
B18M	0 to 1499
NA9C	0 to 699
NA8S	0 to 919
PA4M	1 to 400, 472 to 871, 1536 to 1715
PA8M	0 to 239
IEXT	0 to 1399
USPC	0 to 1299
AWS	0 to 899
U25B, U25F	140 to 1459
LO7C	0 to 360

PREPare:LTE:SIGN<i>:HANDover:EXTernal:GSM <Band>, <DLChannel>, <BandIndicator>

Configures the destination parameters for handover to a GSM destination at another instrument.

Parameters:

<Band> G085 | G09 | G18 | G19

GSM 850, GSM 900, GSM 1800, GSM 1900

*RST: G09

<DLChannel> Channel number used for the BCCH

Range: depends on GSM band, see table below
*RST: 20

<BandIndicator> G18 | G19

Band indicator for distinction of GSM 1800 and GSM 1900 bands. The two bands partially use the same channel numbers for different frequencies.

*RST: G18

Example: See Performing a Handover to Another Instrument

Firmware/Software: V3.0.20

Manual operation: See "Destination Parameters" on page 125

Table 2-32: Channel number range depending on GSM band

Band	Channel number
G085	128 to 251
G09	0 to 124, 940 to 1023
G18	512 to 885
G19	512 to 810

PREPare:LTE:SIGN<i>:HANDover:EXTernal:LTE <Band>, <DLChannel>

Configures the destination parameters for handover to an LTE destination at another instrument.

For channel number ranges depending on operating bands, see Chapter 2.2.17, "Operating Bands", on page 67.

Parameters:

<Band> UDEFined | OB1 | ... | OB46 | OB65 | ... | OB67 | OB252 | OB255

Operating band

*RST: OB1

<DLChannel> Downlink channel number

Range: depends on operating band
*RST: 300

Example: See Performing a Handover to Another Instrument

Firmware/Software: V3.0.20, some bands added in later versions

Manual operation: See "Destination Parameters" on page 125

PREPare:LTE:SIGN<i>:HANDover:EXTernal:TDSCdma <Band>, <DLChannel>

Configures the destination parameters for handover to a TD-SCDMA destination at another instrument.

Parameters:

<Band> OB1 | OB2 | OB3

OB1: Band 1 (F), 1880 MHz to 1920 MHz
OB2: Band 2 (A), 2010 MHz to 2025 MHz
OB3: Band 3 (E), 2300 MHz to 2400 MHz

*RST: OB1

<DLChannel> Downlink channel number
The allowed range depends on the frequency band:
OB1: 9400 to 9600
OB2: 10050 to 10125
OB3: 11500 to 12000

*RST: 10563

Example: See Performing a Handover to Another Instrument

Firmware/Software: V3.0.50

Manual operation: See "Destination Parameters" on page 125

PREPare:LTE:SIGN<i>:HANDover:EXTernal:WCDMa <Band>, <DLChannel>

Configures the destination parameters for handover to a WCDMA destination at another instrument.

Parameters:

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OB19 | OB20 | OB21 | OB22 | OB25 | OBS1 | OBS2 | OBS3 | OBL1

OB1, ..., OB14: band I to XIV
OB19, ..., OB22, OB25: band XIX to XXII, XXV
OBS1: band S
OBS2: band S 170 MHz
OBS3: band S 190 MHz
OBL1: band L

*RST: OB1

<DLChannel> Downlink channel number

Range: Depends on operating band, see table below
*RST: not documented

Example: See Performing a Handover to Another Instrument

Firmware/Software: V3.0.20, V3.5.40: OB22, OB25

Manual operation: See "Destination Parameters" on page 125

Table 2-33: Channel number range depending on operating band

Operating band	Channel number
OB1	10562 to 10838
OB2	412 to 687 (step 25), 9662 to 9938

Operating band	Channel number
OB3	1162 to 1513
OB4	1537 to 1738, 1887 to 2087 (step 25)
OB5	1007, 1012, 1032, 1037, 1062, 1087, 4357 to 4458
OB6	1037, 1062, 4387 to 4413
OB7	2237 to 2563, 2587 to 2912 (step 25)
OB8	2937 to 3088
OB9	9237 to 9387
OB10	3112 to 3388, 3412 to 3687 (step 25)
OB11	3712 to 3787
OB12	3842 to 3903, 3932, 3957, 3962, 3987, 3992
OB13	4017 to 4043, 4067, 4092
OB14	4117 to 4143, 4167, 4192
OB19	712 to 763, 787, 812, 837
OB20	4512 to 4638
OB21	862 to 912
OB22	4662 to 5038
OB25	5112 to 5413, 6292 to 6592 (step 25)
OBS1	10912 to 10988
OBS2	10900 to 10950
OBS3	10950 to 11000
OBL1	7637 to 7783, 7788 to 7933

2.6.4 Event Log

The following commands retrieve event log entries and clear the log.

SENSe:LTE:SIGN<i>:ELOG:LAST?....................323
SENSe:LTE:SIGN<i>:ELOG:ALL?....................324
CLEan:LTE:SIGN<i>:ELOG....................324

SENSe:LTE:SIGN<i>:ELOG:LAST?

Queries the latest entry of the event log.

Return values:

<Timestamp> Timestamp of the entry as string in the format "hh:mm:ss"

<Category> INFO | WARNing | ERRor | CONTinue

Category of the entry, as indicated in the main view by an icon

<Event>	Text string describing the event, e.g. "`RRC Connection Established`"
Usage:	Query only
Firmware/Software:	V2.1.30
Manual operation:	See "Event log entries" on page 110

SENSe:LTE:SIGN<i>:ELOG:ALL?

Queries all entries of the event log.

For each entry, three parameters are returned, from oldest to latest entry: {<Timestamp>, <Category>, <Event>}$_{\text{entry 1}}$, {<Timestamp>, <Category>, <Event>}$_{\text{entry 2}}$, ...

Return values:

<Timestamp>	Timestamp of the entry as string in the format "hh:mm:ss"
<Category>	INFO | WARNing | ERRor | CONTinue Category of the entry, as indicated in the main view by an icon
<Event>	Text string describing the event, e.g. "`RRC Connection Established`"
Usage:	Query only
Firmware/Software:	V2.1.30
Manual operation:	See "Event log entries" on page 110

CLEan:LTE:SIGN<i>:ELOG

Clears the event log.

Usage:	Event
Firmware/Software:	V3.5.30
Manual operation:	See "Event log entries" on page 110

2.6.5 UE Measurement Report Contents

The following commands retrieve UE measurement report contents for the serving cell and for measured neighbor cells.

SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRP?....................325
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP?....................325
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRP:RANGe?....................325
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP:RANGe?....................325
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRQ?....................326
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ?....................326
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRQ:RANGe?....................326
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ:RANGe?....................326

SENSe:LTE:SIGN<i>:UEReport[:PCC]:SCELl?....326
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl?....326
SENSe:LTE:SIGN<i>:UEReport[:PCC]:SCELl:RANGe?....327
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl:RANGe?....327
SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>?....327
SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>:RANGe?....328
SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>?....328
SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>:RANGe?....329
SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>?....329
SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>:RANGe?....330
SENSe:LTE:SIGN<i>:UEReport:NCELl:CDMA:CELL<no>?....330
SENSe:LTE:SIGN<i>:UEReport:NCELl:EVDO:CELL<no>?....331
SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>?....331
SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>:RANGe?....331

SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRP?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP?

Returns the RSRP reported by the UE as dimensionless index.

Suffix:
<c> 1..3

Return values:
<RSRP> Range: 0 to 97

Usage: Query only

Firmware/Software: V2.0.10, SCC command V3.2.70

Manual operation: See "LTE Serving Cell > RSRP" on page 112

SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRP:RANGe?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP:RANGe?

Returns the RSRP value range, corresponding to the RSRP index reported by the UE.

Suffix:
<c> 1..3

Return values:
<Lower> Range: -140 dBm to -44 dBm
Default unit: dBm

<Upper> Range: -140 dBm to -44 dBm
Default unit: dBm

Usage: Query only

Firmware/Software: V2.0.10, SCC command V3.2.70

Manual operation: See "LTE Serving Cell > RSRP" on page 112

SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRQ?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ?

Returns the RSRQ reported by the UE as dimensionless index.

Suffix:
<c> 1..3

Return values:
<RSRQ> Range: 0 to 34

Usage: Query only

Firmware/Software: V2.0.10, SCC command V3.2.70

Manual operation: See "LTE Serving Cell > RSRQ" on page 112

SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRQ:RANGe?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ:RANGe?

Returns the RSRQ value range, corresponding to the RSRQ index reported by the UE.

Suffix:
<c> 1..3

Return values:
<Lower> Range: -19.5 dB to -3 dB
Default unit: dB

<Upper> Range: -19.5 dB to -3 dB
Default unit: dB

Usage: Query only

Firmware/Software: V2.0.10, SCC command V3.2.70

Manual operation: See "LTE Serving Cell > RSRQ" on page 112

SENSe:LTE:SIGN<i>:UEReport[:PCC]:SCELl?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl?

Returns measurement report values for the serving LTE cell.

Suffix:
<c> 1..3

Return values:
<RSRP> RSRP as dimensionless index
Range: 0 to 97

<RSRQ> RSRQ as dimensionless index
Range: 0 to 34

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.2.70

Manual operation: See "LTE Serving Cell > RSRP" on page 112

SENSe:LTE:SIGN<i>:UEReport[:PCC]:SCELl:RANGe?
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl:RANGe?

Returns the value ranges corresponding to the dimensionless index values reported for the serving LTE cell.

Suffix:
<c> 1..3

Return values:

<RSRPlower> RSRP minimum value
Range: -140 dBm to -44 dBm
Default unit: dBm

<RSRPupper> RSRP maximum value
Range: -140 dBm to -44 dBm
Default unit: dBm

<RSRQlower> RSRQ minimum value
Range: -19.5 dB to -3 dB
Default unit: dB

<RSRQupper> RSRQ maximum value
Range: -19.5 dB to -3 dB
Default unit: dB

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.2.70

Manual operation: See "LTE Serving Cell > RSRP" on page 112

SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>?

Returns measurement report values for the LTE neighbor cell number <no>.

Suffix:
<no> 1..16

Return values:

<RSRP> RSRP as dimensionless index
Range: 0 to 97

<RSRQ> RSRQ as dimensionless index
Range: 0 to 34

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "LTE Neighbor Cells > RSRP, RSRQ" on page 112

SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>:RANGe?

Returns the value ranges corresponding to the dimensionless index values reported for the LTE neighbor cell number <no>.

Suffix:
<no> 1..16

Return values:

<RSRPlower> RSRP minimum value
Range: -140 dBm to -44 dBm
Default unit: dBm

<RSRPupper> RSRP maximum value
Range: -140 dBm to -44 dBm
Default unit: dBm

<RSRQlower> RSRQ minimum value
Range: -19.5 dB to -3 dB
Default unit: dB

<RSRQupper> RSRQ maximum value
Range: -19.5 dB to -3 dB
Default unit: dB

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "LTE Neighbor Cells > RSRP, RSRQ" on page 112

SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>?

Returns the RSSI value reported as dimensionless index for the GSM neighbor cell number <no>.

Suffix:
<no> 1..4

Return values:
<RSSI> Range: 0 to 63

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "GSM > RSSI" on page 112

SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>:RANGe?

Returns the value range corresponding to the dimensionless RSSI index value reported for the GSM neighbor cell number <no>.

Suffix:

<no> 1..4

Return values:

<RSSIlower> RSSI minimum value

Range: -110 dBm to -48 dBm
Default unit: dBm

<RSSIupper> RSSI maximum value

Range: -110 dBm to -48 dBm
Default unit: dBm

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "GSM > RSSI" on page 112

SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>?

Returns measurement report values for the WCDMA neighbor cell number <no>.

Suffix:

<no> 1..4

Return values:

<RSCP> RSCP as dimensionless index

Range: -5 to 91

<EcNO> Ec/No as dimensionless index

Range: 0 to 49

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "WCDMA > RSCP, EcNO" on page 113

SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>:RANGe?

Returns the value ranges corresponding to the dimensionless index values reported for the WCDMA neighbor cell number <no>.

Suffix:

<no> 1..4

Return values:

<RSCPlower> RSCP minimum value
Range: -120 dBm to -25 dBm
Default unit: dBm

<RSCPupper> RSCP maximum value
Range: -120 dBm to -25 dBm
Default unit: dBm

<EcNOlower> Ec/No minimum value
Range: -24 dB to 0 dB
Default unit: dB

<EcNOupper> Ec/No maximum value
Range: -24 dB to 0 dB
Default unit: dB

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "WCDMA > RSCP, EcNO" on page 113

SENSe:LTE:SIGN<i>:UEReport:NCELl:CDMA:CELL<no>?

Returns measurement report values for the CDMA2000 neighbor cell number <no>.

Suffix:

<no> 1..4

Return values:

<pilotPnPhase> Reported pilot PN phase value
Range: 0 PN chips to 32767 PN chips
Default unit: PN chips

<pilotStrength> Reported pilot strength value
Range: 0 to 63

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "CDMA2000 / 1xEV-DO > pilot Pn Phase, pilot Strength" on page 113

SENSe:LTE:SIGN<i>:UEReport:NCELl:EVDO:CELL<no>?

Returns measurement report values for the 1xEV-DO neighbor cell number <no>.

Suffix:

<no> 1..4

Return values:

<pilotPnPhase> Reported pilot PN phase value

Range: 0 PN chips to 32767 PN chips
Default unit: PN chips

<pilotStrength> Reported pilot strength value

Range: 0 to 63

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "CDMA2000 / 1xEV-DO > pilot Pn Phase, pilot Strength" on page 113

SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>?

Returns measurement report values for the TD-SCDMA neighbor cell number <no>.

Suffix:

<no> 1..4

Return values:

<RSCP> RSCP as dimensionless index

Range: -5 to 91

Example: See Querying UE Measurement Report Contents

Usage: Query only

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "TD-SCDMA > RSCP" on page 113

SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>:RANGe?

Returns the value ranges corresponding to the dimensionless index values reported for the TD-SCDMA neighbor cell number <no>.

Suffix:

<no>	1..4

Return values:

<RSCPlower>	RSCP minimum value Range: -120 dBm to -25 dBm Default unit: dBm
<RSCPupper>	RSCP maximum value Range: -120 dBm to -25 dBm Default unit: dBm

Example:	See Querying UE Measurement Report Contents
Usage:	Query only
Firmware/Software:	V3.2.20
Options:	R&S CMW-KS510
Manual operation:	See "TD-SCDMA > RSCP" on page 113

2.6.6 UE Capabilities

The commands in this section retrieve information about the connected mobile as shown in the "UE Capabilities" area of the main view.

For some parameters, three remote control commands are listed:

- First command:
  Queries the parameter in the upper part of the capability report. Features indicated as "supported" are supported for FDD and TDD.
- Command with additional `:FAUeeutra:` mnemonic:
  Queries the parameter in section "fdd Add UE-EUTRA Capabilities". Features indicated as "supported" are supported only for FDD, not for TDD.
- Command with additional `:TAUeeutra:` mnemonic:
  Queries the parameter in section "tdd Add UE-EUTRA Capabilities". Features indicated as "supported" are supported only for TDD, not for FDD.

2.6.6.1 General UE Capability Information

The following commands query the information at the highest level of the "UE Capabilities" section (or the highest level of the additional FDD section and additional TDD section).

SENSe:LTE:SIGN<i>:UECapability:ASRelease?... 333
SENSe:LTE:SIGN<i>:UECapability:UECategory?... 333
SENSe:LTE:SIGN<i>:UECapability:UECategory:DL?... 333
SENSe:LTE:SIGN<i>:UECapability:UECategory:UL?... 333
SENSe:LTE:SIGN<i>:UECapability:FGINdicators?.. 334
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators?.................................. 334
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators?.................................. 334
SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RNADd?..................................... 334

SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RNADd?...............................334
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RNADd?...............................334
SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RTEN?.. 334
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RTEN?.................................334
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RTEN?.................................334
SENSe:LTE:SIGN<i>:UECapability:DTYPe?..335
SENSe:LTE:SIGN<i>:UECapability:RREPort?.. 335

SENSe:LTE:SIGN<i>:UECapability:ASRelease?

Returns the "Access Stratum Release" according to the UE capability information.

Return values:

<AccStratRelease> REL8 | REL9 | REL10 | REL11 | REL12

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.10

Manual operation: See "Access Stratum Release" on page 240

SENSe:LTE:SIGN<i>:UECapability:UECategory?

Returns the UE category according to the UE capability information.

Return values:

<UEcategory> Range: 1 to 12

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.70, V3.5.50 range changed

Manual operation: See "UE Category" on page 240

SENSe:LTE:SIGN<i>:UECapability:UECategory:DL?

Returns the DL UE category according to the UE capability information.

Return values:

<UEcategory> Range: 0 to 16

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.40

Manual operation: See "UE Category" on page 240

SENSe:LTE:SIGN<i>:UECapability:UECategory:UL?

Returns the UL UE category according to the UE capability information.

Return values:

<UEcategory> Range: 0 to 13

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.40

Manual operation: See "UE Category" on page 240

SENSe:LTE:SIGN<i>:UECapability:FGINdicators?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators?

Returns the "featureGroupIndicators" contained in the UE capability information.

The 32-bit value contains one bit per feature group (1 = supported, 0 = not supported).

Return values:

<FeatureGroupInd> Range: #B0 to #B11111111111111111111111111111111

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30, `FAUeeutra` / `TAUeeutra` V3.2.80

Manual operation: See "Feature Group Indicators" on page 240

SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RNADd?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RNADd?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RNADd?

Returns the "featureGroupIndRel9Add-r9" contained in the UE capability information.

The 32-bit value contains one bit per feature group (1 = supported, 0 = not supported).

Return values:

<FeatureGroupInd> Range: #B0 to #B11111111111111111111111111111111

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Feature Group Indicators Rel9 Add" on page 240

SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RTEN?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RTEN?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RTEN?

Returns the "featureGroupIndRel10-r10" contained in the UE capability information.

The 32-bit value contains one bit per feature group (1 = supported, 0 = not supported).

Return values:
<FeatureGroupInd> Range: #B0 to #B11111111111111111111111111111111

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Feature Group Indicators Rel 10" on page 241

SENSe:LTE:SIGN<i>:UECapability:DTYPe?

Returns whether the UE benefits from NW-based battery consumption optimization or not.

Return values:
<DeviceType> NBFBcopt | NAV

NBFBcopt: UE does not benefit
NAV: UE does benefit

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Device Type" on page 241

SENSe:LTE:SIGN<i>:UECapability:RREPort?

Returns whether the UE supports the delivery of RACH reports or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "rach Report" on page 241

2.6.6.2 PDCP UE Capabilities

The following commands query in which way the UE supports the PDCP protocol.

SENSe:LTE:SIGN<i>:UECapability:PDCP:SRPRofiles?..336
SENSe:LTE:SIGN<i>:UECapability:PDCP:MRCSessions?..336
SENSe:LTE:SIGN<i>:UECapability:PDCP:SNEXtension?..337
SENSe:LTE:SIGN<i>:UECapability:PDCP:SRCContinue?..337

SENSe:LTE:SIGN<i>:UECapability:PDCP:SRPRofiles?

Returns UE capability information indicating the support of the individual robust header compression (ROHC) profiles.

Return values:

<ROHC_RTP> OFF | ON
Support of profile 0x0001, ROHC RTP

<ROHC_UDP> OFF | ON
Support of profile 0x0002, ROHC UDP

<ROHC_ESP> OFF | ON
Support of profile 0x0003, ROHC ESP

<ROHC_IP> OFF | ON
Support of profile 0x0004, ROHC IP

<ROHC_TCP> OFF | ON
Support of profile 0x0006, ROHC TCP

<ROHCv2_RTP> OFF | ON
Support of profile 0x0101, ROHCv2 RTP

<ROHCv2_UDP> OFF | ON
Support of profile 0x0102, ROHCv2 UDP

<ROHCv2_ESP> OFF | ON
Support of profile 0x0103, ROHCv2 ESP

<ROHCv2_IP> OFF | ON
Support of profile 0x0104, ROHCv2 IP

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "ROHC RTP to ROHCv2 IP" on page 242

SENSe:LTE:SIGN<i>:UECapability:PDCP:MRCSessions?

Returns the maximum number of ROHC context sessions supported by the UE.

Return values:

<MaxSessions> CS2 | CS4 | CS8 | CS12 | CS16 | CS24 | CS32 | CS48 | CS64 | CS128 | CS256 | CS512 | CS1024 | CS16384

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "Max Num ROHC Context Sessions" on page 242

SENSe:LTE:SIGN<i>:UECapability:PDCP:SNEXtension?

Returns whether the UE supports PDCP SN extension.

Return values:
<Extension> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "PDCP SN Extension" on page 242

SENSe:LTE:SIGN<i>:UECapability:PDCP:SRCContinue?

Returns whether the UE supports ROHC context continuation during handover.

Return values:
<Supportrcc> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Support ROHC Context Continue" on page 242

2.6.6.3 Physical Layer UE Capabilities

The following commands query the physical layer capabilities of the UE.

SENSe:LTE:SIGN<i>:UECapability:PLAYer:UTASupported?....338
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:UTASupported?....338
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:UTASupported?....338
SENSe:LTE:SIGN<i>:UECapability:PLAYer:USRSsupport?....338
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:USRSsupport?....338
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:USRSsupport?....338
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLFsupport?....339
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLTsupport?....339
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TAPPsupport?....339
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TAPPsupport?....339
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TAPPsupport?....339
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TWEFsupport?....340
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TWEFsupport?....340
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TWEFsupport?....340
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PDSupport?....340
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:PDSupport?....340
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:PDSupport?....340
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CCSSupport?....340
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:CCSSupport?....340
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:CCSSupport?....340

SENSe:LTE:SIGN<i>:UECapability:PLAYer:SPPSupport?....341
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:SPPSupport?....341
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:SPPSupport?....341
SENSe:LTE:SIGN<i>:UECapability:PLAYer:MCPCsupport?....341
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:MCPCsupport?....341
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:MCPCsupport?....341
SENSe:LTE:SIGN<i>:UECapability:PLAYer:NURClist?....341
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:NURClist?....341
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:NURClist?....341
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CIHandl?....342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EPDCch?....342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:MACReporting?....342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:SCIHandl?....342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TSSubframe?....343
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TDPChselect?....343
SENSe:LTE:SIGN<i>:UECapability:PLAYer:ULComp?....343
SENSe:LTE:SIGN<i>:UECapability:PLAYer:ITCWithdiff?....344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EHPFdd?....344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EFTCodebook?....344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TFCPcelldplx?....344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCTddpcell?....345
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCFddpcell?....345
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PFMode?....345
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PSPSfset?....346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CSFSet?....346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:NRRT?....346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:DSDCell?....346

SENSe:LTE:SIGN<i>:UECapability:PLAYer:UTASupported?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:UTASupported?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:UTASupported?

Returns whether the UE supports transmit antenna selection or not.

Return values:
<UE_TXantSelSupp> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30, `FAUeeutra` / `TAUeeutra` V3.2.80

Manual operation: See "UE TX Antenna Selection Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:USRSsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:USRSsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:USRSsupport?

Returns whether the UE supports PDSCH transmission mode 7 for FDD or not.

Return values:
<UEspRefSigsSupp> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30, `FAUeeutra` / `TAUeeutra` V3.2.80

Manual operation: See "UE-Specific Ref. Sigs. Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLFsupport?

Returns whether the UE supports enhanced dual layer (PDSCH TM 8) for FDD or not.

Return values:
<EnDualLayFDDsup> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "enhanced Dual layer FDD/TDD Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLTsupport?

Returns whether the UE supports enhanced dual layer (PDSCH TM 8) for TDD or not.

Return values:
<EnDualLayTDDsup> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "enhanced Dual layer FDD/TDD Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TAPPsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TAPPsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TAPPsupport?

Returns whether the UE supports transmit diversity for specific PUCCH formats.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Two Antenna Ports for PUCCH Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TWEFsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TWEFsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TWEFsupport?

Returns whether the UE supports PDSCH TM 9 with 8 CSI reference signal ports for FDD.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "tm9 with 8TX FDD Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:PDSupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:PDSupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:PDSupport?

Returns whether the UE supports PMI disabling.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "pmi Disabling Supported" on page 243

SENSe:LTE:SIGN<i>:UECapability:PLAYer:CCSSupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:CCSSupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:CCSSupport?

Returns whether the UE supports cross-carrier scheduling for CA.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "cross Carrier Scheduling Supported" on page 244

SENSe:LTE:SIGN<i>:UECapability:PLAYer:SPPSupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:SPPSupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:SPPSupport?

Returns whether the UE supports the simultaneous transmission of PUCCH and PUSCH.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "simultaneous PUCCH PUSCH Supported" on page 244

SENSe:LTE:SIGN<i>:UECapability:PLAYer:MCPCsupport?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:MCPCsupport?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:MCPCsupport?

Returns whether the UE supports multi-cluster PUSCH transmission within a CC.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "multi Cluster PUSCH within CC Supported" on page 244

SENSe:LTE:SIGN<i>:UECapability:PLAYer:NURClist?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:NURClist?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:NURClist?

Returns a list of values, indicating whether the UE supports non-contiguous UL resource allocations within a CC for the individual E-UTRA operating bands.

Return values:

<SupportedBand> OFF | ON

256 values: user-defined band, band 1 to band 255

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80
V3.5.40: result array restructured

Manual operation: See "non Contiguous UL RA within CC List Supported" on page 244

SENSe:LTE:SIGN<i>:UECapability:PLAYer:CIHandl?

Returns whether the UE supports CRS interference handling.

Return values:
<InterfHandl> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "CRS InterfHandl" on page 245

SENSe:LTE:SIGN<i>:UECapability:PLAYer:EPDCch?

Returns whether the UE supports DCI reception via UE-specific search space on enhanced PDCCH.

Return values:
<Epdcch> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "ePDCCH" on page 245

SENSe:LTE:SIGN<i>:UECapability:PLAYer:MACReporting?

Returns whether the UE supports multi-cell HARQ ACK, periodic CSI reporting and SR on PUCCH format 3.

Return values:
<Reporting> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "multiACK CSI Reporting" on page 245

SENSe:LTE:SIGN<i>:UECapability:PLAYer:SCIHandl?

Returns whether the UE supports synchronization signal and common channel interference handling.

Return values:
<Handl> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "SS CCH InterfHandl" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TSSubframe?

Returns whether the UE supports TDD special subframe as defined in 3GPP TS 36.211.

Return values:
<TddSpecialSf> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "TDD SpecialSubframe" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TDPChselect?

Returns whether the UE supports transmit diversity for PUCCH format 1b with channel selection.

Return values:
<Tdpch> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "txDiv PUCCH1b ChSelect" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:ULComp?

Returns whether the UE supports UL coordinated multi-point operation.

Return values:
<Comp> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "UL CoMP" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:ITCWithdiff?

Returns whether the UE supports inter-band TDD CA with different UL/DL configuration combinations.

Return values:

<InterBand>	String with two bits, for example "b00" or "b01"
Example:	See Querying UE Capability Report Contents
Usage:	Query only
Firmware/Software:	V3.5.50
Manual operation:	See "interBand TDD CA With Different Config" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:EHPFdd?

Returns whether the UE supports enhanced HARQ pattern for TTI bundling operation for FDD.

Return values:

<EHPattern>	OFF | ON
Example:	See Querying UE Capability Report Contents
Usage:	Query only
Firmware/Software:	V3.5.50
Manual operation:	See "e HARQ Pattern FDD" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:EFTCodebook?

Returns whether the UE supports enhanced 4 TX codebook.

Return values:

<Codebook>	OFF | ON
Example:	See Querying UE Capability Report Contents
Usage:	Query only
Firmware/Software:	V3.5.50
Manual operation:	See "enhanced 4 Tx Codebook" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TFCPcelldplx?

Returns whether the UE supports PCell in any supported band combination including at least one FDD band and at least one TDD band.

Return values:

<Celldplx>	String with two bits, for example "b00" or "b10"
Example:	See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "tdd FDD CA PCell Duplex" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCTddpcell?

Returns whether the UE supports TDD UL/DL reconfiguration for TDD serving cell via monitoring PDCCH on a TDD PCell.

Return values:
<Pcell> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "phy TDD ReConfig TDD PCell" on page 246

SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCFddpcell?

Returns whether the UE supports TDD UL/DL reconfiguration for TDD serving cell via monitoring PDCCH on an FDD PCell.

Return values:
<Pcell> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "phy TDD ReConfig FDD PCell" on page 247

SENSe:LTE:SIGN<i>:UECapability:PLAYer:PFMode?

Returns whether the UE supports PUSCH feedback mode 3-2.

Return values:
<Mode> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "pusch Feedback Mode" on page 247

SENSe:LTE:SIGN<i>:UECapability:PLAYer:PSPSfset?

Returns whether the UE supports subframe set dependent UL power control for PUSCH and SRS.

Return values:
<SfSet> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "pusch SRS PowerControl SubframeSet" on page 247

SENSe:LTE:SIGN<i>:UECapability:PLAYer:CSFSet?

Returns whether the UE supports R12 DL CSI subframe set configuration.

Return values:
<Subframeset> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "CSI Subframe Set" on page 247

SENSe:LTE:SIGN<i>:UECapability:PLAYer:NRRT?

Returns whether the UE supports TTI bundling without resource allocation restriction.

Return values:
<Norr> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "no Resource Restriction For TTI Bundling" on page 247

SENSe:LTE:SIGN<i>:UECapability:PLAYer:DSDCell?

Returns whether the UE supports discovery signal detection for deactivated SCells.

Return values:
<Discovery> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "discovery Signals In Deact SCell" on page 247

2.6.6.4 RF UE Capabilities

The following commands query the supported E-UTRA operating bands, band combinations and other RF capabilities.

SENSe:LTE:SIGN<i>:UECapability:RF:SUPPorted?....347
SENSe:LTE:SIGN<i>:UECapability:RF:HDUPlex?....347
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:BCSet?....348
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>?....348
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:UL?....349
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:DL?....349
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:UL?....349
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:DL?....349
SENSe:LTE:SIGN<i>:UECapability:RF:FBRetrieval?....350
SENSe:LTE:SIGN<i>:UECapability:RF:RBANds?....350
SENSe:LTE:SIGN<i>:UECapability:RF:FBPadjust?....350

SENSe:LTE:SIGN<i>:UECapability:RF:SUPPorted?

Returns a list of values indicating the support of the individual E-UTRA operating bands by the UE.

Return values:

<SupportedBand> OFF | ON
256 values: user-defined band, band 1 to band 255

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.0.30
V3.5.40: result array restructured

Manual operation: See "Supported Bands" on page 248

SENSe:LTE:SIGN<i>:UECapability:RF:HDUPlex?

Returns a list of values indicating whether the UE supports only half duplex operation for the individual E-UTRA operating bands.

Return values:

<HalfDuplex> OFF | ON
256 values: user-defined band, band 1 to band 255

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.0.30
V3.5.40: result array restructured

Manual operation: See "Supported Bands" on page 248

SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:BCSet?

Returns a list of binary numbers, indicating which bandwidth combination sets the UE supports for the individual carrier aggregation band combinations.

Suffix:
<Number> 1020

Return values:
<Band> Comma-separated list of binary numbers, one binary number per band combination (combination 0 to n)
Each binary number indicates which bandwidth combination sets are supported for the band combination. The leftmost bit corresponds to set 0, the next bit to set 1, and so on. "0" means not supported. "1" means supported.

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Supported Band Combination" on page 248

SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>?

Returns the operating band combinations supported for carrier aggregation.

Suffix:
<Number> 1020,1090
Selects the UE capability report element to be evaluated:
`RF-Parameters-v1020` or `RF-Parameters-v1090`

<BandNr> 1..4
Selects which band of the band combinations is returned

Return values:
<Band> UDEFined | OB1 | ... | OB46 | OB65 | ... | OB67 | OB252 | OB255

Comma-separated list of bands, one band per band combination (combination 0 to n)

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80, some bands added in later versions
V3.5.20: band no 3+4

Manual operation: See "Supported Band Combination" on page 248

SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:UL?
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:DL?

Returns the bandwidth classes supported by the UE in the uplink or downlink. The information is returned for a selected band of all supported carrier aggregation band combinations.

Suffix:

<Number> 1020

<BandNr> 1..4
Selects for which band of the band combinations the information is returned

Return values:

<BandwidthClass> Comma-separated list of strings, one string per band combination (combination 0 to n)
Each string indicates the bandwidth classes supported for the selected band (<BandNr>) of the combination, for example "abc".

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80, V3.5.20 band 3+4

Manual operation: See "Supported Band Combination" on page 248

SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:UL?
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:DL?

Returns the number of layers supported by the UE for spatial multiplexing in the uplink or downlink. The information is returned for a selected band of all supported carrier aggregation band combinations.

Suffix:

<Number> 1020

<BandNr> 1..4
Selects for which band of the band combinations the information is returned

Return values:

<MIMOcapability> Comma-separated list of numbers, 26 numbers per band combination (combination 0 to n)
The 26 numbers indicate the supported number of layers for bandwidth class "a" to "z".

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80, V3.5.20 band 3+4

Manual operation: See "Supported Band Combination" on page 248

SENSe:LTE:SIGN<i>:UECapability:RF:FBRetrieval?

Returns whether the UE supports the reception of "requestedFrequencyBands".

Return values:

<Retrieval> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Retrieval" on page 249

SENSe:LTE:SIGN<i>:UECapability:RF:RBANds?

Returns all frequency bands requested by E-UTRAN.

Return values:

<RequestedBands> UDEFined | OB1 | ... | OB46 | OB65 | ... | OB67 | OB252 | OB255

Comma-separated list of 64 values
Typically, fewer than 64 bands are requested and the remaining values are filled with NAV.

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Requested Bands" on page 249

SENSe:LTE:SIGN<i>:UECapability:RF:FBPadjust?

Returns whether the UE supports the prioritization of frequency bands as requested by "freqBandIndicatorPriority-r12".

Return values:

<Adjustment> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Freq Band Priority Adjustment" on page 249

2.6.6.5 Measurement UE Capabilities

The following commands query the UE capabilities for channel measurements.

SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps?....... 351
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UFDD?....... 352
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UTDD<n>?....... 352
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:GERan?....... 353
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CHRPd?....... 354
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CXRTt?....... 355
SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps:V<number>?....... 355
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UFDD?....... 356
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UTDD<n>?....... 357
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:GERan?....... 358
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CHRPd?....... 358
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CXRTt?....... 359
SENSe:LTE:SIGN<i>:UECapability:MEAS:RMWideband?....... 360
SENSe:LTE:SIGN<i>:UECapability:MEAS:BFINterrupt?....... 360

SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band and measuring on (another) specific E-UTRA band.

The full list contains 256 times 256 values. The 256 values/repetitions correspond to the LTE bands. The list is ordered as follows:

{measured band: user-defined, 1, 2, ..., 255}$_{\text{used band: user-defined}}$,

{measured band: user-defined, 1, 2, ..., 255}$_{\text{used band: 1}}$, ...,

{measured band: user-defined, 1, 2, ..., 255}$_{\text{used band: 255}}$

Via the optional parameter <Index>, you can alternatively query the list for one measured band:

{used band: user-defined, 1, 2, ..., 255}$_{\text{measured band <Index>}}$

Query parameters:

<Index>	UDEFined | OB1 | ... | OB46 | OB65 | ... | OB67 | OB252 | OB255 Selects the measured E-UTRA band, for which the list is returned.

Return values:

<Value>	OFF | ON Without <Index>: 256 x 256 = 65536 values With <Index>: 256 values
Example:	See Querying UE Capability Report Contents
Usage:	Query only

Firmware/Software: V3.0.30
V3.2.80: added <Index>, some bands added in later versions
V3.5.40: result array restructured

Manual operation: See "Inter-Freq Need for Gaps" on page 250

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UFDD? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band and measuring on a specific UTRA FDD band.

The full list contains 32 times 256 values. Each block of 32 values corresponds to the UTRA FDD bands. The 256 repetitions correspond to the E-UTRA bands:

$\{\text{measured band: 1, 2, ..., 32}\}_{\text{used band: user-defined}}$,

$\{\text{measured band: 1, 2, ..., 32}\}_{\text{used band: 1}}$, ...,

$\{\text{measured band: 1, 2, ..., 32}\}_{\text{used band: 255}}$

Via the optional parameter <Index>, you can alternatively query the list for a single UTRA FDD band:

$\{\text{used band: user-defined, 1, 2, ..., 255}\}_{\text{measured band <Index>}}$

Query parameters:

<Index> OB1 | OB2 | ... | OB32
Selects the measured UTRA FDD band, for which the list is returned.

Return values:

<Value> OFF | ON
Without <Index>: 32 x 256 = 8192 values
With <Index>: 256 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.0.30
V3.2.80: added <Index>
V3.5.40: result array restructured

Manual operation: See "Inter-RAT Need for Gaps" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UTDD<n>? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band and measuring on a specific UTRA TDD band.

The full list contains 32 times 256 values. Each block of 32 values corresponds to the UTRA TDD bands. The 256 repetitions correspond to the E-UTRA bands:

$\{\text{measured band: 1, 2, ..., 32}\}_{\text{used band: user-defined}}$,

$\{\text{measured band: 1, 2, ..., 32}\}_{\text{used band: 1}}$, ..., {measured band: 1, 2, ..., 32}$_{\text{used band: 255}}$

Via the optional parameter <Index>, you can alternatively query the list for a single UTRA TDD band:

{used band: user-defined, 1, 2, ..., 255}$_{\text{measured band <Index>}}$

Suffix:

<n>	128

Query parameters:

<Index>	OB1 | OB2 | ... | OB32 Selects the measured UTRA TDD band, for which the list is returned.

Return values:

<Value>	OFF | ON Without <Index>: 32 x 256 = 8192 values With <Index>: 256 values
Example:	See Querying UE Capability Report Contents
Usage:	Query only
Firmware/Software:	V3.2.80 V3.5.40: result array restructured
Manual operation:	See "Inter-RAT Need for Gaps" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:GERan? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band and measuring on a specific GERAN band.

The full list contains 11 times 256 values. Each block of 11 values corresponds to the following GERAN bands: GSM 450, GSM 480, GSM 710, GSM 750, GSM 810, GSM 850, P-GSM 900, E-GSM 900, R-GSM 900, GSM 1800, GSM 1900. The 256 repetitions correspond to the E-UTRA bands:

{measured band: GSM 450, GSM 480, ..., GSM 1900}$_{\text{used band: user-defined,}}$

{measured band: GSM 450, GSM 480, ..., GSM 1900}$_{\text{used band: 1, ...,}}$

{measured band: GSM 450, GSM 480, ..., GSM 1900}$_{\text{used band: 256}}$

Via the optional parameter <Index>, you can alternatively query the list for a single GERAN band:

{used band: user-defined, 1, 2, ..., 255}$_{\text{measured band <Index>}}$

Query parameters:

<Index>	G045 | G048 | G071 | G075 | G081 | G085 | G09P | G09E | G09R | G18 | G19 Selects the measured GERAN band, for which the list is returned.

Return values:

<Value> OFF | ON

Without <Index>: 11 x 256 = 2816 values
With <Index>: 256 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.0.30
V3.2.80: added <Index>
V3.5.40: result array restructured

Manual operation: See "Inter-RAT Need for Gaps" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CHRPd? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band and measuring on a specific CDMA2000 HRPD band.

The full list contains 18 times 256 values. Each block of 18 values corresponds to the CDMA2000 band classes. The 256 repetitions correspond to the E-UTRA bands:

$\{\text{measured band: 0, 1, ..., 17}\}_{\text{used band: user-defined}}$,

$\{\text{measured band: 0, 1, ..., 17}\}_{\text{used band: 1}}$, ...,

$\{\text{measured band: 0, 1, ..., 17}\}_{\text{used band: 256}}$

Via the optional parameter <Index>, you can alternatively query the list for a single CDMA2000 band class:

$\{\text{used band: user-defined, 1, 2, ..., 255}\}_{\text{measured band <Index>}}$

Query parameters:

<Index> BC0 | BC1 | ... | BC17

Selects the measured CDMA2000 band class, for which the list is returned.

Return values:

<Value> OFF | ON

Without <Index>: 18 x 256 = 4608 values
With <Index>: 256 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.0.30
V3.2.80: added <Index>
V3.5.40: result array restructured

Manual operation: See "Inter-RAT Need for Gaps" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CXRTt? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band and measuring on a specific CDMA2000 1xRTT band class.

The full list contains 18 times 256 values. Each block of 18 values corresponds to the CDMA2000 band classes. The 256 repetitions correspond to the E-UTRA bands:

{measured band: 0, 1, ..., 17}$_{\text{used band: user-defined}}$,

{measured band: 0, 1, ..., 17}$_{\text{used band: 1}}$, ...,

{measured band: 0, 1, ..., 17}$_{\text{used band: 256}}$

Via the optional parameter <Index>, you can alternatively query the list for a single CDMA2000 band class:

{used band: user-defined, 1, 2, ..., 255}$_{\text{measured band <Index>}}$

Query parameters:

<Index> BC0 | BC1 | ... | BC17

Selects the measured CDMA2000 band class, for which the list is returned.

Return values:

<Value> OFF | ON

Without <Index>: 18 x 256 = 4608 values
With <Index>: 256 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.0.30
V3.2.80: added <Index>
V3.5.40: result array restructured

Manual operation: See "Inter-RAT Need for Gaps" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps:V<number>? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band combination and measuring on a specific E-UTRA band.

The full list contains 256 times n+1 values. Each block of 256 values corresponds to the measured E-UTRA bands. Each repetition corresponds to a supported band combination.

The list is ordered as follows:

{measured band: user-defined, 1, 2, ..., 255}$_{\text{used band combination 0}}$,

{measured band: user-defined, 1, 2, ..., 255}$_{\text{used band combination 1}}$, ...,

{measured band: user-defined, 1, 2, ..., 255}$_{\text{used band combination n}}$

Via the optional parameter <Index>, you can alternatively query the list for a single measured E-UTRA band:

{used combination: 0, 1, ..., n}$_{\text{measured band <Index>}}$

Suffix:
<number> 1020

Query parameters:
<Index> UDEFined | OB1 | ... | OB46 | OB65 | ... | OB67 | OB252 | OB255

Selects the measured E-UTRA band, for which the list is returned.

Return values:
<Value> OFF | ON

Without <Index>: 256 x (n+1) values
With <Index>: n+1 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80, some bands added in later versions
V3.5.40: result array restructured

Manual operation: See "Inter-Freq Need for Gaps v1020" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UFDD? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band combination and measuring on a specific UTRA FDD band.

The full list contains 32 times n+1 values. Each block of 32 values corresponds to the UTRA FDD bands. Each repetition corresponds to a supported band combination:

{measured band: 1, 2, ..., 32}$_{\text{used band combination 0}}$,

{measured band: 1, 2, ..., 32}$_{\text{used band combination 1}}$, ...,

{measured band: 1, 2, ..., 32}$_{\text{used band combination n}}$

Via the optional parameter <Index>, you can alternatively query the list for a single UTRA FDD band:

{used combination: 0, 1, ..., n}$_{\text{measured band <Index>}}$

Suffix:
<number> 1020

Query parameters:
<Index> OB1 | OB2 | ... | OB32

Selects the measured UTRA FDD band, for which the list is returned.

Return values:
<Value> OFF | ON
Without <Index>: 32 x (n+1) values
With <Index>: n+1 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter-RAT Need for Gaps v1020" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UTDD<n>? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band combination and measuring on a specific UTRA TDD band.

The full list contains 32 times n+1 values. Each block of 32 values corresponds to the UTRA TDD bands. Each repetition corresponds to a supported band combination:

$\{\text{measured band: } 1, 2, ..., 32\}_{\text{used band combination } 0}$,

$\{\text{measured band: } 1, 2, ..., 32\}_{\text{used band combination } 1}$, ...,

$\{\text{measured band: } 1, 2, ..., 32\}_{\text{used band combination } n}$

Via the optional parameter <Index>, you can alternatively query the list for a single UTRA TDD band:

$\{\text{used combination: } 0, 1, ..., n\}_{\text{measured band <Index>}}$

Suffix:
<n> 128

<number> 1020

Query parameters:
<Index> OB1 | OB2 | ... | OB32
Selects the measured UTRA TDD band, for which the list is returned.

Return values:
<Value> OFF | ON
Without <Index>: 32 x (n+1) values
With <Index>: n+1 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter-RAT Need for Gaps v1020" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:GERan? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band combination and measuring on a specific GERAN band.

The full list contains 11 times n+1 values. Each block of 11 values corresponds to the following GERAN bands: GSM 450, GSM 480, GSM 710, GSM 750, GSM 810, GSM 850, P-GSM 900, E-GSM 900, R-GSM 900, GSM 1800, GSM 1900. Each repetition corresponds to a supported band combination:

{measured band: GSM 450, GSM 480, ..., GSM 1900}$_{\text{used band combination 0}}$,

{measured band: GSM 450, GSM 480, ..., GSM 1900}$_{\text{used band combination 1}}$, ...,

{measured band: GSM 450, GSM 480, ..., GSM 1900}$_{\text{used band combination n}}$

Via the optional parameter <Index>, you can alternatively query the list for a single GERAN band:

{used combination: 0, 1, ..., n}$_{\text{measured band <Index>}}$

Suffix:

<number>	1020

Query parameters:

<Index>	G045 | G048 | G071 | G075 | G081 | G085 | G09P | G09E | G09R | G18 | G19 Selects the measured GERAN band, for which the list is returned.

Return values:

<Value>	OFF | ON Without <Index>: 11 x (n+1) values With <Index>: n+1 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter-RAT Need for Gaps v1020" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CHRPd? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band combination and measuring on a specific CDMA2000 HRPD band class.

The full list contains 18 times n+1 values. Each block of 18 values corresponds to the CDMA2000 band classes. Each repetition corresponds to a supported band combination:

{measured band: 0, 1, ..., 17}$_{\text{used band combination 0}}$,

{measured band: 0, 1, ..., 17}$_{\text{used band combination 1}}$, ...,

{measured band: 0, 1, ..., 17}$_{\text{used band combination n}}$

Via the optional parameter <Index>, you can alternatively query the list for a single CDMA2000 band class:

{used combination: 0, 1, ..., n}$_{\text{measured band <Index>}}$

Suffix:

<number> 1020

Query parameters:

<Index> BC0 | BC1 | ... | BC17

Selects the measured CDMA2000 band class, for which the list is returned.

Return values:

<Value> OFF | ON

Without <Index>: 18 x (n+1) values
With <Index>: n+1 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter-RAT Need for Gaps v1020" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CXRTt? [<Index>]

Returns a list of values indicating the need for downlink measurement gaps when operating on a specific E-UTRA band combination and measuring on a specific CDMA2000 1xRTT band class.

The full list contains 18 times n+1 values. Each block of 18 values corresponds to the CDMA2000 band classes. Each repetition corresponds to a supported band combination:

{measured band: 0, 1, ..., 17}$_{\text{used band combination 0}}$,

{measured band: 0, 1, ..., 17}$_{\text{used band combination 1}}$, ...,

{measured band: 0, 1, ..., 17}$_{\text{used band combination n}}$

Via the optional parameter <Index>, you can alternatively query the list for a single CDMA2000 band class:

{used combination: 0, 1, ..., n}$_{\text{measured band <Index>}}$

Suffix:

<number> 1020

Query parameters:

<Index> BC0 | BC1 | ... | BC17

Selects the measured CDMA2000 band class, for which the list is returned.

Return values:

<Value> OFF | ON

Without <Index>: 18 x (n+1) values
With <Index>: n+1 values

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter-RAT Need for Gaps v1020" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:RMWideband?

Returns whether the UE supports RSRQ measurements with wider bandwidth.

Return values:

<Wideband> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "RSRQ Meas Wideband" on page 251

SENSe:LTE:SIGN<i>:UECapability:MEAS:BFINterrupt?

Returns whether the UE power consumption can be reduced by allowing the UE to cause interruptions to serving cells during measurements.

Return values:

<Benefits> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Benefits from Interruption" on page 251

2.6.6.6 Inter-RAT UE Capabilities

The following commands query the inter-RAT handover capabilities of the UE.

SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:SUPPorted?....................................361
SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:EREDirection:UTRA?..........................361
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTRA?....................361

SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTRA?......................... 361
SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:SUPPorted?..................................... 362
SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:EREDirection:UTDD?......................... 362
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTDD?......................... 362
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTDD?......................... 362
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:SUPPorted?... 362
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:SUPPorted?.......................... 362
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:SUPPorted?.......................... 362
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:PHGeran?... 363
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:PHGeran?............................ 363
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:PHGeran?............................ 363
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:DTM?.. 363
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:EREDirection?....................................... 363
SENSe:LTE:SIGN<i>:UECapability:IRAT:CDMA2000:NWSHaring?.................................. 364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:SUPPorted?.. 364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:TCONfig?.. 364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:RCONfig?.. 364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:SUPPorted?.. 365
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:TCONfig?.. 365
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:RCONfig?.. 365
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECSFb?... 366
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECSFb?................................ 366
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECSFb?................................ 366
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECCMob?.. 366
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECCMob?.............................. 366
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECCMob?.............................. 366
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECDual?.. 366
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECDual?................................ 366
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECDual?................................ 366

SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:SUPPorted?

Returns a list of values indicating the support of the individual UTRA FDD operating bands by the UE.

Return values:

<SupportedBand> OFF | ON

32 values: band 1, ..., band 32

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "Supported Bands" on page 253

SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:EREDirection:UTRA?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTRA?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTRA?

Returns whether the UE supports an enhanced redirection to UTRA FDD or not.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "e Redirection UTRA" on page 253

SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:SUPPorted?

Returns a list of values indicating the support of the individual UTRA TDD operating bands by the UE, according to the UE capability information.

Return values:

<SupportedBand> OFF | ON
26 values: band a to band z

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Supported Bands" on page 253

SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:ERED irection:UTDD?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTDD?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTDD?

Returns whether the UE supports an enhanced redirection to UTRA TDD or not.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "e Redirection UTRA TDD" on page 253

SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:SUPPorted?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:SUPPorted?

Returns a list of values indicating the support of the individual GERAN operating bands by the UE.

Return values:
<SupportedBand> OFF | ON

11 values: GSM 450, GSM 480, GSM 710, GSM 750, GSM 810, GSM 850, P-GSM 900, E-GSM 900, R-GSM 900, GSM 1800, GSM 1900

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30, `FAUeeutra` / `TAUeeutra` V3.2.80

Manual operation: See "Supported Bands" on page 253

SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:PHGeran?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:PHGeran?

Returns whether the UE supports handover to GERAN or not.

Return values:
<PS_HO_GERAN> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30, `FAUeeutra` / `TAUeeutra` V3.2.80

Manual operation: See "Inter-RAT PS HO to GERAN" on page 253

SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:DTM?

Returns whether the UE supports DTM in GERAN or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "dtm" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:EREDirection?

Returns whether the UE supports an enhanced redirection to GERAN or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "e Redirection GERAN" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:CDMA2000:NWSHaring?

Returns whether the UE supports network sharing for CDMA2000.

Return values:
<Sharing> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "CDMA2000 NW Sharing" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:SUPPorted?

Returns a list of values indicating the support of the individual CDMA2000 HRPD band classes by the UE.

Return values:
<SupportedBand> OFF | ON
18 values: band class 0 to 17

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "Supported Bands" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:TCONfig?

Returns whether the UE supports dual transmitter for HRPD/E-UTRAN or only single transmitter.

Return values:
<TXconfiguration> SINGle | DUAL

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "TX Config" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:RCONfig?

Returns whether the UE supports dual receiver for HRPD/E-UTRAN or only single receiver.

Return values:

<RXconfiguration> SINGle | DUAL

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "RX Config" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:SUPPorted?

Returns a list of values indicating the support of the individual CDMA2000 1xRTT band classes by the UE.

Return values:

<SupportedBand> OFF | ON

18 values: band class 0 to 17

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "Supported Bands" on page 254

SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:TCONfig?

Returns whether the UE supports dual transmitter for 1xRTT/E-UTRAN or only single transmitter.

Return values:

<TXconfiguration> SINGle | DUAL

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "TX Config" on page 255

SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:RCONfig?

Returns whether the UE supports dual receiver for 1xRTT/E-UTRAN or only single receiver.

Return values:

<RXconfiguration> SINGle | DUAL

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "RX Config" on page 255

SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECSFb?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECSFb?

Returns whether the UE supports enhanced CS fallback to CDMA2000 1xRTT or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "e CSFB" on page 255

SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECCMob?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECCMob?

Returns whether the UE supports concurrent enhanced CS fallback to CDMA2000 1xRTT and handover/redirection to CDMA2000 HRPD or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "e CSFB ConcPS Mob" on page 255

SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECDual?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECDual?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECDual?

Returns whether the UE supports enhanced CS fallback to CDMA2000 1xRTT for dual Rx/Tx configuration or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "e CSFB dual" on page 255

2.6.6.7 Other UE Capabilities

The following commands query the UE capabilities categorized by 3GPP as "other parameters".

SENSe:LTE:SIGN<i>:UECapability:IDCindex?..367
SENSe:LTE:SIGN<i>:UECapability:PPINdex?..367
SENSe:LTE:SIGN<i>:UECapability:URTTimediff?..367
SENSe:LTE:SIGN<i>:UECapability:DCIulca?..368

SENSe:LTE:SIGN<i>:UECapability:IDCindex?

Returns whether the UE supports in-device coexistence indication and autonomous denial functionality.

Return values:
<Index> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "In Device Coex Ind" on page 256

SENSe:LTE:SIGN<i>:UECapability:PPINdex?

Returns whether the UE supports power preference indication.

Return values:
<Index> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Power Pref Ind" on page 256

SENSe:LTE:SIGN<i>:UECapability:URTTimediff?

Returns whether the UE supports RX-TX time difference measurements.

Return values:
<Timediff> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "UE Rx Tx Time Diff Measurements" on page 256

SENSe:LTE:SIGN<i>:UECapability:DCIulca?

Returns whether the UE supports in-device coexistence indication for UL CA.

Return values:
<Index> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "In Device Coex Div UL CA" on page 256

2.6.6.8 MBMS UE Capabilities

The following commands query the UE capabilities for MBMS reception.

SENSe:LTE:SIGN<i>:UECapability:MBMS:SCELl?... 368
SENSe:LTE:SIGN<i>:UECapability:MBMS:NSCell?.. 368

SENSe:LTE:SIGN<i>:UECapability:MBMS:SCELl?

Returns whether the UE supports MBMS reception via an SCell.

Return values:
<Scell> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "MBMS SCell" on page 256

SENSe:LTE:SIGN<i>:UECapability:MBMS:NSCell?

Returns whether the UE supports MBMS reception via a serving cell to be added.

Return values:
<Cell> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "MBMS Non Serving Cell" on page 256

2.6.6.9 CSG Proximity Indication Capabilities

The following commands query whether the UE supports proximity indications or not.

SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTRa?............................... 369
SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTer?................................369
SENSe:LTE:SIGN<i>:UECapability:CPINdication:UTRan?... 369

SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTRa?

Returns whether the UE supports proximity indications for intra-frequency E-UTRAN CSG member cells or not.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Intra Freq Proximity Indication" on page 257

SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTer?

Returns whether the UE supports proximity indications for inter-frequency E-UTRAN CSG member cells or not.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter Freq Proximity Indication" on page 257

SENSe:LTE:SIGN<i>:UECapability:CPINdication:UTRan?

Returns whether the UE supports proximity indications for UTRAN CSG member cells or not.

Return values:

<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "utran Proximity Indication" on page 257

2.6.6.10 Neighbor Cell SI-Acquisition Capabilities

The following commands query whether the UE supports system information requests for handover or not.

SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTRa?.................................... 370
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTRa?......................370
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTRa?......................370
SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTer?......................................370
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTer?....................... 370
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTer?....................... 370
SENSe:LTE:SIGN<i>:UECapability:NCSacq:UTRan?...371
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:UTRan?...................................... 371
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:UTRan?...................................... 371

SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTRa?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTRa?

Returns whether the UE supports system information acquisition for intra-frequency neighbor cells or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Intra Freq SI-Acquisition for HO" on page 257

SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTer?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTer?

Returns whether the UE supports system information acquisition for inter-frequency neighbor cells or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Inter Freq SI-Acquisition for HO" on page 257

SENSe:LTE:SIGN<i>:UECapability:NCSacq:UTRan?
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:UTRan?
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:UTRan?

Returns whether the UE supports system information acquisition for UMTS neighbor cells or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "utran SI-Acquisition for HO" on page 258

2.6.6.11 UE-Based Network Performance Measurement Capabilities

The following commands query the UE capabilities for UE-based network performance measurements.

SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:LMIDle?..371
SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:SGLocation?...371
SENSe:LTE:SIGN<i>:UECapability:LMMeas?...372

SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:LMIDle?

Returns whether the UE supports logged measurements in idle mode or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "logged Measurements Idle" on page 258

SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:SGLocation?

Returns whether the UE is equipped with a GNSS receiver or not.

Return values:
<Supported> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Standalone GNSS Location" on page 258

SENSe:LTE:SIGN<i>:UECapability:LMMeas?

Returns whether the UE supports logged MBSFN measurements in RRC idle and connected mode.

Return values:
<Lmbsfn> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Logged MBSFN Measurements" on page 258

2.6.6.12 RLC UE Capabilities

The following commands query the UE capabilities for RLC.

SENSe:LTE:SIGN<i>:UECapability:ERLField?

Returns whether the UE supports 15-bit RLC length indicators.

Return values:
<Field> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "extended RLC LI Fields" on page 258

2.6.6.13 WLAN Interworking UE Capabilities

The following commands query the UE capabilities for WLAN interworking.

SENSe:LTE:SIGN<i>:UECapability:WIW:WIRRules?..372
SENSe:LTE:SIGN<i>:UECapability:WIW:WIAPolicies?..373

SENSe:LTE:SIGN<i>:UECapability:WIW:WIRRules?

Returns whether the UE supports RAN-assisted WLAN interworking based on access network selection and traffic steering rules specified in 3GPP TS 36.304.

Return values:
<rules> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "WLAN IW RAN Rules" on page 259

SENSe:LTE:SIGN<i>:UECapability:WIW:WIAPolicies?

Returns whether the UE supports RAN-assisted WLAN interworking based on ANDSF policies specified in 3GPP TS 24.312.

Return values:

<Policies> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "WLAN IW ANDSF Policies" on page 259

2.6.6.14 Dual Connectivity UE Capabilities

The following commands query the UE capabilities for dual connectivity (DC).

SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSPlit?..373
SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSCg?..373

SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSPlit?

Returns whether the UE supports the DRB type of split bearer.

Return values:

<Typesplit> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "DRB TypeSplit" on page 259

SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSCg?

Returns whether the UE supports the DRB type of SCG bearer.

Return values:

<Typescg> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "DRB TypeSCG" on page 259

2.6.6.15 MAC UE Capabilities

The following commands query the UE capabilities for the MAC layer.

SENSe:LTE:SIGN<i>:UECapability:MAC:LCSPtimer?... 374
SENSe:LTE:SIGN<i>:UECapability:MAC:LDRXcommand?... 374

SENSe:LTE:SIGN<i>:UECapability:MAC:LCSPtimer?

Returns whether the UE supports the logical channel SR prohibit timer as specified in 3GPP TS 36.321.

Return values:
<Channel> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Logical Channel SR Prohibit Timer" on page 260

SENSe:LTE:SIGN<i>:UECapability:MAC:LDRXcommand?

Returns whether the UE supports the long DRX command MAC control element as specified in 3GPP TS 36.321.

Return values:
<Command> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Long DRX Command" on page 260

2.6.6.16 SL UE Capabilities

The following commands query the UE capabilities for sidelink communication.

SENSe:LTE:SIGN<i>:UECapability:SL:CSTX?...374
SENSe:LTE:SIGN<i>:UECapability:SL:DSRalloc?..375
SENSe:LTE:SIGN<i>:UECapability:SL:DUSRalloc?.. 375
SENSe:LTE:SIGN<i>:UECapability:SL:DSLSs?... 375
SENSe:LTE:SIGN<i>:UECapability:SL:DSPRoc?..376

SENSe:LTE:SIGN<i>:UECapability:SL:CSTX?

Returns whether the UE supports simultaneous transmission of EUTRA and sidelink communication on different carriers.

Return values:
<Simultaneous> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Comm Simultaneous Tx" on page 261

SENSe:LTE:SIGN<i>:UECapability:SL:DSRalloc?

Returns whether the UE supports transmission of discovery announcements based on network scheduled resource allocation.

Return values:
<Alloc> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Disc Scheduled Resource Alloc" on page 261

SENSe:LTE:SIGN<i>:UECapability:SL:DUSRalloc?

Returns whether the UE supports transmission of discovery announcements based on UE autonomous resource selection.

Return values:
<Alloc> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Disc UE Selected Resource Alloc" on page 261

SENSe:LTE:SIGN<i>:UECapability:SL:DSLSs?

Returns whether the UE supports SLSS transmission and reception.

Return values:
<Slss> OFF | ON

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Disc SLSS" on page 261

SENSe:LTE:SIGN<i>:UECapability:SL:DSPRoc?

Returns the number of processes supported by the UE for sidelink discovery.

Return values:
<Proc> N50 | N400

Example: See Querying UE Capability Report Contents

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Disc Supported Proc" on page 261

2.6.7 UE Info

The following queries retrieve information about the connected mobile as shown in the "UE Info" area of the main view.

SENSe:LTE:SIGN<i>:UESinfo:IMEI? 376
SENSe:LTE:SIGN<i>:UESinfo:IMSI? 376
SENSe:LTE:SIGN<i>:UESinfo:VDPReference? 377
SENSe:LTE:SIGN<i>:UESinfo:UEUSage? 377
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:IPV<n>? 377
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer? 378
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer:SEParate? 378

SENSe:LTE:SIGN<i>:UESinfo:IMEI?

Queries the IMEI of the UE.

Return values:
<IMEI> IMEI as string with up to 18 digits

Example: See Querying UE Information

Usage: Query only

Firmware/Software: V2.0.20

Manual operation: See "IMEI" on page 114

SENSe:LTE:SIGN<i>:UESinfo:IMSI?

Queries the IMSI of the UE.

Return values:
<IMSI> IMSI as string with up to 16 digits

Example: See Querying UE Information

Usage: Query only

Firmware/Software: V2.0.20

Manual operation: See "IMSI" on page 115

SENSe:LTE:SIGN<i>:UESinfo:VDPReference?

Queries the voice domain preference of the UE.

Return values:

<Value> CVONly | IPVonly | CVPRefered | IPVPrefered

CVONly: CS voice only
IPVonly: IMS PS voice only
CVPRefered: CS voice preferred, IMS PS voice as secondary
IPVPrefered: IMS PS voice preferred, CS voice as secondary

Example: See Querying UE Information

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Voice Domain Preference" on page 115

SENSe:LTE:SIGN<i>:UESinfo:UEUSage?

Queries the usage setting of the UE.

Return values:

<Usage> VCENtric | DCENtric

VCENtric: Voice centric
DCENtric: Data centric

Example: See Querying UE Information

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "UE's Usage Setting" on page 115

SENSe:LTE:SIGN<i>:UESinfo:UEADdress:IPV<n>?

Returns the IPv4 addresses (<n> = 4) or the IPv6 prefixes (<n> = 6) assigned to the UE by the R&S CMW.

Suffix:

<n> 4,6

Return values:

<IPAddresses> Comma-separated list of IP address/prefix strings

Example: See Setting Up a Test Mode Connection

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "Default Bearer" on page 115

SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer?

Returns information about all established dedicated bearers. Three values are returned per bearer:

{<ID>, <TFTPortLow>, <TFTPortHigh>}$_{\text{Bearer 1}}$, ..., {...}$_{\text{Bearer n}}$

Use this command if you have configured a single port range per bearer, applicable to the uplink and the downlink.

Return values:

<ID> Dedicated bearer ID as string
Example: "6 (->5, Voice)" means dedicated bearer 6, mapped to default bearer 5, using dedicated bearer profile "Voice"

<TFTPortLow> Lower end of TFT port range assigned to the dedicated bearer
Range: 1 to 65535

<TFTPortHigh> Upper end of TFT port range assigned to the dedicated bearer
Range: 1 to 65535

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "Dedicated Bearer" on page 115

SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer:SEParate?

Returns information about all established dedicated bearers. Five values are returned per bearer:

{<ID>, <TFTPortLowDL>, <TFTPortHighDL>, <TFTPortLowUL>, <TFTPortHighUL>}$_{\text{Bearer 1}}$, ..., {...}$_{\text{Bearer n}}$

Use this command if you have configured separate port ranges for the uplink and the downlink.

Return values:

<ID> Dedicated bearer ID as string
Example: "6 (->5, Voice)" means dedicated bearer 6, mapped to default bearer 5, using dedicated bearer profile "Voice"

<TFTPortLowDL> Lower end of TFT port range assigned to the downlink
Range: 1 to 65535

<TFTPortHighDL> Upper end of TFT port range assigned to the downlink
Range: 1 to 65535

<TFTPortLowUL> Lower end of TFT port range assigned to the uplink
Range: 1 to 65535

<TFTPortHighUL> Upper end of TFT port range assigned to the uplink
Range: 1 to 65535

Example: See Querying UE Information

Usage: Query only

Firmware/Software: V3.5.30

Manual operation: See "Dedicated Bearer" on page 115

2.6.8 Routing Settings

The following commands configure the signal input and output paths.

- Scenario Selection and Signal Routing....................379
- RF Path Properties....................401
- Signal Settings....................403
- User-Defined Band....................411

2.6.8.1 Scenario Selection and Signal Routing

The commands in this section configure the scenario and select the paths for the generated downlink signal (output) and the analyzed signal (input).

LTE-specific configuration rules:

- For scenarios with carrier aggregation, select a different signaling unit for each carrier.
- For scenarios with several output paths (MIMO or carrier aggregation), select a different TX module for each output path.
- For scenarios with MIMO, select a different connector for each output path of a carrier.

The following table lists all scenarios and the related commands, so that you can easily find the relevant command.

For configuration of the SCC uplink routing, see `CONFigure:LTE:SIGN<i>:SCC<c>:UUL` on page 307.

Scenario name at GUI	Commands
"1 Cell - 1 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:SCELl:FLEXible` on page 383
"1 Cell - 2 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:TRO:FLEXible` on page 383
"1 Cell - 4 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:FRO:FLEXible` on page 384
"1 Cell - IQ Out, RF In"	`ROUTe:LTE:SIGN<i>:SCENario:IORI:FLEXible` on page 384
"1 Cell - Fading - 1 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:SCFading:FLEXible:INTernal` on page 385 `ROUTe:LTE:SIGN<i>:SCENario:SCFading:FLEXible[:EXTernal]` on page 385
"1 Cell - Fading - 2 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:TROFading:FLEXible:INTernal` on page 386 `ROUTe:LTE:SIGN<i>:SCENario:TROFading:FLEXible[:EXTernal]` on page 386
"1 Cell - Fad. - MIMO4x2 - 2 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:MTFading:FLEXible:INTernal` on page 387 `ROUTe:LTE:SIGN<i>:SCENario:MTFading:FLEXible[:EXTernal]` on page 387
"2CC CA - 2 RF Out"	`ROUTe:LTE:SIGN<i>:SCENario:CATRfout:FLEXible` on page 388

Scenario name at GUI	Commands
"2CC CA - 4 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CAFRfout:FLEXible on page 389
"2CC CA - Fading - 2 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CATF:FLEXible:INTernal on page 389 ROUTe:LTE:SIGN<i>:SCENario:CATF:FLEXible[:EXTernal] on page 390
"2CC CA - Fading - 4 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CAFF:FLEXible:INTernal on page 391 ROUTe:LTE:SIGN<i>:SCENario:CAFF:FLEXible[:EXTernal] on page 391
"3CC CA - 3 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CC:FLEXible on page 392
"3CC CA - PCC MIMO - 4 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CCMP:FLEXible on page 393
"3CC CA - SCC1 MIMO - 4 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CCMS<c>:FLEXible on page 394
"3CC CA - 6 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CF on page 394
"3CC CA - Fading - 6 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:CFF:INTernal on page 395 ROUTe:LTE:SIGN<i>:SCENario:CFF[:EXTernal] on page 396
"4CC CA - 4 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:DD:FLEXible on page 397
"4CC CA - 8 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:DH on page 398
"4CC CA - Fading - 8 RF Out"	ROUTe:LTE:SIGN<i>:SCENario:DHF:INTernal on page 399 ROUTe:LTE:SIGN<i>:SCENario:DHF[:EXTernal] on page 400

CATalog:LTE:SIGN<i>:SCENario?

Queries a list of all supported scenarios, depending on the available hardware and licenses.

Return values:

<Scenarios> SCEL | TRO | FRO | IORI | SCF | TROF | MTF | CATR | CAFR | BDD | CATF | CAFF | BDFD | CC | CCMP | CCMS1 | CF | CFF | DD | DH | DHF

Comma-separated list of all supported scenarios

For mapping of the values to scenario names, see ROUTe:LTE:SIGN<i>:SCENario?.

Usage: Query only

Firmware/Software: V3.5.50

ROUTe:LTE:SIGN<i>:SCENario?

Returns the active scenario.

Return values:

<Scenario> SCEL | TRO | FRO | IORI | SCF | TROF | MTF | CATR | CAFR | BDD | CATF | CAFF | BDFD | CC | CCMP | CCMS1 | CF | CFF | DD | DH | DHF

BDD: "2CC CA - 4 RF Out - Distributed"
BDFD: "2CC CA - Fading - 4 RF Out - Distributed"
CAFF: "2CC CA - Fading - 4 RF Out"
CAFR: "2CC CA - 4 RF Out"
CATF: "2CC CA - Fading - 2 RF Out"
CATR: "2CC CA - 2 RF Out"
CC: "3CC CA - 3 RF Out"
CCMP: "3CC CA - PCC MIMO - 4 RF Out"
CCMS1: "3CC CA - SCC1 MIMO - 4 RF Out"
CF: "3CC CA - 6 RF Out"
CFF: "3CC CA - Fading - 6 RF Out"
DD: "4CC CA - 4 RF Out"
DH: "4CC CA - 8 RF Out"
DHF: "4CC CA - Fading - 8 RF Out"
FRO: "1 Cell - 4 RF Out"
IORI: "1 Cell - IQ Out, RF In"
MTF: "1 Cell - Fading - MIMO4x2 - 2 RF Out"
SCEL: "1 Cell - 1 RF Out"
SCF: "1 Cell - Fading - 1 RF Out"
TRO: "1 Cell - 2 RF Out"
TROF: "1 Cell - Fading - 2 RF Out"

<Fader> EXTernal | INTernal

Only returned for fading scenarios, e.g. SCF, TROF
Indicates whether internal or external fading is active.

Usage: Query only

Firmware/Software: V2.0.10, some return values added in later versions
V3.0.20: added <Fader>
V3.5.20: added BDD, CF, CFF, DD, DH, BDFD, DHF

ROUTe:LTE:SIGN<i>?

Returns the configured routing settings. The parameters <Scenario> and <Controller> are always returned. From the other parameters, only the subset relevant for the active scenario is returned.

For possible connector and converter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Return values:

<Scenario>	SCEL | TRO | FRO | IORI | SCF | TROF | MTF | CATR | CAFR | BDD | CATF | CAFF | BDFD | CC | CCMP | CCMS1 | CF | CFF | DD | DH | DHF Active scenario For mapping of the values to scenario names, see `ROUTe:LTE:SIGN<i>:SCENario?`.
<Controller>	For future use - returned value not relevant
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<TXConnector1>	RF connector for output path 1
<TXConverter1>	TX module for output path 1
<TXConnector2>	RF connector for output path 2
<TXConverter2>	TX module for output path 2
<TXConnector3>	RF connector for output path 3
<TXConverter3>	TX module for output path 3
<TXConnector4>	RF connector for output path 4
<TXConverter4>	TX module for output path 4
<TXConnector5>	RF connector for output path 5
<TXConverter5>	TX module for output path 5
<TXConnector6>	RF connector for output path 6
<TXConverter6>	TX module for output path 6
<TXConnector7>	RF connector for output path 7
<TXConverter7>	TX module for output path 7
<TXConnector8>	RF connector for output path 8
<TXConverter8>	TX module for output path 8
<IQConnector1>	DIG IQ OUT connector for output path 1
<IQConnector2>	DIG IQ OUT connector for output path 2
<IQConnector3>	DIG IQ OUT connector for output path 3
<IQConnector4>	DIG IQ OUT connector for output path 4
<IQConnector5>	DIG IQ OUT connector for output path 5
<IQConnector6>	DIG IQ OUT connector for output path 6
<IQConnector7>	DIG IQ OUT connector for output path 7
<IQConnector8>	DIG IQ OUT connector for output path 8

Usage: Query only

Firmware/Software: V2.0.10, some return values added in later versions
V3.5.20: added scenarios BDD, CF, CFF, DD, DH, BDFD, DHF and path 5 to 8

ROUTe:LTE:SIGN<i>:SCENario:SCELl:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>

Activates the scenario "1 Cell - 1 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard> Signaling unit

<RXConnector> RF connector for the input path

<RXConverter> RX module for the input path

<TXConnector> RF connector for the output path

<TXConverter> TX module for the output path

Example: See Selecting a Scenario

Firmware/Software: V3.5.40

ROUTe:LTE:SIGN<i>:SCENario:TRO:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <TX2Connector>, <TX2Converter>

Activates the scenario "1 Cell - 2 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard> Signaling unit

<RXConnector> RF connector for the input path

<RXConverter> RX module for the input path

<TXConnector> RF connector for the first output path

<TXConverter> TX module for the first output path

<TX2Connector> RF connector for the second output path

<TX2Converter> TX module for the second output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:FRO:FLEXible <PCCBBBoard>, <PCCBBBoard2>, <RXConnector>, <RXConverter>, <TX1Connector>, <TX1Converter>, <TX2Connector>, <TX2Converter>, <TX3Connector>, <TX3Converter>, <TX4Connector>, <TX4Converter>

Activates the scenario "1 Cell - 4 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the first and second output and the input path
<PCCBBBoard2>	Signaling unit for the third and fourth output path
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TX1Connector>	RF connector for the first output path
<TX1Converter>	TX module for the first output path
<TX2Connector>	RF connector for the second output path
<TX2Converter>	TX module for the second output path
<TX3Connector>	RF connector for the third output path
<TX3Converter>	TX module for the third output path
<TX4Connector>	RF connector for the fourth output path
<TX4Converter>	TX module for the fourth output path
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS520 and R&S CMW-KS521

ROUTe:LTE:SIGN<i>:SCENario:IORI:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>

Activates the scenario "1 Cell - IQ Out, RF In" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TXConnector>	DIG IQ OUT rear panel connector for the output path
<TXConverter>	For future use. Send KEEP to ensure compatible settings.
Firmware/Software:	V3.5.40

ROUTe:LTE:SIGN<i>:SCENario:SCFading:FLEXible:INTernal <PCCBBBoard>, <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <Fader>

Activates the scenario "1 Cell - Fading - 1 RF Out" with internal fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TXConnector>	RF connector for the output path
<TXConverter>	TX module for the output path
<Fader>	I/Q board used for fading
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS510, R&S CMW-KE100 and R&S CMW-KE500

ROUTe:LTE:SIGN<i>:SCENario:SCFading:FLEXible[:EXTernal] <PCCBBBoard>, <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <IQConnector>

Activates the scenario "1 Cell - Fading - 1 RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TXConnector>	RF connector for the output path
<TXConverter>	TX module for the output path
<IQConnector>	DIG IQ OUT connector for external fading of the output path
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS510

ROUTe:LTE:SIGN<i>:SCENario:TROFading:FLEXible:INTernal <PCCBBBoard>, <RXConnector>, <RXConverter>, <TX1Connector>, <TX1Converter>, <TX2Connector>, <TX2Converter>, <Fader>

Activates the scenario "1 Cell - Fading - 2 RF Out" with internal fading and selects the signal paths. The fading I/Q board is selectable.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TX1Connector>	RF connector for the first output path
<TX1Converter>	TX module for the first output path
<TX2Connector>	RF connector for the second output path
<TX2Converter>	TX module for the second output path
<Fader>	I/Q board used for fading
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS510, R&S CMW-KS520, R&S CMW-KE100 and R&S CMW-KE500

ROUTe:LTE:SIGN<i>:SCENario:TROFading:FLEXible[:EXTernal] <PCCBBBoard>, <RXConnector>, <RXConverter>, <TX1Connector>, <TX1Converter>, <IQ1Connector>, <TX2Connector>, <TX2Converter>, <IQ2Connector>

Activates the scenario "1 Cell - Fading - 2 RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TX1Connector>	RF connector for the first output path
<TX1Converter>	TX module for the first output path
<IQ1Connector>	DIG IQ OUT connector for external fading of the first output path
<TX2Connector>	RF connector for the second output path
<TX2Converter>	TX module for the second output path
<IQ2Connector>	DIG IQ OUT for external fading of the second output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS510 and R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:MTFading:FLEXible:INTernal <PCCBBBoard>, <PCCBBBoard2>, <RXConnector>, <RXConverter>, <TX1Connector>, <TX1Converter>, <TX2Connector>, <TX2Converter>

Activates the scenario "1 Cell - Fading - MIMO4x2 - 2 RF Out" with internal fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	First signaling unit
<PCCBBBoard2>	Second signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path
<TX1Connector>	RF connector for the first output path
<TX1Converter>	TX module for the first output path
<TX2Connector>	RF connector for the second output path
<TX2Converter>	TX module for the second output path

Example: See Selecting a Scenario

Firmware/Software: V3.5.40

Options: R&S CMW-KS510, R&S CMW-KS520, R&S CMW-KS521
R&S CMW-KE100, R&S CMW-KE500 and R&S CMW-KE501

ROUTe:LTE:SIGN<i>:SCENario:MTFading:FLEXible[:EXTernal] <PCCBBBoard>, <PCCBBBoard2>, <RXConnector>, <RXConverter>, <TX1Connector>, <TX1Converter>, <IQ1Connector>, <IQ2Connector>, <TX2Connector>, <TX2Converter>, <IQ3Connector>, <IQ4Connector>

Activates the scenario "1 Cell - Fading - MIMO4x2 - 2 RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	First signaling unit
<PCCBBBoard2>	Second signaling unit
<RXConnector>	RF connector for the input path
<RXConverter>	RX module for the input path

<TX1Connector>	RF connector for the first output path
<TX1Converter>	TX module for the first output path
<IQ1Connector>	DIG IQ OUT connector for fading of the first output path
<IQ2Connector>	DIG IQ OUT connector for fading of the second output path
<TX2Connector>	RF connector for the second output path
<TX2Converter>	TX module for the second output path
<IQ3Connector>	DIG IQ OUT connector for fading of the third output path
<IQ4Connector>	DIG IQ OUT connector for fading of the fourth output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS510, R&S CMW-KS520 and R&S CMW-KS521

ROUTe:LTE:SIGN<i>:SCENario:CATRfout:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTXConnector>, <PCCTXConverter>, <SCCBBBoard>, <SCCTXConnector>, <SCCTXConverter>[, <SCCRXConnector>, <SCCRXConverter>]

Activates the scenario "2CC CA - 2 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTXConnector>	RF connector for the PCC output path
<PCCTXConverter>	TX module for the PCC output path
<SCCBBBoard>	Signaling unit for the SCC
<SCCTXConnector>	RF connector for the SCC output path
<SCCTXConverter>	TX module for the SCC output path
<SCCRXConnector>	RF connector for the SCC input path, for UL CA only
<SCCRXConverter>	RX module for the SCC input path, for UL CA only

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD

ROUTe:LTE:SIGN<i>:SCENario:CAFRfout:FLEXible <PCCBBBoard>, <PCCRXConnector>, <PCCRXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCTX2Connector>, <PCCTX2Converter>, <SCCBBBoard>, <SCCTX1Connector>, <SCCTX1Converter>, <SCCTX2Connector>, <SCCTX2Converter>[, <SCCRXConnector>, <SCCRXConverter>]

Activates the scenario "2CC CA - 4 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<PCCRXConnector>	RF connector for the PCC input path
<PCCRXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path
<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<SCCBBBoard>	Signaling unit for the SCC
<SCCTX1Connector>	RF connector for the first SCC output path
<SCCTX1Converter>	TX module for the first SCC output path
<SCCTX2Connector>	RF connector for the second SCC output path
<SCCTX2Converter>	TX module for the second SCC output path
<SCCRXConnector>	RF connector for the SCC input path, for UL CA only
<SCCRXConverter>	RX module for the SCC input path, for UL CA only

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:CATF:FLEXible:INTernal <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTXConnector>, <PCCTXConverter>, <SCC1BBBoard>, <SCCTXConnector>, <SCCTXConverter>

Activates the scenario "2CC CA - Fading - 2 RF Out" with internal fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC

<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTXConnector>	RF connector for the PCC output path
<PCCTXConverter>	TX module for the PCC output path
<SCC1BBBoard>	Signaling unit for the SCC
<SCCTXConnector>	RF connector for the SCC output path
<SCCTXConverter>	TX module for the SCC output path
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD R&S CMW-KS512, R&S CMW-KE100 and R&S CMW-KE500

ROUTe:LTE:SIGN<i>:SCENario:CATF:FLEXible[:EXTernal] <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTXConnector>, <PCCTXConverter>, <PCCIQConnector>, <SCC1BBBoard>, <SCC1TXConnector>, <SCC1TXConverter>, <SCC1IQConnector>

Activates the scenario "2CC CA - Fading - 2 RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTXConnector>	RF connector for the PCC output path
<PCCTXConverter>	TX module for the PCC output path
<PCCIQConnector>	DIG IQ OUT connector for fading of the PCC output path
<SCC1BBBoard>	Signaling unit for the SCC
<SCC1TXConnector>	RF connector for the SCC output path
<SCC1TXConverter>	TX module for the SCC output path
<SCC1IQConnector>	DIG IQ OUT connector for fading of the SCC output path
Example:	See Selecting a Scenario
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD R&S CMW-KS512

ROUTe:LTE:SIGN<i>:SCENario:CAFF:FLEXible:INTernal <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCTX2Connector>, <PCCTX2Converter>, <SCC1BBBoard>, <SCC1TX1Conn>, <SCC1TX1Conv>, <SCC1TX2Conn>, <SCC1TX2Conv>

Activates the scenario "2CC CA - Fading - 4 RF Out" with internal fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path
<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC
<SCC1TX1Conn>	RF connector for the first SCC output path
<SCC1TX1Conv>	TX module for the first SCC output path
<SCC1TX2Conn>	RF connector for the second SCC output path
<SCC1TX2Conv>	TX module for the second SCC output path
Example:	See Selecting a Scenario
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD R&S CMW-KS512, R&S CMW-KE100 and R&S CMW-KE500 R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:CAFF:FLEXible[:EXTernal] <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCIQ1Connector>, <PCCTX2Connector>, <PCCTX2Converter>, <PCCIQ2Connector>, <SCC1BBBoard>, <SCC1TX1Conn>, <SCC1TX1Conv>, <SCC1IQ1Conn>, <SCC1TX2Conn>, <SCC1TX2Conv>, <SCC1IQ2Conn>

Activates the scenario "2CC CA - Fading - 4 RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC

<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path
<PCCIQ1Connector>	DIG IQ OUT connector for fading of the first PCC output path
<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<PCCIQ2Connector>	DIG IQ OUT connector for fading of the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC
<SCC1TX1Conn>	RF connector for the first SCC output path
<SCC1TX1Conv>	TX module for the first SCC output path
<SCC1IQ1Conn>	DIG IQ OUT connector for fading of the first SCC output path
<SCC1TX2Conn>	RF connector for the second SCC output path
<SCC1TX2Conv>	TX module for the second SCC output path
<SCC1IQ2Conn>	DIG IQ OUT connector for fading of the second SCC output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512, R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:CC:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTXConnector>, <PCCTXConverter>, <SCC1BBBoard>, <SCC1TXConnector>, <SCC1TXConverter>, <SCC2BBBoard>, <SCC2TXConnector>, <SCC2TXConverter>

Activates the scenario "3CC CA - 3 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTXConnector>	RF connector for the PCC output path
<PCCTXConverter>	TX module for the PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TXConnector>	RF connector for the SCC1 output path
<SCC1TXConverter>	TX module for the SCC1 output path

<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TXConnector>	RF connector for the SCC2 output path
<SCC2TXConverter>	TX module for the SCC2 output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512

ROUTe:LTE:SIGN<i>:SCENario:CCMP:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCTX2Connector>, <PCCTX2Converter>, <SCC1BBBoard>, <SCC1TXConnector>, <SCC1TXConverter>, <SCC2BBBoard>, <SCC2TXConnector>, <SCC2TXConverter>

Activates the scenario "3CC CA - PCC MIMO - 4 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path
<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TXConnector>	RF connector for the SCC1 output path
<SCC1TXConverter>	TX module for the SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TXConnector>	RF connector for the SCC2 output path
<SCC2TXConverter>	TX module for the SCC2 output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512, R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:CCMS<c>:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <SCC1BBBoard>, <SCC1TX1Connect>, <SCC1TX1Convert>, <SCC1TX2Connect>, <SCC1TX2Convert>, <SCC2BBBoard>, <SCC2TXConnector>, <SCC2TXConverter>

Activates the scenario "3CC CA - SCC1 MIMO - 4 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Suffix:

<c>	1 MIMO SCC number

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the PCC output path
<PCCTX1Converter>	TX module for the PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Connect>	RF connector for the first SCC1 output path
<SCC1TX1Convert>	TX module for the first SCC1 output path
<SCC1TX2Connect>	RF connector for the second SCC1 output path
<SCC1TX2Convert>	TX module for the second SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TXConnector>	RF connector for the SCC2 output path
<SCC2TXConverter>	TX module for the SCC2 output path

Example: See Selecting a Scenario

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512, R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:CF <PCCBBBoard>, <PCCRXConnect>, <PCCRXConvert>, <PCCTX1Connect>, <PCCTX1Convert>, <PCCTX2Connect>, <PCCTX2Convert>, <SCC1BBBoard>, <SCC1TX1Connect>, <SCC1TX1Convert>, <SCC1TX2Connect>, <SCC1TX2Convert>, <SCC2BBBoard>, <SCC2TX1Connect>, <SCC2TX1Convert>, <SCC2TX2Connect>, <SCC2TX2Convert>

Activates the scenario "3CC CA - 6 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<PCCRXConnect>	RF connector for the PCC input path
<PCCRXConvert>	RX module for the PCC input path
<PCCTX1Connect>	RF connector for the first PCC output path
<PCCTX1Convert>	TX module for the first PCC output path
<PCCTX2Connect>	RF connector for the second PCC output path
<PCCTX2Convert>	TX module for the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Connect>	RF connector for the first SCC1 output path
<SCC1TX1Convert>	TX module for the first SCC1 output path
<SCC1TX2Connect>	RF connector for the second SCC1 output path
<SCC1TX2Convert>	TX module for the second SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TX1Connect>	RF connector for the first SCC2 output path
<SCC2TX1Convert>	TX module for the first SCC2 output path
<SCC2TX2Connect>	RF connector for the second SCC2 output path
<SCC2TX2Convert>	TX module for the second SCC2 output path

Firmware/Software: V3.5.30

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512, R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:CFF:INTernal <PCCBBBoard>, <RXConnect>, <RXConvert>, <PCCTX1Connect>, <PCCTX1Convert>, <PCCTX2Connect>, <PCCTX2Convert>, <SCC1BBBoard>, <SCC1TX1Connect>, <SCC1TX1Convert>, <SCC1TX2Connect>, <SCC1TX2Convert>, <SCC2BBBoard>, <SCC2TX1Connect>, <SCC2TX1Convert>, <SCC2TX2Connect>, <SCC2TX2Convert>

Activates the scenario "3CC CA - Fading - 6 RF Out" with internal fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnect>	RF connector for the PCC input path

<RXConvert>	RX module for the PCC input path
<PCCTX1Connect>	RF connector for the first PCC output path
<PCCTX1Convert>	TX module for the first PCC output path
<PCCTX2Connect>	RF connector for the second PCC output path
<PCCTX2Convert>	TX module for the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Connect>	RF connector for the first SCC1 output path
<SCC1TX1Convert>	TX module for the first SCC1 output path
<SCC1TX2Connect>	RF connector for the second SCC1 output path
<SCC1TX2Convert>	TX module for the second SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TX1Connect>	RF connector for the first SCC2 output path
<SCC2TX1Convert>	TX module for the first SCC2 output path
<SCC2TX2Connect>	RF connector for the second SCC2 output path
<SCC2TX2Convert>	TX module for the second SCC2 output path

Firmware/Software: V3.5.30

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512, R&S CMW-KS520
R&S CMW-KE100, R&S CMW-KE500

ROUTe:LTE:SIGN<i>:SCENario:CFF[:EXTernal] <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCIQ1Connector>, <PCCTX2Connector>, <PCCTX2Converter>, <PCCIQ2Connector>, <SCC1BBBoard>, <SCC1TX1Conn>, <SCC1TX1Conv>, <SCC1IQ1Conn>, <SCC1TX2Conn>, <SCC1TX2Conv>, <SCC1IQ2Conn>, <SCC2BBBoard>, <SCC2TX1Conn>, <SCC2TX1Conv>, <SCC2IQ1Conn>, <SCC2TX2Conn>, <SCC2TX2Conv>, <SCC2IQ2Conn>

Activates the scenario "3CC CA - Fading - 6 RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path

<PCCIQ1Connector>	DIG IQ OUT connector for fading of the first PCC output path
<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<PCCIQ2Connector>	DIG IQ OUT connector for fading of the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Conn>	RF connector for the first SCC1 output path
<SCC1TX1Conv>	TX module for the first SCC1 output path
<SCC1IQ1Conn>	DIG IQ OUT connector for the first SCC1 output path
<SCC1TX2Conn>	RF connector for the second SCC1 output path
<SCC1TX2Conv>	TX module for the second SCC1 output path
<SCC1IQ2Conn>	DIG IQ OUT connector for the second SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TX1Conn>	RF connector for the first SCC2 output path
<SCC2TX1Conv>	TX module for the first SCC2 output path
<SCC2IQ1Conn>	DIG IQ OUT connector for the first SCC2 output path
<SCC2TX2Conn>	RF connector for the second SCC2 output path
<SCC2TX2Conv>	TX module for the second SCC2 output path
<SCC2IQ2Conn>	DIG IQ OUT connector for the second SCC2 output path
Firmware/Software:	V3.5.30
Options:	R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD R&S CMW-KS512, R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:DD:FLEXible <PCCBBBoard>, <RXConnector>, <RXConverter>, <TX1Connector>, <TX1Converter>, <SCC1BBBoard>, <TX2Connector>, <TX2Converter>, <SCCBBBoard2>, <TX3Connector>, <TX3Converter>, <SCCBBBoard3>, <TX4Connector>, <TX4Converter>

Activates the scenario "4CC CA - 4 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<TX1Connector>	RF connector for the PCC output path
<TX1Converter>	TX module for the PCC output path

<SCC1BBBoard>	Signaling unit for the SCC1
<TX2Connector>	RF connector for the SCC1 output path
<TX2Converter>	TX module for the SCC1 output path
<SCCBBBoard2>	Signaling unit for the SCC2
<TX3Connector>	RF connector for the SCC2 output path
<TX3Converter>	TX module for the SCC2 output path
<SCCBBBoard3>	Signaling unit for the SCC3
<TX4Connector>	RF connector for the SCC3 output path
<TX4Converter>	TX module for the SCC3 output path

Firmware/Software: V3.5.40

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512

ROUTe:LTE:SIGN<i>:SCENario:DH <PCCBBBoard>, <PCCRXConnector>, <PCCRXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCTX2Connector>, <PCCTX2Converter>, <SCC1BBBoard>, <SCC1TX1Conn>, <SCC1TX1Conv>, <SCC1TX2Conn>, <SCC1TX2Conv>, <SCC2BBBoard>, <SCC2TX1Conn>, <SCC2TX1Conv>, <SCC2TX2Conn>, <SCC2TX2Conv>, <SCC3BBBoard>, <SCC3TX1Conn>, <SCC3TX1Conv>, <SCC3TX2Conn>, <SCC3TX2Conv>

Activates the scenario "4CC CA - 8 RF Out" and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<PCCRXConnector>	RF connector for the PCC input path
<PCCRXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path
<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Conn>	RF connector for the first SCC1 output path
<SCC1TX1Conv>	TX module for the first SCC1 output path
<SCC1TX2Conn>	RF connector for the second SCC1 output path
<SCC1TX2Conv>	TX module for the second SCC1 output path

<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TX1Conn>	RF connector for the first SCC2 output path
<SCC2TX1Conv>	TX module for the first SCC2 output path
<SCC2TX2Conn>	RF connector for the second SCC2 output path
<SCC2TX2Conv>	TX module for the second SCC2 output path
<SCC3BBBoard>	Signaling unit for the SCC3
<SCC3TX1Conn>	RF connector for the first SCC3 output path
<SCC3TX1Conv>	TX module for the first SCC3 output path
<SCC3TX2Conn>	RF connector for the second SCC3 output path
<SCC3TX2Conv>	TX module for the second SCC3 output path

Firmware/Software: V3.5.30

Options: R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD
R&S CMW-KS512, R&S CMW-KS520

ROUTe:LTE:SIGN<i>:SCENario:DHF:INTernal <PCCBBBoard>, <RXConnect>, <RXConvert>, <PCCTX1Connect>, <PCCTX1Convert>, <PCCTX2Connect>, <PCCTX2Convert>, <SCC1BBBoard>, <SCC1TX1Connect>, <SCC1TX1Convert>, <SCC1TX2Connect>, <SCC1TX2Convert>, <SCC2BBBoard>, <SCC2TX1Connect>, <SCC2TX1Convert>, <SCC2TX2Connect>, <SCC2TX2Convert>, <SCC3BBBoard>, <SCC3TX1Connect>, <SCC3TX1Convert>, <SCC3TX2Connect>, <SCC3TX2Convert>

Activates the scenario "4CC CA - Fading - 8RF Out" with internal fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnect>	RF connector for the PCC input path
<RXConvert>	RX module for the PCC input path
<PCCTX1Connect>	RF connector for the first PCC output path
<PCCTX1Convert>	TX module for the first PCC output path
<PCCTX2Connect>	RF connector for the second PCC output path
<PCCTX2Convert>	TX module for the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Connect>	RF connector for the first SCC1 output path
<SCC1TX1Convert>	TX module for the first SCC1 output path

<SCC1TX2Connect>	RF connector for the second SCC1 output path
<SCC1TX2Convert>	TX module for the second SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TX1Connect>	RF connector for the first SCC2 output path
<SCC2TX1Convert>	TX module for the first SCC2 output path
<SCC2TX2Connect>	RF connector for the second SCC2 output path
<SCC2TX2Convert>	TX module for the second SCC2 output path
<SCC3BBBoard>	Signaling unit for the SCC3
<SCC3TX1Connect>	RF connector for the first SCC3 output path
<SCC3TX1Convert>	TX module for the first SCC3 output path
<SCC3TX2Connect>	RF connector for the second SCC3 output path
<SCC3TX2Convert>	TX module for the second SCC3 output path
Example:	See Selecting a Scenario
Firmware/Software:	V3.5.30
Options:	R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD R&S CMW-KS512, R&S CMW-KS520 R&S CMW-KE100, R&S CMW-KE500

ROUTe:LTE:SIGN<i>:SCENario:DHF[:EXTernal] <PCCBBBoard>, <RXConnector>, <RXConverter>, <PCCTX1Connector>, <PCCTX1Converter>, <PCCIQ1Connector>, <PCCTX2Connector>, <PCCTX2Converter>, <PCCIQ2Connector>, <SCC1BBBoard>, <SCC1TX1Conn>, <SCC1TX1Conv>, <SCC1IQ1Conn>, <SCC1TX2Conn>, <SCC1TX2Conv>, <SCC1IQ2Conn>, <SCC2BBBoard>, <SCC2TX1Conn>, <SCC2TX1Conv>, <SCC2IQ1Conn>, <SCC2TX2Conn>, <SCC2TX2Conv>, <SCC2IQ2Conn>, <SCC3BBBoard>, <SCC3TX1Conn>, <SCC3TX1Conv>, <SCC3IQ1Conn>, <SCC3TX2Conn>, <SCC3TX2Conv>, <SCC3IQ2Conn>

Activates the scenario "4CC CA - Fading - 8RF Out" with external fading and selects the signal paths.

For possible parameter values, see Chapter 2.6.1.4, "Values for Signal Path Selection", on page 300.

Parameters:

<PCCBBBoard>	Signaling unit for the PCC
<RXConnector>	RF connector for the PCC input path
<RXConverter>	RX module for the PCC input path
<PCCTX1Connector>	RF connector for the first PCC output path
<PCCTX1Converter>	TX module for the first PCC output path
<PCCIQ1Connector>	DIG IQ OUT connector for fading of the first PCC output path

<PCCTX2Connector>	RF connector for the second PCC output path
<PCCTX2Converter>	TX module for the second PCC output path
<PCCIQ2Connector>	DIG IQ OUT connector for fading of the second PCC output path
<SCC1BBBoard>	Signaling unit for the SCC1
<SCC1TX1Conn>	RF connector for the first SCC1 output path
<SCC1TX1Conv>	TX module for the first SCC1 output path
<SCC1IQ1Conn>	DIG IQ OUT connector for the first SCC1 output path
<SCC1TX2Conn>	RF connector for the second SCC1 output path
<SCC1TX2Conv>	TX module for the second SCC1 output path
<SCC1IQ2Conn>	DIG IQ OUT connector for the second SCC1 output path
<SCC2BBBoard>	Signaling unit for the SCC2
<SCC2TX1Conn>	RF connector for the first SCC2 output path
<SCC2TX1Conv>	TX module for the first SCC2 output path
<SCC2IQ1Conn>	DIG IQ OUT connector for the first SCC2 output path
<SCC2TX2Conn>	RF connector for the second SCC2 output path
<SCC2TX2Conv>	TX module for the second SCC2 output path
<SCC2IQ2Conn>	DIG IQ OUT connector for the second SCC2 output path
<SCC3BBBoard>	Signaling unit for the SCC3
<SCC3TX1Conn>	RF connector for the first SCC3 output path
<SCC3TX1Conv>	TX module for the first SCC3 output path
<SCC3IQ1Conn>	DIG IQ OUT connector for the first SCC3 output path
<SCC3TX2Conn>	RF connector for the second SCC3 output path
<SCC3TX2Conv>	TX module for the second SCC3 output path
<SCC3IQ2Conn>	DIG IQ OUT connector for the second SCC3 output path
Firmware/Software:	V3.5.30
Options:	R&S CMW-KS502 for FDD / R&S CMW-KS552 for TDD R&S CMW-KS512, R&S CMW-KS520

2.6.8.2 RF Path Properties

The following commands define path properties to be compensated (external attenuation and time delay).

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:OUTPut<n>............................. 402
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:OUTPut<n>..........................402
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut......................................402
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut..................................402

CONFigure:LTE:SIGN<i>:RFSettings:EDC:OUTPut.. 402
CONFigure:LTE:SIGN<i>:RFSettings:EDC:INPut..402

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:OUTPut<n> <ExtRFOutAtt>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:OUTPut<n> <ExtRFOutAtt>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF output path number <n>. Depending on the transmission scheme, several output paths are used for each carrier and the attenuation can be configured per output path.

Suffix:

<n> 1..4

<c> 1..3

Parameters:

<ExtRFOutAtt> Range: -50 dB to 90 dB
*RST: 0 dB
Default unit: dB

Example: See Selecting a Scenario

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "External Attenuation" on page 133

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut <ExtRFInAtt>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut <ExtRFInAtt>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF input connector.

Suffix:

<c> 1..2

Parameters:

<ExtRFInAtt> Range: -50 dB to 90 dB
*RST: 0 dB
Default unit: dB

Example: See Selecting a Scenario

Firmware/Software: V1.0.15.20, SCC command V3.5.20

Manual operation: See "External Attenuation" on page 133

CONFigure:LTE:SIGN<i>:RFSettings:EDC:OUTPut <Time>
CONFigure:LTE:SIGN<i>:RFSettings:EDC:INPut <Time>

Defines the value of an external time delay in the output path and in the input path, so that it can be compensated.

Parameters:

<Time>	Range: 0 s to 20E-6 s *RST: 0 s Default unit: s

Example: See Specifying General Settings

Firmware/Software: V3.2.50

Manual operation: See "External Delay Compensation" on page 134

2.6.8.3 Signal Settings

The following commands provide settings for the downlink and uplink signals.

SENSe:LTE:SIGN<i>:IQOut[:PCC]:PATH<n>? 403
SENSe:LTE:SIGN<i>:IQOut:SCC<c>:PATH<n>? 403
CONFigure:LTE:SIGN<i>:IQIN[:PCC]:PATH<n> 404
CONFigure:LTE:SIGN<i>:IQIN:SCC<c>:PATH<n> 404
CONFigure:LTE:SIGN<i>:RFSettings:ALL:BWCHannel 405
CONFigure:LTE:SIGN<i>[:PCC]:BAND 406
CONFigure:LTE:SIGN<i>:SCC<c>:BAND 406
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:DL 407
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:DL 407
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL 407
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL 407
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL 407
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:DL 407
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL:UCSPecific 408
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific 408
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL 408
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL 408
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode 409
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode 409
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower 409
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower 409
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin 410
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin 410
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset 410
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset 410

SENSe:LTE:SIGN<i>:IQOut[:PCC]:PATH<n>?
SENSe:LTE:SIGN<i>:IQOut:SCC<c>:PATH<n>?

Queries properties of the baseband signal at the I/Q output for DL path number <n>.

Suffix:

<n>	1..2
<c>	1..3

Return values:

<SampleRate>	M100 Fixed value, indicating a sample rate of 100 Msamples/s (100 MHz)
<PEP>	Peak envelope power of the baseband signal Range: -60 dBFS to 0 dBFS Default unit: dBFS
<CrestFactor>	Crest factor of the baseband signal Range: 0 dB to 60 dB Default unit: dB
Example:	See Configuring the I/Q Settings
Usage:	Query only
Firmware/Software:	V3.0.10, SCC command V3.2.70
Manual operation:	See "Sample Rate (Out / In)" on page 130

CONFigure:LTE:SIGN<i>:IQIN[:PCC]:PATH<n> <PEP>, <Level>
CONFigure:LTE:SIGN<i>:IQIN:SCC<c>:PATH<n> <PEP>, <Level>

Specifies properties of the baseband signal at the I/Q input for DL path number <n>.

Suffix:

<n>	1..2
<c>	1..3

Parameters:

<PEP>	Peak envelope power of the incoming baseband signal Range: -60 dBFS to 0 dBFS *RST: 0 dBFS Default unit: dBFS
<Level>	Average level of the incoming baseband signal (without noise) Range: depends on crest factor and level of outgoing baseband signal Default unit: dBFS
Example:	See Configuring the I/Q Settings
Firmware/Software:	V3.0.10, SCC command V3.2.70
Manual operation:	See "Baseband PEP (Out / In)" on page 131

CONFigure:LTE:SIGN<i>:RFSettings:ALL:BWCHannel <BandPCC>, <DLChannelPCC>, <BandwithPCC>[, <BandSCC1>, <DLChannelSCC1>, <BandwithSCC1>[, <BandSCC2>, <DLChannelSCC2>, <BandwithSCC2>[, <BandSCC3>, <DLChannelSCC3>, <BandwithSCC3>]]]

Selects the operating band, the downlink channel number and the cell bandwidth for the PCC and optionally for the SCCs.

A query returns only the component carriers that are supported by the current scenario.

Parameters:

<BandPCC>
FDD: UDEFined | OB1 | ... | OB28 | OB30 | OB31 | OB65 | OB66
TDD: UDEFined | OB33 | ... | OB46
Selects the PCC operating band
*RST: OB1 (OB33 for TDD)

<DLChannelPCC>
PCC DL channel number
Range: depends on operating band
*RST: 300

<BandwithPCC>
B014 | B030 | B050 | B100 | B150 | B200
PCC cell bandwidth
B014: 1.4 MHz
B030: 3 MHz
B050: 5 MHz
B100: 10 MHz
B150: 15 MHz
B200: 20 MHz
*RST: B100

<BandSCC1>
FDD: UDEFined | OB1 | ... | OB32 | OB65 | ... | OB67 | OB252 | OB255
TDD: UDEFined | OB33 | ... | OB46
SCC1 operating band
*RST: OB1 (OB33 for TDD)

<DLChannelSCC1>
SCC1 DL channel number
Range: depends on operating band
*RST: 302

<BandwithSCC1>
B014 | B030 | B050 | B100 | B150 | B200
SCC1 cell bandwidth
*RST: B100

<BandSCC2>
FDD: UDEFined | OB1 | ... | OB32 | OB65 | ... | OB67 | OB252 | OB255
TDD: UDEFined | OB33 | ... | OB46
SCC2 operating band
*RST: OB1 (OB33 for TDD)

<DLChannelSCC2>	SCC2 DL channel number Range: depends on operating band *RST: 304
<BandwithSCC2>	B014 | B030 | B050 | B100 | B150 | B200 SCC2 cell bandwidth *RST: B100
<BandSCC3>	FDD: UDEFined | OB1 | ... | OB32 | OB65 | ... | OB67 | OB252 | OB255 TDD: UDEFined | OB33 | ... | OB46 SCC3 operating band *RST: OB1 (OB33 for TDD)
<DLChannelSCC3>	SCC3 DL channel number Range: depends on operating band *RST: 306
<BandwithSCC3>	B014 | B030 | B050 | B100 | B150 | B200 SCC3 cell bandwidth *RST: B100

Firmware/Software: V3.2.80, some bands added in later versions
V3.5.10: added SCC2/3

Options: R&S CMW-KS525 for UDEFined, OB252, OB255

Manual operation: See "Operating Band, Channel, Frequency" on page 135

CONFigure:LTE:SIGN<i>[:PCC]:BAND <Band>
CONFigure:LTE:SIGN<i>:SCC<c>:BAND <Band>

Selects the operating band (OB). The allowed input range depends on the duplex mode (FDD or TDD).

Suffix:

<c> 1..3

Parameters:

<Band> FDD: UDEFined | OB1 | ... | OB32 | OB65 | ... | OB67 | OB252 | OB255
TDD: UDEFined | OB33 | ... | OB46
OB29/32/67/252/255 only for SCC DL

Example: See Configuring Operating Bands and Channels

Firmware/Software: V3.0.10, some bands added in later versions
V3.2.50: SCC command

Options: R&S CMW-KS525 for UDEFined, OB252, OB255

Manual operation: See "Operating Band, Channel, Frequency" on page 135

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:DL <Channel>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:DL <Channel>

Selects the DL channel number. It must be valid for the current operating band. The related UL channel number is calculated and set automatically.

By appending a Hz unit (e.g. Hz, kHz, MHz) to a setting command, you can set the channel via its center frequency (only integer numbers accepted). By appending a Hz unit to a query command, you can query the center frequency instead of the channel number.

For channel numbers and frequencies depending on operating bands, see Chapter 2.2.17, "Operating Bands", on page 67.

Suffix:
<c> 1..3

Parameters:
<Channel> Range: depends on operating band

Example: See Configuring Operating Bands and Channels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "Operating Band, Channel, Frequency" on page 135

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL <Channel>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL <Channel>

Selects the UL channel number. It must be valid for the current operating band. The related DL channel number is calculated and set automatically.

By appending a Hz unit (e.g. Hz, kHz, MHz) to a setting command, you can set the channel via its center frequency (only integer numbers accepted). By appending a Hz unit to a query command, you can query the center frequency instead of the channel number.

For channel numbers and frequencies depending on operating bands, see Chapter 2.2.17, "Operating Bands", on page 67.

Suffix:
<c> 1..3

Parameters:
<Channel> Range: depends on operating band

Example: See Configuring Operating Bands and Channels

Firmware/Software: V1.0.15.20, SCC command V3.5.20

Manual operation: See "Operating Band, Channel, Frequency" on page 135

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL <Offset>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:DL <Offset>

Specifies a positive or negative frequency offset to be added to the center frequency of the configured downlink channel.

You can use the PCC command to configure the same offset for the PCC and all SCCs. Or you can use the PCC and SCC command to configure different values. See also `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL:UCSPecific` on page 408.

Suffix:

<c> 1..3

Parameters:

<Offset> Range: -100E+3 Hz to 100E+3 Hz
*RST: 0 Hz
Default unit: Hz

Example: See Configuring Operating Bands and Channels

Firmware/Software: V3.2.10, SCC command V3.2.81

Manual operation: See "Frequency Offset" on page 135

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL:UCSPecific <Enable>
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific <Enable>

Enables or disables the usage of different frequency offset values for the individual downlink or uplink component carriers.

Parameters:

<Enable> OFF | ON

OFF: The configured PCC offset is also used for the SCCs. The configured SCC offsets have no effect.
ON: You can configure the frequency offset per carrier.

*RST: OFF

Example: See Configuring Operating Bands and Channels

Firmware/Software: V3.2.80, UL command V3.5.20

Manual operation: See "Frequency Offset" on page 135

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL <Offset>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL <Offset>

Specifies a positive or negative frequency offset to be added to the center frequency of the configured uplink channel.

Suffix:

<c> 1..3

Parameters:

<Offset> Range: -100E+3 Hz to 100E+3 Hz
*RST: 0 Hz
Default unit: Hz

Example: See Configuring Operating Bands and Channels

Firmware/Software: V3.2.10, SCC command V3.5.20

Manual operation: See "Frequency Offset" on page 135

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode <Mode>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode <Mode>

Selects the expected nominal power mode. The expected nominal power of the UL signal can be defined manually or calculated automatically, according to the UL power control settings.

For manual configuration, see:

- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower` on page 409
- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin` on page 410

For UL power control settings, see Chapter 2.6.11, "Uplink Power Control", on page 432.

Suffix:
<c> 1..2

Parameters:
<Mode> MANual | ULPC

MANual: The expected nominal power and margin are specified manually.
ULPC: The expected nominal power is calculated according to the UL power control settings. For the margin, 12 dB are applied.

*RST: ULPC

Example: See Specifying General Settings

Firmware/Software: V1.0.15.21, SCC command V3.5.20

Manual operation: See "Exp. Nominal Power..., Margin" on page 137

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower <ExpectedPower>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower <ExpectedPower>

Sets the expected nominal power of the UL signal in manual mode.

If the expected nominal power is calculated automatically according to the UL power control settings, you can only query the result.

To configure the expected nominal power mode, see `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode` on page 409.

Suffix:
<c> 1..2

Parameters:

<ExpectedPower> In manual mode, the range of the expected nominal power can be calculated as follows:
Range (expected nominal power) = range (input power) + external attenuation - margin
The input power range is stated in the data sheet.
*RST: -20 dBm
Default unit: dBm

Example: See Specifying General Settings

Firmware/Software: V1.0.15.21, SCC command V3.5.20

Manual operation: See "Exp. Nominal Power..., Margin" on page 137

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin <UserMargin>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin <UserMargin>

Sets the margin that the R&S CMW adds to the expected nominal power to determine the reference level in manual mode. If the expected nominal power is calculated automatically according to the UL power control settings, a fix margin of 12 dB is used instead.

The reference level minus the external input attenuation must be within the power range of the selected input connector; refer to the data sheet.

Refer also to the following commands:

- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode` on page 409
- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower` on page 409
- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut` on page 402

Suffix:

<c> 1..2

Parameters:

<UserMargin> Range: 0 dB to (42 dB + external attenuation - expected nominal power)
*RST: 12 dB
Default unit: dB

Example: See Specifying General Settings

Firmware/Software: V1.0.15.21, SCC command V3.5.20

Manual operation: See "Exp. Nominal Power..., Margin" on page 137

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset <MixLevOffset>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset <MixLevOffset>

Varies the input level of the mixer in the analyzer path.

Suffix:

<c> 1..2

Parameters:

<MixLevOffset>	Range: -10 dB to 10 dB *RST: 0 dB Default unit: dB

Example: See Specifying General Settings

Firmware/Software: V3.2.10, SCC command V3.5.20

Manual operation: See "Mixer Level Offset" on page 138

2.6.8.4 User-Defined Band

The following commands configure a user-defined band.

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:UDSeparation................................411
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:UDSeparation.............................411
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:BINDicator....................................412
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:BINDicator................................412
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:DL:MINimum..................412
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:DL:MAXimum.................412
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MINimum................412
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MAXimum...............412
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MINimum...............413
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MINimum...........413
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MAXimum?............414
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MAXimum?.........414
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:UL:MINimum..................414
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MINimum................414
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:UL:MAXimum?................414
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MAXimum?.............414
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:UL:MINimum?.............415
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:UL:MAXimum?............415
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MINimum?..........415
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MAXimum?.........415

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:UDSeparation <Frequency>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:UDSeparation <Frequency>

Configures the UL/DL separation F_{DL} - F_{UL} for the user-defined band.

The allowed range depends on the remaining user-defined band settings: The resulting uplink carrier center frequencies must be within the allowed frequency range. For calculations, see `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MINimum`.

Suffix:

<c>	1..3

Parameters:

<Frequency> Depending on the other settings, only a part of the following range is allowed.

Range: -5930E+6 Hz to 5930E+6 Hz
*RST: 190E+6 Hz
Default unit: Hz

Example: See Configuring Operating Bands and Channels

Firmware/Software: V2.1.30, SCC command V3.5.20

Options: R&S CMW-KS525

Manual operation: See "UL/DL Separation" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:BINDicator <BandIndicator>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:BINDicator <BandIndicator>

Configures the frequency band indicator, identifying the user-defined band in signaling messages.

Suffix:

<c> 1..2

Parameters:

<BandIndicator> Range: 1 to 256
*RST: 1

Example: See Configuring Operating Bands and Channels

Firmware/Software: V2.1.30, SCC command V3.2.50
V3.5.10: changed maximum from 64 to 256

Options: R&S CMW-KS525

Manual operation: See "Band Indicator" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:DL:MINimum <Channel>
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:DL:MAXimum <Channel>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MINimum <Channel>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MAXimum <Channel>

Configures channel numbers for the user-defined band: the minimum downlink channel number and the maximum downlink channel number.

Combinations that result in frequencies outside of the allowed range are corrected automatically.

Suffix:
<c> 1..3

Parameters:
<Channel> Range: 0 to 262143

Example: See Configuring Operating Bands and Channels

Firmware/Software: V2.1.30, SCC commands V3.2.50

Options: R&S CMW-KS525

Manual operation: See "DL Channel, Frequency" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MINimum <Frequency>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MINimum <Frequency>

Configures the carrier center frequency corresponding to the minimum downlink channel number for the user-defined band.

The other frequencies are calculated from the settings as follows:

*FREQ:DL:MAX = FREQ:DL:MIN + (CHAN:DL:MAX - CHAN:DL:MIN) * 100 kHz*

FREQ:UL:MIN = FREQ:DL:MIN - UDSeparation

*FREQ:UL:MAX = FREQ:DL:MIN - UDSeparation + (CHAN:DL:MAX - CHAN:DL:MIN) * 100 kHz*

Suffix:
<c> 1..3

Parameters:
<Frequency> The allowed range depends on the remaining user-defined band settings. All frequencies resulting from the calculations stated above must be located within the following frequency range.

Range: 70E+6 Hz to 6E+9 Hz
*RST: 2110E+6 Hz
Default unit: Hz

Example: See Configuring Operating Bands and Channels

Firmware/Software: V2.1.30, SCC command V3.2.50

Options: R&S CMW-KS525

Manual operation: See "DL Channel, Frequency" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MAXimum?
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MAXimum?

Queries the maximum downlink carrier center frequency resulting from the user-defined band settings. For calculation, see `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MINimum`.

Suffix:
<c> 1..3

Return values:
<Frequency> Range: 70E+6 Hz to 6E+9 Hz
Default unit: Hz

Example: See Configuring Operating Bands and Channels

Usage: Query only

Firmware/Software: V2.1.30, SCC command V3.2.50

Options: R&S CMW-KS525

Manual operation: See "DL Channel, Frequency" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:UL:MINimum <Channel>
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MINimum <Channel>

Configures the minimum uplink channel number for the user-defined band.

Combinations that result in frequencies outside of the allowed range are corrected automatically.

Suffix:
<c> 1..3

Parameters:
<Channel> Range: 0 to 262143

Example: See Configuring Operating Bands and Channels

Firmware/Software: V2.1.30, SCC command V3.5.20

Options: R&S CMW-KS525

Manual operation: See "UL Channel, Frequency" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:UL:MAXimum?
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MAXimum?

Queries the maximum uplink channel number for the user-defined band, resulting from the other channel number settings.

Suffix:
<c> 1..2

Return values:
<Channel> Maximum uplink channel number
CHAN:UL:MAX = CHAN:UL:MIN + CHAN:DL:MAX - CHAN:DL:MIN

Example: See Configuring Operating Bands and Channels

Usage: Query only

Firmware/Software: V2.1.30, SCC command V3.5.20

Options: R&S CMW-KS525

Manual operation: See "UL Channel, Frequency" on page 136

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:UL:MINimum?
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:UL:MAXimum?
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MINimum?
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MAXimum?

Query the minimum and maximum uplink carrier center frequencies resulting from the user-defined band settings. For calculations, see `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MINimum`.

Suffix:
<c> 1..2

Return values:
<Frequency> Range: 70E+6 Hz to 6E+9 Hz
Default unit: Hz

Example: See Configuring Operating Bands and Channels

Usage: Query only

Firmware/Software: V2.1.30, SCC commands V3.5.20

Options: R&S CMW-KS525

Manual operation: See "UL Channel, Frequency" on page 136

2.6.9 Internal Fading

The following commands configure the internal fader of the R&S CMW.

2.6.9.1 Fading Simulator

The following commands configure the fading simulator of the internal fader for fading of the PCC and SCC downlink.

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:ENABle............................ 416
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:ENABle.........................416
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:FOFFset..417
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:FOFFset... 417
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:PROFile............................417
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:PROFile........................ 417
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ENABle.. 417
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ENABle...417
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:PROFile..418
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:PROFile...418
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart:MODE.................................419
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart:MODE............................ 419
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart.. 419
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart..419
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:GLOBal:SEED..................................420
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:GLOBal:SEED............................... 420
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:MODE................................... 420
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:MODE.................................420
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:LOSS.................................... 420
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:LOSS..................................420
SENSe:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:CSAMples<path>?........................ 421
SENSe:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:CSAMples<n>?......................... 421
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift:MODE...................................421
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift:MODE............................... 421
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift... 422
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift..422

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:ENABle <Enable>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:ENABle <Enable>

Enables/disables the fading simulator for standard fading.

Suffix:

<c> 1..3

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Internal Fading

Firmware/Software: V3.5.10

Options: See relevant fading scenario

Manual operation: See "Enable" on page 139

CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:FOFFset <Offset>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:FOFFset <Offset>

Shifts the center frequency of the noise bandwidth relative to the carrier center frequency.

Suffix:
<c> 1..3

Parameters:
<Offset> Range: -40E+6 Hz to 40E+6 Hz
*RST: 0 Hz
Default unit: Hz

Example: See Configuring Internal Fading

Firmware/Software: V3.5.40

Options: See relevant fading scenario

Manual operation: See "Frequency Offset" on page 142

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:PROFile <Profile>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:PROFile <Profile>

Selects a propagation condition profile for standard fading.

Suffix:
<c> 1..3

Parameters:
<Profile> EP5Low | EP5Medium | EP5High | EV5Low | EV5Medium | EV5High

EP5Low | EP5Medium | EP5High
EPA, 5 Hz Doppler, low/medium/high correlation

EV5Low | EV5Medium | EV5High
EVA, 5 Hz Doppler, low/medium/high correlation

*RST: EP5Low

Example: See Configuring Internal Fading

Firmware/Software: V3.5.10

Options: See relevant fading scenario

Manual operation: See "Profile" on page 139

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ENABle <Enable>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ENABle <Enable>

Enables/disables the fading simulator for extended fading.

Suffix:
<c> 1..3

Parameters:

<Enable>	OFF | ON *RST: OFF

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Enable" on page 139

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:PROFile <Profile>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:PROFile <Profile>

Selects a propagation condition profile for extended fading.

Suffix:

<c>	1..3

Parameters:

<Profile>
EP5Low | EP5Medium | EP5High | EV5Low | EV5Medium | EV5High | EV7Low | EV7Medium | EV7High | ET7Low | ET7Medium | ET7High | ET3Low | ET3Medium | ET3High | HSTRain | HST | CTESt | ETL30 | ETM30 | ETH30 | EVL200 | EVM200 | EVH200

EP5Low | EP5Medium | EP5High
EPA, 5 Hz Doppler, low/medium/high correlation

ETL30 | ETM30 | ETH30
ETU, 30 Hz Doppler, low/medium/high correlation

ET7Low | ET7Medium | ET7High
ETU, 70 Hz Doppler, low/medium/high correlation

ET3Low | ET3Medium | ET3High
ETU, 300 Hz Doppler, low/medium/high correlation

EV5Low | EV5Medium | EV5High
EVA, 5 Hz Doppler, low/medium/high correlation

EV7Low | EV7Medium | EV7High
EVA, 70 Hz Doppler, low/medium/high correlation

EVL200 | EVM200 | EVH200
EVA, 200 Hz Doppler, low/medium/high correlation

HSTRain | HST
High-speed train scenario (both values have the same effect)

CTESt
Multi-path profile for CQI tests

*RST: EP5Low

Example: See Configuring Internal Fading

Firmware/Software: V3.5.10
V3.5.30: EVL200, EVM200, EVH200

Options: See relevant fading scenario

Manual operation: See "Profile" on page 139

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart:MODE <RestartMode>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart:MODE <RestartMode>

Sets the restart mode of the fading simulator.

The scenario "1 Cell - Fading - MIMO4x2 - 2 RF Out" supports only the mode `TRIGger`. The other scenarios support only the modes `AUTO` and `MANual`.

Suffix:
<c> 1..3

Parameters:
<RestartMode> AUTO | MANual | TRIGger

AUTO: fading automatically starts with the DL signal
MANual: fading is started and restarted manually (see `CONFigure:...:FSIMulator:RESTart`)
TRIGger: fading starts automatically and synchronously on both I/Q boards

*RST: AUTO

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20
V3.2.70: SCC command
V3.2.80: TRIGger

Options: See relevant fading scenario

Manual operation: See "Restart Event" on page 140

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart

Restarts the fading process in `MANual` mode (see also `CONFigure:...:FSIMulator:RESTart:MODE`).

Suffix:
<c> 1..3

Usage: Event

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Restart Event" on page 140

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:GLOBal:SEED <Seed>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:GLOBal:SEED <Seed>

Sets the start seed for the pseudo-random fading algorithm.

Suffix:
<c> 1..3

Parameters:
<Seed> Range: 0 to 9
*RST: 0

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Start Seed" on page 140

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:MODE <InsertLossMode>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:MODE <InsertLossMode>

Sets the insertion loss mode.

Suffix:
<c> 1..3

Parameters:
<InsertLossMode> NORMal | USER

NORMal: The insertion loss is determined by the fading profile.
USER: The insertion loss is configurable.

*RST: NORM

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Insertion Loss" on page 140

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:LOSS <InsertionLoss>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:LOSS <InsertionLoss>

Sets the insertion loss for the fading simulator.

A setting is only allowed in `USER` mode (see `CONFigure:...:FSIMulator:ILOSs:MODE`).

Suffix:
<c> 1..3

Parameters:

<InsertionLoss> Range: 0 dB to 18 dB
*RST: 0 dB
Default unit: dB

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Insertion Loss" on page 140

SENSe:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:CSAMples<path>?
SENSe:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:CSAMples<n>?

Returns the percentage of clipped samples for the output path number <n>.

Suffix:

<n> 1..2

<c> 1..3

Return values:

<ClippedSamples> Range: 0 % to 100 %
Default unit: %

Usage: Query only

Firmware/Software: V3.2.10, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Insertion Loss" on page 140

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift:MODE <Mode>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift:MODE <Mode>

Sets the Doppler shift mode.

Suffix:

<c> 1..3

Parameters:

<Mode> NORMal | USER

NORMal: The maximum Doppler frequency is determined by the fading profile.
USER: The maximum Doppler frequency is configurable.

*RST: NORM

Example: See Configuring Internal Fading

Firmware/Software: V3.2.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Doppler Frequency Mode, Doppler Frequency" on page 141

CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift <Frequency>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift <Frequency>

Sets the maximum Doppler frequency for the fading simulator.

A setting is only allowed in `USER` mode (see `CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift:MODE`).

Suffix:
<c> 1..3

Parameters:
<Frequency> Range: 1 Hz to 2000 Hz
*RST: 5 Hz
Default unit: Hz

Example: See Configuring Internal Fading

Firmware/Software: V3.2.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Doppler Frequency Mode, Doppler Frequency" on page 141

2.6.9.2 DL Settings

The following commands query noise power information for the PCC and SCC downlink.

CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe?....422
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe?....422
CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe:TOTal?....423
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe:TOTal?....423
CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:SUM?....423
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:SUM?....423

CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe?
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe?

Queries the calculated noise power on the DL channel, i.e. within the cell bandwidth.

Suffix:
<c> 1..3

Return values:
<NoisePower> Default unit: dBm

Example: See Configuring Internal Fading

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Noise (System BW) Power" on page 141

CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe:TOTal?
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe:TOTal?

Queries the total noise power for one carrier.

Suffix:

<c> 1..3

Return values:

<NoisePower> Default unit: dBm

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Noise (Total BW) Power" on page 141

CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:SUM?
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:SUM?

Queries the calculated total power (signal + noise) on the DL channel, i.e. within the cell bandwidth.

Suffix:

<c> 1..3

Return values:

<Power> Default unit: dBm

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Signal + Noise (System BW) Power" on page 141

2.6.9.3 Fading Module AWGN

The following commands configure the AWGN generator of the internal fader for the PCC and SCC downlink.

CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:ENABle... 424
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:ENABle... 424
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:RATio.. 424
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:RATio..................................... 424
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:NOISe?...................................... 424
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:NOISe?................................... 424
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:SNRatio.. 425
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:SNRatio... 425

CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:ENABle <Enable>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:ENABle <Enable>

Enables or disables AWGN insertion via the fading module.

Suffix:
<c> 1..3

Parameters:
<Enable> OFF | ON
*RST: OFF

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Enable" on page 142

CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:RATio <Ratio>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:RATio <Ratio>

Specifies the minimum ratio between the noise bandwidth and the cell bandwidth.

Suffix:
<c> 1..3

Parameters:
<Ratio> Range: 1 to 1000
*RST: 1

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20, SCC command V3.2.70
V3.5.40 range enhanced

Options: See relevant fading scenario

Manual operation: See "Min. Noise/System BW Ratio" on page 142

CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:NOISe?
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:NOISe?

Queries the noise bandwidth.

Suffix:
<c> 1..3

Return values:
<NoiseBandwidth> Range: 0 Hz to 80E+6 Hz
Default unit: Hz

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Noise Bandwidth" on page 143

CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:SNRatio <Ratio>
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:SNRatio <Ratio>

Specifies the signal to noise ratio for the AWGN inserted on the internal fading module.

Suffix:
<c> 1..3

Parameters:
<Ratio> Range: -50 dB to 40 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring Internal Fading

Firmware/Software: V3.0.20, SCC command V3.2.70

Options: See relevant fading scenario

Manual operation: See "Signal/Noise Ratio" on page 143

2.6.10 Downlink Power Levels

The following commands define power levels of physical downlink channels and signals.

CONFigure:LTE:SIGN<i>:DL[:PCC]:RSEPre:LEVel....426
CONFigure:LTE:SIGN<i>:DL:SCC<c>:RSEPre:LEVel....426
SENSe:LTE:SIGN<i>:DL[:PCC]:FCPower?....426
SENSe:LTE:SIGN<i>:DL:SCC<c>:FCPower?....426
CONFigure:LTE:SIGN<i>:DL[:PCC]:PSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL[:PCC]:SSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL:SCC<c>:SSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL[:PCC]:PBCH:POFFset....427
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PBCH:POFFset....427
CONFigure:LTE:SIGN<i>:DL[:PCC]:PCFich:POFFset....428
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PCFich:POFFset....428
CONFigure:LTE:SIGN<i>:DL[:PCC]:PHICh:POFFset....428
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PHICh:POFFset....428
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDCCh:POFFset....429
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDCCh:POFFset....429
CONFigure:LTE:SIGN<i>:DL[:PCC]:OCNG....429
CONFigure:LTE:SIGN<i>:DL:SCC<c>:OCNG....429
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:PA....429
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:PA....429
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:RINDex....430
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:RINDex....430
CONFigure:LTE:SIGN<i>:DL[:PCC]:POWer:PORTs....430
CONFigure:LTE:SIGN<i>:DL:SCC<c>:POWer:PORTs....430

CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:MODE...430
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:MODE..430
CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:POFFset..431
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:POFFset...431
CONFigure:LTE:SIGN<i>:DL[:PCC]:AWGN...431
CONFigure:LTE:SIGN<i>:DL:SCC<c>:AWGN..431

CONFigure:LTE:SIGN<i>:DL[:PCC]:RSEPre:LEVel <Level>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:RSEPre:LEVel <Level>

Defines the energy per resource element (EPRE) of the cell-specific reference signal (C-RS). The power levels of resource elements used for other channels/signals are defined relative to this power level.

The allowed value range depends basically on the used connector, the number of allocated resource blocks (specified via the cell bandwidth) and the external attenuation in the output path.

$level_{RS\ EPRE,\ min} = level_{connector,\ min} - 10*log_{10}(12*N_{RB}) - ext\ att_{out}$

$level_{RS\ EPRE,\ max} = level_{connector,\ max} - 10*log_{10}(12*N_{RB}) - ext\ att_{out} - 15\ dB$

With $\text{level}_{\text{connector, min}}$ = -130 dBm (-120 dBm), $\text{level}_{\text{connector, max}}$ = -5 dBm (8 dBm) for RF COM (RF OUT). Notice also the ranges quoted in the data sheet.

The range is also affected by active AWGN ("Downlink Power Levels" parameter), internal fading (insertion loss value), external fading (baseband level), CSI-RS power, number of MIMO transmit antennas.

Suffix:

<c>	1..3

Parameters:

<Level>	Range: see above *RST: -85 dBm/15kHz Default unit: dBm/15kHz

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "RS EPRE" on page 144

SENSe:LTE:SIGN<i>:DL[:PCC]:FCPower?
SENSe:LTE:SIGN<i>:DL:SCC<c>:FCPower?

Queries the "Full Cell BW Power". The power results from the configured RS EPRE and the cell bandwidth.

Suffix:

<c>	1..3

Return values:

<Level>	Range: -220 dBm to 48 dBm Default unit: dBm

Example: See Configuring DL Power Levels

Usage: Query only

Firmware/Software: V3.0.10, SCC command V3.2.50

Manual operation: See "RS EPRE" on page 144

CONFigure:LTE:SIGN<i>:DL[:PCC]:PSS:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PSS:POFFset <Offset>

Defines the power level of a primary synchronization signal (PSS) resource element.

Suffix:
<c> 1..3

Parameters:
<Offset> PSS power relative to RS EPRE
Range: -30 dB to 0 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "PSS Power Offset" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:SSS:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:SSS:POFFset <Offset>

Defines the power level of a secondary synchronization signal (SSS) resource element.

Suffix:
<c> 1..3

Parameters:
<Offset> SSS power relative to RS EPRE
Range: -30 dB to 0 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "SSS Power Offset" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:PBCH:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PBCH:POFFset <Offset>

Defines the power level of a physical broadcast channel (PBCH) resource element.

Suffix:
<c> 1..3

Parameters:
<Offset> PBCH power relative to RS EPRE
Range: -30 dB to 0 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "PBCH Power Offset" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:PCFich:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PCFich:POFFset <Offset>

Defines the power level of a physical control format indicator channel (PCFICH) resource element.

Suffix:
<c> 1..3

Parameters:
<Offset> PCFICH power relative to RS EPRE
Range: -30 dB to 0 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "PCFICH Power Offset" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:PHICh:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PHICh:POFFset <Offset>

Defines the power level of a physical hybrid ARQ indicator channel (PHICH) resource element.

Suffix:
<c> 1..3

Parameters:
<Offset> PHICH power relative to RS EPRE
Range: -30 dB to 0 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V3.2.10, SCC command V3.2.50

Manual operation: See "PHICH Power Offset" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:PDCCh:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDCCh:POFFset <Offset>

Defines the power level of a physical downlink control channel (PDCCH) resource element.

Suffix:
<c> 1..3

Parameters:
<Offset> PDCCH power relative to RS EPRE

Range: -30 dB to 0 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "PDCCH Power Offset" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:OCNG <Enable>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:OCNG <Enable>

Enables or disables the OFDMA channel noise generator (OCNG).

Suffix:
<c> 1..3

Parameters:
<Enable> OFF | ON

*RST: OFF

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "OCNG" on page 145

CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:PA <PA>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:PA <PA>

Defines the power offset P_A.

Suffix:
<c> 1..3

Parameters:
<PA> ZERO | N3DB | N6DB

Power offset of 0 dB | -3 dB | -6 dB

*RST: ZERO

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.21, SCC command V3.2.50

Manual operation: See "PDSCH" on page 146

CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:RINDex <RatioIndex>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:RINDex <RatioIndex>

Defines the power ratio index P_B. The index is required for calculation of the power level of a PDSCH resource element.

Suffix:

<c>	1..3

Parameters:

<RatioIndex>	Range: 0 to 3 *RST: 0

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "PDSCH" on page 146

CONFigure:LTE:SIGN<i>:DL[:PCC]:POWer:PORTs <power>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:POWer:PORTs <power>

Defines the power offset for the antenna ports 7 to 10.

Suffix:

<c>	1..3

Parameters:

<power>	Range: -12 dB to 0 dB *RST: 0 dB Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V3.5.40

Options: R&S CMW-KS520

Manual operation: See "PDSCH" on page 146

CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:MODE <Mode>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:MODE <Mode>

Selects a configuration mode for the used CSI-RS power offset.

Suffix:

<c>	1..3

Parameters:

<Mode> ACSirs | MANual

ACSirs
The used power offset matches the signaled value.
For configuration of the signaled value, see `CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:POWer` on page 508.

MANual
The used power offset is independent from the signaled value.
For configuration of the used power offset, see `CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:POFFset` on page 431.

*RST: ACS

Example: See Configuring DL Power Levels

Firmware/Software: V3.5.40

Options: R&S CMW-KS520

Manual operation: See "CSI-RS" on page 146

CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:POFFset <Offset>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:POFFset <Offset>

Sets the EPRE of the PDSCH relative to the EPRE of the CSI reference signal.

The value is only used for `CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:MODE` = `ACSirs`.

Suffix:

<c> 1..3

Parameters:

<Offset> Range: -30 dB to 8 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring DL Power Levels

Firmware/Software: V3.5.40

Options: R&S CMW-KS520

Manual operation: See "CSI-RS" on page 146

CONFigure:LTE:SIGN<i>:DL[:PCC]:AWGN <AWGN>
CONFigure:LTE:SIGN<i>:DL:SCC<c>:AWGN <AWGN>

Specifies the total level of the additional white Gaussian noise (AWGN) interferer. The unit dBm/15 kHz indicates the spectral density integrated across one subcarrier.

The range depends on several parameters. It either equals the range of the RS EPRE or is a part of this range.

Suffix:
<c> 1..3

Parameters:
<AWGN> Range: depends on many parameters
*RST: -98 dBm/15kHz, OFF
Default unit: dBm/15kHz
Additional parameters: OFF | ON (disables | enables the AWGN interferer)

Example: See Configuring DL Power Levels

Firmware/Software: V1.0.15.21, SCC command V3.2.50

Options: R&S CMW-KS510

Manual operation: See "AWGN" on page 147

2.6.11 Uplink Power Control

The following commands define parameters related to UE uplink power control by the instrument.

2.6.11.1 General Power Control Parameters

The following commands configure the power control mode for UL CA and specify the cell-specific maximum allowed power.

CONFigure:LTE:SIGN<i>:UL[:PCC]:JUPower....................432
CONFigure:LTE:SIGN<i>:UL[:PCC]:PMAX....................432
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PMAX....................432

CONFigure:LTE:SIGN<i>:UL[:PCC]:JUPower <Enable>

Enables or disables joint uplink power control for uplink carrier aggregation.

Parameters:
<Enable> OFF | ON
*RST: ON

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.5.30

Manual operation: See "Joint UL Power" on page 147

CONFigure:LTE:SIGN<i>:UL[:PCC]:PMAX <Power>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PMAX <Power>

Specifies the maximum allowed UE power.

Suffix:
<c> 1..3

Parameters:

<Power> Range: -30 dBm to 33 dBm
*RST: 24 dBm
Default unit: dBm
Additional parameters: OFF | ON (disables | enables signaling of the value to the UE)

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.0.10, SCC command V3.5.20

Manual operation: See "Max. allowed Power P-Max" on page 148

2.6.11.2 PRACH and Initial PUSCH Power

The following commands define parameters related to PRACH and initial PUSCH power configuration.

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:EASettings....434
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:EASettings....434
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:OLNPower....434
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:OLNPower....434
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:BASic?....434
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:BASic?....434
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:BASic?....435
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:BASic?....435
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:BASic?....435
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:BASic?....435
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:BASic?....436
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:BASic?....436
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:BASic?....436
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:BASic?....436
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:ADVanced....436
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:ADVanced....436
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:ADVanced....437
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:ADVanced....437
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:ADVanced....437
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:ADVanced....437
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:ADVanced....438
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:ADVanced....438
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:ADVanced....438
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:ADVanced....438
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PATHloss?....438
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PATHloss?....438
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EPPPower?....439
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EPPPower?....439
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EOPower?....439
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EOPower?....439

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:EASettings <Enable>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:EASettings <Enable>

Enables or disables advanced configuration of the PRACH and open loop power settings via the other `CONFigure:LTE:SIGN:UL:PCC/SCC<c>:APPower:...` commands.

Suffix:
<c> 1..3

Parameters:
<Enable> OFF | ON
*RST: OFF

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Enable Advanced Settings" on page 149

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:OLNPower <Power>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:OLNPower <Power>

Defines a cell-specific nominal power value for full resource block allocation in the UL (entire channel bandwidth used). From this value, the cell-specific nominal power value $P_{O\_NOMINAL\_PUSCH}$ related to one resource block is determined and sent to all UEs via broadcast.

This command is only relevant for basic configuration and rejected if advanced configuration is active.

Suffix:
<c> 1..3

Parameters:
<Power> Range: -50 dBm to 23 dBm
*RST: -20 dBm
Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.5.10, SCC command V3.5.30

Manual operation: See "Open Loop Nominal Power" on page 149

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:BASic?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:BASic?

Queries the "referenceSignalPower" value, signaled to the UE if basic UL power configuration applies.

Suffix:
<c> 1..3

Return values:

<RefSignalPower>	Range: -60 dBm to 50 dBm Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Reference Signal Power" on page 149

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:BASic?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:BASic?

Queries the "preambleInitialReceivedTargetPower" value, signaled to the UE if basic UL power configuration applies.

Suffix:

<c>	1..3

Return values:

<TargetPower>	Range: -120 dBm to -90 dBm Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Preamble Initial Received Target Power" on page 149

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:BASic?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:BASic?

Queries the "p0-NominalPUSCH" value, signaled to the UE if basic UL power configuration applies.

Suffix:

<c>	1..3

Return values:

<P0NominalPUSCH>	Range: -126 dBm to 24 dBm Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "P0 Nominal PUSCH" on page 150

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:BASic?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:BASic?

Queries the value of parameter "alpha", signaled to the UE if basic UL power configuration applies.

Suffix:
<c> 1..3

Return values:
<PathCompAlpha> ZERO | DOT4 | DOT5 | DOT6 | DOT7 | DOT8 | DOT9 | ONE

ZERO: 0
DOT4 ... DOT9: 0.4 ... 0.9
ONE: 1.0

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Pathloss Compensation Alpha" on page 150

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:BASic?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:BASic?

Queries the state of P0-UE-PUSCH toggling, determining the P0-UE-PUSCH values signaled to the UE during RRC connection setup if basic UL power configuration applies.

Suffix:
<c> 1..3

Return values:
<Enable> OFF | ON

*RST: OFF

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.2.20, SCC command V3.5.30

Manual operation: See "Toggle P0-UE-PUSCH at RRC Setup" on page 150

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:ADVanced <RefSignalPower>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:ADVanced <RefSignalPower>

Specifies the "referenceSignalPower" value, signaled to the UE if advanced UL power configuration applies.

Suffix:
<c> 1..3

Parameters:

<RefSignalPower> Range: -60 dBm to 50 dBm
*RST: 18 dBm
Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Reference Signal Power" on page 149

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:ADVanced <TargetPower>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:ADVanced <TargetPower>

Specifies the "preambleInitialReceivedTargetPower" value, signaled to the UE if advanced UL power configuration applies.

Suffix:

<c> 1..3

Parameters:

<TargetPower> Range: -120 dBm to -90 dBm
Increment: 2 dB
*RST: -104 dBm
Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Preamble Initial Received Target Power" on page 149

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:ADVanced <P0NominalPUSCH>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:ADVanced <P0NominalPUSCH>

Specifies the "p0-NominalPUSCH" value, signaled to the UE if advanced UL power configuration applies.

Suffix:

<c> 1..3

Parameters:

<P0NominalPUSCH> Range: -126 dBm to 24 dBm
*RST: -85 dBm
Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "P0 Nominal PUSCH" on page 150

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:ADVanced <PathCompAlpha>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:ADVanced <PathCompAlpha>

Specifies the value of parameter "alpha", signaled to the UE if advanced UL power configuration applies.

Suffix:
<c> 1..3

Parameters:
<PathCompAlpha> ZERO | DOT4 | DOT5 | DOT6 | DOT7 | DOT8 | DOT9 | ONE

ZERO: 0
DOT4 ... DOT9: 0.4 ... 0.9
ONE: 1.0

*RST: DOT8

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.0.50, SCC command V3.5.30

Manual operation: See "Pathloss Compensation Alpha" on page 150

CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:ADVanced <Enable>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:ADVanced <Enable>

Enables or disables P0-UE-PUSCH toggling and thus determines the P0-UE-PUSCH values signaled to the UE during RRC connection setup if advanced UL power configuration applies.

Suffix:
<c> 1..3

Parameters:
<Enable> OFF | ON

*RST: OFF

Example: See Configuring UL Power Control for Call Setup

Firmware/Software: V3.2.20, SCC command V3.5.30

Manual operation: See "Toggle P0-UE-PUSCH at RRC Setup" on page 150

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PATHloss?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PATHloss?

Queries the pathloss resulting from the advanced UL power settings.

Suffix:
<c> 1..3

Return values:
<Pathloss> Default unit: dB

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.20

Manual operation: See "Pathloss" on page 151

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EPPPower?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EPPPower?

Queries the expected power of the first preamble, resulting from the advanced UL power settings.

Suffix:
<c> 1..3

Return values:
<Power> Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.20

Manual operation: See "Expected PRACH Preamble Power" on page 151

SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EOPower?
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EOPower?

Queries the expected initial PUSCH power, resulting from the advanced UL power settings.

Suffix:
<c> 1..3

Return values:
<ExpectedOLpower> Default unit: dBm

Example: See Configuring UL Power Control for Call Setup

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.20

Manual operation: See "Expected OL Power" on page 151

2.6.11.3 TX Power Control (TPC)

The following commands define parameters related to UE uplink power control via TPC commands.

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SET..440
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SET..440
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:PEXecute..440
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:PEXecute..440

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:RPControl....441
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:RPControl....441
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:TPOWer....441
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:TPOWer....441
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:CLTPower....441
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower....441
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower:OFFSet....442
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SINGle....442
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SINGle....442
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:UDPattern....443
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:UDPattern....443

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SET <SetType>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SET <SetType>

Selects the active TPC setup to be executed for power control of the PUSCH.

For some TPC setups, the execution must be explicitly triggered via `CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:PEXecute`.

Suffix:

<c> 1..3

Parameters:

<SetType> MINPower | MAXPower | CONStant | SINGle | UDSingle | UDContinuous | ALT0 | CLOop | RPControl | FULPower

MINPower: command the UE to minimum power
MAXPower: command the UE to maximum power
CONStant: command the UE to keep the power constant
SINGle: send a pattern once (pattern contains only one type of TPC command)
UDSingle: send a pattern once (mix of different TPC commands possible)
UDContinuous: send a pattern over and over again
ALT0: send an alternating pattern continuously
CLOop: command the UE to a configurable target power
RPControl: patterns for 3GPP relative power control test
FULPower: flexible uplink power

*RST: CLO

Example: See Modifying Parameters for an Established Connection

Firmware/Software: V3.2.50, V3.5.30: FULPower and SCC command

Manual operation: See "Active TPC Setup" on page 152

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:PEXecute
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:PEXecute

Execute the active TPC setup for power control of the PUSCH. This command is only relevant for setups which are not executed automatically (`SINGle`, `UDSingle`, `RPControl`, `FULPower`).

Suffix:
<c> 1..3

Example: See Modifying Parameters for an Established Connection

Usage: Event

Firmware/Software: V2.0.20, SCC command V3.5.20

Manual operation: See "Active TPC Setup" on page 152

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:RPControl <Pattern>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:RPControl <Pattern>

Selects a TPC pattern for 3GPP relative power control tests with the TPC setup `RPControl`.

Suffix:
<c> 1..3

Parameters:
<Pattern> RUA | RDA | RUB | RDB | RUC | RDC

RUA | RUB | RUC: ramping up A | B | C
RDA | RDB | RDC: ramping down A | B | C

*RST: RUA

Example: See Modifying Parameters for an Established Connection

Firmware/Software: V3.2.50, SCC command V3.5.20

Manual operation: See "3GPP Rel. Pow. Ctrl. Pattern" on page 153

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:TPOWer <Power>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:TPOWer <Power>

Defines the target powers for power control with the TPC setup `FULPower`.

Suffix:
<c> 1..3

Parameters:
<Power> Range: -50 dBm to 33 dBm
*RST: -20 dBm
Default unit: dBm

Firmware/Software: V3.5.30

Manual operation: See "Target Power PCC / SCC" on page 153

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:CLTPower <Power>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower <Power>

Defines the target power for power control with the TPC setup `CLOop`.

Suffix:
<c> 1..3

Parameters:
<Power> Range: -50 dBm to 33 dBm
*RST: -20 dBm
Default unit: dBm

Example: See Modifying Parameters for an Established Connection

Firmware/Software: V3.2.60, SCC command V3.5.30

Manual operation: See "Closed Loop Target Power" on page 153

CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower:OFFSet <Offset>

Defines an SCC target power offset for power control with the TPC setup `CLOop`.

This command is only relevant if joint uplink power control is mandatory.

Suffix:
<c> 1..3

Parameters:
<Offset> SCC target power = PCC target power + <Offset>
Range: -7 dB to 7 dB
*RST: 0 dB
Default unit: dB

Example: See Modifying Parameters for an Established Connection

Firmware/Software: V3.5.50

Manual operation: See "Closed Loop Target Power" on page 153

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SINGle <NoOfSteps>, <StepDirection>
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SINGle <NoOfSteps>, <StepDirection>

Defines a pattern for power control of the PUSCH with the TPC setup `SINGle`. The pattern consists of 1 to 35 up (+1 dB) or down (-1 dB) commands, followed by "constant power" commands (0 dB).

Suffix:
<c> 1..3

Parameters:
<NoOfSteps> Range: 1 to 35
*RST: 1

<StepDirection> UP | DOWN
*RST: UP

Example: See Modifying Parameters for an Established Connection

Firmware/Software: V3.0.10, SCC command V3.5.30

Manual operation: See "Single Pattern" on page 154

CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:UDPattern <PatternLength>, <Value1>[, <Value2>, <Value3>, <Value4>, <Value5>, <Value6>, <Value7>, <Value8>, <Value9>, <Value10>, <Value11>, <Value12>, <Value13>, <Value14>, <Value15>, <Value16>, <Value17>, <Value18>, <Value19>, <Value20>]

CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:UDPattern <PatternLength>, <Value1>[, <Value2>, <Value3>, <Value4>, <Value5>, <Value6>, <Value7>, <Value8>, <Value9>, <Value10>, <Value11>, <Value12>, <Value13>, <Value14>, <Value15>, <Value16>, <Value17>, <Value18>, <Value19>, <Value20>]

Defines a pattern for power control of the PUSCH with the TPC setup `UDSingle` or `UDContinuous`.

The pattern consists of 1 to 20 TPC commands. To configure the pattern, specify the pattern length and a corresponding number of TPC commands.

If you specify fewer TPC commands than required according to the pattern length, the previously defined values are used for the remaining commands. If you specify more TPC commands than required according to the pattern length, all values are set, but only the values corresponding to the pattern length are used.

Suffix:

<c> 1..3

Parameters:

<PatternLength> Number of values to be considered for the pattern

Range: 1 to 20
*RST: 10

<Value1>
Range: -1 dB to 3 dB
*RST: 1 dB
Default unit: dB

<Value2>
Range: -1 dB to 3 dB
*RST: 1 dB
Default unit: dB

<Value3>
Range: -1 dB to 3 dB
*RST: 1 dB
Default unit: dB

<Value4>
Range: -1 dB to 3 dB
*RST: 1 dB
Default unit: dB

<Value5>
Range: -1 dB to 3 dB
*RST: 1 dB
Default unit: dB

<Value6>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value7>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value8>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value9>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value10>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value11>	Range: -1 dB to 3 dB *RST: 1 dB Default unit: dB
<Value12>	Range: -1 dB to 3 dB *RST: 1 dB Default unit: dB
<Value13>	Range: -1 dB to 3 dB *RST: 1 dB Default unit: dB
<Value14>	Range: -1 dB to 3 dB *RST: 1 dB Default unit: dB
<Value15>	Range: -1 dB to 3 dB *RST: 1 dB Default unit: dB
<Value16>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value17>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value18>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB
<Value19>	Range: -1 dB to 3 dB *RST: -1 dB Default unit: dB

<Value20> Range: -1 dB to 3 dB
*RST: -1 dB
Default unit: dB

Example: See Modifying Parameters for an Established Connection

Firmware/Software: V2.0.20, SCC command V3.5.30

Manual operation: See "User-Defined Pattern" on page 154

2.6.12 Physical Cell Setup

The following commands configure physical layer attributes of the simulated cell.

CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL........445
CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL........445
CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID........446
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID........446
CONFigure:LTE:SIGN<i>:CELL:CPRefix........446
CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle........447
CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable........447
CONFigure:LTE:SIGN<i>:CELL:SRS:BWConfig........447
CONFigure:LTE:SIGN<i>:CELL:SRS:SFConfig........447
CONFigure:LTE:SIGN<i>:CELL:SRS:DBANdwidth........448
CONFigure:LTE:SIGN<i>:CELL:SRS:HBANdwidth........448
CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:FDD........448
CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:TDD........449
CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific........449
CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL........450
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL........450
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe........450
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe........450
CONFigure:LTE:SIGN<i>:CELL:PRACh:NRPReambles........451
CONFigure:LTE:SIGN<i>:CELL:PRACh:NIPRach........451
CONFigure:LTE:SIGN<i>:CELL:PRACh:PRSTep........451
CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD........451
CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD........452
CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset........453
CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex........453
CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig........453
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:ENABle........454
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:DMTCperiod........454
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:ONSDuration........454
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:OFFSduration........455
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:PMAC........455

CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL <Bandwidth>
CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL <Bandwidth>

Defines the DL cell/channel bandwidth. The PCC DL bandwidth is also used for the UL.

Suffix:
<c> 1..3

Parameters:
<Bandwidth> B014 | B030 | B050 | B100 | B150 | B200

B014: 1.4 MHz
B030: 3 MHz
B050: 5 MHz
B100: 10 MHz
B150: 15 MHz
B200: 20 MHz

*RST: B100

Example: See Configuring Physical Cell Setup

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "DL / UL Cell Bandwidth" on page 155

CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID <ID>
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID <ID>

Defines the physical cell ID used for generation of the DL physical synchronization signals. If you use carrier aggregation, configure different values for the component carriers.

Suffix:
<c> 1..3

Parameters:
<ID> Range: 0 to 503
*RST: 0 for PCC / 1 for SCC1 / 2 for SCC2

Example: See Configuring Physical Cell Setup

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "Physical Cell ID" on page 155

CONFigure:LTE:SIGN<i>:CELL:CPRefix <CyclicPrefix>

Defines whether a normal or extended cyclic prefix (CP) is used.

Parameters:
<CyclicPrefix> NORMal | EXTended

*RST: NORM

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.0.50

Options: R&S CMW-KS510 for EXTended

Manual operation: See "Cyclic Prefix" on page 155

CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle <Enable>

Enables support of SRS.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.0.20

Manual operation: See "Sounding RS (SRS)" on page 156

CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable <Enable>

Enables or disables the manual configuration of signaled values for SRS configuration.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.2.60

Options: R&S CMW-KS510

Manual operation: See "Manual Configuration" on page 156

CONFigure:LTE:SIGN<i>:CELL:SRS:BWConfig <BWConfiguration>

Specifies the "srs-BandwidthConfig" value.

The setting is only used if manual configuration is enabled, see `CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable`.

Parameters:

<BWConfiguration> Range: 0 to 7
*RST: 7

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.40

Options: R&S CMW-KS510

Manual operation: See "Bandwidth Config (Common)" on page 157

CONFigure:LTE:SIGN<i>:CELL:SRS:SFConfig <Subframe>

Specifies the "srs-SubframeConfig" value.

The setting is only used if manual configuration is enabled, see `CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable`.

Parameters:

<Subframe>	Range:	0 to 15
	*RST:	3

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.2.60

Options: R&S CMW-KS510

Manual operation: See "Subframe Configuration" on page 157

CONFigure:LTE:SIGN<i>:CELL:SRS:DBANdwidth <DedicatedBW>

Specifies the "srs-Bandwidth" value.

The setting is only used if manual configuration is enabled, see `CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable`.

Parameters:

<DedicatedBW>	Range:	0 to 3
	*RST:	3

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.40

Options: R&S CMW-KS510

Manual operation: See "Bandwidth (Dedicated)" on page 157

CONFigure:LTE:SIGN<i>:CELL:SRS:HBANdwidth <HoppingBW>

Specifies the "srs-HoppingBandwidth" value.

The setting is only used if manual configuration is enabled, see `CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable`.

Parameters:

<HoppingBW>	Range:	0 to 3
	*RST:	3

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.40

Options: R&S CMW-KS510

Manual operation: See "Hopping Bandwidth" on page 157

CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:FDD <Index>

Specifies the "srs-ConfigIndex" value for FDD.

The setting is only used if manual configuration is enabled, see `CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable`.

Parameters:

<Index>	Range:	0 to 636
	*RST:	7

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.2.70

Options: R&S CMW-KS510

Manual operation: See "Configuration Index" on page 157

CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:TDD <Index>

Specifies the "srs-ConfigIndex" value for TDD.

The setting is only used if manual configuration is enabled, see `CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable`.

Parameters:

<Index>	Range:	0 to 644
	*RST:	0

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.2.70

Options: R&S CMW-KS510

Manual operation: See "Configuration Index" on page 157

CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific <UseSpecific>

Enables the carrier-specific configuration of the UL/DL configuration and of the special subframe configuration.

- Enabled: Configuration per carrier via
  `CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL`
  `CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL`
  `CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe`
  `CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe`
- Disabled: Global configuration via
  `CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL`
  `CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe`

Parameters:

<UseSpecific>	OFF | ON	
	*RST:	OFF

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.20

Options: R&S CMW-KS550 and R&S CMW-KS512

Manual operation: See "Use Carrier Specific" on page 158

CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL <UplinkDownlink>
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL <UplinkDownlink>

Selects an uplink-downlink configuration, defining the combination of uplink, downlink and special subframes within a radio frame. This command is only relevant for duplex mode TDD.

See also CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific on page 449.

Suffix:
<c> 1..3

Parameters:
<UplinkDownlink> Range: 0 to 6
*RST: 1

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.0.10, V3.0.50 value 0, 2, 3, 4, 6
V3.5.20 SCC command

Options: R&S CMW-KS550 and R&S CMW-KS510
R&S CMW-KS512 for carrier-specific configuration

Manual operation: See "Uplink Downlink Configuration" on page 158

CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe <SpecialSubframe>
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe <SpecialSubframe>

Selects a special subframe configuration, defining the inner structure of special subframes. This parameter is only relevant for TDD signals.

The special subframe configurations are defined in 3GPP TS 36.211, chapter 4, "Frame Structure".

See also CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific on page 449.

Suffix:
<c> 1..3

Parameters:
<SpecialSubframe> Value 8 and 9 can only be used with normal cyclic prefix.
Range: 0 to 9
*RST: 7

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.1.20, V3.5.10 value 9, V3.5.20 SCC command

Options: R&S CMW-KS550
R&S CMW-KS512 for value 7 plus extended cyclic prefix / for value 9 / for carrier-specific configuration

Manual operation: See "Special Subframe" on page 158

CONFigure:LTE:SIGN<i>:CELL:PRACh:NRPReambles <Enable>

Selects whether the application ignores received preambles or not.

Parameters:

<Enable> OFF | ON | NIPReambles

OFF: respond to received preambles
ON: ignore received preambles
NIPReambles: ignore a configured number of preambles, then respond to subsequent preambles - for configuration see `CONFigure:LTE:SIGN<i>:CELL:PRACh:NIPRach`, only allowed for power ramping step size 0 dB

*RST: OFF

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.2.20

Manual operation: See "No Response to Preambles, # Ignored Preambles" on page 159

CONFigure:LTE:SIGN<i>:CELL:PRACh:NIPRach <Count>

Configures the number of preambles to be ignored if the mode NIPReambles is active, see `CONFigure:LTE:SIGN<i>:CELL:PRACh:NRPReambles`.

Parameters:

<Count> Range: 1 to 250
*RST: 1

Firmware/Software: V3.2.20

Manual operation: See "No Response to Preambles, # Ignored Preambles" on page 159

CONFigure:LTE:SIGN<i>:CELL:PRACh:PRSTep <Step>

Specifies the transmit power difference between two consecutive preambles.

Parameters:

<Step> ZERO | P2DB | P4DB | P6DB

0 dB, 2 dB, 4 dB, 6 dB

*RST: P2DB

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.0.20

Manual operation: See "Power Ramping Step" on page 159

CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD <PRACHconfIndex>

Selects the PRACH configuration index for FDD.

Parameters:
<PRACHconfIndex> Range: 0 to 63
*RST: 12

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.1.20

Options: R&S CMW-KS500

Manual operation: See "Configuration Index" on page 160

CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD <PRACHconfIndex>

Selects the PRACH configuration index for TDD.

Parameters:
<PRACHconfIndex> Range: depends on UL-DL configuration, see tables below
*RST: 12

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.1.20

Options: R&S CMW-KS550

Manual operation: See "Configuration Index" on page 160

The general range for the TDD PRACH configuration index equals 0 to 57. Within this range, 3GPP defines forbidden values depending on the UL-DL configuration, see 3GPP TS 36.211, table 5.7.1-4. The following tables list the allowed values.

Table 2-34: Allowed values for cell bandwidth > 1.4 MHz

UL-DL configuration	Allowed PRACH configuration indices
0	0-10, 12-18, 20-57
1	0-7, 9-12, 15-39, 48-57
2	0-4, 6, 9, 10, 12, 15, 16, 18, 48-57
3	0-9, 12-18, 20, 21, 23, 25-29, 30, 31, 33, 35-39, 40, 41, 43, 45-49, 51, 53-57
4	0-4, 6, 9, 10, 12, 15, 16, 18, 20, 21, 23, 25-29, 30, 31, 33, 35-39, 48, 49, 51, 53-57
5	0, 1, 3, 6, 9, 12, 15, 18, 48, 49, 51, 53-57
6	0-15, 18-41, 43, 45-57

Table 2-35: Allowed values for cell bandwidth = 1.4 MHz

UL-DL configuration	Allowed PRACH configuration indices
0	0-10, 12-18, 20-26, 30-36, 40-45, 48-53
1	0-7, 9-12, 20-25, 30-35, 48-53
2	0-4, 6, 48-53
3	0-9, 20, 21, 23, 30, 31, 33, 40, 41, 43, 48, 49, 51
4	0-4, 6, 20, 21, 23, 30, 31, 33, 48, 49, 51

UL-DL configuration	Allowed PRACH configuration indices
5	0, 1, 3, 48, 49, 51
6	0-15, 20-25, 30-35, 40, 41, 43, 48-53

CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset <PRACHfreqOffset>

Specifies the PRACH frequency offset.

Parameters:

<PRACHfreqOffset> Range: 0 to <total RB - 6> depending on channel bandwidth, see table below
*RST: 0

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.0.10

Manual operation: See "Frequency Offset" on page 160

Table 2-36: Maximum input value depending on channel bandwidth

Channel bandwidth / MHz	1.4	3	5	10	15	20
<total RB - 6>	0	9	19	44	69	94

CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex <LogRootSeqIndex>

Specifies the logical root sequence index to be used by the UE for generation of the preamble sequence.

Parameters:

<LogRootSeqIndex> Range: 0 to 837
*RST: 123

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.0.10

Manual operation: See "Logical Root Sequ.Idx" on page 160

CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig <ZeroCorrZoneCon>

Specifies the zero correlation zone config.

Parameters:

<ZeroCorrZoneCon> Range: 0 to 15
*RST: 9

Example: See Configuring Physical Cell Setup

Firmware/Software: V2.0.10

Manual operation: See "Zero Corr. Zone Conf." on page 160

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:ENABle <Enable>

Enables CSAT, including LDS transmission and SCell muting.

Suffix:
<c> 1..3

Parameters:
<Enable> OFF | ON
*RST: OFF

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.50

Options: R&S CMW-KS525

Manual operation: See "Enable" on page 161

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:DMTCperiod <Period>

Configures the LDS periodicity.

Suffix:
<c> 1..3

Parameters:
<Period> M40 | M80 | M160
40 ms, 80 ms, 160 ms
*RST: M40

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.50

Options: R&S CMW-KS525

Manual operation: See "DMTC Period" on page 161

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:ONSDuration <Duration>

Configures the ON state duration for SCell muting (SCC DL muting).

Suffix:
<c> 1..3

Parameters:
<Duration> Range: 1 ms to 1000 ms
*RST: 10 ms
Default unit: ms

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.50

Options: R&S CMW-KS525

Manual operation: See "ON State Duration / OFF State Duration" on page 161

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:OFFSduration <Duration>

Configures the OFF state duration for SCell muting (SCC DL muting).

Suffix:
<c> 1..3

Parameters:
<Duration> Range: 1 ms to 1000 ms
*RST: 10 ms
Default unit: ms

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.50

Options: R&S CMW-KS525

Manual operation: See "ON State Duration / OFF State Duration" on page 161

CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:PMAC <Activation>

Enables periodic MAC activation.

Suffix:
<c> 1..3

Parameters:
<Activation> OFF | ON
*RST: OFF

Example: See Configuring Physical Cell Setup

Firmware/Software: V3.5.50

Options: R&S CMW-KS525

Manual operation: See "Periodic MAC Activation" on page 162

2.6.13 Network Settings

The commands in this section configure parameters of the simulated radio network.

- Neighbor Cell Settings....456
- Cell Reselection Settings....464
- Identity Settings....466
- Security Settings....467
- UE Identity....470
- Timer and Constants....470
- Time....471
- NAS Signaling Settings....474
- Synchronization Settings....478

2.6.13.1 Neighbor Cell Settings

The following commands define neighbor cell information to be broadcasted to the UE.

CONFigure:LTE:SIGN<i>:NCELl:LTE:THResholds:LOW....456
CONFigure:LTE:SIGN<i>:NCELl:GSM:THResholds:LOW....456
CONFigure:LTE:SIGN<i>:NCELl:WCDMa:THResholds:LOW....456
CONFigure:LTE:SIGN<i>:NCELl:CDMA:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:EVDO:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:ALL:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:LTE:CELL<n>....458
CONFigure:LTE:SIGN<i>:NCELl:GSM:CELL<n>....459
CONFigure:LTE:SIGN<i>:NCELl:WCDMa:CELL<n>....460
CONFigure:LTE:SIGN<i>:NCELl:CDMA:CELL<n>....461
CONFigure:LTE:SIGN<i>:NCELl:EVDO:CELL<n>....461
CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:CELL<n>....463

CONFigure:LTE:SIGN<i>:NCELl:LTE:THResholds:LOW <Low>

Configures the reselection threshold value "threshX-Low" for LTE neighbor cells.

Parameters:

<Low> Range: 0 to 31
*RST: 5

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V2.1.30

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:GSM:THResholds:LOW <Low>

Configures the reselection threshold value "threshX-Low" for GSM neighbor cells.

Parameters:

<Low> Range: 0 to 31
*RST: 0

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V2.1.30

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:WCDMa:THResholds:LOW <Low>

Configures the reselection threshold value "threshX-Low" for WCDMA neighbor cells.

Parameters:

<Low> Range: 0 to 31
*RST: 5

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V2.1.30

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:CDMA:THResholds:LOW <Low>

Configures the reselection threshold value "threshX-Low" for CDMA2000 neighbor cells.

Parameters:

<Low> Range: 0 to 63
*RST: 0

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V2.1.30

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:EVDO:THResholds:LOW <Low>

Configures the reselection threshold value "threshX-Low" for 1xEV-DO neighbor cells.

Parameters:

<Low> Range: 0 to 63
*RST: 0

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V2.1.30

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:THResholds:LOW <Low>

Configures the reselection threshold value "threshX-Low" for TD-SCDMA neighbor cells.

Parameters:

<Low> Range: 0 to 31
*RST: 5

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.2.20

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:ALL:THResholds:LOW <Valid>, <Low>

Configures a common reselection threshold value "threshX-Low" applicable to all technologies.

Alternatively to a common threshold you can also use individual thresholds. They are defined per technology via the commands `CONFigure:LTE:SIGN<i>:NCELl:<Technology>:THResholds:LOW`. The parameter `<Valid>` selects whether common or individual thresholds are used.

Parameters:

<Valid> OFF | ON

OFF: use individual thresholds defined by separate commands
ON: use common threshold defined by this command

*RST: OFF

<Low> Range: 0 to 31
*RST: 5

Firmware/Software: V2.1.30

Manual operation: See "Threshold" on page 164

CONFigure:LTE:SIGN<i>:NCELl:LTE:CELL<n> <Enable>, <Band>, <Channel>, <CellID>, <QOffset>[, <Measurement>]

Configures the entry number <n> of the neighbor cell list for LTE.

For channel number ranges depending on operating bands see Chapter 2.2.17, "Operating Bands", on page 67.

Note that only 5 entries with different channel numbers can be active at a time. Entries with the same channel number must have different cell IDs.

Suffix:

<n> 1..16

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> FDD: UDEFined | OB1 | ... | OB32 | OB65 | ... | OB67 | OB252 | OB255

TDD: UDEFined | OB33 | ... | OB46

*RST: OB1

<Channel> Downlink channel number

Range: depends on operating band
*RST: 300

<CellID> Physical layer cell ID

Range: 0 to 503
*RST: 0

<QOffset> N24 | N22 | N20 | N18 | N16 | N14 | N12 | N10 | N8 | N6 | N5 | N4 | N3 | N2 | N1 | ZERO | P1 | P2 | P3 | P4 | P5 | P6 | P8 | P10 | P12 | P14 | P16 | P18 | P20 | P22 | P24

Corresponds to value "q-OffsetCell" in 3GPP TS 36.331
N24 to N1: -24 dB to -1 dB
ZERO: 0 dB
P1 to P24: 1 dB to 24 dB

*RST: ZERO

<Measurement> OFF | ON

Disables / enables neighbor cell measurements for the entry
ON is only allowed if also <Enable> = ON

*RST: OFF

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.0.10, some bands added in later versions
V3.0.50: added <Measurement>

Options: R&S CMW-KS510 for neighbor cell measurements

Manual operation: See "LTE" on page 164

CONFigure:LTE:SIGN<i>:NCELl:GSM:CELL<n> <Enable>, <Band>, <Channel>[, <Measurement>]

Configures the entry number <n> of the neighbor cell list for GSM.

Suffix:
<n> 1..4

Parameters:
<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> G085 | G09 | G18 | G19

GSM 850, GSM 900, GSM 1800, GSM 1900

*RST: G09

<Channel> Channel number used for the broadcast control channel (BCCH)

Range: 0 to 1023, depending on GSM band, see table below
*RST: 20

<Measurement> OFF | ON

Disables / enables neighbor cell measurements for the entry
ON is only allowed if also <Enable> = ON

*RST: OFF

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.0.50

Options: R&S CMW-KS510 for neighbor cell measurements

Manual operation: See "GSM" on page 164

Table 2-37: Channel number range depending on GSM band

Band	Channel number
G085	128 to 251
G09	0 to 124, 940 to 1023
G18	512 to 885
G19	512 to 810

CONFigure:LTE:SIGN<i>:NCELl:WCDMa:CELL<n> <Enable>, <Band>, <Channel>, <ScramblingCode>[, <Measurement>]

Configures the entry number <n> of the neighbor cell list for WCDMA.

Suffix:

<n> 1..4

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OB19 | OB20 | OB21 | OB22 | OB25 | OBS1 | OBS2 | OBS3 | OBL1

OB1, ..., OB14: band I to XIV
OB19, ..., OB22, OB25: band XIX to XXII, XXV
OBS1: band S
OBS2: band S 170 MHz
OBS3: band S 190 MHz
OBL1: band L

*RST: OB1

<Channel> Downlink channel number

Range: 412 to 11000, depending on operating band, see table below
*RST: 10563

<ScramblingCode> Primary scrambling code

Range: #H0 to #H1FF
*RST: #H0

<Measurement> OFF | ON

Disables / enables neighbor cell measurements for the entry
ON is only allowed if also <Enable> = ON

*RST: OFF

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.0.50, V3.5.40: OB22, OB25

Options: R&S CMW-KS510 for neighbor cell measurements

Manual operation: See "WCDMA FDD" on page 164

Table 2-38: Channel number range depending on operating band

Operating band	Channel number
OB1	10562 to 10838
OB2	412 to 687 (step 25), 9662 to 9938
OB3	1162 to 1513
OB4	1537 to 1738, 1887 to 2087 (step 25)
OB5	1007, 1012, 1032, 1037, 1062, 1087, 4357 to 4458
OB6	1037, 1062, 4387 to 4413
OB7	2237 to 2563, 2587 to 2912 (step 25)
OB8	2937 to 3088
OB9	9237 to 9387
OB10	3112 to 3388, 3412 to 3687 (step 25)
OB11	3712 to 3787
OB12	3842 to 3903, 3932, 3957, 3962, 3987, 3992
OB13	4017 to 4043, 4067, 4092
OB14	4117 to 4143, 4167, 4192
OB19	712 to 763, 787, 812, 837
OB20	4512 to 4638
OB21	862 to 912
OB22	4662 to 5038
OB25	5112 to 5413, 6292 to 6592 (step 25)
OBS1	10912 to 10988
OBS2	10900 to 10950
OBS3	10950 to 11000
OBL1	7637 to 7783, 7788 to 7933

CONFigure:LTE:SIGN<i>:NCELl:CDMA:CELL<n> <Enable>, <BandClass>, <Channel>, <CellID>[, <Measurement>]
CONFigure:LTE:SIGN<i>:NCELl:EVDO:CELL<n> <Enable>, <BandClass>, <Channel>, <CellID>[, <Measurement>]

Configures the entry number <n> of the neighbor cell list for CDMA2000 (1xRTT) or 1xEV-DO (HRPD).

Suffix:

<n> 1..4

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<BandClass> USC | KCEL | NAPC | TACS | JTAC | KPCS | N45T | IM2K | NA7C | B18M | NA8S | PA4M | PA8M | IEXT | USPC | AWS | U25B | U25F | NA9C | PS7C | LO7C

USC: BC 0, US cellular
KCEL: BC 0, Korean cellular
NAPC: BC 1, North American PCS
TACS: BC 2, TACS band
JTAC: BC 3, JTACS band
KPCS: BC 4, Korean PCS
N45T: BC 5, NMT-450
IM2K: BC 6, IMT-2000
NA7C: BC 7, upper 700 MHz
B18M: BC 8, 1800 MHz band
NA9C: BC 9, North American 900 MHz
NA8S: BC 10, secondary 800 MHz
PA4M: BC 11, European 400 MHz PAMR
PA8M: BC 12, 800 MHz PAMR
IEXT: BC 13, IMT-2000 2.5 GHz extension
USPC: BC 14, US PCS 1900 MHz
AWS: BC 15, AWS band
U25B: BC 16, US 2.5 GHz band
U25F: BC 17, US 2.5 GHz forward
PS7C: BC 18, public safety band 700 MHz
LO7C: BC 19, lower 700 MHz

*RST: USC

<Channel> Channel number

Range: 0 to 2108, depending on band class, see table below
*RST: 283

<CellID> Physical cell ID

Range: 0 to 511
*RST: 0

<Measurement> OFF | ON

Disables / enables neighbor cell measurements for the entry
ON is only allowed if also <Enable> = ON

*RST: OFF

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.0.50

Options: R&S CMW-KS510 for neighbor cell measurements

Manual operation: See "CDMA2000, 1xEV-DO" on page 165

Table 2-39: Channel number range depending on band class

Band class	Channel number
USC, KCEL	1 to 799, 991 to 1323
NAPC, IM2K	0 to 1199
TACS	0 to 1000, 1329 to 2108
JTAC	1 to 799, 801 to 1039, 1041 to 1199, 1201 to 1600
KPCS	0 to 599
N45T	1 to 400, 472 to 871, 1039 to 1473, 1536 to 1715, 1792 to 2016
NA7C, PS7C	0 to 240
B18M	0 to 1499
NA9C	0 to 699
NA8S	0 to 919
PA4M	1 to 400, 472 to 871, 1536 to 1715
PA8M	0 to 239
IEXT	0 to 1399
USPC	0 to 1299
AWS	0 to 899
U25B, U25F	140 to 1459
LO7C	0 to 360

CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:CELL<n> <Enable>, <Band>, <Channel>, <ScramblingCode>[, <Measurement>]

Configures the entry number <n> of the neighbor cell list for TD-SCDMA.

Suffix:
<n> 1..4

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> OB1 | OB2 | OB3

OB1: Band 1 (F), channel 9400 to 9600
OB2: Band 2 (A), channel 10050 to 10125
OB3: Band 3 (E), channel 11500 to 12000

*RST: OB1

<Channel>	Channel number Range: 9400 to 12000, depending on operating band *RST: 9600
<ScramblingCode>	Cell parameter ID Range: #H0 to #H7F *RST: #H0
<Measurement>	OFF | ON Disables / enables neighbor cell measurements for the entry ON is only allowed if also <Enable> = ON *RST: OFF

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.2.20

Options: R&S CMW-KS510 for neighbor cell measurements

Manual operation: See "TD-SCDMA" on page 165

2.6.13.2 Cell Reselection Settings

The following commands define cell reselection information to be broadcasted to the UE.

CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:INTRasearch....464
CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:NINTrasearch....465
CONFigure:LTE:SIGN<i>:CELL:RESelection:TSLow....465
CONFigure:LTE:SIGN<i>:CELL:RESelection:QUALity:RXLevmin....465

CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:INTRasearch <Sintrasearch>

Defines the threshold $S_{IntraSearch}$. The value divided by 2 is broadcasted to the UE in SIB3.

Parameters:

<Sintrasearch>	Range: 0 dB to 62 dB Increment: 2 dB *RST: 32 dB Default unit: dB Additional parameters: OFF | ON (disables | enables transmission of the information element)

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.2.70

Options: R&S CMW-KS510

Manual operation: See "S IntraSearch" on page 165

CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:NINTrasearch <Snonintrasearch>

Defines the threshold $S_{nonIntraSearch}$. The value divided by 2 is broadcasted to the UE in SIB3.

Parameters:

<Snonintrasearch> Range: 0 dB to 62 dB
Increment: 2 dB
*RST: 32 dB
Default unit: dB
Additional parameters: OFF | ON (disables | enables transmission of the information element)

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.2.70

Options: R&S CMW-KS510

Manual operation: See "S NonIntraSearch" on page 166

CONFigure:LTE:SIGN<i>:CELL:RESelection:TSLow <Value>

Defines $Thresh_{Serving,Low}$. The value divided by 2 is broadcasted to the UE in SIB3.

Parameters:

<Value> Range: 0 dB to 62 dB
Increment: 2 dB
*RST: 16 dB
Default unit: dB

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.2.70

Options: R&S CMW-KS510

Manual operation: See "ThreshServingLow" on page 166

CONFigure:LTE:SIGN<i>:CELL:RESelection:QUALity:RXLevmin <Qrxlevmin>

Defines the level $Q_{rxlevmin}$. The value divided by 2 is broadcasted to the UE in SIB1.

Parameters:

<Qrxlevmin> Range: -140 dBm to -44 dBm
Increment: 2 dB
*RST: -132 dBm
Default unit: dBm

Example: See Configuring Neighbor Cells and Reselection

Firmware/Software: V3.0.10

Options: R&S CMW-KS510

Manual operation: See "Q rxlevmin" on page 166

2.6.13.3 Identity Settings

The following commands configure identities of the simulated radio network.

CONFigure:LTE:SIGN<i>:CELL:MCC.......... 466
CONFigure:LTE:SIGN<i>:CELL:MNC.......... 466
CONFigure:LTE:SIGN<i>:CELL:MNC:DIGits.......... 466
CONFigure:LTE:SIGN<i>:CELL:TAC.......... 467
CONFigure:LTE:SIGN<i>:CELL[:PCC]:CID:EUTRan.......... 467
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CID:EUTRan.......... 467

CONFigure:LTE:SIGN<i>:CELL:MCC <MCC>

Specifies the three-digit mobile country code (MCC). You can omit leading zeros.

Parameters:

<MCC> Range: 0 to 999
*RST: 1

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "MCC" on page 166

CONFigure:LTE:SIGN<i>:CELL:MNC <MNC>

Specifies the mobile network code (MNC). You can omit leading zeros.

A two or three-digit MNC can be set, see `CONFigure:LTE:SIGN<i>:CELL:MNC:DIGits`.

Parameters:

<MNC> Range: 0 to 99 or 999
*RST: 1

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "MNC" on page 166

CONFigure:LTE:SIGN<i>:CELL:MNC:DIGits <NoDigits>

Specifies the number of digits of the mobile network code (MNC).

For setting the MNC, see `CONFigure:LTE:SIGN<i>:CELL:MNC`.

Parameters:

<NoDigits> TWO | THRee
*RST: TWO

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "MNC" on page 166

CONFigure:LTE:SIGN<i>:CELL:TAC <TAC>

Specifies the tracking area code.

Parameters:

<TAC> Range: 0 to 65535
*RST: 1

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "TAC" on page 167

CONFigure:LTE:SIGN<i>:CELL[:PCC]:CID:EUTRan <CID>
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CID:EUTRan <CID>

Specifies the E-UTRAN cell identifier (28-digit binary number). If you use carrier aggregation, configure different values for the component carriers.

Suffix:

<c> 1..3

Parameters:

<CID> Range: #B0 to #B1111111111111111111111111111
*RST: #B100000000 for PCC, #B100000001 for SCC1, #B100000010 for SCC2

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20, SCC command V3.2.50

Manual operation: See "E-UTRAN Cell Identifier" on page 167

2.6.13.4 Security Settings

The following commands configure parameters related to the authentication procedure and other security procedures.

CONFigure:LTE:SIGN<i>:CELL:SECurity:AUTHenticat....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:NAS.... 468
CONFigure:LTE:SIGN<i>:CELL:SECurity:AS....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:IALGorithm....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:MILenage....469
CONFigure:LTE:SIGN<i>:CELL:SECurity:OPC....469
CONFigure:LTE:SIGN<i>:CELL:SECurity:SKEY....469
CONFigure:LTE:SIGN<i>:CELL:SECurity:RVALue....469

CONFigure:LTE:SIGN<i>:CELL:SECurity:AUTHenticat <Enable>

Enables or disables authentication, to be performed during the attach procedure.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Authentication" on page 167

CONFigure:LTE:SIGN<i>:CELL:SECurity:NAS <Enable>

Enables or disables the NAS security mode.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "NAS Security" on page 168

CONFigure:LTE:SIGN<i>:CELL:SECurity:AS <Enable>

Enables or disables the AS security mode.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "AS Security" on page 168

CONFigure:LTE:SIGN<i>:CELL:SECurity:IALGorithm <Algorithm>

Selects an algorithm for integrity protection.

Parameters:

<Algorithm> NULL | S3G

NULL: no integrity protection
S3G: SNOW3G (EIA1) algorithm

*RST: S3G

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.50

Manual operation: See "Integrity Algorithm" on page 168

CONFigure:LTE:SIGN<i>:CELL:SECurity:MILenage <Enable>

Enables or disables using the MILENAGE algorithm set instead of the standard algorithms.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Milenage" on page 168

CONFigure:LTE:SIGN<i>:CELL:SECurity:OPC <OPC>

Specifies the key OP_c as 32-digit hexadecimal number.

Parameters:

<OPC> Range: #H00000000000000000000000000000000 to #HFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

*RST: #H00000000000000000000000000000000

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "OPc" on page 168

CONFigure:LTE:SIGN<i>:CELL:SECurity:SKEY <SecretKey>

Defines the secret key K as 32-digit hexadecimal number. You can omit leading zeros.

K is used for the authentication procedure including a possible integrity check.

Parameters:

<SecretKey> Range: #H0 to #HFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

*RST: #H000102030405060708090A0B0C0D0E0F

Example: See Configuring Other Network Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Secret Key" on page 168

CONFigure:LTE:SIGN<i>:CELL:SECurity:RVALue <Mode>

Selects whether an even or odd RAND value is used.

Parameters:

<Mode> EVEN | ODD

Example: See Configuring Other Network Settings

Firmware/Software: V2.1.20

Manual operation: See "RAND Value" on page 169

2.6.13.5 UE Identity

The following command configures the default IMSI.

CONFigure:LTE:SIGN<i>:CELL:UEIDentity:IMSI <Value>

Specifies the default IMSI.

Parameters:

<Value> String value, containing 14 to 16 digits.
*RST: '001010123456063'

Firmware/Software: V1.0.15.20

Manual operation: See "Default IMSI" on page 169

2.6.13.6 Timer and Constants

The commands in this section configure timer.

CONFigure:LTE:SIGN<i>:CELL:TOUT:OSYNch.. 470
CONFigure:LTE:SIGN<i>:CELL:TOUT:T<no>..470

CONFigure:LTE:SIGN<i>:CELL:TOUT:OSYNch <Value>

Specifies the time after which the instrument, having waited for a signal from the connected UE, releases the connection.

Parameters:

<Value> Range: 1 s to 50 s
*RST: 5 s
Default unit: s

Example: See Configuring Other Network Settings

Firmware/Software: V2.1.30

Manual operation: See "Out of Sync" on page 169

CONFigure:LTE:SIGN<i>:CELL:TOUT:T<no> <Value>

Configures one of the following timers:

- T3402, attach/TAU reattempts
- T3412, periodic tracking area updates

The information elements support the values 1 to 31 combined with the units 2 seconds, 1 minute and 6 minutes.

This command configures the timer value in seconds. So there are three subranges with different increments.

Suffix:
<no> 3402,3412

Parameters:
<Value> Range: 2 s to 11160 s
Increment: 2 s (2 s to 62 s), 60 s (120 s to 1860 s), 360 s (2160 s to 11160 s)
*RST: 720 s for T3402, 2 s for T3412
Additional parameters: OFF | ON (disables | enables the timer)

Example: See Configuring Other Network Settings

Firmware/Software: V3.0.10, V3.5.40: added T3402

Manual operation: See "T3402" on page 169

2.6.13.7 Time

The commands in this section configure and send date and time information to the UE.

CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce............ 471
CONFigure:LTE:SIGN<i>:CELL:TIME:DATE............ 472
CONFigure:LTE:SIGN<i>:CELL:TIME:TIME............ 472
CONFigure:LTE:SIGN<i>:CELL:TIME:DSTime............ 472
CONFigure:LTE:SIGN<i>:CELL:TIME:LTZoffset............ 473
CONFigure:LTE:SIGN<i>:CELL:TIME:SNOW............ 473
CONFigure:LTE:SIGN<i>:CELL:TIME:SATTach............ 473

CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce <SourceTime>

Selects the date and time source.

The time source DATE is configured via the following commands:

- `CONFigure:LTE:SIGN<i>:CELL:TIME:DATE`
- `CONFigure:LTE:SIGN<i>:CELL:TIME:TIME`
- `CONFigure:LTE:SIGN<i>:CELL:TIME:DSTime`
- `CONFigure:LTE:SIGN<i>:CELL:TIME:LTZoffset`

Parameters:
<SourceTime> CMWTime | DATE

CMWTime: Windows date and time
DATE: Date and time specified via remote commands
*RST: CMWT

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS510

Manual operation: See "Time Source" on page 170

CONFigure:LTE:SIGN<i>:CELL:TIME:DATE <Day>, <Month>, <Year>

Specifies the UTC date for the time source `DATE` (see `CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce` on page 471).

Parameters:

<Day>	Range:	1 to 31
	*RST:	11
<Month>	Range:	1 to 12
	*RST:	11
<Year>	Range:	2011 to 9999
	*RST:	2011

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS510

Manual operation: See "Date / Time (UTC)" on page 170

CONFigure:LTE:SIGN<i>:CELL:TIME:TIME <Hour>, <Minute>, <Second>

Specifies the UTC time for the time source `DATE` (see `CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce` on page 471).

Parameters:

<Hour>	Range:	0 to 23
	*RST:	11
<Minute>	Range:	0 to 59
	*RST:	11
<Second>	Range:	0 to 59
	*RST:	0

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS510

Manual operation: See "Date / Time (UTC)" on page 170

CONFigure:LTE:SIGN<i>:CELL:TIME:DSTime <Enable>

Specifies a daylight saving time (DST) offset for the time source `DATE` (see `CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce` on page 471).

Parameters:

<Enable> P1H | P2H

P1H: +1h offset if DST is ON
P2H: +2h offset if DST is ON

*RST: OFF (P1H)
Additional parameters: OFF | ON (disables | enables DST)

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS510

Manual operation: See "Daylight Saving Time" on page 170

CONFigure:LTE:SIGN<i>:CELL:TIME:LTZoffset <TimeZoneOffset>

Specifies the time zone offset for the time source `DATE` (see `CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce` on page 471).

Parameters:

<TimeZoneOffset> Range: -19.75 h to 19.75 h
Increment: 0.25 h
*RST: 0 h
Default unit: h

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.5.30

Options: R&S CMW-KS510

Manual operation: See "Local Time Zone Offset" on page 170

CONFigure:LTE:SIGN<i>:CELL:TIME:SNOW

Triggers the transfer of the date and time information to the UE.

Example: See Sending Date and Time Information to the UE

Usage: Event

Firmware/Software: V3.0.30

Options: R&S CMW-KS510

Manual operation: See "Send Time" on page 171

CONFigure:LTE:SIGN<i>:CELL:TIME:SATTach <Enable>

Specifies whether the date and time information is sent to the UE during the attach procedure or not.

Parameters:

<Enable> OFF | ON

ON: send date and time at attach
OFF: do not send date and time at attach

*RST: OFF

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS510

Manual operation: See "Send Time" on page 171

2.6.13.8 NAS Signaling Settings

The commands in this section configure settings related to NAS signaling messages to be sent to the UE.

CONFigure:LTE:SIGN<i>:CONNection:SDNSpco.....474
CONFigure:LTE:SIGN<i>:CELL:RCAuse:ATTach.....474
CONFigure:LTE:SIGN<i>:CELL:RCAuse:TAU.....474
CONFigure:LTE:SIGN<i>:CELL:NAS:EPSNetwork.....476
CONFigure:LTE:SIGN<i>:CELL:NAS:IMSVops.....476
CONFigure:LTE:SIGN<i>:CELL:NAS:EMCBs.....477
CONFigure:LTE:SIGN<i>:CELL:NAS:EPCLcs.....477
CONFigure:LTE:SIGN<i>:CELL:NAS:CSLCs.....478

CONFigure:LTE:SIGN<i>:CONNection:SDNSpco <Enable>

Enables or disables sending of a DNS IP address to the UE.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Configuring Other Network Settings

Firmware/Software: V3.0.10

Manual operation: See "Send DNS PCO" on page 171

CONFigure:LTE:SIGN<i>:CELL:RCAuse:ATTach <Cause>
CONFigure:LTE:SIGN<i>:CELL:RCAuse:TAU <Cause>

Enables or disables the rejection of attach requests and tracking area update requests and selects the rejection cause to be transmitted.

Parameters:

<Cause> IUE3 | EPS7 | PLMN11 | TANA12 | C13 | C17 | CONG22 | C2 | C5 | C6 | C8 | C9 | C10 | C14 | C15 | C16 | C18 | C19 | C20 | C21 | C23 | C24 | C25 | C26 | C35 | C39 | C40 | C42 | C95 | C96 | C97 | C98 | C99 | C100 | C101 | C111 | ON | OFF

See table for explanation of values

*RST: OFF

Example: See Configuring Other Network Settings

Firmware/Software: V3.0.20
V3.2.70: added C13, V3.5.40: added C17
V3.5.50: added C2, C5, C6, C8 to C10, C14 to C16, C18 to C21, C23 to C26, C35, C39, C40, C42, C95 to C101, C111

Options: R&S CMW-KS510

Manual operation: See "Attach Reject Cause, TAU Reject Cause" on page 171

<Cause>	Number	Meaning
C2	2	IMSI unknown in HSS
IUE3	3	Illegal UE
C5	5	IMEI not accepted
C6	6	Illegal mobile equipment
EPS7	7	EPS services not allowed
C8	8	EPS and non-EPS services not allowed
C9	9	UE identity cannot be derived by the network
C10	10	Implicitly detached
PLMN11	11	PLMN not allowed
TANA12	12	Tracking area not allowed
C13	13	Roaming not allowed in this tracking area
C14	14	EPS services not allowed in this PLMN
C15	15	No suitable cells in tracking area
C16	16	MSC temporarily not reachable
C17	17	Network failure
C18	18	CS domain not available
C19	19	ESM failure
C20	20	MAC failure
C21	21	Synch failure
CONG22	22	Congestion
C23	23	UE security capabilities mismatch

<Cause>	Number	Meaning
C24	24	Security mode rejected, unspecified
C25	25	Not authorized for this CSG
C26	26	Non-EPS authentication unacceptable
C35	35	Requested service option not authorized in this PLMN
C39	39	CS service temporarily not available
C40	40	No EPS bearer context activated
C42	42	Severe network failure
C95	95	Semantically incorrect message
C96	96	Invalid mandatory information
C97	97	Message type non-existent or not implemented
C98	98	Message type not compatible with protocol state
C99	99	Information element non-existent or not implemented
C100	100	Conditional information element error
C101	101	Message not compatible with protocol state
C111	111	Protocol error, unspecified
ON	-	Enables the rejection with previously selected cause
OFF	-	Disables the rejection

CONFigure:LTE:SIGN<i>:CELL:NAS:EPSNetwork <Enable>

Enables or disables sending of the information element "EPS Network Feature Support" to the UE in the attach accept message.

For configuration of the information element contents, see other `CONFigure:LTE:SIGN<i>:CELL:NAS:...` commands.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.20

Manual operation: See "EPS Network Feature Support" on page 172

CONFigure:LTE:SIGN<i>:CELL:NAS:IMSVops <Support>

Configures the field "IMS voice over PS session indicator" of the information element "EPS Network Feature Support".

Parameters:

<Support> NSUPported | SUPPorted

NSUPported: not supported
SUPPorted: supported

*RST: NSUP

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.20

Manual operation: See "IMS Voice Over PS Session Indicator" on page 172

CONFigure:LTE:SIGN<i>:CELL:NAS:EMCBs <Support>

Configures the field "Emergency bearer services indicator" of the information element "EPS Network Feature Support".

Parameters:

<Support> NSUPported | SUPPorted

NSUPported: not supported
SUPPorted: supported

*RST: NSUP

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Emergency Bearer Services Indicator" on page 172

CONFigure:LTE:SIGN<i>:CELL:NAS:EPCLcs <Support>

Configures the field "Location services indicator in EPC" of the information element "EPS Network Feature Support".

Parameters:

<Support> NSUPported | SUPPorted

NSUPported: not supported
SUPPorted: supported

*RST: NSUP

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Location Service Indicator in EPC" on page 172

CONFigure:LTE:SIGN<i>:CELL:NAS:CSLCs <Support>

Configures the field "Location services indicator in CS" of the information element "EPS Network Feature Support".

Parameters:

<Support> NSUPported | SUPPorted | NINFormation

NSUPported: not supported
SUPPorted: supported
NINFormation: no information

*RST: NSUP

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Location Service Indicator in CS" on page 172

2.6.13.9 Synchronization Settings

The commands in this section configure the synchronization to other signaling applications and the synchronization between the component carriers.

CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:ZONE 478
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:OFFSet 478
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SYNC:OFFSet 478

CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:ZONE <Zone>

Selects the synchronization zone for the signaling application.

Parameters:

<Zone> NONE | Z1

NONE: no synchronization
Z1: synchronization to zone 1

*RST: NONE

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.50

Manual operation: See "Synchronization Zone" on page 173

CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:OFFSet <Offset>
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SYNC:OFFSet <Offset>

Configures the timing offset relative to the time zone.

Suffix:

<c> 1..3

Parameters:

<Offset>	Range:	0 s to 1E-3 s
	*RST:	0 s
	Default unit:	s

Example: See Configuring Other Network Settings

Firmware/Software: V3.2.50

Options: R&S CMW-KS510 for PCC, R&S CMW-KS512 for SCC

Manual operation: See "Synchronization Offset" on page 173

2.6.14 Connection Configuration

The commands in this section define parameters for the supported scheduling types.

- General Connection Settings....479
- General MIMO Settings....496
- MIMO Channel Model TM 2 to TM 6....499
- MIMO Beamforming Settings TM 7/8....502
- MIMO TM 9 Settings....506
- PDCCH Settings....514
- HARQ Connection Settings....517
- Connected DRX Settings....520
- Global UL/DL Commands....525
- RMC Settings....527
- User-Defined Channel Settings....532
- User-Defined TTI-Based Channel Settings....536
- Fixed CQI Settings....541
- Follow WB CQI Settings....543
- Follow WB PMI Settings....548
- Follow WB PMI-RI Settings....550
- Follow WB CQI-RI Settings....552
- Follow WB CQI-PMI-RI Settings....556
- SPS Settings....561

2.6.14.1 General Connection Settings

The following commands define general connection parameters.

CONFigure:LTE:SIGN<i>:CONNection:EASY:BFBW....480
CONFigure:LTE:SIGN<i>:CONNection:GHOPping....481
CONFigure:LTE:SIGN<i>:CONNection:UECategory:MANual....481
CONFigure:LTE:SIGN<i>:CONNection:UECategory:REPorted....481
CONFigure:LTE:SIGN<i>:CONNection:UECategory:CZALlowed....482
CONFigure:LTE:SIGN<i>:CONNection:PSMallowed....482
CONFigure:LTE:SIGN<i>:CONNection:DPCYcle....482
CONFigure:LTE:SIGN<i>:CONNection:ASEMission....482
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation....483
CONFigure:LTE:SIGN<i>:CONNection:FCOefficient....483

CONFigure:LTE:SIGN<i>:CONNection:CTYPe....484
CONFigure:LTE:SIGN<i>:CONNection:EDAU:ENABle....484
CONFigure:LTE:SIGN<i>:CONNection:EDAU:NSEGment....484
CONFigure:LTE:SIGN<i>:CONNection:EDAU:NID....485
CONFigure:LTE:SIGN<i>:CONNection:TMODe....485
CONFigure:LTE:SIGN<i>:CONNection:RLCMode....485
CONFigure:LTE:SIGN<i>:CONNection:IPVersion....485
CONFigure:LTE:SIGN<i>:CONNection:APN....486
CONFigure:LTE:SIGN<i>:CONNection:QCI....486
CONFigure:LTE:SIGN<i>:CONNection:SIBReconfig....486
CONFigure:LTE:SIGN<i>:CONNection:KRRC....487
CONFigure:LTE:SIGN<i>:CONNection:RITimer....487
CONFigure:LTE:SIGN<i>:CONNection:DLPadding....487
CONFigure:LTE:SIGN<i>:CONNection:DLEinsertion....488
CONFigure:LTE:SIGN<i>:CONNection:UETSelection....488
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:STYPe....488
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:STYPe....488
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL....489
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL....489
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:DL....490
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:DL....490
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:QAM<ModOrder>:DL....490
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:QAM<ModOrder>:DL....490
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TTIBundling....490
CONFigure:LTE:SIGN<i>:CONNection:ROHC:ENABle....491
CONFigure:LTE:SIGN<i>:CONNection:ROHC:PROFiles....491
CONFigure:LTE:SIGN<i>:CONNection:OBCHange....491
CONFigure:LTE:SIGN<i>:CONNection:FCHange....492
CONFigure:LTE:SIGN<i>:CONNection:CSFB:DESTination....492
CONFigure:LTE:SIGN<i>:CONNection:CSFB:GSM....492
CONFigure:LTE:SIGN<i>:CONNection:CSFB:WCDMa....493
CONFigure:LTE:SIGN<i>:CONNection:CSFB:TDSCdma....494
CONFigure:LTE:SIGN<i>:CONNection:AMDBearer....495
CONFigure:LTE:SIGN<i>:UECapability:RFBands:ALL....495
CONFigure:LTE:SIGN<i>:CONNection:TAControl....495

CONFigure:LTE:SIGN<i>:CONNection:EASY:BFBW <Enable>

Specifies whether the easy mode is used if the band or the frequency or the cell bandwidth is changed.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.5.30

Manual operation: See "Band/Frequency/BW Change" on page 175

CONFigure:LTE:SIGN<i>:CONNection:GHOPping <Enable>

Enables or disables group hopping.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.0.30

Manual operation: See "Group Hopping" on page 176

CONFigure:LTE:SIGN<i>:CONNection:UECategory:MANual <UECatManual>

Configures the UE category to be used by the R&S CMW if no reported value is available or usage of the reported value is disabled, see `CONFigure:LTE:SIGN<i>:CONNection:UECategory:REPorted`.

Parameters:

<UECatManual> Range: 0 to 15

*RST: 3

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.0.10

Manual operation: See "UE Category" on page 176

CONFigure:LTE:SIGN<i>:CONNection:UECategory:REPorted <UseReported>

Enables or disables the usage of the UE category value reported by the UE.

When disabled, the UE category must be set manually, see `CONFigure:LTE:SIGN<i>:CONNection:UECategory:MANual`. The manually set value is also used if no reported value is available.

Parameters:

<UseReported> OFF | ON

*RST: ON

Return values:

<UECatReported> UE category reported by the UE (NAV indicates that none has been reported)

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.0.10

Manual operation: See "UE Category" on page 176

CONFigure:LTE:SIGN<i>:CONNection:UECategory:CZALlowed <Allowed>

Specifies whether category 0 UEs are allowed to access the cell. This information is sent to the UE via broadcast in system information block 1.

Parameters:

<Allowed> OFF | ON
*RST: OFF

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.5.30

Options: R&S CMW-KS590

Manual operation: See "UE Category 0 Allowed" on page 176

CONFigure:LTE:SIGN<i>:CONNection:PSMallowed <Allowed>

Specifies whether a UE request for power-saving mode is accepted or rejected.

Parameters:

<Allowed> OFF | ON
*RST: OFF

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.5.40

Options: R&S CMW-KS590

Manual operation: See "PSM Allowed" on page 176

CONFigure:LTE:SIGN<i>:CONNection:DPCYcle <Cycle>

Selects the cell-specific default paging cycle.

Parameters:

<Cycle> P032 | P064 | P128 | P256
32, 64, 128 or 256 radio frames
*RST: P064

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V2.1.30

Manual operation: See "Default Paging Cycle" on page 176

CONFigure:LTE:SIGN<i>:CONNection:ASEMission <Value>

Selects a value signaled to the UE as additional ACLR and spectrum emission requirement.

Parameters:

<Value> NS01 | NS02 | NS03 | NS04 | NS05 | NS06 | NS07 | NS08 | NS09 | NS10 | NS11 | NS12 | NS13 | NS14 | NS15 | NS16 | NS17 | NS18 | NS19 | NS20 | NS21 | NS22 | NS23 | NS24

Value NS_01 to NS_24

*RST: NS01

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.0.10
V3.2.70: added NS16, NS17, NS18, NS20
V3.2.82: added NS19, NS21, NS22, NS23, NS24

Manual operation: See "Additional Spectrum Emission" on page 177

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation <Value>

Selects a value signaled to the UE as additional ACLR and spectrum emission requirement for the SCC<c>.

The setting is only relevant if the SCC uplink is enabled.

Suffix:

<c> 1..3

Parameters:

<Value> NS01 | NS02 | NS03 | NS04 | NS05 | NS06 | NS07 | NS08 | NS09 | NS10 | NS11 | NS12 | NS13 | NS14 | NS15 | NS16 | NS17 | NS18 | NS19 | NS20 | NS21 | NS22 | NS23 | NS24 | NS25 | NS26 | NS27 | NS28 | NS29 | NS30 | NS31 | NS32

Value CA_NS_01 to CA_NS_32

*RST: NS01

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.5.30

Options: R&S CMW-KS512

Manual operation: See "Add. Spectrum Emission Scell" on page 177

CONFigure:LTE:SIGN<i>:CONNection:FCOefficient <Filter>

Selects the value to be sent to the UE as "filterCoefficient" in RRC messages containing this information element.

Parameters:

<Filter> FC4 | FC8

*RST: FC4

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V1.0.15.21

Manual operation: See "UE Meas. Filter Coefficient" on page 177

CONFigure:LTE:SIGN<i>:CONNection:CTYPe <Type>

Selects the connection type to be applied.

Parameters:

<Type> TESTmode | DAPPlication

TESTmode: for signaling tests not involving the DAU
DAPPlication: for data application measurements using the DAU

*RST: TEST

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V2.0.20

Options: For DAPPlication: installed DAU with R&S CMW-KM050 or external DAU

Manual operation: See "Connection Type" on page 177

CONFigure:LTE:SIGN<i>:CONNection:EDAU:ENABle <Enable>

Enables usage of an external DAU.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.80

Options: R&S CMW-KA120

Manual operation: See "Use external DAU" on page 178

CONFigure:LTE:SIGN<i>:CONNection:EDAU:NSEGment <NetworkSegment>

Specifies the network segment of the instrument where the external DAU is installed.

Parameters:

<NetworkSegment> A | B | C

*RST: A

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.80

Options: R&S CMW-KA120

Manual operation: See "Network Segment, Subnet Node ID" on page 178

CONFigure:LTE:SIGN<i>:CONNection:EDAU:NID <ID>

Specifies the subnet node ID of the instrument where the external DAU is installed.

Parameters:

<ID> Range: 1 to 254
*RST: 1

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.80

Options: R&S CMW-KA120

Manual operation: See "Network Segment, Subnet Node ID" on page 178

CONFigure:LTE:SIGN<i>:CONNection:TMODe <Enable>

Specifies whether the UE is forced into a test mode. If enabled, the message "ACTIVATE TEST MODE" is sent to the UE.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V2.1.20

Manual operation: See "Test Mode > Use "Activate Testmode" Message" on page 178

CONFigure:LTE:SIGN<i>:CONNection:RLCMode <Mode>

Selects the RLC mode for downlink transmissions.

Parameters:

<Mode> UM | AM

UM: unacknowledged mode
AM: acknowledged mode
*RST: UM

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V2.1.20

Options: R&S CMW-KS510

Manual operation: See "RLC Mode" on page 179

CONFigure:LTE:SIGN<i>:CONNection:IPVersion <IPversion>

Configures the allowed IP versions for default bearers and data application tests. In test mode, the setting is fixed and can only be queried.

Parameters:

<IPversion> IPV4 | IPV6 | IPV46

IPV4: IPV4 only
IPV6: IPV6 only
IPV46: IPv4 and IPv6

*RST: IPV46

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "IP Version" on page 179

CONFigure:LTE:SIGN<i>:CONNection:APN <APN>

Configures the default APN for default bearers and data application tests. In test mode, the setting is fixed and can only be queried.

Parameters:

<APN> APN default value as string

*RST: "cmw500.rohde-schwarz.com"

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.80

Manual operation: See "APN" on page 179

CONFigure:LTE:SIGN<i>:CONNection:QCI <QCI>

Configures the QCI value for default bearers and data application tests. In test mode, the setting is fixed and can only be queried.

Parameters:

<QCI> Quality-of-service class identifier

Range: 5 to 9
*RST: 7

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "QCI" on page 179

CONFigure:LTE:SIGN<i>:CONNection:SIBReconfig <Type>

Selects a method for information of the UE about changes in the system information, resulting from modified parameters: SIB paging or RRC reconfiguration.

Parameters:

<Type> SIBPaging | RRCReconfig

*RST: SIBP

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.0.20

Manual operation: See "SIB Reconfiguration" on page 179

CONFigure:LTE:SIGN<i>:CONNection:KRRC <Enable>

Selects whether the RRC connection is kept or released after attach.

Parameters:

<Enable> OFF | ON

OFF: the RRC connection is released after the inactivity timer has expired
ON: the RRC connection is kept

*RST: ON

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V2.1.20

Manual operation: See "Keep RRC Connection" on page 179

CONFigure:LTE:SIGN<i>:CONNection:RITimer <Time>

Configures the inactivity timeout for disabled "Keep RRC Connection" (`CONFigure:LTE:SIGN:CONNection:KRRC OFF`).

Parameters:

<Time> Range: 1 s to 255 s
*RST: 5 s
Default unit: s

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V3.2.50

Options: R&S CMW-KS510

Manual operation: See "Keep RRC Connection" on page 179

CONFigure:LTE:SIGN<i>:CONNection:DLPadding <Value>

Activates or deactivates downlink padding at the MAC layer (filling an allocated RMC with padding bits when no data is available from higher layers).

Parameters:

<Value> OFF | ON

*RST: ON

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V1.0.15.20

Manual operation: See "Downlink MAC Padding" on page 180

CONFigure:LTE:SIGN<i>:CONNection:DLEinsertion <Value>

Configures the rate of transport block errors to be inserted into the downlink data.

Parameters:

<Value>
Range: 0 % to 100 %
Increment: 10 %
*RST: 0 %
Default unit: %

Example: See Configuring General Connection Settings Part 1

Firmware/Software: V1.0.15.20

Manual operation: See "Downlink MAC Error Insertion" on page 180

CONFigure:LTE:SIGN<i>:CONNection:UETSelection <Selection>

Configures the parameter "ue-TransmitAntennaSelection" signaled to the UE.

Parameters:

<Selection> OFF | OLOop

OFF
UE transmit antenna selection not allowed

OLOop
Open-loop UE transmit antenna selection

*RST: OFF

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.5.40

Manual operation: See "UE Transmit Antenna Selection" on page 191

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:STYPe <Type>[, <CQIMode>]
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:STYPe <Type>[, <CQIMode>]

Selects the scheduling type.

Suffix:

<c> 1..3

Parameters:

<Type> RMC | UDCHannels | UDTTibased | CQI | SPS

RMC: 3GPP-compliant reference measurement channel
UDCHannels: user-defined channel
UDTTibased: user-defined channel configurable per TTI
CQI: CQI channel, as specified by next parameter
SPS: semi-persistent scheduling (only PCC, not SCC)

*RST: RMC

<CQIMode> TTIBased | FWB | FPMI | FCPRi | FCRI | FPRI

Only relevant for <Type> = CQI
TTIBased: fixed CQI
FWB: follow wideband CQI
FPMI: follow wideband PMI
FCPRi: follow wideband CQI-PMI-RI
FCRI: follow wideband CQI-RI
FPRI: follow wideband PMI-RI

*RST: TTIB

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.0.10
V3.0.50: added <CQIMode>
V3.2.50: added SCC command
V3.2.80: added SPS, FPMI, FCPRi and FCRI
V3.5.10: added FPRI

Options: R&S CMW-KS510 for UDCH, UDTT, SPS, CQI-TTIB
R&S CMW-KS510/-KS512 (without CA/with CA) for all other CQI-...

Manual operation: See "Scheduling Type" on page 191

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL <Multicluster>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL <Multicluster>

Enables/disables multi-cluster allocation for the UL.

Suffix:

<c> 1..3

Parameters:

<Multicluster> OFF | ON

OFF: contiguous allocation, resource allocation type 0
ON: multi-cluster allocation, resource allocation type 1

Example: See Configuring RMCs

Firmware/Software: V3.5.20

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Multicluster UL" on page 192

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:DL <Multicluster>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:DL <Multicluster>

Enables/disables multi-cluster allocation for the DL.

Suffix:

<c>	1..3

Parameters:

<Multicluster>	OFF | ON **OFF**: contiguous allocation **ON**: multi-cluster allocation *RST: OFF
Example:	See Configuring User-Defined Channels
Firmware/Software:	V3.5.50
Manual operation:	See "Multicluster DL" on page 192

Option R&S CMW-KS510/-KS512 is required (without CA/with CA).

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:QAM<ModOrder>:DL <Enable>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:QAM<ModOrder>:DL <Enable>

Selects which 3GPP tables are used for CQI scheduling: tables with 256-QAM or without 256-QAM.

Suffix:

<ModOrder>	256
<c>	1..3

Parameters:

<Enable>	OFF | ON **ON**: use tables with 256-QAM **OFF**: use tables without 256-QAM *RST: OFF
Example:	See Configuring CQI DL Channels
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS504/-KS554 for FDD/TDD
Manual operation:	See "Use 256-QAM" on page 210

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TTIBundling <Enable>

Enables or disables TTI bundling for the uplink.

Parameters:

<Enable>	OFF | ON *RST: OFF
Example:	See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "TTI Bundling" on page 193

CONFigure:LTE:SIGN<i>:CONNection:ROHC:ENABle <Enable>

Enables or disables robust header compression.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Enable Header Compression" on page 194

CONFigure:LTE:SIGN<i>:CONNection:ROHC:PROFiles <Profile0x0001>, <Profile0x0002>, <Profile0x0004>

Enables header compression profiles. You can enable one or two profiles, but not all three profiles in parallel.

Parameters:

<Profile0x0001> OFF | ON

Profile 1, for IP/UDP/RTP

*RST: OFF

<Profile0x0002> OFF | ON

Profile 2, for IP/UDP/...

*RST: OFF

<Profile0x0004> OFF | ON

Profile 4, for IP/...

*RST: OFF

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Profile ..." on page 194

CONFigure:LTE:SIGN<i>:CONNection:OBCHange <Mode>

Selects the mechanism to be used for inter-band handover.

Parameters:

<Mode> BHANdover | REDirection

Blind handover or redirection

*RST: RED

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V2.1.30

Manual operation: See "Mobility Mode, Operating Band Change, Frequency Change" on page 124

CONFigure:LTE:SIGN<i>:CONNection:FCHange <Mode>

Selects the mechanism to be used for inter-frequency handover (operating band not changed).

Parameters:

<Mode> BHANdover | REDirection

Blind handover or redirection

*RST: BHAN

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V2.1.20

Manual operation: See "Mobility Mode, Operating Band Change, Frequency Change" on page 124

CONFigure:LTE:SIGN<i>:CONNection:CSFB:DESTination <Destination>

Selects the target radio access technology for MO CSFB.

Parameters:

<Destination> GSM | WCDMa | TDSCdma | NONE

*RST: GSM

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.20
V3.5.20: added TDSCdma, V3.5.40: added NONE

Manual operation: See "CS Fallback (MO)" on page 196

CONFigure:LTE:SIGN<i>:CONNection:CSFB:GSM <Band>, <DLChannel>, <BandIndicator>

Configures the GSM target for MO CSFB.

Parameters:

<Band> G085 | G09 | G18 | G19

GSM 850, GSM 900, GSM 1800, GSM 1900

*RST: G09

<DLChannel> Channel number used for the broadcast control channel (BCCH)

Range: 0 to 1023, depending on GSM band, see table below

*RST: 20

<BandIndicator> G18 | G19

Band indicator for distinction of GSM 1800 and GSM 1900 bands. The two bands partially use the same channel numbers for different frequencies.

*RST: G18

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.20

Manual operation: See "CS Fallback (MO)" on page 196

Table 2-40: Channel number range depending on GSM band

Band	Channel number
G085	128 to 251
G09	0 to 124, 940 to 1023
G18	512 to 885
G19	512 to 810

CONFigure:LTE:SIGN<i>:CONNection:CSFB:WCDMa <Band>, <DLChannel>

Configures the WCDMA target for MO CSFB.

Parameters:

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OB19 | OB20 | OB21 | OB22 | OB25 | OBS1 | OBS2 | OBS3 | OBL1

OB1, ..., OB14: band I to XIV
OB19, ..., OB22, OB25: band XIX to XXII, XXV
OBS1: band S
OBS2: band S 170 MHz
OBS3: band S 190 MHz
OBL1: band L

*RST: OB1

<DLChannel> Downlink channel number

Range: 412 to 11000, depending on operating band, see table below

*RST: 10563

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.20, V3.5.40: OB22, OB25

Manual operation: See "CS Fallback (MO)" on page 196

Table 2-41: Channel number range depending on operating band

Operating band	Channel number
OB1	10562 to 10838
OB2	412 to 687 (step 25), 9662 to 9938
OB3	1162 to 1513
OB4	1537 to 1738, 1887 to 2087 (step 25)
OB5	1007, 1012, 1032, 1037, 1062, 1087, 4357 to 4458
OB6	1037, 1062, 4387 to 4413
OB7	2237 to 2563, 2587 to 2912 (step 25)
OB8	2937 to 3088
OB9	9237 to 9387
OB10	3112 to 3388, 3412 to 3687 (step 25)
OB11	3712 to 3812
OB12	3837 to 3903, 3927, 3932, 3957, 3962, 3987, 3992
OB13	4017 to 4043, 4067, 4092
OB14	4117 to 4143, 4167, 4192
OB19	712 to 763, 787, 812, 837
OB20	4512 to 4638
OB21	862 to 912
OB22	4662 to 5038
OB25	5112 to 5413, 6292 to 6592 (step 25)
OBS1	5912 to 5987 (step 25), 10912 to 10988
OBS2	10900 to 10950
OBS3	5962, 5987, 10950 to 11000
OBL1	7637 to 7783, 7788 to 7933

CONFigure:LTE:SIGN<i>:CONNection:CSFB:TDSCdma <Band>, <DLChannel>

Configures the TD-SCDMA target for MO CSFB.

Parameters:

<Band> OB1 | OB2 | OB3

OB1: Band 1 (F), 1880 MHz to 1920 MHz
OB2: Band 2 (A), 2010 MHz to 2025 MHz
OB3: Band 3 (E), 2300 MHz to 2400 MHz

*RST: OB1

<DLChannel> Downlink channel number
The allowed range depends on the frequency band:
OB1: 9400 to 9600
OB2: 10050 to 10125
OB3: 11500 to 12000
*RST: 9400

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.5.20

Manual operation: See "CS Fallback (MO)" on page 196

CONFigure:LTE:SIGN<i>:CONNection:AMDBearer <Enable>

Enables/disables accepting multiple default bearer requests.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.50

Manual operation: See "Accept Multiple Default Bearer" on page 196

CONFigure:LTE:SIGN<i>:UECapability:RFBands:ALL {<Enable>, <Band>}...

Configures the list of operating bands for the information element "requestedFrequencyBands" of the "ueCapabilityEnquiry" message.

The command has 32 parameters, for 16 entries with two parameters each:

{<Enable>, <Band>}$_{\text{entry 1}}$, {<Enable>, <Band>}$_{\text{entry 2}}$, ..., {<Enable>, <Band>}$_{\text{entry 16}}$

Parameters:

<Enable> OFF | ON
Disables or enables the entry
*RST: OFF

<Band> UDEFined | OB1 | ... | OB46 | OB65 | ... | OB67 | OB252 | OB255
Assigns a band to the entry

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.5.40

Manual operation: See "Capabilities" on page 198

CONFigure:LTE:SIGN<i>:CONNection:TAControl <Enable>

Enables the correction of a changing UL frame timing via timing advance commands.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.5.10

Manual operation: See "Timing Advance Control" on page 199

2.6.14.2 General MIMO Settings

The following commands configure MIMO connection settings applicable to most transmission modes.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TRANsmission....................................... 496
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TRANsmission.................................... 496
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DCIFormat.. 496
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DCIFormat....................................... 496
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:NENBantennas.................................... 497
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:NENBantennas................................ 497
SENSe:LTE:SIGN<i>:CONNection[:PCC]:TSCHeme?.. 497
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:TSCHeme?.. 497
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PMATrix... 498
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PMATrix... 498

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TRANsmission <Mode>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TRANsmission <Mode>

Selects the LTE transmission mode. The value must be compatible to the active scenario, see Table 2-6.

Suffix:

<c> 1..3

Parameters:

<Mode> TM1 | TM2 | TM3 | TM4 | TM6 | TM7 | TM8 | TM9
Transmission mode 1, 2, 3, 4, 6, 7, 8, 9
*RST: TM1

Example: See Configuring MIMO Settings

Firmware/Software: V3.2.70, V3.5.10: TM9 added

Options: R&S CMW-KS520 for all values except TM 1 and TM 7

Manual operation: See "Transmission Mode" on page 181

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DCIFormat <DCI>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DCIFormat <DCI>

Selects the DCI format. The value must be compatible to the transmission mode, see Table 2-6.

Suffix:

<c>	1..3

Parameters:

<DCI> D1 | D1A | D1B | D2 | D2A | D2B | D2C

Format 1, 1A, 1B, 2, 2A, 2B, 2C

*RST: D1A

Example: See Configuring MIMO Settings

Firmware/Software: V3.2.70, V3.5.10: D2C added

Manual operation: See "DCI Format" on page 181

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:NENBantennas <Antennas>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:NENBantennas <Antennas>

Selects the number of downlink Tx antennas for transmission mode 1 to 6. The value must be compatible to the active scenario and transmission mode, see Table 2-6.

Suffix:

<c>	1..3

Parameters:

<Antennas> ONE | TWO | FOUR

*RST: ONE

Example: See Configuring MIMO Settings

Firmware/Software: V3.0.50, SCC command V3.2.50

Options: TWO (2x2): R&S CMW-KS520
FOUR (4x2): R&S CMW-KS520 and -KS521

Manual operation: See "Antenna Configuration" on page 182

SENSe:LTE:SIGN<i>:CONNection[:PCC]:TSCHeme?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:TSCHeme?

Queries the transmission scheme.

Suffix:

<c>	1..3

Return values:

<Scheme> SISO | SIMO | TXDiversity | OLSMultiplex | CLSMultiplex | CLSingle | SBF5 | SBF8 | DBF78

SISO: single input single output
SIMO: single input multiple output (receive diversity)
TXDiversity: transmit diversity
OLSMultiplex: open loop spatial multiplexing
CLSMultiplex: closed loop spatial multiplexing
CLSingle: closed loop spatial multiplexing, single layer
SBF5: single-layer beamforming (port 5)
SBF8: single-layer beamforming (port 8)
DBF78: dual-layer beamforming (ports 7, 8)

Example: See Configuring MIMO Settings

Usage: Query only

Firmware/Software: V3.2.70

Manual operation: See "Transmission Scheme" on page 182

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PMATrix <Mode>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PMATrix <Mode>

Selects the precoding matrix. The value must be compatible to the active scenario and transmission mode, see Table 2-6.

For TM 8 and TM 9, the matrix is used as beamforming matrix, not for precoding.

Suffix:

<c> 1..3

Parameters:

<Mode> PMI0 | PMI1 | PMI2 | PMI3 | PMI4 | PMI5 | PMI6 | PMI7 | PMI8 | PMI9 | PMI10 | PMI11 | PMI12 | PMI13 | PMI14 | PMI15 | RANDom_pmi

Matrix according to PMI 0, PMI 1, ... PMI15.
RANDom_pmi: The PMI value is selected randomly as defined in 3GPP TS 36.521, annex B.4.1 and B.4.2.

*RST: PMI0

Example: See Configuring MIMO Settings

Firmware/Software: V3.0.10
V3.0.50: PMI2 to PMI15
V3.2.50: SCC command
V3.5.10: RANDom_pmi added

Options: R&S CMW-KS520

Manual operation: See "Precoding Matrix" on page 182

2.6.14.3 MIMO Channel Model TM 2 to TM 6

The following commands configure the static channel model for transmission mode 2 to 6.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:ENABle..................................... 499
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:ENABle.................................499
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel...499
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel...499
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:MIMO<Mimo>............................ 500
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:MIMO<Mimo>.........................500

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:ENABle <Enable>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:ENABle <Enable>

Enables or disables the MIMO 2x2 static channel model. Disabling the static channel model results in an ideal radio channel without any coupling between the downlink signals.

Suffix:

<c> 1..3

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring MIMO Settings

Firmware/Software: V2.0.10, SCC command V3.2.50

Options: R&S CMW-KS520

Manual operation: See "2x2 channel model" on page 183

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel <h11abs>, <h11phi>, <h12phi>, <h21abs>, <h21phi>, <h22phi>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel <h11abs>, <h11phi>, <h12phi>, <h21abs>, <h21phi>, <h22phi>

Configures the channel coefficients, characterizing the radio channel for MIMO 2x2.

Suffix:

<c> 1..3

Parameters:

<h11abs> Square of magnitude of h_{11}
Range: 0 to 1
*RST: 1

<h11phi> Phase of h_{11}
Range: 0 deg to 345 deg
Increment: 15 deg
*RST: 0 deg
Default unit: deg

<h12phi>	Phase of h_{12} Range: 0 deg to 345 deg Increment: 15 deg *RST: 0 deg Default unit: deg
<h21abs>	Square of magnitude of h_{21} Range: 0 to 1 *RST: 0
<h21phi>	Phase of h_{21} Range: 0 deg to 345 deg Increment: 15 deg *RST: 0 deg Default unit: deg
<h22phi>	Phase of h_{22} Range: 0 deg to 345 deg Increment: 15 deg *RST: 0 deg Default unit: deg
Example:	See Configuring MIMO Settings
Firmware/Software:	V2.0.10, SCC command V3.2.50
Options:	R&S CMW-KS520
Manual operation:	See "2x2 channel model" on page 183

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:MIMO<Mimo> <h11abs>, <h11phi>, <h12abs>, <h12phi>, <h13abs>, <h13phi>, <h14abs>, <h14phi>, <h21abs>, <h21phi>, <h22abs>, <h22phi>, <h23abs>, <h23phi>, <h24abs>, <h24phi>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:MIMO<Mimo> <h11abs>, <h11phi>, <h12abs>, <h12phi>, <h13abs>, <h13phi>, <h14abs>, <h14phi>, <h21abs>, <h21phi>, <h22abs>, <h22phi>, <h23abs>, <h23phi>, <h24abs>, <h24phi>

Configures the channel coefficients, characterizing the radio channel for MIMO 4x2.

There are two types of parameters:

- <hnmabs> defines the square of the magnitude of the channel coefficient nm:
  <hnmabs> = $(h_{nm})^2$
  The sum of all <h1mabs> and of all <h2mabs> must equal 1:
  <h11abs> + <h12abs> + <h13abs> + <h14abs> = 1
  <h21abs> + <h22abs> + <h23abs> + <h24abs> = 1
- <hnmphi> defines the phase of the channel coefficient nm:
  <hnmphi> = $\varphi(h_{nm})$
  The phase can be entered in steps of 15 degrees. The setting is rounded, if necessary.

Suffix:

<Mimo>	42	
<c>	1..3	

Parameters:

<h11abs>	Range:	0 to 1
	*RST:	0.25
<h11phi>	Range:	0 deg to 345 deg
	*RST:	0 deg
	Default unit:	deg
<h12abs>	Range:	0 to 1
	*RST:	0.25
<h12phi>	Range:	0 deg to 345 deg
	*RST:	0 deg
	Default unit:	deg
<h13abs>	Range:	0 to 1
	*RST:	0.25
<h13phi>	Range:	0 deg to 345 deg
	*RST:	0 deg
	Default unit:	deg
<h14abs>	Range:	0 to 1
	*RST:	0.25
<h14phi>	Range:	0 deg to 345 deg
	*RST:	270 deg
	Default unit:	deg
<h21abs>	Range:	0 to 1
	*RST:	0.25
<h21phi>	Range:	0 deg to 345 deg
	*RST:	270 deg
	Default unit:	deg
<h22abs>	Range:	0 to 1
	*RST:	0.25
<h22phi>	Range:	0 deg to 345 deg
	*RST:	90 deg
	Default unit:	deg
<h23abs>	Range:	0 to 1
	*RST:	0.25
<h23phi>	Range:	0 deg to 345 deg
	*RST:	90 deg
	Default unit:	deg
<h24abs>	Range:	0 to 1
	*RST:	0.25

<h24phi>	Range: 0 deg to 345 deg *RST: 180 deg Default unit: deg
Example:	See Configuring MIMO Settings
Firmware/Software:	V3.0.50, SCC command V3.2.50
Options:	R&S CMW-KS520 and R&S CMW-KS521
Manual operation:	See "4x2 channel model" on page 183

2.6.14.4 MIMO Beamforming Settings TM 7/8

The following commands configure the beamforming settings for transmission mode 7 and 8.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PZERo:MAPPing....................................... 502
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PZERo:MAPPing.....................................502
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MODE..................................503
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MODE............................... 503
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:NOLayers...............................503
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:NOLayers.......................... 503
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MATRix.................................504
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MATRix............................. 504
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<8>:CHMatrix...505
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<8>:CHMatrix.....................................505

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PZERo:MAPPing <Port>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PZERo:MAPPing <Port>

Selects the mapping of antenna port 0 to the RF output paths.

Only for TM 7 in scenarios with two RF output paths, without fading.

Suffix:

<c>	1..3

Parameters:

<Port>	R1 | R1R2 **R1**: Map port 0 to the first RF output path. **R1R2**: Map port 0 to both RF output paths. *RST: R1
Example:	See Configuring MIMO Settings
Firmware/Software:	V3.5.40
Options:	R&S CMW-KS520
Manual operation:	See "Port 0 Mapping" on page 184

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MODE <Mode>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MODE <Mode>

Selects the beamforming mode for TM 7 and 8.

Depending on other settings, only a subset of the values is allowed, see:

- TM 7: "Beamforming Mode" on page 184
- TM 8: "Beamforming Mode" on page 185

Suffix:

<c> 1..3

Parameters:

<Mode> OFF | ON | TSBF | PMAT

OFF: Beamforming is disabled
ON: Beamforming is enabled. The configured beamforming matrix is used.
TSBF: Beamforming is enabled. The beamforming matrix is selected randomly as defined in 3GPP TS 36.521, annex B.4.1 and B.4.2.
PMAT: Beamforming is enabled. A precoding matrix is used as beamforming matrix, see `CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PMATrix`.

*RST: OFF

Example: See Configuring MIMO Settings

Firmware/Software: V3.2.70, V3.5.40 PMAT added

Options: R&S CMW-KS520

Manual operation: See "Beamforming Mode" on page 184

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:NOLayers <Number>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:NOLayers <Number>

Selects the number of layers for transmission mode 8.

Suffix:

<c> 1..3

Parameters:

<Number> L1 | L2

L1: single-layer beamforming
L2: dual-layer beamforming

*RST: L2

Example: See Configuring MIMO Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KS520

Manual operation: See "Number of Layers" on page 185

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MATRix <h11phi>[, <h12phi>[, <h11abs>, <h12abs>, <h21phi>, <h22phi>[, <h13phi>, <h14phi>[, <h13abs>, <h14abs>, <h23phi>, <h24phi>]]]]
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MATRix <h11phi>[, <h12phi>[, <h11abs>, <h12abs>, <h21phi>, <h22phi>[, <h13phi>, <h14phi>[, <h13abs>, <h14abs>, <h23phi>, <h24phi>]]]]

Configures the beamforming matrix coefficients for TM 7 and TM 8.

There are two types of parameters:

- <hnmabs> defines the square of the magnitude of the coefficient nm:
  <hnmabs> = $(h_{nm})^2$
- <hnmphi> defines the phase of the coefficient nm:
  <hnmphi> = $\varphi(h_{nm})$
  The phase can be entered in steps of 15 degrees. The setting is rounded, if necessary.

Depending on the size of your matrix, use the following parameters:

- 1x1: <h11phi>
- 1x2: <h11phi>, <h12phi>
- 2x2: <h11phi>, <h12phi>, <h11abs>, <h12abs>, <h21phi>, <h22phi>

The last six parameters are for future use and can always be omitted.

Suffix:

<c>	1..3

Parameters:

<h11phi>	Range: 0 deg to 345 deg Default unit: deg
<h12phi>	Range: 0 deg to 345 deg Default unit: deg
<h11abs>	Range: 0 to 1
<h12abs>	Range: 0 to 1
<h21phi>	Range: 0 deg to 345 deg Default unit: deg
<h22phi>	Range: 0 deg to 345 deg Default unit: deg
<h13phi>	Range: 0 deg to 345 deg Default unit: deg
<h14phi>	Range: 0 deg to 345 deg Default unit: deg
<h13abs>	Range: 0 to 1
<h14abs>	Range: 0 to 1
<h23phi>	Range: 0 deg to 345 deg Default unit: deg

<h24phi> Range: 0 deg to 345 deg
Default unit: deg

Example: See Configuring MIMO Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KS520

Manual operation: See "Beamforming Matrix" on page 184

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<8>:CHMatrix <abs11>, <phase11>, <abs12>, <phase12>, <abs21>, <phase21>, <abs22>, <phase22>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<8>:CHMatrix <abs11>, <phase11>, <abs12>, <phase12>, <abs21>, <phase21>, <abs22>, <phase22>

Configures the channel coefficients, characterizing the radio channel for TM 8.

Suffix:

<c> 1..3

<8> 8

Parameters:

<abs11> Square of magnitude of h_{11}
<abs11> + <abs21> must equal 1
Range: 0 to 1
*RST: 1

<phase11> Phase of h_{11}
Range: 0 deg to 345 deg
Increment: 15 deg
*RST: 0 deg
Default unit: deg

<abs12> Square of magnitude of h_{12}
<abs12> + <abs22> must equal 1
Range: 0 to 1
*RST: 1

<phase12> Phase of h_{12}
Range: 0 deg to 345 deg
Increment: 15 deg
*RST: 0 deg
Default unit: deg

<abs21> Square of magnitude of h_{21}
Range: 0 to 1
*RST: 1

<phase21> Phase of h_{21}

Range: 0 deg to 345 deg
Increment: 15 deg
*RST: 0 deg
Default unit: deg

<abs22> Square of magnitude of h_{22}

Range: 0 to 1
*RST: 1

<phase22> Phase of h_{22}

Range: 0 deg to 345 deg
Increment: 15 deg
*RST: 0 deg
Default unit: deg

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.40

Options: R&S CMW-KS520

Manual operation: See "Channel Matrix 2x2 TM8" on page 186

2.6.14.5 MIMO TM 9 Settings

The following commands configure settings that are specific for transmission mode 9.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:NTXantennas................................ 507
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:NTXantennas.............................507
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CODewords..................................507
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CODewords.............................. 507
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:PMATrix.......................................507
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:PMATrix.................................... 507
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:POWer............................... 508
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:POWer.............................508
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:APORts.............................. 508
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:APORts............................508
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:RESource........................... 509
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:RESource.........................509
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:SUBFrame...........................509
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:SUBFrame....................... 509
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:BITS...510
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:BITS.................................... 510
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:CSIRs:SUBFrame......................510
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:CSIRs:SUBFrame.................. 510
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:TWO<line>....................... 511
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:TWO<line>....................511
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:FOUR<line>......................511
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:FOUR<line>.................. 511
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:EIGHt<line>...................... 513
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:EIGHt<line>.................. 513

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:NTXantennas <Antennas>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:NTXantennas <Antennas>

Selects the number of downlink TX antennas for TM 9.

Suffix:

<no>	9
<c>	1..3

Parameters:

<Antennas>	TWO | FOUR | EIGHt *RST: TWO
Example:	See Configuring MIMO Settings
Firmware/Software:	V3.5.10
Options:	TWO (2x2): R&S CMW-KS520 FOUR (4x2): R&S CMW-KS520 and -KS521 EIGHt (8x2): R&S CMW-KS520 and -KS521 and -KS522
Manual operation:	See "Number Tx Antennas TM 9" on page 187

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CODewords <Codewords>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CODewords <Codewords>

Selects the number of code words for TM 9.

Suffix:

<no>	9
<c>	1..3

Parameters:

<Codewords>	ONE | TWO *RST: TWO
Example:	See Configuring MIMO Settings
Firmware/Software:	V3.5.10
Options:	R&S CMW-KS520
Manual operation:	See "Codewords / Layers" on page 187

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:PMATrix <Mode>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:PMATrix <Mode>

Selects the second precoding matrix for TM 9.

Suffix:

<c>	1..3
<no>	9

Parameters:

<Mode> PMI0 | PMI1 | PMI2 | PMI3 | PMI4 | PMI5 | PMI6 | PMI7 | PMI8 | PMI9 | PMI10 | PMI11 | PMI12 | PMI13 | PMI14 | PMI15

Matrix according to PMI 0, PMI 1, ... PMI 15.

*RST: PMI0

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520 to R&S CMW-KS522

Manual operation: See "Precoding Matrix 2" on page 188

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:POWer <Power>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:POWer <Power>

Sets the value P_c to be signaled to the UE. P_c is the assumed ratio of the RS EPRE to the CSI-RS EPRE.

Suffix:

<no> 9

<c> 1..3

Parameters:

<Power> Range: -8 dB to 15 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520

Manual operation: See "CSI-RS Power" on page 188

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:APORts <Ports>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:APORts <Ports>

Selects the antenna ports used for the CSI-RS for TM 9.

Suffix:

<no> 9

<c> 1..3

Parameters:

<Ports>	NONE | P15 | P1516 | P1518 | P1522 **NONE**: no CSI-RS **P15**: port 15 **P1516**: port 15 and 16 **P1518**: port 15 to 18 **P1522**: port 15 to 22 *RST: P1516

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: P1516 (2x2): R&S CMW-KS520
P1518 (4x2): R&S CMW-KS520 and -KS521
P1522 (8x2): R&S CMW-KS520 and -KS521 and -KS522

Manual operation: See "CSI-RS Antenna Ports" on page 188

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:RESource <Resource>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:RESource <Resource>

Selects the CSI reference signal configuration.

Suffix:

<no>	9
<c>	1..3

Parameters:

<Resource>	Range: 0 to 31 *RST: 0

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520

Manual operation: See "CSI-RS Configuration " on page 188

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:SUBFrame <Config>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:SUBFrame <Config>

Selects the CSI-RS subframe configuration.

Suffix:

<no>	9
<c>	1..3

Parameters:

<Config> Range: 0 to 154
*RST: 2

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520

Manual operation: See "CSI-RS Subframe Cfg" on page 189

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:BITS <Bits>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:BITS <Bits>

Specifies the bitmap "ZeroPowerCSI-RS".

Suffix:

<no> 9

<c> 1..3

Parameters:

<Bits> 16-bit value

Range: #B0000000000000000 to #B1111111111111111
*RST: #B0000000000000000

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520

Manual operation: See "Zero Power CSI-RS" on page 189

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:CSIRs:SUBFrame <Config>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:CSIRs:SUBFrame <Config>

Selects the zero power CSI-RS subframe configuration.

Suffix:

<no> 9

<c> 1..3

Parameters:

<Config> Range: 0 to 154
*RST: 2

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520

Manual operation: See "ZP CSI-RS Subframe Cfg" on page 189

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:TWO<line> <h1xabs>, <h1xphi>, <h2xphi>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:TWO<line> <h1xabs>, <h1xphi>, <h2xphi>

Configures the 2x2 channel coefficients for TM 9.

The value <h2xabs> is calculated automatically from <h1xabs>, so that the sum of the values equals 1.

A query returns <h1xabs>, <h1xphi>, <h2xabs>, <h2xphi>.

Suffix:

<no> 9

<line> 1,2
Selects the matrix line (value "x" in the other parameters)

<c> 1..3

Parameters:

<h1xabs> Square of magnitude of h_{1x}

Range: 0 to 1

<h1xphi> Phase of h_{1x}

Range: 0 deg to 345 deg
Increment: 15 deg
Default unit: deg

<h2xphi> Phase of h_{2x}

Range: 0 deg to 345 deg
Increment: 15 deg
Default unit: deg

Return values:

<h2xabs> Square of magnitude of h_{2x}

Range: 0 to 1

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520

Manual operation: See "Channel Matrix" on page 189

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:FOUR<line> <h1xabs>, <h1xphi>, <h2xabs>, <h2xphi>, <h3xabs>, <h3xphi>, <h4xphi>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:FOUR<line> <h1xabs>, <h1xphi>, <h2xabs>, <h2xphi>, <h3xabs>, <h3xphi>, <h4xphi>

Configures the 4x2 channel coefficients for TM 9.

There are two types of parameters:

- <hnmabs> defines the square of the magnitude of the channel coefficient nm:

<hnmabs> = $(h_{nm})^2$
The sum of all values in one matrix line must not be greater than 1. <h4xabs> is calculated automatically, so that the sum equals 1.

- <hnmphi> defines the phase of the channel coefficient nm:
  <hnmphi> = $\varphi(h_{nm})$

A query returns <h1xabs>, <h1xphi>, <h2xabs>, ..., <h4xabs>, <h4xphi>.

Suffix:

<no>	9
<line>	1,2 Selects the matrix line (value "x" in the other parameters)
<c>	1..3

Parameters:

<h1xabs>	Range: 0 to 1
<h1xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h2xabs>	Range: 0 to 1
<h2xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h3xabs>	Range: 0 to 1
<h3xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h4xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg

Return values:

<h4xabs>	Range: 0 to 1

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520, R&S CMW-KS521

Manual operation: See "Channel Matrix" on page 189

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:EIGHt<line> <h1xabs>, <h1xphi>, <h2xabs>, <h2xphi>, <h3xabs>, <h3xphi>, <h4xabs>, <h4xphi>, <h5xabs>, <h5xphi>, <h6xabs>, <h6xphi>, <h7xabs>, <h7xphi>, <h8xphi>

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:EIGHt<line> <h1xabs>, <h1xphi>, <h2xabs>, <h2xphi>, <h3xabs>, <h3xphi>, <h4xabs>, <h4xphi>, <h5xabs>, <h5xphi>, <h6xabs>, <h6xphi>, <h7xabs>, <h7xphi>, <h8xphi>

Configures the 8x2 channel coefficients for TM 9.

There are two types of parameters:

- <hnmabs> defines the square of the magnitude of the channel coefficient nm:
  <hnmabs> = $(h_{nm})^2$
  The sum of all values in one matrix line must not be greater than 1. <h8xabs> is calculated automatically, so that the sum equals 1.
- <hnmphi> defines the phase of the channel coefficient nm:
  <hnmphi> = $\varphi(h_{nm})$

A query returns <h1xabs>, <h1xphi>, <h2xabs>, ..., <h8xabs>, <h8xphi>.

Suffix:

<no>	9
<line>	1,2 Selects the matrix line (value "x" in the other parameters)
<c>	1..3

Parameters:

<h1xabs>	Range: 0 to 1
<h1xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h2xabs>	Range: 0 to 1
<h2xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h3xabs>	Range: 0 to 1
<h3xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h4xabs>	Range: 0 to 1
<h4xphi>	Range: 0 deg to 345 deg Increment: 15 deg Default unit: deg
<h5xabs>	Range: 0 to 1

<h5xphi>	Range:	0 deg to 345 deg
	Increment:	15 deg
	Default unit:	deg
<h6xabs>	Range:	0 to 1
<h6xphi>	Range:	0 deg to 345 deg
	Increment:	15 deg
	Default unit:	deg
<h7xabs>	Range:	0 to 1
<h7xphi>	Range:	0 deg to 345 deg
	Increment:	15 deg
	Default unit:	deg
<h8xphi>	Range:	0 deg to 345 deg
	Increment:	15 deg
	Default unit:	deg

Return values:

<h8xabs> Range: 0 to 1

Example: See Configuring MIMO Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KS520, R&S CMW-KS521, R&S CMW-KS522

Manual operation: See "Channel Matrix" on page 189

2.6.14.6 PDCCH Settings

The following commands configure the used PDCCH configuration.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:SYMBol..514
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:SYMBol.....................................514
SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:PSYMbols?..515
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:PSYMbols?.....................................515
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel...515
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel......................................515
SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel?..516
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel?...516
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:RPDCch.......................................517
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:RPDCch...................................517

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:SYMBol <PDCCH>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:SYMBol <PDCCH>

Configures the number of PDCCH symbols per normal subframe.

Suffix:

<c> 1..3

Parameters:

<PDCCH> AUTO | P1 | P2 | P3 | P4

AUTO: automatic configuration depending on scheduling type
P1 to **P4**: 1, 2, 3, 4 symbols

*RST: AUTO

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.82

Manual operation: See "PDCCH Symbol Config, #PDCCH Symbols" on page 194

Table 2-42: Allowed values, depending on cell bandwidth

	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
AUTO				X	X	X
P1				X	X	X
P2		X	X	X	X	X
P3		X	X	X	X	X
P4	X					

SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:PSYMbols?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:PSYMbols?

Queries the number of PDCCH symbols per normal subframe.

Suffix:

<c> 1..3

Return values:

<PDCCHsymbols> Range: 1 to 4

Example: See Configuring General Connection Settings Part 2

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.2.50

Manual operation: See "PDCCH Symbol Config, #PDCCH Symbols" on page 194

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel <Aggregationlevel>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel <Aggregationlevel>

Configures the aggregation levels for DCI messages with C-RNTI.

Suffix:

<c> 1..3

Parameters:
<Aggregationlevel> AUTO | D8U4 | D4U4 | D4U2 | D1U1

AUTO: automatic configuration
D<a>U<b>: <a> CCE for DCI messages for the DL, <b> CCE for messages for the UL

*RST: AUTO

Example: See Configuring General Connection Settings Part 2

Firmware/Software: V3.2.82

Manual operation: See "Aggr. Level DL/UL Config, Aggreg. Level ..." on page 194

Table 2-43: Allowed values, depending on cell bandwidth

	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
AUTO	X	X	X	X	X	X
D8U4			X			
D4U4		X	X			
D4U2	X	X				
D1U1	X					

SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel?

Queries the used PDCCH aggregation levels.

Suffix:
<c> 1..3

Return values:
<DLDCI_CRNTI> DCI for DL with C-RNTI

Range: 1 to 8

<ULDCI_CRNTI> DCI for UL with C-RNTI

Range: 1 to 8

<DLDCI_SIRNTI> DCI for DL with SI-RNTI

Range: 1 to 8

Example: See Configuring General Connection Settings Part 2

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.2.50

Manual operation: See "Aggr. Level DL/UL Config, Aggreg. Level ..." on page 194

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:RPDCch <ReducedPDCCH>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:RPDCch <ReducedPDCCH>

Enables / disables the reduction of PDCCH resources.

Suffix:
<c> 1..2

Parameters:
<ReducedPDCCH> OFF | ON
*RST: OFF

Firmware/Software: V3.0.50, SCC command V3.2.50

Manual operation: See "Reduced PDCCH" on page 195

2.6.14.7 HARQ Connection Settings

The following commands configure HARQ connection settings.

CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:ENABle....517
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:NHT....517
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:DPHich....518
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:MAXTx....518
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:ENABle....518
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:NHT....519
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:RVCSequence....519
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence:LENGth....519
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence....520

CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:ENABle <Enable>

Enables or disables HARQ for uplink transmissions.

Parameters:
<Enable> OFF | ON
*RST: OFF

Example: See Configuring HARQ

Firmware/Software: V3.5.10

Options: R&S CMW-KS510

Manual operation: See "UL HARQ" on page 196

CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:NHT <Number>

Specifies the maximum number of uplink transmissions, including initial transmissions and retransmissions.

Parameters:

<Number> Range: 1 to 4
*RST: 4

Example: See Configuring HARQ

Firmware/Software: V3.5.10

Options: R&S CMW-KS510

Manual operation: See "Number of HARQ Transmissions" on page 197

CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:DPHich <Mode>

Selects how the UE is informed about required retransmissions / successful transmissions for UL HARQ.

Parameters:

<Mode> D0ONly | PHIChonly | D0PHich

D0ONly
PDCCH with DCI 0 plus new data indicator (NDI) bit

PHIChonly
Physical hybrid-ARQ indicator channel (PHICH) with ACK/NACK

D0PHich
Both methods

*RST: D0ONly

Example: See Configuring HARQ

Firmware/Software: V3.5.50

Options: R&S CMW-KS510

Manual operation: See "DCI-0 / PHICH" on page 197

CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:MAXTx <Number>

Specifies the signaling parameter "maxHARQ-Tx". The setting is only relevant for the scheduling type SPS.

Parameters:

<Number> Range: 1 to 4
*RST: 1

Firmware/Software: V3.5.30

Options: R&S CMW-KS510

Manual operation: See "maxHARQ-Tx" on page 197

CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:ENABle <Enable>

Enables or disables HARQ for downlink transmissions.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring HARQ

Firmware/Software: V3.0.50

Options: R&S CMW-KS510 for scenarios without carrier aggregation
R&S CMW-KS512 for scenarios with carrier aggregation

Manual operation: See "DL HARQ" on page 197

CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:NHT <Number>

Specifies the maximum number of downlink transmissions, including initial transmissions and retransmissions.

Parameters:

<Number> Range: 2 to 4
*RST: 2

Example: See Configuring HARQ

Firmware/Software: V3.0.50

Manual operation: See "Number of HARQ Transmissions" on page 198

CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:RVCSequence <Sequence>

Selects the redundancy version sequence for DL HARQ.

Parameters:

<Sequence> TS1 | TS4 | UDEFined

TS1: according to 3GPP TS 36.101
TS4: according to 3GPP TS 36.104
UDEFined: user-defined sequence, see `CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence`

*RST: TS1

Example: See Configuring HARQ

Firmware/Software: V3.0.50

Manual operation: See "Redundancy Version Coding Sequence, User-Defined Sequence" on page 198

CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence:LENGth <Length>

Specifies the length of the user-defined redundancy version sequence.

Parameters:

<Length> Range: 1 to 4
*RST: 4

Example: See Configuring HARQ

Firmware/Software: V3.0.50

Manual operation: See "Redundancy Version Coding Sequence, User-Defined Sequence" on page 198

CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence <Value1>[, <Value2>, <Value3>, <Value4>]

Specifies the user-defined redundancy version sequence. Only the first n values are used, according to the specified length, see `CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence:LENGth`.

You can either set the first value only (relevant for initial transmissions) or all four values.

Parameters:

<Value1> In this software version fixed set to 0

Range: 0
*RST: 0

<Value2> Range: 0 to 3
*RST: 0

<Value3> Range: 0 to 3
*RST: 0

<Value4> Range: 0 to 3
*RST: 0

Example: See Configuring HARQ

Firmware/Software: V3.0.50

Manual operation: See "Redundancy Version Coding Sequence, User-Defined Sequence" on page 198

2.6.14.8 Connected DRX Settings

The following commands configure discontinuous reception (DRX) of the UE during an established connection.

CONFigure:LTE:SIGN<i>:CONNection:CDRX:ENABle.. 521
CONFigure:LTE:SIGN<i>:CONNection:CDRX:ODTimer..521
CONFigure:LTE:SIGN<i>:CONNection:CDRX:ITIMer... 521
CONFigure:LTE:SIGN<i>:CONNection:CDRX:RTIMer..522
CONFigure:LTE:SIGN<i>:CONNection:CDRX:LDCYcle..522
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SOFFset..523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCENable...523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SDCYcle..523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCTimer..523

CONFigure:LTE:SIGN<i>:CONNection:CDRX:UDScheduling... 524
CONFigure:LTE:SIGN<i>:CONNection:SRPRindex... 524
CONFigure:LTE:SIGN<i>:CONNection:SRCindex... 524

CONFigure:LTE:SIGN<i>:CONNection:CDRX:ENABle <Enable>

Enables or disables DRX and selects a set of DRX settings.

Parameters:

<Enable> DRXS | DRXL | UDEFined | ON | OFF

DRXS: DRX_S, 3GPP TS 36.521-3, table H.3.6-1
DRXL: DRX_L, 3GPP TS 36.521-3, table H.3.6-2
UDEFined: user-defined DRX settings
ON: enables DRX with previously selected set
OFF: disables DRX

*RST: OFF

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Connected DRX" on page 200

CONFigure:LTE:SIGN<i>:CONNection:CDRX:ODTimer <Timer>

Configures the onDurationTimer. The value must be smaller than or equal to the long DRX cycle duration.

Parameters:

<Timer> PSF1 | PSF2 | PSF3 | PSF4 | PSF5 | PSF6 | PSF8 | PSF10 | PSF20 | PSF30 | PSF40 | PSF50 | PSF60 | PSF80 | PSF100 | PSF200

PSFn means n PDCCH subframes

*RST: PSF2

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "On Duration Timer" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:ITIMer <Timer>

Configures the "drx-InactivityTimer".

Parameters:

<Timer> PSF1 | PSF2 | PSF3 | PSF4 | PSF5 | PSF6 | PSF8 | PSF10 | PSF20 | PSF30 | PSF40 | PSF50 | PSF60 | PSF80 | PSF100 | PSF200 | PSF300 | PSF500 | PSF750 | PSF1280 | PSF1920 | PSF2560

PSFn means n PDCCH subframes

*RST: PSF100

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Inactivity Timer" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:RTIMer <Timer>

Configures the "drx-RetransmissionTimer".

Parameters:

<Timer> PSF1 | PSF2 | PSF4 | PSF6 | PSF8 | PSF16 | PSF24 | PSF33

PSFn means n PDCCH subframes

*RST: PSF16

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Retransmission Timer" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:LDCYcle <Cycle>

Configures the duration of one long DRX cycle. If short DRX cycles are enabled, the long DRX cycle duration must be a multiple of the short DRX cycle duration.

Parameters:

<Cycle> SF10 | SF20 | SF32 | SF40 | SF64 | SF80 | SF128 | SF160 | SF256 | SF320 | SF512 | SF640 | SF1024 | SF1280 | SF2048 | SF2560

SFn means n subframes

*RST: SF40

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Long DRX Cycle" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:SOFFset <Offset>

Configures the "drxStartOffset", shifting all DRX cycles.

Parameters:

<Offset> Range: 0 to length of long DRX cycle - 1
*RST: 0

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Start Offset" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCENable <Enable>

Enables or disables short DRX cycles.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Enable" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:SDCYcle <Cycle>

Configures the duration of one short DRX cycle. The long DRX cycle duration must be a multiple of the short DRX cycle duration.

Parameters:

<Cycle> SF2 | SF5 | SF8 | SF10 | SF16 | SF20 | SF32 | SF40 | SF64 | SF80 | SF128 | SF160 | SF256 | SF320 | SF512 | SF640
SFn means n subframes
If a query returns NAV, short cycles are disabled.
*RST: SF2

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Short DRX Cycle" on page 201

CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCTimer <Timer>

Configures the short cycle timer.

Parameters:
<Timer> Number of short DRX cycles
Range: 1 to 16
*RST: 1

Example: See Configuring Connected DRX

Firmware/Software: V3.2.20

Options: R&S CMW-KS510

Manual operation: See "Short Cycle Timer" on page 202

CONFigure:LTE:SIGN<i>:CONNection:CDRX:UDScheduling <Enable>

Enables or disables uplink dynamic scheduling.

Parameters:
<Enable> OFF | ON
*RST: OFF

Example: See Configuring Connected DRX

Firmware/Software: V3.2.70

Options: R&S CMW-KS510

Manual operation: See "UL Dynamic Scheduling" on page 202

CONFigure:LTE:SIGN<i>:CONNection:SRPRindex <Index>

Specifies the "sr-PUCCH ResourceIndex".

Parameters:
<Index> Range: 0 to 2047
*RST: 41

Example: See Configuring Connected DRX

Firmware/Software: V3.5.10

Options: R&S CMW-KS510

Manual operation: See "sr-PUCCH ResourceIndex" on page 202

CONFigure:LTE:SIGN<i>:CONNection:SRCindex <Index>

Specifies the "sr-ConfigIndex".

Parameters:
<Index> Range: 0 to 157
*RST: 27

Example: See Configuring Connected DRX

Firmware/Software: V3.5.10

Options: R&S CMW-KS510

Manual operation: See "sr-ConfigIndex" on page 202

2.6.14.9 Global UL/DL Commands

The following commands are related to UL/DL settings and are independent of the scheduling type.

Scheduling-type specific commands are described in the subsequent sections.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DLEQual....................525
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DLEQual....................525
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?....................525
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>:STReam<s>?....................525
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]?....................526
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>?....................526
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:ALL?....................526
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?....................527
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?....................527

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DLEQual <Enable>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DLEQual <Enable>

Enables or disables the coupling of all MIMO downlink streams.

When you switch on the coupling, the settings for DL stream 1 are applied to all DL streams.

With enabled coupling, commands of the format `CONFigure:...:DL<s>...` configure all DL streams at once, independent of the specified `<s>`.

With disabled coupling, such commands configure a single selected DL stream `<s>`. However, some settings are never configurable per stream and are always coupled.

Suffix:
<c> 1..3

Parameters:
<Enable> OFF | ON
*RST: ON

Example: See Configuring RMCs

Firmware/Software: V3.2.60

Manual operation: See "Use Stream 1 Settings" on page 203

SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>:STReam<s>?

Returns the expected maximum throughput (averaged over one frame) for one DL stream of one component carrier. The throughput is calculated for the currently selected scheduling type.

Suffix:
<s> 1..2

<c> 1..3

Return values:
<Throughput> Default unit: Mbit/s

Example: See Configuring User-Defined Channels

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.50

Manual operation: See "Throughput" on page 205

SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>?

Returns the expected maximum throughput (averaged over one frame) for the sum of all DL streams of one component carrier. The throughput is calculated for the currently selected scheduling type.

Suffix:
<c> 1..3

Return values:
<Throughput> Default unit: Mbit/s

Example: See Configuring User-Defined Channels

Usage: Query only

Firmware/Software: V3.2.50

Manual operation: See "Max Throughput" on page 193

SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:ALL?

Returns the expected maximum throughput (averaged over one frame) for the sum of all DL streams of all component carriers. The throughput is calculated for the currently selected scheduling type.

Return values:
<Throughput> Default unit: Mbit/s

Example: See Configuring User-Defined Channels

Usage: Query only

Firmware/Software: V3.0.20

SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?

Returns the expected maximum throughput (averaged over one frame) for the uplink of one component carrier. The throughput is calculated for the currently selected scheduling type.

Suffix:

<c> 1..3

Return values:

<Throughput> Default unit: Mbit/s

Example: See Configuring User-Defined Channels

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "Max Throughput" on page 193

2.6.14.10 RMC Settings

The following commands define parameters for the scheduling type "RMC".

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:DL<s> ... 527
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:DL<s> ... 527
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:UL ... 528
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:UL ... 528
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:RBPosition:DL<s> ... 529
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:DL<s> ... 529
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:RBPosition:UL ... 530
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:UL ... 530
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:VERSion:DL<s> ... 530
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:VERSion:DL<s> ... 530
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL ... 531
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL ... 531

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:DL<s> <NumberRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:DL<s> <NumberRB>, <Modulation>, <TransBlockSizeIdx>

Configures a downlink reference measurement channel (RMC). Only certain value combinations are accepted, see Chapter 2.2.13, "Scheduling Type RMC", on page 47.

Suffix:

<s> 1..2

<c> 1..3

Parameters:

<NumberRB> ZERO | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 | N12 | N15 | N16 | N17 | N18 | N20 | N24 | N25 | N27 | N30 | N32 | N36 | N40 | N42 | N45 | N48 | N50 | N54 | N60 | N64 | N72 | N75 | N80 | N81 | N83 | N90 | N92 | N96 | N100

Number of allocated resource blocks. The same value must be configured for all streams of the carrier.

*RST: N50

<Modulation> QPSK | Q16 | Q64 | Q256

Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM

*RST: QPSK

<TransBlockSizeIdx> ZERO | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T10 | T11 | T12 | T13 | T14 | T17 | T18 | T19 | T21 | T22 | T23 | T24 | T25 | T30 | T31 | T32

Transport block size index. Use KEEP to select a compatible value.

*RST: T5

Example: See Configuring RMCs

Firmware/Software: V3.0.20
V3.2.50: added SCC command
V3.2.70: added N32, N45, N60
V3.2.82: added T17, T22
V3.5.10: added T7, N7, N42, N64, N92, N96
V3.5.30: added 256-QAM, T30, T31, T32
V3.5.40: added T10, N72, N81, N90

Options: 256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "# Resource Blocks" on page 204

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:UL <NumberRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:UL <NumberRB>, <Modulation>, <TransBlockSizeIdx>

Configures an uplink reference measurement channel (RMC) with contiguous allocation. Only certain value combinations are accepted, see Chapter 2.2.13, "Scheduling Type RMC", on page 47.

Suffix:

<c> 1..3

Parameters:

<NumberRB> ZERO | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 | N12 | N15 | N16 | N17 | N18 | N20 | N24 | N25 | N27 | N30 | N32 | N36 | N40 | N42 | N45 | N48 | N50 | N54 | N60 | N64 | N72 | N75 | N80 | N81 | N83 | N90 | N92 | N96 | N100

Number of allocated resource blocks

*RST: N50

<Modulation> QPSK | Q16

Modulation type QPSK | 16-QAM

*RST: QPSK

<TransBlockSizeIdx> ZERO | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T10 | T11 | T12 | T13 | T14 | T17 | T18 | T19 | T21 | T22 | T23 | T24 | T25 | T30 | T31 | T32

Transport block size index. Use KEEP to select a compatible value.

*RST: T6

Example: See Configuring RMCs

Firmware/Software: V3.0.20
V3.2.70: added N32, N45, N60
V3.2.82: added T17, T22
V3.5.10: added T7, N7, N42, N64, N92, N96, SCC command
V3.5.40: added T10, N72, N81, N90

Manual operation: See "# Resource Blocks" on page 204

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:RBPosition:DL<s> <Position>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:DL<s> <Position>

Selects the position of the allocated downlink resource blocks within the channel bandwidth. Set the same value for both streams of a carrier.

The RBs can always be at the lower end, starting with RB number 0, or at the upper end of the channel. The other values are only allowed for certain configurations with one TX antenna, see Chapter 2.2.13.3, "DL RMCs, One TX Antenna (TM 1)", on page 52.

Suffix:

<s> 1..2

<c> 1..3

Parameters:

<Position> LOW | HIGH | P5 | P10 | P23 | P35 | P48

*RST: LOW

Example: See Configuring RMCs

Firmware/Software: V3.2.50

Manual operation: See "RB Position/Start RB" on page 204

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:RBPosition:UL <Position>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:UL <Position>

Selects the position of the allocated uplink resource blocks within the channel bandwidth, for contiguous allocation.

The RBs can always be at the lower end, starting with RB number 0 (LOW), or at the upper end of the channel (HIGH). Other values are only allowed for certain RMC configurations, see Chapter 2.2.13.1, "UL RMCs, Contiguous Allocation", on page 48.

Suffix:
<c> 1..3

Parameters:
<Position> LOW | HIGH | MID | P0 | P1 | P2 | P3 | P4 | P6 | P7 | P8 | P9 | P10 | P11 | P12 | P13 | P14 | P15 | P16 | P19 | P20 | P21 | P22 | P24 | P25 | P28 | P30 | P31 | P33 | P36 | P37 | P39 | P40 | P43 | P44 | P45 | P48 | P49 | P50 | P51 | P52 | P54 | P56 | P57 | P58 | P62 | P63 | P66 | P68 | P70 | P74 | P75 | P83 | P96 | P99

*RST: LOW

Example: See Configuring RMCs

Firmware/Software: V3.0.20, SCC command V3.5.10
V3.2.70: values P1 - P4, P7, P9, P10, P14, P15, P36, P39, P44, P49, P74, P75, P99
V3.5.10: values P0, P6, P8, P12, P22, P24, P45, P68, P96
V3.5.30: values P20, P21, P28, P30, P31, P33, P40, P50-P52, P54, P57, P58, P62, P63, P66, P70, P83

Manual operation: See "RB Position/Start RB" on page 204

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:VERSion:DL<s> <Version>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:VERSion:DL<s> <Version>

Selects the version to distinguish ambiguous RMCs. This command is only relevant for certain downlink RMCs for TDD multiple antenna configurations, see Chapter 2.2.13.4, "DL RMCs, Multiple TX Antennas (TM 2 to 6)", on page 54.

Suffix:
<s> 1..2

<c> 1..3

Parameters:
<Version> Range: 0 to 1
*RST: 0

Example: See Configuring RMCs

Firmware/Software: V3.2.70

Manual operation: See "Version" on page 204

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL <NumberRB1>, <PositionRB1>, <NumberRB2>, <PositionRB2>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL <NumberRB1>, <PositionRB1>, <NumberRB2>, <PositionRB2>, <Modulation>, <TransBlockSizeIdx>

Configures an uplink reference measurement channel (RMC) with multi-cluster allocation.

Only certain value combinations are accepted, see Chapter 2.2.13, "Scheduling Type RMC", on page 47.

Suffix:

<c> 1..3

Parameters:

<NumberRB1> ZERO | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 | N12 | N15 | N16 | N17 | N18 | N20 | N24 | N25 | N27 | N30 | N32 | N36 | N40 | N42 | N45 | N48 | N50 | N54 | N60 | N64 | N72 | N75 | N80 | N81 | N83 | N90 | N92 | N96 | N100

Number of allocated resource blocks, cluster 1

*RST: N42

<PositionRB1> FULL | LOW | HIGH | MID | P0 | P1 | P2 | P3 | P4 | P6 | P7 | P8 | P9 | P10 | P11 | P12 | P13 | P14 | P15 | P16 | P19 | P20 | P21 | P22 | P24 | P25 | P28 | P30 | P31 | P33 | P36 | P37 | P39 | P40 | P43 | P44 | P45 | P48 | P49 | P50 | P51 | P52 | P54 | P56 | P57 | P58 | P62 | P63 | P66 | P68 | P70 | P74 | P75 | P83 | P96 | P99

Position of first RB, cluster 1

*RST: P0

<NumberRB2> ZERO | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 | N12 | N15 | N16 | N17 | N18 | N20 | N24 | N25 | N27 | N30 | N32 | N36 | N40 | N42 | N45 | N48 | N50 | N54 | N60 | N64 | N72 | N75 | N80 | N81 | N83 | N90 | N92 | N96 | N100

Number of allocated resource blocks, cluster 2

*RST: N3

<PositionRB2> FULL | LOW | HIGH | MID | P0 | P1 | P2 | P3 | P4 | P6 | P7 | P8 | P9 | P10 | P11 | P12 | P13 | P14 | P15 | P16 | P19 | P20 | P21 | P22 | P24 | P25 | P28 | P30 | P31 | P33 | P36 | P37 | P39 | P40 | P43 | P44 | P45 | P48 | P49 | P50 | P51 | P52 | P54 | P56 | P57 | P58 | P62 | P63 | P66 | P68 | P70 | P74 | P75 | P83 | P96 | P99

Position of first RB, cluster 2

*RST: P45

<Modulation> QPSK | Q16

Modulation type QPSK | 16-QAM

*RST: Q16

<TransBlockSizeIdx> ZERO | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T10 | T11 | T12 | T13 | T14 | T17 | T18 | T19 | T21 | T22 | T23 | T24 | T25 | T30 | T31 | T32

Transport block size index. Use KEEP to select a compatible value.

*RST: T11

Example: See Configuring RMCs

Firmware/Software: V3.5.20
V3.5.40: added T10, N72, N81, N90

Manual operation: See "# Resource Blocks" on page 204

2.6.14.11 User-Defined Channel Settings

The following commands define parameters for the scheduling type "User-Defined Channels".

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s>....................................532
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>................................ 532
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL.. 533
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL.....................................533
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:DL<s>.....................534
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:DL<s>................. 534
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL.......................... 534
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL........................534
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s>:CRATe:ALL?.......................535
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>:CRATe:ALL?................... 535
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL:CRATe:ALL?...........................536
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL:CRATe:ALL?........................ 536

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s> <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s> <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>

Configures a user-defined downlink channel with contiguous allocation. The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

Suffix:

<s> 1..2

<c> 1..3

Parameters:

<NumberRB> Number of allocated resource blocks. Configure the same value for all streams of a carrier.

*RST: 50

<StartRB>	Position of first resource block. Configure the same value for all streams of a carrier. *RST: 0
<Modulation>	QPSK | Q16 | Q64 | Q256 Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM *RST: QPSK
<TransBlockSizeIdx>	Transport block size index *RST: 5
Example:	See Configuring User-Defined Channels
Firmware/Software:	V2.0.10, SCC command V3.2.50, V3.5.30 added 256-QAM
Options:	R&S CMW-KS510 256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD
Manual operation:	See "# Resource Blocks ... Transport Block Size" on page 206

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>

Configures a user-defined uplink channel with contiguous allocation. The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

Suffix:

<c>	1..3

Parameters:

<NumberRB>	Number of allocated resource blocks *RST: 50
<StartRB>	Position of first resource block *RST: 0
<Modulation>	QPSK | Q16 Modulation type QPSK | 16-QAM *RST: QPSK
<TransBlockSizeIdx>	Transport block size index *RST: 6
Example:	See Configuring User-Defined Channels
Firmware/Software:	V2.0.20, SCC command V3.5.20
Options:	R&S CMW-KS510
Manual operation:	See "# Resource Blocks ... Transport Block Size" on page 206

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:DL<s> <Cluster>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:DL<s> <Cluster>, <Modulation>, <TransBlockSizeIdx>

Configures a user-defined downlink channel with multi-cluster allocation. The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59 and especially Table 2-20.

Suffix:

<s> 1..2

<c> 1..3

Parameters:

<Cluster> Bitmap, enabling or disabling the individual RBGs
1 means RBG allocated, 0 means RBG not allocated
The number of bits depends on the cell bandwidth and equals the total number of RBGs.
The bitmap starts with RBG 0 (most significant bit) and continues with increasing RBG index / frequency.
Example for 1.4 MHz BW:
#B101010 means that RBG 0, 2 and 4 are allocated

<Modulation> QPSK | Q16 | Q64 | Q256
Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM
*RST: QPSK

<TransBlockSizeIdx> Transport block size index
*RST: 5

Example: See Configuring User-Defined Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "DL multi-cluster allocation" on page 207

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL <NumberRB1>, <StartRB1>, <NumberRB2>, <StartRB2>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL <NumberRB1>, <StartRB1>, <NumberRB2>, <StartRB2>, <Modulation>, <TransBlockSizeIdx>

Configures a user-defined uplink channel with multi-cluster allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

Suffix:

<c> 1..3

Parameters:

<NumberRB1> Number of allocated resource blocks, cluster 1
*RST: 45

<StartRB1> Position of first RB, cluster 1
*RST: 0

<NumberRB2> Number of allocated resource blocks, cluster 2
*RST: 2

<StartRB2> Position of first RB, cluster 2
*RST: 48

<Modulation> QPSK | Q16
Modulation type QPSK | 16-QAM
*RST: QPSK

<TransBlockSizeIdx> Transport block size index
*RST: 6

Example: See Configuring User-Defined Channels

Firmware/Software: V3.5.20

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "# Resource Blocks ... Transport Block Size" on page 206

SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s>:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>:CRATe:ALL?

Queries the code rate for all downlink subframes for the scheduling type "User-defined Channels".

Suffix:

<s> 1..2

<c> 1..3

Return values:

<CodeRate> Comma-separated list of 10 values (subframe 0 to subframe 9)
Range: 0 to 50

Example: See Configuring User-Defined Channels

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.50

Options: R&S CMW-KS510

Manual operation: See "Code Rate" on page 207

SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL:CRATe:ALL?

Queries the code rate for all uplink subframes for the scheduling type "User-defined Channels".

Suffix:

<c>	1..3

Return values:

<CodeRate>	Comma-separated list of 10 values (subframe 0 to subframe 9) Range: 0 to 10

Example:	See Configuring User-Defined Channels
Usage:	Query only
Firmware/Software:	V3.0.20, SCC command V3.5.20
Options:	R&S CMW-KS510
Manual operation:	See "Code Rate" on page 207

2.6.14.12 User-Defined TTI-Based Channel Settings

The following commands define parameters for the scheduling type "User-Defined TTI-Based Channels".

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>....................................536
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>................................536
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:ALL..............................537
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:ALL.......................... 537
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL...538
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL..................................... 538
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:ALL................................. 539
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:ALL................................539
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:CRATe:ALL?...................... 540
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:CRATe:ALL?....................540
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:CRATe:ALL?............................541
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:CRATe:ALL?......................... 541

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s> <TTI>, <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>? <TTI>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s> <TTI>, <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>? <TTI>

Configures a selected downlink subframe for the scheduling type "User-defined TTI-Based".

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

A query for TDD can also return `OFF,OFF,OFF,OFF`, indicating that the queried subframe is no DL subframe.

Suffix:

<s>	1..2
<c>	1..3

Parameters:

<NumberRB> Number of allocated resource blocks. The same value must be configured for all streams.
*RST: 50

<StartRB> Position of first resource block. The same value must be configured for all streams of the carrier.
*RST: 0

<Modulation> QPSK | Q16 | Q64 | Q256 | OFF
Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM | no DL subframe
*RST: QPSK

<TransBlockSizeIdx> Transport block size index
*RST: 5

Parameters for setting and query:

<TTI> Number of the subframe to be configured/queried.
Range: 0 to 9
*RST: 0

Example: See Configuring TTI-Based User-Defined Channels

Firmware/Software: V3.2.50, V3.5.10 added value `OFF`, V3.5.40 added 256-QAM

Options: R&S CMW-KS510
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "User-Defined TTI-Based" on page 211

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:ALL <NumberRB>(10), <StartRB>(10), <Modulation>(10), <TransBlockSizeIdx>(10)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:ALL <NumberRB>(10), <StartRB>(10), <Modulation>(10), <TransBlockSizeIdx>(10)

Configures all downlink subframes for the scheduling type "User-defined TTI-Based".

The parameters are entered 10 times, so that all subframes are configured by a single command (index = subframe number 0 to 9):

<NumberRB>$_0$, ..., <NumberRB>$_9$, <StartRB>$_0$, ..., <StartRB>$_9$, <Modulation>$_0$, ..., <Modulation>$_9$, <TransBlockSizeIdx>$_0$, ..., <TransBlockSizeIdx>$_9$

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

For TDD UL and special subframes, you can set OFF or specify a number from the allowed input range. The effect is the same. A query returns OFF for non-DL subframes.

Suffix:

<s>	1..2
<c>	1..3

Parameters:

<NumberRB> Number of allocated resource blocks. The same value must be configured for all streams of the carrier.

*RST: 50

<StartRB> Position of first resource block. The same value must be configured for all streams of the carrier.

*RST: 0

<Modulation> QPSK | Q16 | Q64 | Q256 | OFF

Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM | no DL subframe

*RST: QPSK

<TransBlockSizeIdx> Transport block size index

*RST: 5

Example: See Configuring TTI-Based User-Defined Channels

Firmware/Software: V2.1.30, SCC command V3.2.50
V3.5.10 added value OFF, V3.5.40 added 256-QAM

Options: R&S CMW-KS510
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "User-Defined TTI-Based" on page 211

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL <TTI>, <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL? <TTI>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL <TTI>, <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL? <TTI>

Configures a selected uplink subframe for all scheduling types with a TTI-based UL definition.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

A query for TDD can also return OFF,OFF,OFF,OFF, indicating that the queried subframe is no UL subframe.

For UL-DL configuration 0, use the command CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:ALL on page 539.

Suffix:

<c>	1..3

Parameters:

<NumberRB>	Number of allocated resource blocks *RST: 50
<StartRB>	Position of first resource block *RST: 0
<Modulation>	QPSK | Q16 | OFF Modulation type QPSK | 16-QAM | no UL subframe *RST: QPSK
<TransBlockSizeIdx>	Transport block size index *RST: 6

Parameters for setting and query:

<TTI>	Number of the subframe to be configured/queried. Range: 0 to 9

Example: See Configuring TTI-Based User-Defined Channels

Firmware/Software: V2.0.20
V3.5.10: Value `OFF` added
V3.5.20: SCC command added

Options: R&S CMW-KS510

Manual operation: See "UL configuration commands" on page 210

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:ALL <NumberRB>(10), <StartRB>(10), <Modulation>(10), <TransBlockSizeIdx>(10)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:ALL <NumberRB>(10), <StartRB>(10), <Modulation>(10), <TransBlockSizeIdx>(10)

Configures the uplink channel for all scheduling types with a TTI-based UL definition.

The parameters are entered 10 times, so that all subframes are configured by a single command (index = subframe number 0 to 9):

<NumberRB>$_0$, ..., <NumberRB>$_9$, <StartRB>$_0$, ..., <StartRB>$_9$, <Modulation>$_0$, ..., <Modulation>$_9$, <TransBlockSizeIdx>$_0$, ..., <TransBlockSizeIdx>$_9$

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.14, "User-Defined Channels", on page 59.

For TDD DL and special subframes, you can set `OFF` or specify a number from the allowed input range. The effect is the same. A query returns `OFF` for non-UL subframes.

For UL-DL configuration 0, the settings specified for subframe number 2 are automatically applied to all UL subframes.

Suffix:

<c>	1..3

Parameters:

<NumberRB>	Number of allocated resource blocks *RST: 50
<StartRB>	Position of first resource block *RST: 0
<Modulation>	QPSK | Q16 | OFF Modulation type QPSK | 16-QAM | no UL subframe *RST: QPSK
<TransBlockSizeIdx>	Transport block size index *RST: 6

Example: See Configuring TTI-Based User-Defined Channels

Firmware/Software: V2.1.30
V3.5.10: Value OFF added
V3.5.20: SCC command added

Options: R&S CMW-KS510

Manual operation: See "UL configuration commands" on page 210

SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:CRATe:ALL?

Queries the code rate for all downlink subframes for the scheduling type "User-defined TTI-Based".

Suffix:

<s>	1..2
<c>	1..3

Return values:

<CodeRate>	Comma-separated list of 10 values (subframe 0 to subframe 9) Range: 0 to 50

Example: See Configuring TTI-Based User-Defined Channels

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.2.50

Options: R&S CMW-KS510

Manual operation: See "Code Rate" on page 211

SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:CRATe:ALL?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:CRATe:ALL?

Queries the code rate for all uplink subframes, applicable to all scheduling types with a TTI-based UL definition.

Suffix:

<c> 1..3

Return values:

<CodeRate> Comma-separated list of 10 values (subframe 0 to subframe 9)

Range: 0 to 10

Example: See Configuring TTI-Based User-Defined Channels

Usage: Query only

Firmware/Software: V3.0.20, SCC command V3.5.20

Options: R&S CMW-KS510

Manual operation: See "Code Rate" on page 211

2.6.14.13 Fixed CQI Settings

The following commands define DL settings for the scheduling type "Fixed CQI".

For the query of code rates and all UL settings, use the "User-Defined TTI-Based" commands, see Chapter 2.6.14.12, "User-Defined TTI-Based Channel Settings", on page 536.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>....................................541
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>................................ 541
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>:ALL.............................. 542
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>:ALL..........................542

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s> <TTI>, <NumberRB>, <StartRB>, <CQIIdx>
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>? <TTI>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s> <TTI>, <NumberRB>, <StartRB>, <CQIIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>? <TTI>

Configures a selected downlink subframe for the scheduling type "Fixed CQI".

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

A query for TDD can also return `OFF,OFF,OFF,OFF`, indicating that the queried subframe is no DL subframe.

Suffix:

<s> 1..2

<c> 1..3

Parameters:

<NumberRB> Number of allocated resource blocks. The same value must be configured for all streams of the carrier.

*RST: 50

<StartRB> Position of first resource block. The same value must be configured for all streams of the carrier.

*RST: 0

<CQIIdx> CQI index

Range: 1 to 15
*RST: 1

Parameters for setting and query:

<TTI> Number of the subframe to be configured/queried

Range: 0 to 9
*RST: 0

Example: See Configuring CQI DL Channels

Firmware/Software: V3.0.10, SCC command V3.2.50
V3.5.10: Value `OFF` added

Options: R&S CMW-KS510

Manual operation: See "Fixed CQI" on page 211

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>:ALL <NumberRB>(10), <StartRB>(10), <CQIIdx>(10)

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>:ALL <NumberRB>(10), <StartRB>(10), <CQIIdx>(10)

Configures the downlink channel for the scheduling type "Fixed CQI".

The parameters are entered 10 times, so that all subframes are configured by a single command (index = subframe number 0 to 9):

<NumberRB>$_0$, ..., <NumberRB>$_9$, <StartRB>$_0$, ..., <StartRB>$_9$, <CQIIdx>$_0$, ..., <CQIIdx>$_9$

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

For TDD UL and special subframes, you can set `OFF` or specify a number from the allowed input range. The effect is the same. A query returns `OFF` for non-DL subframes.

Suffix:

<s> 1..2

<c> 1..3

Parameters:

<NumberRB> Number of allocated resource blocks. The same value must be configured for all streams of the carrier.

*RST: 50

<StartRB> Position of first resource block. The same value must be configured for all streams of the carrier.

*RST: 0

<CQIIdx> CQI index

Range: 1 to 15
*RST: 1

Example: See Configuring CQI DL Channels

Firmware/Software: V3.0.10, SCC command V3.2.50
V3.5.10: Value OFF added

Options: R&S CMW-KS510

Manual operation: See "Fixed CQI" on page 211

2.6.14.14 Follow WB CQI Settings

The following commands define DL settings for the scheduling type "Follow WB CQI".

For the UL settings, use the "User-Defined TTI-Based" commands, see Chapter 2.6.14.12, "User-Defined TTI-Based Channel Settings", on page 536.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:STTI....................................... 544
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:STTI...................................544
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL... 544
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL... 544
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:MCLuster:DL................................ 545
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:MCLuster:DL.............................545
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:UDEFined................. 545
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:UDEFined............. 545
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:CSIRs:UDEFined.......546
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:UDEFined... 546
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:SSUBframe:
UDEFined..546
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:
UDEFined..546
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:DETermined?..................547
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:DETermined?.............. 547
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:CSIRs:DETermined?........547
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:DETermined?.... 547
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:SSUBframe:
DETermined?...548
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:
DETermined?...548

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:STTI <Scheduled>...
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:STTI <Scheduled>...

Configures which subframes are scheduled for the DL of the scheduling type "Follow WB CQI".

For most subframes, the setting is fixed, depending on the duplex mode and the UL-DL configuration. For these subframes, your setting is ignored.

Suffix:

<c> 1..3

Parameters:

<Scheduled> OFF | ON

Comma-separated list of 10 values, for subframe 0 to 9

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Scheduled CQI" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL <NumberRB>, <StartRB>, <Table>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL <NumberRB>, <StartRB>, <Table>

Configures the downlink for the scheduling type "Follow WB CQI", with contiguous RB allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

Suffix:

<c> 1..3

Parameters:

<NumberRB> Number of allocated resource blocks

*RST: 50

<StartRB> Position of first resource block

*RST: 0

<Table> DETermined | UDEFined

DETermined: Automatic CQI to MCS mapping table
UDEFined: User-defined mapping table

*RST: DET

Example: See Configuring CQI DL Channels

Firmware/Software: V3.0.50, SCC command V3.2.70

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "#RB / Start RB" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:MCLuster:DL <Cluster>, <Table>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:MCLuster:DL <Cluster>, <Table>

Configures the downlink for the scheduling type "Follow WB CQI", with multi-cluster allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62 and especially Table 2-20.

Suffix:

<c>	1..3

Parameters:

<Cluster>	Bitmap, enabling or disabling the individual RBGs 1 means RBG allocated, 0 means RBG not allocated The number of bits depends on the cell bandwidth and equals the total number of RBGs. The bitmap starts with RBG 0 (most significant bit) and continues with increasing RBG index / frequency. Example for 1.4 MHz BW: #B101010 means that RBG 0, 2 and 4 are allocated
<Table>	DETermined | UDEFined **DETermined**: Automatic CQI to MCS mapping table **UDEFined**: User-defined mapping table *RST: DET

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "DL multi-cluster allocation" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:UDEFined <MCS>(15)

Configures a user-defined mapping table that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI" if the table mode is set to `UDEFined`.

Suffix:

<c>	1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,2,3,5,7,9,12,14,16,19,22,24,27,27

Example: See Configuring CQI DL Channels

Firmware/Software: V3.0.50, SCC command V3.2.70

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI" on page 214

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:CSIRs:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:UDEFined <MCS>(15)

Configures a user-defined mapping table for subframes with CSI-RS that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI" if the table mode is set to `UDEFined`.

Suffix:

<c> 1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,3,5,7,10,12,14,17,19,21,22,24,25,25

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.40

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI" on page 214

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:SSUBframe:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:UDEFined <MCS>(15)

Configures a user-defined mapping table for special subframes that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI" if the table mode is set to `UDEFined`.

Suffix:

<c> 1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,3,5,7,10,12,14,17,19,21,22,24,25,25

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI" on page 214

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:DETermined?

Queries the automatically determined mapping table. The table is used for the scheduling type "Follow WB CQI" if the table mode is set to `DETermined`.

Suffix:

<c> 1..3

Return values:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 31

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.2.70

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI" on page 214

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:CSIRs:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:DETermined?

Queries the automatically determined mapping table for subframes with CSI-RS. The table is used for the scheduling type "Follow WB CQI" if the table mode is set to `DETermined`.

Suffix:

<c> 1..3

Return values:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 31

Usage: Query only

Firmware/Software: V3.5.40

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI" on page 214

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:SSUBframe:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:DETermined?

Queries the automatically determined mapping table for special subframes. The table is used for the scheduling type "Follow WB CQI" if the table mode is set to `DETermined`.

Suffix:
<c> 1..3

Return values:
<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15
Range: 0 to 31

Usage: Query only

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI" on page 214

2.6.14.15 Follow WB PMI Settings

The following commands define DL settings for the scheduling type "Follow WB PMI".

For the UL settings, use the "User-Defined TTI-Based" commands, see Chapter 2.6.14.12, "User-Defined TTI-Based Channel Settings", on page 536.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL:STTI <Scheduled>...
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL:STTI <Scheduled>...

Configures which subframes are scheduled for the DL of the scheduling type "Follow WB PMI".

For most subframes, the setting is fixed, depending on the duplex mode and the UL-DL configuration. For these subframes, your setting is ignored.

Suffix:
<c> 1..3

Parameters:
<Scheduled> OFF | ON
Comma-separated list of 10 values, for subframe 0 to 9

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Scheduled CQI" on page 216

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>

Configures the downlink for the scheduling type "Follow WB PMI", with contiguous allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

Suffix:
<c> 1..3

Parameters:

<NumberRB> Number of allocated resource blocks
*RST: 50

<StartRB> Position of first resource block
*RST: 0

<Modulation> QPSK | Q16 | Q64 | Q256
Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM
*RST: QPSK

<TransBlockSizeIdx> Transport block size index
*RST: 5

Example: See Configuring CQI DL Channels

Firmware/Software: V3.2.80, V3.5.40 added 256-QAM

Options: R&S CMW-KS510/-KS512 (without CA/with CA)
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "#RB / Start RB" on page 216

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:MCLuster:DL <Cluster>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:MCLuster:DL <Cluster>, <Modulation>, <TransBlockSizeIdx>

Configures the downlink for the scheduling type "Follow WB PMI", with multi-cluster allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62 and especially Table 2-20.

Suffix:

<c> 1..3

Parameters:

<Cluster> Bitmap, enabling or disabling the individual RBGs
1 means RBG allocated, 0 means RBG not allocated
The number of bits depends on the cell bandwidth and equals the total number of RBGs.
The bitmap starts with RBG 0 (most significant bit) and continues with increasing RBG index / frequency.
Example for 1.4 MHz BW:
#B101010 means that RBG 0, 2 and 4 are allocated

<Modulation> QPSK | Q16 | Q64 | Q256
Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM
*RST: QPSK

<TransBlockSizeIdx> Transport block size index
*RST: 5

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "DL multi-cluster allocation" on page 217

2.6.14.16 Follow WB PMI-RI Settings

The following commands define DL settings for the scheduling type "Follow WB PMI-RI".

For the UL settings, use the "User-Defined TTI-Based" commands, see Chapter 2.6.14.12, "User-Defined TTI-Based Channel Settings", on page 536.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL:STTI <Scheduled>...
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL:STTI <Scheduled>...

Configures which subframes are scheduled for the DL of the scheduling type "Follow WB PMI-RI".

For most subframes, the setting is fixed, depending on the duplex mode and the UL-DL configuration. For these subframes, your setting is ignored.

Suffix:

<c> 1..3

Parameters:

<Scheduled> OFF | ON
Comma-separated list of 10 values, for subframe 0 to 9

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Scheduled CQI" on page 216

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>

Configures the downlink for the scheduling type "Follow WB PMI-RI", with contiguous allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

Suffix:
<c> 1..3

Parameters:

<NumberRB> Number of allocated resource blocks
*RST: 50

<StartRB> Position of first resource block
*RST: 0

<Modulation> QPSK | Q16 | Q64 | Q256
Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM
*RST: QPSK

<TransBlockSizeIdx> Transport block size index
*RST: 5

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.10, V3.5.40 added 256-QAM

Options: R&S CMW-KS510/-KS512 (without CA/with CA)
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "#RB / Start RB" on page 216

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:MCLuster:DL <Cluster>, <Modulation>, <TransBlockSizeIdx>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:MCLuster:DL <Cluster>, <Modulation>, <TransBlockSizeIdx>

Configures the downlink for the scheduling type "Follow WB PMI-RI", with multi-cluster allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62 and especially Table 2-20.

Suffix:
<c> 1..3

Parameters:

<Cluster>	Bitmap, enabling or disabling the individual RBGs 1 means RBG allocated, 0 means RBG not allocated The number of bits depends on the cell bandwidth and equals the total number of RBGs. The bitmap starts with RBG 0 (most significant bit) and continues with increasing RBG index / frequency. Example for 1.4 MHz BW: #B101010 means that RBG 0, 2 and 4 are allocated
<Modulation>	QPSK | Q16 | Q64 | Q256 Modulation type QPSK | 16-QAM | 64-QAM | 256-QAM *RST: QPSK
<TransBlockSizeIdx>	Transport block size index *RST: 5

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)
256-QAM: R&S CMW-KS504/-KS554 for FDD/TDD

Manual operation: See "DL multi-cluster allocation" on page 217

2.6.14.17 Follow WB CQI-RI Settings

The following commands define DL settings for the scheduling type "Follow WB CQI-RI".

For the UL settings, use the "User-Defined TTI-Based" commands, see Chapter 2.6.14.12, "User-Defined TTI-Based Channel Settings", on page 536.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:STTI....553
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:STTI....553
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL....553
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL....553
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:MCLuster:DL....554
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:MCLuster:DL....554
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:UDEFined....554
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:UDEFined....554
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:SSUBframe:UDEFined....555
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:UDEFined....555
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:DETermined?....555
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:DETermined?....555
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:SSUBframe:DETermined?....556
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:DETermined?....556

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:STTI <Scheduled>...
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:STTI <Scheduled>...

Configures which subframes are scheduled for the DL of the scheduling type "Follow WB CQI-RI".

For most subframes, the setting is fixed, depending on the duplex mode and the UL-DL configuration. For these subframes, your setting is ignored.

Suffix:
<c> 1..3

Parameters:
<Scheduled> OFF | ON
Comma-separated list of 10 values, for subframe 0 to 9

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Scheduled CQI" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL <NumberRB>, <StartRB>, <Table>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL <NumberRB>, <StartRB>, <Table>

Configures the downlink for the scheduling type "Follow WB CQI-RI", with contiguous allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

Suffix:
<c> 1..3

Parameters:
<NumberRB> Number of allocated resource blocks
*RST: 50

<StartRB> Position of first resource block
*RST: 0

<Table> DETermined | UDEFined
DETermined: Automatic CQI to MCS mapping table
UDEFined: User-defined mapping table
*RST: DET

Example: See Configuring CQI DL Channels

Firmware/Software: V3.2.80

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "#RB / Start RB" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:MCLuster:DL <Cluster>, <Table>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:MCLuster:DL <Cluster>, <Table>

Configures the downlink for the scheduling type "Follow WB CQI-RI", with multi-cluster allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62 and especially Table 2-20.

Suffix:

<c> 1..3

Parameters:

<Cluster> Bitmap, enabling or disabling the individual RBGs
1 means RBG allocated, 0 means RBG not allocated
The number of bits depends on the cell bandwidth and equals the total number of RBGs.
The bitmap starts with RBG 0 (most significant bit) and continues with increasing RBG index / frequency.
Example for 1.4 MHz BW:
#B101010 means that RBG 0, 2 and 4 are allocated

<Table> DETermined | UDEFined

DETermined: Automatic CQI to MCS mapping table
UDEFined: User-defined mapping table

*RST: DET

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "DL multi-cluster allocation" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:UDEFined <MCS>(15)

Configures a user-defined mapping table that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI-RI" if the table mode is set to `UDEFined`.

Suffix:

<c> 1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,2,3,5,7,9,12,14,16,19,22,24,27,28

Example: See Configuring CQI DL Channels

Firmware/Software: V3.2.80

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-RI" on page 215

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:SSUBframe:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:UDEFined <MCS>(15)

Configures a user-defined mapping table for special subframes that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI-RI" if the table mode is set to `UDEFined`.

Suffix:

<c> 1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,3,5,7,10,12,14,17,19,21,22,24,25,25

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-RI" on page 215

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:DETermined?

Queries the automatically determined mapping table. The table is used for the scheduling type "Follow WB CQI-RI" if the table mode is set to `DETermined`.

Suffix:

<c> 1..3

Return values:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 31

Usage: Query only

Firmware/Software: V3.2.80

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-RI" on page 215

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:SSUBframe: DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe: DETermined?

Queries the automatically determined mapping table for special subframes. The table is used for the scheduling type "Follow WB CQI-RI" if the table mode is set to `DETermined`.

Suffix:
<c> 1..3

Return values:
<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15
Range: 0 to 31

Usage: Query only

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-RI" on page 215

2.6.14.18 Follow WB CQI-PMI-RI Settings

The following commands define DL settings for the scheduling type "Follow WB CQI-PMI-RI".

For the UL settings, use the "User-Defined TTI-Based" commands, see Chapter 2.6.14.12, "User-Defined TTI-Based Channel Settings", on page 536.

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:STTI....557
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:STTI....557
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL....557
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL....557
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:MCLuster:DL....558
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:MCLuster:DL....558
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:UDEFined....559
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:UDEFined....559
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:CSIRs:UDEFined....559
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:UDEFined....559
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:SSUBframe: UDEFined....560

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:
UDEFined....................560
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:DETermined?....................560
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:DETermined?....................560
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:CSIRs:DETermined?..........561
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:DETermined?...... 561
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:SSUBframe:
DETermined?....................561
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:
DETermined?....................561

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:STTI <Scheduled>...
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:STTI <Scheduled>...

Configures which subframes are scheduled for the DL of the scheduling type "Follow WB CQI-PMI-RI".

For most subframes, the setting is fixed, depending on the duplex mode and the UL-DL configuration. For these subframes, your setting is ignored.

Suffix:
<c> 1..3

Parameters:
<Scheduled> OFF | ON

Comma-separated list of 10 values, for subframe 0 to 9

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Scheduled CQI" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL <NumberRB>, <StartRB>, <Table>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL <NumberRB>, <StartRB>, <Table>

Configures the downlink for the scheduling type "Follow WB CQI-PMI-RI", with contiguous allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62.

Suffix:
<c> 1..3

Parameters:
<NumberRB> Number of allocated resource blocks

*RST: 50

<StartRB> Position of first resource block

*RST: 0

<Table> DETermined | UDEFined

DETermined: Automatic CQI to MCS mapping table
UDEFined: User-defined mapping table

*RST: DET

Example: See Configuring CQI DL Channels

Firmware/Software: V3.2.80

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "#RB / Start RB" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:MCLuster:DL <Cluster>, <Table>
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:MCLuster:DL <Cluster>, <Table>

Configures the downlink for the scheduling type "Follow WB CQI-PMI-RI", with multi-cluster allocation.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.15, "CQI Channels", on page 62 and especially Table 2-20.

Suffix:

<c> 1..3

Parameters:

<Cluster> Bitmap, enabling or disabling the individual RBGs
1 means RBG allocated, 0 means RBG not allocated
The number of bits depends on the cell bandwidth and equals the total number of RBGs.
The bitmap starts with RBG 0 (most significant bit) and continues with increasing RBG index / frequency.
Example for 1.4 MHz BW:
#B101010 means that RBG 0, 2 and 4 are allocated

<Table> DETermined | UDEFined

DETermined: Automatic CQI to MCS mapping table
UDEFined: User-defined mapping table

*RST: DET

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "DL multi-cluster allocation" on page 213

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:UDEFined <MCS>(15)

Configures a user-defined mapping table that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI-PMI-RI" if the table mode is set to `UDEFined`.

Suffix:

<c> 1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,2,3,5,7,9,12,14,16,19,22,24,27,27

Example: See Configuring CQI DL Channels

Firmware/Software: V3.2.80

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-PMI-RI" on page 215

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:CSIRs:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:UDEFined <MCS>(15)

Configures a user-defined mapping table for subframes with CSI-RS that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI-PMI-RI" if the table mode is set to `UDEFined`.

Suffix:

<c> 1..3

Parameters:

<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,3,5,7,10,12,14,17,19,21,22,24,25,25

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.40

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-PMI-RI" on page 215

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:SSUBframe:UDEFined <MCS>(15)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:UDEFined <MCS>(15)

Configures a user-defined mapping table for special subframes that assigns an MCS index value to each possible reported wideband CQI index value.

The table is used for the scheduling type "Follow WB CQI-PMI-RI" if the table mode is set to `UDEFined`.

Suffix:
<c> 1..3

Parameters:
<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 28
*RST: 0,1,3,5,7,10,12,14,17,19,21,22,24,25,25

Example: See Configuring CQI DL Channels

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-PMI-RI" on page 215

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:DETermined?

Queries the automatically determined mapping table. The table is used for the scheduling type "Follow WB CQI-PMI-RI" if the table mode is set to `DETermined`.

Suffix:
<c> 1..3

Return values:
<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15

Range: 0 to 31

Usage: Query only

Firmware/Software: V3.2.80

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-PMI-RI" on page 215

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:CSIRs:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:DETermined?

Queries the automatically determined mapping table for subframes with CSI-RS. The table is used for the scheduling type "Follow WB CQI-PMI-RI" if the table mode is set to `DETermined`.

Suffix:
<c> 1..3

Return values:
<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15
Range: 0 to 31

Usage: Query only

Firmware/Software: V3.5.40

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-PMI-RI" on page 215

SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:SSUBframe:DETermined?
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:DETermined?

Queries the automatically determined mapping table for special subframes. The table is used for the scheduling type "Follow WB CQI-PMI-RI" if the table mode is set to `DETermined`.

Suffix:
<c> 1..3

Return values:
<MCS> Comma-separated list of 15 MCS values, for reported CQI index value 1 to 15
Range: 0 to 31

Usage: Query only

Firmware/Software: V3.5.50

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Follow WB CQI-PMI-RI" on page 215

2.6.14.19 SPS Settings

The following commands define parameters for the scheduling type "SPS".

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:TIConfig...562
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:SINTerval.. 562
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>... 562
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL...563
SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>:CRATe:ALL?................................. 564
SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL:CRATe:ALL?...................................... 564

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:TIConfig <Enable>

Configures the parameter "twoIntervalsConfig", signaled to the UE for the scheduling type SPS in TDD mode.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring SPS

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "SPS TwoIntervalsConfig TDD" on page 193

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:SINTerval <Interval>

Configures the subframe periodicity n for the scheduling type SPS. The UE is granted the configured RB allocation in every nth subframe.

For TDD, the selected value is internally rounded down to a multiple of 10. Example: S128 means every 120th subframe.

Parameters:

<Interval> S10 | S20 | S32 | S40 | S64 | S80 | S128 | S160 | S320 | S640
Every 10th subframe to every 640th subframe
*RST: S20

Example: See Configuring SPS

Firmware/Software: V3.2.80
V3.2.82: changed *RST value

Options: R&S CMW-KS510

Manual operation: See "Interval" on page 119

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s> <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>

Configures the downlink RB allocation for the scheduling type SPS.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.16, "Semi-Persistent Scheduling (SPS)", on page 66.

Suffix:

<s> 1..2

Parameters:

<NumberRB> Number of allocated resource blocks

*RST: 50

<StartRB> Position of first resource block

*RST: 0

<Modulation> QPSK | Q16

Modulation type QPSK | 16-QAM

*RST: QPSK

<TransBlockSizeIdx> Transport block size index

*RST: 5

Example: See Configuring SPS

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "# RB ... TBSI /TBS" on page 120

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL <NumberRB>, <StartRB>, <Modulation>, <TransBlockSizeIdx>

Configures the uplink RB allocation for the scheduling type SPS.

The allowed input ranges have dependencies and are described in the background information, see Chapter 2.2.16, "Semi-Persistent Scheduling (SPS)", on page 66.

Parameters:

<NumberRB> Number of allocated resource blocks

*RST: 50

<StartRB> Position of first resource block

*RST: 0

<Modulation> QPSK | Q16

Modulation type QPSK | 16-QAM

*RST: QPSK

<TransBlockSizeIdx> Transport block size index

*RST: 6

Example: See Configuring SPS

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "# RB ... TBSI /TBS" on page 120

SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>:CRATe:ALL?

Queries the code rate for all downlink subframes for the scheduling type SPS.

Suffix:

<s> 1..2
Selects the downlink stream

Return values:

<CodeRate> Comma-separated list of 10 values (subframe 0 to subframe 9)
Range: 0 to 50

Example: See Configuring SPS

Usage: Query only

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Code Rate" on page 120

SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL:CRATe:ALL?

Queries the code rate for all uplink subframes for the scheduling type SPS.

Return values:

<CodeRate> Comma-separated list of 10 values (subframe 0 to subframe 9)
Range: 0 to 10

Example: See Configuring SPS

Usage: Query only

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Code Rate" on page 120

2.6.15 CQI Reporting Settings

The following commands configure CQI reporting.

CONFigure:LTE:SIGN<i>:CQIReporting:ENABle....565
CONFigure:LTE:SIGN<i>:CQIReporting:CSIRmode....565
CONFigure:LTE:SIGN<i>:CQIReporting:PRIReporting:ENABle....565
CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex[:FDD]....566
CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex[:FDD]....566
CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex:TDD....566
CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex:TDD....566
SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:RPERiod?....566
SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:RPERiod?....566
SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:ROFFset?....567
SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:ROFFset?....567

CONFigure:LTE:SIGN<i>:CQIReporting:ENABle <Enable>

Enables/disables periodic CQI reporting.

Parameters:

<Enable> OFF | PERiodic

OFF: no CQI reporting
PERiodic: periodic CQI reporting

*RST: OFF

Example: See Configuring CQI Reporting

Firmware/Software: V3.0.10

Options: R&S CMW-KS510 for scenarios without carrier aggregation
R&S CMW-KS512 for scenarios with carrier aggregation

Manual operation: See "Enable CQI Reporting" on page 218

CONFigure:LTE:SIGN<i>:CQIReporting:CSIRmode <Mode>

Configures the CSI reporting mode.

Parameters:

<Mode> S1 | S2

S1: submode 1
S2: submode 2

*RST: S2

Example: See Configuring CQI Reporting

Firmware/Software: V3.5.10

Options: R&S CMW-KS510 for scenarios without carrier aggregation
R&S CMW-KS512 for scenarios with carrier aggregation

Manual operation: See "CSI - Report Mode" on page 218

CONFigure:LTE:SIGN<i>:CQIReporting:PRIReporting:ENABle <Enable>

Enables/disables PMI/RI reporting for transmission mode 8 and 9. As a prerequisite for PMI and RI reporting, CQI reporting must also be enabled.

Parameters:

<Enable> OFF | ON

OFF: only CQI reporting
ON: CQI, PMI and RI reporting

*RST: OFF

Example: See Configuring CQI Reporting

Firmware/Software: V3.2.80

Options: R&S CMW-KS510 for scenarios without carrier aggregation

R&S CMW-KS512 for scenarios with carrier aggregation

Manual operation: See "Enable PMI/RI Reporting (TM 8, 9)" on page 218

CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex[:FDD] <Index>
CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex[:FDD] <Index>

Specifies the FDD "cqi-pmi-ConfigIndex" ($I_{CQI/PMI}$).

Suffix:

<c> 1..3

Parameters:

<Index> Range: 0 to 316, 318 to 541
*RST: PCC: 0, SCC1: 8, SCC2: 10, SCC3: 12

Example: See Configuring CQI Reporting

Firmware/Software: V3.0.10, SCC command V3.2.70

Options: R&S CMW-KS500
R&S CMW-KS510 for scenarios without carrier aggregation
R&S CMW-KS512 for scenarios with carrier aggregation

Manual operation: See "CQI/PMI Config Index" on page 219

CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex:TDD <Index>
CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex:TDD <Index>

Specifies the TDD "cqi-pmi-ConfigIndex" ($I_{CQI/PMI}$).

Suffix:

<c> 1..3

Parameters:

<Index> Range: 1 to 315
*RST: PCC: 3, SCC1: 88, SCC2: 98, SCC3: 108

Example: See Configuring CQI Reporting

Firmware/Software: V3.0.50, SCC command V3.2.70

Options: R&S CMW-KS550
R&S CMW-KS510 for scenarios without carrier aggregation
R&S CMW-KS512 for scenarios with carrier aggregation

Manual operation: See "CQI/PMI Config Index" on page 219

SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:RPERiod?
SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:RPERiod?

Queries the reporting period N_p in subframes, resulting from the configured "cqi-pmi-ConfigIndex".

Suffix:

<c> 1..3

Return values:

<Period>	Range: 1 to 160
Example:	See Configuring CQI Reporting
Usage:	Query only
Firmware/Software:	V3.0.10, SCC command V3.2.70
Options:	R&S CMW-KS510 for scenarios without carrier aggregation R&S CMW-KS512 for scenarios with carrier aggregation
Manual operation:	See "CQI/PMI Reporting Period / Offset" on page 219

SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:ROFFset?
SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:ROFFset?

Queries the reporting offset $N_{OFFSET,CQI}$ in subframes, resulting from the configured "cqi-pmi-ConfigIndex".

Suffix:

<c>	1..3

Return values:

<Offset>	Range: 0 to 159
Example:	See Configuring CQI Reporting
Usage:	Query only
Firmware/Software:	V3.0.10, SCC command V3.2.70
Options:	R&S CMW-KS510 for scenarios without carrier aggregation R&S CMW-KS512 for scenarios with carrier aggregation
Manual operation:	See "CQI/PMI Reporting Period / Offset" on page 219

2.6.16 UE Measurement Report Settings

The following commands configure UE measurement reports.

CONFigure:LTE:SIGN<i>:UEReport:ENABle.......... 567
CONFigure:LTE:SIGN<i>:UEReport:RINTerval.......... 568
CONFigure:LTE:SIGN<i>:UEReport:MGENable.......... 568
CONFigure:LTE:SIGN<i>:UEReport:MGPeriod.......... 568
CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRP.......... 569
CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRQ.......... 569
CONFigure:LTE:SIGN<i>:UEReport:WMQuantity.......... 569
CONFigure:LTE:SIGN<i>:UEReport:MCSCell.......... 569

CONFigure:LTE:SIGN<i>:UEReport:ENABle <Enable>

Enables or disables UE measurement reports.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Measurement Reports

Firmware/Software: V2.0.10

Manual operation: See "Report" on page 221

CONFigure:LTE:SIGN<i>:UEReport:RINTerval <Interval>

Sets the interval between two consecutive measurement reports.

Parameters:

<Interval> I120 | I240 | I480 | I640 | I1024 | I2048 | I5120 | I10240

Interval in ms, e.g. I240 = 240 ms

*RST: I1024

Example: See Configuring Measurement Reports

Firmware/Software: V2.1.20

Manual operation: See "Reporting Interval" on page 221

CONFigure:LTE:SIGN<i>:UEReport:MGENable <Enable>

Enables or disables transmission gaps for neighbor cell measurements.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Configuring Measurement Reports

Firmware/Software: V3.5.40

Options: R&S CMW-KS510

Manual operation: See "Measurement Gap Enable" on page 221

CONFigure:LTE:SIGN<i>:UEReport:MGPeriod <Gap>

Specifies the periodicity of transmission gaps for neighbor cell measurements.

Parameters:

<Gap> G040 | G080

G040: one gap per 40 ms
G080: one gap per 80 ms

*RST: G040

Example: See Configuring Measurement Reports

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "Measurement Gap Period" on page 221

CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRP <Filter>

Selects the value to be sent to the UE as "filterCoefficientRSRP". It is used by the UE to measure the reference signal received power (RSRP).

Parameters:

<Filter> FC0 | FC4

*RST: FC4

Example: See Configuring Measurement Reports

Firmware/Software: V3.2.81

Manual operation: See "Filter Coefficient RSRP/RSRQ" on page 221

CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRQ <Filter>

Selects the value to be sent to the UE as "filterCoefficientRSRQ". It is used by the UE to measure the reference signal received quality (RSRQ).

Parameters:

<Filter> FC0 | FC4

*RST: FC4

Example: See Configuring Measurement Reports

Firmware/Software: V3.2.81

Manual operation: See "Filter Coefficient RSRP/RSRQ" on page 221

CONFigure:LTE:SIGN<i>:UEReport:WMQuantity <Quantity>

Selects whether the UE must determine the RSCP or the Ec/No during WCDMA neighbor cell measurements.

Parameters:

<Quantity> RSCP | ECNO

*RST: RSCP

Example: See Configuring Measurement Reports

Firmware/Software: V3.0.50

Options: R&S CMW-KS510

Manual operation: See "WCDMA Measurement Quantity" on page 221

CONFigure:LTE:SIGN<i>:UEReport:MCSCell <Cycle>

Specifies the signaling parameter "measCycleSCell".

Parameters:

<Cycle> OFF | SF160 | SF256 | SF320 | SF512 | SF640 | SF1024 | SF1280

OFF: Do not signal "measCycleSCell"
SFn: n subframes

*RST: OFF

Example: See Configuring Measurement Reports

Firmware/Software: V3.2.70

Manual operation: See "Measurement Cycle SCell" on page 222

2.6.17 Messaging (SMS)

The following commands configure parameters of the short message service (SMS) and return information about received short messages.

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:LHANdling....570
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MESHandling....571
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:INTernal....571
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:BINary....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:PIDentifier....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:DCODing....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:UDHeader....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:CGRoup....573
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MCLass....573
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OSADdress....573
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OADDress....574
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TSOurce....574
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:DATE....574
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TIME....575
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE....575
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE:INFO?....575
SENSe:LTE:SIGN<i>:SMS:OUTGoing:INFO:LMSent?....576
CONFigure:LTE:SIGN<i>:SMS:INComing:FILE....576
CONFigure:LTE:SIGN<i>:SMS:INComing:FILE:INFO?....576
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:DCODing?....577
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt?....577
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MLENgth?....577
CLEan:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt....578
SENSe:LTE:SIGN<i>:SMS:INFO:LRMessage:RFLag?....578

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:LHANdling <LSMSHandling>

Selects the handling of messages exceeding 160 characters.

Parameters:

<LSMSHandling> TRUNcate | MSMS

TRUNcate
The SMS is truncated to 160 characters, the rest is discarded.

MSMS
Up to five concatenated messages are sent, consisting in sum of up to 800 characters.

*RST: TRUN

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.5.30

Manual operation: See "Large SMS Handling" on page 223

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MESHandling <MessageHandling>

Selects whether an outgoing message is defined directly via the GUI/commands or read from a file.

For file selection, see `CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE` on page 575.

Parameters:

<MessageHandling> INTernal | FILE

INTernal: message defined directly
FILE: message specified via a file

*RST: INT

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.5.50

Manual operation: See "Outgoing Message Handling" on page 224

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:INTernal <SMSInternal>

Defines the message text for outgoing 7-bit ASCII messages.

Parameters:

<SMSInternal> Message contents as string with up to 800 characters

RST: "R&S Short Message Service Text.The quick brown fox jumps over the lazy dog.THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG. 0123456789 !"#%+-/()<>?=;@$,"

Example: See Sending / Receiving a Short Message

Firmware/Software: V2.1.20

Manual operation: See "Outgoing SMS" on page 224

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:BINary <SMSbinary>

Defines the message contents for outgoing 8-bit binary messages.

Parameters:

<SMSbinary> Message contents as hexadecimal number with up to 1400 digits

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.70

Manual operation: See "Outgoing SMS binary" on page 224

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:PIDentifier <ID>

Specifies the TP protocol identifier (TP-PID) value to be sent.

Parameters:

<ID> Range: #H0 to #HFF
*RST: #H0

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.5.20

Manual operation: See "Protocol Identifier" on page 224

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:DCODing <DataCoding>

Selects the data coding for outgoing messages.

Parameters:

<DataCoding> BIT7 | BIT8

BIT7: 7-bit encoded ASCII message
BIT8: 8-bit encoded binary message

*RST: BIT7

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.70

Manual operation: See "Data Coding / Character Set" on page 224

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:UDHeader <Header>

Configures the TP user data header.

Parameters:

<Header> Up to 16 hexadecimal digits

Range: #H0 to #HFFFFFFFFFFFFFFFF
*RST: OFF
Additional parameters: OFF | ON (disables | enables sending the header)

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.5.40

Manual operation: See "User Data Header" on page 224

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:CGRoup <CodingGroup>

Selects the coding group to be indicated to the message recipient in the TP-Data-Coding-Scheme field.

Parameters:

<CodingGroup> GDCoding | DCMClass

GDCoding: general data coding
DCMClass: data coding / message class

*RST: GDC

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.70

Manual operation: See "Coding Group" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MCLass <MessageClass>

Selects the message class to be indicated to the message recipient in the TP-Data-Coding-Scheme field.

Parameters:

<MessageClass> CL0 | CL1 | CL2 | CL3 | NONE

CL0, CL1, CL2, CL3: Class 0 to 3
NONE: Do not send message class

*RST: NONE

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.70

Manual operation: See "Message Class" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OSADdress <OrigSMSCAddress>

Specifies the originator short message service center address to be sent to the recipient.

Parameters:

<OrigSMSCAddress> Address as string

*RST: '764332637249279'

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.70

Manual operation: See "Originator SMSC Address" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OADDress <OrigAddress>

Specifies the originating address to be sent to the message recipient.

Parameters:

<OrigAddress> Address as string

*RST: '764332637249279'

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.70

Manual operation: See "Originating Address" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TSOurce <SourceTime>

Selects the source for the service center time stamp.

The date and time for the source DATE is configured via the following commands:

- `CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:DATE`
- `CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TIME`

Parameters:

<SourceTime> CMWTime | DATE

CMWTime: Current date and time of the operation system
DATE: Date and time specified via remote commands

*RST: CMWT

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Service Center Time Stamp" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:DATE <Day>, <Month>, <Year>

Specifies the date of the service center time stamp for the time source `DATE` (see `CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TSOurce`).

Parameters:

<Day> Range: 1 to 31
*RST: 11

<Month> Range: 1 to 12
*RST: 11

<Year> Range: 2011 to 9999
*RST: 2011

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Service Center Time Stamp" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TIME <Hour>, <Minute>, <Second>

Specifies the time of the service center time stamp for the time source `DATE` (see `CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TSOurce`).

Parameters:

<Hour> Range: 0 to 23
*RST: 11

<Minute> Range: 0 to 59
*RST: 11

<Second> Range: 0 to 59
*RST: 0

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.2.80

Options: R&S CMW-KS510

Manual operation: See "Service Center Time Stamp" on page 225

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE <SMSFile>

Selects a file containing the message to be transmitted.

Parameters:

<SMSFile> Path of the file as string, for example:
`"@USERDATA\sms\LTE\Send\example_ascii.sms"`
*RST: No File Selected

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.5.50

Manual operation: See "Select File" on page 226

CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE:INFO?

Displays information about the file selected via `CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE`.

Return values:

<MessageEncoding> Encoding of the message as string (7-bit ASCII, 8-bit binary, 16-bit unicode)

<MessageText> Message text as string

<MessageLength> Number of characters in the message
Range: 0 to 10E+3

Example: See Sending / Receiving a Short Message

Usage: Query only

Firmware/Software: V3.5.50

Manual operation: See "Message Encoding, Message Text, Message Length" on page 226

SENSe:LTE:SIGN<i>:SMS:OUTGoing:INFO:LMSent?

Queries whether the last outgoing short message transfer was successful or not.

Return values:

<LastMessageSent> SUCCessful | FAILed | NAV

NAV is returned during an outgoing short message transfer and if there has been no transfer since the cell was switched on / the session has been started.

Example: See Sending / Receiving a Short Message

Usage: Query only

Firmware/Software: V3.5.20

Manual operation: See "Last Message Sent" on page 226

CONFigure:LTE:SIGN<i>:SMS:INComing:FILE <SMSFile>

Selects the file of a received message. You can display information about the selected file via the command `CONFigure:LTE:SIGN<i>:SMS:INComing:FILE:INFO?`.

Parameters:

<SMSFile> Path of the file as string, for example:
`"@USERDATA\sms\LTE\Received\rx_001.sms"`
*RST: No File Selected

Example: See Sending / Receiving a Short Message

Firmware/Software: V3.5.50

Manual operation: See "Select File" on page 227

CONFigure:LTE:SIGN<i>:SMS:INComing:FILE:INFO?

Displays information about the file selected via `CONFigure:LTE:SIGN<i>:SMS:INComing:FILE`.

Return values:

<MessageEncoding> Encoding of the message as string (7-bit "ascii", 8-bit "binary", 16-bit "unicode")

<MessageText>	Message text as string
<MessageLength>	Number of characters in the message Range: 0 to 10E+3
<MessageSegments>	Number of segments Range: 0 to 1000
Example:	See Sending / Receiving a Short Message
Usage:	Query only
Firmware/Software:	V3.5.50
Manual operation:	See "Select File" on page 227

SENSe:LTE:SIGN<i>:SMS:INComing:INFO:DCODing?

Returns the data coding of the last message received from the UE.

Return values:

<MessageEncoding>	Encoding as string ("7bit" ASCII, "8bit" binary, "16bit" unicode)
Example:	See Sending / Receiving a Short Message
Usage:	Query only
Firmware/Software:	V3.2.70
Manual operation:	See "Data Coding / Character Set" on page 227

SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt?

Returns the text of the last SMS message received from the UE.

Return values:

<MessageText>	Message text as string
Example:	See Sending / Receiving a Short Message
Usage:	Query only
Firmware/Software:	V2.1.20
Manual operation:	See "Message Text / Message Length" on page 227

SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MLENgth?

Returns the length of the last SMS message received from the UE.

Return values:

<MessageLength>	Number of characters of the message
Example:	See Sending / Receiving a Short Message
Usage:	Query only
Firmware/Software:	V2.1.20

Manual operation: See "Message Text / Message Length" on page 227

CLEan:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt

Resets all parameters related to a received SMS message. The "message read" flag is set to true.

Example: See Sending / Receiving a Short Message

Usage: Event

Firmware/Software: V2.1.20

Manual operation: See "Clear Message Text" on page 227

SENSe:LTE:SIGN<i>:SMS:INFO:LRMessage:RFLag?

Queries the "message read" flag for the last received message.

The flag is true (ON) in the following cases:

- No SMS message has been received.
- The last received SMS message has been read, see `SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt?` on page 577.
- The last received SMS message has been deleted, see `CLEan:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt` on page 578.

Return values:

<LastRecMessRead> OFF | ON

OFF: unread message available
ON: no unread message available

*RST: ON

Example: See Sending / Receiving a Short Message

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Clear Message Text" on page 227

2.6.18 Messaging (CBS)

The following commands configure the cell broadcast service (CBS).

CONFigure:LTE:SIGN<i>:CBS:MESSage:ENABle.......579
CONFigure:LTE:SIGN<i>:CBS:MESSage:ID.......579
CONFigure:LTE:SIGN<i>:CBS:MESSage:IDTYpe.......579
CONFigure:LTE:SIGN<i>:CBS:MESSage:SERial.......580
CONFigure:LTE:SIGN<i>:CBS:MESSage:CGRoup?.......581
CONFigure:LTE:SIGN<i>:CBS:MESSage:LANGuage.......581
CONFigure:LTE:SIGN<i>:CBS:MESSage:SOURce.......582
CONFigure:LTE:SIGN<i>:CBS:MESSage:DATA.......582

CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE....583
CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE:INFO?....583
CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:ALERt....583
CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:POPup....584

CONFigure:LTE:SIGN<i>:CBS:MESSage:ENABle <Enable>

Enables the transmission of cell broadcast messages.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Enable" on page 229

CONFigure:LTE:SIGN<i>:CBS:MESSage:ID <ID>

Specifies the message ID as decimal value. The related message type is set automatically.

Parameters:

<ID> Range: 0 to 65535
*RST: 4370

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40, V3.5.50 enhanced range for user-defined values

Options: R&S CMW-KS170

Manual operation: See "ID" on page 229

CONFigure:LTE:SIGN<i>:CBS:MESSage:IDTYpe <Type>

Selects the message type. The related message ID is set automatically.

For user-defined CMAS/ETWS, specify the message ID via `CONFigure:LTE:SIGN<i>:CBS:MESSage:ID`.

Parameters:

<Type> APResidentia | AEXTreme | ASEVere | AAMBer | EARThquake | TSUNami | ETWarning | ETWTest | UDCMas | UDETws

APResidentia: presidential alert
AEXTreme: extreme alert
ASEVere: severe alert
AAMBer: amber alert
EARThquake: earthquake
TSUNami: tsunami
ETWarning: earthquake + tsunami
ETWTest: ETWS test
UDCMas: user-defined CMAS
UDETws: user-defined ETWS

*RST: APR

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40, V3.5.50 added UDEFined, UDETws

Options: R&S CMW-KS170

Manual operation: See "ID" on page 229

CONFigure:LTE:SIGN<i>:CBS:MESSage:SERial <GeoScope>, <MessageCode>, <AutoIncr>[, <UpdateNumber>]

Specifies the serial number, consisting of the geographical scope, the message code and the update number.

Parameters:

<GeoScope> CIMMediate | PLMN | LOCation | CNORmal

Geographical scope
CIMMediate: cell immediate
PLMN: PLMN normal
LOCation: tracking area normal
CNORmal: cell normal

*RST: CIMM

<MessageCode> Range: 0 to 1023
*RST: 0

<AutoIncr> OFF | ON

OFF: `<UpdateNumber>` is not changed automatically
ON: `<UpdateNumber>` is increased if message is changed

*RST: OFF

<UpdateNumber> Range: 0 to 15
*RST: 0

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Serial Number" on page 229

CONFigure:LTE:SIGN<i>:CBS:MESSage:CGRoup?

Queries the coding group of the message.

Return values:

<CodingGroup>
0: used for internal data source
1: used for file data source
*RST: 0

Example: See Configuring the Cell Broadcast Service

Usage: Query only

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Data Coding Scheme" on page 229

CONFigure:LTE:SIGN<i>:CBS:MESSage:LANGuage <Language>, <LngIndication>

Specifies the language of the message.

Setting a language is only possible for the internal data source. For a file data source, the value is fixed (1,"UCS-2").

The mapping of language codes to language indication strings is listed in the table below. If you specify a value pair that does not match, the specified code is used and the correct string is set automatically.

Parameters:

<Language>
Range: 0 to 15
*RST: 1

<LngIndication>
Language indication as string
*RST: English

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Data Coding Scheme" on page 229

<Language>	<LngIndication>
0	"German"
1	"English"
2	"Italian"
3	"French"

<Language>	<LngIndication>
4	"Spanish"
5	"Dutch"
6	"Swedish"
7	"Danish"
8	"Portuguese"
9	"Finnish"
10	"Norwegian"
11	"Greek"
12	"Turkish"
13	"Hungarian"
14	"Polish"
15	"Language unspecified"

CONFigure:LTE:SIGN<i>:CBS:MESSage:SOURce <MessageHandling>

Selects the source of the message text.

Parameters:

<MessageHandling> INTernal | FILE

INTernal: message text defined via `CONFigure:LTE:SIGN<i>:CBS:MESSage:DATA`

FILE: message text read from file, selected via `CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE`

*RST: INT

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Data Source" on page 229

CONFigure:LTE:SIGN<i>:CBS:MESSage:DATA <Data>

Defines the message text for the data source `INTernal`.

Parameters:

<Data> String with up to 1395 characters

*RST: Coffee is running out!!!

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Data" on page 230

CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE <File>

Selects a message file for the data source `FILE`.

Store your message files in the directory
`D:\Rohde-Schwarz\CMW\Data\cbs\LTE\`.

Parameters:

<File> Path and filename as string

*RST: No File Selected

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Select File..." on page 230

CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE:INFO?

Queries information about the message in the selected file (see `CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE`).

Return values:

<MessageEncoding> Encoding as string

<MessageText> Message text as string

<MessageLength> Number of characters in the message

Range: 0 to 600

Usage: Query only

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "Message Encoding, Message Text, Message Length" on page 230

CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:ALERt <Enable>

Deactivates / activates ETWS emergency user alerting.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "ETWS" on page 230

CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:POPup <Enable>

Deactivates / activates ETWS warning popups.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring the Cell Broadcast Service

Firmware/Software: V3.5.40

Options: R&S CMW-KS170

Manual operation: See "ETWS" on page 230

2.6.19 Message Monitoring Settings

The following commands configure message monitoring for LTE.

CONFigure:LTE:SIGN<i>:MMONitor:ENABle..584
CONFigure:LTE:SIGN<i>:MMONitor:IPADdress..584

CONFigure:LTE:SIGN<i>:MMONitor:ENABle <Enable>

Enables or disables message monitoring for the LTE signaling application.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Message Monitoring

Firmware/Software: V2.1.30

Manual operation: See "Add LTE Signaling to logging" on page 231

CONFigure:LTE:SIGN<i>:MMONitor:IPADdress <Index>

Selects the IP address to which signaling messages are sent for message monitoring. The address pool is configured globally via `CONFigure:BASE:MMONitor:IPADdress<n>`.

A query returns both the current index and the resulting IP address.

Parameters:

<Index> IP1 | IP2 | IP3

Address pool index

Return values:

<IPAddress> Used IP address as string

Example: See Configuring Message Monitoring

Firmware/Software: V3.0.10

Manual operation: See "Logging PC IPv4 Address" on page 231

2.6.20 BLER Measurement

The following sections describe the commands related to the "Extended BLER" measurement.

- Measurement Control and States 585
- Measurement Settings 587
- Measurement Results 590

2.6.20.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:LTE:SIGN<i>:EBLer 585
STOP:LTE:SIGN<i>:EBLer 585
ABORt:LTE:SIGN<i>:EBLer 585
FETCh:LTE:SIGN<i>:EBLer:STATe? 586
FETCh:LTE:SIGN<i>:EBLer:STATe:ALL? 586

INITiate:LTE:SIGN<i>:EBLer
STOP:LTE:SIGN<i>:EBLer
ABORt:LTE:SIGN<i>:EBLer

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement. The measurement enters the "RUN" state.
- `STOP...` halts the measurement immediately. The measurement enters the "RDY" state. Measurement results are kept. The resources remain allocated to the measurement.
- `ABORt...` halts the measurement immediately. The measurement enters the "OFF" state. All measurement values are set to NAV. Allocated resources are released.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Example: See Performing a Single-Shot BLER Measurement

Usage: Event

Firmware/Software: V1.0.15.20

Manual operation: See "Extended BLER (Softkey)" on page 232

FETCh:LTE:SIGN<i>:EBLer:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<State> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "Extended BLER (Softkey)" on page 232

FETCh:LTE:SIGN<i>:EBLer:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MainState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: adjustments finished, measurement running ("adjusted")
INV: not applicable, <MainState> OFF or RDY ("invalid")

<ResourceState> QUE | ACT | INV
QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable, <MainState> OFF or RDY ("invalid")

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "Extended BLER (Softkey)" on page 232

2.6.20.2 Measurement Settings

The following commands configure the BLER measurement.

CONFigure:LTE:SIGN<i>:EBLer:TOUT 587
CONFigure:LTE:SIGN<i>:EBLer:REPetition 588
CONFigure:LTE:SIGN<i>:EBLer:SCONdition 588
CONFigure:LTE:SIGN<i>:EBLer:SFRames 588
CONFigure:LTE:SIGN<i>:EBLer:ERCalc 589
CONFigure:LTE:SIGN<i>:EBLer:CONFidence:OASCondition 589
CONFigure:LTE:SIGN<i>:EBLer:CONFidence:MTTime 589
CONFigure:LTE:SIGN<i>:EBLer:CONFidence:LERate 590

CONFigure:LTE:SIGN<i>:EBLer:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY`. The reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results, there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:
<Timeout> Default unit: s

Firmware/Software: V2.0.10

CONFigure:LTE:SIGN<i>:EBLer:REPetition <Repetition>

Specifies whether the measurement is stopped after a single shot or repeated continuously.

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Configuring a BLER Measurement

Firmware/Software: V3.0.30

Manual operation: See "Repetition" on page 234

CONFigure:LTE:SIGN<i>:EBLer:SCONdition <StopCondition>

Selects whether a BLER measurement without stop condition or a confidence BLER measurement with early decision concept is performed.

Parameters:

<StopCondition> NONE | CLEVel

NONE: no stop condition, no early termination of measurement
CLEVel: confidence BLER measurement

*RST: NONE

Example: See Configuring a BLER Measurement

Firmware/Software: V3.0.30

Options: R&S CMW-KS510/-KS512 for CLEVel (without CA/with CA)

Manual operation: See "Stop Condition" on page 234

CONFigure:LTE:SIGN<i>:EBLer:SFRames <Subframes>

Defines the number of subframes (= number of transport blocks) to be processed per measurement cycle.

For confidence BLER measurements, this parameter specifies only the length of the throughput result trace but does not influence the duration of the measurement.

Parameters:

<Subframes> Range: 100 to 400E+3
*RST: 10E+3

Example: See Configuring a BLER Measurement

Firmware/Software: V3.0.30

Manual operation: See "No. of Subframes" on page 235

CONFigure:LTE:SIGN<i>:EBLer:ERCalc <Algorithm>

Selects the formula to be used for calculation of the BLER from the number of ACK, NACK and DTX.

Parameters:

<Algorithm> ERC1 | ERC2 | ERC3 | ERC4

ERC1: *BLER = (NACK + DTX) / (ACK + NACK + DTX)*
ERC2: *BLER = DTX / (ACK + NACK + DTX)*
ERC3: *BLER = NACK / (ACK + NACK + DTX)*
ERC4: *BLER = NACK / (ACK + NACK)*

*RST: ERC1

Example: See Configuring a BLER Measurement

Firmware/Software: V3.0.30

Manual operation: See "Error Ratio Calculation" on page 235

CONFigure:LTE:SIGN<i>:EBLer:CONFidence:OASCondition <Condition>

Configures the stop decision and the overall result calculation for confidence BLER measurements with carrier aggregation.

Parameters:

<Condition> PCC | SCC1 | SCC2 | AC1St | ACWait

PCC: PCC only
SCC1: SCC1 only
SCC2: SCC2 only
AC1St: all carriers, stop on 1st fail
ACWait: all carriers, wait for all CCs

*RST: AC1S

Example: See Configuring a BLER Measurement

Firmware/Software: V3.2.80
V3.5.10: added SCC2

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Over All Stop Decision" on page 235

CONFigure:LTE:SIGN<i>:EBLer:CONFidence:MTTime <Time>

Specifies a minimum test time for confidence BLER measurements.

Parameters:

<Time> Minimum number of processed subframes

Range: 0 to 500E+3
Increment: 200
*RST: 0

Example: See Configuring a BLER Measurement

Firmware/Software: V3.0.30

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Minimum Test Time" on page 236

CONFigure:LTE:SIGN<i>:EBLer:CONFidence:LERate <Rate>

Selects the limit error ratio for a confidence BLER measurement.

Parameters:

<Rate> P001 | P010 | P050

P001: 0.1 %, 3GPP TS 36.521 annex G.4
P010: 1 %, 3GPP TS 36.521 annex G.4
P050: 5 %, 3GPP TS 36.521 annex G.2

*RST: P050

Example: See Configuring a BLER Measurement

Firmware/Software: V3.0.30

Options: R&S CMW-KS510/-KS512 (without CA/with CA)

Manual operation: See "Limit Error Rate" on page 236

2.6.20.3 Measurement Results

All results of the BLER measurement are retrieved via `FETCh` commands.

There are two types of `FETCh` commands:

- `FETCh:LTE:...` waits until the current measurement cycle is complete and returns the final results of the measurement cycle.
  This type of command is available for all results.
- `FETCh:INTermediate:LTE:...` returns the already available measurement results immediately, even if the first measurement cycle is not yet complete.
  This type of command is only available for selected results.

The following commands retrieve the results of the BLER measurement.

FETCh:LTE:SIGN<i>:EBLer[:PCC]:CONFidence?.....591
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:CONFidence?.....591
FETCh:LTE:SIGN<i>:EBLer:ALL:CONFidence?.....592
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:ABSolute?.....592
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:ABSolute?.....592
FETCh:LTE:SIGN<i>:EBLer[:PCC]:ABSolute?.....592
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:ABSolute?.....592
FETCh:INTermediate:LTE:SIGN<i>:EBLer:ALL:ABSolute?.....593
FETCh:LTE:SIGN<i>:EBLer:ALL:ABSolute?.....593
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:RELative?.....594
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:RELative?.....594
FETCh:LTE:SIGN<i>:EBLer[:PCC]:RELative?.....594
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:RELative?.....594
FETCh:INTermediate:LTE:SIGN<i>:EBLer:ALL:RELative?.....595

FETCh:LTE:SIGN<i>:EBLer:ALL:RELative? 595
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:ABSolute? 595
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:ABSolute? 595
FETCh:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:ABSolute? 595
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:ABSolute? 595
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:RELative? 596
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:RELative? 596
FETCh:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:RELative? 596
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:RELative? 596
FETCh:LTE:SIGN<i>:EBLer[:PCC]:CQIReporting:STReam<s>? 597
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:CQIReporting:STReam<s>? 597
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]:STReam<s>? 598
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>:STReam<s>? 598
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]? 599
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>? 599
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:ALL? 599
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]:MCQI:STReam<s>? 600
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>:MCQI:STReam<s>? 600
FETCh:LTE:SIGN<i>:EBLer:TRACe:CQIReporting[:PCC]:STReam<s>? 600
FETCh:LTE:SIGN<i>:EBLer:TRACe:CQIReporting:SCC<c>:STReam<s>? 600
FETCh:LTE:SIGN<i>:EBLer[:PCC]:RI? 601
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:RI? 601
FETCh:LTE:SIGN<i>:EBLer[:PCC]:PMI:RI<no>? 601
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:PMI:RI<no>? 601
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:TRANsmission:ABSolute? 602
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:TRANsmission:ABSolute? 602
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:TRANsmission:RELative? 603
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:TRANsmission:RELative? 603
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:SUBFrame:ABSolute? 603
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:SUBFrame:ABSolute? 603
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:SUBFrame:RELative? 604
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:SUBFrame:RELative? 604
FETCh:LTE:SIGN<i>:EBLer[:PCC]:UPLink? 605
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:UPLink? 605

FETCh:LTE:SIGN<i>:EBLer[:PCC]:CONFidence?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:CONFidence?

Returns the pass/fail result of a confidence BLER measurement, for one carrier.

Suffix:

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<Confidence> EPASs | EFAil | PASS | FAIL | UNDecided

EPASs, EFAil: early pass, early fail
PASS, FAIL: pass, fail
UNDecided: undecided

Example: See Performing a Confidence BLER Measurement

Usage: Query only

Firmware/Software: V3.0.30
V3.2.80: added value UNDecided and SCC command

FETCh:LTE:SIGN<i>:EBLer:ALL:CONFidence?

Returns the overall pass/fail result of a confidence BLER measurement.

Return values:

<Reliability> See Reliability Indicator

<Confidence> EPASs | EFAil | PASS | FAIL | UNDecided

EPASs, EFAil: early pass, early fail
PASS, FAIL: pass, fail
UNDecided: undecided

Example: See Performing a Confidence BLER Measurement

Usage: Query only

Firmware/Software: V3.2.80

FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:ABSolute?
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:ABSolute?
FETCh:LTE:SIGN<i>:EBLer[:PCC]:ABSolute?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:ABSolute?

Returns the absolute overall results of the BLER measurement for the sum of all DL streams of one carrier.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<c> 1..3

Return values:

<1_Reliability> See Reliability Indicator

<2_ACK> Number of received acknowledgments (sum of all downlink streams)

Range: 0 to 4E+9

<3_NACK> Number of received negative acknowledgments (sum of all downlink streams)

Range: 0 to 4E+9

<4_Subframes> Number of already processed subframes (per downlink stream)

Range: 0 to 2E+9

<5_ThroughputAver>
<6_ThroughputMin>
<7_ThroughputMax> Average, minimum and maximum throughput (sum of all downlink streams)

Default unit: kbit/s

<8_DTX>	Number of sent scheduled subframes for which no ACK and no NACK has been received (sum of all downlink streams) Range: 0 to 4E+9
<9_Scheduled>	Number of already sent scheduled subframes (per downlink stream) Range: 0 to 2E+9
<10_MedianCQI>	Median value of received CQI indices Range: 0 to 15

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V3.0.10
V3.0.30: INTermediate command, max number of subframes enhanced for continuous measurements
V3.2.50: SCC command

FETCh:INTermediate:LTE:SIGN<i>:EBLer:ALL:ABSolute?
FETCh:LTE:SIGN<i>:EBLer:ALL:ABSolute?

Returns the absolute overall results of the BLER measurement for the sum of all downlink streams of all carriers.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	See Reliability Indicator
<2_ACK>	Number of received acknowledgments (sum of all downlink streams) Range: 0 to 4E+9
<3_NACK>	Number of received negative acknowledgments (sum of all downlink streams) Range: 0 to 4E+9
<4_Subframes>	Number of already processed subframes (per downlink stream) Range: 0 to 2E+9
<5_ThroughputAver> <6_ThroughputMin> <7_ThroughputMax>	Average, minimum and maximum throughput (sum of all downlink streams) Default unit: kbit/s
<8_DTX>	Number of sent scheduled subframes for which no ACK and no NACK has been received (sum of all downlink streams) Range: 0 to 4E+9
<9_Scheduled>	Number of already sent scheduled subframes (per downlink stream) Range: 0 to 2E+9

<10_MedianCQI> Median value of received CQI indices
Range: 0 to 15

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V3.2.50

FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:RELative?
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:RELative?
FETCh:LTE:SIGN<i>:EBLer[:PCC]:RELative?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:RELative?

Returns the relative overall results of the BLER measurement for the sum of all DL streams of one carrier.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:
<c> 1..3

Return values:
<1_Reliability> See Reliability Indicator

<2_ACK> Received acknowledgments (percentage of sent scheduled subframes)
Range: 0 % to 100 %
Default unit: %

<3_NACK> Received negative acknowledgments (percentage of sent scheduled subframes)
Range: 0 % to 100 %
Default unit: %

<4_BLER> Block error ratio (percentage of sent scheduled subframes for which no ACK has been received)
Range: 0 % to 100 %
Default unit: %

<5_ThroughputAver> Average DL throughput (as percentage of maximum reachable throughput)
Range: 0 % to 100 %
Default unit: %

<6_DTX> Percentage of sent scheduled subframes for which no ACK and no NACK has been received
Range: 0 % to 100 %
Default unit: %

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V3.0.30, SCC command V3.2.50

FETCh:INTermediate:LTE:SIGN<i>:EBLer:ALL:RELative?
FETCh:LTE:SIGN<i>:EBLer:ALL:RELative?

Returns the relative overall results of the BLER measurement for the sum of all downlink streams of all carriers.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> See Reliability Indicator

<2_ACK> Received acknowledgments (percentage of sent scheduled subframes)
Range: 0 % to 100 %
Default unit: %

<3_NACK> Received negative acknowledgments (percentage of sent scheduled subframes)
Range: 0 % to 100 %
Default unit: %

<4_BLER> Block error ratio (percentage of sent scheduled subframes for which no ACK has been received)
Range: 0 % to 100 %
Default unit: %

<5_ThroughputAver> Average DL throughput (as percentage of maximum reachable throughput)
Range: 0 % to 100 %
Default unit: %

<6_DTX> Percentage of sent scheduled subframes for which no ACK and no NACK has been received
Range: 0 % to 100 %
Default unit: %

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V3.2.50

FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:ABSolute?
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:ABSolute?
FETCh:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:ABSolute?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:ABSolute?

Returns the absolute results of the BLER measurement for one downlink stream of one carrier.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<s>	1..2
<c>	1..3

Return values:

<1_Reliability>	See Reliability Indicator
<2_ACK>	Number of received acknowledgments Range: 0 to 2E+9
<3_NACK>	Number of received negative acknowledgments Range: 0 to 2E+9
<4_Subframes>	Number of already processed subframes Range: 0 to 2E+9
<5_Throughput>	Average DL throughput Default unit: kbit/s
<6_DTX>	Number of sent scheduled subframes for which no ACK and no NACK has been received Range: 0 to 2E+9
<7_Scheduled>	Number of already sent scheduled subframes Range: 0 to 2E+9
<8_MedianCQI>	Median value of received CQI indices Range: 0 to 15

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V3.0.10
V3.0.30: INTermediate command, max number of subframes enhanced for continuous measurements
V3.2.50: SCC command

Options: R&S CMW-KS520

FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:RELative?
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:RELative?
FETCh:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:RELative?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:RELative?

Returns the relative results of the BLER measurement for one downlink stream of one carrier.

Suffix:

<s>	1..2
<c>	1..3

Return values:

<Reliability> See Reliability Indicator

<ACK> Received acknowledgments (percentage of sent scheduled subframes)

Range: 0 % to 100 %
Default unit: %

<NACK> Received negative acknowledgments (percentage of sent scheduled subframes)

Range: 0 % to 100 %
Default unit: %

<BLER> Block error ratio (percentage of sent scheduled subframes for which no ACK has been received)

Range: 0 % to 100 %
Default unit: %

<Throughput> Average DL throughput (percentage of maximum reachable throughput)

Range: 0 % to 100 %
Default unit: %

<DTX> Percentage of sent scheduled subframes for which no ACK and no NACK has been received

Range: 0 % to 100 %
Default unit: %

Example: See Performing a Continuous BLER Measurement

Usage: Query only

Firmware/Software: V3.0.30, SCC command V3.2.50

Options: R&S CMW-KS520

FETCh:LTE:SIGN<i>:EBLer[:PCC]:CQIReporting:STReam<s>?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:CQIReporting:STReam<s>?

Returns the single results of the CQI reporting view for one downlink stream of one carrier.

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<CQImedian> Median reported CQI value

Range: 0 to 15

<RangeAbsolute> Number of reports received for the range from median CQI - 1 to median CQI + 1

Range: 0 to 2E+9

<RangeRelative> <RangeAbsolute> as percentage of total number of received reports

Range: 0 % to 100 %
Default unit: %

<BLER> Block error ratio (percentage of sent scheduled subframes for which no ACK has been received)

Range: 0 % to 100 %
Default unit: %

<TotalNumber> Total number of received CQI reports

Range: 0 to 2E+9

<ExpiredSubframes> Number of already sent scheduled subframes

Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.0.30, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]:STReam<s>?
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>:STReam<s>?

Returns the throughput trace for one downlink stream of one carrier.

Each value is returned as a pair of X-value and Y-value. The number of result pairs n equals the number of subframes to be processed per measurement cycle, divided by 200.

Returned results: <Reliability>, $\langle XValue\rangle_1$, $\langle YValue\rangle_1$, ..., $\langle XValue\rangle_n$, $\langle YValue\rangle_n$

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<XValue> Subframe label, 0 = last processed subframe, -1 = previously processed subframe, and so on

Range: -199800 to 0

<YValue> Throughput value calculated from the BLER result of 200 processed subframes (the labeled subframe and the previous 199 subframes)

Default unit: kbit/s

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V2.0.10, SCC command V3.2.50

Options: R&S CMW-KS520

FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]?
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>?

Returns the throughput trace for the sum of all DL streams of one carrier.

Each value is returned as a pair of X-value and Y-value. The number of result pairs n equals the number of subframes to be processed per measurement cycle, divided by 200.

Returned results: <Reliability>, <XValue>$_1$, <YValue>$_1$, ..., <XValue>$_n$, <YValue>$_n$

Suffix:
<c> 1..3

Return values:
<Reliability> See Reliability Indicator

<XValue> Subframe label, 0 = last processed subframe, -1 = previously processed subframe, and so on
Range: -199800 to 0

<YValue> Throughput value calculated from the BLER result of 200 processed subframes (the labeled subframe and the previous 199 subframes)
Default unit: kbit/s

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V2.0.10. SCC command V3.2.50

FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:ALL?

Returns the throughput trace for the sum of all downlink streams of all carriers.

Each value is returned as a pair of X-value and Y-value. The number of result pairs n equals the number of subframes to be processed per measurement cycle, divided by 200.

Returned results: <Reliability>, <XValue>$_1$, <YValue>$_1$, ..., <XValue>$_n$, <YValue>$_n$

Return values:
<Reliability> See Reliability Indicator

<XValue> Subframe label, 0 = last processed subframe, -1 = previously processed subframe, and so on
Range: -199800 to 0

<YValue> Throughput value calculated from the BLER result of 200 processed subframes (the labeled subframe and the previous 199 subframes)

Default unit: kbit/s

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.50

FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]:MCQI:STReam<s>?
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>:MCQI:STReam<s>?

Returns the median CQI trace for one downlink stream.

Each value is returned as a pair of X-value and Y-value. The number of result pairs n equals the number of subframes to be processed per measurement cycle, divided by 200.

Returned results: <Reliability>, <XValue>$_1$, <YValue>$_1$, ..., <XValue>$_n$, <YValue>$_n$

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<XValue> Subframe label, 0 = last processed subframe, -1 = previously processed subframe, and so on

Range: -199800 to 0

<YValue> Median CQI value calculated from the CQI indices reported within 200 processed subframes (the labeled subframe and the previous 199 subframes)

Range: 0 to 15

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.0.10, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer:TRACe:CQIReporting[:PCC]:STReam<s>?
FETCh:LTE:SIGN<i>:EBLer:TRACe:CQIReporting:SCC<c>:STReam<s>?

Returns the Y-values of the CQI index bar graph for one downlink stream.

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<YValue> Comma-separated list of 16 Y-values, for CQI index 0 to 15

Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.0.10, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:RI?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:RI?

Returns the rank indicator (RI) results.

Suffix:

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<RI> Comma-separated list of two values:
Number of received "RI = 1"
Number of received "RI = 2"

Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.20, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:PMI:RI<no>?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:PMI:RI<no>?

Returns the PMI results for the RI value <no>.

Suffix:

<no> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<PMI> Comma-separated list of values, indicating number of received PMI values
The number of results depends on the number of transmit antennas and the selected RI:
2 antennas, RI = 1: 4 values for PMI = 0, 1, 2, 3
2 antennas, RI = 2: 2 values for PMI = 0, 1
4 antennas: 16 values for PMI = 0, 1, ..., 15
8 ant.: 256 values for $\{PMI2 = 0, ..., 15\}_{PMI1 = 0}, ..., \{...\}_{PMI1 = 15}$

Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.20, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:TRANsmission:ABSolute?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:TRANsmission:ABSolute?

Returns absolute HARQ results for one downlink stream. All columns of the "HARQ per Transmissions" result table are returned:

<Reliability>, $\{$<Sent>, <ACK>, <NACK>, <DTX>$\}_{column\ 1}, \{...\}_{col.\ 2}, \{...\}_{col.\ 3}, \{...\}_{col.\ 4}$

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<Sent> Number of sent subframes

Range: 0 to 2E+9

<ACK> Number of received acknowledgments

Range: 0 to 2E+9

<NACK> Number of received negative acknowledgments

Range: 0 to 2E+9

<DTX> Number of sent subframes for which no ACK and no NACK has been received

Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.10, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:TRANsmission:RELative?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:TRANsmission:RELative?

Returns relative HARQ results for one downlink stream. All columns of the "HARQ per Transmissions" result table are returned:

<Reliability>, {<Sent>, <ACK>, <NACK>, <DTX>}$_{\text{column 1}}$, {...}$_{\text{col. 2}}$, {...}$_{\text{col. 3}}$, {...}$_{\text{col. 4}}$

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<Sent> Sent subframes (percentage of sum of sent subframes over all transmissions)
Range: 0 % to 100 %
Default unit: %

<ACK> Received acknowledgments (percentage of ACK+NACK+DTX in the column)
Range: 0 % to 100 %
Default unit: %

<NACK> Received negative acknowledgments (percentage of ACK +NACK+DTX in the column)
Range: 0 % to 100 %
Default unit: %

<DTX> Sent subframes for which no ACK and no NACK has been received (percentage of ACK+NACK+DTX in the column)
Range: 0 % to 100 %
Default unit: %

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.10, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:SUBFrame:ABSolute?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:SUBFrame:ABSolute?

Returns absolute HARQ results for one downlink stream. All columns of the "HARQ per Subframe" result table are returned:

<Reliability>, {<Sent>, <ACK>, <NACK>, <DTX>}$_{\text{column 0}}$, {...}$_{\text{column 1}}$, ..., {...}$_{\text{column 9}}$

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<Sent> NAV returned, for future use

<ACK> Number of received acknowledgments
Range: 0 to 2E+9

<NACK> Number of received negative acknowledgments
Range: 0 to 2E+9

<DTX> Number of sent subframes for which no ACK and no NACK has been received
Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.10, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:SUBFrame:RELative?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:SUBFrame:RELative?

Returns relative HARQ results for one downlink stream. All columns of the "HARQ per Subframe" result table are returned:

<Reliability>, {<Sent>, <ACK>, <NACK>, <DTX>}$_{\text{column 0}}$, {...}$_{\text{column 1}}$, ..., {...}$_{\text{column 9}}$

Suffix:

<s> 1..2

<c> 1..3

Return values:

<Reliability> See Reliability Indicator

<Sent> NAV returned, for future use

<ACK> Received acknowledgments (percentage of ACK+NACK+DTX in the column)
Range: 0 % to 100 %
Default unit: %

<NACK> Received negative acknowledgments (percentage of ACK +NACK+DTX in the column)
Range: 0 % to 100 %
Default unit: %

<DTX> Sent subframes for which no ACK and no NACK has been received (percentage of ACK+NACK+DTX in the column)
Range: 0 % to 100 %
Default unit: %

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.2.10, SCC command V3.2.70

FETCh:LTE:SIGN<i>:EBLer[:PCC]:UPLink?
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:UPLink?

Returns the uplink results of the BLER measurement.

Suffix:
<c> 1..3

Return values:
<Reliability> See Reliability Indicator

<BLER> Block error ratio (percentage of received uplink subframes with failed CRC check)
Range: 0 % to 100 %
Default unit: %

<Throughput> Average uplink throughput
Default unit: bit/s

<CRCPass> Number of received subframes with passed CRC check
Range: 0 to 2E+9

<CRCFail> Number of received subframes with failed CRC check
Range: 0 to 2E+9

<DTX> Number of scheduled UL subframes not sent by the UE
Range: 0 to 2E+9

Example: See Performing a Single-Shot BLER Measurement

Usage: Query only

Firmware/Software: V3.0.50, SCC command V3.5.20
V3.5.50 added <DTX>

Options: R&S CMW-KS510

2.6.21 RLC Throughput Measurement

The following sections describe the commands related to the "RLC Throughput" measurement.

- Measurement Control and States....605
- Measurement Settings....607
- Measurement Results....609

2.6.21.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:LTE:SIGN<i>:THRoughput.......... 606
STOP:LTE:SIGN<i>:THRoughput.......... 606
ABORt:LTE:SIGN<i>:THRoughput.......... 606
FETCh:LTE:SIGN<i>:THRoughput:STATe?.......... 606
FETCh:LTE:SIGN<i>:THRoughput:STATe:ALL?.......... 607

INITiate:LTE:SIGN<i>:THRoughput
STOP:LTE:SIGN<i>:THRoughput
ABORt:LTE:SIGN<i>:THRoughput

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement. The measurement enters the "RUN" state.
- `STOP...` halts the measurement immediately. The measurement enters the "RDY" state. Measurement results are kept. The resources remain allocated to the measurement.
- `ABORt...` halts the measurement immediately. The measurement enters the "OFF" state. All measurement values are set to NAV. Allocated resources are released.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Example: See Performing an RLC Throughput Measurement

Usage: Event

Firmware/Software: V3.2.80

Manual operation: See "RLC Throughput (Softkey)" on page 237

FETCh:LTE:SIGN<i>:THRoughput:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<State> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

Example: See Performing an RLC Throughput Measurement

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "RLC Throughput (Softkey)" on page 237

FETCh:LTE:SIGN<i>:THRoughput:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MainState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: adjustments finished, measurement running ("adjusted")
INV: not applicable, <MainState> OFF or RDY ("invalid")

<ResourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable, <MainState> OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V3.2.80

Manual operation: See "RLC Throughput (Softkey)" on page 237

2.6.21.2 Measurement Settings

The following commands configure the "RLC Throughput" measurement.

CONFigure:LTE:SIGN<i>:THRoughput:TOUT....608
CONFigure:LTE:SIGN<i>:THRoughput:REPetition....608
CONFigure:LTE:SIGN<i>:THRoughput:UPDate....608
CONFigure:LTE:SIGN<i>:THRoughput:WINDow....609

CONFigure:LTE:SIGN<i>:THRoughput:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY`. The reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results, there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout> Default unit: s

Firmware/Software: V3.2.80

CONFigure:LTE:SIGN<i>:THRoughput:REPetition <Repetition>

Specifies whether the measurement is stopped after a single shot (window size) or repeated continuously.

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Configuring an RLC Throughput Measurement

Firmware/Software: V3.2.80

Manual operation: See "Repetition" on page 238

CONFigure:LTE:SIGN<i>:THRoughput:UPDate <Interval>

Configures the number of subframes used to derive a single throughput result.

Parameters:

<Interval> Range: 200 to 10000
Increment: 100
*RST: 500

Example: See Configuring an RLC Throughput Measurement

Firmware/Software: V3.2.80

Manual operation: See "Update Interval" on page 239

CONFigure:LTE:SIGN<i>:THRoughput:WINDow <Size>

Configures the number of subframes on the X-axis of the throughput diagram (duration of a single-shot measurement).

The size cannot be smaller than the update interval.

Parameters:

<Size>	Range:	200 to 120000
	*RST:	60000

Example: See Configuring an RLC Throughput Measurement

Firmware/Software: V3.2.80

Manual operation: See "Window Size" on page 239

2.6.21.3 Measurement Results

The following commands retrieve the results of the "RLC Throughput" measurement.

FETCh:LTE:SIGN<i>:THRoughput?..........609
READ:LTE:SIGN<i>:THRoughput?..........609
FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?..........610
FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?..........610
READ:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?..........610
READ:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?..........610
FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?..........610
FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?..........610
READ:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?..........610
READ:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?..........610

FETCh:LTE:SIGN<i>:THRoughput?
READ:LTE:SIGN<i>:THRoughput?

Returns the contents of the RLC throughput result table.

Return values:

<Reliability>	See Reliability Indicator
<CurrDlPDU>	Current downlink throughput Default unit: bit/s
<AvgDlPDU>	Average downlink throughput Default unit: bit/s
<MaxDlPDU>	Maximum downlink throughput Default unit: bit/s
<MinDlPDU>	Minimum downlink throughput Default unit: bit/s
<BytesDlPDU>	Number of bytes transmitted in the downlink

<CurrUlPDU>	Current uplink throughput Default unit: bit/s
<AvgUlPDU>	Average uplink throughput Default unit: bit/s
<MaxUlPDU>	Maximum uplink throughput Default unit: bit/s
<MinUlPDU>	Minimum uplink throughput Default unit: bit/s
<BytesUlPDU>	Number of bytes received in the uplink
Example:	See Performing an RLC Throughput Measurement
Usage:	Query only
Firmware/Software:	V3.2.80

FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?
FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?
READ:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?
READ:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?

Returns the values of the uplink throughput traces. The results of the current and average traces can be retrieved.

The number of trace values n depends on the configured update interval and window size: *n = integer (<window size> / <update interval>) + 1*

Return values:

<Reliability>	See Reliability Indicator
<UplinkPDU>	Comma-separated list of n throughput values Default unit: bit/s
Example:	See Performing an RLC Throughput Measurement
Usage:	Query only
Firmware/Software:	V3.2.80

FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?
FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?
READ:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?
READ:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?

Returns the values of the downlink throughput traces. The results of the current and average traces can be retrieved.

The number of trace values n depends on the configured update interval and window size: *n = integer (<window size> / <update interval>) + 1*

Return values:

<Reliability>	See Reliability Indicator

<DownlinkPDU>	Comma-separated list of n throughput values Default unit: bit/s
Example:	See Performing an RLC Throughput Measurement
Usage:	Query only
Firmware/Software:	V3.2.80

2.7 List of Commands

ABORt:LTE:SIGN<i>:EBLer....585
ABORt:LTE:SIGN<i>:THRoughput....606
CALL:LTE:SIGN<i>:PSWitched:ACTion....311
CALL:LTE:SIGN<i>:SCC<c>:ACTion....311
CATalog:LTE:SIGN<i>:CONNection:DEDBearer?....313
CATalog:LTE:SIGN<i>:CONNection:DEFBearer?....313
CATalog:LTE:SIGN<i>:SCENario?....380
CLEan:LTE:SIGN<i>:ELOG....324
CLEan:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt....578
CONFigure:LTE:SIGN<i>:CBS:MESSage:CGRoup?....581
CONFigure:LTE:SIGN<i>:CBS:MESSage:DATA....582
CONFigure:LTE:SIGN<i>:CBS:MESSage:ENABle....579
CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:ALERt....583
CONFigure:LTE:SIGN<i>:CBS:MESSage:ETWS:POPup....584
CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE....583
CONFigure:LTE:SIGN<i>:CBS:MESSage:FILE:INFO?....583
CONFigure:LTE:SIGN<i>:CBS:MESSage:ID....579
CONFigure:LTE:SIGN<i>:CBS:MESSage:IDTYpe....579
CONFigure:LTE:SIGN<i>:CBS:MESSage:LANGuage....581
CONFigure:LTE:SIGN<i>:CBS:MESSage:SERial....580
CONFigure:LTE:SIGN<i>:CBS:MESSage:SOURce....582
CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL....445
CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL....445
CONFigure:LTE:SIGN<i>:CELL:CPRefix....446
CONFigure:LTE:SIGN<i>:CELL:MCC....466
CONFigure:LTE:SIGN<i>:CELL:MNC....466
CONFigure:LTE:SIGN<i>:CELL:MNC:DIGits....466
CONFigure:LTE:SIGN<i>:CELL:NAS:CSLCs....478
CONFigure:LTE:SIGN<i>:CELL:NAS:EMCBs....477
CONFigure:LTE:SIGN<i>:CELL:NAS:EPCLcs....477
CONFigure:LTE:SIGN<i>:CELL:NAS:EPSNetwork....476
CONFigure:LTE:SIGN<i>:CELL:NAS:IMSVops....476
CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex....453
CONFigure:LTE:SIGN<i>:CELL:PRACh:NIPRach....451
CONFigure:LTE:SIGN<i>:CELL:PRACh:NRPReambles....451
CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD....451
CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD....452
CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset....453

CONFigure:LTE:SIGN<i>:CELL:PRACh:PRSTep....451
CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig....453
CONFigure:LTE:SIGN<i>:CELL:RCAuse:ATTach....474
CONFigure:LTE:SIGN<i>:CELL:RCAuse:TAU....474
CONFigure:LTE:SIGN<i>:CELL:RESelection:QUALity:RXLevmin....465
CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:INTRasearch....464
CONFigure:LTE:SIGN<i>:CELL:RESelection:SEARch:NINTrasearch....465
CONFigure:LTE:SIGN<i>:CELL:RESelection:TSLow....465
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CID:EUTRan....467
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:DMTCperiod....454
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:CSAT:ENABle....454
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID....446
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:OFFSduration....455
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:ONSDuration....454
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SCMuting:PMAC....455
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe....450
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SYNC:OFFSet....478
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL....450
CONFigure:LTE:SIGN<i>:CELL:SECurity:AS....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:AUTHenticat....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:IALGorithm....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:MILenage....469
CONFigure:LTE:SIGN<i>:CELL:SECurity:NAS....468
CONFigure:LTE:SIGN<i>:CELL:SECurity:OPC....469
CONFigure:LTE:SIGN<i>:CELL:SECurity:RVALue....469
CONFigure:LTE:SIGN<i>:CELL:SECurity:SKEY....469
CONFigure:LTE:SIGN<i>:CELL:SRS:BWConfig....447
CONFigure:LTE:SIGN<i>:CELL:SRS:DBANdwidth....448
CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle....447
CONFigure:LTE:SIGN<i>:CELL:SRS:HBANdwidth....448
CONFigure:LTE:SIGN<i>:CELL:SRS:MCENable....447
CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:FDD....448
CONFigure:LTE:SIGN<i>:CELL:SRS:SCINdex:TDD....449
CONFigure:LTE:SIGN<i>:CELL:SRS:SFConfig....447
CONFigure:LTE:SIGN<i>:CELL:TAC....467
CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific....449
CONFigure:LTE:SIGN<i>:CELL:TIME:DATE....472
CONFigure:LTE:SIGN<i>:CELL:TIME:DSTime....472
CONFigure:LTE:SIGN<i>:CELL:TIME:LTZoffset....473
CONFigure:LTE:SIGN<i>:CELL:TIME:SATTach....473
CONFigure:LTE:SIGN<i>:CELL:TIME:SNOW....473
CONFigure:LTE:SIGN<i>:CELL:TIME:TIME....472
CONFigure:LTE:SIGN<i>:CELL:TIME:TSOurce....471
CONFigure:LTE:SIGN<i>:CELL:TOUT:OSYNch....470
CONFigure:LTE:SIGN<i>:CELL:TOUT:T<no>....470
CONFigure:LTE:SIGN<i>:CELL:UEIDentity:IMSI....470
CONFigure:LTE:SIGN<i>:CELL[:PCC]:CID:EUTRan....467
CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID....446
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe....450
CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:OFFSet....478

CONFigure:LTE:SIGN<i>:CELL[:PCC]:SYNC:ZONE....478
CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL....450
CONFigure:LTE:SIGN<i>:CONNection:AMDBearer....495
CONFigure:LTE:SIGN<i>:CONNection:APN....486
CONFigure:LTE:SIGN<i>:CONNection:ASEMission....482
CONFigure:LTE:SIGN<i>:CONNection:CDRX:ENABle....521
CONFigure:LTE:SIGN<i>:CONNection:CDRX:ITIMer....521
CONFigure:LTE:SIGN<i>:CONNection:CDRX:LDCYcle....522
CONFigure:LTE:SIGN<i>:CONNection:CDRX:ODTimer....521
CONFigure:LTE:SIGN<i>:CONNection:CDRX:RTIMer....522
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCENable....523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SCTimer....523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SDCYcle....523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:SOFFset....523
CONFigure:LTE:SIGN<i>:CONNection:CDRX:UDSCheduling....524
CONFigure:LTE:SIGN<i>:CONNection:CSFB:DESTination....492
CONFigure:LTE:SIGN<i>:CONNection:CSFB:GSM....492
CONFigure:LTE:SIGN<i>:CONNection:CSFB:TDSCdma....494
CONFigure:LTE:SIGN<i>:CONNection:CSFB:WCDMa....493
CONFigure:LTE:SIGN<i>:CONNection:CTYPe....484
CONFigure:LTE:SIGN<i>:CONNection:DEDBearer....315
CONFigure:LTE:SIGN<i>:CONNection:DLEinsertion....488
CONFigure:LTE:SIGN<i>:CONNection:DLPadding....487
CONFigure:LTE:SIGN<i>:CONNection:DPCYcle....482
CONFigure:LTE:SIGN<i>:CONNection:EASY:BFBW....480
CONFigure:LTE:SIGN<i>:CONNection:EDAU:ENABle....484
CONFigure:LTE:SIGN<i>:CONNection:EDAU:NID....485
CONFigure:LTE:SIGN<i>:CONNection:EDAU:NSEGment....484
CONFigure:LTE:SIGN<i>:CONNection:FCHange....492
CONFigure:LTE:SIGN<i>:CONNection:FCOefficient....483
CONFigure:LTE:SIGN<i>:CONNection:GHOPping....481
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:ENABle....518
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:NHT....519
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:RVCSequence....519
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence....520
CONFigure:LTE:SIGN<i>:CONNection:HARQ:DL:UDSequence:LENGth....519
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:DPHich....518
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:ENABle....517
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:MAXTx....518
CONFigure:LTE:SIGN<i>:CONNection:HARQ:UL:NHT....517
CONFigure:LTE:SIGN<i>:CONNection:IPVersion....485
CONFigure:LTE:SIGN<i>:CONNection:KRRC....487
CONFigure:LTE:SIGN<i>:CONNection:OBCHange....491
CONFigure:LTE:SIGN<i>:CONNection:PSMallowed....482
CONFigure:LTE:SIGN<i>:CONNection:QCI....486
CONFigure:LTE:SIGN<i>:CONNection:RITimer....487
CONFigure:LTE:SIGN<i>:CONNection:RLCMode....485
CONFigure:LTE:SIGN<i>:CONNection:ROHC:ENABle....491
CONFigure:LTE:SIGN<i>:CONNection:ROHC:PROFiles....491
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation....483

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MATRix........504
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:MODE........503
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:BEAMforming:NOLayers........503
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:CEXecute........309
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DCIFormat........496
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:DLEQual........525
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL........557
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:UDEFined........559
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:UDEFined........560
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:UDEFined........559
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:STTI........557
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:MCLuster:DL........558
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL........553
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:UDEFined........555
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:UDEFined........554
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:STTI........553
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:MCLuster:DL........554
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>........541
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FCTTibased:DL<s>:ALL........542
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL........549
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:DL:STTI........548
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPMI:MCLuster:DL........549
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL........551
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:DL:STTI........550
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FPRI:MCLuster:DL........551
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL........544
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:UDEFined........546
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:UDEFined........546
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:UDEFined........545
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:STTI........544
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:MCLuster:DL........545
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:DL........490
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL........489
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:NENBantennas........497
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel........515
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:RPDCch........517
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:SYMBol........514
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PMATrix........498
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:PZERo:MAPPing........502
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:QAM<ModOrder>:DL........490
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:DL<s>........527
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL........531
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:DL<s>........529
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:RBPosition:UL........530
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:UL........528
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:VERSion:DL<s>........530
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel........499
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:ENABle........499
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SCHModel:MIMO<Mimo>........500
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:SEXecute........308

CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:STYPe....488
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<8>:CHMatrix....505
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:EIGHt<line>....513
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:FOUR<line>....511
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CMATrix:TWO<line>....511
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CODewords....507
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:APORts....508
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:POWer....508
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:RESource....509
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:CSIRs:SUBFrame....509
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:NTXantennas....507
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:PMATrix....507
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:BITS....510
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TM<no>:ZP:CSIRs:SUBFrame....510
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:TRANsmission....496
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>....532
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:DL<s>....534
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL....534
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL....533
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>....536
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:ALL....537
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL....538
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:ALL....539
CONFigure:LTE:SIGN<i>:CONNection:SDNSpco....474
CONFigure:LTE:SIGN<i>:CONNection:SIBReconfig....486
CONFigure:LTE:SIGN<i>:CONNection:SRCindex....524
CONFigure:LTE:SIGN<i>:CONNection:SRPRindex....524
CONFigure:LTE:SIGN<i>:CONNection:TAControl....495
CONFigure:LTE:SIGN<i>:CONNection:TMODe....485
CONFigure:LTE:SIGN<i>:CONNection:UECategory:CZALlowed....482
CONFigure:LTE:SIGN<i>:CONNection:UECategory:MANual....481
CONFigure:LTE:SIGN<i>:CONNection:UECategory:REPorted....481
CONFigure:LTE:SIGN<i>:CONNection:UETSelection....488
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MATRix....504
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:MODE....503
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:BEAMforming:NOLayers....503
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DCIFormat....496
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:DLEQual....525
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL....557
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:CSIRs:UDEFined....559
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:SSUBframe:UDEFined....560
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:UDEFined....559
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:STTI....557
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:MCLuster:DL....558
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL....553
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:SSUBframe:UDEFined....555
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:UDEFined....554
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:STTI....553
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCRI:MCLuster:DL....554
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>....541

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FCTTibased:DL<s>:ALL....542
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL.... 549
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:DL:STTI....548
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPMI:MCLuster:DL....549
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL....551
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:DL:STTI....550
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FPRI:MCLuster:DL.... 551
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL....544
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:CSIRs:UDEFined....546
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:SSUBframe:UDEFined....546
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:UDEFined....545
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:STTI....544
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:MCLuster:DL....545
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:DL.... 490
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL.... 489
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:NENBantennas....497
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel.... 515
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:RPDCch.... 517
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:SYMBol.... 514
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PMATrix....498
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:PZERo:MAPPing....502
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:QAM<ModOrder>:DL.... 490
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:DL<s>....527
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL.... 531
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:RBPosition:DL<s>....529
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:RBPosition:UL....530
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:UL....528
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:VERSion:DL<s>.... 530
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel.... 499
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:ENABle....499
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SCHModel:MIMO<Mimo>.... 500
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>....562
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:SINTerval.... 562
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:TIConfig....562
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL....563
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:STYPe.... 488
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<8>:CHMatrix.... 505
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:EIGHt<line>....513
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:FOUR<line>.... 511
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CMATrix:TWO<line>....511
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CODewords....507
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:APORts....508
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:POWer....508
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:RESource.... 509
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:CSIRs:SUBFrame....509
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:NTXantennas.... 507
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:PMATrix.... 507
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:BITS....510
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TM<no>:ZP:CSIRs:SUBFrame.... 510
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TRANsmission....496

CONFigure:LTE:SIGN<i>:CONNection[:PCC]:TTIBundling....490
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s>....532
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:DL<s>....534
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL....534
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL....533
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>....536
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:ALL....537
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL....538
CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:ALL....539
CONFigure:LTE:SIGN<i>:CQIReporting:CSIRmode....565
CONFigure:LTE:SIGN<i>:CQIReporting:ENABle....565
CONFigure:LTE:SIGN<i>:CQIReporting:PRIReporting:ENABle....565
CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex:TDD....566
CONFigure:LTE:SIGN<i>:CQIReporting:SCC<c>:CINDex[:FDD]....566
CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex:TDD....566
CONFigure:LTE:SIGN<i>:CQIReporting[:PCC]:CINDex[:FDD]....566
CONFigure:LTE:SIGN<i>:DL:SCC<c>:AWGN....431
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:MODE....430
CONFigure:LTE:SIGN<i>:DL:SCC<c>:CSIRs:POFFset....431
CONFigure:LTE:SIGN<i>:DL:SCC<c>:OCNG....429
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PBCH:POFFset....427
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PCFich:POFFset....428
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDCCh:POFFset....429
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:PA....429
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PDSCh:RINDex....430
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PHICh:POFFset....428
CONFigure:LTE:SIGN<i>:DL:SCC<c>:POWer:PORTs....430
CONFigure:LTE:SIGN<i>:DL:SCC<c>:PSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL:SCC<c>:RSEPre:LEVel....426
CONFigure:LTE:SIGN<i>:DL:SCC<c>:SSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL[:PCC]:AWGN....431
CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:MODE....430
CONFigure:LTE:SIGN<i>:DL[:PCC]:CSIRs:POFFset....431
CONFigure:LTE:SIGN<i>:DL[:PCC]:OCNG....429
CONFigure:LTE:SIGN<i>:DL[:PCC]:PBCH:POFFset....427
CONFigure:LTE:SIGN<i>:DL[:PCC]:PCFich:POFFset....428
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDCCh:POFFset....429
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:PA....429
CONFigure:LTE:SIGN<i>:DL[:PCC]:PDSCh:RINDex....430
CONFigure:LTE:SIGN<i>:DL[:PCC]:PHICh:POFFset....428
CONFigure:LTE:SIGN<i>:DL[:PCC]:POWer:PORTs....430
CONFigure:LTE:SIGN<i>:DL[:PCC]:PSS:POFFset....427
CONFigure:LTE:SIGN<i>:DL[:PCC]:RSEPre:LEVel....426
CONFigure:LTE:SIGN<i>:DL[:PCC]:SSS:POFFset....427
CONFigure:LTE:SIGN<i>:EBLer:CONFidence:LERate....590
CONFigure:LTE:SIGN<i>:EBLer:CONFidence:MTTime....589
CONFigure:LTE:SIGN<i>:EBLer:CONFidence:OASCondition....589
CONFigure:LTE:SIGN<i>:EBLer:ERCalc....589
CONFigure:LTE:SIGN<i>:EBLer:REPetition....588
CONFigure:LTE:SIGN<i>:EBLer:SCONdition....588

CONFigure:LTE:SIGN<i>:EBLer:SFRames....588
CONFigure:LTE:SIGN<i>:EBLer:TOUT....587
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:NOISe?....424
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:BWIDth:RATio....424
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:ENABle....424
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:FOFFset....417
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:AWGN:SNRatio....425
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift....422
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:DSHift:MODE....421
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ENABle....417
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:GLOBal:SEED....420
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:LOSS....420
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:MODE....420
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:PROFile....418
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart....419
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:RESTart:MODE....419
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:ENABle....416
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:STANdard:PROFile....417
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe:TOTal?....423
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:NOISe?....422
CONFigure:LTE:SIGN<i>:FADing:SCC<c>:POWer:SUM?....423
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:NOISe?....424
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:BWIDth:RATio....424
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:ENABle....424
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:FOFFset....417
CONFigure:LTE:SIGN<i>:FADing[:PCC]:AWGN:SNRatio....425
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift....422
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:DSHift:MODE....421
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ENABle....417
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:GLOBal:SEED....420
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:LOSS....420
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:MODE....420
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:PROFile....418
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart....419
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:RESTart:MODE....419
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:ENABle....416
CONFigure:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:STANdard:PROFile....417
CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe:TOTal?....423
CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:NOISe?....422
CONFigure:LTE:SIGN<i>:FADing[:PCC]:POWer:SUM?....423
CONFigure:LTE:SIGN<i>:IQIN:SCC<c>:PATH<n>....404
CONFigure:LTE:SIGN<i>:IQIN[:PCC]:PATH<n>....404
CONFigure:LTE:SIGN<i>:MMONitor:ENABle....584
CONFigure:LTE:SIGN<i>:MMONitor:IPADdress....584
CONFigure:LTE:SIGN<i>:NCELl:ALL:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:CDMA:CELL<n>....461
CONFigure:LTE:SIGN<i>:NCELl:CDMA:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:EVDO:CELL<n>....461
CONFigure:LTE:SIGN<i>:NCELl:EVDO:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:GSM:CELL<n>....459

CONFigure:LTE:SIGN<i>:NCELl:GSM:THResholds:LOW....456
CONFigure:LTE:SIGN<i>:NCELl:LTE:CELL<n>....458
CONFigure:LTE:SIGN<i>:NCELl:LTE:THResholds:LOW....456
CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:CELL<n>....463
CONFigure:LTE:SIGN<i>:NCELl:TDSCdma:THResholds:LOW....457
CONFigure:LTE:SIGN<i>:NCELl:WCDMa:CELL<n>....460
CONFigure:LTE:SIGN<i>:NCELl:WCDMa:THResholds:LOW....456
CONFigure:LTE:SIGN<i>:RFSettings:ALL:BWCHannel....405
CONFigure:LTE:SIGN<i>:RFSettings:EDC:INPut....402
CONFigure:LTE:SIGN<i>:RFSettings:EDC:OUTPut....402
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:DL....407
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL....407
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut....402
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:OUTPut<n>....402
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode....409
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower....409
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:DL....407
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL....408
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset....410
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:BINDicator....412
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MAXimum....412
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:DL:MINimum....412
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MAXimum?....414
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:CHANnel:UL:MINimum....414
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MAXimum?....414
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:DL:MINimum....413
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MAXimum?....415
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:FREQuency:UL:MINimum?....415
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UDEFined:UDSeparation....411
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin....410
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:DL....407
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL....407
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut....402
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:OUTPut<n>....402
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode....409
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower....409
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL....407
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:DL:UCSPecific....408
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL....408
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific....408
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset....410
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:BINDicator....412
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:DL:MAXimum....412
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:DL:MINimum....412
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:UL:MAXimum?....414
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:CHANnel:UL:MINimum....414
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MAXimum?....414
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:DL:MINimum....413
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:UL:MAXimum?....415
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:FREQuency:UL:MINimum?....415

CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UDEFined:UDSeparation....411
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin....410
CONFigure:LTE:SIGN<i>:SCC:AMODe....307
CONFigure:LTE:SIGN<i>:SCC<c>:BAND....406
CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE....308
CONFigure:LTE:SIGN<i>:SCC<c>:DMODe....306
CONFigure:LTE:SIGN<i>:SCC<c>:UUL....307
CONFigure:LTE:SIGN<i>:SMS:INComing:FILE....576
CONFigure:LTE:SIGN<i>:SMS:INComing:FILE:INFO?....576
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:BINary....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:CGRoup....573
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:DCODing....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE....575
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:FILE:INFO?....575
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:INTernal....571
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:LHANdling....570
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MCLass....573
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:MESHandling....571
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OADDress....574
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:OSADdress....573
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:PIDentifier....572
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:DATE....574
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TIME....575
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:SCTStamp:TSOurce....574
CONFigure:LTE:SIGN<i>:SMS:OUTGoing:UDHeader....572
CONFigure:LTE:SIGN<i>:THRoughput:REPetition....608
CONFigure:LTE:SIGN<i>:THRoughput:TOUT....608
CONFigure:LTE:SIGN<i>:THRoughput:UPDate....608
CONFigure:LTE:SIGN<i>:THRoughput:WINDow....609
CONFigure:LTE:SIGN<i>:UECapability:RFBands:ALL....495
CONFigure:LTE:SIGN<i>:UEReport:ENABle....567
CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRP....569
CONFigure:LTE:SIGN<i>:UEReport:FCOefficient:RSRQ....569
CONFigure:LTE:SIGN<i>:UEReport:MCSCell....569
CONFigure:LTE:SIGN<i>:UEReport:MGENable....568
CONFigure:LTE:SIGN<i>:UEReport:MGPeriod....568
CONFigure:LTE:SIGN<i>:UEReport:RINTerval....568
CONFigure:LTE:SIGN<i>:UEReport:WMQuantity....569
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:EASettings....434
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:ADVanced....438
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:ADVanced....437
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:ADVanced....437
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:ADVanced....436
CONFigure:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:ADVanced....438
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PMAX....432
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:OLNPower....434
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower....441
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:CLTPower:OFFSet....442
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:PEXecute....440
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:RPControl....441

CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SET 440
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:SINGle 442
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:TPOWer 441
CONFigure:LTE:SIGN<i>:UL:SCC<c>:PUSCh:TPC:UDPattern 443
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:EASettings 434
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:ADVanced 438
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:ADVanced 437
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:ADVanced 437
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:ADVanced 436
CONFigure:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:ADVanced 438
CONFigure:LTE:SIGN<i>:UL[:PCC]:JUPower 432
CONFigure:LTE:SIGN<i>:UL[:PCC]:PMAX 432
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:OLNPower 434
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:CLTPower 441
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:PEXecute 440
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:RPControl 441
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SET 440
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:SINGle 442
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:TPOWer 441
CONFigure:LTE:SIGN<i>:UL[:PCC]:PUSCh:TPC:UDPattern 443
CONFigure:LTE:SIGN<i>[:PCC]:BAND 406
CONFigure:LTE:SIGN<i>[:PCC]:DMODe 306
CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific 307
FETCh:INTermediate:LTE:SIGN<i>:EBLer:ALL:ABSolute? 593
FETCh:INTermediate:LTE:SIGN<i>:EBLer:ALL:RELative? 595
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:ABSolute? 592
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:RELative? 594
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:ABSolute? 595
FETCh:INTermediate:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:RELative? 596
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:ABSolute? 592
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:RELative? 594
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:ABSolute? 595
FETCh:INTermediate:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:RELative? 596
FETCh:LTE:SIGN<i>:EBLer:ALL:ABSolute? 593
FETCh:LTE:SIGN<i>:EBLer:ALL:CONFidence? 592
FETCh:LTE:SIGN<i>:EBLer:ALL:RELative? 595
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:ABSolute? 592
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:CONFidence? 591
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:CQIReporting:STReam<s>? 597
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:SUBFrame:ABSolute? 603
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:SUBFrame:RELative? 604
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:TRANsmission:ABSolute? 602
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:HARQ:STReam<s>:TRANsmission:RELative? 603
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:PMI:RI<no>? 601
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:RELative? 594
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:RI? 601
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:ABSolute? 595
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:STReam<s>:RELative? 596
FETCh:LTE:SIGN<i>:EBLer:SCC<c>:UPLink? 605
FETCh:LTE:SIGN<i>:EBLer:STATe:ALL? 586

FETCh:LTE:SIGN<i>:EBLer:STATe?....586
FETCh:LTE:SIGN<i>:EBLer:TRACe:CQIReporting:SCC<c>:STReam<s>?....600
FETCh:LTE:SIGN<i>:EBLer:TRACe:CQIReporting[:PCC]:STReam<s>?....600
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:ALL?....599
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>:MCQI:STReam<s>?....600
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>:STReam<s>?....598
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput:SCC<c>?....599
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]:MCQI:STReam<s>?....600
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]:STReam<s>?....598
FETCh:LTE:SIGN<i>:EBLer:TRACe:THRoughput[:PCC]?....599
FETCh:LTE:SIGN<i>:EBLer[:PCC]:ABSolute?....592
FETCh:LTE:SIGN<i>:EBLer[:PCC]:CONFidence?....591
FETCh:LTE:SIGN<i>:EBLer[:PCC]:CQIReporting:STReam<s>?....597
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:SUBFrame:ABSolute?....603
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:SUBFrame:RELative?....604
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:TRANsmission:ABSolute?....602
FETCh:LTE:SIGN<i>:EBLer[:PCC]:HARQ:STReam<s>:TRANsmission:RELative?....603
FETCh:LTE:SIGN<i>:EBLer[:PCC]:PMI:RI<no>?....601
FETCh:LTE:SIGN<i>:EBLer[:PCC]:RELative?....594
FETCh:LTE:SIGN<i>:EBLer[:PCC]:RI?....601
FETCh:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:ABSolute?....595
FETCh:LTE:SIGN<i>:EBLer[:PCC]:STReam<s>:RELative?....596
FETCh:LTE:SIGN<i>:EBLer[:PCC]:UPLink?....605
FETCh:LTE:SIGN<i>:PSWitched:STATe?....311
FETCh:LTE:SIGN<i>:SCC<c>:STATe?....312
FETCh:LTE:SIGN<i>:THRoughput:STATe:ALL?....607
FETCh:LTE:SIGN<i>:THRoughput:STATe?....606
FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?....610
FETCh:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?....610
FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?....610
FETCh:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?....610
FETCh:LTE:SIGN<i>:THRoughput?....609
INITiate:LTE:SIGN<i>:EBLer....585
INITiate:LTE:SIGN<i>:THRoughput....606
PREPare:LTE:SIGN<i>:CONNection:DEDBearer....313
PREPare:LTE:SIGN<i>:CONNection:DEDBearer:SEParate....314
PREPare:LTE:SIGN<i>:HANDover....317
PREPare:LTE:SIGN<i>:HANDover:CATalog:DESTination?....316
PREPare:LTE:SIGN<i>:HANDover:CTYPe....317
PREPare:LTE:SIGN<i>:HANDover:DESTination....316
PREPare:LTE:SIGN<i>:HANDover:ENHanced....318
PREPare:LTE:SIGN<i>:HANDover:EXTernal:CDMA....319
PREPare:LTE:SIGN<i>:HANDover:EXTernal:DESTination....319
PREPare:LTE:SIGN<i>:HANDover:EXTernal:EVDO....319
PREPare:LTE:SIGN<i>:HANDover:EXTernal:GSM....320
PREPare:LTE:SIGN<i>:HANDover:EXTernal:LTE....321
PREPare:LTE:SIGN<i>:HANDover:EXTernal:TDSCdma....321
PREPare:LTE:SIGN<i>:HANDover:EXTernal:WCDMa....322
PREPare:LTE:SIGN<i>:HANDover:MMODe....316
READ:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?....610

READ:LTE:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?....610
READ:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?....610
READ:LTE:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?....610
READ:LTE:SIGN<i>:THRoughput?....609
ROUTe:LTE:SIGN<i>:SCENario:CAFF:FLEXible:INTernal....391
ROUTe:LTE:SIGN<i>:SCENario:CAFF:FLEXible[:EXTernal]....391
ROUTe:LTE:SIGN<i>:SCENario:CAFRfout:FLEXible....389
ROUTe:LTE:SIGN<i>:SCENario:CATF:FLEXible:INTernal....389
ROUTe:LTE:SIGN<i>:SCENario:CATF:FLEXible[:EXTernal]....390
ROUTe:LTE:SIGN<i>:SCENario:CATRfout:FLEXible....388
ROUTe:LTE:SIGN<i>:SCENario:CC:FLEXible....392
ROUTe:LTE:SIGN<i>:SCENario:CCMP:FLEXible....393
ROUTe:LTE:SIGN<i>:SCENario:CCMS<c>:FLEXible....394
ROUTe:LTE:SIGN<i>:SCENario:CF....394
ROUTe:LTE:SIGN<i>:SCENario:CFF:INTernal....395
ROUTe:LTE:SIGN<i>:SCENario:CFF[:EXTernal]....396
ROUTe:LTE:SIGN<i>:SCENario:DD:FLEXible....397
ROUTe:LTE:SIGN<i>:SCENario:DH....398
ROUTe:LTE:SIGN<i>:SCENario:DHF:INTernal....399
ROUTe:LTE:SIGN<i>:SCENario:DHF[:EXTernal]....400
ROUTe:LTE:SIGN<i>:SCENario:FRO:FLEXible....384
ROUTe:LTE:SIGN<i>:SCENario:IORI:FLEXible....384
ROUTe:LTE:SIGN<i>:SCENario:MTFading:FLEXible:INTernal....387
ROUTe:LTE:SIGN<i>:SCENario:MTFading:FLEXible[:EXTernal]....387
ROUTe:LTE:SIGN<i>:SCENario:SCELl:FLEXible....383
ROUTe:LTE:SIGN<i>:SCENario:SCFading:FLEXible:INTernal....385
ROUTe:LTE:SIGN<i>:SCENario:SCFading:FLEXible[:EXTernal]....385
ROUTe:LTE:SIGN<i>:SCENario:TRO:FLEXible....383
ROUTe:LTE:SIGN<i>:SCENario:TROFading:FLEXible:INTernal....386
ROUTe:LTE:SIGN<i>:SCENario:TROFading:FLEXible[:EXTernal]....386
ROUTe:LTE:SIGN<i>:SCENario?....380
ROUTe:LTE:SIGN<i>?....381
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:ALL?....526
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>:STReam<s>?....525
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL:SCC<c>?....526
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]:STReam<s>?....525
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:DL[:PCC]?....526
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL:SCC<c>?....527
SENSe:LTE:SIGN<i>:CONNection:ETHRoughput:UL[:PCC]?....527
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:CSIRs:DETermined?....561
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:DETermined?....560
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCPRi:DL:MCSTable:SSUBframe:DETermined?....561
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:DETermined?....555
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FCRI:DL:MCSTable:SSUBframe:DETermined?....556
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:CSIRs:DETermined?....547
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:DETermined?....547
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:FWBCqi:DL:MCSTable:SSUBframe:DETermined?....548
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:ALEVel?....516
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:PDCCh:PSYMbols?....515
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:TSCHeme?....497

SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:DL<s>:CRATe:ALL?..535
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:UL:CRATe:ALL?..536
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:DL<s>:CRATe:ALL?..540
SENSe:LTE:SIGN<i>:CONNection:SCC<c>:UDTTibased:UL:CRATe:ALL?...541
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:CSIRs:DETermined?..............................561
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:DETermined?..560
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCPRi:DL:MCSTable:SSUBframe:DETermined?......................561
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:DETermined?...555
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FCRI:DL:MCSTable:SSUBframe:DETermined?.........................556
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:CSIRs:DETermined?..........................547
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:DETermined?.......................................547
SENSe:LTE:SIGN<i>:CONNection[:PCC]:FWBCqi:DL:MCSTable:SSUBframe:DETermined?...................548
SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:ALEVel?..516
SENSe:LTE:SIGN<i>:CONNection[:PCC]:PDCCh:PSYMbols?...515
SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:DL<s>:CRATe:ALL?..564
SENSe:LTE:SIGN<i>:CONNection[:PCC]:SPS:UL:CRATe:ALL?...564
SENSe:LTE:SIGN<i>:CONNection[:PCC]:TSCHeme?..497
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:DL<s>:CRATe:ALL?..535
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:UL:CRATe:ALL?...536
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:DL<s>:CRATe:ALL?..540
SENSe:LTE:SIGN<i>:CONNection[:PCC]:UDTTibased:UL:CRATe:ALL?..541
SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:ROFFset?..567
SENSe:LTE:SIGN<i>:CQIReporting:SCC<c>:RPERiod?...566
SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:ROFFset?...567
SENSe:LTE:SIGN<i>:CQIReporting[:PCC]:RPERiod?...566
SENSe:LTE:SIGN<i>:DL:SCC<c>:FCPower?...426
SENSe:LTE:SIGN<i>:DL[:PCC]:FCPower?..426
SENSe:LTE:SIGN<i>:ELOG:ALL?..324
SENSe:LTE:SIGN<i>:ELOG:LAST?..323
SENSe:LTE:SIGN<i>:FADing:SCC<c>:FSIMulator:ILOSs:CSAMples<n>?...421
SENSe:LTE:SIGN<i>:FADing[:PCC]:FSIMulator:ILOSs:CSAMples<path>?...421
SENSe:LTE:SIGN<i>:IQOut:SCC<c>:PATH<n>?..403
SENSe:LTE:SIGN<i>:IQOut[:PCC]:PATH<n>?...403
SENSe:LTE:SIGN<i>:RRCState?..310
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:DCODing?...577
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MLENgth?...577
SENSe:LTE:SIGN<i>:SMS:INComing:INFO:MTEXt?...577
SENSe:LTE:SIGN<i>:SMS:INFO:LRMessage:RFLag?..578
SENSe:LTE:SIGN<i>:SMS:OUTGoing:INFO:LMSent?...576
SENSe:LTE:SIGN<i>:UECapability:ASRelease?...333
SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTer?..369
SENSe:LTE:SIGN<i>:UECapability:CPINdication:FREQuency:INTRa?..369
SENSe:LTE:SIGN<i>:UECapability:CPINdication:UTRan?..369
SENSe:LTE:SIGN<i>:UECapability:DCIulca?..368
SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSCg?..373
SENSe:LTE:SIGN<i>:UECapability:DCParameters:DTSPlit?...373
SENSe:LTE:SIGN<i>:UECapability:DTYPe?..335
SENSe:LTE:SIGN<i>:UECapability:ERLField?...372
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RNADd?..334
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators:RTEN?...334

SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:FGINdicators?....334
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECCMob?....366
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECDual?....366
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:CXRTt:ECSFb?....366
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTDD?....362
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:EREDirection:UTRA?....361
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:PHGeran?....363
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:IRAT:GERan:SUPPorted?....362
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTer?....370
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:FREQuency:INTRa?....370
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:NCSacq:UTRan?....371
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:CCSSupport?....340
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:MCPCsupport?....341
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:NURClist?....341
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:PDSupport?....340
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:SPPSupport?....341
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TAPPsupport?....339
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:TWEFsupport?....340
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:USRSsupport?....338
SENSe:LTE:SIGN<i>:UECapability:FAUeeutra:PLAYer:UTASupported?....338
SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RNADd?....334
SENSe:LTE:SIGN<i>:UECapability:FGINdicators:RTEN?....334
SENSe:LTE:SIGN<i>:UECapability:FGINdicators?....334
SENSe:LTE:SIGN<i>:UECapability:IDCindex?....367
SENSe:LTE:SIGN<i>:UECapability:IRAT:CDMA2000:NWSHaring?....364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:RCONfig?....364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:SUPPorted?....364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CHRPd:TCONfig?....364
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECCMob?....366
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECDual?....366
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:ECSFb?....366
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:RCONfig?....365
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:SUPPorted?....365
SENSe:LTE:SIGN<i>:UECapability:IRAT:CXRTt:TCONfig?....365
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:DTM?....363
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:EREDirection?....363
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:PHGeran?....363
SENSe:LTE:SIGN<i>:UECapability:IRAT:GERan:SUPPorted?....362
SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:EREDirection:UTRA?....361
SENSe:LTE:SIGN<i>:UECapability:IRAT:UFDD:SUPPorted?....361
SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:EREDirection:UTDD?....362
SENSe:LTE:SIGN<i>:UECapability:IRAT:UTDD128:SUPPorted?....362
SENSe:LTE:SIGN<i>:UECapability:LMMeas?....372
SENSe:LTE:SIGN<i>:UECapability:MAC:LCSPtimer?....374
SENSe:LTE:SIGN<i>:UECapability:MAC:LDRXcommand?....374
SENSe:LTE:SIGN<i>:UECapability:MBMS:NSCell?....368
SENSe:LTE:SIGN<i>:UECapability:MBMS:SCELl?....368
SENSe:LTE:SIGN<i>:UECapability:MEAS:BFINterrupt?....360
SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps:V<number>?....355
SENSe:LTE:SIGN<i>:UECapability:MEAS:IFNGaps?....351

SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CHRPd? 354
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:CXRTt? 355
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:GERan? 353
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UFDD? 352
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:UTDD<n>? 352
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CHRPd? 358
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:CXRTt? 359
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:GERan? 358
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UFDD? 356
SENSe:LTE:SIGN<i>:UECapability:MEAS:IRNGaps:V<number>:UTDD<n>? 357
SENSe:LTE:SIGN<i>:UECapability:MEAS:RMWideband? 360
SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTer? 370
SENSe:LTE:SIGN<i>:UECapability:NCSacq:FREQuency:INTRa? 370
SENSe:LTE:SIGN<i>:UECapability:NCSacq:UTRan? 371
SENSe:LTE:SIGN<i>:UECapability:PDCP:MRCSessions? 336
SENSe:LTE:SIGN<i>:UECapability:PDCP:SNEXtension? 337
SENSe:LTE:SIGN<i>:UECapability:PDCP:SRCContinue? 337
SENSe:LTE:SIGN<i>:UECapability:PDCP:SRPRofiles? 336
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CCSSupport? 340
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CIHandl? 342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:CSFSet? 346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:DSDCell? 346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLFsupport? 339
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EDLTsupport? 339
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EFTCodebook? 344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EHPFdd? 344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:EPDCch? 342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:ITCWithdiff? 344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:MACReporting? 342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:MCPCsupport? 341
SENSe:LTE:SIGN<i>:UECapability:PLAYer:NRRT? 346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:NURClist? 341
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PDSupport? 340
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PFMode? 345
SENSe:LTE:SIGN<i>:UECapability:PLAYer:PSPSfset? 346
SENSe:LTE:SIGN<i>:UECapability:PLAYer:SCIHandl? 342
SENSe:LTE:SIGN<i>:UECapability:PLAYer:SPPSupport? 341
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TAPPsupport? 339
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TDPChselect? 343
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TFCPcelldplx? 344
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCFddpcell? 345
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TRCTddpcell? 345
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TSSubframe? 343
SENSe:LTE:SIGN<i>:UECapability:PLAYer:TWEFsupport? 340
SENSe:LTE:SIGN<i>:UECapability:PLAYer:ULComp? 343
SENSe:LTE:SIGN<i>:UECapability:PLAYer:USRSsupport? 338
SENSe:LTE:SIGN<i>:UECapability:PLAYer:UTASupported? 338
SENSe:LTE:SIGN<i>:UECapability:PPINdex? 367
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:BCSet? 348
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:DL? 349

SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:BCLass:UL?..........349
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:DL?...349
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>:MCAPability:UL?...349
SENSe:LTE:SIGN<i>:UECapability:RF:BCOMbination:V<Number>:EUTRa<BandNr>?............................348
SENSe:LTE:SIGN<i>:UECapability:RF:FBPadjust?..350
SENSe:LTE:SIGN<i>:UECapability:RF:FBRetrieval?.. 350
SENSe:LTE:SIGN<i>:UECapability:RF:HDUPlex?.. 347
SENSe:LTE:SIGN<i>:UECapability:RF:RBANds?.. 350
SENSe:LTE:SIGN<i>:UECapability:RF:SUPPorted?.. 347
SENSe:LTE:SIGN<i>:UECapability:RREPort?...335
SENSe:LTE:SIGN<i>:UECapability:SL:CSTX?...374
SENSe:LTE:SIGN<i>:UECapability:SL:DSLSs?... 375
SENSe:LTE:SIGN<i>:UECapability:SL:DSPRoc?...376
SENSe:LTE:SIGN<i>:UECapability:SL:DSRalloc?...375
SENSe:LTE:SIGN<i>:UECapability:SL:DUSRalloc?..375
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RNADd?....................................... 334
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators:RTEN?...334
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:FGINdicators?.. 334
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECCMob?....................................366
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECDual?....................................... 366
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:CXRTt:ECSFb?.. 366
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTDD?...............................362
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:EREDirection:UTRA?...............................361
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:PHGeran?...................................363
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:IRAT:GERan:SUPPorted?.................................362
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTer?.............................370
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:FREQuency:INTRa?........................... 370
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:NCSacq:UTRan?...371
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:CCSSupport?..340
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:MCPCsupport?.....................................341
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:NURClist?.. 341
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:PDSupport?..340
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:SPPSupport?....................................... 341
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TAPPsupport?......................................339
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:TWEFsupport?.....................................340
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:USRSsupport?..................................... 338
SENSe:LTE:SIGN<i>:UECapability:TAUeeutra:PLAYer:UTASupported?.................................. 338
SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:LMIDle?..371
SENSe:LTE:SIGN<i>:UECapability:UBNPmeas:SGLocation?.. 371
SENSe:LTE:SIGN<i>:UECapability:UECategory:DL?..333
SENSe:LTE:SIGN<i>:UECapability:UECategory:UL?..333
SENSe:LTE:SIGN<i>:UECapability:UECategory?.. 333
SENSe:LTE:SIGN<i>:UECapability:URTTimediff?...367
SENSe:LTE:SIGN<i>:UECapability:WIW:WIAPolicies?...373
SENSe:LTE:SIGN<i>:UECapability:WIW:WIRRules?...372
SENSe:LTE:SIGN<i>:UEReport:NCELl:CDMA:CELL<no>?...330
SENSe:LTE:SIGN<i>:UEReport:NCELl:EVDO:CELL<no>?... 331
SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>:RANGe?...329
SENSe:LTE:SIGN<i>:UEReport:NCELl:GSM:CELL<no>?...328
SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>:RANGe?... 328

SENSe:LTE:SIGN<i>:UEReport:NCELl:LTE:CELL<no>?....327
SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>:RANGe?....331
SENSe:LTE:SIGN<i>:UEReport:NCELl:TDSCdma:CELL<no>?....331
SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>:RANGe?....330
SENSe:LTE:SIGN<i>:UEReport:NCELl:WCDMa:CELL<no>?....329
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP:RANGe?....325
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRP?....325
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ:RANGe?....326
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:RSRQ?....326
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl:RANGe?....327
SENSe:LTE:SIGN<i>:UEReport:SCC<c>:SCELl?....326
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRP:RANGe?....325
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRP?....325
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRQ:RANGe?....326
SENSe:LTE:SIGN<i>:UEReport[:PCC]:RSRQ?....326
SENSe:LTE:SIGN<i>:UEReport[:PCC]:SCELl:RANGe?....327
SENSe:LTE:SIGN<i>:UEReport[:PCC]:SCELl?....326
SENSe:LTE:SIGN<i>:UESinfo:IMEI?....376
SENSe:LTE:SIGN<i>:UESinfo:IMSI?....376
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer:SEParate?....378
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:DEDBearer?....378
SENSe:LTE:SIGN<i>:UESinfo:UEADdress:IPV<n>?....377
SENSe:LTE:SIGN<i>:UESinfo:UEUSage?....377
SENSe:LTE:SIGN<i>:UESinfo:VDPReference?....377
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EOPower?....439
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:EPPPower?....439
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PATHloss?....438
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PCALpha:BASic?....436
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PIRPower:BASic?....435
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:PNPusch:BASic?....435
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:RSPower:BASic?....434
SENSe:LTE:SIGN<i>:UL:SCC<c>:APPower:TPRRcsetup:BASic?....436
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EOPower?....439
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:EPPPower?....439
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PATHloss?....438
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PCALpha:BASic?....436
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PIRPower:BASic?....435
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:PNPusch:BASic?....435
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:RSPower:BASic?....434
SENSe:LTE:SIGN<i>:UL[:PCC]:APPower:TPRRcsetup:BASic?....436
SOURce:LTE:SIGN<i>:CELL:STATe....309
SOURce:LTE:SIGN<i>:CELL:STATe:ALL?....310
STOP:LTE:SIGN<i>:EBLer....585
STOP:LTE:SIGN<i>:THRoughput....606

3 LTE Multi-Evaluation Measurement

The LTE multi-evaluation measurement provides quick and flexible TX tests on LTE uplink signals. FDD and TDD are supported. An RX test (block error ratio test) is also included.

The TX tests cover the following UE transmitter properties:

- UE output power per resource block (inband emissions)
- UE output power per subframe (power monitor)
- PUCCH/PUSCH OFF/ON power, SRS OFF/ON power (power dynamics)
- UE power variation across the allocated subcarriers (equalizer spectrum flatness)
- Modulation accuracy per SC-FDMA symbol (EVM, magnitude error, phase error)
- Modulation accuracy per subcarrier (EVM)
- I/Q constellation diagram
- Overview of allocated resource blocks (RB allocation table)
- Out-of-band emissions (spectrum emission mask and ACLR)

Many of the tests and conformance requirements are specified in 3GPP TS 36.101 or 3GPP TS 36.521.

The multi-evaluation measurement requires option R&S CMW-KM500 for FDD signals and R&S CMW-KM550 for TDD signals.

If you want to generate an LTE downlink signal in parallel to the measurement, you can use the GPRF generator and an LTE waveform file. To process an LTE waveform file, you need the option R&S CMW-KW500.

3.1 What's New in This Revision

This revision describes version 3.5.50 and later of the LTE multi-evaluation measurement application. Compared to version 3.5.40, it provides the following new features:

- Measurement of signals with multi-cluster allocation, see Resource Block Allocation
- Carrier aggregation spectrum limits for combination 20 MHz + 5 MHz, see Spectrum Limits
- Measurement of total TX power of all carriers in list mode, see related commands:
  – `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer`
  – `FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:CURRent?` plus statistics
  – `FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:CURRent?` plus statistics
- EVM limit default values for 64-QAM adapted to the latest 3GPP test specification, see Error Vector Magnitude

3.2 General Description

The LTE multi-evaluation measurement captures an uplink (UL) LTE signal and provides the TX measurement results for a configurable UL subframe / range of subframes.

Both FDD signals (option R&S CMW-KM500) and TDD signals (option R&S CMW-KM550) can be measured. For signals with uplink carrier aggregation, an additional option is required (R&S CMW-KM502 for FDD, R&S CMW-KM552 for TDD).

For block error ratio (BLER) measurements (RX tests), the GPRF generator and an LTE waveform file are used to generate a downlink signal.

The following sections describe how to perform and configure the measurement.

- LTE TX Tests...630
- LTE RX Tests...636
- List Mode...637
- LTE UL Signal Properties...643
- Limit Settings and Conformance Requirements...647
- Measurement Results...657

3.2.1 LTE TX Tests

TX tests have many characteristics in common. The following sections describe these characteristics and show you how to perform TX tests.

3.2.1.1 Test Setup

Connect the external RF signal source (mobile station, signal generator etc.) to one of the bidirectional RF connectors on the front panel of the R&S CMW.

See also: "RF Connectors" in the R&S CMW base unit manual, chapter "Getting Started"

3.2.1.2 How to Measure an Uplink LTE Signal

After connecting your LTE UE to the R&S CMW, you have to adjust at least the following analyzer settings to the properties of the analyzed UL LTE signal:

- "Duplex Mode"
- Analyzer "Frequency"
- "Expected Nominal Power", "External Attenuation (Input)" and "User Margin"
  Recommended values: "Expected Nominal Power" = peak power of the UE signal during the measurement; "User Margin" = 0 dB. The smallest possible value of the "Expected Nominal Power" plus the "User Margin" ensures maximum dynamic range.

For synchronization to the received signal and proper decoding, some settings must be in accordance with the measured signal. In particular, ensure that the following parameters match up:

- For TDD signals: "Uplink Downlink", "Special Subframe" and "Measure Subframe"
  Ensure that you select an UL subframe as "Measure Subframe". When a frame trigger signal is used, subframe 0 selected by default is a DL subframe.
- Length of the "Cyclic Prefix"
- "Channel Bandwidth"
- For signals with PUCCH: "PUCCH Format"
- "Physical Cell ID" and "Delta Seq. Shift PUSCH"
- "Group Hopping"

The R&S CMW can auto-detect the "Modulation Scheme" of the received signal.

With matching "Measurement Control" settings, the R&S CMW is able to decode the signal and determine its frame timing. No additional measurement trigger is required (see Chapter 3.2.1.6, "Trigger Modes", on page 634).

Non-matching "Measurement Control" settings generally result in large EVM results.

3.2.1.3 Defining the Scope of the Measurement

The LTE multi-evaluation measurement can capture up to 320 consecutive subframes, starting at a configurable offset from the trigger event.

The results "Power Monitor" and "RB Allocation Table" are available for the entire range of captured subframes. All other TX measurement results are derived from a selected subframe within the range of captured subframes (setting "Measure Subframe"). You can select which slot of the selected subframe is evaluated: the first one only, the second one only or both (setting "Measure Slot").

For TDD signals, you must ensure that the selected subframe is an uplink subframe. Which subframe is labeled 0, depends on the type of trigger signal and the subframe offset. For subframe offset 0, the subframe labeled 0 is an uplink subframe for power trigger signals (first detected uplink subframe). But for frame trigger signals, it is a downlink subframe (first subframe of frame).

For signals with carrier aggregation, some results are available for PCC and SCC. Other results are measured either on the PCC or on the SCC, depending on the selected "Measurement Carrier". For details, see Chapter 3.2.1.4, "Carrier Aggregation", on page 632.

Depending on the measurement, the statistic count is defined in subframes or in slots.

Example

Assume the following settings (see Chapter 3.3.5, "Measurement Control Settings", on page 687):

- "Subframe Offset" = 3
- "Number of Subframes" = 10
- "Measure Subframe" = 4

- "Measure Slot" = 0 / 1 / all
- All statistic counts = 5

Resulting measurement scope:

- The power monitor and the RB allocation table show 10 subframes ("Number of Subframes"), labeled 0 to 9. The subframe labeled 0 is the fourth subframe (first + "Subframe Offset" 3) captured after the trigger event.
  For the power monitor, the 10 subframes are captured five times (statistic count) to complete one statistics cycle.
- For the power dynamics measurement, the subframe labeled 4 ("Measure Subframe") is captured five times (statistic count) to complete one statistics cycle.
- For all other results, five slots (statistic count) have to be measured per statistics cycle. Only slots within the subframe labeled 4 ("Measure Subframe") contribute to the results.
  Each subframe contains two slots. To measure five slots with "Measure Slot" = all, the entire subframe range has to be captured three times. The first and second time, both slots of subframe 4 are measured. The third time, only the first slot of subframe 4 is measured. Now the statistics cycle is complete and a single-shot measurement stops.
  With "Measure Slot" = 0, only the first slot is evaluated. With "Measure Slot" = 1, only the second slot is evaluated. In both cases, the entire subframe range has to be captured five times to measure five slots.

3.2.1.4 Carrier Aggregation

Most tests specified for signals with uplink carrier aggregation (CA) measure one carrier at a time. The tests are the same as for signals without carrier aggregation. No additional option is required. There are no special settings or measurement results, compared to tests without carrier aggregation.

Only for signals with intra-band contiguous uplink CA, some tests measure the primary component carrier (PCC) and the secondary component carrier (SCC) at the same time. Option R&S CMW-KM502 is required for FDD tests, option R&S CMW-KM552 for TDD tests. The following applies to such measurements.

The following results are measured for one carrier at a time. For synchronization, this carrier must contain allocated RBs. You can either measure the PCC or the SCC.

- EVM, magnitude error, phase error
- I/Q diagram
- Modulation result tables
- Equalizer spectrum flatness
- Power dynamics

The spectrum results are measured for the combination of PCC and SCC, the aggregated bandwidth.

- Spectrum ACLR
- Spectrum emission mask

The following results are measured for both carriers in parallel. There are separate PCC and SCC results.

- Inband emission diagram
- Power monitor
- RB allocation table

How to measure an uplink LTE signal with CA

The basic measurement procedure is the same as for signals without carrier aggregation. Even the test setup is the same.

In addition, consider the following points:

- For a standalone measurement:
  - Select the "Carrier Aggregation Mode" to enable carrier aggregation.
  - Configure the PCC and the SCC center frequency according to the 3GPP rules for intra-band contiguous CA.
    An automatism facilitates the configuration. You only need to configure the bandwidths and the PCC frequency. Then you specify whether the SCC frequency is above or below the PCC frequency and adjust the SCC frequency via a button.
- For a combined signal path measurement:
  - Configure intra-band contiguous uplink CA in the signaling application, as described in the signaling application documentation.
    The measurement automatically sets the "Carrier Aggregation Mode" accordingly.
  - Use the SCC frame trigger signal provided by the signaling application. The PCC frame trigger signal is not suitable for contiguous CA measurements.
- Select a "Measurement Carrier". This carrier is used for synchronization, so it must have allocated RBs. The selected carrier is evaluated by single-carrier measurements, for example for measurement of modulation or power dynamics results.
- Select the local oscillator location of the UE transmitter.

See also:

- Chapter 3.3.4, "Carrier Aggregation Settings", on page 683
- "Carrier Aggregation" on page 699

3.2.1.5 Parallel Signaling and Measurement

You can use the multi-evaluation measurement in parallel to the LTE signaling application (option R&S CMW-KS500/-KS550). Set up a connection to the UE with the signaling application. Then measure the resulting uplink signal with the multi-evaluation measurement.

To use both applications in parallel, the combined signal path scenario must be activated (see "Scenario = Combined Signal Path" on page 680). Most signal routing and analyzer settings and some measurement control settings are then configured by the signaling application. The multi-evaluation measurement displays the corresponding signaling settings instead of its own settings. These signaling settings can be configured both in the measurement GUI and in the GUI of the signaling application.

To configure these settings via remote commands, use the commands of the signaling application. For a command mapping table, see Chapter 3.5.4, "Combined Signal Path Commands", on page 883.

The most important signaling parameters not relevant for standalone measurements can nevertheless be configured both in the measurement GUI and in the GUI of the signaling application. In the measurement GUI, they can be accessed via hotkeys.

Whenever the combined signal path scenario is activated or the controlling application is changed, the frame trigger signal provided by the controlling signaling application is selected automatically as trigger source.

3.2.1.6 Trigger Modes

The LTE multi-evaluation measurement can be performed in the following trigger modes:

- "Free Run (Fast Sync)": The measurement starts immediately after it is initiated. The R&S CMW decodes the signal to derive its slot timing and frame timing so that the "Measurement Length" can start at a slot or subframe boundary of the UL LTE signal.
  Use this trigger mode only if all uplink subframes are used for transmission.
- "Free Run (No Sync)": The measurement starts immediately after it is initiated, without any synchronization.
  This trigger mode is faster than the "Free Run (Fast Sync)" mode. It can be used for power monitor, ACLR and emission mask measurements, if the resource block allocation and uplink power are continuous. All other results must be ignored (e.g. modulation results, RB allocation and power dynamics).
- "IF Power": With an internal IF power trigger, the measurement is triggered by the power ramp of the received bursts.
- "External Trigger A/B": External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument (availability depends on instrument model).
- Additional trigger modes: Other firmware applications, for example the LTE signaling application or the GPRF generator provide additional trigger modes. Refer to the documentation of the corresponding firmware application for a description of these trigger modes.

For configuration, see Chapter 3.3.6, "Trigger Settings", on page 703

3.2.1.7 Calculation of Modulation Results

Modulation results are based on a comparison of an ideal reference waveform with the measured signal. The measured signal is corrected by the average frequency and timing offset for each measured subframe.

See also: "Modulation Accuracy" in the R&S CMW base unit manual, chapter "System Overview"

3GPP TS 36.101, annex F, specifies the following additional conditions:

- The I/Q origin offset must be removed from the evaluated signal before calculating the EVM and the inband emissions.
- The EVM calculation must be based on two different FFT processing windows in the time domain, separated by the "EVM window length" W. The minimum test requirement applies to the larger of the two obtained EVM values.

The definition of the EVM window and the two FFT processing windows is shown below.

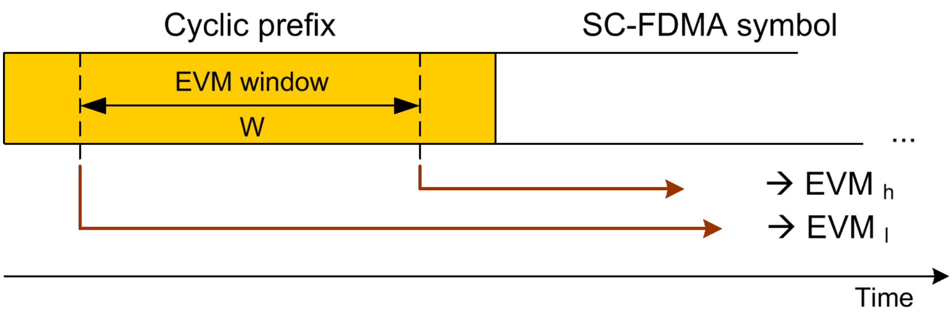


Figure 3-1: EVM window definition

The EVM window is centered on the cyclic prefix (CP) at the beginning of the SC-FDMA symbol. Its length is specified in the standard, depending on the channel bandwidth and the CP type (see 3GPP TS 36.101, tables F.5.3-1 and F.5.4-1).

The CP is a cyclic extension of the SC-FDMA symbol. As a consequence, the EVM for a signal with good modulation accuracy is expected to be largely independent of the EVM window size. Differences between EVM_h and EVM_l are caused for example by the effects of time domain windowing of FIR pulse shaping.

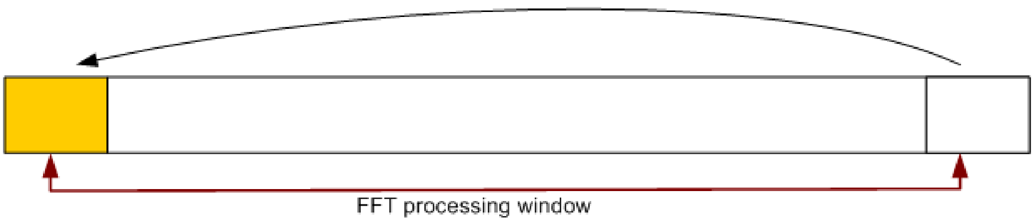


Figure 3-2: Cyclic prefix

EVM window length settings

Use the settings in the EVM Window Length section to adjust the length of the EVM window ("Config > Measurement Control > Modulation > EVM Window Length"). The minimum value of one FFT symbol corresponds to a window of zero length, so that $EVM_h = EVM_l$.

3.2.2 LTE RX Tests

You can perform RX tests in parallel to the TX tests. The following sections describe how to perform LTE BLER tests in non-signaling mode. In signaling mode (combined signal path), use the BLER measurement provided by the LTE signaling application.

For RX tests in non-signaling mode, you need the GPRF generator and an LTE waveform file. Option R&S CMW-KW500 is required to process LTE waveform files.

3.2.2.1 Test Setup

The downlink RF generator signal of the R&S CMW is fed to the input of the DUT. The R&S CMW measures the uplink signal. Most conveniently, a bi-directional connection with a single coax cable is used. Connect the DUT to one of the bidirectional RF connectors on the front panel of the R&S CMW.

See also: "RF Connectors" in the R&S CMW base unit manual, chapter "Getting Started"

3.2.2.2 Performing an LTE RX Measurement

The R&S CMW uses the ARB generator of the GPRF generator to send data to the receiver of the UE under test, transmitting a configurable number of PDSCH subframes. The UE is requested to acknowledge the correct reception of each subframe. It must return the positive acknowledgment (ACK) or negative acknowledgment (NACK) messages over the PUCCH using format F1a.

The R&S CMW calculates the BLER from the received ACKs, NACKs and missing answers (DTX). As the transmit time interval for LTE equals one subframe, a subframe corresponds to one transport block.

To synchronize the measurement to the ARB generator signal, an appropriate marker in the ARB file is recommended as a trigger source.

To perform an LTE BLER test, proceed as follows:

1. Establish the basic test setup for RX tests, connecting the UE under test to an RF input connector.
2. Generator:
   a) Open the GPRF generator application.
   b) Start an LTE ARB file:
   Select "Baseband Mode: ARB" and press the "ARB > Select ARB File..." hotkey to open a dialog from where you can select the file.
   c) Turn on the RF generator.
3. Measurement:
   a) Open the LTE multi-evaluation measurement application.
   b) Enable the BLER measurement ("Multi Evaluation > Assign Views > BLER: ON").

4. Select "Measurement Control > PUCCH Format: F1a".

   This setting also ensures that a TX measurement which runs in parallel to the BLER test is configured in accordance with the expected UL signal.

5. Select "Measurement Control > Measurement Subframe > No. of Subframes: 320".

   This action configures the maximum value resulting in maximum measurement speed. And it is a multiple of 10, ensuring that the number of scheduled subframes per radio frame can be evaluated correctly.

6. Click "Measurement Control > BLER > No. of Subframes".
   Configure the number of subframes that you want to evaluate in total.

7. Click "Measurement Control > BLER > Scheduled Subframes/Frame".
   Specify the number of scheduled subframes per radio frame according to the generated downlink signal.

8. Click "Trigger > Trigger Source".
   Select one of the marker signals in the ARB file to trigger the BLER measurement.

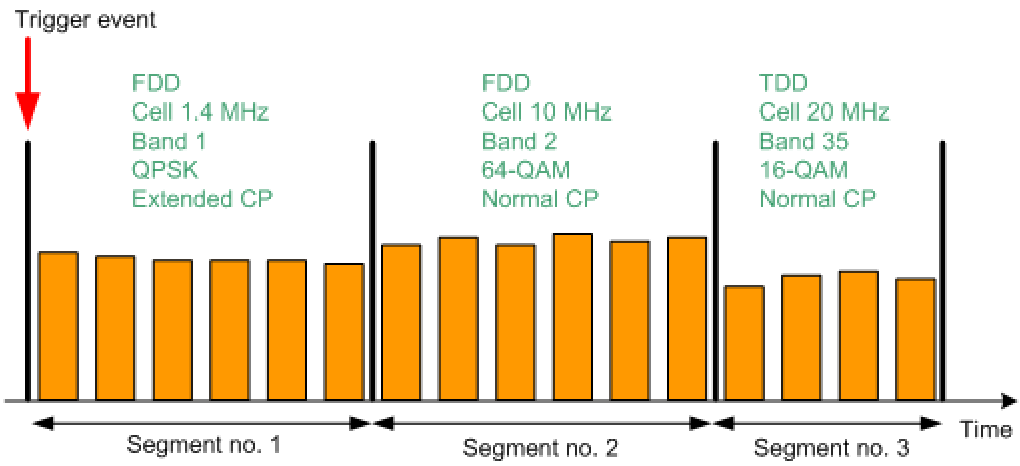
9. Select the appropriate view ("Display > Select View: BLER") and start the measurement.

3.2.3 List Mode

The LTE multi-evaluation list mode requires option R&S CMW-KM012. In this mode, the measurement interval is subdivided into segments, according to basic uplink signal properties like expected power, frequency, channel bandwidth and type of cyclic prefix.

3.2.3.1 List Mode Configuration

Each segment contains an integer number of subframes and is measured at constant analyzer settings. The figure below shows a series of three segments with different lengths, expected powers and the listed signal properties. Orange rectangles depict subframes.

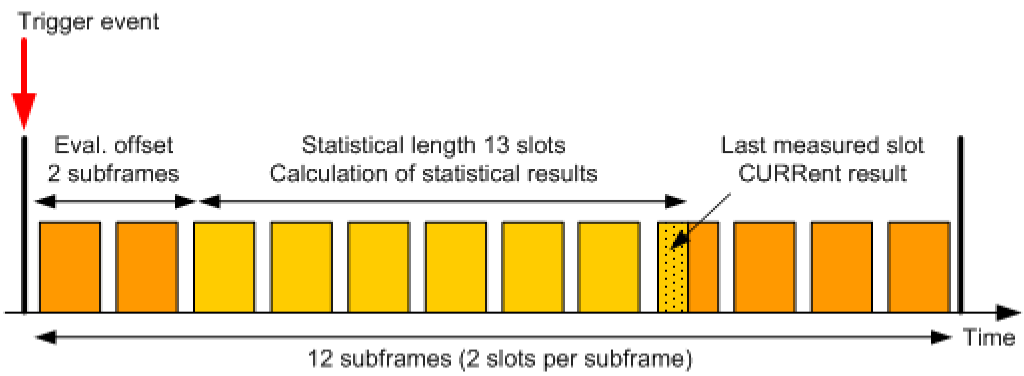


You can configure up to 2000 segments in total as preparation for list mode measurements. One list mode measurement can cover up to 1000 segments with in total up to 4000 measured subframes. For details, see Maximum number of measured subframes. That means, for each measurement you select a range of up to 1000 segments to be measured from the total range of up to 2000 configured segments.

In list mode, the R&S CMW can measure modulation results (including inband emission and equalizer spectrum flatness results), ACLR, spectrum emission and power monitor results. The measured quantities can be enabled or disabled individually for each segment.

A segment without any enabled measurements is called inactive segment. Inactive segments are useful for time-consuming UE reconfiguration. For that purpose, you define alternating active and inactive segments. In the active segments, you measure the signal. In the inactive segments, you reconfigure the UE for the next measured segment.

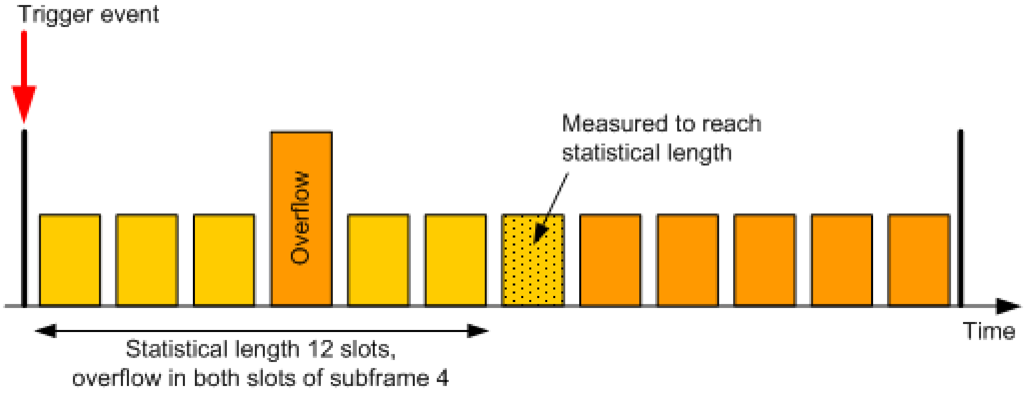
It is possible to measure all subframes of a segment or to exclude subframes/slots at the beginning and/or the end of the segment. The evaluation offset specifies how many subframes are excluded at the beginning of the segment. The statistical length defines the number of slots to be measured. The "current" result of a segment refers to the last measured slot of the statistical length. Additional statistical values (average, minimum, maximum and standard deviation) are calculated for the entire statistical length. Statistical length and statistical values are not relevant for power monitor measurements. The following figure provides a summary.



Two consecutive segments are often measured at different analyzer settings. The R&S CMW changes the analyzer settings in the last subframes of the first segment. This change impairs the accuracy of the measurement results for up to three subframes at the end of the segment. The affected subframes/slots are automatically excluded from the measurement.

Results of other slots that cannot be measured accurately e.g. because of overflow, low signal or synchronization error can also be discarded automatically (parameter Measure on Exception = Off). In that case, the measurement still tries to provide results for the specified statistical length. If not enough slots of the segment can be measured, a shorter statistical length is used. The reached statistical length, a reliability indicator for the measurement and a reliability indicator for the segment are included in most measurement results. TDD downlink subframes and special subframes are automatically ignored and do not contribute to the (reached) statistical length.

In the example shown below, overflow occurs in the fourth subframe. The samples of this subframe are discarded and subframe number 7 is measured to reach the specified statistical length of 12 slots.



Maximum number of measured subframes

The limit of 4000 measured subframes comprises measured subframes included in a statistical length and subframes measured with the power monitor. The not measured subframes of an active segment do not contribute. Other contributions that "cost" subframes are inactive segments and triggering of a segment.

All segments selected for the measurement are considered. In the worst case, the sum of the following components must not exceed 4000:

- One subframe per inactive segment
- Two times the number of triggered segments
- For each active segment without power monitor:
  Subframes in the statistic count of the segment plus three subframes
- For each active segment with power monitor:
  All subframes in the segment

The limit of 4000 measured subframes applies if a baseband measurement board with 4 GB memory is installed. If less memory is installed, the limit is 2000 measured subframes.

Trigger modes

A list mode measurement can either be triggered only once, or it can be retriggered at the beginning of specified segments.

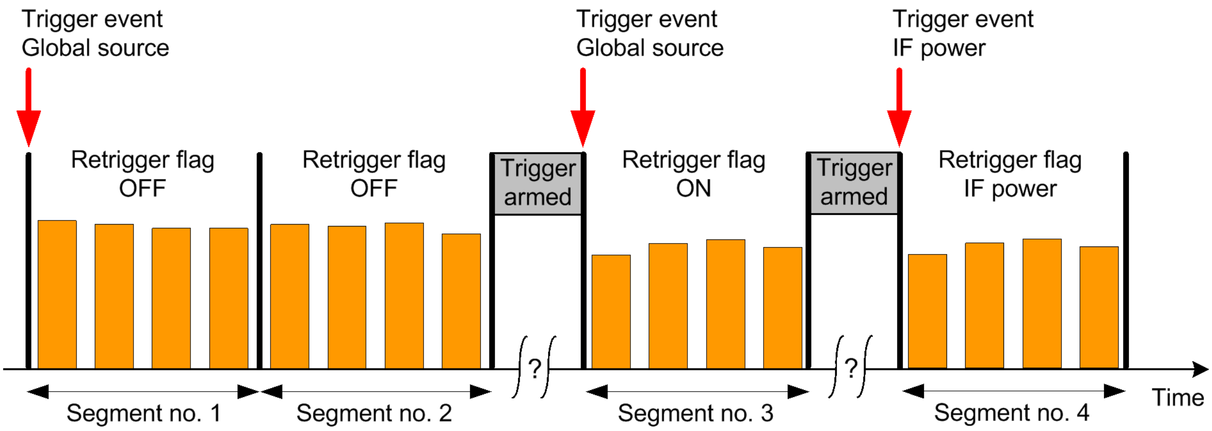
In "Once" mode, a trigger event is only required to start the measurement. As a result, the entire range of segments (up to 1000) is measured without additional trigger event. The trigger is rearmed after the measurement has been finished. The retrigger flag of the first segment specifies which trigger source is used (IF power trigger or trigger source configured via global trigger settings). The retrigger flags of subsequent segments are ignored.

The "Once" mode is recommended for UL signals with accurate timing over the entire range of segments.

In "Segment" mode, the retrigger flag of each segment is evaluated. It defines whether the measurement waits for a trigger event before measuring the segment, or not and which trigger source is used. For the first segment, the value OFF is interpreted as ON.

Retriggering the measurement is recommended, if the timing of the first subframe of a segment is inaccurate, for example because of signal reconfiguration at the UE. Furthermore, retriggering from time to time can compensate for a possible time drift of the UE.

In the following example, the "Segment" mode is enabled. The measurement stops when the second segment has been captured and waits for a trigger event from the globally configured trigger source, before capturing the third segment. After the third segment, it waits for a trigger event from the IF power trigger source, before capturing the fourth segment.



Spectrum measurements

Segments with active spectrum measurements and channel bandwidths > 10 MHz are divided into three parts. Segments with active spectrum measurements and carrier aggregation (CA) are divided into five parts.

The first part is measured using the nominal carrier frequency and is evaluated for all enabled measurements. The other parts are only evaluated for spectrum measurements.

The maximum statistical length reachable in such a segment is smaller than the statistical length reachable with disabled spectrum measurements. Without CA, it is reduced to one third. With CA, it is reduced to one fifth.

Assign more subframes to reach a higher statistical length. The minimum length of such a segment equals 9 subframes without CA and 15 subframes with CA. If you configure a shorter segment length, the effect is the same as if you disable the spectrum measurements for the segment.

Configuration of segments and measurement

Segment configuration and measurement are independent from each other. To perform a sequence of measurements at maximum speed, proceed as follows:

1. Configure all segments ever needed.

The R&S CMW supports a range of up to 2000 configured segments.

2. Select up to 1000 consecutive segments within the configured segment range (consider the maximum number of measured subframes).
3. Measure the selected segments.
4. Repeat steps 2 and 3 as often as needed.

The list mode is essentially a single-shot remote control application. When a measurement is initiated in list mode, all defined segments are measured once. Afterwards, the results can be retrieved using FETCh commands.

The following remote control commands are used for list mode settings and result retrieval.

Table 3-1: List mode commands

Parameters	SCPI commands
Activate / deactivate list mode	CONFigure:LTE:MEAS<i>:MEValuation:LIST
Range of measured segments	CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge
Segment configuration (duplex mode, cell bandwidth, number of subframes, ...)	CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SCC<c> CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:ACSPacing CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:MCARrier CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:TDD CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:RBALlocation
Statistical length and result activation	CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation etc.
Trigger mode	TRIGger:LTE:MEAS<i>:MEValuation:LIST:MODE
R&S CMWS connector	CONFigure:LTE:MEAS<i>:MEValuation:LIST:CMWS:CMODe CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CMWS:CONNector
Retrieve results	FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:... FETCh:LTE:MEAS<i>:MEValuation:LIST:... See: • Chapter 3.5.3.29, "List Mode Results (One Segment)", on page 837 • Chapter 3.5.3.30, "List Mode Results (All Segments, One Result)", on page 859 The segment number <no> for configure commands is an absolute number (1 to 2000). The segment number <no> for result retrieval is a relative number within the range of measured segments (1 to 1000). Example: Segment 1 to 100 configured. Segment 50 to 59 measured. For result retrieval <no> = 1 refers to segment 50, <no> = 10 to segment 59.

You can deactivate the list mode via a command and also via the GUI:

1. Go to local using the corresponding hotkey.

   The active list mode is indicated in the upper right corner of the current view by the words "List Mode!".

2. Open the configuration dialog box.

3. In section "Measurement Control", select another measurement mode.

Global and list mode parameters

Some settings are available as special list mode settings and as multi-evaluation settings (e.g. duplex mode, cell bandwidth and modulation scheme). In list mode, the R&S CMW ignores these multi-evaluation parameters. All other settings not available as special list mode settings are taken from the multi-evaluation measurement, e.g.:

- "External Attenuation"
- "Measure on Exception"
- "Carrier Aggregation Mode"
- "Subframe Offset", "Number of Subframes", "Measure Subframe": Always use the *RST values (0, 1, 0) for list mode measurements.
- Trigger settings
- Limit settings

3.2.3.2 Offline Mode and Offline Segment

In list mode, it is possible to select the results of a single segment for display in the measurement diagram (see also "List Mode > Offline Segment No." on page 703). This "offline mode" offers several advantages:

- Check of the measurement results (e.g. while developing test scripts)
- Calculation and display of additional measurement results (traces). Use the `FETCh:LTE:MEAS:MEValuation:TRACe:...` commands to retrieve these results.

After a list mode measurement is completed, the measurement diagram shows the last segment measured. Calculation of the offline results in an arbitrary segment requires a two-stage measurement:

1. Start a single-shot list mode measurement (`INITiate:LTE:MEAS:MEValuation`) to collect all measurement data.

2. Select the offline segment (CONFigure:LTE:MEAS:MEValuation:LIST:OSINdex <Segment>).

3. Initiate a second measurement (repeat `INITiate:LTE:MEAS:MEValuation`).

4. Go to local to view the results.

The second measurement stage implies a calculation of all measurement results in the offline segment from the existing raw data; no new measurement data is acquired. By repeating this second stage for different segments, you can obtain a complete set of measurement results over the entire measurement length.

Reconfiguration of the measurement, example

To obtain consistent results in the second measurement stage, the raw data must still correspond to the measurement settings. Avoid any reconfiguration that would require a new measurement, if you wish to re-use your data in offline mode.

3.2.4 LTE UL Signal Properties

This section describes the following selected topics related to LTE UL signal properties.

- Resources in Time and Frequency Domain....643
- Resource Block Allocation....644
- Frequency Bands....646

3.2.4.1 Resources in Time and Frequency Domain

The UL radio resources in an LTE system are divided into time-frequency units called resource elements. In the time domain, a resource element corresponds to one SC-FDMA symbol. In the frequency domain, it corresponds to one subcarrier.

For the mapping of physical channels to resources, the resource elements are grouped into resource blocks (RB). Each RB consists of 12 consecutive subcarriers (180 kHz) and 6 or 7 consecutive SC-FDMA symbols (0.5 ms).

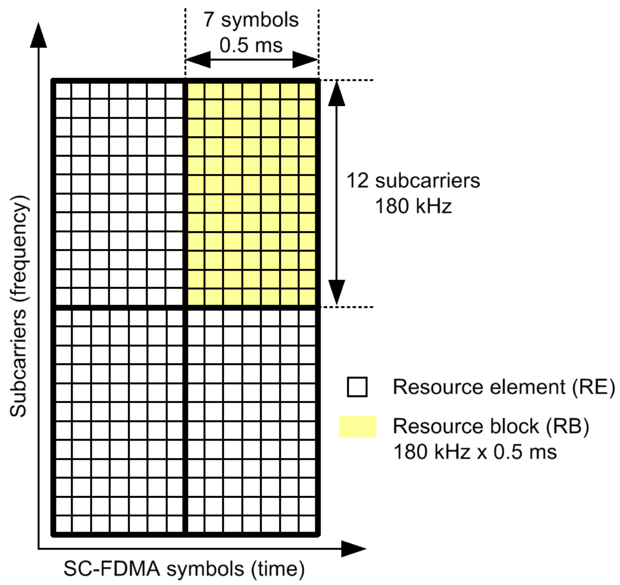


Figure 3-3: Resource element grid (seven symbols per RB)

In the time domain, the additional units radio frame, subframe and slot (containing the SC-FDMA symbols) are defined, see figures below. Each SC-FDMA symbol contains a guard time called cyclic prefix (CP). Depending on the duration of the guard time, it is either called normal CP or extended CP. A slot contains either seven SC-FDMA symbols with normal CP or six SC-FDMA symbols with extended CP.

The basic time unit in LTE is the sample interval T_s. T_s can be calculated from the sampling frequency 30.72 MHz: 1 T_s = 1/30.72 MHz ≈ 32.55 ns.

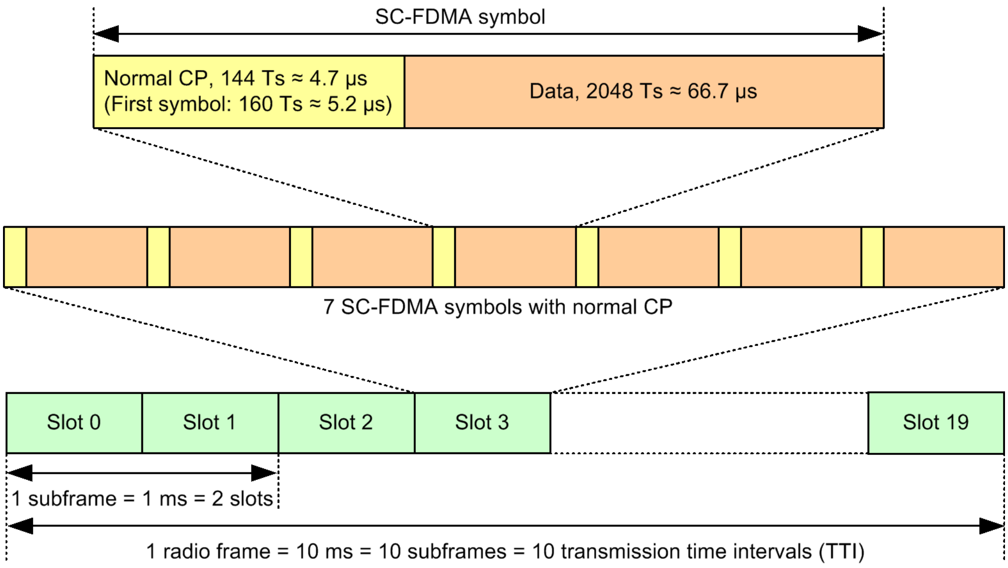


Figure 3-4: LTE UL frame structure for FDD, normal CP

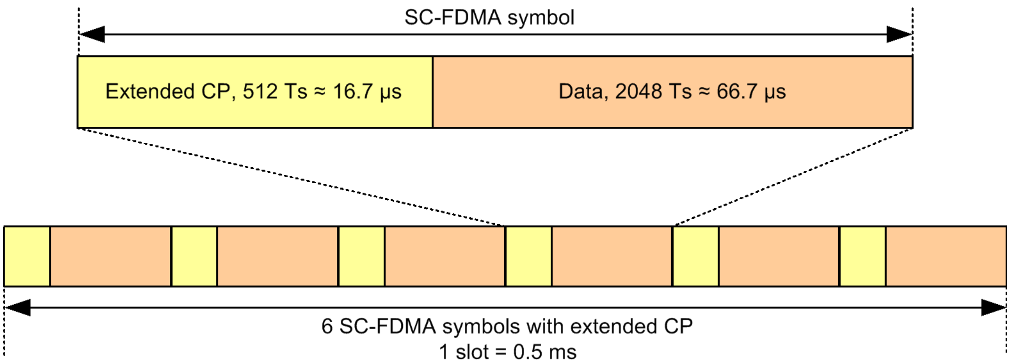


Figure 3-5: LTE UL slot structure for FDD, extended CP

The figures above are for FDD, but the shown structure of SC-FDMA symbols and UL slots applies also to TDD.

3.2.4.2 Resource Block Allocation

The total number of resource blocks available per channel depends on the channel bandwidth as shown in the following table.

Channel bandwidth / MHz	1.4	3	5	10	15	20
Resource blocks (RB)	6	15	25	50	75	100

The total number of allocated resource blocks is restricted by the following formula, specified in 3GPP TS 36.211. For multi-cluster RB allocation, it applies to the sum of both clusters.

$N_{RB} = 2^i \times 3^j \times 5^k$, with i, j, k being non-negative integer values

Example: For a channel bandwidth of 3 MHz, the following values are allowed in the uplink: 0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15 RB. Not allowed are 7, 11, 13 and 14 RB.

The other rules depend on the usage of multi-cluster allocation, as described in the following.

Contiguous RB allocation, single cluster, allocation type 0

This resource allocation type is defined in 3GPP TS 36.213 section 8.1.1.

The position of the first allocated RB is freely selectable within the channel bandwidth. The number of allocated RBs is only restricted by the channel bandwidth and the stated formula.

Multi-cluster RB allocation, two clusters, allocation type 1

This resource allocation type is defined in 3GPP TS 36.213 section 8.1.2

The available resource blocks are divided into resource block groups (RBG) as specified in 3GPP TS 36.213, section 7.1.6.1. The RBG size depends on the channel bandwidth. The last RBG can be smaller than the other RBGs. Only entire RBGs can be allocated.

The allocated RBGs are divided into two clusters. Within each cluster, the RBG allocation is contiguous. There must be at least one unused RBG between the two clusters.

The following table provides an overview of the resource block groups.

Table 3-2: RBG parameters

Channel bandwidth	Maximum no. of RBs	RBG size	Size of last RBG	Allowed start RB
1.4 MHz	6	1	1	0, 1, 2, 3, 4, 5
3 MHz	15	2	1	0, 2, 4, 6, 8, 10, 12, 14
5 MHz	25	2	1	0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
10 MHz	50	3	2	0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48
15 MHz	75	4	3	0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72
20 MHz	100	4	4	0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96

3.2.4.3 Frequency Bands

The carrier frequencies for LTE uplink signals are defined in 3GPP TS 36.101. Each operating band contains uplink carrier frequencies identified by channel numbers (EARFCN, E-UTRA absolute radio frequency channel number). The assignment between channel numbers N and carrier center frequencies F is defined as:

$N = 10 \times (F - F_{Offset})/MHz + N_{Offset}$

The tables below provide an overview of all uplink channels for FDD and TDD signals. For each band, they list the offset frequencies F_{Offset}, channel numbers N, channel number offsets N_{Offset} and carrier center frequencies F.

FDD band	F_{Offset} / MHz	N_{Offset}	Channel no N	F / MHz
1	1920	18000	18000 to 18599	1920 to 1979.9
2	1850	18600	18600 to 19199	1850 to 1909.9
3	1710	19200	19200 to 19949	1710 to 1784.9
4	1710	19950	19950 to 20399	1710 to 1754.9
5	824	20400	20400 to 20649	824 to 848.9
6	830	20650	20650 to 20749	830 to 839.9
7	2500	20750	20750 to 21449	2500 to 2569.9
8	880	21450	21450 to 21799	880 to 914.9
9	1749.9	21800	21800 to 22149	1749.9 to 1784.8
10	1710	22150	22150 to 22749	1710 to 1769.9
11	1427.9	22750	22750 to 22949	1427.9 to 1447.8
12	699	23010	23010 to 23179	699 to 715.9
13	777	23180	23180 to 23279	777 to 786.9
14	788	23280	23280 to 23379	788 to 797.9
15	1900	23380	23380 to 23579	1900 to 1919.9
16	2010	23580	23580 to 23729	2010 to 2024.9
17	704	23730	23730 to 23849	704 to 715.9
18	815	23850	23850 to 23999	815 to 829.9
19	830	24000	24000 to 24149	830 to 844.9
20	832	24150	24150 to 24449	832 to 861.9
21	1447.9	24450	24450 to 24599	1447.9 to 1462.8
22	3410	24600	24600 to 25499	3410 to 3499.9
23	2000	25500	25500 to 25699	2000 to 2019.9
24	1626.5	25700	25700 to 26039	1626.5 to 1660.4
25	1850	26040	26040 to 26689	1850 to 1914.9

FDD band	F_{Offset} / MHz	N_{Offset}	Channel no N	F / MHz
26	814	26690	26690 to 27039	814 to 848.9
27	807	27040	27040 to 27209	807 to 823.9
28	703	27210	27210 to 27659	703 to 747.9
30	2305	27660	27660 to 27759	2305 to 2314.9
31	452.5	27760	27760 to 27809	452.5 to 457.4
65	1920	131072	131072 to 131971	1920 to 2009.9
66	1710	131972	131972 to 132671	1710 to 1779.9

TDD band	F_{Offset} / MHz	N_{Offset}	Channel no N	F / MHz
33	1900	36000	36000 to 36199	1900 to 1919.9
34	2010	36200	36200 to 36349	2010 to 2024.9
35	1850	36350	36350 to 36949	1850 to 1909.9
36	1930	36950	36950 to 37549	1930 to 1989.9
37	1910	37550	37550 to 37749	1910 to 1929.9
38	2570	37750	37750 to 38249	2570 to 2619.9
39	1880	38250	38250 to 38649	1880 to 1919.9
40	2300	38650	38650 to 39649	2300 to 2399.9
41	2496	39650	39650 to 41589	2496 to 2689.9
42	3400	41590	41590 to 43589	3400 to 3599.9
43	3600	43590	43590 to 45589	3600 to 3799.9
44	703	45590	45590 to 46589	703 to 802.9
45	1447	46590	46590 to 46789	1447 to 1466.9
46	5150	46790	46790 to 54539	5150 to 5924.9

3.2.5 Limit Settings and Conformance Requirements

Conformance requirements for LTE UE transmitter tests are specified in 3GPP TS 36.521, section 6, "Transmitter Characteristics".

The following sections give an overview of the LTE multi-evaluation limit settings and the related test requirements.

- Modulation Limits...648
- Error Vector Magnitude...648
- Frequency Error Limits..649
- I/Q Origin Offset Limits...649
- Inband Emissions Limits..649
- Equalizer Spectrum Flatness Limits..651

- Spectrum Limits... 652
- Occupied Bandwidth Limits... 653
- Spectrum Emission Mask.. 653
- ACLR Limits.. 654
- Power Dynamics Limits.. 655

3.2.5.1 Modulation Limits

All modulation limits can be configured per modulation scheme.

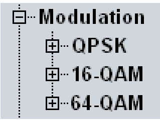


Figure 3-6: One node per modulation scheme

The individual modulation limits are described in the following sections.

3.2.5.2 Error Vector Magnitude

A poor modulation accuracy of the UE transmitter increases the transmission errors in the uplink channel of the LTE network and decreases the system capacity. The error vector magnitude (EVM) is the critical quantity to assess the modulation accuracy of an LTE UE.

According to 3GPP, the EVM measured at UE output powers ≥ -40 dBm must not exceed 17.5 % for QPSK-modulated signals and 12.5 % for 16-QAM-modulated signals.

The EVM limits can be set in the configuration dialog, depending on the modulation scheme and along with limits for the other measured quantities.

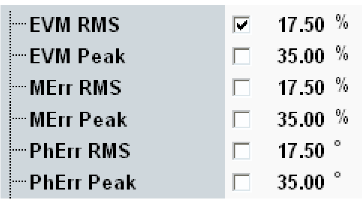


Figure 3-7: Limit settings for QPSK

Characteristics	Refer to 3GPP TS 36.521 V13.1.0, section...	Specified limit
EVM (RMS)	6.5.2.1 Error Vector Magnitude (EVM) 6.5.2A.1 Error Vector Magnitude (EVM) for CA 6.5.2.1_1 Error Vector Magnitude (EVM) for UL 64QAM 6.5.2A.1_1 EVM for CA ... with UL 64QAM	≤ 17.5 % (QPSK) ≤ 12.5 % (16-QAM) ≤ 8 % (64-QAM)

3.2.5.3 Frequency Error Limits

According to 3GPP, the UE modulated carrier frequency must be accurate within ±0.1 ppm, compared to the nominal carrier frequency. The frequency error can be set in the configuration dialog, depending on the modulation scheme.

Figure 3-8: Frequency error limit settings

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	Specified limit
Frequency error	6.5.1 Frequency Error 6.5.1A Frequency Error for CA	< 0.1 ppm

3.2.5.4 I/Q Origin Offset Limits

An I/Q origin offset is due to an additive sinusoid waveform at the frequency of the reference signal. The standard specifies the I/Q origin offset power limit as a function of the output power of the UE transmitter (see "TX power" in the table).

I/Q origin offset limits for three different TX power ranges can be set in the configuration dialog, depending on the modulation scheme.

Figure 3-9: I/Q origin offset limit settings

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	TX power	Specified limit
I/Q origin offset	6.5.2.2 Carrier Leakage 6.5.2A.2 Carrier Leakage for CA	> 0 dBm 0 dBm to -30 dBm < -30 dBm to -40 dBm	-24.2 dBc -19.2 dBc -9.2 dBc

3.2.5.5 Inband Emissions Limits

The inband emission is the relative UE output power of non-allocated resource blocks (RBs). Inband emissions are interferers in the subcarrier range that is potentially used by other connected UEs. 3GPP defines a complex combined inband emission limit described below.

The combined limit can be determined via the following rules:

- The minimum of the combined limit is -29.2 dB. In the R&S CMW, this general minimum is configurable.
- A general component is considered for all non-allocated RBs.

- For non-allocated RBs at image frequencies of allocated RBs, an IQ image component is added to the general component.
- For RBs at the carrier frequency or next to the carrier frequency, an IQ offset component is added to the general component.

So the most complex limit must be determined for a non-allocated RB located both at an image frequency and next to the carrier frequency. In that case, the general component, the IQ image component and the IQ offset component have to be added. Then the result must be compared to the general minimum and the bigger value of both applies.

The following table provides an overview of the three components.

Component	Value	Applicable RBs
General	See formula below table	Non-allocated RBs
IQ image	-24.2 dB	Image frequencies
IQ offset	-24.2 dBc to -9.2 dBc depending on TX power See Chapter 3.2.5.4, "I/Q Origin Offset Limits", on page 649	Carrier frequency
For contiguous uplink carrier aggregation, the carrier frequency and the image frequencies depend on the transmitter architecture. The UE can use a single local oscillator for the aggregated carriers or one local oscillator per component carrier, see "Carrier Aggregation" on page 699.		

The general limit is derived using the following formula:

$$\text{Limit}_{\text{General}} = \max \begin{bmatrix} -25 - 10 * \log_{10}\left(\dfrac{<\text{All RB}>}{<\text{No RB}>}\right), \\ 20 * \log_{10} <\text{EVM}> -3 - \dfrac{5 * (<\text{Offset}> -1)}{<\text{No RB}>}, \\ -<\text{RB Power}> - <\text{RB Power Meas}> \end{bmatrix} \text{dB} + 0.8\,\text{dB}$$

The variables are defined as follows:

- <All RB> = total number of RBs within the channel bandwidth of the allocated component carrier (as defined by 3GPP, e.g. 75 RBs for 15 MHz channel bandwidth)
- <No RB> = number of allocated RBs in the slot
- <EVM> = maximum allowed EVM in percent (configurable), see Chapter 3.2.5.2, "Error Vector Magnitude", on page 648
- <Offset> = distance of the RB from the closest allocated RB
- <RB Power> = -57 (configurable)
- <RB Power Meas> = arithmetic mean value of the average powers in all allocated resource blocks in dBm/180 kHz

The general minimum, the variables <EVM> and <RB Power>, the IQ image component and the IQ offset component can be set in the configuration dialog, depending on the modulation scheme.

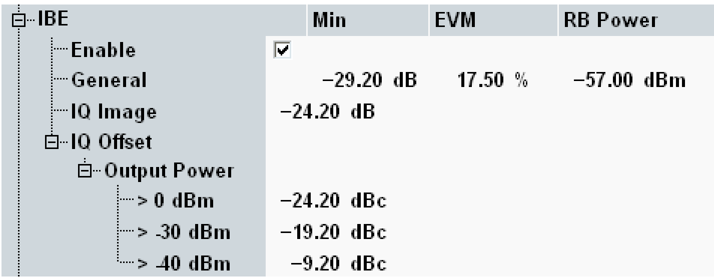


Figure 3-10: Inband emissions limit settings for QPSK

With carrier aggregation, RBs are allocated for the PCC, but not for the SCC. The limits apply to both component carriers. The measurement displays inband emission result diagrams for both carriers.

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	Specified limit
IBE min	6.5.2.3 In-band emissions for non-allocated RB 6.5.2A.3 In-band emissions for non-allocated RB for CA	See table above

3.2.5.6 Equalizer Spectrum Flatness Limits

For EVM measurements, an equalization step has to be performed after the FFT. The spectrum flatness of this equalizer has to be verified to validate the EVM results.

For equalizer spectrum flatness measurements, 3GPP divides each frequency band into two ranges. For normal conditions, range 1 contains the subcarriers with at least 3 MHz distance to the band edges. And range 2 contains all subcarriers within 3 MHz distance to the band edges. For extreme conditions, 5 MHz instead of 3 MHz are specified.

The conformance requirements define limits for the maximum power variations within each range and between the ranges. These limits are listed in the table below. The following figure illustrates the limits for normal conditions.

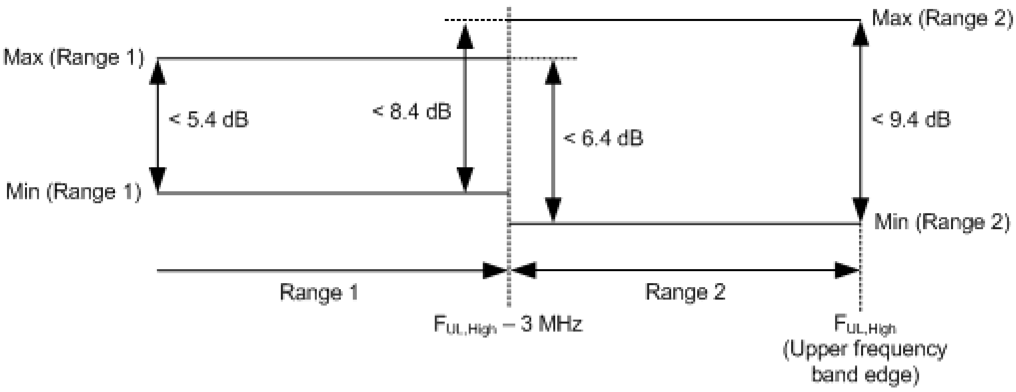


Figure 3-11: Limits for normal conditions (vertical arrows)

The limits and the band edge distance can be set in the configuration dialog, depending on the modulation scheme.

Figure 3-12: Spectrum flatness limit settings

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	Specified limit, normal / extreme conditions
Spectrum flatness	6.5.2.4 / E.4.4 EVM equalizer spectrum flatness	max(range 1) - min(range 1) ≤ 5.4 dB / 5.4 dB max(range 2) - min(range 2) ≤ 9.4 dB / 13.4 dB max(range 1) - min(range 2) ≤ 6.4 dB / 7.4 dB max(range 2) - min(range 1) ≤ 8.4 dB / 11.4 dB

3.2.5.7 Spectrum Limits

Without carrier aggregation, all spectrum limits can be configured per channel bandwidth.

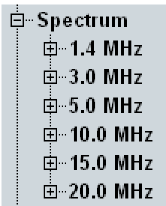


Figure 3-13: One node per bandwidth, no CA

With carrier aggregation, the spectrum limits can be configured per channel bandwidth combination. There are some nodes for specific channel bandwidth combinations, required for 3GPP tests. If you use another bandwidth combination, the node "Other Combination" applies.

Example: The node "CA 20 MHz + 10 MHz" applies, if the PCC has a bandwidth of 20 MHz and the SCC a bandwidth of 10 MHz, or vice versa. The node "Other Combination" is used for example for 15 MHz + 10 MHz or 1.4 MHz + 5 MHz.

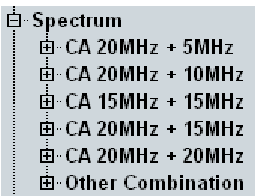


Figure 3-14: One node per bandwidth combination, with CA

The individual spectrum limits are described in the following sections.

3.2.5.8 Occupied Bandwidth Limits

The occupied bandwidth is the bandwidth that contains 99 % of the total integrated power of the transmitted spectrum. According to 3GPP, the occupied bandwidth must be less than the theoretical (aggregated) channel bandwidth. The limit for the occupied bandwidth can be set in the configuration dialog.

Without carrier aggregation, the limit can be set per channel bandwidth.

Figure 3-15: OBW limit setting for 1.4 MHz BW

With carrier aggregation, it can be set per channel bandwidth combination.

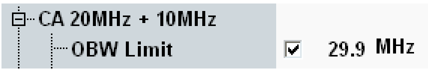


Figure 3-16: OBW limit setting for 20 MHz + 10 MHz

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	Specified limit
Occupied bandwidth (OBW)	6.6.1 Occupied bandwidth	< channel bandwidth
	6.6.1A Occupied bandwidth for CA	< aggregated channel bandwidth

3.2.5.9 Spectrum Emission Mask

The energy, that spills outside the designated radio channel, increases the interference with adjacent channels and decreases the system capacity. The amount of unwanted off-carrier energy is assessed by the out-of-band emissions (excluding spurious emissions). They are specified in terms of the spectrum emission mask and the adjacent channel leakage power ratio (ACLR).

3GPP specifies a general spectrum emission mask and several additional spectrum emission masks. Which of the emission masks is applicable, depends on the parameter Network Signaled Value. The masks differ for signals with and without carrier aggregation.

Both the general requirements and the additional requirements can be defined in the configuration dialog, depending on the channel bandwidth / the channel bandwidth combination. The information displayed above the general limits indicates whether the general limits are applicable, or which set of additional limits applies instead.

The following figure shows the general limits for a signal without carrier aggregation and a channel bandwidth of 1.4 MHz. For each emission mask area, you can define the borders, set an upper power limit and select the resolution bandwidth to be used. Additional limits and limits for other channel bandwidths are configured in the same way.

The start and stop frequencies of each emission mask area are defined relative to the edge of the assigned channel bandwidth. For carrier aggregation, they are defined relative to the edge of the assigned aggregated channel bandwidth.

Example:

Assume 0 MHz as start frequency and 1 MHz as stop frequency for a channel bandwidth of 1.4 MHz. The resulting area ranges from +0.7 MHz to +1.7 MHz relative to the carrier frequency. As all ranges are symmetrical, it ranges also from -0.7 MHz to -1.7 MHz relative to the carrier frequency.

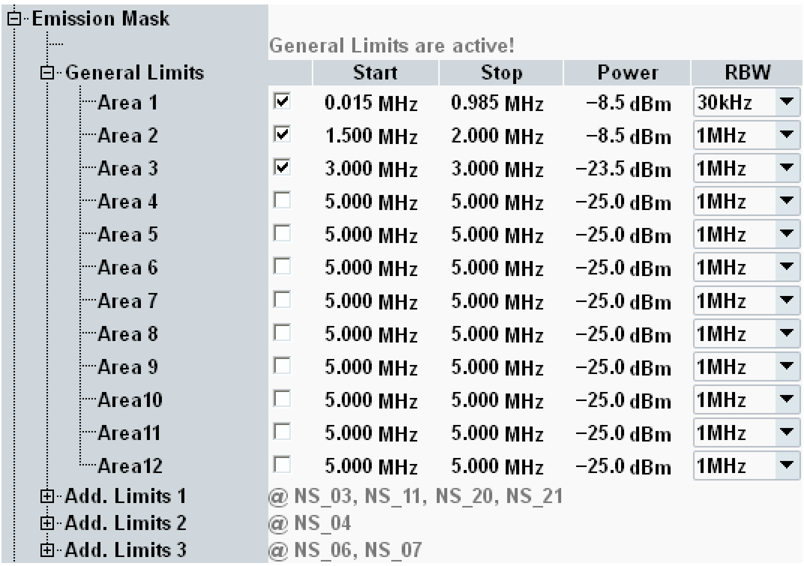


Figure 3-17: Emission mask settings for 1.4 MHz channel BW, no CA

The default settings are suitable to check the 3GPP requirements.

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...
General emission mask	6.6.2.1 Spectrum Emission Mask 6.6.2.1A Spectrum Emission Mask for CA
Additional emission mask requirements	6.6.2.2 Additional Spectrum Emission Mask 6.6.2.2A Additional Spectrum Emission Mask for CA

3.2.5.10 ACLR Limits

The adjacent channel leakage power ratio (ACLR) limits complement the spectrum emission mask. The limits can be set in the configuration dialog, depending on the channel bandwidth / the channel bandwidth combination.

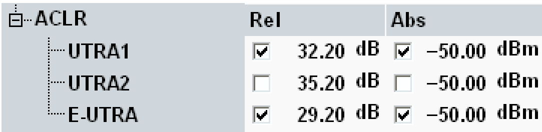


Figure 3-18: ACLR limit settings for 1.4 MHz channel bandwidth

The default values are identical for all bandwidths and for signals with and without carrier aggregation.

According to 3GPP, the relative limit must be evaluated only, if the measured adjacent channel power is greater than -50 dBm (absolute limit). In that case, the ACLR must be greater than the limits listed in the following table. The ACLR is defined as the mean power in the assigned E-UTRA channel divided by the mean power in an adjacent channel.

The ACLR must be evaluated for the first adjacent UTRA channel (UTRA1) and the first adjacent E-UTRA channel (E-UTRA). For channel bandwidths > 3 MHz, also the ACLR for the second adjacent UTRA channel (UTRA2) must be evaluated.

For carrier aggregation, the term "E-UTRA channel" refers to the aggregated bandwidth. Adjacent E-UTRA channels have the same bandwidth as the assigned E-UTRA channel.

The default settings are suitable to check the 3GPP requirements. The relative limits are only evaluated, if the corresponding absolute limit is exceeded. If you disable an absolute limit, the corresponding enabled relative limit is always evaluated.

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	Relative limit
ACLR	6.6.2.3 Adjacent Channel Leakage power Ratio 6.6.2.3A Adjacent Channel Leakage power Ratio for CA	UTRA1: 32.2 dB UTRA2: 35.2 dB E-UTRA: 29.2 dB

3.2.5.11 Power Dynamics Limits

Transmission at excessive uplink power increases interference to other channels. A too low uplink power increases transmission errors. 3GPP defines a general ON/OFF time mask. The mask contains limits for the UL power in subframes not used for transmission (transmit OFF power), subframes used for transmission (transmit ON power) and the power ramping between them.

The ON power is specified as the mean UE output power within a subframe used for transmission, excluding a transient period of 20 µs at the beginning of the subframe. According to 3GPP, subframe number 3 has to be used. For the measurement, the used subframe is selected via the parameter "Measure Subframe", see "Measurement Subframe" on page 696.

For the OFF power, the mean power has to be measured both in the preceding subframe and in the subsequent subframe. For the subsequent subframe, a transient period of 20 µs at the beginning is excluded.

The following figure provides a summary of the time periods relevant for ON and OFF power limits.

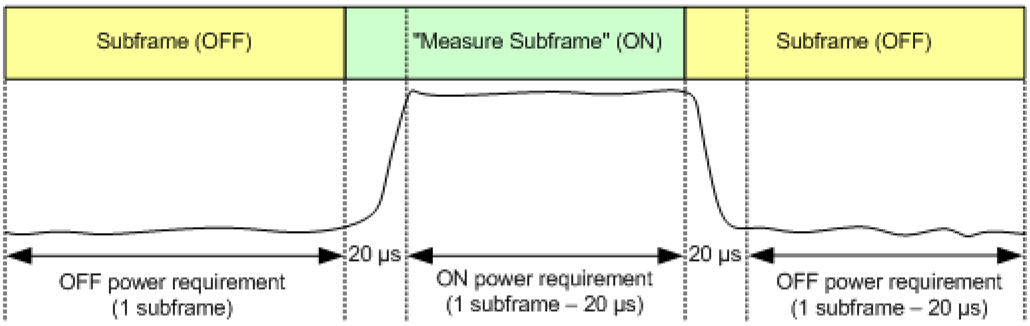


Figure 3-19: Measurement periods ON/OFF power

The OFF power must not exceed -48.5 dBm. The ON power limit must be within a range depending on the channel bandwidth. The limits can be set in the configuration dialog.

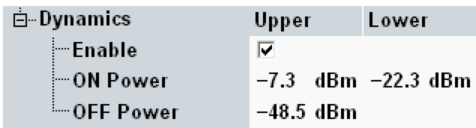


Figure 3-20: Power dynamics limit settings (1.4 MHz channel)

Characteristics	Refer to 3GPP TS 36.521 V10.3.0, section...	Cell BW	Specified limit
ON power	6.3.4.1 General ON/OFF Time Mask 6.3.4A.1 General ON/OFF Time Mask for CA	1.4 MHz	≥ -22.3 dBm, ≤ -7.3 dBm
		3 MHz	≥ -18.3 dBm, ≤ -3.3 dBm
		5 MHz	≥ -16.1 dBm, ≤ -1.1 dBm
		10 MHz	≥ -13.1 dBm, ≤ 1.9 dBm
		15 MHz	≥ -11.4 dBm, ≤ 3.6 dBm
		20 MHz	≥ -10.1 dBm, ≤ 4.9 dBm
OFF power	6.3.4.1 General ON/OFF Time Mask 6.3.4A.1 General ON/OFF Time Mask for CA	any	≤ -48.5 dBm

The power dynamics measurement supports additional time masks, defined in 3GPP TS 36.101. The following list provides an overview of all supported time masks:

- "General ON/OFF" time mask described in detail in the preceding section and defined in 3GPP TS 36.521, section 6.3.4.1 / 6.3.4A.1
  Three subframes with the power sequence OFF - ON - OFF are measured. Exclusion periods of 20 µs are used. The limits are evaluated for all ON and OFF powers.

  <table>
  <tr><td>Subframe</td><td colspan="2">"Measure Subframe"</td><td colspan="2">Subframe</td></tr>
  <tr><td>OFF power</td><td>20 µs</td><td>ON power</td><td>20 µs</td><td>OFF power</td></tr>
  </table>

- "PUCCH / PUSCH / SRS" time mask with transmission before and after the SRS, see 3GPP TS 36.101, figure 6.3.4.4-2
  Two subframes with ON power are measured. The UE sends an SRS at the end of the first subframe. So the power sequence is ON - SRS ON - ON.

Exclusion periods of 40 µs are used around the SRS. The limits are evaluated for the "ON power", but not for the "SRS ON" power.

"Measure Subframe"				Subframe	
20 µs	ON power	40 µs	SRS ON	40 µs	ON power

- SRS time mask with "SRS blanking", see 3GPP TS 36.101, figure 6.3.4.4-4
  Two subframes with ON power are measured. The UE assumes that another UE sends an SRS at the end of the first subframe. It does not transmit at all during this SRS period. So the power sequence is ON - SRS OFF - ON.
  Exclusion periods of 20 µs are used around the SRS. The limits are evaluated for all ON and OFF powers, including SRS OFF.

"Measure Subframe"				Subframe	
20 µs	ON power	20 µs	SRS OFF	20 µs	ON power

Note that you can shift the borders of all OFF power evaluation periods, see "Add. Excl. OFF Power" on page 701.

3.2.6 Measurement Results

The results of the LTE multi-evaluation measurement are displayed in several different views. Use the "Display" parameters to select the views and to change the appearance and contents of the views. The views are described in the following sections.

- Overview....................657
- View Error Vector Magnitude....................658
- View EVM vs Subcarrier....................660
- Views Magnitude Error, Phase Error....................661
- View Inband Emissions....................662
- View Equalizer Spectrum Flatness....................663
- View Spectrum Emission Mask....................664
- View Spectrum ACLR....................666
- View I/Q Constellation....................667
- View RB Allocation Table....................668
- View Power Monitor....................669
- View Power Dynamics....................670
- View TX Measurement and BLER....................674
- Selecting and Modifying Views....................676
- Using Markers....................676
- Common View Elements....................677

3.2.6.1 Overview

In the overview, a selection of the following results can be displayed:

- EVM (vs SC-FDMA symbol)
- EVM vs subcarrier
- Magnitude error
- Phase error
- Inband emissions

- Equalizer spectrum flatness
- Spectrum emission mask
- Spectrum ACLR
- I/Q constellation diagram
- RB allocation table
- Power monitor
- Most important results of detailed views "TX Measurement" and "BLER"

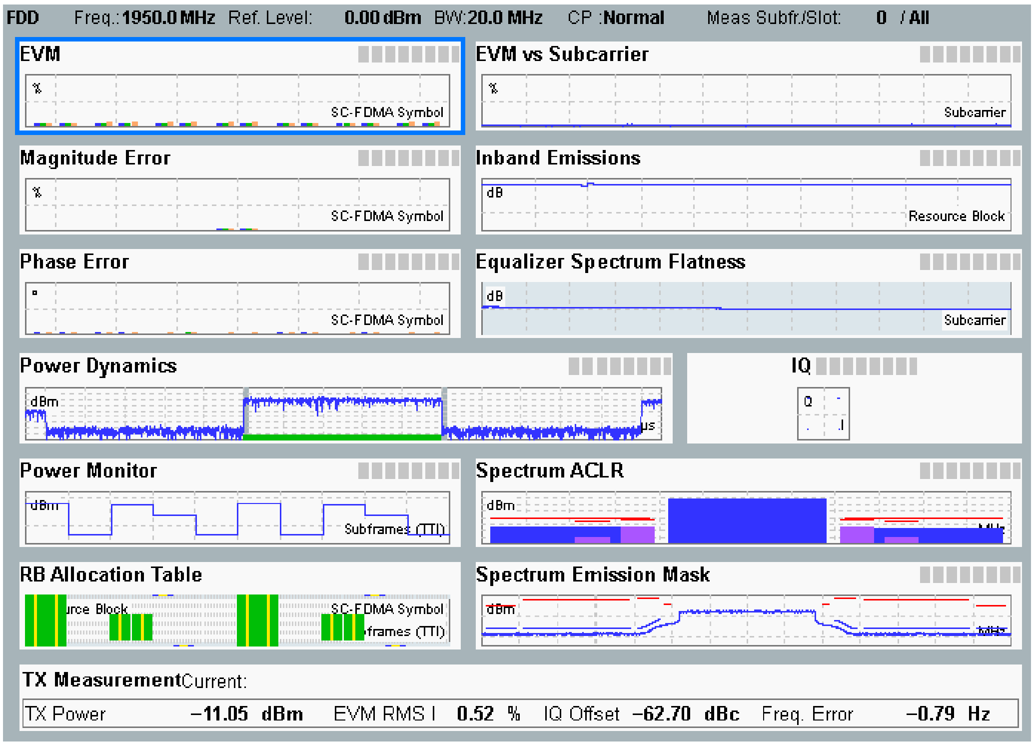


Figure 3-21: Result overview

The results to be measured and displayed in the overview can be limited using the hotkey "Assign Views", see Chapter 3.3.9, "Additional Softkeys and Hotkeys", on page 707.

You can enlarge one of the diagrams in the overview and show a detailed view with additional measurement results, see Chapter 3.2.6.14, "Selecting and Modifying Views", on page 676. The traces and bar graphs are described in the following sections.

3.2.6.2 View Error Vector Magnitude

The view shows one or two diagrams and a statistical overview of results per slot.

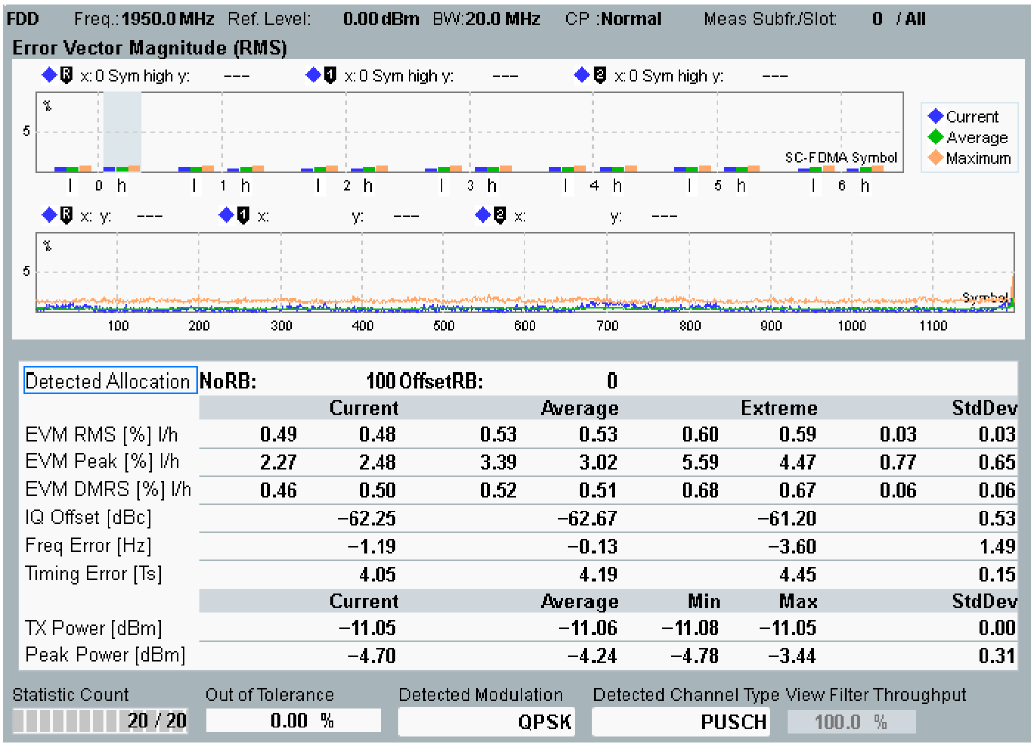


Figure 3-22: Error Vector Magnitude view

All results are derived from the measured slot, located in the configured "Measure Subframe". Only a single carrier is analyzed. For signals with carrier aggregation, you can select which carrier is measured (setting "Measurement Carrier").

- **Upper diagram**
  The bar graph shows the EVM for each SC-FDMA symbol in the measured slot.
  The symbols are numbered from 0 to 6 (5) for normal (extended) cyclic prefix duration, with the reference symbol labeled 3 (2).
  The measurement calculates two values (EVM_l and EVM_h) for each SC-FDMA symbol and displays both values. See also Chapter 3.2.1.7, "Calculation of Modulation Results", on page 634.
  Each value is an RMS value or a peak value over all modulation symbols in the SC-FDMA symbol. The title above the bar graph indicates whether RMS or peak values are currently displayed. To switch between RMS and peak values, use the softkey - hotkey combination "Display" - "Select Trace".
  If SRS signals are enabled, the diagram shows no results for the last SC-FDMA symbol of each subframe (second slot, last symbol).
- **Lower diagram**
  The lower diagram shows the EVM for all modulation symbols in a selected SC-FDMA symbol.
  The results are either EVM_l or EVM_h values. The selected SC-FDMA symbol and the selected low/high position are indicated in the upper diagram by a shadowed rectangle.
  The lower diagram is only shown, if the measurement of "EVM vs symbol" results is enabled. For enabling the diagram and configuring the SC-FDMA symbol selection, see "Multi Evaluation > EVM vs. Symbol" on page 707.

The lower diagram shows results even for SRS signals. To use the diagram for SRS, restrict the measurement to the second slot of the measured subframe ("Measure Slot" = 1) and select the last SC-FDMA symbol for display.

For a description of the statistical overview, see Chapter 3.2.6.13, "View TX Measurement and BLER", on page 674.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram contents via remote control, see Chapter 3.5.3.16, "EVM Results (Traces)", on page 807.

3.2.6.3 View EVM vs Subcarrier

The view shows a diagram and a statistical overview of results per slot.

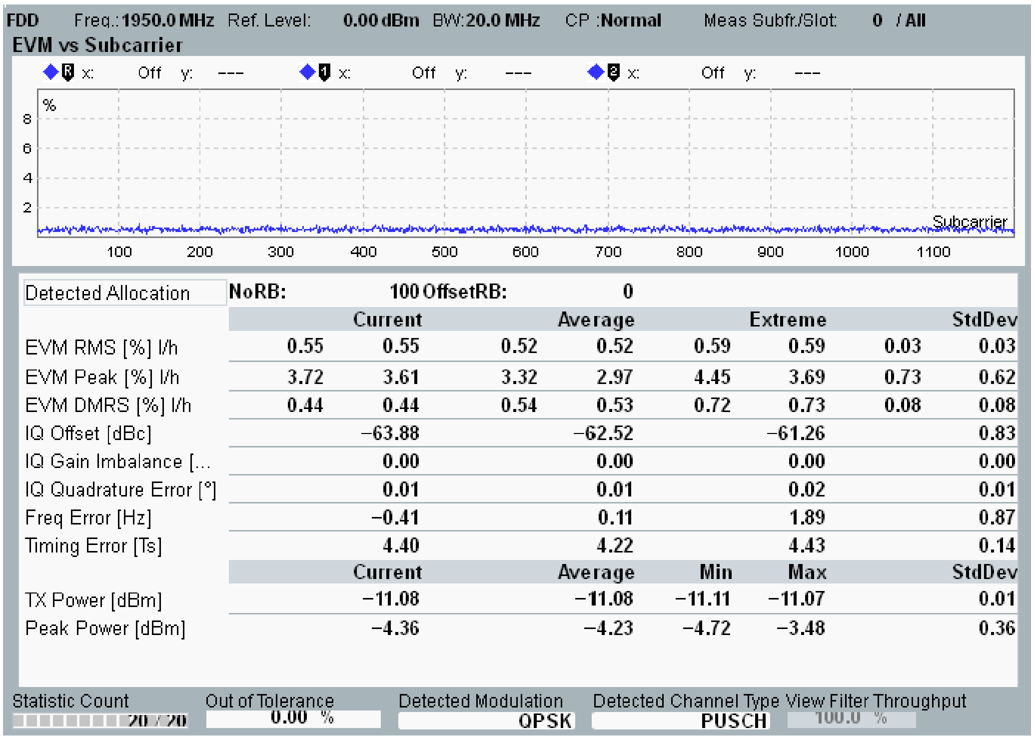


Figure 3-23: EVM vs Subcarrier view

The diagram shows the EVM in all allocated subcarriers of the measured slot. Only a single carrier is analyzed. For signals with carrier aggregation, you can select which carrier is measured (setting "Measurement Carrier").

The values are RMS averaged over the SC-FDMA data symbols in the subcarrier.

For a description of the statistical overview, see Chapter 3.2.6.13, "View TX Measurement and BLER", on page 674.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram contents via remote control, see Chapter 3.5.3.16, "EVM Results (Traces)", on page 807.

3.2.6.4 Views Magnitude Error, Phase Error

Both views show a diagram and a statistical overview of results per slot.

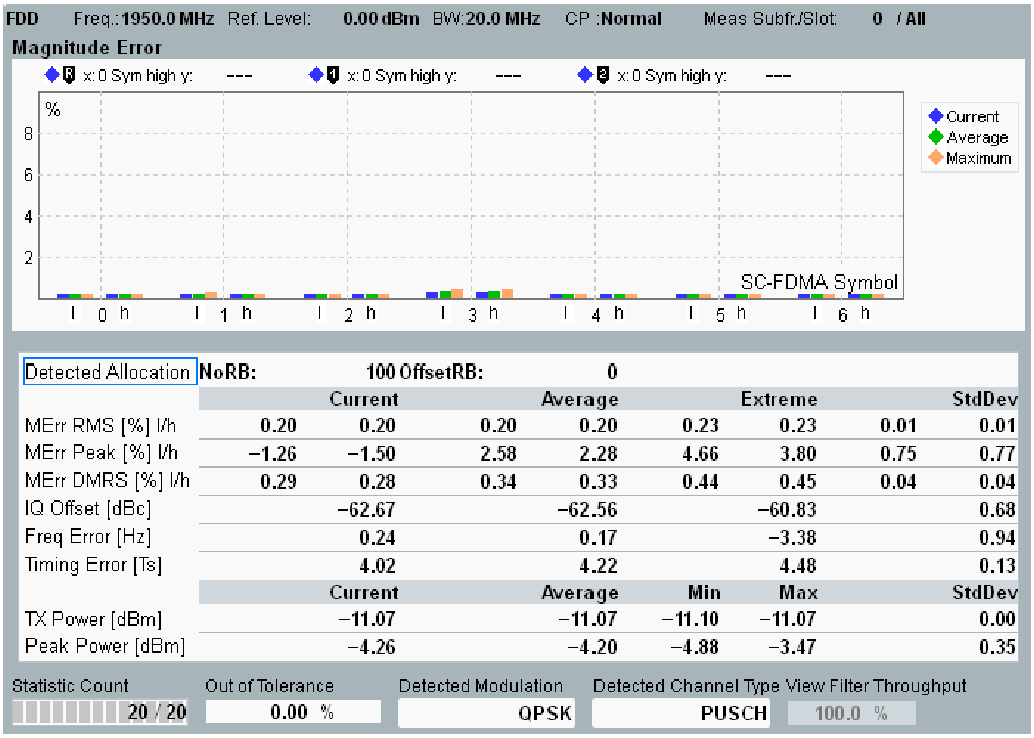


Figure 3-24: Magnitude Error view

The diagrams (bar graphs) show the average magnitude error and phase error for each SC-FDMA symbol in the measured slot. The symbols are numbered from 0 to 6 (5) for normal (extended) cyclic prefix duration, with the reference symbol labeled 3 (2).

The measured slot is located in the configured "Measure Subframe". Only a single carrier is analyzed. For signals with carrier aggregation, you can select which carrier is measured (setting "Measurement Carrier").

The bar graphs show RMS-averaged and therefore positive values. The average runs over all modulation symbols in the SC-FDMA symbol. The R&S CMW calculates two values for each SC-FDMA symbol and displays both values, see also Chapter 3.2.1.7, "Calculation of Modulation Results", on page 634.

For a description of the statistical overview, see Chapter 3.2.6.13, "View TX Measurement and BLER", on page 674.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram contents via remote control, see:

- Chapter 3.5.3.17, "Magnitude Error Results (Traces)", on page 810

- Chapter 3.5.3.18, "Phase Error Results (Traces)", on page 811

3.2.6.5 View Inband Emissions

The inband emissions are displayed in one diagram per component carrier and as a table of statistical results.

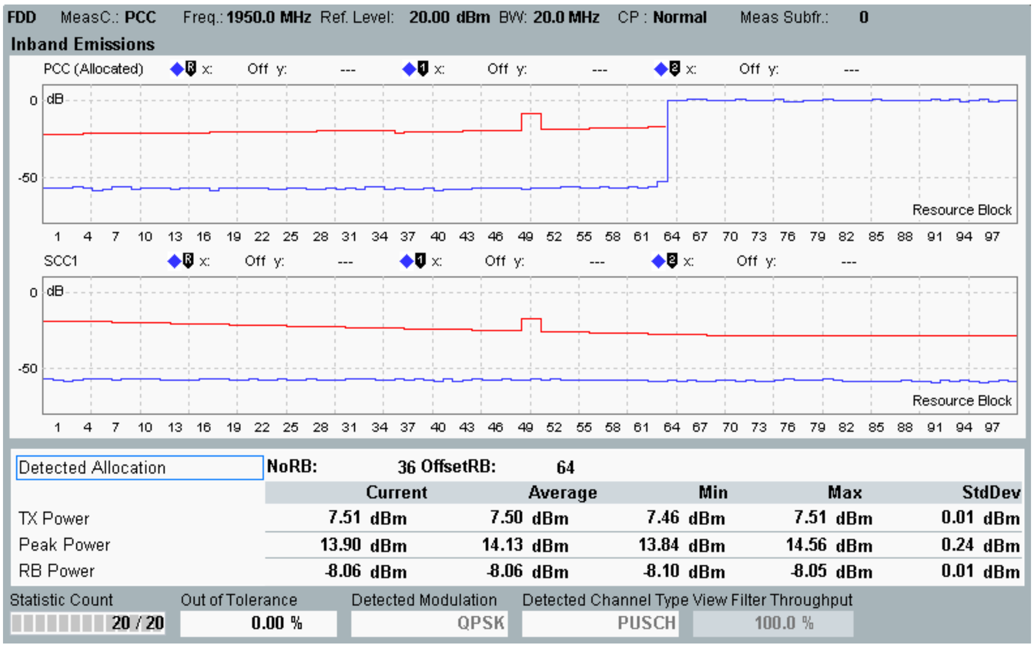


Figure 3-25: Inband Emissions view

For measurements without carrier aggregation, only the PCC is measured and a single diagram is displayed. For measurements with carrier aggregation, the PCC and the SCC are measured and the results are displayed in two diagrams.

Each diagram shows the average power in all resource blocks (RBs) of the measured slot. So it shows a power vs. frequency representation where every RB comprises 12 subcarriers. The RB powers are normalized to the current RB power.

The figure shows a measurement with carrier aggregation. In the PCC diagram, 36 out of 100 resource blocks are allocated. The power of the remaining, non-allocated blocks must be below the red limit line. For the SCC, no resource blocks are allocated. So the entire trace must be below the red limit line.

The carrier currently selected as "Measurement Carrier" is marked by the string "(Allocated)". It must contain allocated resource blocks. Otherwise the measurement fails ("Underdriven" or "Sync Error").

The inband emissions are calculated from the I/Q origin offset-corrected signal, see Chapter 3.2.1.7, "Calculation of Modulation Results", on page 634.

NRB view filter

Resource blocks are allocated dynamically: Their number and position within the sub-carrier range can vary from one measured slot to another. Use filter settings ("Config... > Measurement Control > View Filter") to restrict the measurement to a definite number of allocated RBs.

The table results refer to the configured "Measurement Carrier" (displayed as "MeasC" at the top of the view). For details about the table results, see Chapter 3.2.6.13, "View TX Measurement and BLER", on page 674.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram contents via remote control, see Chapter 3.5.3.19, "Inband Emission Results", on page 811.

3.2.6.6 View Equalizer Spectrum Flatness

The equalizer spectrum flatness is determined for the post FFT equalization step, as specified in the standard. It reflects the spectrum flatness of the equalizer.

The results are displayed in a diagram and as a table of statistical results.

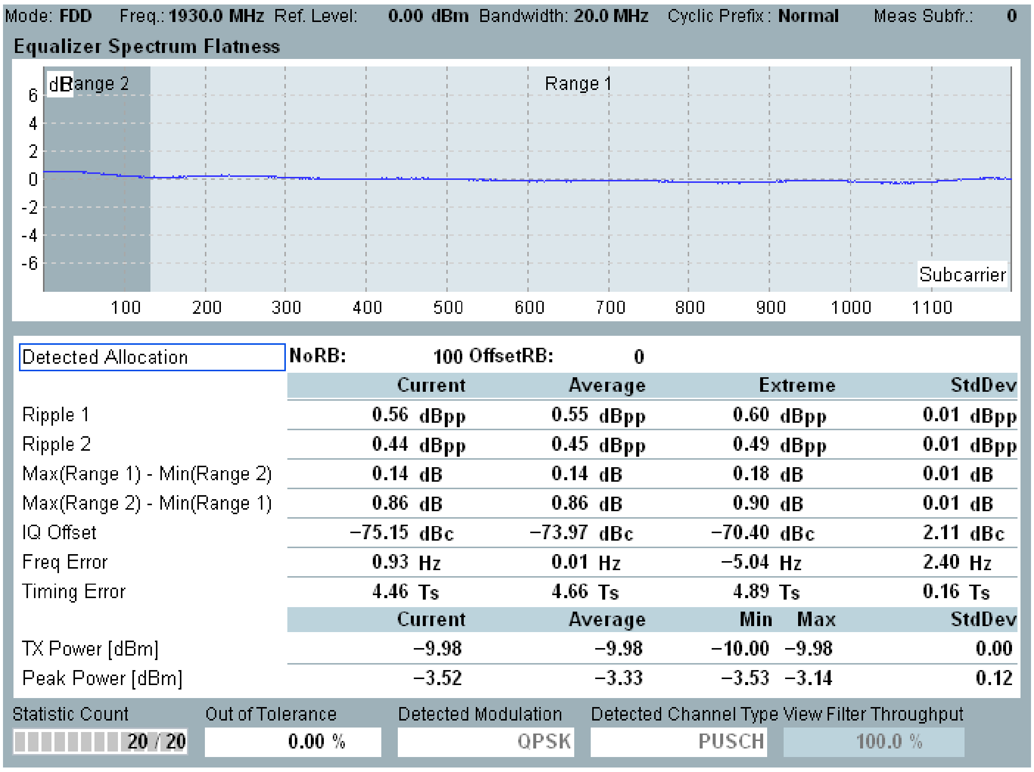


Figure 3-26: Equalizer Spectrum Flatness view

The diagram shows the power of the equalizer coefficients for all allocated subcarriers of the measured slot. The measured slot is located in the configured "Measure Subframe". Only a single carrier is analyzed. For signals with carrier aggregation, you can select which carrier is measured (setting "Measurement Carrier").

The results are normalized to the arithmetic mean value of all results. Hence the measured curve is centered on the 0 dB line.

The table below the diagram presents statistical values. The first four values are related to the spectrum flatness limits. They indicate the difference between maximum and minimum values within range 1 ("Ripple 1"), within range 2 ("Ripple 2") and between the ranges. For details, see Chapter 3.2.5.6, "Equalizer Spectrum Flatness Limits", on page 651.

For the other results in the table, see Chapter 3.2.6.13, "View TX Measurement and BLER", on page 674.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram contents and of the first four table rows, see Chapter 3.5.3.20, "Equalizer Spectrum Flatness Results", on page 815.

3.2.6.7 View Spectrum Emission Mask

The spectrum emission mask results are displayed in a diagram and as a table of statistical results. Additional margin results can be shown/hidden via hotkey.

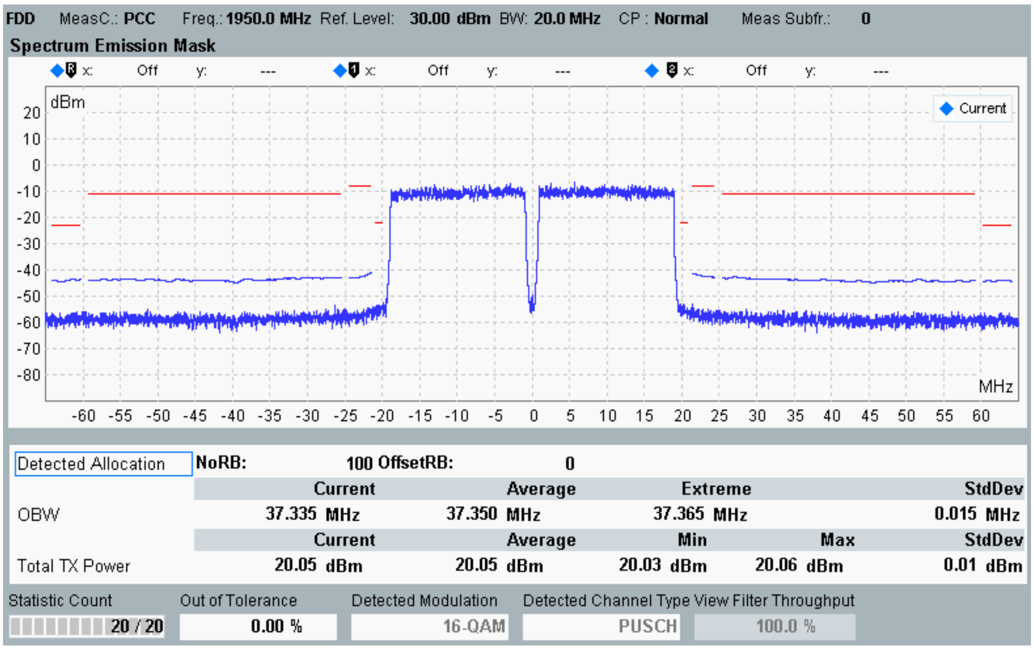


Figure 3-27: Spectrum Emission Mask view

Without carrier aggregation, the measurement covers a symmetric frequency range around the carrier center frequency. With carrier aggregation, both carriers are measured. So the measurement covers a symmetric frequency range around the center frequency of the aggregated bandwidth.

Resolution filters with bandwidths of 30 kHz, 100 kHz and 1 MHz are available. Traces for all three resolution bandwidths (RBW) can be displayed in parallel. The 30 kHz continuous trace is at the bottom, the 1 MHz trace on top and the 100 kHz trace in-between.

The 100 kHz and 1 MHz traces are only displayed for frequency ranges with active limits. Depending on the limits, the traces are hidden completely, displayed partially or displayed for the entire out-of-band range.

In the figure above, the outer limit lines and traces are for RBW = 1 MHz. The short inner limit lines and the continuous trace correspond to RBW = 30 kHz and the 100 kHz trace is hidden because no limits use it. See also Chapter 3.2.5.9, "Spectrum Emission Mask", on page 653.

The shape of the resolution filter is configurable for 100 kHz and 1 MHz bandwidth (Gaussian or bandpass). For 30 kHz traces, a Gaussian filter is used.

According to 3GPP TS 36.521, the measurement must be carried out at maximum output power of the UE.

Margin results

To show/hide the margin results, use the softkey - hotkey combination "Display" - "Margin On | Off".

Margin

Margin	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10	Area 11	Area 12
Curr neg												
X [MHz]	−5.01	−6.50	−10.80	−19.08	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP
Y [dB]	36.51	43.62	55.38	43.27	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP
Curr pos												
X [MHz]	5.01	6.50	11.88	15.57	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP
Y [dB]	39.97	45.22	55.48	43.68	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP	NCAP

Figure 3-28: Emission mask, margin results

A margin indicates the vertical distance between the spectrum emission mask limit line and a trace. For each emission mask area, the margin represents the "worst" value, i.e. the minimum determined for the frequencies of the area:

$Margin = minimum\ (P(f)_{mask} - P(f)_{trace})$

A negative margin indicates that the trace is located above the limit line, i.e. the limit is exceeded.

The margin result display presents for each active area an "X [MHz]" and a "Y [dB]" value, for negative ("neg") and positive ("pos") offset frequencies. The Y value indicates the margin (worst value within area). The X value indicates the frequency offset at which the margin value was found. These frequency offsets are indicated relative to the center frequency.

The screenshot above shows margin results for the current trace. Corresponding margin results are displayed for all active traces (current, average, maximum trace). In this context, "Average" means "margins for average trace" and not "average values of margins for current trace". "Minimum" means "margins for maximum trace" (resulting in minimum margins).

The "Total TX Power" in the table indicates the sum of the TX power of all component carriers. For other table results, see Chapter 3.2.6.13, "View TX Measurement and BLER", on page 674.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the spectrum emission mask results via remote control, see Chapter 3.5.3.21, "Spectrum Emission Results", on page 818.

3.2.6.8 View Spectrum ACLR

The adjacent channel leakage ratio (ACLR) results are displayed in a diagram and as a table of statistical results.

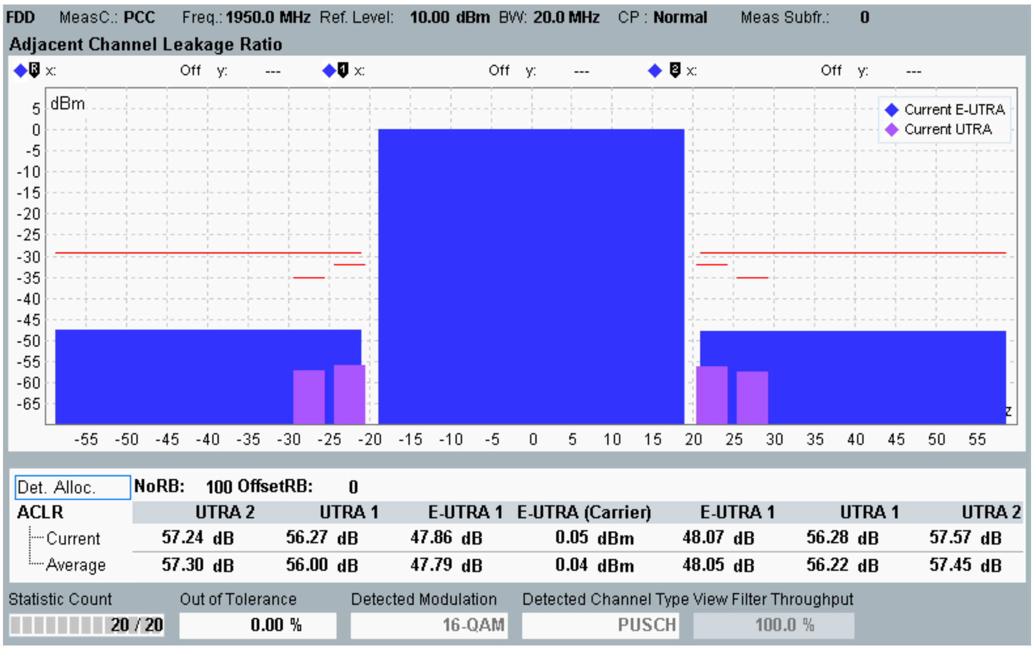


Figure 3-29: ACLR view

The diagram shows the mean power in the assigned E-UTRA channel as central bar. The other bars indicate the mean powers in the first adjacent E-UTRA channels and in the first and second adjacent UTRA channels. All values are absolute power levels in dBm.

With carrier aggregation, an E-UTRA channel comprises the aggregated bandwidth minus a guard band. The figure shows a measurement with carrier aggregation and a channel bandwidth of 20 MHz for PCC and SCC. The width of an E-UTRA bar is 38 MHz.

The displayed absolute limit lines are calculated from the configured relative ACLR limits. They are only displayed for adjacent channels with a power level above the configured absolute limit.

The ACLR values resulting from the measured powers are displayed in the table below the diagram. According to 3GPP TS 36.521, the ACLR is defined as the mean power in the assigned E-UTRA channel divided by the mean power in an adjacent channel. The mean power in the assigned E-UTRA channel is also displayed.

The filters used for the ACLR measurement are compliant with 3GPP TS 36.521. According to this specification, ACLR tests must be carried out at maximum output power of the UE.

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the ACLR results via remote control, see Chapter 3.5.3.22, "ACLR Spectrum Results", on page 823.

3.2.6.9 View I/Q Constellation

The constellation diagram shows the modulation symbols in the measured slot of the measured component carrier as points in the I/Q plane.

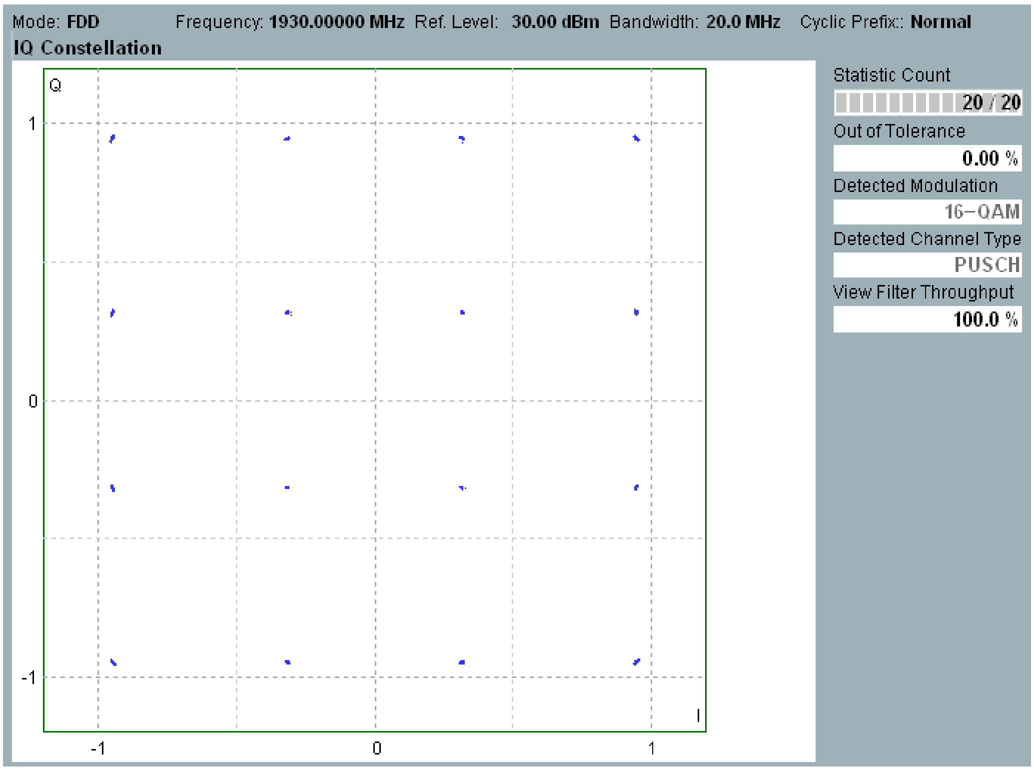


Figure 3-30: I/Q constellation diagram

The constellation diagrams depend on the modulation type. For an ideal signal, the QPSK constellation diagram consists of four points, on a circle around the origin, with relative phase angles of 90 deg. The 16-QAM and 64-QAM modulation schemes produce rectangular patterns with 16 and 64 points, respectively; see example above.

If channel type PUCCH is detected, the constellation diagram shows the SC-FDMA symbols in the frequency domain.

Constellation diagrams give a graphical representation of the signal quality and can help to reveal typical modulation errors causing signal distortions.

See also: "I/Q Constellation Diagram" in the R&S CMW base unit manual, chapter "System Overview"

The LTE constellation diagram shows the following peculiarities:

- The I/Q amplitudes correspond to the values that the R&S CMW uses for the EVM calculation: A possible I/Q origin offset is already subtracted out.
- Due to the properties of the UL LTE signal, a pure I/Q imbalance causes circular constellation points.

For the parameters on the right, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram contents, see Chapter 3.5.3.23, "I/Q Constellation Results", on page 825.

3.2.6.10 View RB Allocation Table

The resource block (RB) allocation table provides an overview of the detected RB allocation, including the detected channel type as color coded information.

With carrier aggregation, separate tables are displayed for the PCC and the SCC.

Figure 3-31: RB allocation table

Each table presents the time domain on the X-axis (subframes and SC-FDMA symbols) and the frequency domain on the Y-axis (resource blocks). The allocated resource blocks are marked by colored bars. The colors indicate the detected channel type as listed in the legend below the table: Physical uplink control channel (PUCCH) or physical uplink shared channel (PUSCH).

"DMRS" refers to the demodulation reference signal within PUCCH and PUSCH.

The PUCCH region indicates the resource block regions at the edges of the channel where a PUCCH can be located. Within this region, automatic channel detection distinguishes between PUCCH and PUSCH. Outside of this region, automatic channel detection always assumes PUSCH.

For TDD signals, the downlink subframes and special subframes are also indicated.

Related settings and dependencies:

- The number of subframes to be captured and shown on the X-axis is configurable. The offset of subframe 0 relative to the trigger event is also configurable. One specific subframe can be selected for slot measurements. For settings, see "Measurement Subframe" on page 696.
- The number of resource blocks displayed on the Y-axis depends on the channel bandwidth.
- The number of SC-FDMA symbols per slot depends on the cyclic prefix type.
- The automatic detection of the channel type can be disabled for measurements that evaluate the "Measure Subframe". The detected channel type is then set manually as PUCCH or PUSCH irrespective of the PUCCH region and displayed accordingly in the table. For configuration, see "Channel Type" on page 692.
  The range of allocated resource blocks in the measured subframe can also be defined manually. For configuration, see "RB Allocation" on page 694.
- The location of downlink and special subframes for TDD signals is always defined manually and never detected automatically. For configuration, see "Uplink Downlink" on page 691.

For background information on the UL structure, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

For "View Filter Throughput", see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the table contents, see Chapter 3.5.3.24, "RB Allocation Table Results", on page 825.

3.2.6.11 View Power Monitor

The power monitor view displays the power in the captured subframes. With carrier aggregation, the component carriers are measured separately. One curve per carrier is displayed.

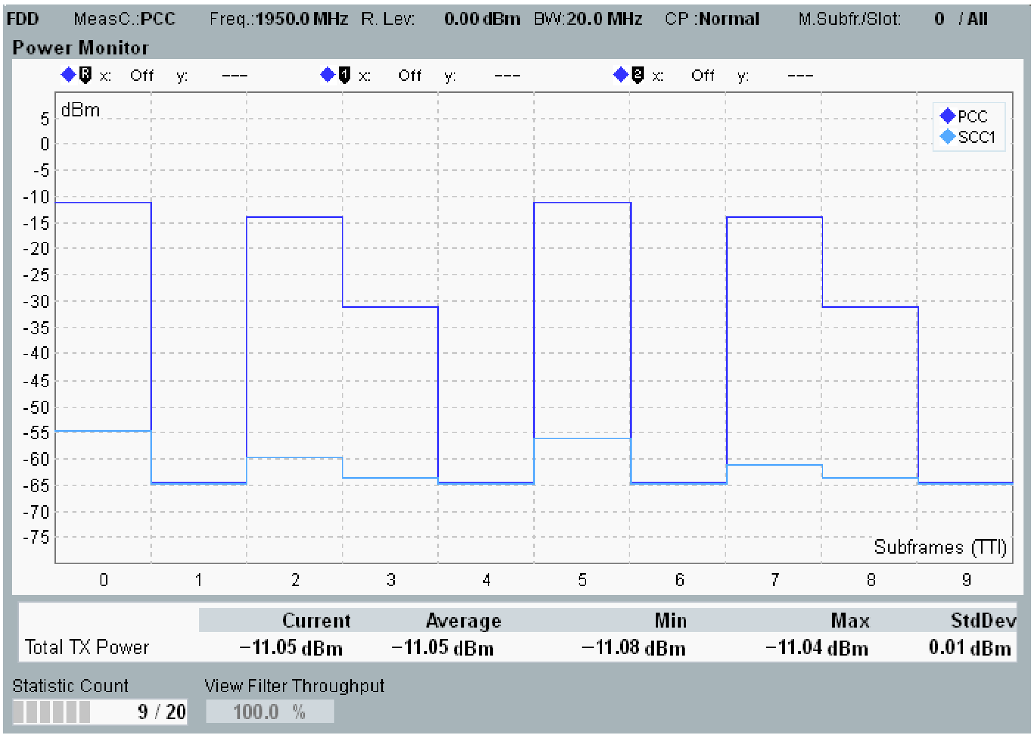


Figure 3-32: Power monitor

Each subframe power value is RMS averaged over the entire subframe, excluding 20 µs at each subframe border.

The number of subframes to be captured and shown on the X-axis is configurable. The offset of subframe 0 relative to the trigger event is also configurable. For settings, see "Measurement Subframe" on page 696.

The "Total TX Power" in the table indicates the sum of the TX power of all component carriers, in the configured "Measure Subframe".

The power monitor can be used for power control tests, especially for aggregate power control tests (see 3GPP TS 36.521, 6.3.5 "Power Control").

For the parameters at the bottom, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the power monitor results via remote control, see Chapter 3.5.3.25, "Power Monitor Results", on page 827.

3.2.6.12 View Power Dynamics

The power dynamics view shows a diagram and a statistical overview of related power results. For signals with carrier aggregation, only the configured "Measurement Carrier" is measured.

The following figure shows measurement results for the general ON/OFF time mask.

Figure 3-33: Power Dynamics view, general time mask

The following statements apply also to power dynamics measurements with other time masks.

The diagram shows the UE output power vs. time, sampled with 48 T_s (1.5625 µs). The measured trace covers the range from -1100 µs to +2098.4375 µs relative to the start of the "Measure Subframe" (see "Measurement Subframe" on page 696). The diagram shows a subsection of the measured trace, depending on the configured time mask.

The individual ON and OFF power areas are labeled in the diagram. ON power periods are marked by a green horizontal bar. The measured subframe and an eventual SRS period at the end of the "Measure Subframe" are indicated. Exclusion periods are marked by gray vertical bars.

The table below the diagram shows a statistical evaluation of the ON power and OFF power values. The table columns are not necessarily ordered in the same way as the related diagram sections.

Depending on the selected time mask, the following results are available:

- "ON Power, RMS/Peak":
  Mean value and peak value of the UE output power over the "Measure Subframe" (minus exclusion period and SRS period)
- "OFF Power (after)", "ON Power (after)":
  Mean power in one subframe after the "Measure Subframe" (minus exclusion period)
- "OFF Power (before)":

Mean power in one subframe before the "Measure Subframe"

- "SRS ON/OFF":
  Mean power in the SRS period at the end of the "Measure Subframe"

For the parameters at the bottom of the view, see Chapter 3.2.6.16, "Common View Elements", on page 677.

For query of the diagram and table contents via remote control, see Chapter 3.5.3.26, "Power Dynamics Results", on page 829.

Signal configuration for general time mask

The "Measure Subframe" must be on and one subframe before and after the "Measure Subframe" must be off.

However, it is recommended to configure two subframes off before and after the "Measure Subframe" (OFF, OFF, ON, OFF, OFF). This configuration guarantees that the measured "OFF Power (before)" is not falsified by power contributions of a preceding ON subframe ramped down too slowly. And that the "OFF Power (after)" is not falsified by a subsequent ON subframe ramped up too early.

The trace sections below -1000 μs and above 2000 μs belong to the second subframes before and after the "Measure Subframe". In the figure above, they are on.

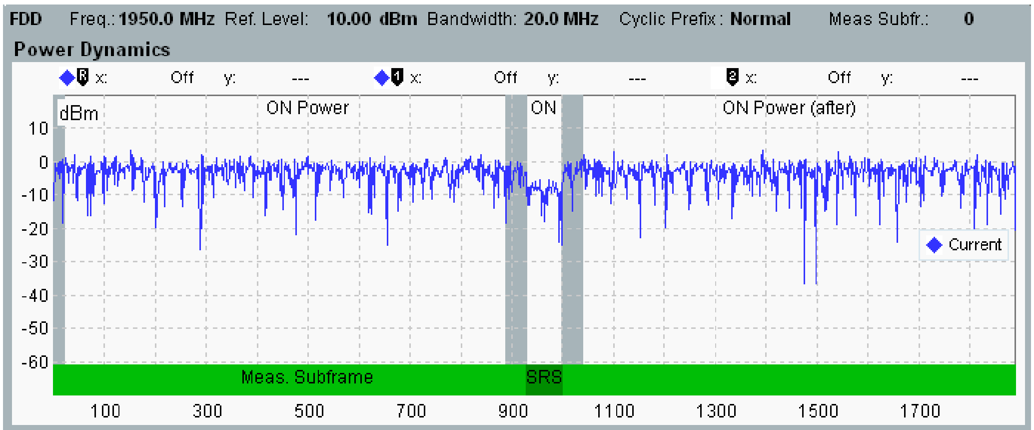
Signal configuration for SRS time masks

The "Measure Subframe" and one subframe after the "Measure Subframe" must be on.

At the end of the "Measure Subframe", there must be an SRS. Depending on the time mask, it must be a UE-specific SRS (SRS ON, UE transmitting) or a cell-specific SRS (SRS OFF, another UE assumed to transmit).

For FDD, you can achieve this SRS configuration with the combined signal path scenario. In the signaling application, enable SRS and use the default SRS subframe configuration and SRS configuration index. In the measurement, set the "Measure Subframe" to subframe 0 for SRS ON and to subframe 5 for SRS OFF.

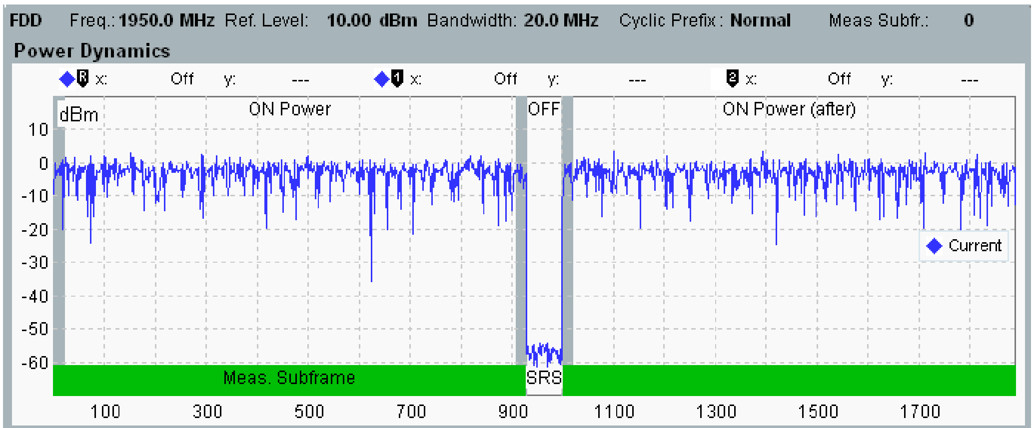
The following figures show measurement results for the PUCCH / PUSCH / SRS time mask and the SRS blanking time mask.



	SRS ON	ON Power		ON Power (after)
		RMS	Peak	
Current	-8.53 dBm	-2.33 dBm	4.45 dBm	-2.33 dBm
Average	-8.53 dBm	-2.32 dBm	4.49 dBm	-2.33 dBm
Min	-8.55 dBm	-2.35 dBm	4.41 dBm	-2.35 dBm
Max	-8.53 dBm	-2.32 dBm	4.58 dBm	-2.32 dBm
StdDev	0.01 dBm	0.01 dBm	0.05 dBm	0.01 dBm

Statistic Count 20 / 20 Out of Tolerance 0.00 %

Figure 3-34: Power Dynamics view, PUCCH / PUSCH / SRS time mask



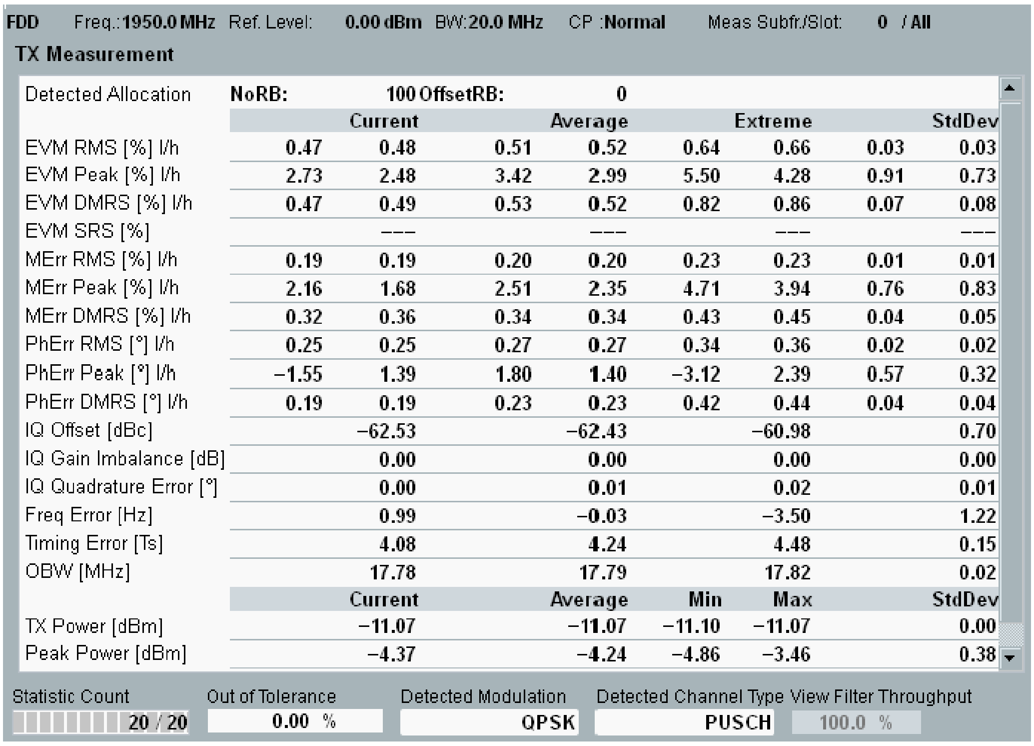
	SRS OFF	ON Power		ON Power (after)
		RMS	Peak	
Current	-55.48 dBm	-2.28 dBm	4.59 dBm	-2.28 dBm
Average	-55.44 dBm	-2.28 dBm	4.54 dBm	-2.29 dBm
Min	-55.67 dBm	-2.31 dBm	4.45 dBm	-2.31 dBm
Max	-55.13 dBm	-2.28 dBm	4.61 dBm	-2.28 dBm
StdDev	0.12 dBm	0.01 dBm	0.06 dBm	0.01 dBm

Statistic Count 20 / 20 Out of Tolerance 0.00 %

Figure 3-35: Power Dynamics view, SRS blanking time mask

3.2.6.13 View TX Measurement and BLER

This view contains tables of statistical results for the TX and RX measurements.



FDD Freq.:1950.0 MHz Ref. Level: 0.00 dBm BW:20.0 MHz CP :Normal Meas Subfr./Slot: 0 / All

TX Measurement

Detected Allocation	NoRB:	100 OffsetRB:		0				
	Current		Average		Extreme		StdDev	
EVM RMS [%] l/h	0.47	0.48	0.51	0.52	0.64	0.66	0.03	0.03
EVM Peak [%] l/h	2.73	2.48	3.42	2.99	5.50	4.28	0.91	0.73
EVM DMRS [%] l/h	0.47	0.49	0.53	0.52	0.82	0.86	0.07	0.08
EVM SRS [%]		---		---		---		---
MErr RMS [%] l/h	0.19	0.19	0.20	0.20	0.23	0.23	0.01	0.01
MErr Peak [%] l/h	2.16	1.68	2.51	2.35	4.71	3.94	0.76	0.83
MErr DMRS [%] l/h	0.32	0.36	0.34	0.34	0.43	0.45	0.04	0.05
PhErr RMS [°] l/h	0.25	0.25	0.27	0.27	0.34	0.36	0.02	0.02
PhErr Peak [°] l/h	−1.55	1.39	1.80	1.40	−3.12	2.39	0.57	0.32
PhErr DMRS [°] l/h	0.19	0.19	0.23	0.23	0.42	0.44	0.04	0.04
IQ Offset [dBc]		−62.53		−62.43		−60.98		0.70
IQ Gain Imbalance [dB]		0.00		0.00		0.00		0.00
IQ Quadrature Error [°]		0.00		0.01		0.02		0.01
Freq Error [Hz]		0.99		−0.03		−3.50		1.22
Timing Error [Ts]		4.08		4.24		4.48		0.15
OBW [MHz]		17.78		17.79		17.82		0.02
	Current		Average		Min	Max	StdDev	
TX Power [dBm]		−11.07		−11.07	−11.10	−11.07		0.00
Peak Power [dBm]		−4.37		−4.24	−4.86	−3.46		0.38

Statistic Count	Out of Tolerance	Detected Modulation	Detected Channel Type	View Filter Throughput
20 / 20	0.00 %	QPSK	PUSCH	100.0 %

Figure 3-36: TX measurement

TX measurement

The table provides an overview of statistical values obtained in the measured slot. Except for the OBW result, only a single carrier is analyzed. For signals with carrier aggregation, you can select which carrier is measured (setting "Measurement Carrier").

Other detailed views provide a subset of these values:

- Detected allocation:
  "NoRB" is the number of allocated resource blocks.
  "OffsetRB" is the offset of the first allocated resource block from the edge of the allocated UL transmission bandwidth.
- EVM, magnitude error ("MErr"), phase error ("PhErr"):
  The R&S CMW calculates and displays two values (l/h) for low and high EVM window position, see Chapter 3.2.1.7, "Calculation of Modulation Results", on page 634.
  For the SC-FDMA data symbols (all symbols except reference symbol), RMS and peak values are provided. The DMRS value refers to the reference symbol (demodulation reference signal).
  An "EVM SRS" line is only shown if SRS is enabled in the modulation settings. And result values are only shown if an SRS signal is detected in the last SC-FDMA symbol of a subframe.

- I/Q origin offset: The I/Q offset is estimated from the distribution of the constellation points.
- Gain imbalance: absolute value of (1 + I/Q imbalance)
  Quadrature error: angular component of (1 + I/Q imbalance)
  These results are only available, if the view "EVM vs. subcarrier" is enabled and the measured carrier has a full RB allocation (for example 50 RB at 10 MHz bandwidth). Otherwise, these results are not calculated, to speed up the measurement.
- Carrier frequency error: offset between the measured carrier frequency and the nominal RF frequency of the measured radio channel
- Timing error: difference between the actual timing and the expected timing
  The timing error measurement requires an "external" trigger signal to derive the expected timing. Suitable trigger signals are for example the frame trigger signal provided by the signaling application or an external trigger fed in via the TRIG A or TRIG B connector.
  The unit T_s stands for the basic LTE time unit, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.
- Occupied bandwidth (OBW): width of the frequency range that contains 99% of the total integrated power of the transmitted spectrum
  With carrier aggregation, the transmitted spectrum comprises all carriers. The center of the frequency range is the carrier center frequency / the aggregated bandwidth center frequency.
- TX power: RMS averaged power over all samples in the slot, equivalent to the sum of the powers of all (allocated and non-allocated) RBs
- Peak power: peak power of all samples in the slot
- RB power: arithmetic mean value of the average powers in all allocated resource blocks

For query of the results via remote control, see Chapter 3.5.3.27, "Modulation Results (Single Values)", on page 831.

For the parameters below the "TX Measurement" table, see Chapter 3.2.6.16, "Common View Elements", on page 677.

RX measurement

The RX measurement results are displayed at the bottom of the view.

The table provides the following results:

- Subframes: number of already processed subframes and total number of subframes to be processed
  All downlink subframes are counted, scheduled subframes and subframes without allocated resource blocks.
- Scheduled: number of already measured subframes (scheduled downlink subframes)
  If the measurement is configured correctly, this number equals the sum of the absolute values for ACK, NACK and DTX.

- BLER: block error ratio, percentage of sent scheduled subframes for which no acknowledgment has been received
  The result considers received NACK and PDCCH decoding errors (DTX):
  BLER = (#NACK + #DTX) / (#ACK + #NACK + #DTX)
- ACK / NACK / DTX: number of acknowledgments and negative acknowledgments received over the PUCCH
  No answer at all (no ACK and no NACK) is counted as DTX. If a PUSCH is detected instead of a PUCCH, a NACK is counted.
  The results are presented as absolute number and as percentage relative to the number of sent scheduled subframes.

For query of the results via remote control, see Chapter 3.5.3.28, "BLER Results", on page 836.

For information about this measurement, refer to Chapter 3.2.2, "LTE RX Tests", on page 636.

3.2.6.14 Selecting and Modifying Views

Press the "Display" softkey to show hotkeys for view configuration. They change the appearance and contents of the active view. The following hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Select View ..."	Switch to a certain detailed view or overview. Alternatively, select a diagram in the overview and press ENTER or the rotary knob.
"Select Trace ..."	Select the trace types to be displayed in the view.
"X Scale... / Y Scale..."	Modify the ranges of the X-axis and the Y-axis.
"EVM Window Position ..."	Select which of the results calculated at the low and high extremities of the EVM window is displayed, see Chapter 3.2.1.7, "Calculation of Modulation Results", on page 634.
"Margin On | Off"	For the spectrum emission mask measurement: Show or hide margin results.

Additional options are available in the "Measurement Control" section of the configuration dialog.

3.2.6.15 Using Markers

Press the "Marker" softkey to show hotkeys for marker configuration. They activate markers and modify their position. The following hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Ref. Marker..."	Enable or disable the reference marker and select the marker position. If several traces can be displayed, a trace can also be selected.
"Marker 1/2..."	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker). Depending on the trace mode, a trace can also be selected.
"Select Trace Mode"	Define whether markers 1 and 2 are set to the same trace as the reference marker (collective) or to selectable individual traces.

See also: "Markers" in the R&S CMW base unit manual, chapter "System Overview"

3.2.6.16 Common View Elements

This section describes elements that are displayed in most views.

Tables

Most detailed views show tables providing a statistical evaluation of results obtained in the measured slot. The statistical values in the tables are calculated as follows:

- **"Current":** Value of the result obtained in the last measurement interval. For some modulation results, an RMS value and a peak value are available. They are calculated as the average and peak of all samples in the measured slot.
- **"Average":** Average of all "Current" values referenced to the last statistics cycle.
- **"Extreme", "Min", "Max":** Largest or smallest "Current" value that the R&S CMW obtained since the start of the measurement. For EVM, magnitude error and phase error, the extreme value of all modulation symbols in the slot. No average over data symbols is involved.
- **"StdDev":** Standard deviation of all "Current" values since the start of the measurement.

All statistical results (statistical tables and "Average" or "Max" traces) are calculated according to the general rules for statistical results.

See also: "Statistical Results" in the R&S CMW base unit manual, chapter "System Overview"

Statistic Count

Progress bar for the measurement. During the first single shot after the start of the measurement, the bar shows the number of elapsed measured slots or subframes relative to the configured "Statistic Count". A filled progress bar indicates that the first shot is complete and the statistical depth has been reached.

Note that two slots can be measured when the defined number of subframes is captured once. For an example, see Chapter 3.2.1.3, "Defining the Scope of the Measurement", on page 631.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "System Overview"

Out of Tolerance

Percentage of measurement intervals (slots) that were failed because they exceeded the limits in the diagram.

Detected Modulation
Modulation scheme in the measured slot. The modulation scheme is either detected automatically or selected manually (see "Modulation Scheme" on page 697). If channel type PUCCH is detected, QPSK is displayed as modulation type, because the QPSK limits are applied in that case.

Detected Channel Type
Channel type (PUCCH or PUSCH) for the measured slot. The channel type is either detected automatically or selected manually, see "Channel Type" on page 692.

View Filter Throughput
Percentage of measurement intervals where the detected signal configuration was found to correspond to the "View Filter" settings. Only slots which contribute to the "View Filter Throughput" are displayed, counted, and used for the statistical results. Other slots are rejected. For filter settings, see Chapter 3.3.5, "Measurement Control Settings", on page 687.

The "View Filter Throughput" is evaluated in a moving window of 1000 frames. If a non-matching signal configuration is changed according to the "View Filter" settings, the throughput increases linearly from 0 % to 100 %.

3.3 GUI Reference

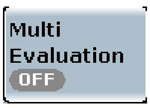
The following sections provide detailed reference information on the graphical user interface (GUI) and the parameters of the LTE multi-evaluation measurement.

- Measurement Control.....678
- Accessing Parameters and Settings.....679
- Signal Routing and Analyzer Settings.....679
- Carrier Aggregation Settings.....683
- Measurement Control Settings.....687
- Trigger Settings.....703
- Limit Settings.....706
- Shortcut Configuration.....706
- Additional Softkeys and Hotkeys.....707
- Measurement Results.....709

3.3.1 Measurement Control

To turn the measurement on or off, select the control softkey and press ON | OFF or RESTART | STOP. Alternatively, right-click the control softkey.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "System Overview"



Multi Evaluation (Softkey)
The softkey shows the current measurement state. Additional measurement substates can be retrieved via remote control.

Remote command:
INITiate:LTE:MEAS<i>:MEValuation
ABORt:LTE:MEAS<i>:MEValuation
STOP:LTE:MEAS<i>:MEValuation
FETCh:LTE:MEAS<i>:MEValuation:STATe?
FETCh:LTE:MEAS<i>:MEValuation:STATe:ALL?

3.3.2 Accessing Parameters and Settings

The most important settings of the LTE multi-evaluation measurement are displayed at the top of the measurement dialog.

All settings are defined via softkeys and hotkeys or using the main configuration dialog. The configuration dialog is described in the following sections. To open the dialog box, select the "Multi Evaluation" tab and press the "Config" hotkey.

3.3.3 Signal Routing and Analyzer Settings

The parameters at the top of the configuration tree configure the RF input path. Most parameters are common measurement settings. They have the same value in all measurements (for example PRACH measurement and multi-evaluation measurement).

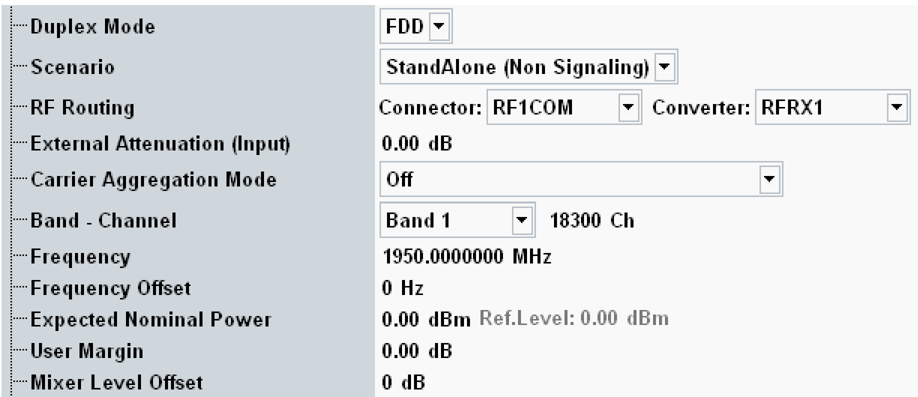


Figure 3-37: Signal routing and analyzer settings

Duplex Mode....680
Scenario = StandAlone....680
Scenario = Combined Signal Path....680
Scenario = Measure@ProtocolTest....681
RF Routing....681
External Attenuation (Input)....681
Carrier Aggregation Mode....681

Band / Channel / Frequency 681
Frequency Offset 682
Expected Nominal Power 682
User Margin 683
Mixer Level Offset 683

Duplex Mode

Selects the duplex mode of the LTE signal: FDD or TDD.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:DMODe` (SA)
`CONFigure:LTE:SIGN<i>[:PCC]:DMODe` (CSP)
`CONFigure:LTE:SIGN<i>:SCC<c>:DMODe` (CSP)
`CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific` (CSP)

Scenario = StandAlone

The measurement is used standalone.

Remote command:
`ROUTe:LTE:MEAS<i>:SCENario:SALone`
`ROUTe:LTE:MEAS<i>:SCENario?`
`ROUTe:LTE:MEAS<i>?`

Scenario = Combined Signal Path

Allows you to use an LTE signaling application (option R&S CMW-KS500/-KS550) in parallel to the LTE measurement.

The additional parameter "Controlled by" selects the signaling application and the uplink carrier to be measured. If there are two contiguous uplink carriers, the used SCC is indicated. It is measured in addition to the PCC.

Most parameters described in this section and some measurement control settings display values determined by the signaling application. The corresponding measurement settings are remembered in the background and displayed again when switching back to the standalone scenario.

Connection status information of the signaling application is displayed at the bottom of the measurement views. Softkeys and hotkeys provide access to the settings of the signaling application and allow you to switch the downlink signal on or off, see Chapter 3.3.9, "Additional Softkeys and Hotkeys", on page 707.

For additional information, see Chapter 3.2.1.5, "Parallel Signaling and Measurement", on page 633.

Remote command:
`ROUTe:LTE:MEAS<i>:SCENario:CSPath`
`ROUTe:LTE:MEAS<i>:SCENario?`
`ROUTe:LTE:MEAS<i>?`

Scenario = Measure@ProtocolTest
Allows you to use an LTE protocol test application in parallel to the LTE measurement. The protocol test application is selected by the additional parameter "Controlled by".

The signal routing and analyzer settings described in this section are ignored by the measurement application. Configure the corresponding settings within the protocol test application.

Remote command:
`ROUTe:LTE:MEAS<i>:SCENario:MAPRotocol`
`ROUTe:LTE:MEAS<i>:SCENario?`

RF Routing
Selects the input path for the measured RF signal, i.e. the input connector and the RX module to be used.

In the standalone (SA) scenario, these parameters are controlled by the measurement. In the combined signal path (CSP) scenario, they are controlled by the signaling application.

For connector and converter settings in the combined signal path scenario, use one of the `ROUTe:LTE:SIGN<i>:SCENario:...` signaling commands.

Remote command:
`ROUTe:LTE:MEAS<i>:SCENario:SALone` (SA)
`ROUTe:LTE:SIGN<i>:SCENario:...` (CSP)

External Attenuation (Input)
Defines the value of an external attenuation (or gain, if the value is negative) in the input path. The power readings of the R&S CMW are corrected by the external attenuation value.

The external attenuation value is also used in the calculation of the maximum input power that the R&S CMW can measure.

If a correction table for frequency-dependent attenuation is active for the chosen connector, then the table name and a button are displayed. Press the button to display the table entries.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:RFSettings:EATTenuation` (SA)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut` (CSP)

Carrier Aggregation Mode
Selects whether the measured signal uses carrier aggregation or not, see Chapter 3.3.4, "Carrier Aggregation Settings", on page 683.

Band / Channel / Frequency
Center frequency of the RF analyzer for measurements without carrier aggregation. Set this frequency to the frequency of the measured RF signal to obtain a meaningful measurement result. The relation between operating band, frequency and channel number is defined by 3GPP (see Chapter 3.2.4.3, "Frequency Bands", on page 646).

You can specify the RF frequency in two ways:

- Enter the frequency directly. The band and channel settings can be ignored or used for validation of the entered frequency. For validation, select the designated band. The channel number resulting from the selected band and frequency is displayed. For an invalid combination, no channel number is displayed.
- Select a band and enter a channel number valid for this band. The R&S CMW calculates the resulting frequency.

In the standalone (SA) scenario, these parameters are controlled by the measurement. In the combined signal path (CSP) scenario, they are controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:BAND` (SA)
`CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency` (SA)
`CONFigure:LTE:SIGN<i>[:PCC]:BAND` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL` (CSP)
`CONFigure:LTE:SIGN<i>:SCC<c>:BAND` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL` (CSP)

Frequency Offset

Positive or negative frequency offset to be added to the specified center frequency of the RF analyzer.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:RFSettings:FOFFset` (SA)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific` (CSP)

Expected Nominal Power

Defines the nominal power of the RF signal to be measured. An appropriate value for LTE signals is the peak output power at the DUT during the measurement. The "Ref. Level" is calculated as follows:

Reference level = Expected Nominal Power + User Margin

Note: The actual input power at the connectors must be within the level range of the selected RF input connector; refer to the data sheet. If all power settings are configured correctly, the actual power equals the "Reference Level" minus the "External Attenuation (Input)" value.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:RFSettings:ENPower` (SA)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower` (CSP)

User Margin
Margin that the R&S CMW adds to the "Expected Nominal Power" to determine its reference power ("Ref. Level"). The "User Margin" is typically used to account for the known variations of the RF input signal power, e.g. the variations due to a specific channel configuration.

The variations (crest factor) depend on the LTE signal parameters, in particular the modulation scheme. If the "Expected Nominal Power" is set to the peak power during the measurement, a 0 dB user margin is sufficient.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:RFSettings:UMARgin` (SA)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin` (CSP)

Mixer Level Offset
Varies the input level of the mixer in the analyzer path. A negative offset reduces the mixer input level. A positive offset increases the mixer input level. Optimize the mixer input level according to the properties of the measured signal.

Mixer level offset	Advantages	Possible shortcomings
< 0 dB	Suppression of distortion (e.g. of the intermodulation products generated in the mixer)	Lower dynamic range (due to smaller signal-to-noise ratio)
> 0 dB	High signal-to-noise ratio, higher dynamic range	Risk of intermodulation, smaller overdrive reserve

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:RFSettings:MLOFfset` (SA)
`CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset` (CSP)
`CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset` (CSP)

3.3.4 Carrier Aggregation Settings

The carrier aggregation mode is part of the analyzer settings at the top of the configuration tree.

If the mode is set to contiguous uplink carrier aggregation, an additional node is displayed for configuration of the individual component carriers. The band, channel and frequency settings are moved into this node, as well as the channel bandwidth setting and the physical cell ID setting from the "Measurement Control" section.

These settings are described in the following. Other parameters that depend on the carrier aggregation mode are the spectrum limits and the network signaled value.

Some measurement result views are also modified depending on the carrier aggregation mode.

Option R&S CMW-KM502/552 is required to measure FDD/TDD uplink signals with contiguous uplink carrier aggregation. Without these options, the parameters in this section are not visible.

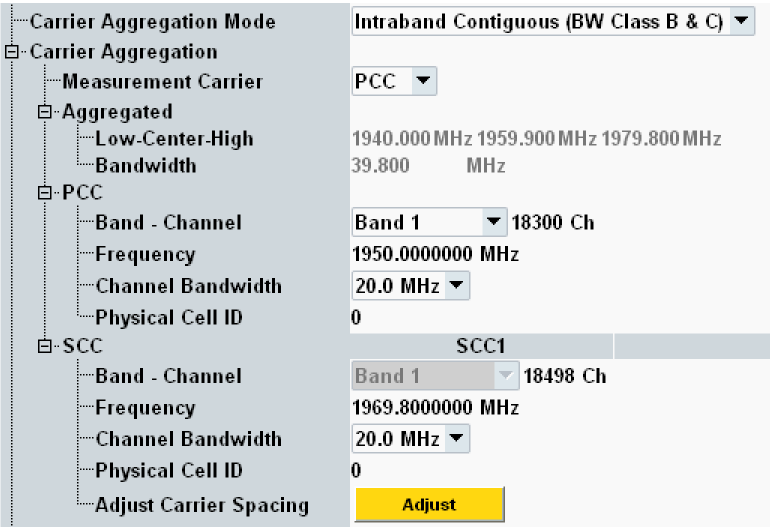


Figure 3-38: Carrier aggregation settings

Configuring the component carrier frequencies

To ensure that the component carriers are aggregated contiguously in the standalone scenario, proceed as follows.

1. Select the PCC channel bandwidth and the SCC channel bandwidth.
2. Specify the PCC center frequency (directly or via band plus channel number).
3. Select whether the SCC center frequency is lower or higher than the PCC center frequency:
   Specify any SCC frequency above or below the PCC frequency.
4. Press the "Adjust" button.

   The SCC center frequency is adjusted automatically, so that the spacing between SCC and PCC is correct. The channel spacing is defined in 3GPP TS 36.101, section 5.7.1A.

The settings in Figure 3-38 are described in the following.

Carrier Aggregation Mode....................685
Measurement Carrier....................685
Aggregated....................685
Band / Channel / Frequency....................686
Channel Bandwidth....................686
Physical Cell ID....................686
Adjust Carrier Spacing....................687

Carrier Aggregation Mode
Selects whether the measured signal uses carrier aggregation or not.

The following modes are supported:

- **"Off"**:
  The UL signal contains a single carrier, no carrier aggregation. Or it contains non-contiguous carriers, for example in different bands. Only one carrier is measured.
  The node "Carrier Aggregation" is hidden and the remainder of this section is irrelevant.
- **"Intraband Contiguous (BW Class B & C)"**:
  The UL signal contains one PCC and one SCC. The two carriers use a continuous spectrum in the same operating band. For details about the BW classes, see 3GPP TS 36.101, section 5.6A.
  The node "Carrier Aggregation" is shown and the remaining parameters in this section must be configured.
  Option R&S CMW-KM502/552 is required for FDD/TDD.

In the standalone (SA) scenario, these parameters are controlled by the measurement. In the combined signal path (CSP) scenario, they are controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:CAGGregation:MODE` (SA)
`CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE` (CSP)

Measurement Carrier
Selects a component carrier for single-carrier measurements. If the selected carrier is not available, a "Sync Error" or an "Underdriven" error is displayed.

Single-carrier measurement views, evaluating the "Measurement Carrier":

- EVM vs. symbol / vs. subcarrier, magnitude error, phase error
- Equalizer spectrum flatness
- Power dynamics
- I/Q diagram
- TX measurement

Multi-carrier measurements, evaluating all carriers:

- Inband emission diagrams
- Spectrum ACLR
- Spectrum emission mask
- Power monitor
- RB allocation table

Option R&S CMW-KM502/552 is required for FDD/TDD.

Remote command:
`CONFigure:LTE:MEAS<i>:CAGGregation:MCARrier`

Aggregated
Displays information about the aggregated bandwidth, resulting from the configured PCC and SCC frequencies and the channel bandwidths.

"Low-Center-High" indicates the lower edge of the aggregated bandwidth, the center frequency and the higher edge. "Bandwidth" indicates the width of the aggregated bandwidth (higher edge minus lower edge).

The displayed bandwidth can be slightly less than the sum of the PCC and SCC channel bandwidths. For details, see 3GPP TS 36.101, sections 5.6A and 5.7.1A.

Option R&S CMW-KM502/552 is required for FDD/TDD.

Remote command:
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:LOW?
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:CENTer?
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:HIGH?
CONFigure:LTE:MEAS<i>:CAGGregation:CBANdwidth:AGGRegated?

Band / Channel / Frequency
The "Frequency" defines the PCC or SCC center frequency. The two component carriers must be aggregated contiguously. The correct channel spacing depends on the bandwidths. For standalone measurements, see also "Configuring the component carrier frequencies" on page 684.

The "Band" setting is identical for the two carriers. Configuring the band and the channel numbers is optional, as for configurations without carrier aggregation.

Option R&S CMW-KM502/552 is required for FDD/TDD.

In the standalone (SA) scenario, these parameters are controlled by the measurement. In the combined signal path (CSP) scenario, they are controlled by the signaling application.

Remote command:
CONFigure:LTE:MEAS<i>:BAND (SA)
CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency (SA)
CONFigure:LTE:MEAS<i>:RFSettings:SCC<no>:FREQuency (SA)
CONFigure:LTE:SIGN<i>[:PCC]:BAND (CSP)
CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL (CSP)
CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL (CSP)

Channel Bandwidth
You can set different channel bandwidths for the PCC and the SCC. Set the bandwidths in accordance with the measured LTE signal.

Option R&S CMW-KM502/552 is required for FDD/TDD.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth (SA)
CONFigure:LTE:MEAS<i>:SCC<no>:CBANdwidth (SA)
CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL (CSP)
CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL (CSP)

Physical Cell ID
Set the physical cell IDs for the PCC and the SCC in accordance with the measured LTE signal.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation[:PCC]:PLCid (SA)
CONFigure:LTE:MEAS<i>:MEValuation:SCC<no>:PLCid (SA)
CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID (CSP)
CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID (CSP)

Adjust Carrier Spacing
Adjusts the SCC frequency, so that the PCC and the SCC are aggregated contiguously. Readjust the SCC frequency after you have changed a channel bandwidth or the PCC frequency.

Option R&S CMW-KM502/552 is required for FDD/TDD.

The button is only relevant and visible for the standalone (SA) scenario. In the combined signal path (CSP) scenario with contiguous uplink carrier aggregation, the signaling application automatically adjusts the SCC.

Remote command:
CONFigure:LTE:MEAS<i>:CAGGregation:SCC<no>:ACSPacing (SA)
CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE (CSP)

3.3.5 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the LTE multi-evaluation measurement.

While the combined signal path scenario is active, some of the measurement control parameters display values determined by the controlling signaling application. For these parameters, a hint is given in the parameter description. See also "Scenario = Combined Signal Path" on page 680.

● Miscellaneous, Part 1....687
● Miscellaneous, Part 2....692
● Modulation Settings....696
● Spectrum Settings....699
● Power Settings....700
● BLER and List Mode Settings....702

3.3.5.1 Miscellaneous, Part 1

This section describes the following "Measurement Control" settings.

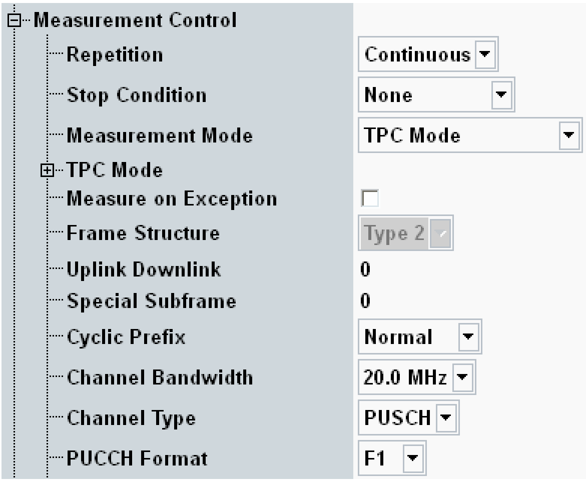


Figure 3-39: Measurement control settings - part 1

Repetition....688
Stop Condition....688
Measurement Mode....689
TPC Mode....689
Measure on Exception....690
Frame Structure....690
Uplink Downlink....691
Special Subframe....691
Cyclic Prefix....691
Channel Bandwidth....691
Channel Type....692
PUCCH Format....692

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

CONFigure:LTE:MEAS<i>:MEValuation:REPetition

Stop Condition

Specifies the conditions for an early termination of the measurement:

- **"None":** The measurement is performed according to its "Repetition" mode and "Statistic Count", irrespective of the limit check results.

- **"On Limit Failure":** The measurement is stopped when one of the limits is exceeded, irrespective of the repetition mode set. If no limit failure occurs, it is performed according to its "Repetition" mode and "Statistic Count". Use this setting for measurements that are intended for checking limits, e.g. production tests.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:SCONdition

Measurement Mode
Selects/displays the measurement mode.

- **"Normal"**:
  In normal mode, the measurement uses a constant reference level for the entire measurement duration.
  Use the normal mode for the standalone scenario. For the other scenarios, the normal mode is only suitable, if the controlling application does not modify the reference level during the measurement.
- **"TPC Mode"**:
  In TPC mode, the measurement configures the reference level once per subframe.
  In the combined signal path scenario, the reference level is controlled by the signaling application. In the standalone scenario, the reference levels to be used must be configured, see parameter TPC Mode.
  The TPC mode has been designed for TPC measurements where the UE power is ramped up or down over a wide range, exceeding the dynamic range of the measurement. A typical example is a conformance test case according to 3GPP TS 36.521, section "6.3.5.2 Power Control Relative power tolerance".
  Note that for spectrum measurements the normal mode is recommended. For channel bandwidths > 10 MHz, spectrum measurements are not supported in TPC mode.
- **"Multi Eval List Mode"**:
  The list mode can only be enabled via the remote control command listed below.
  When it has been enabled, "Multi Eval List Mode" is displayed as measurement mode. You can disable it by selecting one of the other modes.
  For an introduction to the list mode, see Chapter 3.2.3, "List Mode", on page 637.
  Option R&S CMW-KM012 is required.

While the combined signal path scenario is active, this parameter is not configurable.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:MMODe
CONFigure:LTE:MEAS<i>:MEValuation:LIST

TPC Mode
This node configures a sequence of expected nominal power values to be applied during a measurement in TPC mode, using the standalone scenario. It is only visible, if the measurement mode "TPC Mode" is selected.

For each list entry, you can configure the number of subframes and the expected nominal power applicable to these subframes. The resulting reference level is calculated and displayed for information. The first entry is coupled to the standard expected nominal power setting, see "Expected Nominal Power" on page 682.

TPC Mode	Nr of Subframes	Exp.Nom. Power	Reference Level
[0]	320	0.00 dBm	0.00 dBm
[1]	320	0.00 dBm	0.00 dBm
[2]	320	0.00 dBm	0.00 dBm

The list defines the expected nominal powers to be applied within one sequence of measured subframes, configured via parameter Measurement Subframe > "No. of Subframes".

Example:

- Configured "No. of Subframes" = 30, to be measured two times (defined via statistic count)
- List entry 0 = 10 subframes, 0 dBm
  List entry 1 = 15 subframes, 10 dBm
  List entry 2 = 10 subframes, 20 dBm
- Resulting used expected nominal power:
  Measured subframe 1 to 10: entry 0, 0 dBm
  Measured subframe 11 to 25: entry 1, 10 dBm
  Measured subframe 26 to 30: entry 2, 20 dBm
  second measurement of 30 subframes: again entry 0 to 2 are applied

If the configured number of subframes to be measured is longer than the sequence defined via the list entries, the last list entry is used for the remaining subframes.

Note: Between two list entries, the R&S CMW reconfigures the reference level according to the next entry. This action can impair the accuracy of measurement results for the preceding and the subsequent subframe. Keep this effect in mind when configuring the measurement and evaluating the results. Do not reconfigure the reference level directly before/after the "Measure Subframe".

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:TMODe:SCOunt`
`CONFigure:LTE:MEAS<i>:MEValuation:TMODe:ENPower`
`CONFigure:LTE:MEAS<i>:MEValuation:TMODe:RLEVel?`

Measure on Exception

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected. A faulty result occurs e.g. when an overload is detected. In remote control, the cause of the error is indicated by the "reliability indicator".

- **Off:** Faulty results are rejected. The measurement is continued; the statistical counters are not reset. Use this mode to ensure that a single faulty result does not affect the entire measurement.
- **On:** Results are never rejected. Use this mode e.g. for development purposes, if you want to analyze the reason for occasional wrong transmissions.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:MOEXception`

Frame Structure

Displays the frame structure of the uplink signal as defined in 3GPP TS 36.211. The value is set implicitly via the Duplex Mode ("Type 1" = FDD, "Type 2" = TDD).

For a TDD signal, the additional parameters "Uplink Downlink" and "Special Subframe" have to be set to specify the frame structure.

Remote command:
`CONFigure:LTE:MEAS<i>:FSTRucture?`

Uplink Downlink
Uplink-downlink configuration of a TDD signal, as defined in 3GPP TS 36.211, chapter 4, "Frame Structure". Each configuration defines a combination of uplink subframes, downlink subframes and special subframes within a radio frame. The selected configuration is visualized in the "RB Allocation Table".

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:ULDL` (SA)
`CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific` (CSP)

Special Subframe
Configuration of the special subframes of a TDD signal, as defined in 3GPP TS 36.211, chapter 4, "Frame Structure". Each configuration defines the inner structure of a special subframe, i.e. the lengths of DwPTS, GP and UpPTS.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:SSUBframe` (SA)
`CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific` (CSP)

Cyclic Prefix
Normal or extended cyclic prefix. Set this parameter in accordance with the cyclic prefix of the measured LTE signal. The number of measured data symbols is 7 (6) for normal (extended) cyclic prefix duration.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:CPRefix` (SA)
`CONFigure:LTE:SIGN<i>:CELL:CPRefix` (CSP)

Channel Bandwidth
Channel bandwidth in the range 1.4 MHz to 20 MHz. Set the bandwidth in accordance with the measured LTE signal.

To configure the channel bandwidth for carrier aggregation, see Chapter 3.3.4, "Carrier Aggregation Settings", on page 683.

The parameter is a common measurement setting, i.e. it has the same value in all measurements (e.g. PRACH measurement and multi-evaluation measurement).

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth` (SA)
`CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL` (CSP)

Channel Type
Configures the channel type detection for the measured subframe of the measured carrier. With carrier aggregation, the measured carrier is the configured "Measurement Carrier".

The channel type can usually be detected automatically. If automatic detection fails, e.g. because the signal contains a PUCCH outside of the PUCCH region, select the channel type manually.

- **AUTO**: The channel type is detected automatically. Within the PUCCH region, it can be PUCCH or PUSCH. Outside of the PUCCH region, PUSCH is always assumed.
- **PUSCH**: The measured subframe contains only PUSCH.
- **PUCCH**: The measured subframe contains only PUCCH.

To verify detected channel types, you can use the RB allocation table, see Chapter 3.2.6.10, "View RB Allocation Table", on page 668.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:CTYPe`

PUCCH Format
Specifies the format of the PUCCH. With carrier aggregation, only the PUCCH of the "Measurement Carrier" is relevant.

If your signal contains a PUCCH, adjust this value to ensure that the R&S CMW can synchronize to the signal and perform channel estimation.

All PUCCH contained in the measured carrier must have the same format. The PUCCH formats are defined in 3GPP TS 36.211.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:PFORmat`

3.3.5.2 Miscellaneous, Part 2

This section describes the following "Measurement Control" settings.

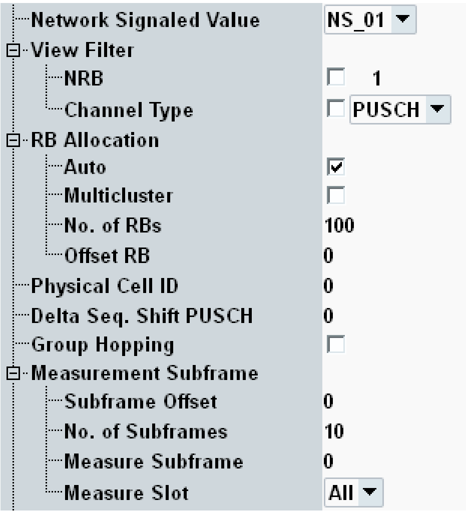


Figure 3-40: Measurement control settings - part 2

Network Signaled Value....693
View Filter....694
└ NRB....694
└ Channel Type....694
RB Allocation....694
└ Auto....694
└ Multicluster....694
└ No. of RBs, Offset RB (no multi-cluster)....695
└ No. of RBs, Offset RB (with multi-cluster)....695
Physical Cell ID....695
Delta Seq. Shift PUSCH....696
Group Hopping....696
Measurement Subframe....696

Network Signaled Value

Adjust this value to the "network signaled value" used by the UE. The selected value has impacts on the spectrum emission mask limit check, see Chapter 3.2.5.9, "Spectrum Emission Mask", on page 653.

The available values depend on the configured carrier aggregation mode ("NS_xx" values or "CA_NS_xx" values).

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:NSValue (SA)
CONFigure:LTE:MEAS<i>:MEValuation:NSValue:CAGGregation (SA)
CONFigure:LTE:SIGN<i>:CONNection:ASEMission (CSP)
CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation (CSP)

View Filter
Restricts the measurement to signal periods with certain properties. Periods that do not match the filter settings, do not contribute to the measurement results.

NRB ← View Filter
Specifies the number of allocated resource blocks (RB) in the measured slot. Slots with a different number of allocated blocks are rejected. Use this setting for signals with a varying number of allocated RBs, if you wish to restrict the measurement to a subset of slots with a specific number of RBs.

With carrier aggregation, the view filter is applied to the "Measurement Carrier".

The allowed values for this parameter are restricted by 3GPP TS 36.211. For details, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:NVFilter`

Channel Type ← View Filter
Allows you to measure only slots for which the detected channel type equals physical uplink shared channel (PUSCH) or only slots with channel type physical uplink control channel (PUCCH). The detected channel type is influenced by the parameters Channel Type and PUCCH Format.

With carrier aggregation, the view filter is applied to the "Measurement Carrier".

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:CTVFilter`

RB Allocation
Configure the settings according to the resource block allocation of the measured signal.

With carrier aggregation, the settings apply to the "Measurement Carrier".

For background information, see Chapter 3.2.4.2, "Resource Block Allocation", on page 644.

Auto ← RB Allocation
If "Auto" is enabled, the RB configuration is detected automatically. The settings "No. of RBs" and "Offset RB" are ignored.

Automatic detection is not possible for multi-cluster allocation.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:AUTO`

Multicluster ← RB Allocation
Specifies whether the UL signal uses multi-cluster allocation or not.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

"OFF"	All allocated RBs are grouped in a single contiguous cluster. Allocation type 0 is used (no resource block groups).

"ON" The allocated RBs are divided into two clusters. Within each cluster, the allocation is contiguous. Allocation type 1 is used (resource block groups).
The view "RB Allocation Table" is not available. For inband emission results, the limit check is disabled.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster` (SA)
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL` (CSP)
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL` (CSP)

No. of RBs, Offset RB (no multi-cluster) ← RB Allocation
Number of allocated RBs in the measured slot and offset of the first allocated RB from the edge of the allocated transmission bandwidth.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:NRB`
`CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:ORB`

No. of RBs, Offset RB (with multi-cluster) ← RB Allocation
The settings are configurable per cluster.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:NRB<Number>` (SA)
`CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:ORB<Number>` (SA)
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL` (CSP)
`CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL` (CSP)
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL` (CSP)
`CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL` (CSP)

Physical Cell ID
Adjust this parameter to the physical cell ID used by the measured LTE signal. This setting is required to ensure that the R&S CMW can synchronize to the signal and perform channel estimation.

To configure the physical cell ID for carrier aggregation, see Chapter 3.3.4, "Carrier Aggregation Settings", on page 683.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation[:PCC]:PLCid` (SA)
`CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID` (CSP)

Delta Seq. Shift PUSCH
Delta sequence shift value (Δ_{ss}) used to calculate the sequence shift pattern for PUSCH from the sequence shift pattern for PUCCH (refer to "group hopping" in 3GPP TS 36.211). Adjust this value to the measured LTE signal to ensure that the R&S CMW can synchronize to the signal and perform channel estimation.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:DSSPusch`

Group Hopping
Specifies whether group hopping is used or not (refer to "group hopping" in 3GPP TS 36.211). Set this parameter according to the measured LTE signal to ensure that the R&S CMW can synchronize to the signal and perform channel estimation.

Measurements with group hopping require a frame trigger signal.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:GHOPping` (SA)
`CONFigure:LTE:SIGN<i>:CONNection:GHOPping` (CSP)

Measurement Subframe
Configures the scope of the measurement, i.e. which subframes are measured.
- **"Subframe Offset"** specifies the start of the measured subframe range relative to the trigger event
- **"No. of Subframes"** specifies the length of the measured subframe range, i.e.:
  – Number of subframes to be measured and displayed in the views "Power Monitor" and "RB Allocation Table"
  – Number of subframes to be evaluated for BLER measurements. Select a high value being a multiple of 10 to speed up BLER measurements and ensure that the number of scheduled subframes per radio frame can be evaluated correctly.
- **"Measure Subframe"** selects one subframe of the measured subframe range containing the measured slots for all other results, e.g. modulation and spectrum results. For "Power Dynamics" measurements, the ON power is measured in this subframe.
- **"Measure Slot"** selects which slots of the "Measure Subframe" are measured: both slots, the first slot only (slot #0) or the second slot only (slot #1).

See also Chapter 3.2.1.3, "Defining the Scope of the Measurement", on page 631.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes`
`CONFigure:LTE:MEAS<i>:MEValuation:MSLot`

3.3.5.3 Modulation Settings

The following "Measurement Control" parameters configure the modulation measurement settings.

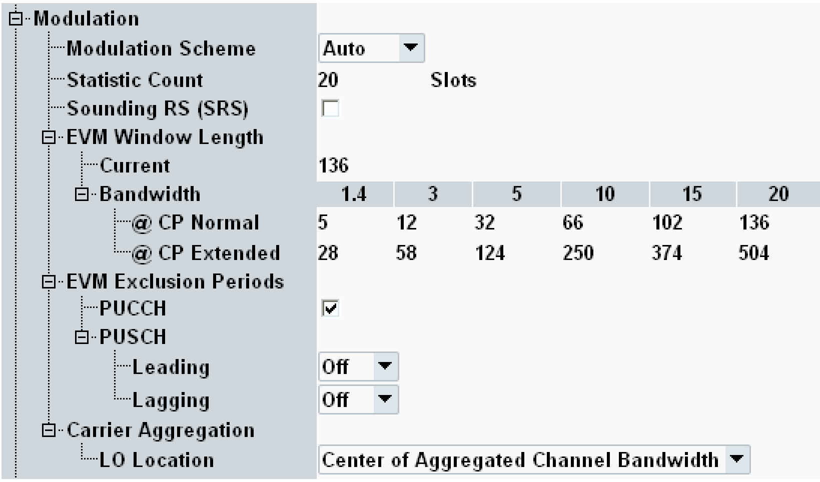


Figure 3-41: Measurement control settings - modulation

Modulation Scheme....................697
Statistic Count....................697
Sounding RS (SRS)....................698
EVM Window Length....................698
EVM Exclusion Periods....................698
Carrier Aggregation....................699

Modulation Scheme

Selects one of the three possible modulation schemes (QPSK, 16-QAM, 64-QAM) for LTE uplink signals. The R&S CMW can also auto-detect the modulation scheme (setting: "Auto").

Auto-detection can fail for signals with a poor modulation accuracy. In this case, select the modulation scheme in accordance with the measured signal.

For remote operation, it is recommended to select the modulation scheme manually to ensure correct detection and speed up the measurement. The reset value differs from the preset value.

Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:MODulation:MSCHeme`

Statistic Count

Defines the number of measurement intervals per measurement cycle for modulation measurements. The following result views use this statistic count: EVM, magnitude error, phase error, inband emissions, equalizer spectrum flatness, I/Q diagram and TX measurement.

One measurement interval is completed when the R&S CMW has measured a full slot of the configured "Measure Subframe". The measurement always extends over the whole subcarrier range.

The measurement provides independent statistic counts for different results. In single-shot mode, a measurement with a completed statistic count is stopped, even if another measurement with an incomplete statistic count is still running.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:MODulation

Sounding RS (SRS)
Indicates whether the uplink signal can contain a sounding reference signal (SRS) or not.

- **Disabled**: The uplink signal must not contain an SRS. Otherwise the modulation results are distorted.
- **Enabled**: The uplink signal can contain an SRS in the last SC-FDMA symbol of a subframe.
  This SC-FDMA symbol is analyzed to derive an EVM result for SRS (EVM SRS). For all other modulation results, the SC-FDMA symbol is not evaluated.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, this parameter is set by the signaling application. A subsequent modification in the signaling application is also applied to the measurement. But changing the setting in the measurement does not affect the signaling application.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:SRS:ENABle (SA)
CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle (CSP)

EVM Window Length
Length of the EVM window, defined in samples. The standard (3GPP TS 36.101, annex F) specifies the window length as a function of the bandwidth and the cyclic prefix. The R&S CMW uses the "Current" value. This value is linked to the value in the table, corresponding to the current cyclic prefix and bandwidth settings.

The window length defines the two sets of "l / h" modulation quantities in the result tables; see Chapter 3.2.1.7, "Calculation of Modulation Results", on page 634.

The minimum value of one FFT symbol actually corresponds to a window of zero length so that $EVM_h = EVM_l$.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength:CBANdwidth<Band>

EVM Exclusion Periods
Exclusion periods to be considered for calculation of EVM, magnitude error and phase error results (quantities with "low" and "high" values).

Separate settings are available for slots with detected channel type "PUCCH" and "PUSCH":

- **PUCCH**: This parameter affects low and high single value results (tables below bar graphs). If the parameter is enabled, the first and the last SC-FDMA symbol of each slot is excluded from the calculation of these results. If the last symbol of a slot is already excluded because SRS signals are allowed, the second but last symbol is also excluded.

- **PUSCH**: This parameter affects all low and high results (single values and bar graphs). The selected time intervals are excluded from the calculation of these results.
  The "Leading" time interval is excluded at the beginning of each subframe.
  The "Lagging" time interval is excluded at the end of each subframe; if SRS signals are allowed, at the end of each shortened subframe.

Remote command:

```
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUCCh
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:
LEADing
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:
LAGGing
```

Carrier Aggregation

The "Carrier Aggregation" node is only visible for carrier aggregation measurements, see "Carrier Aggregation Mode" on page 685.

Configure the parameter "LO Location" according to the UE transmitter architecture:

- **"Center of Aggregated Channel Bandwidth"**:
  The transmitter uses a single local oscillator (LO). The LO frequency is the center frequency of the aggregated channel bandwidth.
- **"Center of each Component Carrier"**:
  The transmitter uses a separate LO for each component carrier. The LO frequencies are the center frequencies of the component carriers.

The setting influences the measured I/Q offset and the inband emission mask. The mask depends on the location of the RF carriers ("IQ Offset" component) and on the location of the image frequencies ("IQ Image" component), see also Chapter 3.2.5.5, "Inband Emissions Limits", on page 649.

Remote command:

```
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:CAGGregation:
LLOCation
```

3.3.5.4 Spectrum Settings

The following "Measurement Control" parameters configure the spectrum measurement settings.

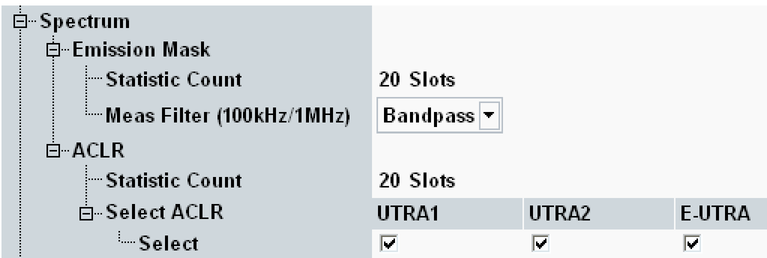


Figure 3-42: Measurement control settings - spectrum

Emission Mask / ACLR > Statistic Count....700
Emission Mask > Meas Filter....700
ACLR > Select ACLR....700

Emission Mask / ACLR > Statistic Count

Defines the number of measurement intervals per measurement cycle for emission mask and ACLR measurements.

One measurement interval is completed when the R&S CMW has measured a full slot of the configured "Measure Subframe".

Remote command:

`CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:SEMask`
`CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:ACLR`

Emission Mask > Meas Filter

Selects the resolution filter type for filter bandwidths of 100 kHz and 1 MHz (Gaussian or bandpass filter). For 30 kHz filters, the type is fixed (Gaussian). The filter bandwidth to be used can be configured per emission mask area as part of the limits.

Remote command:

`CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:SEMask:MFILter`

ACLR > Select ACLR

Specifies which adjacent channels are evaluated: first adjacent UTRA channels, second adjacent UTRA channels or first adjacent E-UTRA channels. Any combinations are supported, including the activation of all three options in parallel.

Remote command:

`CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:ACLR:ENABle`

3.3.5.5 Power Settings

The following "Measurement Control" parameters configure the power measurement settings.

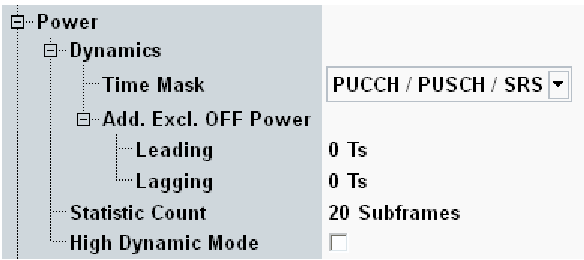


Figure 3-43: Measurement control settings - power

Dynamics....701
└ Time Mask....701
└ Add. Excl. OFF Power....701
Statistic Count....701
High Dynamic Mode....702

Dynamics
The following parameters configure the power dynamics measurement.

Time Mask ← Dynamics
Selects the time mask for power dynamics measurements. The time masks are defined by 3GPP. Each mask is designed for a specific sequence of powers.

"ON" and "OFF" indicate the PUCCH/PUSCH power. "SRS ON" and "SRS OFF" indicate the SRS power.

- **General On / Off**: OFF - ON - OFF
  See 3GPP TS 36.521, section 6.3.4.1 / 6.3.4A.1
- **PUCCH / PUSCH / SRS**: ON - SRS ON - ON
  See 3GPP TS 36.101, figure 6.3.4.4-2
- **SRS blanking**: ON - SRS OFF - ON
  See 3GPP TS 36.101, figure 6.3.4.4-4

See also Chapter 3.2.5.11, "Power Dynamics Limits", on page 655

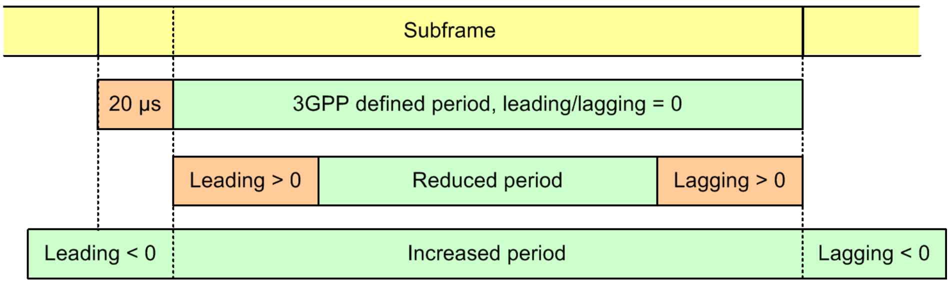
Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:TMASk`

Add. Excl. OFF Power ← Dynamics
Shifts the OFF power evaluation periods.

With the default value 0 Ts, the OFF power is measured over the evaluation period defined by 3GPP. The leading value shifts the beginning of the evaluation period, the lagging value shifts the end. Positive values decrease the evaluation period. Negative values increase it.

This setting affects the measurement of PUCCH, PUSCH and SRS OFF powers.

Example, default period is one subframe with 20 µs exclusion at beginning:



Remote command:
`CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LEADing`
`CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LAGGing`

Statistic Count
Defines the number of measurement intervals per measurement cycle for power measurements. The following result views use this statistic count: power dynamics and power monitor.

For power dynamics results, one measurement interval is completed when the R&S CMW has measured one complete diagram.

For power monitor results, one measurement interval is completed when the number of subframes specified via parameter Measurement Subframe has been captured.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:POWer

High Dynamic Mode
Enables or disables the high dynamic mode.

The high dynamic mode is suitable for power dynamics measurements involving high ON powers. In that case, the dynamic range of the R&S CMW is eventually not sufficient to measure both the high ON powers and the low OFF powers accurately.

In high dynamic mode, the dynamic range is increased by measuring the results in two shots. One shot uses the configured settings to measure the ON power. The other shot uses a lower "Expected Nominal Power" value to measure the OFF power results.

Disable the high dynamic mode if you do not need it, to optimize the measurement speed. Disable it especially if you are not interested in power dynamics results or if you measure low ON powers using a low "Expected Nominal Power" setting.

While the combined signal path scenario is active, this parameter is not configurable.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:POWer:HDMode

3.3.5.6 BLER and List Mode Settings

This section describes the following "Measurement Control" settings.

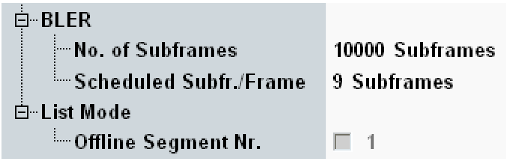


Figure 3-44: Measurement control settings - BLER, list mode

BLER > No. of Subframes....................702
BLER > Scheduled Subfr./Frame....................702
List Mode > Offline Segment No....................703

BLER > No. of Subframes
Defines the number of subframes to be evaluated per measurement cycle (statistics cycle). This value includes all downlink subframes (scheduled and unscheduled). The BLER measurement is a single-shot measurement.

All subframes of the configured subframe range contribute to the measurement, see "Measurement Subframe" on page 696.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:BLER:SFRames

BLER > Scheduled Subfr./Frame
Number of scheduled subframes per radio frame. Configure this parameter according to the properties of the generated downlink signal. A wrong value can result in wrong measurement results (BLER, DTX, relative ACK, relative NACK, number of processed scheduled subframes).

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:BLER:SFRames

List Mode > Offline Segment No.
Selects the list mode segment to be displayed in the measurement diagram. To select a segment number, the list mode must be enabled.

Option R&S CMW-KM012 is required.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:LIST:OSINdex

3.3.6 Trigger Settings

The trigger settings configure the trigger system for the LTE multi-evaluation measurement.

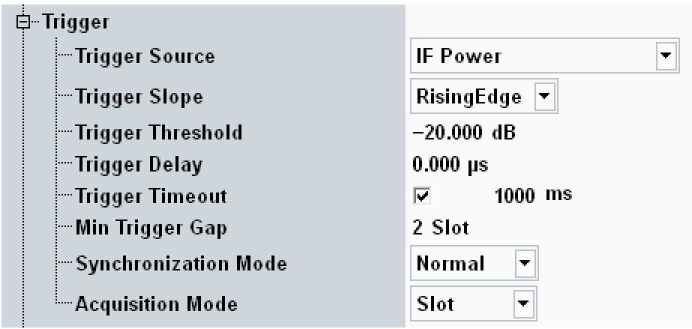


Figure 3-45: Trigger settings

Trigger Source....................703
Trigger Slope....................704
Trigger Threshold....................704
Trigger Delay....................704
Trigger Timeout....................704
Min Trigger Gap....................704
Synchronization Mode....................705
Acquisition Mode....................705

Trigger Source
Selects the source of the trigger event. Some of the trigger sources require additional options.

"Free Run (Fast Sync)"	The measurement starts immediately after it is initiated. The R&S CMW decodes the signal to derive its slot and frame timing. This procedure is repeated after each measurement cycle. This value is not suitable for list mode measurements.
"Free Run (No Sync)"	The measurement starts immediately after it is initiated, without any synchronization. This trigger mode can only be used for power monitor, ACLR and emission mask measurements.

"IF Power" The measurement is triggered by the power of the received signal, converted into an IF signal. The trigger event coincides with the rising or falling edge of the detected LTE burst.

"…External…" External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument (availability depends on instrument model).

Remote command:
TRIGger:LTE:MEAS<i>:MEValuation:SOURce
TRIGger:LTE:MEAS<i>:MEValuation:CATalog:SOURce?

Trigger Slope

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse. This setting has no influence on "Free Run" measurements and for evaluation of trigger pulses provided by other firmware applications.

Remote command:
TRIGger:LTE:MEAS<i>:MEValuation:SLOPe

Trigger Threshold

Defines the input signal power where the trigger condition is satisfied and a trigger event is generated. The trigger threshold is valid for power trigger sources. It is a dB value, relative to the reference level minus the external attenuation ("<Ref. Level> – <External Attenuation (Input)> – <Frequency Dependent External Attenuation>"). If the reference level equals the maximum output power of the DUT and the external attenuation settings are correct, the trigger threshold is relative to the maximum input power.

A low threshold can be required to ensure that the R&S CMW can always detect the input signal. A higher threshold can prevent unintended trigger events.

Remote command:
TRIGger:LTE:MEAS<i>:MEValuation:THReshold

Trigger Delay

Defines a time delaying the start of the measurement relative to the trigger event. This setting has no influence on "Free Run" measurements.

Remote command:
TRIGger:LTE:MEAS<i>:MEValuation:DELay

Trigger Timeout

Sets a time after which an initiated measurement must have received a trigger event. If no trigger event is received, a trigger timeout is indicated in manual operation mode. In remote control mode, the measurement is automatically stopped. The parameter can be disabled so that no timeout occurs.

This setting has no influence on "Free Run" measurements.

Remote command:
TRIGger:LTE:MEAS<i>:MEValuation:TOUT

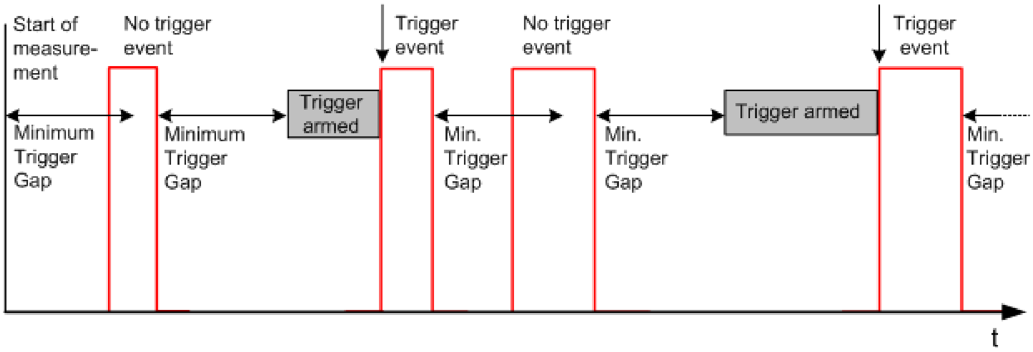
Min Trigger Gap

Defines a minimum duration of the power-down periods (gaps) between two triggered power pulses. This setting is valid for an "(IF) Power" trigger source.

The trigger system is controlled by a timer which is reset to zero in the following instances:

- At the IF power-down ramp of each triggered or untriggered pulse, even if the previous counter has not yet elapsed. A power-down ramp is detected when the signal power falls below the trigger threshold.
- At the beginning of each measurement. The minimum gap defines the minimum time between the start of the measurement and the first trigger event.

The trigger system is rearmed when the timer has reached the specified minimum gap.



This parameter can be used to prevent unwanted trigger events due to fast power variations.

Remote command:
`TRIGger:LTE:MEAS<i>:MEValuation:MGAP`

Synchronization Mode

Selects the size of the search window for synchronization - normal or enhanced.

If the trigger signal is timed accurately, the normal synchronization mode is sufficient and recommended for performance reasons. With increasing inaccuracy of the trigger signal timing, the search window in normal mode can become too small, resulting in a "Synchronization Problem". In that case, select the enhanced mode to increase the search window size.

For "Free Run (Fast Sync)", an enhanced search window is used irrespective of this parameter.

Remote command:
`TRIGger:LTE:MEAS<i>:MEValuation:SMODe`

Acquisition Mode

Selects whether the R&S CMW synchronizes to a slot boundary or to a subframe boundary. The parameter is relevant for "Free Run (Fast Sync)" and for list mode measurements with "Synchronization Mode" = "Enhanced".

Remote command:
`TRIGger:LTE:MEAS<i>:MEValuation:AMODe`

3.3.7 Limit Settings

The "Limits" section in the configuration dialog defines lower and/or upper limits for the modulation, spectrum and power results. Separate limits can be set for the individual modulation schemes or channel bandwidths.

For details, see Chapter 3.2.5, "Limit Settings and Conformance Requirements", on page 647.

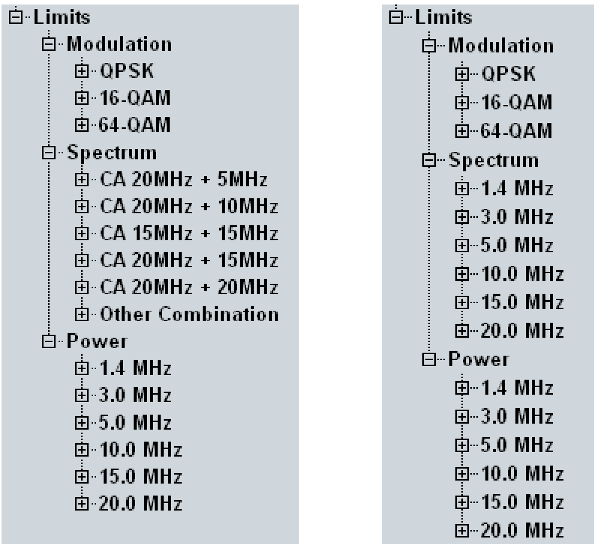


Figure 3-46: Limit settings with and without carrier aggregation

For limit configuration via remote commands, refer to the following sections:

- Chapter 3.5.3.10, "Limits (Modulation, QPSK)", on page 782
- Chapter 3.5.3.11, "Limits (Modulation, 16-QAM / 64-QAM)", on page 786
- Chapter 3.5.3.12, "Limits (Spectrum, No Carrier Aggregation)", on page 791
- Chapter 3.5.3.13, "Limits (Spectrum, with Carrier Aggregation)", on page 796
- Chapter 3.5.3.14, "Limits (Power)", on page 804

3.3.8 Shortcut Configuration

This section configures a shortcut softkey that provides a fast way to access the GPRF generator from the measurement.

The setting is a common measurement setting. It has the same value in all measurements (e.g. PRACH measurement and multi-evaluation measurement).

Figure 3-47: Shortcut configuration

Generator Shortcut

Selects a GPRF generator instance. Softkeys for the selected instance are added to the softkey panel.

3.3.9 Additional Softkeys and Hotkeys

The measurement provides some softkey/hotkey combinations which have no equivalent in the configuration dialog. Most of these hotkeys provide display configurations (like diagram scaling). They are self-explanatory and do not have any remote-control commands assigned.

The remaining softkeys > hotkeys are described below. Most of them are available for multi-evaluation, PRACH and SRS measurements.

The softkeys "Signaling Parameter" and "LTE Signaling" are displayed only if the combined signal path scenario is active and are provided by the "LTE Signaling" application selected as master application. See also "Scenario = Combined Signal Path" on page 680.

The softkeys "ARB / List Mode" and "GPRF Generator" are displayed only if the standalone scenario is active and the generator shortcut is enabled, see Chapter 3.3.8, "Shortcut Configuration", on page 706.

While one of the signaling or generator softkeys is selected, the "Config" hotkey opens the configuration dialog of the generator or signaling application, not the configuration dialog of the measurement.

Multi Evaluation, PRACH > Assign Views

Selects the view types to be displayed in the overview. The R&S CMW does not evaluate the results for disabled views. Therefore, limiting the number of assigned views can speed up the measurement.

Remote command:

CONFigure:LTE:MEAS<i>:MEValuation:RESult[:ALL]

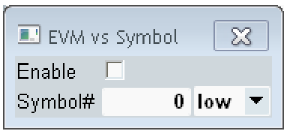
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PDYNamics etc.

CONFigure:LTE:MEAS<i>:PRACh:RESult[:ALL]

CONFigure:LTE:MEAS<i>:PRACh:RESult:PVPReamble etc.

Multi Evaluation > EVM vs. Symbol

The hotkey is only available in the view "Error Vector Magnitude". It opens the following dialog box.



The checkbox enables the measurement of EVM vs. modulation symbol results. They are shown in the lower diagram in the "Error Vector Magnitude" view.

"Symbol#" selects the SC-FDMA symbol to be evaluated. "low" and "high" select between EVM_l and EVM_h results.

For SRS signals, the low/high setting is irrelevant. The FFT processing window begins at the center of the cyclic prefix, not at the low or high position.

Remote command:
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude:EVMSymbol

Signaling Parameter > ...
Provides access to the most essential settings of the "LTE Signaling" application.

Remote command:
Use the commands of the signaling application.

LTE Signaling
Select this softkey and press ON | OFF to turn the downlink signal transmission on or off. Alternatively, right-click the softkey.

Press the softkey two times (select it and press it again) to switch to the signaling application.

Remote command:
Use the commands of the signaling application.

ARB / List Mode > ...
Provides access to the most important ARB and list mode settings of the GPRF generator.

Remote command:
Use the commands of the GPRF generator.

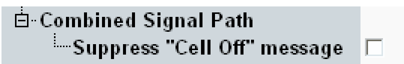
GPRF Generator
Select this softkey and press ON | OFF to turn the GPRF generator on or off. Alternatively, right-click the softkey.

Press the softkey two times (select it and press it again) to switch to the generator application.

The hotkeys assigned to this softkey provide access to the most important GPRF generator settings.

Remote command:
Use the commands of the GPRF generator.

Suppress "Cell Off" Message



This setting is located in the configuration tree. It is only visible if the combined signal path scenario is active.

The checkbox suppresses a warning that is displayed if the "... Signaling" softkey is selected and the cell signal is on and you press ON | OFF. The warning asks you whether you really want to switch off the cell signal.

Remote command:
n/a

3.3.10 Measurement Results

The results of the LTE multi-evaluation measurement are displayed in a single overview and one detailed view for each part of the overview.

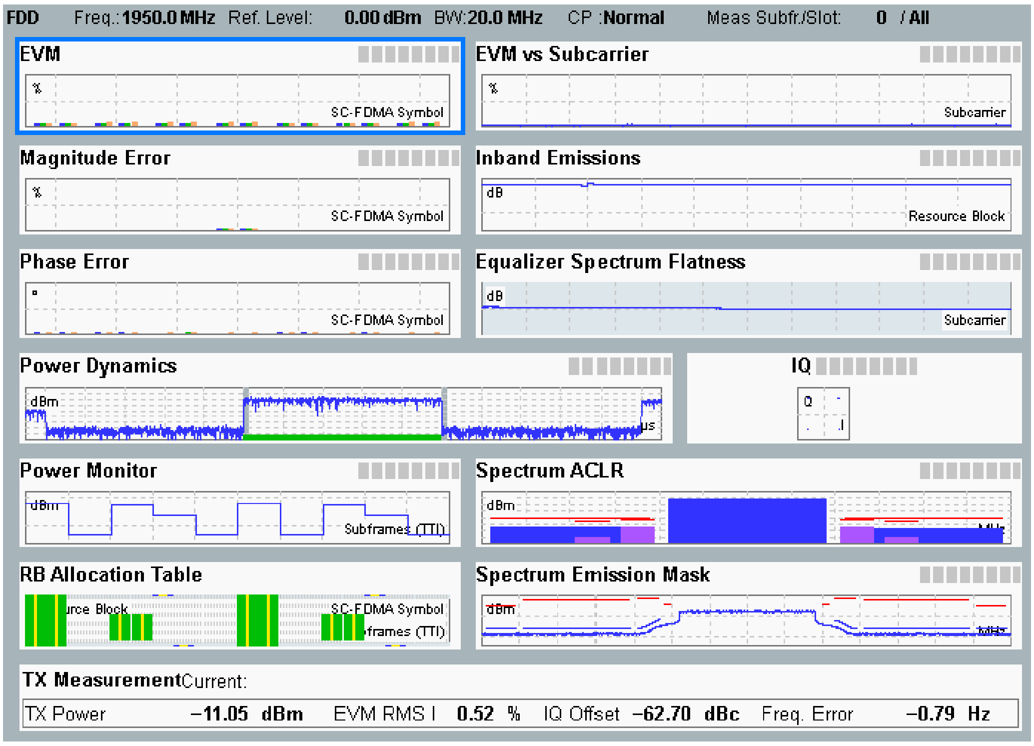


Figure 3-48: Result overview

Most of the detailed views show a diagram and a statistical overview of single-slot results.

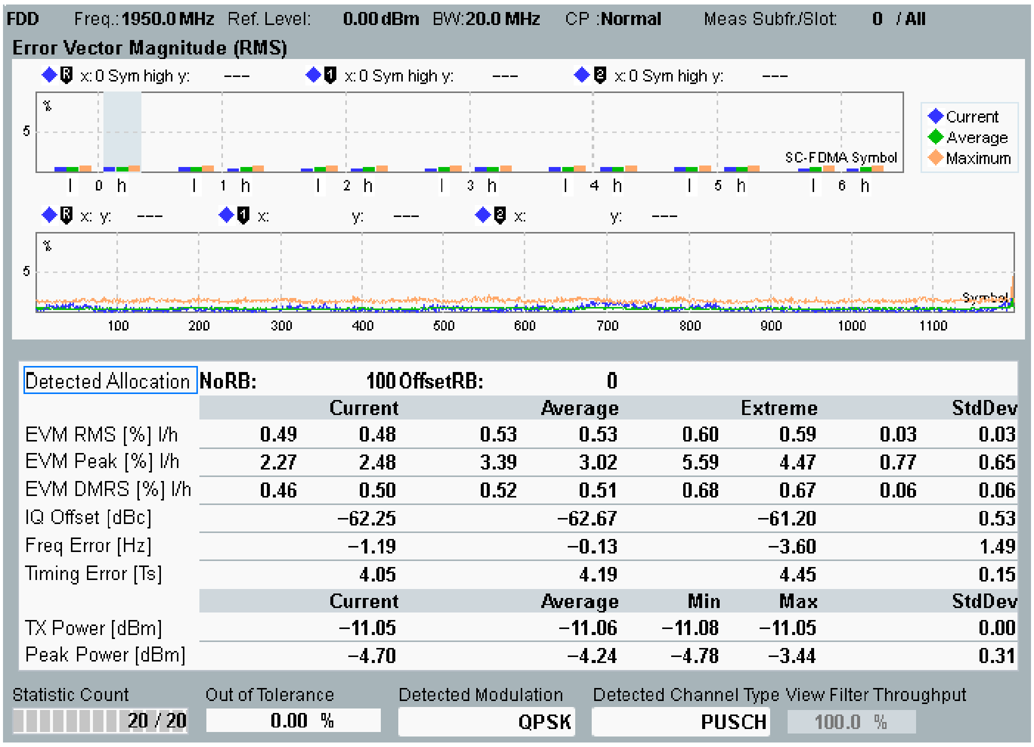


Figure 3-49: Error Vector Magnitude result view

For a detailed description of all result views, see Chapter 3.2.6, "Measurement Results", on page 657.

Query of results via remote control

All commands for result query start with `FETCh`, `READ` or `CALCulate` and continue with `:LTE:MEAS<i>:MEValuation:`. A `TRACE` in the remainder indicates that a measured curve is queried. Bar graphs and tables are queried without `TRACE`.

Examples:

- `FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMC?`
- `READ:LTE:MEAS<i>:MEValuation:PERRor:CURRent?`
- `CALCulate:LTE:MEAS<i>:MEValuation:ACLR:AVERage?`

For links to the relevant command reference sections, refer to the result view descriptions in Chapter 3.2.6, "Measurement Results", on page 657.

3.4 Programming

The following sections provide programming examples for the LTE multi-evaluation measurement.

See also: "Remote Control" in the R&S CMW base unit manual

● General Examples..711
● Using LTE List Mode...718

3.4.1 General Examples

The LTE multi-evaluation measurement is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...LTE:MEAS:MEValuation...`
- Use general commands of the type `...:LTE:MEAS...` (no `:MEValuation` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off. Use `READ:LTE:MEAS:MEValuation...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:LTE:MEAS:MEValuation` and retrieve the results using `FETCh:LTE:MEAS:MEValuation...?`.
- For synchronization and proper decoding, some UE signal settings must be in accordance with the measured signal; see Chapter 3.4.1.2, "Specifying Required Settings", on page 712.

3.4.1.1 Specifying General and Common Measurement Settings

```
// *****************************************************************************
// Initial system-reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing and perform RF and analyzer settings:
// PCC center frequency 1850 MHz, frequency offset 1 kHz, peak power 7 dBm,
// 5 dB user margin and 1 dB mixer level offset.
// Specify PCC channel bandwidth 1.4 MHz.
// *****************************************************************************
ROUTe:LTE:MEAS:SCENario:SALone RF1C, RX1
CONFigure:LTE:MEAS:RFSettings:EATTenuation 2
CONFigure:LTE:MEAS:RFSettings:PCC:FREQuency 1850E+6
CONFigure:LTE:MEAS:RFSettings:FOFFset 1000
CONFigure:LTE:MEAS:RFSettings:ENPower 7
CONFigure:LTE:MEAS:RFSettings:UMARgin 5
CONFigure:LTE:MEAS:RFSettings:MLOFfset 1
CONFigure:LTE:MEAS:PCC:CBANdwidth B014

// *****************************************************************************
// Enable carrier aggregation.
// Define the SCC channel bandwidth. Adjust and query the SCC frequency.
```

```
// Query information about the resulting aggregated bandwidth.
// Select the PCC for single-carrier mesaurements.
// *****************************************************************************
CONFigure:LTE:MEAS:CAGGregation:MODE INTRaband
CONFigure:LTE:MEAS:SCC:CBANdwidth B014
CONFigure:LTE:MEAS:CAGGregation:SCC:ACSPacing
CONFigure:LTE:MEAS:RFSettings:SCC:FREQuency?

CONFigure:LTE:MEAS:CAGGregation:FREQuency:AGGRegated:LOW?
CONFigure:LTE:MEAS:CAGGregation:FREQuency:AGGRegated:CENTer?
CONFigure:LTE:MEAS:CAGGregation:FREQuency:AGGRegated:HIGH?
CONFigure:LTE:MEAS:CAGGregation:CBANdwidth:AGGRegated?

CONFigure:LTE:MEAS:CAGGregation:MCARrier PCC

// *****************************************************************************
// Set duplex mode TDD and query the resulting frame structure type (T2).
// *****************************************************************************
CONFigure:LTE:MEAS:DMODe TDD
CONFigure:LTE:MEAS:FSTRucture?
```

3.4.1.2 Specifying Required Settings

```
// *****************************************************************************
// Specify required UE signal settings: UL/DL configuration 1,
// special subframe configuration 1, extended cyclic prefix,
// contains PUCCH with format 1a, PCC physical layer cell ID 5,
// SCC cell ID 10, delta sequence shift value 10, no group hopping.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:ULDL 1
CONFigure:LTE:MEAS:MEValuation:SSUBframe 1
CONFigure:LTE:MEAS:MEValuation:CPRefix EXTended
CONFigure:LTE:MEAS:MEValuation:PFORmat F1A
CONFigure:LTE:MEAS:MEValuation:PCC:PLCid 5
CONFigure:LTE:MEAS:MEValuation:SCC:PLCid 10
CONFigure:LTE:MEAS:MEValuation:DSSPusch 10
CONFigure:LTE:MEAS:MEValuation:GHOPping OFF
```

3.4.1.3 Specifying Measurement-Specific Settings

```
// *****************************************************************************
// Define stop condition (stop on limit failure), measurement mode and error
// handling, measured subframe contains only PUCCH (no automatic detection),
// network signaled value NS_10 (without CA) and CA_NS_11 (with CA),
// set no. of resource blocks filter to 10, set a channel type filter.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:SCONdition SLFail
CONFigure:LTE:MEAS:MEValuation:MMODe NORMal
CONFigure:LTE:MEAS:MEValuation:MOEXception ON
```

```
CONFigure:LTE:MEAS:MEValuation:TOUT 3600
CONFigure:LTE:MEAS:MEValuation:CTYPe PUCCH
CONFigure:LTE:MEAS:MEValuation:NSValue NS10
CONFigure:LTE:MEAS:MEValuation:NSValue:CAGGregation NS11
CONFigure:LTE:MEAS:MEValuation:NVFilter 10
CONFigure:LTE:MEAS:MEValuation:CTVFilter PUSCh

// *****************************************************************************
// Define the "TPC Mode" list of expected nominal powers.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:TMODe:SCOunt 5,8,4,4,1,1,1,1,1,1,1,1,1,1,1
CONFigure:LTE:MEAS:MEValuation:TMODe:ENPower 3,9,12,15,0,0,0,0,0,0,0,0,0,0,0
CONFigure:LTE:MEAS:MEValuation:TMODe:RLEVel?

// *****************************************************************************
// Disable automatic detection of RB configuration and
// set the number of resource blocks and the RB offset manually.
// No multi-cluster allocation.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:RBALlocation:AUTO OFF
CONFigure:LTE:MEAS:MEValuation:RBALlocation:NRB 5
CONFigure:LTE:MEAS:MEValuation:RBALlocation:ORB 2

// *****************************************************************************
// Enable multi-cluster allocation.
// Configure the number of resource blocks and the RB offset for both clusters.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:RBALlocation:MCLuster ON
CONFigure:LTE:MEAS:MEValuation:RBALlocation:MCLuster:NRB1 2
CONFigure:LTE:MEAS:MEValuation:RBALlocation:MCLuster:ORB1 0
CONFigure:LTE:MEAS:MEValuation:RBALlocation:MCLuster:NRB2 3
CONFigure:LTE:MEAS:MEValuation:RBALlocation:MCLuster:ORB2 3

// *****************************************************************************
// Define the scope of the measurement:
// Skip 2 subframes after the trigger event, then capture 20 subframes,
// use subframe number 9 for slot measurements (both slots).
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:MSUBframes 2, 20, 9
CONFigure:LTE:MEAS:MEValuation:MSLot ALL

// *****************************************************************************
// Specify modulation measurement settings:
// measurement over 20 statistics cycles, modulation scheme QPSK, no SRS,
// EVM window lengths depending on cyclic prefix length and bandwidth.
// Correct EVM window length for 1.4 MHz BW.
// Enable/specify exclusion periods for PUCCH and PUSCH.
// Local oscillator at center of aggregated bandwidth
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:SCOunt:MODulation 20
```

```
CONFigure:LTE:MEAS:MEValuation:MODulation:MSCHeme QPSK
CONFigure:LTE:MEAS:MEValuation:SRS:ENABle OFF
CONF:LTE:MEAS:MEV:MODulation:EWLength 5,12,35,66,102,136,28,58,124,250,374,504
CONFigure:LTE:MEAS:MEValuation:MODulation:EWLength:CBANdwidth14 6,13
CONFigure:LTE:MEAS:MEValuation:MODulation:EEPeriods:PUCCh ON
CONFigure:LTE:MEAS:MEValuation:MODulation:EEPeriods:PUSCh:LEADing MS25
CONFigure:LTE:MEAS:MEValuation:MODulation:EEPeriods:PUSCh:LAGGing MS25
CONFigure:LTE:MEAS:MEValuation:MODulation:CAGGregation:LLOCation CACB

// *****************************************************************************
// Specify spectrum measurement settings:
// select a measurement length of 30 slots, use gaussian resolution filter,
// for ACLR measure all adjacent channels.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:SCOunt:SPECtrum:ACLR 30
CONFigure:LTE:MEAS:MEValuation:SCOunt:SPECtrum:SEMask 30
CONFigure:LTE:MEAS:MEValuation:SPECtrum:SEMask:MFILter GAUSs
CONFigure:LTE:MEAS:MEValuation:SPECtrum:ACLR:ENABle ON,ON,ON

// *****************************************************************************
// Specify power measurement settings:
// time mask, OFF power exclusion, high dynamic mode, statistic count
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:PDYNamics:TMASk SBLanking
CONFigure:LTE:MEAS:MEValuation:PDYNamics:AEOPower:LAGGing -5
CONFigure:LTE:MEAS:MEValuation:PDYNamics:AEOPower:LEADing -5
CONFigure:LTE:MEAS:MEValuation:POWer:HDMode ON
CONFigure:LTE:MEAS:MEValuation:SCOunt:POWer 30

// *****************************************************************************
// Specify BLER measurement settings: number of subframes to be measured
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:BLER:SFRames 5000, 10
```

3.4.1.4 Configuring the Trigger System

```
// *****************************************************************************
// Set trigger source, timeout, trigger level, slope, delay,
// minimum trigger gap, synchronization mode and acquisition mode.
// *****************************************************************************
TRIGger:LTE:MEAS:MEValuation:SOURce 'IF Power'
TRIGger:LTE:MEAS:MEValuation:TOUT 1
TRIGger:LTE:MEAS:MEValuation:THReshold -30
TRIGger:LTE:MEAS:MEValuation:SLOPe FEDGe
TRIGger:LTE:MEAS:MEValuation:DELay 0.0001
TRIGger:LTE:MEAS:MEValuation:MGAP 3
TRIGger:LTE:MEAS:MEValuation:SMODe ENHanced
TRIGger:LTE:MEAS:MEValuation:AMODe SLOT
```

3.4.1.5 Specifying Limits

```
// ******************************************************************************
// Define QPSK modulation limits
// Commands for 16-QAM and 64-QAM are analogous with
// mnemonic QAM16 or QAM64 instead of QPSK.
// ******************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:EVMagnitude 20, 40
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:MERRor 20, OFF
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:PERRor 20, OFF
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:FERRor 0.15
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:IQOFfset ON, -26, -21, -11
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:IBE ON, -20, 20, -60, -27
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:IBE:IQOFfset -26, -21, -11
CONFigure:LTE:MEAS:MEValuation:LIMit:QPSK:ESFLatness ON, 5, 9, 6, 8, 3MHz

// ******************************************************************************
// Define ACLR limits for measurements without carrier aggregation
// ******************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIMit:ACLR:UTRA1:CBANdwidth14 35, -50
CONFigure:LTE:MEAS:MEValuation:LIMit:ACLR:EUTRa:CBANdwidth14 32, -50

// ******************************************************************************
// Define ACLR limits for measurements with carrier aggregation
// ******************************************************************************
CONF:LTE:MEAS:MEV:LIMit:ACLR:UTRA1:CAGG:CBANdwidth200:CBANdwidth100 35, -50
CONF:LTE:MEAS:MEV:LIMit:ACLR:UTRA1:CAGG:OCOMbination 35, -50
CONF:LTE:MEAS:MEV:LIMit:ACLR:EUTRa:CAGG:CBANdwidth200:CBANdwidth100 32, -50
CONF:LTE:MEAS:MEV:LIMit:ACLR:EUTRa:CAGG:OCOMbination 32, -50

// ******************************************************************************
// Define spectrum emission limits for measurements without carrier aggregation
// ******************************************************************************
CONF:LTE:MEAS:MEValuation:LIMit:SEMask:OBWLimit:CBANdwidth14 1.2E+6
CONF:LTE:MEAS:MEV:LIMit:SEM:LIMit1:CBANdwidth14 ON,2E+4,1E+6,-15,K030
CONF:LTE:MEAS:MEV:LIMit:SEM:LIMit1:ADD3:CBANdwidth14 ON,2E+4,1E+6,-15,K030

// ******************************************************************************
// Define spectrum emission limits for measurements with carrier aggregation
// ******************************************************************************
CONF:LTE:MEAS:MEV:LIMit:SEMask:OBWLimit:CAGG:CBAN200:CBAN100 29.8E+6
CONF:LTE:MEAS:MEV:LIMit:SEMask:OBWLimit:CAGG:OCOMbination 2.3E+6
CONF:LTE:MEAS:MEV:LIMit:SEMask:LIMit1:CAGG:CBAN200:CBAN100 ON,2E+4,1E+6,-20,K030
CONF:LTE:MEAS:MEV:LIMit:SEMask:LIMit1:CAGG:OCOMbination ON,2E+4,1E+6,-20,K030
CONF:LTE:MEAS:MEV:LIMit:SEMask:LIM1:ADD1:CAGG:CBAN200:CBAN100 ON,2E+4,1E+6,
    -20,K030
CONF:LTE:MEAS:MEV:LIMit:SEMask:LIM1:ADD1:CAGG:OCOMbination ON,2E+4,1E+6,-20,K030

// ******************************************************************************
// Define power dynamics limits
```

```
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIMit:PDYNamics:CBANdwidth14 ON,-7.6,-22.6,-48.8
```

3.4.1.6 Performing Single-Shot Measurements

```
// *****************************************************************************
// Enable all measurements.
// *****************************************************************************
CONF:LTE:MEAS:MEValuation:RESult:ALL ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON
CONFigure:LTE:MEAS:MEValuation:RESult:EVMagnitude:EVMSymbol ON, 3, LOW

// *****************************************************************************
// Start single-shot measurement, return average EVM bar graph values.
// Query the measurement state (should be "RDY").
// *****************************************************************************
READ:LTE:MEAS:MEValuation:EVMagnitude:AVERage?
FETCh:LTE:MEAS:MEValuation:STATe?

// *****************************************************************************
// Retrieve detected allocation, modulation scheme and channel type for the
// measured slot of modulation measurements.
// Query the View Filter Throughput.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:MODulation:DALLocation?
FETCh:LTE:MEAS:MEValuation:MODulation:DMODulation?
FETCh:LTE:MEAS:MEValuation:MODulation:DCHType?
FETCh:LTE:MEAS:MEValuation:VFTHroughput?

// *****************************************************************************
// Query modulation traces, bar graph values and statistical values
// obtained in the last measurement, without re-starting the measurement.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:EVMagnitude:MAXimum?
FETCh:LTE:MEAS:MEValuation:EVMagnitude:PEAK:MAXimum?
FETCh:LTE:MEAS:MEValuation:TRACe:EVMSymbol:MAXimum?
FETCh:LTE:MEAS:MEValuation:TRACe:EVMC?
FETCh:LTE:MEAS:MEValuation:MERRor:AVERage?
FETCh:LTE:MEAS:MEValuation:MERRor:MAXimum?
FETCh:LTE:MEAS:MEValuation:PERRor:AVERage?
FETCh:LTE:MEAS:MEValuation:PERRor:MAXimum?
FETCh:LTE:MEAS:MEValuation:TRACe:IQ:LOW?
FETCh:LTE:MEAS:MEValuation:TRACe:IQ:HIGH?
FETCh:LTE:MEAS:MEValuation:MODulation:CURRent?
FETCh:LTE:MEAS:MEValuation:MODulation:EXTReme?
FETCh:LTE:MEAS:MEValuation:EVMC:PEAK:MAXimum?

// *****************************************************************************
// Query inband emission results for PCC and SCC.
// *****************************************************************************
```

```
FETCh:LTE:MEAS:MEValuation:TRACe:IEMissions:PCC?
FETCh:LTE:MEAS:MEValuation:TRACe:IEMissions:SCC?
FETCh:LTE:MEAS:MEValuation:IEMission:PCC:MARGin:AVERage?
FETCh:LTE:MEAS:MEValuation:IEMission:SCC:MARGin:AVERage?
FETCh:LTE:MEAS:MEValuation:IEMission:PCC:MARGin:EXTReme:RBINdex?
FETCh:LTE:MEAS:MEValuation:IEMission:SCC:MARGin:EXTReme:RBINdex?

// *****************************************************************************
// Query equalizer spectrum flatness results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:TRACe:ESFLatness?
FETCh:LTE:MEAS:MEValuation:ESFLatness:AVERage?
FETCh:LTE:MEAS:MEValuation:ESFLatness:CURRent:SCINdex?

// *****************************************************************************
// Query spectrum emission results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:TRACe:SEMask:RBW30:CURRent?
FETCh:LTE:MEAS:MEValuation:TRACe:SEMask:RBW100:AVERage?
FETCh:LTE:MEAS:MEValuation:TRACe:SEMask:RBW1000:MAXimum?
FETCh:LTE:MEAS:MEValuation:SEMask:CURRent?
FETCh:LTE:MEAS:MEValuation:SEMask:EXTReme?
FETCh:LTE:MEAS:MEValuation:SEMask:MARGin:ALL?
FETCh:LTE:MEAS:MEValuation:SEMask:MARGin:MINimum:POSitiv?
FETCh:LTE:MEAS:MEValuation:SEMask:MARGin:MINimum:NEGativ?

// *****************************************************************************
// Query ACLR results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:TRACe:ACLR:CURRent?
FETCh:LTE:MEAS:MEValuation:TRACe:ACLR:AVERage?
FETCh:LTE:MEAS:MEValuation:ACLR:CURRent?
FETCh:LTE:MEAS:MEValuation:ACLR:AVERage?

// *****************************************************************************
// Query RB allocation table and power monitor results for PCC and SCC.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:TRACe:RBATable:PCC?
FETCh:LTE:MEAS:MEValuation:TRACe:RBATable:SCC?
FETCh:LTE:MEAS:MEValuation:TRACe:PMONitor:PCC?
FETCh:LTE:MEAS:MEValuation:TRACe:PMONitor:SCC?
FETCh:LTE:MEAS:MEValuation:PMONitor:AVERage?

// *****************************************************************************
// Query power dynamics results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS:MEValuation:TRACe:PDYNamics:MAXimum?
FETCh:LTE:MEAS:MEValuation:PDYNamics:AVERage?
FETCh:LTE:MEAS:MEValuation:PDYNamics:MINimum?
```

```
FETCh:LTE:MEAS:MEValuation:PDYNamics:MAXimum?

// *****************************************************************************
// Query BLER results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:BLER?

// *****************************************************************************
// Query limit check results.
// *****************************************************************************
CALCulate:LTE:MEAS:MEValuation:ACLR:CURRent?
CALCulate:LTE:MEAS:MEValuation:SEMask:CURRent?
CALCulate:LTE:MEAS:MEValuation:ESFLatness:CURRent?
CALCulate:LTE:MEAS:MEValuation:MODulation:CURRent?
CALCulate:LTE:MEAS:MEValuation:PDYNamics:AVERage?
CALCulate:LTE:MEAS:MEValuation:PDYNamics:MINimum?
CALCulate:LTE:MEAS:MEValuation:PDYNamics:MAXimum?
```

3.4.1.7 Single-Shot and Continuous Measurements

```
// *****************************************************************************
// Start single-shot measurement, return magnitude error bar graph values.
// Return maximum magnitude error and phase bar graph values
// (without repeating the measurement).
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:LTE:MEAS:MEValuation
FETCh:LTE:MEAS:MEValuation:MERRor:CURRent?
FETCh:LTE:MEAS:MEValuation:MERRor:MAXimum?
FETCh:LTE:MEAS:MEValuation:PERRor:MAXimum?
FETCh:LTE:MEAS:MEValuation:STATe?

// *****************************************************************************
// Start continuous measurement and wait for 5 s.
// Return average EVM bar graph results.
// Query measurement state and substates (should be "RUN,ADJ,ACT").
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:REPetition CONTinuous
INIT:LTE:MEAS:MEValuation
Pause 5000
FETCh:LTE:MEAS:MEValuation:EVMagnitude:AVERage?
FETCh:LTE:MEAS:MEValuation:STATe:ALL?
```

3.4.2 Using LTE List Mode

The LTE multi-evaluation list mode is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...LTE:MEAS:MEValuation:LIST...`

- Use general commands of the type `...:LTE:MEAS...` (no `:MEValuation` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off and list mode is disabled. Use `CONFigure:LTE:MEAS:MEValuation:LIST ON` to enable the list mode and `INIT:LTE:MEAS:MEValuation` to initiate a single-shot measurement.
- Use `FETCh:LTE:MEAS:MEValuation:LIST:...?` commands to retrieve the results.

Speeding up list mode measurements

List mode tests are often used in production lines. The same tests are repeated for different UEs. Optimizing the test duration is important.

Consider the following rules to minimize the test duration:

- Reduce the number and size of the segments and the statistical length as far as possible for your use case.
- Enable only the results that you need / disable the other result calculations.
- There are two groups of `FETCh` commands. One for result retrieval per segment and one for result retrieval over all segments. Which of the two groups is more effective, depends on the enabled results and on the number of segments. Minimize the number of `FETCh` commands transmitted for result query.
- To reset the system repeatedly, use partial reset commands instead of the global reset command `*RST`.
  Example: Use `SYSTem:RESet 'LTE Meas1'` to reset the LTE measurement instance 1.
- To configure the same list mode settings repeatedly, use partial save/recall commands:
  - Configure all list mode settings once.
  - Save the list mode settings to a file, for example to the file `ListModeLTE1.dfl` located in the directory assigned to the `@SAVE` alias:
    `MMEMory:STORe:ITEM 'LTE Meas:MEV:LIST', '@SAVE\ListModeLTE1.dfl'`
  - If you want to configure the same settings again, recall the stored settings:
    `MMEMory:LOAD:ITEM 'LTE Meas:MEV:LIST', '@SAVE\ListModeLTE1.dfl'`

3.4.2.1 Specifying Global Measurement Settings

```
// *****************************************************************************
// Reset
// *****************************************************************************
SYSTem:RESet 'LTE Meas1'; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing, external attenuation and carrier aggregation.
// *****************************************************************************
```

```
ROUTe:LTE:MEAS:SCENario:SALone RF1C, RX1
CONFigure:LTE:MEAS:RFSettings:EATTenuation 2
CONFigure:LTE:MEAS:CAGGregation:MODE INTRaband

// *****************************************************************************
// Specify required UE signal settings not configurable per segment:
// signal contains PUCCH with format 1a, physical layer cell ID 5,
// delta sequence shift value 10
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:PFORmat F1A
CONFigure:LTE:MEAS:MEValuation:PLCid 5
CONFigure:LTE:MEAS:MEValuation:DSSPusch 10
```

3.4.2.2 Specifying List Mode Settings

```
// *****************************************************************************
// Define 2 segments with a length of 10 subframes each (1 radio frame),
// different expected nominal power and identical remaining settings.
// *****************************************************************************
CONF:LTE:MEAS:MEV:LIST:SEGM1:SET 10,1,FDD,OB1,2E+9,B100,NORM,AUTO,OFF,0,NS04
CONF:LTE:MEAS:MEV:LIST:SEGM2:SET 10,-19,FDD,OB1,2E+9,B100,NORM,AUTO,OFF,0,NS04

// *****************************************************************************
// Define automatic RB allocation detection.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:RBALlocation ON, KEEP, KEEP
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:RBALlocation ON, KEEP, KEEP

// *****************************************************************************
// Define an SCC with lower bandwidth, located above the PCC and adjust the
// SCC frequency automatically.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:SCC 3E+9,B050
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:SCC 3E+9,B050
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:CAGGregation:ACSPacing
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:CAGGregation:ACSPacing

// *****************************************************************************
// For single-carrier measurements, measure the PCC, not the SCC.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:CAGGregation:MCARrier PCC
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:CAGGregation:MCARrier PCC

// *****************************************************************************
// Enable modulation results except phase error for both segments. Use
// a statistical length of 10 slots and select automatic detection of the
// modulation scheme.
// *****************************************************************************
CONF:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation 10,ON,ON,ON,OFF,ON,ON,AUTO
```

```
CONF:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation 10,ON,ON,ON,OFF,ON,ON,AUTO

// *****************************************************************************
// Enable all spectrum emission results for segment 2.
// Enable the E-UTRA ACLR results for segment 2 (no UTRA results).
// Use a statistical length of 10 slots.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask 10,ON,ON,ON
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:ACLR 10,ON,OFF,OFF,ON

// *****************************************************************************
// Enable power results for segment 1 and 2.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:PMONitor ON
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:PMONitor ON
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:POWer 5,ON
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:POWer 5,ON

// *****************************************************************************
// Select both segments for measurement and select trigger mode "ONCE".
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:LRANge 1,2
TRIGger:LTE:MEAS:MEValuation:LIST:MODE ONCE

// *****************************************************************************
// Only for measurements with R&S CMWS:
// Configure the RF input connector per segment.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:CMWS:CMODe LIST
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent1:CMWS:CONNector R11
CONFigure:LTE:MEAS:MEValuation:LIST:SEGMent2:CMWS:CONNector R12

// *****************************************************************************
// Enable the list mode.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST ON
```

3.4.2.3 Performing Single-Shot Measurements

```
// *****************************************************************************
// Start single-shot measurement.
// Return average and extreme modulation results.
// Return extreme inband emission and spectrum flatness results.
// Return limit check results for the average results.
// *****************************************************************************
INIT:LTE:MEAS:MEValuation
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation:EXTReme?
```

```
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:IEMission:MARGin:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:IEMission:MARGin:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:IEMission:MARGin:EXTReme:RBINdex?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:IEMission:MARGin:EXTReme:RBINdex?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:IEMission:SCC:MARGin:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:IEMission:SCC:MARGin:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:IEMission:SCC:MARGin:EXTReme:RBINdex?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:IEMission:SCC:MARGin:EXTReme:RBINdex?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:ESFLatness:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:ESFLatness:EXTReme?
CALCulate:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation:AVERage?
CALCulate:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation:AVERage?
CALCulate:LTE:MEAS:MEValuation:LIST:SEGMent1:ESFLatness:AVERage?
CALCulate:LTE:MEAS:MEValuation:LIST:SEGMent2:ESFLatness:AVERage?

// *****************************************************************************
// Return average and extreme spectrum emission results.
// Return spectrum emission margins: X- and Y-values of minimum margins and
// Y-values of all margins.
// Return limit check results for the average spectrum emission results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask:MARGin:MINimum:POSitiv?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask:MARGin:MINimum:NEGativ?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask:MARGin:ALL?
CALCulate:LTE:MEAS:MEValuation:LIST:SEGMent2:SEMask:AVERage?

// *****************************************************************************
// Return current and average ACLR results.
// Return limit check results for the average ACLR results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:ACLR:CURRent?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:ACLR:AVERage?
CALCulate:LTE:MEAS:MEValuation:LIST:SEGMent2:ACLR:AVERage?

// *****************************************************************************
// Return RMS power monitor results for segment 1 and 2.
// Return current and average total TX power results for segment 2.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:PMONitor:RMS?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:PMONitor:RMS?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:POWer:CURRent?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:POWer:AVERage?

// *****************************************************************************
// Return detected allocation, modulation scheme and channel type of the
// last slot within the statistical length of the modulation measurement.
// *****************************************************************************
```

```
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation:DALLocation?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation:DMODulation?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent1:MODulation:DCHType?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation:DALLocation?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation:DMODulation?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:MODulation:DCHType?

// *****************************************************************************
// Select segment no. 2 as offline segment (and implicitly enable the
// offline mode). Restart the measurement to calculate all results in
// segment 2. Go to local to view the results.
// *****************************************************************************
CONFigure:LTE:MEAS:MEValuation:LIST:OSINdex 2
INIT:LTE:MEAS:MEValuation
&GTL
```

3.4.2.4 Retrieving Single Results for All Segments

```
// *****************************************************************************
// Return selected modulation results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:EVM:RMS:LOW:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:EVM:PEAK:LOW:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:EVM:DMRS:LOW:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:MERRor:RMS:LOW:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:PERRor:RMS:LOW:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:CURRent?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:IQOFfset:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:FERRor:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:TERRor:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:TPOWer:MAXimum?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:PPOWer:MINimum?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:PSD:MINimum?

// *****************************************************************************
// Return selected inband emission and spectrum flatness results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:IEMission:MARGin:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:IEMission:MARGin:RBINdex:EXTReme?
FETCh:LTE:MEAS:MEValuation:LIST:ESFLatness:RIPPle1:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:ESFLatness:DIFFerence2:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:ESFLatness:MINR1:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:ESFLatness:MAXR2:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:ESFLatness:SCINdex:MINimum1:CURRent?

// *****************************************************************************
```

```
// Return selected spectrum emission and ACLR results.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:SEMask:OBW:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:SEMask:TXPower:MAXimum?
FETCh:LTE:MEAS:MEValuation:LIST:SEMask:MARGin:AREA5:NEGativ:MINimum?
FETCh:LTE:MEAS:MEValuation:LIST:ACLR:EUTRa:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:ACLR:EUTRa:NEGativ:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:ACLR:UTRA2:POSitiv:AVERage?

// *****************************************************************************
// Query the RMS power monitor results.
// Query the offset of the first result for segment 2 within the
// returned list of power values.
// Query the number of power results related to segment 2.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:PMONitor:RMS?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:PMONitor:ARRay:STARt?
FETCh:LTE:MEAS:MEValuation:LIST:SEGMent2:PMONitor:ARRay:LENGth?

// *****************************************************************************
// Return selected total TX power results (all carriers).
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:POWer:TXPower:AVERage?
FETCh:LTE:MEAS:MEValuation:LIST:POWer:TXPower:MAXimum?

// *****************************************************************************
// Return detected allocation, modulation scheme and channel type of the
// last slot within the statistical length of the modulation measurement.
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:DALLocation?
FETCh:LTE:MEAS:MEValuation:LIST:MODulation:DMODulation?
FETCh:LTE:MEAS:MEValuation:LIST:SEMask:DCHType?

// *****************************************************************************
// Return the individual segment reliability indicators
// *****************************************************************************
FETCh:LTE:MEAS:MEValuation:LIST:SRELiability?
```

3.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the LTE multi-evaluation measurement and the general commands applicable to all LTE measurements.

- Conventions and General Information.. 725
- General Measurement Settings... 731
- Multi-Evaluation Measurement Commands... 741
- Combined Signal Path Commands...883

3.5.1 Conventions and General Information

The following sections describe the most important conventions and general information concerning the command reference.

3.5.1.1 MEAS<i>

MEAS<i> is used as abbreviation of "MEASurement<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW base unit manual, chapter "Remote Control"

3.5.1.2 FETCh, READ and CALCulate Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.
- `CALCulate...` returns one limit check result per `FETCh` result:
  - **OK**: The `FETCh` result is located within the limits or no limit has been defined/ enabled for this result.
  - **ULEU** ("User limit exceeded upper"): An upper limit is violated. The `FETCh` result is located above the limit.
  - **ULEL** ("User limit exceeded lower"): A lower limit is violated. The `FETCh` result is located below the limit.

See also: "Retrieving Measurement Results" in the R&S CMW base unit manual, chapter "Remote Control"

3.5.1.3 Current and Statistical Results

The R&S CMW repeats measurements according to the selected statistic count and repetition mode. Consecutive measurement values are stored and used to calculate statistical results, e.g. average, minimum, maximum and standard deviation.

See also: "Statistical Results" in the R&S CMW base unit manual, chapter "System Overview"

3.5.1.4 Values for RF Path Selection

To select an RF input path, you must specify an RF connector and an RX module (converter).

Which connectors and modules can be specified in a command, depends on the installed hardware, the test setup and the active subinstrument or instance <i>.

This section lists all values available for path selection. Depending on your configuration, only a subset is relevant for you. Virtual connector names are only relevant for setting commands. Queries return the physical connector names.

Additional information is available in the base software documentation. It describes typical instrument configurations with the allowed RF connector - TX/RX module combinations and the mapping of virtual connector names to physical connectors.

See also: "Signal Path Settings" in the R&S CMW base unit manual, chapter "Remote Control"

R&S CMW100

The following values are applicable for one or two radio test heads connected to a single PC.

RF path selection values:

- RX module:
  `RX11 | RX21`
  RX<a>1: radio test head <a>, RX 1
- RX connector:
  `R11 | R12 | R13 | R14 | R15 | R16 | R17 | R18`
  `R21 | R22 | R23 | R24 | R25 | R26 | R27 | R28`
  `RA1 | RA2 | RA3 | RA4 | RA5 | RA6 | RA7 | RA8`
  R<a><n>: radio test head <a>, connector RF <n>
  RA<n>: virtual name for R1<n> / R2<n>

Single R&S CMW500 / 270 / 290

RF path selection values:

- RX module:
  `RX1 | RX2 | RX3 | RX4`
- RX connector:
  `RF1C | RF2C | RF3C | RF4C | RFAC | RFBC`
  RF 1 COM to RF 4 COM plus virtual connector names

One R&S CMW plus one R&S CMWS

RF path selection values:

- RX module:
  `RX1 | RX2 | RX3 | RX4`
- RX connector:
  `R11 | R12 | R13 | R14 | R15 | R16 | R17 | R18`
  `R21 | R22 | R23 | R24 | R25 | R26 | R27 | R28`

`R31 | R32 | R33 | R34 | R35 | R36 | R37 | R38`
`RA1 | RA2 | RA3 | RA4 | RA5 | RA6 | RA7 | RA8`
`RB1 | RB2 | RB3 | RB4`
R<m><n>: R&S CMWS connector <m>.<n>
RA<n>: virtual name for R1<n> / R3<n>
RB<n>: virtual name for R2<n> / R2<n+4>

Multi-CMW setup with R&S CMWC and several R&S CMW500

RF path selection values:

- RX module:
  `RX11 | RX12 | RX13 | RX14 | RX21 | RX22 | RX23 | RX24`
  `RX31 | RX32 | RX33 | RX34 | RX41 | RX42 | RX43 | RX44`
  RX<a><b>: CMW <a>, RX <b>
  Example `RX34`: RX module 4 of CMW 3
- RX connector:
  `R11C | R12C | R13C | R14C | R21C | R22C | R23C | R24C`
  `R31C | R32C | R33C | R34C | R41C | R42C | R43C | R44C`
  R<a><b>C: CMW <a>, connector RF <b> COM
  Example `R34C`: RF 4 COM of CMW 3

For CMW 1, you can alternatively use the single-CMW RF path selection values.

3.5.1.5 Keywords

Selected keywords used in the command description are described in the following.

- **Command usage**
  If the usage is not explicitly stated, the command allows you to set parameters and query parameters. Otherwise the command usage is stated as follows:
  – "Setting only": Command can only be used to set parameters.
  – "Query only": Command can only be used to query parameters.
  – "Event": Command initiates an event.
- **Parameter usage**
  The parameter usage is indicated by the keyword preceding the parameters:
  – "Parameters" are sent with a setting or query command and are returned as the result of a query
  – "Setting parameters" are only sent with a setting command
  – "Query parameters" are only sent with a query command (to refine the query)
  – "Return values" are only returned as the result of a query
- **Firmware/Software:**
  Indicates the lowest software version supporting the command. Command enhancements in later software versions are also indicated.

3.5.1.6 Reliability Indicator

The first value in the output arrays of `FETCh...?`, `READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 ("OK")**:
  Measurement values available, no error detected.
- **1 ("Measurement Timeout")**:
  The measurement has been stopped after the configured measurement timeout. Measurement results can be available. However, at least a part of the measurement provides only `INValid` results or has not completed the full statistic count.
- **2 ("Capture Buffer Overflow")**:
  The measurement configuration results in a capture length that exceeds the available memory.
- **3 ("Overdriven") / 4 ("Underdriven")**:
  The accuracy of measurement results can be impaired because the input signal level was too high / too low.
- **6 ("Trigger Timeout")**:
  The measurement could not be started or continued because no trigger event was detected.
- **7 ("Acquisition Error")**:
  The R&S CMW could not properly decode the RF input signal.
- **8 ("Sync Error")**:
  The R&S CMW could not synchronize to the RF input signal.
- **9 ("Uncal")**:
  Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 ("Reference Frequency Error")**:
  The instrument has been configured to use an external reference signal. But the reference oscillator could not be phase-locked to the external signal (for example signal level too low, frequency out of range or reference signal not available at all).
- **16 ("RF Not Available")**:
  The measurement could not be started because the configured RF input path was not active. This problem can occur for example if a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 ("RF Level not Settled") / 18 ("RF Frequency not Settled")**:
  The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 ("Call not Established")**:
  For measurements: The measurement could not be started because no signaling connection to the DUT was established.
  For DAU IMS service: Establishing a voice over IMS call failed.
- **20 ("Call Type not Usable")**:
  For measurements: The measurement could not be started because the established signaling connection had wrong properties.

For DAU IMS service: The voice over IMS settings could not be applied.

- **21 ("Call Lost")**:
  For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
  For DAU IMS service: The voice over IMS call was lost.
- **23 ("Missing Option")**:
  The ARB file cannot be played by the GPRF generator due to a missing option.
- **24 ("Invalid RF Setting")**:
  The desired RF TX level or RF RX reference level could not be applied.
- **26 ("Resource Conflict")**:
  The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
  Stop the application that has allocated the conflicting resources and try again.
- **27 ("No Sensor Connected")**:
  The GPRF external power sensor measurement could not be started due to missing power sensor.
- **28 ("Unexpected Parameter Change")**:
  One or more measurement configuration parameters were changed while the measurement completed. The results were not obtained with these new parameter values. Repeat the measurement. This situation can only occur in remote single-shot mode.
- **30 ("File not Found")**:
  The specified file could not be found.
- **31 ("No DTM reply")**:
  The EUT did not reply to the direct test mode (DTM) command.
- **32 ("ACL Disconnected")**:
  The ACL connection has been disconnected or lost.
- **40 ("ARB File CRC Error")**:
  The cyclic redundancy check of the ARB file failed. The ARB file is corrupt and not reliable.
- **42 ("ARB Header Tag Invalid")**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 ("ARB Segment Overflow")**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 ("ARB File not Found")**:
  The selected ARB file could not be found.
- **45 ("ARB Memory Overflow")**:
  The ARB file length is greater than the available memory.
- **46 ("ARB Sample Rate out of Range)"**:
  The clock rate of the ARB file is either too high or too low.
- **47 ("ARB Cycles out of Range")**:
  The repetition mode equals "Single Shot" and the playback length is greater than 40 s. Reduce the playback length or set the repetition mode to "Continuous".
  *<Length> = (<Cycles> * <Samples> + <Additional Samples>) / <Clock Rate>*
- **50 ("Startup Error")**:

The data application unit (DAU), a DAU service or a DAU measurement could not be started. Execute a DAU selftest.

- **51 ("No Reply")**:
  The DAU has received no response, for example for a ping request.
- **52 ("Connection Error")**:
  The DAU could not establish a connection to internal components. Restart the instrument.
- **53 ("Configuration Error")**:
  The current DAU configuration is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 ("Filesystem Error")**:
  The hard disk of the DAU is full or corrupt. Execute a DAU selftest.
- **60 ("Invalid RF-Connector Setting")**
  The individual segments of a list mode measurement with R&S CMWS use different connector benches. All segments must use the same bench.
  Check the "Info" dialog for the relevant segment numbers.
- **93 ("OCXO Oven Temperature too low")**:
  The accuracy of measurement results can be impaired because the oven-controlled crystal oscillator has a too low temperature. After switching-on the instrument, the OCXO requires a warm-up phase to reach its operating temperature.
- **101 ("Firmware Error")**:
  Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.

  If the error occurs again, consider the following hints:

  – Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.

  – If a software package (update) has not been properly installed, this failure is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".

  – Check for software updates correcting the error. Updates are for example provided in the CMW customer web on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, send a problem report including log files to Rohde & Schwarz.
- **102 ("Unidentified Error")**:
  Indicates an error not covered by other reliability values. For troubleshooting, follow the steps described for "101 (Firmware Error)".
- **103 ("Parameter Error")**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.
  If you need assistance to localize the conflicting parameter settings, contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).

- **104 ("Not Functional")**:
  The application could not be started with the configured parameter set.

3.5.2 General Measurement Settings

The commands valid for all LTE measurements are divided into the groups listed below.

- Duplex Mode....................731
- Signal Routing....................732
- Analyzer Settings....................734
- Common Measurement Control Settings....................740

3.5.2.1 Duplex Mode

The following commands select the duplex mode and query the resulting frame structure.

CONFigure:LTE:MEAS<i>:DMODe <Mode>

Selects the duplex mode of the LTE signal: FDD or TDD.

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>[:PCC]:DMODe`
- `CONFigure:LTE:SIGN<i>:SCC<c>:DMODe`
- `CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific`

Parameters:

<Mode> FDD | TDD

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V2.0.10

Options: FDD requires R&S CMW-KM500
TDD requires R&S CMW-KM550

Manual operation: See "Duplex Mode" on page 680

CONFigure:LTE:MEAS<i>:FSTRucture?

Queries the frame structure type of the LTE signal. The value depends on the duplex mode (`CONFigure:LTE:MEAS<i>:DMODe`).

Return values:

<FrameStructure> T1 | T2

T1: Type 1, FDD signal
T2: Type 2, TDD signal

Example: See Specifying General and Common Measurement Settings

Usage: Query only

Firmware/Software: V2.0.20

Options: FDD requires R&S CMW-KM500
TDD requires R&S CMW-KM550

Manual operation: See "Frame Structure" on page 690

3.5.2.2 Signal Routing

The following commands configure the scenario, select the input path for the measured signal and define an external attenuation value.

ROUTe:LTE:MEAS<i>:SCENario:SALone....................732
ROUTe:LTE:MEAS<i>:SCENario:CSPath....................732
ROUTe:LTE:MEAS<i>:SCENario:MAPRotocol....................733
ROUTe:LTE:MEAS<i>:SCENario?....................733
ROUTe:LTE:MEAS<i>?....................733
CONFigure:LTE:MEAS<i>:RFSettings:EATTenuation....................734

ROUTe:LTE:MEAS<i>:SCENario:SALone <RXConnector>, <RFConverter>

Activates the standalone scenario and selects the RF input path for the measured RF signal.

For possible connector and converter values, see Chapter 3.5.1.4, "Values for RF Path Selection", on page 726.

Parameters:

<RXConnector> RF connector for the input path

<RFConverter> RX module for the input path

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Scenario = StandAlone" on page 680

ROUTe:LTE:MEAS<i>:SCENario:CSPath <Master>[, <Carrier>]

Activates the combined signal path scenario and selects the master application and carrier. The master controls most signal routing settings, analyzer settings and some measurement control settings while the combined signal path scenario is active.

The parameter <Carrier> is only relevant for non-contiguous uplink carrier aggregation. The settings of the selected carrier are used in that case.

For signals without carrier aggregation, the PCC is measured. For signals with contiguous carrier aggregation, the PCC and the used SCC are measured.

Parameters:

<Master> String parameter selecting the master application
e.g. `'LTE Sig1'` or `'LTE Sig2'`

<Carrier> String parameter selecting an uplink carrier configured in the master application
e.g. `'PCC'`, `'SCC1'` or `'SCC2'`

Firmware/Software: V1.0.15.20
V3.5.10: <Carrier> added

Manual operation: See "Scenario = Combined Signal Path" on page 680

ROUTe:LTE:MEAS<i>:SCENario:MAPRotocol [<Controler>]

Activates the Measure@ProtocolTest scenario and optionally selects the controlling protocol test application.

The signal routing and analyzer settings are ignored by the measurement application. Configure the corresponding settings within the protocol test application used in parallel.

Setting parameters:

<Controler> String parameter selecting the protocol test application
e.g. `'Protocol Test1'`

Usage: Event

Firmware/Software: V1.0.15.20
V2.1.25: added <Controler>

Manual operation: See "Scenario = Measure@ProtocolTest" on page 681

ROUTe:LTE:MEAS<i>:SCENario?

Returns the active scenario.

Return values:

<Scenario> SALone | CSPath | MAPRotocol

SALone: Standalone (non-signaling)
CSPath: Combined signal path
MAPRotocol: Measure at protocol test

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Scenario = StandAlone" on page 680

ROUTe:LTE:MEAS<i>?

Returns the configured routing settings.

For possible connector and converter values, see Chapter 3.5.1.4, "Values for RF Path Selection", on page 726.

Return values:

<Scenario> SALone | CSPath | MAPRotocol

SALone: Standalone (non-signaling)
CSPath: Combined signal path
MAPRotocol: Measure at protocol test

<Controller> Controlling application for scenario CSPath or MAPRotocol

<RXConnector> RF connector for the input path

<RFConverter> RX module for the input path

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Scenario = StandAlone" on page 680

CONFigure:LTE:MEAS<i>:RFSettings:EATTenuation <RFinputExtAtt>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF input connector.

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut`
- `CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut`

Parameters:

<RFinputExtAtt> Range: -50 dB to 90 dB
*RST: 0 dB
Default unit: dB

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V1.0.10.1

Manual operation: See "External Attenuation (Input)" on page 681

3.5.2.3 Analyzer Settings

The following commands configure the RF input path.

CONFigure:LTE:MEAS<i>:CAGGregation:MODE....735
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:LOW?....735
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:CENTer?....735
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:HIGH?....736
CONFigure:LTE:MEAS<i>:CAGGregation:CBANdwidth:AGGRegated?....736
CONFigure:LTE:MEAS<i>:BAND....736
CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency....737
CONFigure:LTE:MEAS<i>:RFSettings:SCC<no>:FREQuency....737
CONFigure:LTE:MEAS<i>:CAGGregation:SCC<no>:ACSPacing....737
CONFigure:LTE:MEAS<i>:RFSettings:FOFFset....738

CONFigure:LTE:MEAS<i>:RFSettings:ENPower....738
CONFigure:LTE:MEAS<i>:RFSettings:UMARgin....739
CONFigure:LTE:MEAS<i>:RFSettings:MLOFfset.... 739

CONFigure:LTE:MEAS<i>:CAGGregation:MODE <CAmode>

Selects whether the measured signal uses carrier aggregation (CA) or not.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE`.

Parameters:

<CAmode>	OFF | INTRaband **OFF**: no carrier aggregation **INTRaband**: intra-band contiguous CA (BW class B & C) *RST: OFF
Example:	See Specifying General and Common Measurement Settings
Firmware/Software:	V3.2.70
Options:	R&S CMW-KM502/-KM552 (FDD/TDD) for INTRaband
Manual operation:	See "Carrier Aggregation Mode" on page 685

CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:LOW?

Queries the lower edge of the aggregated bandwidth.

Return values:

<FrequencyLow>	Range: 60E+6 Hz to 6010E+6 Hz Default unit: Hz
Example:	See Specifying General and Common Measurement Settings
Usage:	Query only
Firmware/Software:	V3.2.70
Options:	R&S CMW-KM502/-KM552 for FDD/TDD
Manual operation:	See "Aggregated" on page 685

CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:CENTer?

Queries the center frequency of the aggregated bandwidth.

Return values:

<FrequencyCenter>	Range: 60E+6 Hz to 6010E+6 Hz Default unit: Hz
Example:	See Specifying General and Common Measurement Settings
Usage:	Query only
Firmware/Software:	V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Aggregated" on page 685

CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:HIGH?

Queries the upper edge of the aggregated bandwidth.

Return values:

<FrequencyHigh> Range: 60E+6 Hz to 6010E+6 Hz
Default unit: Hz

Example: See Specifying General and Common Measurement Settings

Usage: Query only

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Aggregated" on page 685

CONFigure:LTE:MEAS<i>:CAGGregation:CBANdwidth:AGGRegated?

Queries the width of the aggregated channel bandwidth.

Return values:

<ChBandwidth> Default unit: Hz

Example: See Specifying General and Common Measurement Settings

Usage: Query only

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Aggregated" on page 685

CONFigure:LTE:MEAS<i>:BAND <Band>

Selects the operating band (OB). The allowed input range depends on the duplex mode (FDD or TDD).

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>[:PCC]:BAND`
- `CONFigure:LTE:SIGN<i>:SCC<c>:BAND`

Parameters:

<Band> FDD: OB1 | ... | OB28 | OB30 | OB31 | OB65 | OB66
TDD: OB33 | ... | OB46
*RST: OB1 (OB33 for TDD)

Firmware/Software: V1.0.10.1, some bands added in later versions

Manual operation: See "Band / Channel / Frequency" on page 681

CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency <AnalyzerFreq>

Selects the center frequency of the PCC.

Using the unit CH, the frequency can be set via the channel number. The allowed channel number range depends on the operating band, see Chapter 3.2.4.3, "Frequency Bands", on page 646.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL`.

Parameters:

<AnalyzerFreq>	Range: 70E+6 Hz to 6E+9 Hz *RST: 1.95E+9 Hz Default unit: Hz

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Band / Channel / Frequency" on page 681

CONFigure:LTE:MEAS<i>:RFSettings:SCC<no>:FREQuency <AnalyzerFreq>

Selects the center frequency of the SCC.

Using the unit CH, the frequency can be set via the channel number. The allowed channel number range depends on the operating band, see Chapter 3.2.4.3, "Frequency Bands", on page 646.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL`.

Suffix:

<no>	1 Only SCC1 supported - suffix can be omitted

Parameters:

<AnalyzerFreq>	Range: 70E+6 Hz to 6E+9 Hz *RST: 1.9698E+9 Hz Default unit: Hz

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Band / Channel / Frequency" on page 686

CONFigure:LTE:MEAS<i>:CAGGregation:SCC<no>:ACSPacing

Adjusts the SCC frequency, so that the PCC and the SCC are aggregated contiguously.

For the combined signal path scenario, use CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE.

Suffix:
<no> 1
Only SCC1 supported - suffix can be omitted

Example: See Specifying General and Common Measurement Settings

Usage: Event

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Adjust Carrier Spacing" on page 687

CONFigure:LTE:MEAS<i>:RFSettings:FOFFset <Offset>

Specifies a positive or negative frequency offset to be added to the carrier center frequency (CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency).

For the combined signal path scenario, use:

- CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL
- CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL
- CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific

Parameters:
<Offset> Range: -100E+3 Hz to 100E+3 Hz
*RST: 0 Hz
Default unit: Hz

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V3.2.10

Manual operation: See "Frequency Offset" on page 682

CONFigure:LTE:MEAS<i>:RFSettings:ENPower <ExpNomPow>

Sets the expected nominal power of the measured RF signal.

For the combined signal path scenario, use:

- CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode
- CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower
- CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode
- CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower

Parameters:

<ExpNomPow> The range of the expected nominal power can be calculated as follows:
Range (Expected Nominal Power) = Range (Input Power) + External Attenuation - User Margin
The input power range is stated in the data sheet.
*RST: 0 dBm
Default unit: dBm

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V1.0.10.1
V3.0.10: enhanced range

Manual operation: See "Expected Nominal Power" on page 682

CONFigure:LTE:MEAS<i>:RFSettings:UMARgin <UserMargin>

Sets the margin that the R&S CMW adds to the expected nominal power to determine its reference power. The reference power minus the external input attenuation must be within the power range of the selected input connector; refer to the data sheet.

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin`
- `CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin`

Parameters:

<UserMargin> Range: 0 dB to (55 dB + external attenuation - expected nominal power)
*RST: 0 dB
Default unit: dB

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V1.0.10.1
V3.0.10: enhanced range

Manual operation: See "User Margin" on page 683

CONFigure:LTE:MEAS<i>:RFSettings:MLOFfset <MixLevOffset>

Varies the input level of the mixer in the analyzer path.

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset`
- `CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset`

Parameters:

<MixLevOffset> Range: -10 dB to 10 dB
*RST: 0 dB
Default unit: dB

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Mixer Level Offset" on page 683

3.5.2.4 Common Measurement Control Settings

The following commands configure measurement control settings, valid for all LTE measurements.

CONFigure:LTE:MEAS<i>:CAGGregation:MCARrier.. 740
CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth..740
CONFigure:LTE:MEAS<i>:SCC<no>:CBANdwidth... 741

CONFigure:LTE:MEAS<i>:CAGGregation:MCARrier <MeasCarrier>

Selects a component carrier for single-carrier measurements.

Parameters:

<MeasCarrier> PCC | SCC1 | SCC2 | SCC3

*RST: PCC

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V3.2.70, V3.5.20 SCC2 | SCC3

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Measurement Carrier" on page 685

CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth <ChannelBW>

Selects the channel bandwidth of the PCC.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL`.

Parameters:

<ChannelBW> B014 | B030 | B050 | B100 | B150 | B200

B014: 1.4 MHz
B030: 3 MHz
B050: 5 MHz
B100: 10 MHz
B150: 15 MHz
B200: 20 MHz

*RST: B200

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V2.0.10

Manual operation: See "Channel Bandwidth" on page 686

CONFigure:LTE:MEAS<i>:SCC<no>:CBANdwidth <ChannelBW>

Selects the channel bandwidth of the SCC.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL`.

Suffix:

<no> 1
Only SCC1 supported - suffix can be omitted

Parameters:

<ChannelBW> B014 | B030 | B050 | B100 | B150 | B200

B014: 1.4 MHz
B030: 3 MHz
B050: 5 MHz
B100: 10 MHz
B150: 15 MHz
B200: 20 MHz

*RST: B200

Example: See Specifying General and Common Measurement Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Channel Bandwidth" on page 686

3.5.3 Multi-Evaluation Measurement Commands

The commands for the LTE multi-evaluation measurement are divided into the groups listed below. The general measurement settings also affect the measurement, see Chapter 3.5.2, "General Measurement Settings", on page 731.

- Measurement Control and States 742
- Enabling Results and Views 744
- Measurement Parameters - General Part 747
- Modulation Measurement Settings 759
- Spectrum Measurement Settings 763
- Power Measurement Settings 765
- BLER Measurement Settings 767
- List Mode Settings 767
- Trigger Settings 778
- Limits (Modulation, QPSK) 782
- Limits (Modulation, 16-QAM / 64-QAM) 786
- Limits (Spectrum, No Carrier Aggregation) 791
- Limits (Spectrum, with Carrier Aggregation) 796
- Limits (Power) 804
- Detected Signal Configuration 805
- EVM Results (Traces) 807
- Magnitude Error Results (Traces) 810

- Phase Error Results (Traces)....811
- Inband Emission Results....811
- Equalizer Spectrum Flatness Results....815
- Spectrum Emission Results....818
- ACLR Spectrum Results....823
- I/Q Constellation Results....825
- RB Allocation Table Results....825
- Power Monitor Results....827
- Power Dynamics Results....829
- Modulation Results (Single Values)....831
- BLER Results....836
- List Mode Results (One Segment)....837
- List Mode Results (All Segments, One Result)....859

3.5.3.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:LTE:MEAS<i>:MEValuation....742
STOP:LTE:MEAS<i>:MEValuation....742
ABORt:LTE:MEAS<i>:MEValuation....742
FETCh:LTE:MEAS<i>:MEValuation:STATe?....743
FETCh:LTE:MEAS<i>:MEValuation:STATe:ALL?....743

INITiate:LTE:MEAS<i>:MEValuation
STOP:LTE:MEAS<i>:MEValuation
ABORt:LTE:MEAS<i>:MEValuation

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement. The measurement enters the "RUN" state.
- `STOP...` halts the measurement immediately. The measurement enters the "RDY" state. Measurement results are kept. The resources remain allocated to the measurement.
- `ABORt...` halts the measurement immediately. The measurement enters the "OFF" state. All measurement values are set to NAV. Allocated resources are released.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Example: See Single-Shot and Continuous Measurements

Usage: Event

Firmware/Software: V1.0.10.1

Manual operation: See "Multi Evaluation (Softkey)" on page 679

FETCh:LTE:MEAS<i>:MEValuation:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MeasStatus> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

Manual operation: See "Multi Evaluation (Softkey)" on page 679

FETCh:LTE:MEAS<i>:MEValuation:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MainState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: adjustments finished, measurement running ("adjusted")
INV: not applicable, <MainState> OFF or RDY ("invalid")

<ResourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable, <MainState> OFF or RDY ("invalid")

Example: See Single-Shot and Continuous Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

Manual operation: See "Multi Evaluation (Softkey)" on page 679

3.5.3.2 Enabling Results and Views

The following commands select the evaluated results and the displayed views.

CONFigure:LTE:MEAS<i>:MEValuation:RESult[:ALL]....744
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMC....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:MERRor....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PERRor....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:IEMissions....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:IQ....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:ESFLatness....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:TXM....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:SEMask....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:ACLR....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:RBATable....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PMONitor....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:BLER....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PDYNamics....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude:EVMSymbol....747

CONFigure:LTE:MEAS<i>:MEValuation:RESult[:ALL] <EVM>, <MagnitudeError>, <PhaseError>, <InbandEmissions>, <EVMversusC>, <IQ>, <EquSpecFlatness>, <TXMeasurement>, <SpecEmMask>, <ACLR>[, <RBAllocTable>, <PowerMonitor>, <BLER>, <PowerDynamics>]

Enables or disables the evaluation of results and shows or hides the views in the multi-evaluation measurement. This command combines most other `CONFigure:LTE:MEAS<i>:MEValuation:RESult...` commands.

Parameters:

<EVM> OFF | ON

Error vector magnitude
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

<MagnitudeError>	OFF | ON *RST: OFF
<PhaseError>	OFF | ON *RST: OFF
<InbandEmissions>	OFF | ON *RST: ON
<EVMversusC>	OFF | ON EVM vs. subcarrier *RST: OFF
<IQ>	OFF | ON I/Q constellation diagram *RST: OFF
<EquSpecFlatness>	OFF | ON Equalizer spectrum flatness *RST: ON
<TXMeasurement>	OFF | ON TX measurement statistical overview *RST: ON
<SpecEmMask>	OFF | ON Spectrum emission mask *RST: ON
<ACLR>	OFF | ON Adjacent channel leakage power ratio *RST: ON
<RBAllocTable>	OFF | ON Resource block allocation table *RST: OFF
<PowerMonitor>	OFF | ON *RST: OFF
<BLER>	OFF | ON Block error ratio *RST: OFF
<PowerDynamics>	OFF | ON *RST: OFF
Example:	See Performing Single-Shot Measurements

Firmware/Software: V1.0.10.1
V1.0.15.20: added <RBAllocTable>, <PowerMonitor>
V1.0.15.21: added <BLER>
V2.0.10: added <PowerDynamics>

Manual operation: See "Multi Evaluation, PRACH > Assign Views" on page 707

CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMC <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:MERRor <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PERRor <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:IEMissions <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:IQ <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:ESFLatness <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:TXM <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:SEMask <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:ACLR <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:RBATable <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PMONitor <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:BLER <Enable>
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PDYNamics <Enable>

Enables or disables the evaluation of results and shows or hides the views in the multi-evaluation measurement.

Mnemonic	View type	Mnemonic	View type
EVMagnitude	error vector magnitude	EVMC	EVM vs. subcarrier
MERRor	magnitude error	PERRor	phase error
IEMissions	inband emissions	IQ	I/Q constellation diagram
ESFLatness	equalizer spectrum flatness	TXM	TX meas. statistical overview
SEMask	spectrum emission mask	ACLR	adj. channel leakage power ratio
RBATable	resource block allocation table	PMONitor	power monitor
BLER	block error ratio	PDYNamics	power dynamics

For reset values, see `CONFigure:LTE:MEAS<i>:MEValuation:RESult[:ALL]`.

Parameters:

<Enable> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: Depends on measurement

Firmware/Software: V1.0.10.1
RBATable and PMONitor: V1.0.15.20
BLER: V1.0.15.21
ESFLatness, PDYNamics: V2.0.10

Manual operation: See "Multi Evaluation, PRACH > Assign Views" on page 707

CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude:EVMSymbol <Enable>, <Symbol>, <LowHigh>

Enables or disables the measurement of EVM vs. modulation symbol results and configures the scope of the measurement.

Parameters:

<Enable> OFF | ON

OFF: Do not measure the results and hide the result diagram
ON: Measure the results and show the diagram

*RST: OFF

<Symbol> SC-FDMA symbol to be evaluated

Range: 0 to 6
*RST: 0

<LowHigh> LOW | HIGH

Low or high EVM window position

*RST: LOW

Example: See Performing Single-Shot Measurements

Firmware/Software: V3.5.40

Manual operation: See "Multi Evaluation > EVM vs. Symbol" on page 707

3.5.3.3 Measurement Parameters - General Part

The following commands define general measurement control parameters for the multi-evaluation measurement.

CONFigure:LTE:MEAS<i>:MEValuation:TOUT ... 748
CONFigure:LTE:MEAS<i>:MEValuation:REPetition ... 748
CONFigure:LTE:MEAS<i>:MEValuation:SCONdition ... 749
CONFigure:LTE:MEAS<i>:MEValuation:MMODe ... 749
CONFigure:LTE:MEAS<i>:MEValuation:TMODe:SCOunt ... 749
CONFigure:LTE:MEAS<i>:MEValuation:TMODe:ENPower ... 750
CONFigure:LTE:MEAS<i>:MEValuation:TMODe:RLEVel? ... 750
CONFigure:LTE:MEAS<i>:MEValuation:MOEXception ... 750
CONFigure:LTE:MEAS<i>:MEValuation:ULDL ... 751
CONFigure:LTE:MEAS<i>:MEValuation:SSUBframe ... 751
CONFigure:LTE:MEAS<i>:MEValuation:CPRefix ... 752
CONFigure:LTE:MEAS<i>:MEValuation:CTYPe ... 752
CONFigure:LTE:MEAS<i>:MEValuation:PFORmat ... 752
CONFigure:LTE:MEAS<i>:MEValuation:NSValue ... 753
CONFigure:LTE:MEAS<i>:MEValuation:NSValue:CAGGregation ... 753
CONFigure:LTE:MEAS<i>:MEValuation:NVFilter ... 753
CONFigure:LTE:MEAS<i>:MEValuation:CTVFilter ... 754
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:AUTO ... 754
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster ... 754
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:NRB ... 755
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:NRB<Number> ... 755

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:ORB....756
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:ORB<Number>....756
CONFigure:LTE:MEAS<i>:MEValuation[:PCC]:PLCid....756
CONFigure:LTE:MEAS<i>:MEValuation:SCC<no>:PLCid....757
CONFigure:LTE:MEAS<i>:MEValuation:DSSPusch....757
CONFigure:LTE:MEAS<i>:MEValuation:GHOPping....757
CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes....758
CONFigure:LTE:MEAS<i>:MEValuation:MSLot....758

CONFigure:LTE:MEAS<i>:MEValuation:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY`. The reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results, there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout> Default unit: s

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

CONFigure:LTE:MEAS<i>:MEValuation:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:...:MEAS<i>:...:SCOunt` to determine the number of measurement intervals per single shot.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Single-Shot and Continuous Measurements

Firmware/Software: V1.0.10.1

Manual operation: See "Repetition" on page 688

CONFigure:LTE:MEAS<i>:MEValuation:SCONdition <StopCondition>

Qualifies whether the measurement is stopped after a failed limit check or continued. `SLFail` means that the measurement is stopped and reaches the `RDY` state when one of the results exceeds the limits.

Parameters:

<StopCondition> NONE | SLFail

NONE: Continue measurement irrespective of the limit check
SLFail: Stop measurement on limit failure

*RST: NONE

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Stop Condition" on page 688

CONFigure:LTE:MEAS<i>:MEValuation:MMODe <MeasurementMode>

Selects the measurement mode.

Parameters:

<MeasurementMode> NORMal | TMODe | MELMode

NORMal: normal mode
TMODe: TPC mode
MELMode: multi-evaluation list mode

*RST: NORM

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KM012 for MELMode

Manual operation: See "Measurement Mode" on page 689

CONFigure:LTE:MEAS<i>:MEValuation:TMODe:SCOunt <SubframeCount>...

Defines the subframe counts for all entries of the "TPC Mode" list.

For definition of the corresponding expected nominal power values, see `CONFigure:LTE:MEAS<i>:MEValuation:TMODe:ENPower`.

Parameters:

<SubframeCount> Comma-separated list of 16 values, for list entry number 0 to 15

Range: 1 to 320
*RST: 320

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.30

Manual operation: See "TPC Mode" on page 689

CONFigure:LTE:MEAS<i>:MEValuation:TMODe:ENPower <ExpNomPow>...

Defines the expected nominal power values for all entries of the "TPC Mode" list.

For definition of the corresponding subframe count values, see `CONFigure:LTE:MEAS<i>:MEValuation:TMODe:SCOunt`.

Parameters:

<ExpNomPow> Comma-separated list of 16 values, for list entry number 0 to 15
The range of the expected nominal power can be calculated as follows:
Range (Expected Nominal Power) = Range (Input Power) + External Attenuation - User Margin
The input power range is stated in the data sheet.
*RST: 0 dBm
Default unit: dBm

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.30

Manual operation: See "TPC Mode" on page 689

CONFigure:LTE:MEAS<i>:MEValuation:TMODe:RLEVel?

Queries the reference level for all entries of the "TPC Mode" list. The reference level is calculated from the expected nominal power of each entry and the user margin.

Return values:

<ReferenceLevel> Comma-separated list of 16 values, for list entry number 0 to 15
The range of the reference levels can be calculated as follows:
Range (Reference Level) = Range (Input Power) + External Attenuation
The input power range is stated in the data sheet.
Default unit: dBm

Example: See Specifying Measurement-Specific Settings

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "TPC Mode" on page 689

CONFigure:LTE:MEAS<i>:MEValuation:MOEXception <MeasOnException>

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected.

Parameters:

<MeasOnException> OFF | ON

OFF: Faulty results are rejected
ON: Results are never rejected

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Measure on Exception" on page 690

CONFigure:LTE:MEAS<i>:MEValuation:ULDL <UplinkDownlink>

Selects an uplink-downlink configuration, defining the combination of uplink, downlink and special subframes within a radio frame. This parameter is only relevant for frame structure "Type 2" (`CONFigure:LTE:MEAS<i>:FSTRucture?`).

The uplink-downlink configurations are defined in 3GPP TS 36.211, chapter 4, "Frame Structure".

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL`.

Parameters:

<UplinkDownlink> Range: 0 to 6
*RST: 0

Example: See Specifying Required Settings

Firmware/Software: V1.0.10.1

Options: R&S CMW-KM550

Manual operation: See "Uplink Downlink" on page 691

CONFigure:LTE:MEAS<i>:MEValuation:SSUBframe <SpecialSubframe>

Selects a special subframe configuration, defining the inner structure of special subframes. This parameter is only relevant for frame structure "Type 2" (`CONFigure:LTE:MEAS<i>:FSTRucture?`).

The special subframe configurations are defined in 3GPP TS 36.211, chapter 4, "Frame Structure".

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe`.

Parameters:

<SpecialSubframe> Range: 0 to 8
*RST: 0

Example: See Specifying Required Settings

Firmware/Software: V1.0.10.1

Options: R&S CMW-KM550

Manual operation: See "Special Subframe" on page 691

CONFigure:LTE:MEAS<i>:MEValuation:CPRefix <CyclicPrefix>

Selects the type of cyclic prefix of the LTE signal.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:CPRefix`.

Parameters:
<CyclicPrefix> NORMal | EXTended

*RST: NORM

Example: See Specifying Required Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Cyclic Prefix" on page 691

CONFigure:LTE:MEAS<i>:MEValuation:CTYPe <ChannelType>

Configures the channel type detection for the measured subframe.

Parameters:
<ChannelType> AUTO | PUSCh | PUCCh

AUTO: automatic detection of channel type
PUSCh: only PUSCH in measured subframe
PUCCh: only PUCCH in measured subframe

*RST: PUSC

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Channel Type" on page 692

CONFigure:LTE:MEAS<i>:MEValuation:PFORmat <PUCCHFormat>

Specifies the PUCCH format (only relevant for signals containing a PUCCH). The formats are defined in 3GPP TS 36.211.

Parameters:
<PUCCHFormat> F1 | F1A | F1B | F2 | F2A | F2B | F3

*RST: F1

Example: See Specifying Required Settings

Firmware/Software: V1.0.15.0
V3.5.40: added F3

Manual operation: See "PUCCH Format" on page 692

CONFigure:LTE:MEAS<i>:MEValuation:NSValue <Value>

Selects the "network signaled value" for measurements without carrier aggregation.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CONNection:ASEMission`.

Parameters:

<Value> NS01 | NS02 | NS03 | NS04 | NS05 | NS06 | NS07 | NS08 | NS09 | NS10 | NS11 | NS12 | NS13 | NS14 | NS15 | NS16 | NS17 | NS18 | NS19 | NS20 | NS21 | NS22 | NS23 | NS24

Value NS_01 to NS_24

*RST: NS01

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20
V3.2.70: added NS11 to NS18, NS20
V3.2.82: added NS19, NS21 to NS24

Manual operation: See "Network Signaled Value" on page 693

CONFigure:LTE:MEAS<i>:MEValuation:NSValue:CAGGregation <Value>

Selects the "network signaled value" for measurements with carrier aggregation.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation`.

Parameters:

<Value> NS01 | NS02 | NS03 | NS04 | NS05 | NS06 | NS07 | NS08 | NS09 | NS10 | NS11 | NS12 | NS13 | NS14 | NS15 | NS16 | NS17 | NS18 | NS19 | NS20 | NS21 | NS22 | NS23 | NS24 | NS25 | NS26 | NS27 | NS28 | NS29 | NS30 | NS31 | NS32

Value CA_NS_01 to CA_NS_32

*RST: NS01

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Network Signaled Value" on page 693

CONFigure:LTE:MEAS<i>:MEValuation:NVFilter <NRBViewFilter>

Specifies, enables or disables the number of resource blocks (NRB) view filter. If the filter is active, only slots with a matching number of allocated resource blocks are measured.

Within the indicated input range, only specific numbers are allowed as defined in 3GPP TS 36.211. For details, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

Parameters:

<NRBViewFilter> Number of allocated resource blocks

Range: 1 to 100
*RST: OFF
Additional parameters: OFF | ON (disables | enables the filter)

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "NRB" on page 694

CONFigure:LTE:MEAS<i>:MEValuation:CTVFilter <ChannelType>

Specifies, enables or disables the channel type view filter. If the filter is active, only slots with detected channel type PUSCH or PUCCH are measured.

Parameters:

<ChannelType> PUSCh | PUCCh | ON | OFF

PUSCh: measure only physical uplink shared channel
PUCCh: measure only physical uplink control channel
ON: enable the filter
OFF: disable the filter

*RST: OFF (PUSC)

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Channel Type" on page 694

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:AUTO <Auto>

Enables or disables the automatic detection of the RB configuration.

Parameters:

<Auto> OFF | ON

OFF: manual definition
ON: automatic detection

*RST: ON

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Auto" on page 694

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster <Enable>

Specifies whether the UL signal uses multi-cluster allocation or not.

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL`

- CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL

Parameters:

<Enable> OFF | ON

OFF: contiguous allocation, resource allocation type 0
ON: multi-cluster allocation, resource allocation type 1

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.5.50

Manual operation: See "Multicluster" on page 694

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:NRB <NoRB>

Specifies the number of allocated RBs in the measured slot. For manual RB allocation definition without multi-cluster allocation.

Parameters:

<NoRB> For the allowed input range, see Chapter 3.2.4.2, "Resource Block Allocation", on page 644.

*RST: 100

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "No. of RBs, Offset RB (no multi-cluster)" on page 695

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:NRB<Number> <NoRB>

Specifies the number of allocated RBs in the measured slot, for multi-cluster allocation.

For the combined signal path scenario, use:

- CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL
- CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL
- CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL
- CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL

Suffix:

<Number> 1,2
Selects the cluster to be configured

Parameters:

<NoRB> For the allowed input ranges, see Chapter 3.2.4.2, "Resource Block Allocation", on page 644.

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.5.50

Manual operation: See "No. of RBs, Offset RB (with multi-cluster)" on page 695

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:ORB <OffsetRB>

Specifies the offset of the first allocated resource block for manual RB allocation definition without multi-cluster allocation.

Parameters:

<OffsetRB> For the maximum number of RBs depending on the channel BW, see Chapter 3.2.4.2, "Resource Block Allocation", on page 644.

Range: 0 to maximum number of RBs minus 1
*RST: 0

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "No. of RBs, Offset RB (no multi-cluster)" on page 695

CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:ORB<Number> <OffsetRB>

Specifies the offset of the first allocated resource block, for multi-cluster allocation.

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL`
- `CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL`
- `CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL`
- `CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL`

Suffix:

<Number> 1,2
Selects the cluster to be configured

Parameters:

<OffsetRB> For the allowed input ranges, see Chapter 3.2.4.2, "Resource Block Allocation", on page 644.

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.5.50

Manual operation: See "No. of RBs, Offset RB (with multi-cluster)" on page 695

CONFigure:LTE:MEAS<i>:MEValuation[:PCC]:PLCid <PhsLayerCellID>

Specifies the physical layer cell ID of the PCC.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID`.

Parameters:

<PhsLayerCellID>	Range:	0 to 503
	*RST:	0

Example: See Specifying Required Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Physical Cell ID" on page 686

CONFigure:LTE:MEAS<i>:MEValuation:SCC<no>:PLCid <PhsLayerCellID>

Specifies the physical layer cell ID of the SCC.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID`.

Suffix:

<no> 1
Only SCC1 supported - suffix can be omitted

Parameters:

<PhsLayerCellID>	Range:	0 to 503
	*RST:	0

Example: See Specifying Required Settings

Firmware/Software: V3.5.20

Manual operation: See "Physical Cell ID" on page 686

CONFigure:LTE:MEAS<i>:MEValuation:DSSPusch <DeltaSeqShift>

Specifies the delta sequence shift value (Δ_{ss}) used to calculate the sequence shift pattern for PUSCH.

Parameters:

<DeltaSeqShift>	Range:	0 to 29
	*RST:	0

Example: See Specifying Required Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Delta Seq. Shift PUSCH" on page 696

CONFigure:LTE:MEAS<i>:MEValuation:GHOPping <Value>

Specifies whether group hopping is used or not.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CONNection:GHOPping`.

Parameters:

<Value> OFF | ON

*RST: OFF

Example: See Specifying Required Settings

Firmware/Software: V2.0.20

Manual operation: See "Group Hopping" on page 696

CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes <SubframeOffset>, <SubframeCount>, <MeasSubframe>

Configures the scope of the measurement, i.e. which subframes are measured.

Parameters:

<SubframeOffset> Start of the measured subframe range relative to the trigger event

Range: 0 to 9
*RST: 0

<SubframeCount> Length of the measured subframe range

Range: 1 to 320
*RST: 1

<MeasSubframe> Subframe containing the measured slots for modulation and spectrum results

Range: 0 to <SubframeCount>-1
*RST: 0

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.15.20
V2.1.10: <SubframeCount> maximum increased to 320

Manual operation: See "Measurement Subframe" on page 696

CONFigure:LTE:MEAS<i>:MEValuation:MSLot <MeasureSlot>

Selects which slots of the "Measure Subframe" are measured.

Parameters:

<MeasureSlot> MS0 | MS1 | ALL

MS0: slot number 0 only
MS1: slot number 1 only
ALL: both slots

*RST: ALL

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.5.40

Manual operation: See "Measurement Subframe" on page 696

3.5.3.4 Modulation Measurement Settings

The following commands specify settings for the modulation measurements.

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:MSCHeme....................................... 759
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:MODulation..759
CONFigure:LTE:MEAS<i>:MEValuation:SRS:ENABle.. 760
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength....................................... 760
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength:CBANdwidth<Band>...........761
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUCCh............................ 762
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:LEADing...............762
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:LAGGing............... 763
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:CAGGregation:LLOCation...................763

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:MSCHeme <ModScheme>

Selects the modulation scheme used by the LTE uplink signal.

Parameters:

<ModScheme> AUTO | QPSK | Q16 | Q64

AUTO: automatic detection
QPSK: QPSK
Q16: 16-QAM
Q64: 64-QAM

*RST: QPSK

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Modulation Scheme" on page 697

CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:MODulation <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals (slots)

Range: 1 slot to 1000 slots
*RST: 20 slots

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Statistic Count" on page 697

CONFigure:LTE:MEAS<i>:MEValuation:SRS:ENABle <Enable>

Specifies whether a sounding reference signal is allowed (ON) or not (OFF).

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle`.

Parameters:

<Enable> OFF | ON

OFF: no SRS signal
ON: SRS signal allowed in the last SC-FDMA symbol of each subframe

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.0.10

Manual operation: See "Sounding RS (SRS)" on page 698

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength <CPnormB014>, <CPnormB030>, <CPnormB050>, <CPnormB100>, <CPnormB150>, <CPnormB200>, <CPextB014>, <CPextB030>, <CPextB050>, <CPextB100>, <CPextB150>, <CPextB200>

Specifies the EVM window length in samples for all channel bandwidths, depending on the cyclic prefix (CP) type.

Parameters:

<CPnormB014> Length for normal CP, BW = 1.4 MHz

Range: 1 to 9
*RST: 5

<CPnormB030> Length for normal CP, BW = 3 MHz

Range: 1 to 18
*RST: 12

<CPnormB050> Length for normal CP, BW = 5 MHz

Range: 1 to 36
*RST: 32

<CPnormB100> Length for normal CP, BW = 10 MHz

Range: 1 to 72
*RST: 66

<CPnormB150> Length for normal CP, BW = 15 MHz

Range: 1 to 108
*RST: 102

<CPnormB200> Length for normal CP, BW = 20 MHz

Range: 1 to 144
*RST: 136

<CPextB014>	Length for extended CP, BW = 1.4 MHz Range: 1 to 32 *RST: 28
<CPextB030>	Length for extended CP, BW = 3 MHz Range: 1 to 64 *RST: 58
<CPextB050>	Length for extended CP, BW = 5 MHz Range: 1 to 128 *RST: 124
<CPextB100>	Length for extended CP, BW = 10 MHz Range: 1 to 256 *RST: 250
<CPextB150>	Length for extended CP, BW = 15 MHz Range: 1 to 384 *RST: 374
<CPextB200>	Length for extended CP, BW = 20 MHz Range: 1 to 512 *RST: 504

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "EVM Window Length" on page 698

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength:
CBANdwidth<Band> <CycPrefixNormal>, <CycPrefixExtend>

Specifies the EVM window length in samples for a selected channel bandwidth, depending on the cyclic prefix (CP) type.

Suffix:

<Band>	14,30,50,100,150,200 Channel bandwidth in 0.1 MHz

Parameters:

<CycPrefixNormal>	Samples for normal CP Range: see below *RST: see below
<CycPrefixExtend>	Samples for extended CP Range: see below *RST: see below

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "EVM Window Length" on page 698

<Band>	Range <CycPrefixNormal>	*RST <CycPrefixNormal>	Range <CycPrefixExtend>	*RST <CycPrefixExtend>
14	1 to 9	5	1 to 32	28
30	1 to 18	12	1 to 64	58
50	1 to 36	32	1 to 128	124
100	1 to 72	66	1 to 256	250
150	1 to 108	102	1 to 384	374
200	1 to 144	136	1 to 512	504

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUCCh <PUCCH>

Enables or disables EVM exclusion periods for slots with detected channel type "PUCCH". If enabled, the first and the last SC-FDMA symbol of each slot is excluded from the calculation of EVM, magnitude error and phase error single value results. If the last symbol of a slot is already excluded because SRS signals are allowed, the second but last symbol is also excluded.

Parameters:

<PUCCH> OFF | ON

*RST: ON

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "EVM Exclusion Periods" on page 698

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:LEADing <Leading>

Specifies an EVM exclusion period at the beginning of a subframe (detected channel type "PUSCH"). The specified period is excluded from the calculation of EVM, magnitude error and phase error results.

Parameters:

<Leading> OFF | MS25

OFF: no exclusion
MS25: 25 µs excluded

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "EVM Exclusion Periods" on page 698

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:LAGGing <Lagging>

Specifies an EVM exclusion period at the end of each subframe (detected channel type "PUSCH"); if SRS signals are allowed, at the end of each shortened subframe. The specified period is excluded from the calculation of EVM, magnitude error and phase error results.

Parameters:

<Lagging> OFF | MS05 | MS25

OFF: no exclusion
MS05: 5 µs excluded
MS25: 25 µs excluded

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "EVM Exclusion Periods" on page 698

CONFigure:LTE:MEAS<i>:MEValuation:MODulation:CAGGregation:LLOCation <Value>

Specifies the UE transmitter architecture (local oscillator location) used for contiguous carrier aggregation.

Parameters:

<Value> CACB | CECC

CACB: Center of aggregated channel bandwidth
CECC: Center of each component carrier

*RST: CACB

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.5.10

Options: R&S CMW-KM502/-KM552 for FDD/TDD

Manual operation: See "Carrier Aggregation" on page 699

3.5.3.5 Spectrum Measurement Settings

The following commands specify settings for the spectrum measurements.

CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:ACLR....................................764
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:SEMask.................................764
CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:SEMask:MFILter.................................764
CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:ACLR:ENABle...................................764

CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:ACLR <StatisticCount>
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:SEMask <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Separate statistic counts for ACLR and spectrum emission mask measurements are supported.

Parameters:

<StatisticCount> Number of measurement intervals (slots)

Range: 1 slot to 1000 slots
*RST: 20 slots

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Emission Mask / ACLR > Statistic Count" on page 700

CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:SEMask:MFILter <MeasFilter>

Selects the resolution filter type for filter bandwidths of 100 kHz and 1 MHz. For 30 kHz filters, the type is fixed (Gaussian shape).

Parameters:

<MeasFilter> BANDpass | GAUSs

*RST: BAND

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Emission Mask > Meas Filter" on page 700

CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:ACLR:ENABle <UTRA1>, <UTRA2>, <EUTRA>

Enables or disables the evaluation of the first adjacent UTRA channels, second adjacent UTRA channels and first adjacent E-UTRA channels.

Parameters:

<UTRA1> OFF | ON

*RST: ON

<UTRA2> OFF | ON

*RST: ON

<EUTRA> OFF | ON
*RST: ON

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.15.0

Manual operation: See "ACLR > Select ACLR" on page 700

3.5.3.6 Power Measurement Settings

The following commands specify settings for the power measurements.

CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:TMASk... 765
CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LEADing......................... 765
CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LAGGing..........................766
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:POWer... 766
CONFigure:LTE:MEAS<i>:MEValuation:POWer:HDMode..766

CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:TMASk <TimeMask>

Selects the time mask for power dynamics measurements.

Parameters:

<TimeMask> GOO | PPSRs | SBLanking

GOO: General ON/OFF time mask
PPSRs: PUCCH/PUSCH transmission before and after an SRS
SBLanking: SRS blanking time mask

*RST: GOO

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.2.70

Manual operation: See "Time Mask" on page 701

CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LEADing
<Leading>

Shifts the beginning of the evaluation period for OFF power measurements.

Parameters:

<Leading> Positive values reduce the evaluation period (starts later).
Negative values increase the evaluation period (starts earlier).

Range: -1000 Ts to 1000 Ts
*RST: 0 Ts
Default unit: Ts

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.2.70

Manual operation: See "Add. Excl. OFF Power" on page 701

CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LAGGing <Lagging>

Shifts the end of the evaluation period for OFF power measurements.

Parameters:

<Lagging> Positive values reduce the evaluation period (ends earlier). Negative values increase the evaluation period (ends later).

Range: -1000 Ts to 1000 Ts
*RST: 0 Ts
Default unit: Ts

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.2.70

Manual operation: See "Add. Excl. OFF Power" on page 701

CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:POWer <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals

Range: 1 subframe to 1000 subframes
*RST: 20 subframes

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "Statistic Count" on page 701

CONFigure:LTE:MEAS<i>:MEValuation:POWer:HDMode <HighDynamicMode>

Enables or disables the high dynamic mode for power dynamics measurements.

Parameters:

<HighDynamicMode> OFF | ON

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.25

Manual operation: See "High Dynamic Mode" on page 702

3.5.3.7 BLER Measurement Settings

The following commands specify settings for the block error ratio measurement.

CONFigure:LTE:MEAS<i>:MEValuation:BLER:SFRames <Subframes>[, <SchedSubfrPerFr>]

Specifies the statistic count (number of measured subframes) and the number of scheduled subframes per radio frame for the BLER measurement. BLER is a single shot measurement.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<Subframes> Number of subframes to be measured

Range: 1 subframe to 200E+3 subframes
*RST: 10E+3 subframes

<SchedSubfrPerFr> Number of scheduled subframes per radio frame in the generated downlink signal

Range: 1 subframe to 10 subframes
*RST: 9 subframes

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V1.0.15.21
V3.0.10: added <SchedSubfrPerFr>

Manual operation: See "BLER > No. of Subframes" on page 702

3.5.3.8 List Mode Settings

The following commands configure the list mode. For retrieving list mode results, see Chapter 3.5.3.29, "List Mode Results (One Segment)", on page 837 and Chapter 3.5.3.30, "List Mode Results (All Segments, One Result)", on page 859.

For a description of the list mode, see Chapter 3.2.3, "List Mode", on page 637.

The segment number <no> in the following commands refers to the complete range of configured segments (1..2000).

CONFigure:LTE:MEAS<i>:MEValuation:LIST 768
CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge 768
CONFigure:LTE:MEAS<i>:MEValuation:LIST:OSINdex 768
CONFigure:LTE:MEAS<i>:MEValuation:LIST:CMWS:CMODe 769
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CMWS:CONNector 769
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup 770
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:TDD 772
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SCC<c> 772
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:ACSPacing 773
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:MCARrier 773
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:RBALlocation 774
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation 774

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask............................... 776
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR.................................. 776
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor............................ 777
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer................................ 778
TRIGger:LTE:MEAS<i>:MEValuation:LIST:MODE.. 778

CONFigure:LTE:MEAS<i>:MEValuation:LIST <Enable>

Enables or disables the list mode.

Parameters:

<Enable> OFF | ON

OFF: Disable list mode
ON: Enable list mode

*RST: OFF

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.10

Options: R&S CMW-KM012

Manual operation: See "Measurement Mode" on page 689

CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge <StartIndex>, <NrSegments>

Select a range of measured segments. The segments must be configured using `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup`.

Parameters:

<StartIndex> First measured segment in the range of configured segments

Range: 1 to 2000
*RST: 1

<NrSegments> Number of measured segments

Range: 1 to 1000
*RST: 10

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.10
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:OSINdex <OfflineSegIndex>

Selects the number of the segment to be displayed in offline mode. The selected index must be within the range of measured segments (see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge`).

Setting a value also enables the offline mode.

Parameters:

<OfflineSegIndex> Range: 1 to 1000
*RST: OFF
Additional parameters: OFF (disables offline mode)

Example: See Performing Single-Shot Measurements

Firmware/Software: V2.0.10
V2.1.25: increased maximum to 250
V2.1.30: increased maximum to 512
V3.0.50: increased maximum to 1000

Options: R&S CMW-KM012

Manual operation: See "List Mode > Offline Segment No." on page 703

CONFigure:LTE:MEAS<i>:MEValuation:LIST:CMWS:CMODe <ConnectorMode>

Specifies how the input connector is selected for LTE list mode measurements with the R&S CMWS.

Parameters:

<ConnectorMode> GLOBal | LIST

GLOBal: The same input connector is used for all segments. It is selected in the same way as without list mode, for example via `ROUTe:LTE:MEAS<i>:SCENario:SALone`.

LIST: The input connector is configured individually for each segment. See `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CMWS:CONNector`.

*RST: GLOB

Example: See Specifying List Mode Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CMWS:CONNector <CMWSConnector>

Selects the RF input connector for segment <no> for LTE list mode measurements with the R&S CMWS. This setting is only relevant for connector mode `LIST`, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:CMWS:CMODe`.

All segments of a list mode measurement must use connectors of the same bench.

For possible connector values, see Chapter 3.5.1.4, "Values for RF Path Selection", on page 726.

Suffix:

<no> 1..2000
Segment number

Parameters:

<CMWSConnector> Selects the input connector of the R&S CMWS

Example: See Specifying List Mode Settings

Firmware/Software: V3.2.70

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup <SegmentLength>, <Level>, <DuplexMode>, <Band>, <Frequency>, <ChBandwidth>, <CyclicPrefix>, <ChannelType>, <RetriggerFlag>, <EvaluatOffset>[, <NetworkSigValue>]

Defines the length and analyzer settings of segment <no>. This command must be sent for all segments to be measured (`CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge`).

For the TDD mode, see also `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:TDD`.

For SCC-specific settings, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SCC<c>`.

Suffix:

<no> 1..2000
Segment number

Parameters:

<SegmentLength> Number of subframes in the segment
Range: 1 to 2000
*RST: 1

<Level> Expected nominal power in the segment. The range can be calculated as follows:
Range (Expected Nominal Power) = Range (Input Power) + External Attenuation - User Margin
The input power range is stated in the data sheet.
*RST: 0 dBm
Default unit: dBm

<DuplexMode> FDD | TDD
Duplex mode used in the segment

<Band> FDD: OB1 | ... | OB28 | OB30 | OB31 | OB65 | OB66
TDD: OB33 | ... | OB46
Operating band used in the segment
*RST: OB1 (OB33 for TDD)

<Frequency> PCC center frequency used in the segment
Range: 70E+6 Hz to 6E+9 Hz
*RST: 1.95E+9 Hz
Default unit: Hz

<ChBandwidth>	B014 | B030 | B050 | B100 | B150 | B200 PCC channel bandwidth used in the segment **B014**: 1.4 MHz **B030**: 3 MHz **B050**: 5 MHz **B100**: 10 MHz **B150**: 15 MHz **B200**: 20 MHz *RST: B200
<CyclicPrefix>	NORMal | EXTended Type of cyclic prefix used in the segment *RST: NORM
<ChannelType>	AUTO | PUSCh | PUCCh **AUTO**: automatic detection of channel type **PUSCh**: only PUSCH in measured subframe **PUCCh**: only PUCCH in measured subframe *RST: PUSC
<RetriggerFlag>	OFF | ON | IFPower Specifies whether the measurement waits for a trigger event before measuring the segment, or not. For the first segment, the value OFF is always interpreted as ON. For subsequent segments, the retrigger flag is ignored for trigger mode ONCE and evaluated for trigger mode SEGMent, see `TRIGger:LTE:MEAS<i>:MEValuation:LIST:MODE` on page 778. **OFF**: measure the segment without retrigger **ON**: wait for a trigger event from the trigger source configured via `TRIGger:LTE:MEAS<i>:MEValuation:SOURce` on page 779 **IFPower**: wait for a trigger event from the trigger source "IF Power" *RST: ON
<EvaluatOffset>	Number of subframes at the beginning of the segment that are not evaluated Range: 0 to 1000 *RST: 0
<NetworkSigValue>	NS01 | NS02 | NS03 | NS04 | NS05 | NS06 | NS07 | NS08 | NS09 | NS10 | NS11 | NS12 | NS13 | NS14 | NS15 | NS16 | NS17 | NS18 | NS19 | NS20 | NS21 | NS22 | NS23 | NS24 | NS25 | NS26 | NS27 | NS28 | NS29 | NS30 | NS31 | NS32 Network signaled value to be used for the segment *RST: NS01
Example:	See Specifying List Mode Settings

Firmware/Software: V3.0.10, some bands added in later versions
V3.2.70: added <RetriggerFlag> value IFPower; NS11 to NS18, NS20
V3.2.82: added NS19, NS21 to NS24
V3.5.30: added NS25 to NS32

Options: R&S CMW-KM012
R&S CMW-KM500 for FDD, R&S CMW-KM550 for TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:TDD <UplinkDownlink>, <SpecialSubframe>

Defines segment settings only relevant for the duplex mode TDD.

For general segment configuration, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup`.

Suffix:
<no> 1..2000
Segment number

Parameters:
<UplinkDownlink> Uplink-downlink configuration, defining the combination of uplink, downlink and special subframes within a radio frame

Range: 0 to 6
*RST: 0

<SpecialSubframe> Special subframe configuration, defining the inner structure of special subframes

Range: 0 to 8
*RST: 0

Firmware/Software: V2.0.10

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SCC<c> <Frequency>, <ChBandwidth>

Defines SCC-specific analyzer settings for segment <no>.

Suffix:
<no> 1..2000
Segment number

<c> 1
Only SCC1 supported - suffix can be omitted

Parameters:
<Frequency> SCC center frequency used in the segment

Range: 70E+6 Hz to 6E+9 Hz
*RST: 1.9698E+9 Hz
Default unit: Hz

<ChBandwidth> B014 | B030 | B050 | B100 | B150 | B200

SCC channel bandwidth used in the segment
B014: 1.4 MHz
B030: 3 MHz
B050: 5 MHz
B100: 10 MHz
B150: 15 MHz
B200: 20 MHz

*RST: B200

Example: See Specifying List Mode Settings

Firmware/Software: V3.5.30

Options: R&S CMW-KM012
R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:ACSPacing

Adjusts the SCC frequency in segment <no>, so that the PCC and the SCC are aggregated contiguously.

Suffix:
<no> 1..2000
Segment number

Example: See Specifying List Mode Settings

Usage: Event

Firmware/Software: V3.5.30

Options: R&S CMW-KM012
R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:MCARrier <MeasCarrier>

Selects a component carrier for single-carrier measurements in segment <no>.

Suffix:
<no> 1..2000
Segment number

Parameters:
<MeasCarrier> PCC | SCC1

*RST: PCC

Example: See Specifying List Mode Settings

Firmware/Software: V3.5.30

Options: R&S CMW-KM012
R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:RBALlocation
<Auto>, <NoRB>, <Offset>

Allows you to define the resource block allocation manually for segment <no>. By default, the RB allocation is detected automatically.

Suffix:

<no> 1..2000
Segment number

Parameters:

<Auto> OFF | ON

OFF: manual definition via <NoRB> and <Offset>
ON: automatic detection of RB allocation

*RST: ON

<NoRB> Number of allocated resource blocks in each measured slot

Range: see table below
*RST: 100

<Offset> Offset of first allocated resource block from edge of allocated UL transmission bandwidth

Range: see table below
*RST: 0

Example: See Specifying List Mode Settings

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

Channel bandwidth	Range <NoRB>	Range <Offset>
1.4 MHz	1 to 6	0 to 5
3 MHz	1 to 15	0 to 14
5 MHz	1 to 25	0 to 24
10 MHz	1 to 50	0 to 49
15 MHz	1 to 75	0 to 74
20 MHz	1 to 100	0 to 99

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation
<ModStatistics>, <ModEnable>, <EVMenable>, <MagErrorEnable>, <PhaseErrEnable>, <IBEenable>, <EqSpFlatEnable>, <ModScheme>

Defines settings for modulation measurements in list mode for segment <no>.

Suffix:

<no> 1..2000
Segment number

Parameters:

<ModStatistics> Statistical length in slots

Range: 1 to 1000
*RST: 20

<ModEnable> OFF | ON

Enable or disable the measurement of modulation results
ON: Modulation results are measured according to the other enable flags in this command. Modulation results for which there is no explicit enable flag are also measured (e.g. I/Q offset, frequency error and timing error).
OFF: No modulation results at all are measured. The other enable flags in this command are ignored.

*RST: OFF

<EVMenable> OFF | ON

Enable or disable measurement of EVM

*RST: OFF

<MagErrorEnable> OFF | ON

Enable or disable measurement of magnitude error

*RST: OFF

<PhaseErrEnable> OFF | ON

Enable or disable measurement of phase error

*RST: OFF

<IBEenable> OFF | ON

Enable or disable measurement of inband emissions

*RST: OFF

<EqSpFlatEnable> OFF | ON

Enable or disable measurement of equalizer spectrum flatness results

*RST: OFF

<ModScheme> AUTO | QPSK | Q16 | Q64

Modulation scheme used by the LTE uplink signal
AUTO: automatic detection
QPSK: QPSK
Q16: 16-QAM
Q64: 64-QAM

*RST: QPSK

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.10

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask <SEMstatistics>, <SEenable>, <OBWenable>, <SEMenable>

Defines settings for spectrum emission measurements in list mode for segment <no>.

Suffix:

<no> 1..2000
Segment number

Parameters:

<SEMstatistics> Statistical length in slots

Range: 1 to 1000
*RST: 20

<SEenable> OFF | ON

Enable or disable the measurement of spectrum emission results
ON: Spectrum emission results are measured according to the other enable flags in this command. Results for which there is no explicit enable flag are also measured.
OFF: No spectrum emission results at all are measured. The other enable flags in this command are ignored.

*RST: OFF

<OBWenable> OFF | ON

Enable or disable measurement of occupied bandwidth

*RST: OFF

<SEMenable> OFF | ON

Enable or disable measurement of spectrum emission trace and margin results

*RST: OFF

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.10

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR <ACLRstatistics>, <ACLRenable>, <UTRA1enable>, <UTRA2enable>, <EUTRAenable>

Defines settings for ACLR measurements in list mode for segment <no>.

Suffix:

<no> 1..2000
Segment number

Parameters:

<ACLRstatistics> Statistical length in slots

Range: 1 to 1000
*RST: 20

<ACLRenable> OFF | ON

Enable or disable the measurement of ACLR results
ON: ACLR results are measured according to the other enable flags in this command. ACLR results for which there is no explicit enable flag are also measured (e.g. power in assigned E-UTRA channel).
OFF: No ACLR results at all are measured. The other enable flags in this command are ignored.

*RST: OFF

<UTRA1enable> OFF | ON

Enable or disable evaluation of first adjacent UTRA channels

*RST: OFF

<UTRA2enable> OFF | ON

Enable or disable evaluation of second adjacent UTRA channels

*RST: OFF

<EUTRAenable> OFF | ON

Enable or disable evaluation of first adjacent E-UTRA channels

*RST: OFF

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.10

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor <Enable>

Enables or disables the measurement of power monitor results (power of one carrier) for segment <no>.

Suffix:

<no> 1..2000
Segment number

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.20

Options: R&S CMW-KM012

CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer <PowerStatistics>, <PowerEnable>

Defines settings for the measurement of the total TX power of all carriers for segment <no>.

Suffix:

<no> 1..2000
Segment number

Parameters:

<PowerStatistics> Statistical length in subframes

Range: 1 to 1000
*RST: 20

<PowerEnable> OFF | ON

Enables or disables the measurement of the total TX power

*RST: OFF

Example: See Specifying List Mode Settings

Firmware/Software: V3.5.50

Options: R&S CMW-KM012

TRIGger:LTE:MEAS<i>:MEValuation:LIST:MODE <Mode>

Specifies the trigger mode for list mode measurements. For configuration of retrigger flags, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup` on page 770.

Parameters:

<Mode> ONCE | SEGMent

ONCE: A trigger event is only required to start the measurement. As a result, the entire range of segments to be measured is captured without additional trigger event. The retrigger flag of the first segment is evaluated. The other retrigger flags are ignored.
SEGMent: The retrigger flag of each segment is evaluated. It defines whether the measurement waits for a trigger event before capturing the segment, or not.

*RST: ONCE

Example: See Specifying List Mode Settings

Firmware/Software: V2.0.10

Options: R&S CMW-KM012

3.5.3.9 Trigger Settings

The following commands define the trigger parameters.

TRIGger:LTE:MEAS<i>:MEValuation:CATalog:SOURce?....779
TRIGger:LTE:MEAS<i>:MEValuation:SOURce....779
TRIGger:LTE:MEAS<i>:MEValuation:SLOPe....779
TRIGger:LTE:MEAS<i>:MEValuation:THReshold....780
TRIGger:LTE:MEAS<i>:MEValuation:DELay....780
TRIGger:LTE:MEAS<i>:MEValuation:TOUT....780
TRIGger:LTE:MEAS<i>:MEValuation:MGAP....781
TRIGger:LTE:MEAS<i>:MEValuation:SMODe....781
TRIGger:LTE:MEAS<i>:MEValuation:AMODe....781

TRIGger:LTE:MEAS<i>:MEValuation:CATalog:SOURce?

Lists all trigger source values that can be set using `TRIGger:LTE:MEAS<i>:MEValuation:SOURce`.

Return values:

<Sourcelist> Comma-separated list of all supported values. Each value is represented as a string.

Usage: Query only

Firmware/Software: V1.0.10.1

Manual operation: See "Trigger Source" on page 703

TRIGger:LTE:MEAS<i>:MEValuation:SOURce <Source>

Selects the source of the trigger events. Some values are always available in this firmware application. They are listed below. Depending on the installed options, additional values are available. A complete list of all supported values can be displayed using `TRIGger:...:CATalog:SOURce?`.

Parameters:

<Source>

'Free Run (Fast Sync)'
Free run with synchronization

'Free Run (No Sync)'
Free run without synchronization

'IF Power'
Power trigger (received RF power)

*RST: 'IF Power'

Example: See Configuring the Trigger System

Firmware/Software: V1.0.10.1
V2.0.10: 'Free Run (No Sync)' added

Manual operation: See "Trigger Source" on page 703

TRIGger:LTE:MEAS<i>:MEValuation:SLOPe <Slope>

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse (valid for external and power trigger sources).

Parameters:

<Slope> REDGe | FEDGe

REDGe: Rising edge
FEDGe: Falling edge

*RST: REDG

Example: See Configuring the Trigger System

Firmware/Software: V1.0.10.1

Manual operation: See "Trigger Slope" on page 704

TRIGger:LTE:MEAS<i>:MEValuation:THReshold <TrigThreshold>

Defines the trigger threshold for power trigger sources.

Parameters:

<TrigThreshold> Range: -50 dB to 0 dB
*RST: -20 dB
Default unit: dB (full scale, i.e. relative to reference level minus external attenuation)

Example: See Configuring the Trigger System

Firmware/Software: V1.0.10.1

Manual operation: See "Trigger Threshold" on page 704

TRIGger:LTE:MEAS<i>:MEValuation:DELay <Delay>

Defines a time delaying the start of the measurement relative to the trigger event. This setting has no influence on free run measurements.

Parameters:

<Delay> Range: -250E-6 s to 250E-6 s
*RST: 0 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V1.0.10.1
V2.1.20: default unit changed

Manual operation: See "Trigger Delay" on page 704

TRIGger:LTE:MEAS<i>:MEValuation:TOUT <TriggerTimeOut>

Selects the maximum time that the R&S CMW waits for a trigger event before it stops the measurement in remote control mode or indicates a trigger timeout in manual operation mode. This setting has no influence on "Free Run" measurements.

Parameters:

<TriggerTimeOut> Range: 0.01 s to 167772.15 s
*RST: 0.1 s
Default unit: s
Additional parameters: OFF | ON (disables | enables the timeout)

Example: See Configuring the Trigger System

Firmware/Software: V1.0.10.1

Manual operation: See "Trigger Timeout" on page 704

TRIGger:LTE:MEAS<i>:MEValuation:MGAP <MinTrigGap>

Sets a minimum time during which the IF signal must be below the trigger threshold before the trigger is armed so that an IF power trigger event can be generated.

Parameters:

<MinTrigGap> Range: 0 slots to 20 slots
*RST: 2 slots
Default unit: slots

Example: See Configuring the Trigger System

Firmware/Software: V1.0.10.1

Manual operation: See "Min Trigger Gap" on page 704

TRIGger:LTE:MEAS<i>:MEValuation:SMODe <SyncMode>

Selects the size of the search window for synchronization - normal or enhanced.

Parameters:

<SyncMode> NORMal | ENHanced
*RST: NORM

Example: See Configuring the Trigger System

Firmware/Software: V2.0.10

Manual operation: See "Synchronization Mode" on page 705

TRIGger:LTE:MEAS<i>:MEValuation:AMODe <AcquisitionMode>

Selects whether the R&S CMW synchronizes to a slot boundary or to a subframe boundary. The parameter is relevant for "Free Run (Fast Sync)" and for list mode measurements with "Synchronization Mode" = "Enhanced".

Parameters:

<AcquisitionMode> SLOT | SUBFrame
*RST: SLOT

Example: See Configuring the Trigger System

Firmware/Software: V2.1.25

Manual operation: See "Acquisition Mode" on page 705

3.5.3.10 Limits (Modulation, QPSK)

The following commands define limits for results which characterize the modulation accuracy of signals with modulation scheme QPSK.

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:EVMagnitude....................................782
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:MERRor...782
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:PERRor..783
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:FERRor..783
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IQOFfset...784
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IBE..784
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IBE:IQOFfset....................................785
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:ESFLatness......................................785

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:EVMagnitude <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the error vector magnitude (EVM) for QPSK.

Parameters:

<RMS>
Range: 0 % to 100 %
*RST: 17.5 %, ON
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak>
Range: 0 % to 100 %
*RST: 35 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:MERRor <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the magnitude error for QPSK.

Parameters:

<RMS>
Range: 0 % to 100 %
*RST: 17.5 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak>	Range:	0 % to 100 %
	*RST:	35 %, OFF
	Default unit: %	
	Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)	

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:PERRor <RMS>, <Peak>

Defines symmetric limits for the RMS and peak values of the phase error for QPSK. The limit check fails if the absolute value of the measured phase error exceeds the specified values.

Parameters:

<RMS>	Range:	0 deg to 180 deg
	*RST:	17.5 deg, OFF
	Default unit: deg	
	Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)	
<Peak>	Range:	0 deg to 180 deg
	*RST:	35 deg, OFF
	Default unit: deg	
	Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)	

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:FERRor <FrequencyError>

Defines an upper limit for the carrier frequency error (QPSK modulation).

Parameters:

<FrequencyError>	Range:	0 ppm to 1 ppm
	*RST:	0.1 ppm, ON
	Default unit: ppm	
	Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)	

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IQOFfset <Enable>, <Offset1>, <Offset2>, <Offset3>

Defines upper limits for the I/Q origin offset (QPSK modulation). Three different I/Q origin offset limits can be set for three TX power ranges. For details, see Chapter 3.2.5.4, "I/Q Origin Offset Limits", on page 649.

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<Offset1> I/Q origin offset limit for high TX power range

Range: -256 dBc to 256 dBc
*RST: -24.2 dBc
Default unit: dBc

<Offset2> I/Q origin offset limit for intermediate TX power range

Range: -256 dBc to 256 dBc
*RST: -19.2 dBc
Default unit: dBc

<Offset3> I/Q origin offset limit for low TX power range

Range: -256 dBc to 256 dBc
*RST: -9.2 dBc
Default unit: dBc

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IBE <Enable>, <Minimum>, <EVM>, <RBPower>, <IQImage>

Defines parameters used for calculation of an upper limit for the inband emission (QPSK modulation), see Chapter 3.2.5.5, "Inband Emissions Limits", on page 649.

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<Minimum> Range: -256 dB to 256 dB
*RST: -29.2 dB
Default unit: dB

<EVM> Range: 0 % to 100 %
*RST: 17.5 %
Default unit: %

<RBPower> Range: -256 dBm to 256 dBm
*RST: -57 dBm
Default unit: dBm

<IQImage> Range: -256 dB to 256 dB
*RST: -24.2 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IBE:IQOFfset <Offset1>, <Offset2>, <Offset3>

Defines I/Q origin offset values used for calculation of an upper limit for the inband emission (QPSK modulation). Three different values can be set for three TX power ranges, see Chapter 3.2.5.5, "Inband Emissions Limits", on page 649.

Parameters:

<Offset1> Offset for high TX power range
Range: -256 dBc to 256 dBc
*RST: -24.2 dBc
Default unit: dBc

<Offset2> Offset for intermediate TX power range
Range: -256 dBc to 256 dBc
*RST: -19.2 dBc
Default unit: dBc

<Offset3> Offset for low TX power range
Range: -256 dBc to 256 dBc
*RST: -9.2 dBc
Default unit: dBc

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:ESFLatness <Enable>, <Range1>, <Range2>, <Max1Min2>, <Max2Min1>, <EdgeFrequency>

Defines limits for the equalizer spectrum flatness (QPSK modulation).

Parameters:

<Enable> OFF | ON
OFF: disables the limit check
ON: enables the limit check
*RST: ON

<Range1> Upper limit for max(range 1) - min(range 1)

Range: -256 dBpp to 256 dBpp
*RST: 5.4 dBpp
Default unit: dBpp

<Range2> Upper limit for max(range 2) - min(range 2)

Range: -256 dBpp to 256 dBpp
*RST: 9.4 dBpp
Default unit: dBpp

<Max1Min2> Upper limit for max(range 1) - min(range 2)

Range: -256 dB to 256 dB
*RST: 6.4 dB
Default unit: dB

<Max2Min1> Upper limit for max(range 2) - min(range 1)

Range: -256 dB to 256 dB
*RST: 8.4 dB
Default unit: dB

<EdgeFrequency> Frequency band edge distance of border between range 1 and range 2

Range: 0 MHz to 20 MHz
*RST: 3 MHz
Default unit: Hz

Example: See Specifying Limits

Firmware/Software: V2.0.10

3.5.3.11 Limits (Modulation, 16-QAM / 64-QAM)

The following commands define limits for results which characterize the modulation accuracy of signals with modulation scheme 16-QAM or 64-QAM.

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:EVMagnitude.................... 786
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:MERRor........................... 787
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:PERRor............................788
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:FERRor............................ 788
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IQOFfset..........................789
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IBE................................. 789
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IBE:IQOFfset.................... 790
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:ESFLatness...................... 791

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:EVMagnitude <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the error vector magnitude (EVM) for 16-QAM or 64-QAM.

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<RMS> Range: 0 % to 100 %
*RST: 12.5 % (16-QAM) / 8 % (64-QAM), ON
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 % to 100 %
*RST: 25 % (16-QAM) / 16 % (64-QAM), OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1, V3.5.50 *RST for 64-QAM changed

---

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:MERRor <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the magnitude error for 16-QAM or 64-QAM.

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<RMS> Range: 0 % to 100 %
*RST: 12.5 % (16-QAM) / 7.5 % (64-QAM), OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 % to 100 %
*RST: 25 % (16-QAM) / 15 % (64-QAM), OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:PERRor <RMS>, <Peak>

Defines symmetric limits for the RMS and peak values of the phase error for 16-QAM or 64-QAM. The limit check fails if the absolute value of the measured phase error exceeds the specified values.

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<RMS>
Range: 0 deg to 180 deg
*RST: 12.5 deg (16-QAM) / 7.5 deg (64-QAM), OFF
Default unit: deg
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak>
Range: 0 deg to 180 deg
*RST: 25 deg (16-QAM) / 15 deg (64-QAM), OFF
Default unit: deg
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:FERRor <FrequencyError>

Defines an upper limit for the carrier frequency error (16-QAM or 64-QAM modulation).

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<FrequencyError>
Range: 0 ppm to 1 ppm
*RST: 0.1 ppm, ON
Default unit: ppm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IQOFfset <Enable>, <Offset1>, <Offset2>, <Offset3>

Defines upper limits for the I/Q origin offset (16-QAM or 64-QAM modulation). Three different I/Q origin offset limits can be set for three TX power ranges. For details, see Chapter 3.2.5.4, "I/Q Origin Offset Limits", on page 649.

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<Offset1> I/Q origin offset limit for high TX power range

Range: -256 dBc to 256 dBc
*RST: -24.2 dBc
Default unit: dBc

<Offset2> I/Q origin offset limit for intermediate TX power range

Range: -256 dBc to 256 dBc
*RST: -19.2 dBc
Default unit: dBc

<Offset3> I/Q origin offset limit for low TX power range

Range: -256 dBc to 256 dBc
*RST: -9.2 dBc
Default unit: dBc

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IBE <Enable>, <Minimum>, <EVM>, <RBPower>, <IQImage>

Defines parameters used for calculation of an upper limit for the inband emission (16-QAM or 64-QAM modulation), see Chapter 3.2.5.5, "Inband Emissions Limits", on page 649.

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<Minimum>	Range: -256 dB to 256 dB *RST: -29.2 dB Default unit: dB
<EVM>	Range: 0 % to 100 % *RST: 12.5 % (16-QAM) / 7.5 % (64-QAM) Default unit: %
<RBPower>	Range: -256 dBm to 256 dBm *RST: -57 dBm Default unit: dBm
<IQImage>	Range: -256 dB to 256 dB *RST: -24.2 dB Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IBE:IQOFfset <Offset1>, <Offset2>, <Offset3>

Defines I/Q origin offset values used for calculation of an upper limit for the inband emission (16-QAM or 64-QAM modulation). Three different values can be set for three TX power ranges, see Chapter 3.2.5.5, "Inband Emissions Limits", on page 649.

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<Offset1>	Offset for high TX power range Range: -256 dBc to 256 dBc *RST: -24.2 dBc Default unit: dBc
<Offset2>	Offset for intermediate TX power range Range: -256 dBc to 256 dBc *RST: -19.2 dBc Default unit: dBc
<Offset3>	Offset for low TX power range Range: -256 dBc to 256 dBc *RST: -9.2 dBc Default unit: dBc

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:ESFLatness <Enable>, <Range1>, <Range2>, <Max1Min2>, <Max2Min1>, <EdgeFrequency>

Defines limits for the equalizer spectrum flatness (16-QAM or 64-QAM modulation).

Suffix:

<ModOrder> 16,64
16-QAM or 64-QAM

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<Range1> Upper limit for max(range 1) - min(range 1)

Range: -256 dBpp to 256 dBpp
*RST: 5.4 dBpp
Default unit: dBpp

<Range2> Upper limit for max(range 2) - min(range 2)

Range: -256 dBpp to 256 dBpp
*RST: 9.4 dBpp
Default unit: dBpp

<Max1Min2> Upper limit for max(range 1) - min(range 2)

Range: -256 dB to 256 dB
*RST: 6.4 dB
Default unit: dB

<Max2Min1> Upper limit for max(range 2) - min(range 1)

Range: -256 dB to 256 dB
*RST: 8.4 dB
Default unit: dB

<EdgeFrequency> Frequency band edge distance of border between range 1 and range 2

Range: 0 MHz to 20 MHz
*RST: 3 MHz
Default unit: Hz

Example: See Specifying Limits

Firmware/Software: V2.0.10

3.5.3.12 Limits (Spectrum, No Carrier Aggregation)

The following commands define ACLR and spectrum emission limits for measurements without carrier aggregation.

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CBANdwidth<Band>.......... 792
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CBANdwidth<Band>................792
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CBANdwidth<Band>........ 793
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CBANdwidth<Band>........ 793
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:
CBANdwidth<Band>.. 795

**CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:
CBANdwidth<Band>** <RelativeLevel>, <AbsoluteLevel>

Defines relative and absolute limits for the ACLR measured in the first or second adjacent UTRA channel, depending on <no>. The settings are defined separately for each channel bandwidth.

Suffix:

<Band>	14,30,50,100,150,200 Channel bandwidth in 0.1 MHz
<no>	1..2 Selects first or second adjacent UTRA channel

Parameters:

<RelativeLevel>	Range: -256 dB to 256 dB *RST: 32.2 dB (<no> = 1) / 35.2 dB (<no> = 2, OFF for <Band> = 14 | 30) Default unit: dB Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)
<AbsoluteLevel>	Range: -256 dBm to 256 dBm *RST: -50 dBm (OFF for <no> = 2 and <Band> = 14 | 30) Default unit: dBm Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CBANdwidth<Band>
<RelativeLevel>, <AbsoluteLevel>

Defines relative and absolute limits for the ACLR measured in an adjacent E-UTRA channel. The settings are defined separately for each channel bandwidth.

Suffix:

<Band>	14,30,50,100,150,200 Channel bandwidth in 0.1 MHz

Parameters:

<RelativeLevel> Range: -256 dB to 256 dB
*RST: 29.2 dB, ON
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<AbsoluteLevel> Range: -256 dBm to 256 dBm
*RST: -50 dBm, ON
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CBANdwidth<Band> <OBWlimit>

Defines an upper limit for the occupied bandwidth, depending on the channel bandwidth.

Suffix:

<Band> 14,30,50,100,150,200
Channel bandwidth in 0.1 MHz

Parameters:

<OBWlimit> Range: 0 MHz to 40 MHz
*RST: Equals the channel bandwidth, ON
Default unit: Hz
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CBANdwidth<Band> <Enable>, <FrequencyStart>, <FrequencyEnd>, <Level>, <RBW>

Defines general requirements for the emission mask area <no>. The activation state, the area borders, an upper limit and the resolution bandwidth must be specified.

The emission mask applies to the channel bandwidth <Band>.

Suffix:

<Band> 14,30,50,100,150,200
Channel bandwidth in 0.1 MHz

<no> 1..12
Number of the emission mask area

Parameters:

<Enable> OFF | ON

OFF: disables the check of these requirements
ON: enables the check of these requirements

*RST: depends on channel bandwidth and area number

<FrequencyStart> Start frequency of the area, relative to the edges of the channel bandwidth

Range: see table below
*RST: depends on channel bandwidth and area number
Default unit: Hz

<FrequencyEnd> Stop frequency of the area, relative to the edges of the channel bandwidth

Range: see table below
*RST: depends on channel bandwidth and area number
Default unit: Hz

<Level> Upper limit for the area

Range: -256 dBm to 256 dBm
*RST: depends on channel bandwidth and area number
Default unit: dBm

<RBW> K030 | K100 | M1

Resolution bandwidth to be used for the area
K030: 30 kHz
K100: 100 kHz
M1: 1 MHz

*RST: K030 (<no> = 1) / M1 (<no> = 2 to 10)

Example: See Specifying Limits

Firmware/Software: V1.0.10.1
V3.2.80: <no> of areas enhanced to 12

<Band>	Range for <FrequencyStart> and <FrequencyEnd>
14	0 MHz to 5 MHz
30	0 MHz to 6 MHz
50	0 MHz to 10 MHz
100	0 MHz to 15 MHz
150	0 MHz to 20 MHz
200	0 MHz to 25 MHz

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:CBANdwidth<Band> <Enable>, <FrequencyStart>, <FrequencyEnd>, <Level>, <RBW>

Defines additional requirements for the emission mask area <no>. The activation state, the area borders, an upper limit and the resolution bandwidth must be specified.

The emission mask applies to the channel bandwidth <Band>. Three tables of additional requirements are available.

Suffix:

<Band> 14,30,50,100,150,200
Channel bandwidth in 0.1 MHz

<no> 1..12
Number of the emission mask area

<Table> 1..3
Set of additional requirements
1 = NS_03/11/20/21, 2 = NS_04, 3 = NS_06/07

Parameters:

<Enable> OFF | ON

OFF: disables the check of these requirements
ON: enables the check of these requirements

*RST: depends on channel bandwidth, area number and set of requirements

<FrequencyStart> Start frequency of the area, relative to the edges of the channel bandwidth

Range: see table below
*RST: depends on channel bandwidth, area number and set of requirements
Default unit: Hz

<FrequencyEnd> Stop frequency of the area, relative to the edges of the channel bandwidth

Range: see table below
*RST: depends on channel bandwidth, area number and set of requirements
Default unit: Hz

<Level> Upper limit for the area

Range: -256 dBm to 256 dBm
*RST: depends on channel bandwidth, area number and set of requirements
Default unit: dBm

<RBW> K030 | K100 | M1

Resolution bandwidth to be used for the area
K030: 30 kHz
K100: 100 kHz
M1: 1 MHz

*RST: depends on area number and set of requirements

Example: See Specifying Limits

Firmware/Software: V2.0.20
V3.2.10: table 1 valid for NS_11
V3.2.80: <no> of areas enhanced to 12
V3.2.82: table 1 valid for NS_20 and NS_21

<Band>	Range for <FrequencyStart> and <FrequencyEnd>
14	0 MHz to 5 MHz
30	0 MHz to 6 MHz
50	0 MHz to 10 MHz
100	0 MHz to 15 MHz
150	0 MHz to 20 MHz
200	0 MHz to 25 MHz

3.5.3.13 Limits (Spectrum, with Carrier Aggregation)

The following commands define ACLR and spectrum emission limits for measurements with carrier aggregation.

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation:
CBANdwidth<Band1>:CBANdwidth<Band2>... 797
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation:
OCOMbination...797
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:
CBANdwidth<Band1>:CBANdwidth<Band2>... 798
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:
OCOMbination...799
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:
CBANdwidth<Band1>:CBANdwidth<Band2>... 799
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:
OCOMbination...800
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:
CBANdwidth<Band1>:CBANdwidth<Band2>... 800
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:
OCOMbination...801
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:
CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>..................................802
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:
CAGGregation:OCOMbination.. 803

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation: CBANdwidth<Band1>:CBANdwidth<Band2> <RelativeLevel>, <AbsoluteLevel>

Defines relative and absolute limits for the ACLR measured in the first or second adjacent UTRA channel, depending on <no>.

The settings are defined separately for each channel bandwidth combination of the aggregated channels.

Suffix:

<no>	1..2 Selects first or second adjacent UTRA channel
<Band1>	150,200 First channel bandwidth in 0.1 MHz
<Band2>	50,100,150,200 Second channel bandwidth in 0.1 MHz For <Band1> = 150, only <Band2> = 150 is allowed For <Band1> = 200, all <Band2> values are allowed

Parameters:

<RelativeLevel>	Range: -256 dB to 256 dB *RST: 32.2 dB (<no> = 1) / 35.2 dB (<no> = 2) Default unit: dB Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)
<AbsoluteLevel>	Range: -256 dBm to 256 dBm *RST: -50 dBm Default unit: dBm Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.2.70, V3.5.50 <Band2> = 50

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation: OCOMbination <RelativeLevel>, <AbsoluteLevel>

Defines relative and absolute limits for the ACLR measured in the first or second adjacent UTRA channel, depending on <no>.

The settings apply to all channel bandwidth combinations that are not supported by `CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>`.

Suffix:

<no>	1..2 Selects first or second adjacent UTRA channel

Parameters:

<RelativeLevel> Range: -256 dB to 256 dB
*RST: 32.2 dB (<no> = 1) / 35.2 dB (<no> = 2)
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<AbsoluteLevel> Range: -256 dBm to 256 dBm
*RST: -50 dBm
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2> <RelativeLevel>, <AbsoluteLevel>

Defines relative and absolute limits for the ACLR measured in an adjacent E-UTRA channel.

The settings are defined separately for each channel bandwidth combination of the aggregated channels.

Suffix:

<Band1> 150,200
First channel bandwidth in 0.1 MHz

<Band2> 50,100,150,200
Second channel bandwidth in 0.1 MHz
For <Band1> = 150, only <Band2> = 150 is allowed
For <Band1> = 200, all <Band2> values are allowed

Parameters:

<RelativeLevel> Range: -256 dB to 256 dB
*RST: 29.2 dB, ON
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<AbsoluteLevel> Range: -256 dBm to 256 dBm
*RST: -50 dBm, ON
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.2.70, V3.5.50 <Band2> = 50

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:OCOMbination <RelativeLevel>, <AbsoluteLevel>

Defines relative and absolute limits for the ACLR measured in an adjacent E-UTRA channel.

The settings apply to all channel bandwidth combinations that are not supported by `CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>`.

Parameters:

<RelativeLevel>
Range: -256 dB to 256 dB
*RST: 29.2 dB, ON
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<AbsoluteLevel>
Range: -256 dBm to 256 dBm
*RST: -50 dBm, ON
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2> <OBWlimit>

Defines an upper limit for the occupied bandwidth, depending on the channel bandwidth combination of the aggregated channels.

Suffix:

<Band1>
150,200
First channel bandwidth in 0.1 MHz

<Band2>
50,100,150,200
Second channel bandwidth in 0.1 MHz
For <Band1> = 150, only <Band2> = 150 is allowed
For <Band1> = 200, all <Band2> values are allowed

Parameters:

<OBWlimit>
Range: 0 MHz to 40 MHz
*RST: Depends on the channel bandwidths
Default unit: Hz
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.2.70, V3.5.50 <Band2> = 50

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:OCOMbination <OBWlimit>

Defines an upper limit for the occupied bandwidth.

The settings apply to all channel bandwidth combinations that are not supported by `CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>`.

Parameters:

<OBWlimit>
Range: 0 MHz to 40 MHz
*RST: 0 MHz
Default unit: Hz
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2> <Enable>, <FrequencyStart>, <FrequencyEnd>, <Level>, <RBW>

Defines general requirements for the emission mask area <no>. The activation state, the area borders, an upper limit and the resolution bandwidth must be specified.

The settings are defined separately for each channel bandwidth combination of the aggregated channels.

Suffix:

<no>
1..12
Number of the emission mask area

<Band1>
150,200
First channel bandwidth in 0.1 MHz

<Band2>
50,100,150,200
Second channel bandwidth in 0.1 MHz
For <Band1> = 150, only <Band2> = 150 is allowed
For <Band1> = 200, all <Band2> values are allowed

Parameters:

<Enable>
OFF | ON

OFF: disables the check of these requirements
ON: enables the check of these requirements

*RST: ON (<no> = 1 to 4) / OFF (<no> = 5 to 12)

<FrequencyStart> Start frequency of the area, relative to the edges of the aggregated channel bandwidth

Range: 0 MHz to 45 MHz
*RST: depends on the suffixes
Default unit: Hz

<FrequencyEnd> Stop frequency of the area, relative to the edges of the aggregated channel bandwidth

Range: 0 MHz to 45 MHz
*RST: depends on the suffixes
Default unit: Hz

<Level> Upper limit for the area

Range: -256 dBm to 256 dBm
*RST: depends on the suffixes
Default unit: dBm

<RBW> K030 | K100 | M1

Resolution bandwidth to be used for the area
K030: 30 kHz
K100: 100 kHz
M1: 1 MHz

*RST: K030 (<no> = 1) / M1 (<no> = 2 to 12)

Example: See Specifying Limits

Firmware/Software: V3.2.70, V3.2.80 <no> of areas enhanced to 12
V3.5.50 <Band2> = 50

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:OCOMbination <Enable>, <FrequencyStart>, <FrequencyEnd>, <Level>, <RBW>

Defines general requirements for the emission mask area <no>. The activation state, the area borders, an upper limit and the resolution bandwidth must be specified.

The settings apply to all channel bandwidth combinations that are not supported by `CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>`.

Suffix:

<no> 1..12
Number of the emission mask area

Parameters:

<Enable> OFF | ON

OFF: disables the check of these requirements
ON: enables the check of these requirements

*RST: OFF

<FrequencyStart> Start frequency of the area, relative to the edges of the aggregated channel bandwidth

Range: 0 MHz to 45 MHz
*RST: depends on <no>
Default unit: Hz

<FrequencyEnd> Stop frequency of the area, relative to the edges of the aggregated channel bandwidth

Range: 0 MHz to 45 MHz
*RST: depends on <no>
Default unit: Hz

<Level> Upper limit for the area

Range: -256 dBm to 256 dBm
*RST: depends on <no>
Default unit: dBm

<RBW> K030 | K100 | M1

Resolution bandwidth to be used for the area
K030: 30 kHz
K100: 100 kHz
M1: 1 MHz

*RST: K030 (<no> = 1) / M1 (<no> = 2 to 12)

Example: See Specifying Limits

Firmware/Software: V3.2.70
V3.2.80: <no> of areas enhanced to 12

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2> <Enable>, <FrequencyStart>, <FrequencyEnd>, <Level>, <RBW>

Defines additional requirements for the emission mask area <no>. The activation state, the area borders, an upper limit and the resolution bandwidth must be specified.

The settings are defined separately for each channel bandwidth combination of the aggregated channels.

Suffix:

<no> 1..12
Number of the emission mask area

<Band1> 150,200
First channel bandwidth in 0.1 MHz

<Band2> 50,100,150,200
Second channel bandwidth in 0.1 MHz
For <Band1> = 150, only <Band2> = 150 is allowed
For <Band1> = 200, all <Band2> values are allowed

<Table>	1 Set of additional requirements 1 = CA_NS_04

Parameters:

<Enable>	OFF | ON **OFF**: disables the check of these requirements **ON**: enables the check of these requirements *RST: ON (<no> = 1 to 3) / OFF (<no> = 4 to 12)
<FrequencyStart>	Start frequency of the area, relative to the edges of the aggregated channel bandwidth Range: 0 MHz to 45 MHz *RST: depends on the suffixes Default unit: Hz
<FrequencyEnd>	Stop frequency of the area, relative to the edges of the aggregated channel bandwidth Range: 0 MHz to 45 MHz *RST: depends on the suffixes Default unit: Hz
<Level>	Upper limit for the area Range: -256 dBm to 256 dBm *RST: depends on the suffixes Default unit: dBm
<RBW>	K030 | K100 | M1 Resolution bandwidth to be used for the area **K030**: 30 kHz **K100**: 100 kHz **M1**: 1 MHz *RST: K030 (<no> = 1) / M1 (<no> = 2 to 12)

Example: See Specifying Limits

Firmware/Software: V3.2.70, V3.2.80: <no> of areas enhanced to 12
V3.5.50 <Band2> = 50

Options: R&S CMW-KM502/-KM552 for FDD/TDD

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:CAGGregation:OCOMbination <Enable>, <FrequencyStart>, <FrequencyEnd>, <Level>, <RBW>

Defines additional requirements for the emission mask area <no>. The activation state, the area borders, an upper limit and the resolution bandwidth must be specified.

The settings apply to all channel bandwidth combinations that are not supported by `CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>`.

Suffix:

<no> 1..12
Number of the emission mask area

<Table> 1
Set of additional requirements
1 = CA_NS_04

Parameters:

<Enable> OFF | ON

OFF: disables the check of these requirements
ON: enables the check of these requirements

*RST: OFF

<FrequencyStart> Start frequency of the area, relative to the edges of the aggregated channel bandwidth

Range: 0 MHz to 45 MHz
*RST: depends on the suffixes
Default unit: Hz

<FrequencyEnd> Stop frequency of the area, relative to the edges of the aggregated channel bandwidth

Range: 0 MHz to 45 MHz
*RST: depends on the suffixes
Default unit: Hz

<Level> Upper limit for the area

Range: -256 dBm to 256 dBm
*RST: depends on the suffixes
Default unit: dBm

<RBW> K030 | K100 | M1

Resolution bandwidth to be used for the area
K030: 30 kHz
K100: 100 kHz
M1: 1 MHz

*RST: K030 (<no> = 1) / M1 (<no> = 2 to 12)

Example: See Specifying Limits

Firmware/Software: V3.2.70
V3.2.80: <no> of areas enhanced to 12

Options: R&S CMW-KM502/-KM552 for FDD/TDD

3.5.3.14 Limits (Power)

The following command defines limits for results which characterize the power dynamics of the signal.

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:PDYNamics:CBANdwidth<Band> <Enable>, <OnPowerUpper>, <OnPowerLower>, <OffPowerUpper>

Defines limits for the ON power and OFF power determined with the power dynamics measurement. Separate limits can be defined for each channel bandwidth.

Suffix:

<Band> 14,30,50,100,150,200
Channel bandwidth in 0.1 MHz

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON
Default unit: n/a

<OnPowerUpper> Upper limit for the "ON power"

Range: -256 dBm to 256 dBm
*RST: depends on channel bandwidth, see below
Default unit: dBm

<OnPowerLower> Lower limit for the "ON power"

Range: -256 dBm to 256 dBm
*RST: depends on channel bandwidth, see below
Default unit: dBm

<OffPowerUpper> Upper limit for the "OFF power" and the "SRS OFF" power

Range: -256 dBm to 256 dBm
*RST: -48.5 dBm
Default unit: dBm

Example: See Specifying Limits

Firmware/Software: V2.0.10

<Band>	*RST <OnPowerUpper>	*RST <OnPowerLower>
14	-7.3 dBm	-22.3 dBm
30	-3.3 dBm	-18.3 dBm
50	-1.1 dBm	-16.1 dBm
100	1.9 dBm	-13.1 dBm
150	3.6 dBm	-11.4 dBm
200	4.9 dBm	-10.1 dBm

3.5.3.15 Detected Signal Configuration

The following commands return the detected allocation, modulation scheme and channel type and the view filter throughput.

FETCh:LTE:MEAS<i>:MEValuation:MODulation:DMODulation?....................................... 806
FETCh:LTE:MEAS<i>:MEValuation:MODulation:DCHType?.. 806
FETCh:LTE:MEAS<i>:MEValuation:ACLR:DCHType?..806
FETCh:LTE:MEAS<i>:MEValuation:SEMask:DCHType?... 806
FETCh:LTE:MEAS<i>:MEValuation:MODulation:DALLocation?.. 807
FETCh:LTE:MEAS<i>:MEValuation:ACLR:DALLocation?...807
FETCh:LTE:MEAS<i>:MEValuation:SEMask:DALLocation?... 807
FETCh:LTE:MEAS<i>:MEValuation:VFTHroughput?... 807

FETCh:LTE:MEAS<i>:MEValuation:MODulation:DMODulation?

Returns the detected modulation scheme in the measured slot. If channel type PUCCH is detected, QPSK is returned as modulation type because the QPSK limits are applied in that case.

Return values:

<Reliability> Reliability Indicator

<Modulation> QPSK | Q16 | Q64
QPSK, 16-QAM, 64-QAM

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

FETCh:LTE:MEAS<i>:MEValuation:MODulation:DCHType?
FETCh:LTE:MEAS<i>:MEValuation:ACLR:DCHType?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:DCHType?

Returns the detected channel type for the measured slot.

If the same slot is measured by the individual measurements, all commands yield the same result. If different statistic counts are defined for the modulation, ACLR and spectrum emission mask measurements, different slots can be measured and different results can be returned by the individual commands.

Return values:

<Reliability> Reliability Indicator

<ChannelType> PUSCh | PUCCh
PUSCh: slot contains only PUSCH
PUCCH: slot contains only PUCCH

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10: MODulation command
V2.0.20: ACLR and SEMask commands added

FETCh:LTE:MEAS<i>:MEValuation:MODulation:DALLocation?
FETCh:LTE:MEAS<i>:MEValuation:ACLR:DALLocation?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:DALLocation?

Returns the detected allocation for the measured slot.

If the same slot is measured by the individual measurements, all commands yield the same result. If different statistic counts are defined for the modulation, ACLR and spectrum emission mask measurements, different slots can be measured and different results can be returned by the individual commands.

Return values:

<Reliability> Reliability Indicator

<NrResBlocks> Number of allocated resource blocks
Range: 1 to 100

<OffsetResBlocks> Offset of the first allocated resource block from the edge of the allocated UL transmission bandwidth
Range: 0 to 99

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10: MODulation command
V2.0.20: ACLR and SEMask command

FETCh:LTE:MEAS<i>:MEValuation:VFTHroughput?

Queries the "View Filter Throughput", see "View Filter Throughput" on page 678.

Return values:

<Reliability> Reliability Indicator

<VFThroughput> Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.0.20

3.5.3.16 EVM Results (Traces)

The following commands return the EVM trace results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:CURRent?.. 808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:AVERage?.. 808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:MAXimum?.. 808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:CURRent?.. 808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:AVERage?.. 808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:MAXimum?.. 808

FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:CURRent?.................................808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:AVERage?................................. 808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:MAXimum?.................................808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:CURRent?................................... 808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:AVERage?..................................809
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:MAXimum?.................................809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:CURRent?................................ 809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:AVERage?................................ 809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:MAXimum?............................... 809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:CURRent?..................................809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:AVERage?................................. 809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:MAXimum?.................................809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMC?..809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMC?...809

FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:MAXimum?
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:CURRent?
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:AVERage?
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:MAXimum?

Returns the values of the EVM RMS bar graphs for the SC-FDMA symbols in the measured slot. The results of the current, average and maximum bar graphs can be retrieved.

See also Chapter 3.2.6.2, "View Error Vector Magnitude", on page 658.

Return values:

<Reliability>	Reliability Indicator
<EVMlow0> <EVMhigh0> ... <EVMlow5/6> <EVMhigh5/6>	EVM values, low and high EVM window position. Normal cyclic prefix: values for SC-FDMA symbol 0 to 6, including the reference symbol as symbol number 3. Extended cyclic prefix: values for SC-FDMA symbol 0 to 5, including the reference symbol as symbol number 2. Range: 0 % to 100 % Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:MAXimum?
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:CURRent?

READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:AVERage?
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:MAXimum?

Returns the values of the EVM peak bar graphs for the SC-FDMA symbols in the measured slot. The results of the current, average and maximum bar graphs can be retrieved.

See also Chapter 3.2.6.2, "View Error Vector Magnitude", on page 658.

Return values:

<Reliability> Reliability Indicator

<EVMlow0>
<EVMhigh0> ...
<EVMlow5/6>
<EVMhigh5/6>

EVM values, low and high EVM window position.
Normal cyclic prefix: values for SC-FDMA symbol 0 to 6, including the reference symbol as symbol number 3.
Extended cyclic prefix: values for SC-FDMA symbol 0 to 5, including the reference symbol as symbol number 2.

Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.5.40

FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:MAXimum?
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:CURRent?
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:AVERage?
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:MAXimum?

Returns the values of the EVM vs modulation symbol trace. See also Chapter 3.2.6.2, "View Error Vector Magnitude", on page 658.

Return values:

<Reliability> Reliability Indicator

<Ratio> Comma-separated list of EVM values, one value per modulation symbol

Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.5.40

FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMC?
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMC?

Returns the values of the EVM vs subcarrier trace. See also Chapter 3.2.6.3, "View EVM vs Subcarrier", on page 660.

The number of results n equals 12 times the number of resource blocks, which depends on the channel bandwidth, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

Return values:

<Reliability> Reliability Indicator

<EVM_1> ... <EVM_n> n EVM values, one per subcarrier
For not allocated subcarriers, NCAP is returned.
Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

3.5.3.17 Magnitude Error Results (Traces)

The following commands return the magnitude error vs. SC-FDMA symbol results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:MERRor:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:MERRor:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:MERRor:MAXimum?
READ:LTE:MEAS<i>:MEValuation:MERRor:CURRent?
READ:LTE:MEAS<i>:MEValuation:MERRor:AVERage?
READ:LTE:MEAS<i>:MEValuation:MERRor:MAXimum?

Returns the values of the magnitude error bar graphs for the SC-FDMA symbols in the measured slot. The results of the current, average and maximum bar graphs can be retrieved.

See also Chapter 3.2.6.4, "Views Magnitude Error, Phase Error", on page 661.

Return values:

<Reliability> Reliability Indicator

<MagErrLow0> <MagErrHigh0> ... <MagErrLow5/6> <MagErrHigh5/6> Magnitude error values, low and high EVM window position.
Normal cyclic prefix: values for SC-FDMA symbol 0 to 6, including the reference symbol as symbol number 3.
Extended cyclic prefix: values for SC-FDMA symbol 0 to 5, including the reference symbol as symbol number 2.
Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

3.5.3.18 Phase Error Results (Traces)

The following commands return the phase error vs. SC-FDMA symbol results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:PERRor:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:PERRor:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:PERRor:MAXimum?
READ:LTE:MEAS<i>:MEValuation:PERRor:CURRent?
READ:LTE:MEAS<i>:MEValuation:PERRor:AVERage?
READ:LTE:MEAS<i>:MEValuation:PERRor:MAXimum?

Returns the values of the phase error bar graphs for the SC-FDMA symbols in the measured slot. The results of the current, average and maximum bar graphs can be retrieved.

See also Chapter 3.2.6.4, "Views Magnitude Error, Phase Error", on page 661.

Return values:

<Reliability> Reliability Indicator

<PhaseErrLow0> <PhaseErrHigh0> ... <PhaseErrLow5/6> <PhaseErrHigh5/6>
Phase error values, low and high EVM window position.
Normal cyclic prefix: values for SC-FDMA symbol 0 to 6, including the reference symbol as symbol number 3.
Extended cyclic prefix: values for SC-FDMA symbol 0 to 5, including the reference symbol as symbol number 2.
Range: 0 deg to 180 deg
Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

3.5.3.19 Inband Emission Results

The following commands return the inband emission trace results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:IEMissions[:PCC]?....812
READ:LTE:MEAS<i>:MEValuation:TRACe:IEMissions[:PCC]?....812
FETCh:LTE:MEAS<i>:MEValuation:TRACe:IEMissions:SCC<no>?....812
READ:LTE:MEAS<i>:MEValuation:TRACe:IEMissions:SCC<no>?....812
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:AVERage?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:EXTReme?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:SDEViation?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:AVERage?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:EXTReme?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:SDEViation?....813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent:RBINdex?....814

FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:EXTReme:RBINdex?............ 814
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent:RBINdex?........814
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:EXTReme:RBINdex?.......814

FETCh:LTE:MEAS<i>:MEValuation:TRACe:IEMissions[:PCC]?
READ:LTE:MEAS<i>:MEValuation:TRACe:IEMissions[:PCC]?

Returns the values of the PCC inband emissions trace. See also Chapter 3.2.6.5, "View Inband Emissions", on page 662.

The number of results n (resource blocks) depends on the channel bandwidth, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

Return values:

<Reliability> Reliability Indicator

<Power> n power values, one value per resource block

Range: -100 dB to 10 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

FETCh:LTE:MEAS<i>:MEValuation:TRACe:IEMissions:SCC<no>?
READ:LTE:MEAS<i>:MEValuation:TRACe:IEMissions:SCC<no>?

Returns the values of the SCC inband emissions trace. See also Chapter 3.2.6.5, "View Inband Emissions", on page 662.

The number of results n (resource blocks) depends on the channel bandwidth, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

Suffix:

<no> 1
Only SCC1 supported - suffix can be omitted

Return values:

<Reliability> Reliability Indicator

<Power> n power values, one value per resource block

Range: -100 dB to 10 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:SDEViation?

Return the limit line margin results for the PCC diagram. The `CURRent` margin indicates the minimum (vertical) distance between the inband emissions limit line and the current trace. A negative result indicates that the limit is exceeded.

The `AVERage`, `EXTReme` and `SDEViation` values are calculated from the current margins. The margin results cannot be displayed at the GUI.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified inband emission limits.
Range: 0 % to 100 %
Default unit: %

<Margin> Range: -50 dB to 110 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:SDEViation?

Return the limit line margin results for the SCC diagram. The `CURRent` margin indicates the minimum (vertical) distance between the inband emissions limit line and the current trace. A negative result indicates that the limit is exceeded.

The `AVERage`, `EXTReme` and `SDEViation` values are calculated from the current margins. The margin results cannot be displayed at the GUI.

Suffix:

<no> 1
Only SCC1 supported - suffix can be omitted

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified inband emission limits.
Range: 0 % to 100 %
Default unit: %

<Margin>	Range: -50 dB to 110 dB Default unit: dB
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V3.2.70
Options:	R&S CMW-KM502/-KM552 for FDD/TDD

FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent: RBINdex?
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:EXTReme: RBINdex?

Return resource block indices for PCC inband emission margins. At these RB indices, the `CURRent` and `EXTReme` margins have been detected (see `FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent?` and `...:EXTReme`).

Return values:

<Reliability>	Reliability Indicator
<OutOfTolerance>	Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified inband emission limits. Range: 0 % to 100 %
<RBindex>	Resource block index Range: 0 to 99
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V2.0.10

FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent: RBINdex?
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:EXTReme: RBINdex?

Return resource block indices for SCC inband emission margins. At these RB indices, the `CURRent` and `EXTReme` margins have been detected (see `FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent?` and `...:EXTReme`).

Suffix:

<no>	1 Only SCC1 supported - suffix can be omitted

Return values:

<Reliability>	Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified inband emission limits.

Range: 0 % to 100 %

<RBindex> Resource block index

Range: 0 to 99

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

3.5.3.20 Equalizer Spectrum Flatness Results

The following commands return the equalizer spectrum flatness results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:ESFLatness?..815
READ:LTE:MEAS<i>:MEValuation:TRACe:ESFLatness?...815
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?...816
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?...816
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?...816
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:SDEViation?...816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?...816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?...816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?...816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:SDEViation?...816
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?..817
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?..817
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?..817
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent:SCINdex?..................................818

FETCh:LTE:MEAS<i>:MEValuation:TRACe:ESFLatness?
READ:LTE:MEAS<i>:MEValuation:TRACe:ESFLatness?

Returns the values of the equalizer spectrum flatness trace. See also Chapter 3.2.6.6, "View Equalizer Spectrum Flatness", on page 663.

The number of results n equals 12 times the number of resource blocks, which depends on the channel bandwidth, see Chapter 3.2.4.1, "Resources in Time and Frequency Domain", on page 643.

Return values:

<Reliability> Reliability Indicator

<Power_1> ... <Power_n> n power values, one per subcarrier
For not allocated subcarriers, NCAP is returned.

Range: -20 dB to 20 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:SDEViation?
READ:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?
READ:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?
READ:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?
READ:LTE:MEAS<i>:MEValuation:ESFLatness:SDEViation?

Return current, average, extreme and standard deviation single value results of the equalizer spectrum flatness measurement. See also Chapter 3.2.5.6, "Equalizer Spectrum Flatness Limits", on page 651.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_OutOfTol> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified equalizer spectrum flatness limits.
Range: 0 % to 100 %
Default unit: %

<3_Ripple1> Max (range 1) - min (range 1)
Range: 0 dB to 40 dB
Default unit: dB

<4_Ripple2> Max (range 2) - min (range 2)
Range: 0 dB to 40 dB
Default unit: dB

<5_MaxR1MinR2> Max (range 1) - min (range 2)
Range: -40 dB to 40 dB
Default unit: dB

<6_MaxR2MinR1> Max (range 2) - min (range 1)
Range: -40 dB to 40 dB
Default unit: dB

<7_MinR1> Min (range 1)
Range: -20 dB to 20 dB
Default unit: dB

<8_MaxR1> Max (range 1)
Range: -20 dB to 20 dB
Default unit: dB

<9_MinR2> Min (range 2)
Range: -20 dB to 20 dB
Default unit: dB

<10_MaxR2> Max (range 2)
Range: -20 dB to 20 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.1.25: added <7_MinR1> to <10_MaxR2>

CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?

Return current, average and extreme single value results of the equalizer spectrum flatness measurement. See also Chapter 3.2.5.6, "Equalizer Spectrum Flatness Limits", on page 651.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified equalizer spectrum flatness limits.
Range: 0 % to 100 %
Default unit: %

<Ripple1> Max (range 1) - min (range 1)
Range: 0 dB to 40 dB
Default unit: dB

<Ripple2> Max (range 2) - min (range 2)
Range: 0 dB to 40 dB
Default unit: dB

<MaxR1MinR2> Max (range 1) - min (range 2)
Range: -40 dB to 40 dB
Default unit: dB

<MaxR2MinR1> Max (range 2) - min (range 1)
Range: -40 dB to 40 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.20

FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent:SCINdex?

Returns subcarrier indices of the equalizer spectrum flatness measurement. At these SC indices, the current minimum and maximum power of the equalizer coefficients have been detected within range 1 and range 2.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified equalizer spectrum flatness limits.
Range: 0 % to 100 %

<Maximum1> SC index of "Max (Range 1)"
Range: 0 to 1199

<Minimum1> SC index of "Min (Range 1)"
Range: 0 to 1199

<Maximum2> SC index of "Max (Range 2)"
Range: 0 to 1199

<Minimum2> SC index of "Min (Range 2)"
Range: 0 to 1199

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

3.5.3.21 Spectrum Emission Results

The following commands return the spectrum emission results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:CURRent?...................... 819
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:AVERage?...................... 819
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:MAXimum?..................... 819
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:CURRent?........................819
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:AVERage?....................... 819
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:MAXimum?.......................819
FETCh:LTE:MEAS<i>:MEValuation:SEMask:CURRent?..820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:AVERage?... 820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:SDEViation?... 820
READ:LTE:MEAS<i>:MEValuation:SEMask:CURRent?.. 820
READ:LTE:MEAS<i>:MEValuation:SEMask:AVERage?..820

READ:LTE:MEAS<i>:MEValuation:SEMask:SDEViation?....820
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:CURRent?....820
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:AVERage?....820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?....820
READ:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?....820
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?....820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:ALL?....821
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:CURRent:NEGativ?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:CURRent:POSitiv?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:AVERage:NEGativ?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:AVERage:POSitiv?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:MINimum:NEGativ?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:MINimum:POSitiv?....822

FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:MAXimum?
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:CURRent?
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:AVERage?
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:MAXimum?

Returns the values of the spectrum emission traces. Separate traces are available for the individual resolution bandwidths (<kHz>). The results of the current, average and maximum traces can be retrieved.

See also Chapter 3.2.6.7, "View Spectrum Emission Mask", on page 664.

Suffix:

<kHz> 30,100,1000
Resolution bandwidth in kHz

Return values:

<Reliability> Reliability Indicator

<Power> Comma-separated list of power results
The value in the middle of the result array corresponds to the center frequency.
The test point separation between two results depends on the resolution bandwidth:
`RBW30`: separation 15 kHz
`RBW100`: separation 45 kHz
`RBW1000`: separation 90 kHz
For `RBW100` and `RBW1000`, results are only available for frequencies, for which limits using these RBW have been defined.
For other frequencies INV is returned.

Range: -120 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

FETCh:LTE:MEAS<i>:MEValuation:SEMask:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:SDEViation?
READ:LTE:MEAS<i>:MEValuation:SEMask:CURRent?
READ:LTE:MEAS<i>:MEValuation:SEMask:AVERage?
READ:LTE:MEAS<i>:MEValuation:SEMask:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:AVERage?

Return the current, average and standard deviation single value results of the spectrum emission measurement.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for spectrum emission measurements exceeding the specified spectrum emission mask limits.

Range: 0 % to 100 %
Default unit: %

<OBW> Occupied bandwidth

Range: 0 MHz to 40 MHz
Default unit: Hz

<TXpower> Total TX power in the slot over all component carriers

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

FETCh:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?
READ:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?

Return the extreme single value results of the spectrum emission measurement.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance>	Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for spectrum emission measurements exceeding the specified spectrum emission mask limits. Range: 0 % to 100 % Default unit: %
<OBW>	Occupied bandwidth Range: 0 MHz to 40 MHz Default unit: Hz
<TXpowerMin>	Minimum total TX power in the slot Range: -100 dBm to 55 dBm Default unit: dBm
<TXpowerMax>	Maximum total TX power in the slot Range: -100 dBm to 55 dBm Default unit: dBm
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V2.0.10

FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:ALL?

Returns spectrum emission mask margin results. A negative margin indicates that the trace is located above the limit line, i.e. the limit is exceeded.

Results are provided for the current, average and maximum traces. For each trace, 24 values related to the negative (Neg) and positive (Pos) offset frequencies of emission mask areas 1 to 12 are provided. For inactive areas, NCAP is returned.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	Reliability Indicator
<2_OutOfTol>	Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for spectrum emission measurements exceeding the specified spectrum emission mask limits. Range: 0 % to 100 % Default unit: %
<3_CurrNeg1> ... <14_CurrNeg12> <15_CurrPos1> ... <26_CurrPos12>	Margin results for current trace Range: -160 dB to 160 dB Default unit: dB
<27_AvgNeg1> ... <38_AvgNeg12> <39_AvgPos1> ... <50_AvgPos12>	Margin results for average trace Range: -160 dB to 160 dB Default unit: dB

<51_MinNeg1> ... <62_MinNeg12> <63_MinPos1> ... <74_MinPos12>	Margin results for maximum trace (resulting in minimum margins) Range: -160 dB to 160 dB Default unit: dB
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V3.2.80

FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:CURRent:NEGativ?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:CURRent:POSitiv?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:AVERage:NEGativ?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:AVERage:POSitiv?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:MINimum:NEGativ?
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:MINimum:POSitiv?

Returns spectrum emission mask margin results. A negative margin indicates that the trace is located above the limit line, i.e. the limit is exceeded.

The individual commands provide results for the `CURRent`, `AVERage` and maximum traces (resulting in `MINimum` margins). For each trace, the X and Y values of the margins for emission mask areas 1 to 12 are provided for `NEGative` and `POSitive` offset frequencies. For inactive areas, NCAP is returned.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	Reliability Indicator
<2_OutOfTol>	Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for spectrum emission measurements exceeding the specified spectrum emission mask limits. Range: 0 % to 100 % Default unit: %
<3_MarginX1>	X-position of margin for area 1 Range: -35 MHz to 35 MHz Default unit: Hz
<4_MarginY1>	Y-value of margin for area 1 Range: -160 dB to 160 dB Default unit: dB
<5_MarginX2> <6_MarginY2> ... <25_MarginX12> <26_MarginY12>	X-position and Y-value of margin for area 2 to 12
Example:	See Performing Single-Shot Measurements
Usage:	Query only

Firmware/Software: V2.0.10
V3.2.80: increased number of areas to 12

3.5.3.22 ACLR Spectrum Results

The following commands return the results of the ACLR spectrum multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:ACLR:CURRent?....823
FETCh:LTE:MEAS<i>:MEValuation:TRACe:ACLR:AVERage?....823
READ:LTE:MEAS<i>:MEValuation:TRACe:ACLR:CURRent?....823
READ:LTE:MEAS<i>:MEValuation:TRACe:ACLR:AVERage?....823
FETCh:LTE:MEAS<i>:MEValuation:ACLR:CURRent?....824
FETCh:LTE:MEAS<i>:MEValuation:ACLR:AVERage?....824
READ:LTE:MEAS<i>:MEValuation:ACLR:CURRent?....824
READ:LTE:MEAS<i>:MEValuation:ACLR:AVERage?....824
CALCulate:LTE:MEAS<i>:MEValuation:ACLR:CURRent?....824
CALCulate:LTE:MEAS<i>:MEValuation:ACLR:AVERage?....824

FETCh:LTE:MEAS<i>:MEValuation:TRACe:ACLR:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:ACLR:AVERage?
READ:LTE:MEAS<i>:MEValuation:TRACe:ACLR:CURRent?
READ:LTE:MEAS<i>:MEValuation:TRACe:ACLR:AVERage?

Returns the absolute powers as displayed in the ACLR diagram. The current and average values can be retrieved. See also Chapter 3.2.6.8, "View Spectrum ACLR", on page 666.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_UTRA2neg>
<3_UTRA1neg> Power in the second and first adjacent UTRA channels with lower frequency

Range: -100 dBm to 55 dBm
Default unit: dBm

<4_EUTRAneg> Power in the first adjacent E-UTRA channel with lower frequency

Range: -100 dBm to 55 dBm
Default unit: dBm

<5_EUTRA> Power in the allocated E-UTRA channel

Range: -100 dBm to 55 dBm
Default unit: dBm

<6_EUTRApos> Power in the first adjacent E-UTRA channel with higher frequency

Range: -100 dBm to 55 dBm
Default unit: dBm

<7_UTRA1pos>
<8_UTRA2pos>
Power in the first and second adjacent UTRA channels with higher frequency

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

FETCh:LTE:MEAS<i>:MEValuation:ACLR:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:ACLR:AVERage?
READ:LTE:MEAS<i>:MEValuation:ACLR:CURRent?
READ:LTE:MEAS<i>:MEValuation:ACLR:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:ACLR:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:ACLR:AVERage?

Returns the relative ACLR values as displayed in the table below the ACLR diagram. The current and average values can be retrieved.

See also Chapter 3.2.6.8, "View Spectrum ACLR", on page 666.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<1_Reliability>
Reliability Indicator

<2_UTRA2neg>
<3_UTRA1neg>
ACLR for the second and first adjacent UTRA channels with lower frequency

Range: 0 dB to 100 dB
Default unit: dB

<4_EUTRAneg>
ACLR for the first adjacent E-UTRA channel with lower frequency

Range: 0 dB to 100 dB
Default unit: dB

<5_EUTRA>
Power in the allocated E-UTRA channel

Range: -100 dBm to 55 dBm
Default unit: dBm

<6_EUTRApos>
ACLR for the first adjacent E-UTRA channel with higher frequency

Range: 0 dB to 100 dB
Default unit: dB

<7_UTRA1pos>
<8_UTRA2pos>
ACLR for the first and second adjacent UTRA channels with higher frequency

Range: 0 dB to 100 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

3.5.3.23 I/Q Constellation Results

The following commands return the results in the I/Q constellation diagram.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:IQ:LOW?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:IQ:HIGH?

Returns the results in the I/Q constellation diagram for low and high EVM window position.

See also Chapter 3.2.6.9, "View I/Q Constellation", on page 667

Return values:

<Reliability> Reliability Indicator

<I_Phase_1> <Q_Phase_1> ... <I_Phase_n> <Q_Phase_n> n normalized I and Q amplitudes, one value per modulation symbol

Range: -2 to 2

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

3.5.3.24 RB Allocation Table Results

The following commands return the RB allocation table of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:RBATable[:PCC]?..825
READ:LTE:MEAS<i>:MEValuation:TRACe:RBATable[:PCC]?...825
FETCh:LTE:MEAS<i>:MEValuation:TRACe:RBATable:SCC<no>?.................................. 826
READ:LTE:MEAS<i>:MEValuation:TRACe:RBATable:SCC<no>?................................... 826

FETCh:LTE:MEAS<i>:MEValuation:TRACe:RBATable[:PCC]?
READ:LTE:MEAS<i>:MEValuation:TRACe:RBATable[:PCC]?

Returns the information of the PCC RB allocation table. See also Chapter 3.2.6.10, "View RB Allocation Table", on page 668.

For each captured slot, three results are returned:

<Reliability>, {<ChannelType>, <OffsetRB>, <NoRB>}$_{slot\ 1}$, ..., {<ChannelType>, <OffsetRB>, <NoRB>}$_{slot\ n}$

n equals two times the number of captured subframes (see `CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes`).

Return values:

<Reliability>	Reliability Indicator
<ChannelType>	PUSCh | PUCCh | NONE | DL | SSUB Detected channel type for the first captured slot **PUSCh**: slot contains only PUSCH **PUCCH**: slot contains only PUCCH **NONE**: slot contains no allocated RBs at all **DL**: downlink slot (only relevant for TDD) **SSUB**: part of special subframe (only relevant for TDD)
<OffsetRB>	Offset of first allocated RB in the first captured slot Range: 0 to 99
<NoRB>	Number of allocated RBs in the first captured slot Range: 0 to 100

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.20
V2.0.20: DL and SSUB added to <ChannelType>

FETCh:LTE:MEAS<i>:MEValuation:TRACe:RBATable:SCC<no>?
READ:LTE:MEAS<i>:MEValuation:TRACe:RBATable:SCC<no>?

Returns the information of the SCC RB allocation table. See also Chapter 3.2.6.10, "View RB Allocation Table", on page 668.

For each captured slot, three results are returned:

<Reliability>, {<ChannelType>, <OffsetRB>, <NoRB>}$_{slot\ 1}$, ..., {<ChannelType>, <OffsetRB>, <NoRB>}$_{slot\ n}$

n equals two times the number of captured subframes (see `CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes`).

Suffix:

<no>	1 Only SCC1 supported - suffix can be omitted

Return values:

<Reliability>	Reliability Indicator
<ChannelType>	PUSCh | PUCCh | NONE | DL | SSUB Detected channel type for the first captured slot **PUSCh**: slot contains only PUSCH **PUCCH**: slot contains only PUCCH **NONE**: slot contains no allocated RBs at all **DL**: downlink slot (only relevant for TDD) **SSUB**: part of special subframe (only relevant for TDD)
<OffsetRB>	Offset of first allocated RB in the first captured slot Range: 0 to 99

<NoRB>	Number of allocated RBs in the first captured slot Range: 0 to 100
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V3.2.70
Options:	R&S CMW-KM502/-KM552 for FDD/TDD

3.5.3.25 Power Monitor Results

The following commands return the power monitor results of the multi-evaluation measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:PMONitor[:PCC]?.. 827
READ:LTE:MEAS<i>:MEValuation:TRACe:PMONitor[:PCC]?...827
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PMONitor:SCC<no>?....................................828
READ:LTE:MEAS<i>:MEValuation:TRACe:PMONitor:SCC<no>?.....................................828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:CURRent?...828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:AVERage?.. 828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:MINimum?...828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:MAXimum?..828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:SDEViation?.. 828
READ:LTE:MEAS<i>:MEValuation:PMONitor:CURRent?..828
READ:LTE:MEAS<i>:MEValuation:PMONitor:AVERage?..828
READ:LTE:MEAS<i>:MEValuation:PMONitor:MINimum?..828
READ:LTE:MEAS<i>:MEValuation:PMONitor:MAXimum?...828
READ:LTE:MEAS<i>:MEValuation:PMONitor:SDEViation?... 828

FETCh:LTE:MEAS<i>:MEValuation:TRACe:PMONitor[:PCC]?
READ:LTE:MEAS<i>:MEValuation:TRACe:PMONitor[:PCC]?

Returns the power monitor results for all captured PCC subframes. The number of subframes can be configured, see `CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes`.

Return values:

<Reliability>	Reliability Indicator
<Power>	n power values, one per subframe Range: -100 dBm to 55 dBm Default unit: dBm
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.15.20

FETCh:LTE:MEAS<i>:MEValuation:TRACe:PMONitor:SCC<no>?
READ:LTE:MEAS<i>:MEValuation:TRACe:PMONitor:SCC<no>?

Returns the power monitor results for all captured SCC subframes. The number of subframes can be configured, see `CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes`.

Suffix:

<no> 1
Only SCC1 supported - suffix can be omitted

Return values:

<Reliability> Reliability Indicator

<Power> n power values, one per subframe
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.2.70

Options: R&S CMW-KM502/-KM552 for FDD/TDD

FETCh:LTE:MEAS<i>:MEValuation:PMONitor:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:SDEViation?
READ:LTE:MEAS<i>:MEValuation:PMONitor:CURRent?
READ:LTE:MEAS<i>:MEValuation:PMONitor:AVERage?
READ:LTE:MEAS<i>:MEValuation:PMONitor:MINimum?
READ:LTE:MEAS<i>:MEValuation:PMONitor:MAXimum?
READ:LTE:MEAS<i>:MEValuation:PMONitor:SDEViation?

Returns the total TX power of all carriers.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count that exceed the specified limits
Range: 0 % to 100 %

<TXpower> Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.5.40

3.5.3.26 Power Dynamics Results

The following commands return the results of the power dynamics measurement.

FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:CURRent?...829
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:AVERage?...829
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:MAXimum?...829
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:CURRent?...829
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:AVERage?...829
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:MAXimum?...829
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?...830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?...830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?...830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?...830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:SDEViation?...830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?...830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?...830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?...830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?...830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:SDEViation?...830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?...830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?...830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?...830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?...830

FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:MAXimum?
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:CURRent?
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:AVERage?
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:MAXimum?

Return the values of the power dynamics traces. Each value is sampled with 48 T_s, corresponding to 1.5625 µs. The results of the current, average and maximum traces can be retrieved.

See also Chapter 3.2.6.12, "View Power Dynamics", on page 670.

Return values:

<Reliability> Reliability Indicator

<Power> 2048 power values, from -1100 µs to +2098.4375 µs relative to the start of the measure subframe. The values have a spacing of 1.5625 µs. The 705th value is at the start of the "Measure Subframe" (0 µs).
The diagram at the display shows only a subsection of this trace, depending on the selected time mask.

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:SDEViation?
READ:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?
READ:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?
READ:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?
READ:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?
READ:LTE:MEAS<i>:MEValuation:PDYNamics:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?

Return the current, average, minimum, maximum and standard deviation single value results of the power dynamics measurement.

A single result table row is returned, from left to right. The meaning of the values depends on the selected time mask, as follows:

Time mask	Power1	Power2	Power3	Power4
General on / off	OFF power (before)	ON power RMS	ON power peak	OFF power (after)
PUCCH / PUSCH / SRS	SRS ON	ON power RMS	ON power peak	ON power (after)
SRS blanking	SRS OFF	ON power RMS	ON power peak	ON power (after)

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for power dynamics measurements exceeding the specified power dynamics limits.

Range: 0 % to 100 %
Default unit: %

<Power1> Range: -100 dBm to 55 dBm
Default unit: dBm

<Power2>	Range:	-100 dBm to 55 dBm
	Default unit:	dBm
<Power3>	Range:	-100 dBm to 55 dBm
	Default unit:	dBm
<Power4>	Range:	-100 dBm to 55 dBm
	Default unit:	dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

3.5.3.27 Modulation Results (Single Values)

The following commands return the statistical modulation results.

FETCh:LTE:MEAS<i>:MEValuation:MODulation:CURRent?..........831
FETCh:LTE:MEAS<i>:MEValuation:MODulation:AVERage?..........831
FETCh:LTE:MEAS<i>:MEValuation:MODulation:SDEViation?..........831
READ:LTE:MEAS<i>:MEValuation:MODulation:CURRent?..........831
READ:LTE:MEAS<i>:MEValuation:MODulation:AVERage?..........831
READ:LTE:MEAS<i>:MEValuation:MODulation:SDEViation?..........831
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:CURRent?..........831
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:AVERage?..........831
FETCh:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?..........833
READ:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?..........833
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?..........833
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:CURRent?..........835
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:AVERage?..........835
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:MAXimum?..........835
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:SDEViation?..........835
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:CURRent?..........835
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:AVERage?..........835
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:MAXimum?..........836
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:SDEViation?..........836

FETCh:LTE:MEAS<i>:MEValuation:MODulation:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:MODulation:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:MODulation:SDEViation?
READ:LTE:MEAS<i>:MEValuation:MODulation:CURRent?
READ:LTE:MEAS<i>:MEValuation:MODulation:AVERage?
READ:LTE:MEAS<i>:MEValuation:MODulation:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:AVERage?

Return the current, average and standard deviation single value results.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_OutOfTol> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified modulation limits.

Range: 0 % to 100 %
Default unit: %

<3_EVM_RMSlow>
<4_EVM_RMShigh>
<5_EVMpeakLow>
<6_EVMpeakHigh> Error vector magnitude RMS and peak values for low and high EVM window position

Range: 0 % to 100 %
Default unit: %

<7_MErr_RMSlow>
<8_MErr_RMShigh> Magnitude error RMS value for low and high EVM window position

Range: 0 % to 100 %
Default unit: %

<9_MErrPeakLow>
<10_MErrPeakHigh> Magnitude error peak value for low and high EVM window position

Range: -100 % to 100 % (AVERage: 0 % to 100 %, SDEViation: 0 % to 50 %)
Default unit: %

<11_PErr_RMSlow>
<12_PErr_RMSh> Phase error RMS value for low and high EVM window position

Range: 0 deg to 180 deg
Default unit: deg

<13_PErrPeakLow>
<14_PErrPeakHigh> Phase error peak value for low and high EVM window position

Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg)
Default unit: deg

<15_IQoffset> I/Q origin offset

Range: -100 dBc to 0 dBc
Default unit: dBc

<16_FreqError> Carrier frequency error

Range: -80000 Hz to 80000 Hz
Default unit: Hz

<17_TimingError> Transmit time error

Range: -32000 Ts to 32000 Ts
Default unit: Ts (basic LTE time unit)

<18_TXpower>	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<19_PeakPower>	User equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm
<20_RBpower>	RB power Range: -100 dBm to 55 dBm Default unit: dBm
<21_EVM_DMRSl> <22_EVM_DMRSh>	Error vector magnitude DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<23_MErr_DMRSl> <24_MErr_DMRSh>	Magnitude error DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<25_PErr_DMRS> <26_PErr_DMRSh>	Phase error DMRS values for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<27_GainImbal>	Gain imbalance Range: -256 dB to 256 dB Default unit: dB
<28_QuadError>	Quadrature error Range: -180 deg to 180 deg Default unit: deg
<29_EVM_SRS>	Error vector magnitude result for SRS signals Range: 0 % to 100 % Default unit: %
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1 V3.2.70: added <27_GainImbal> and <28_QuadError> V3.5.40: added <29_EVM_SRS>

FETCh:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?
READ:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?

Returns the extreme single value results.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	Reliability Indicator
<2_OutOfTol>	Out of tolerance result, i.e. percentage of measurement intervals of the statistic count for modulation measurements exceeding the specified modulation limits. Range: 0 % to 100 % Default unit: %
<3_EVM_RMSlow> <4_EVM_RMShigh> <5_EVMpeakLow> <6_EVMpeakHigh>	Error vector magnitude RMS and peak values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<7_MErr_RMSlow> <8_MErr_RMShigh>	Magnitude error RMS value for low and high EVM window position Range: 0 % to 100 % Default unit: %
<9_MErrPeakLow> <10_MErrPeakHigh>	Magnitude error peak value for low and high EVM window position Range: -100 % to 100 % Default unit: %
<11_PErr_RMSlow> <12_PErr_RMSh>	Phase error RMS value for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<13_PErrPeakLow> <14_PErrPeakHigh>	Phase error peak value for low and high EVM window position Range: -180 deg to 180 deg Default unit: deg
<15_IQoffset>	I/Q origin offset Range: -100 dBc to 0 dBc Default unit: dBc
<16_FreqError>	Carrier frequency error Range: -80000 Hz to 80000 Hz Default unit: Hz
<17_TimingError>	Transmit time error Range: -32000 Ts to 32000 Ts Default unit: Ts (basic LTE time unit)
<18_TXpowerMin> <19_TXpowerMax>	Minimum and maximum user equipment power Range: -100 dBm to 55 dBm Default unit: dBm

<20_PeakPowMin> <21_PeakPowMax>	Minimum and maximum user equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm
<22_RBpowMin> <23_RBpowMax>	Minimum and maximum RB power Range: -100 dBm to 55 dBm Default unit: dBm
<24_EVM_DMRSl> <25_EVM_DMRSh>	Error vector magnitude DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<26_MErr_DMRSl> <27_MErr_DMRSh>	Magnitude error DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<28_PErr_DMRS> <29_PErr_DMRSh>	Phase error DMRS values for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<30_GainImbal>	Gain imbalance Range: -256 dB to 256 dB Default unit: dB
<31_QuadError>	Quadrature error Range: -180 deg to 180 deg Default unit: deg
<32_EVM_SRS>	Error vector magnitude result for SRS signals Range: 0 % to 100 % Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

V3.2.70: added <30_GainImbal> and <31_QuadError>

V3.5.40: added <32_EVM_SRS>

FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:SDEViation?
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:CURRent?
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:AVERage?

READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:MAXimum?
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:SDEViation?

The `CURRent` command returns the maximum value of the EVM vs subcarrier trace.

The `AVERage`, `MAXimum` and `SDEViation` values are calculated from the `CURRent` values.

The peak results cannot be displayed at the GUI.

Return values:

<Reliability>	Reliability Indicator
<EVM>	Range: 0 % to 100 % Default unit: %
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V3.2.80

3.5.3.28 BLER Results

The following commands return the results of the block error ratio measurement.

FETCh:LTE:MEAS<i>:MEValuation:BLER?
READ:LTE:MEAS<i>:MEValuation:BLER?

Returns the block error ratio results determined from all captured subframes. To configure which subframes are measured, see `CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes`.

Return values:

<Reliability>	Reliability Indicator
<ACK>	Received acknowledgments (percentage of sent scheduled subframes) Range: 0 % to 100 % Default unit: %
<NACK>	Received negative acknowledgments (percentage of sent scheduled subframes) Range: 0 % to 100 % Default unit: %
<BLER>	Block error ratio (percentage of sent scheduled subframes for which no ACK has been received) Range: 0 % to 100 % Default unit: %
<DTX>	Percentage of sent scheduled subframes for which no ACK and no NACK has been received Range: 0 % to 100 % Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.21
V3.0.10: added <DTX>

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

3.5.3.29 List Mode Results (One Segment)

The following commands return the list mode results for a selected segment.

To configure the list mode, use the commands described in Chapter 3.5.3.8, "List Mode Settings", on page 767.

For a description of the list mode, see Chapter 3.2.3, "List Mode", on page 637.

The segment number <no> in the following commands refers to the range of measured segments (1..1000), see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge` on page 768. It can differ from the absolute segment number used for segment configuration.

The indicated ranges apply to all statistical results except to standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?................839
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?................839
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:SDEViation?..............839
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?...........839
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?...........839
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:EXTReme?................841
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:EXTReme?..........841
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:CURRent?.......843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:AVERage?......843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:EXTReme?......843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:SDEViation?....843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:CURRent:RBINdex?....844
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:EXTReme:RBINdex?....844
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:CURRent?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:AVERage?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:EXTReme?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:SDEViation?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:CURRent:RBINdex?....846

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:
EXTReme:RBINdex?........ 846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent?........ 846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:AVERage?........ 846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:EXTReme?........ 846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:SDEViation?........ 846
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent?........ 848
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:AVERage?........ 848
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:EXTReme?........ 848
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent:
SCINdex?........ 849
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:CURRent?........ 850
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:AVERage?........ 850
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:SDEViation?........ 850
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:CURRent?........ 850
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:AVERage?........ 850
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:EXTReme?........ 851
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:EXTReme?........ 851
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:ALL?........ 852
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:CURRent:
NEGativ?........ 853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:CURRent:
POSitiv?........ 853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:AVERage:
NEGativ?........ 853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:AVERage:
POSitiv?........ 853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:MINimum:
NEGativ?........ 853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:MINimum:
POSitiv?........ 853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:CURRent?........ 854
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:AVERage?........ 854
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:CURRent?........ 854
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:AVERage?........ 854
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:RMS?........ 855
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:PEAK?........ 855
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:CURRent?........ 856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:AVERage?........ 856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:MINimum?........ 856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:MAXimum?........ 856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:SDEViation?........ 856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:DALLocation?........ 857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:DALLocation?........ 857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DALLocation?........ 857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DMODulation?........ 857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:DCHType?........ 858
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:DCHType?........ 858
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DCHType?........ 858

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?

Returns modulation single value results for segment <no> in list mode.

The values described below are returned by `FETCh` commands. The first four values (reliability to out-of-tolerance result) are also returned by `CALCulate` commands. The remaining values returned by `CALCulate` commands are limit check results, one value for each result listed below.

Suffix:

<no> 1..1000

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_StatistExpired> Reached statistical length in slots
Range: 0 to 1000

<4_OutOfTol> Percentage of measured subframes with failed limit check
Range: 0 % to 100 %
Default unit: %

<5_EVM_RMSlow>
<6_EVM_RMShigh>
<7_EVMpeakLow>
<8_EVMpeakHigh> Error vector magnitude RMS and peak values for low and high EVM window position
Range: 0 % to 100 %
Default unit: %

<9_MErr_RMSlow>
<10_MErr_RMShigh> Magnitude error RMS value for low and high EVM window position
Range: 0 % to 100 %
Default unit: %

<11_MErrPeakLow>
<12_MErrPeakHigh> Magnitude error peak value for low and high EVM window position
Range: -100 % to 100 % (AVERage: 0 % to 100 %, SDEViation: 0 % to 50 %)
Default unit: %

<13_PErr_RMSlow> <14_PErr_RMSh>	Phase error RMS value for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<15_PErrPeakLow> <16_PErrPeakHigh>	Phase error peak value for low and high EVM window position Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg) Default unit: deg
<17_IQoffset>	I/Q origin offset Range: -100 dBc to 0 dBc Default unit: dBc
<18_FreqError>	Carrier frequency error Range: -80000 Hz to 80000 Hz Default unit: Hz
<19_TimingError>	Transmit time error Range: -32000 Ts to 32000 Ts Default unit: Ts (basic LTE time unit)
<20_TXpower>	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<21_PeakPower>	User equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm
<22_RBpower>	RB power Range: -100 dBm to 55 dBm Default unit: dBm
<23_EVM_DMRSl> <24_EVM_DMRSh>	Error vector magnitude DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<25_MErr_DMRSl> <26_MErr_DMRSh>	Magnitude error DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<27_PErr_DMRS> <28_PErr_DMRSh>	Phase error DMRS values for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
Example:	See Performing Single-Shot Measurements
Usage:	Query only

Firmware/Software:	V2.0.10 V2.0.20: CALCulate commands V2.1.25: increased maximum number of segments to 250 V2.1.30: increased maximum number of segments to 512 V3.0.50: increased maximum number of segments to 1000
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:EXTReme?

Return modulation single value results for segment <no> in list mode.

The values described below are returned by `FETCh` commands. The first four values (reliability to out-of-tolerance result) are also returned by `CALCulate` commands. The remaining values returned by `CALCulate` commands are limit check results, one value for each result listed below.

Suffix:

<no>	1..1000

Return values:

<1_Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<2_SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<3_StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<4_OutOfTol>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<5_EVM_RMSlow> <6_EVM_RMShigh> <7_EVMpeakLow> <8_EVMpeakHigh>	Error vector magnitude RMS and peak values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<9_MErr_RMSlow> <10_MErr_RMShigh>	Magnitude error RMS value for low and high EVM window position Range: 0 % to 100 % Default unit: %
<11_MErrPeakLow> <12_MErrPeakHigh>	Magnitude error peak value for low and high EVM window position Range: -100 % to 100 % Default unit: %

<13_PErr_RMSlow> <14_PErr_RMSh>	Phase error RMS value for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<15_PErrPeakLow> <16_PErrPeakHigh>	Phase error peak value for low and high EVM window position Range: -180 deg to 180 deg Default unit: deg
<17_IQoffset>	I/Q origin offset Range: -100 dBc to 0 dBc Default unit: dBc
<18_FreqError>	Carrier frequency error Range: -80000 Hz to 80000 Hz Default unit: Hz
<19_TimingError>	Transmit time error Range: -32000 Ts to 32000 Ts Default unit: Ts (basic LTE time unit)
<20_TXpowerMin> <21_TXpowerMax>	Minimum and maximum user equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<22_PeakPowMin> <23_PeakPowMax>	Minimum and maximum user equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm
<24_RBpowMin> <25_RBpowMax>	Minimum and maximum RB power Range: -100 dBm to 55 dBm Default unit: dBm
<26_EVM_DMRSl> <27_EVM_DMRSh>	Error vector magnitude DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<28_MErr_DMRSl> <29_MErr_DMRSh>	Magnitude error DMRS values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<30_PErr_DMRS> <31_PErr_DMRSh>	Phase error DMRS values for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
Example:	See Performing Single-Shot Measurements
Usage:	Query only

Firmware/Software: V2.0.10
V2.0.20: CALCulate command
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:SDEViation?

Return the PCC inband emission limit line margin results for segment <no> in list mode.

The `CURRent` margins indicate the minimum (vertical) distance between the limit line and the current trace. A negative result indicates that the limit is exceeded.

The `AVERage`, `EXTReme` and `SDEViation` values are calculated from the current margins.

Suffix:
<no> 1..1000

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<StatistExpired> Reached statistical length in slots
Range: 0 to 1000

<OutOfTolerance> Percentage of measured subframes with failed limit check
Range: 0 % to 100 %
Default unit: %

<Margin> Range: -50 dB to 110 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:CURRent:RBINdex?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:EXTReme:RBINdex?

Return resource block indices of the PCC inband emission measurement for segment <no> in list mode. At these RB indices, the `CURRent` and `EXTReme` margins have been detected.

Suffix:

<no> 1..1000

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<StatistExpired> Reached statistical length in slots
Range: 0 to 1000

<OutOfTolerance> Percentage of measured subframes with failed limit check
Range: 0 % to 100 %
Default unit: %

<RBindex> Resource block index of margin
Range: 0 to 99

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>: MARGin:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>: MARGin:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>: MARGin:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>: MARGin:SDEViation?

Return the SCC inband emission limit line margin results for segment <no> in list mode.

The `CURRent` margins indicate the minimum (vertical) distance between the limit line and the current trace. A negative result indicates that the limit is exceeded.

The `AVERage`, `EXTReme` and `SDEViation` values are calculated from the current margins.

Suffix:

<no>	1..1000
<c>	1 Only SCC1 supported - suffix can be omitted

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<OutOfTolerance>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<Margin>	Range: -50 dB to 110 dB Default unit: dB

Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V3.5.30
Options:	R&S CMW-KM012 R&S CMW-KM502/-KM552 for FDD/TDD

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:CURRent:RBINdex?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:EXTReme:RBINdex?

Return resource block indices of the SCC inband emission measurement for segment <no> in list mode. At these RB indices, the `CURRent` and `EXTReme` margins have been detected.

Suffix:

<no>	1..1000
<c>	1 Only SCC1 supported - suffix can be omitted

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<OutOfTolerance>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<RBindex>	Resource block index of margin Range: 0 to 99

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.5.30

Options: R&S CMW-KM012
R&S CMW-KM502/-KM552 for FDD/TDD

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:SDEViation?

Return equalizer spectrum flatness single value results for segment <no> in list mode.

Suffix:

<no>	1..1000

Return values:

<1_Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<2_SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<3_StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<4_OutOfTol>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<5_Ripple1>	Max (range 1) - min (range 1) Range: 0 dB to 40 dB Default unit: dB
<6_Ripple2>	Max (range 2) - min (range 2) Range: 0 dB to 40 dB Default unit: dB
<7_MaxR1MinR2>	Max (range 1) - min (range 2) Range: -40 dB to 40 dB Default unit: dB
<8_MaxR2MinR1>	Max (range 2) - min (range 1) Range: -40 dB to 40 dB Default unit: dB
<9_MinR1>	Min (range 1) Range: -20 dB to 20 dB Default unit: dB
<10_MaxR1>	Max (range 1) Range: -20 dB to 20 dB Default unit: dB
<11_MinR2>	Min (range 2) Range: -20 dB to 20 dB Default unit: dB
<12_MaxR2>	Max (range 2) Range: -20 dB to 20 dB Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.0.20: CALCulate commands
V2.1.25: increased maximum number of segments to 250, added <9_MinR1> to <12_MaxR2>
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness: CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness: AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness: EXTReme?

Return equalizer spectrum flatness single value results for segment <no> in list mode.

To define the statistical length for `AVERage` and `EXTReme` calculation and enable the calculation of the results see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation` on page 774.

The values described below are returned by `FETCh` commands. The first four values (reliability to out-of-tolerance result) are also returned by `CALCulate` commands. The remaining values returned by `CALCulate` commands are limit check results, one value for each result listed below.

Suffix:
<no> 1..1000

Return values:
<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_StatistExpired> Reached statistical length in slots
Range: 0 to 1000

<4_OutOfTol> Percentage of measured subframes with failed limit check
Range: 0 % to 100 %
Default unit: %

<5_Ripple1> Max (range 1) - min (range 1)
Range: 0 dB to 40 dB
Default unit: dB

<6_Ripple2>	Max (range 2) - min (range 2) Range: 0 dB to 40 dB Default unit: dB
<7_MaxR1MinR2>	Max (range 1) - min (range 2) Range: -40 dB to 40 dB Default unit: dB
<8_MaxR2MinR1>	Max (range 2) - min (range 1) Range: -40 dB to 40 dB Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.0.20: CALCulate commands
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent:SCINdex?

Return subcarrier indices of the equalizer spectrum flatness measurement for segment <no> in list mode. At these SC indices, the current minimum and maximum power of the equalizer coefficients have been detected within range 1 and range 2.

Suffix:

<no>	1..1000

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<OutOfTolerance>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<Maximum1>	SC index of max (range 1) Range: 0 to 1199

<Minimum1>	SC index of min (range 1) Range: 0 to 1199
<Maximum2>	SC index of max (range 2) Range: 0 to 1199
<Minimum2>	SC index of min (range 2) Range: 0 to 1199
Usage:	Query only
Firmware/Software:	V2.0.10 V2.1.25: increased maximum number of segments to 250 V2.1.30: increased maximum number of segments to 512 V3.0.50: increased maximum number of segments to 1000
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:AVERage?

Return spectrum emission single value results for segment <no> in list mode.

The values described below are returned by `FETCh` commands. The first four values (reliability to out-of-tolerance result) are also returned by `CALCulate` commands. The remaining values returned by `CALCulate` commands are limit check results, one value for each result listed below.

Suffix:

<no>	1..1000

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<OutOfTolerance>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<OBW>	Occupied bandwidth Range: 0 MHz to 40 MHz Default unit: Hz

<TXpower> Total TX power in the slot
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.0.20: CALCulate commands
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:EXTReme?

Return spectrum emission extreme results for segment <no> in list mode.

The values described below are returned by `FETCh` commands. The first four values (reliability to out-of-tolerance result) are also returned by `CALCulate` commands. The remaining values returned by `CALCulate` commands are limit check results, one value for each result listed below.

Suffix:
<no> 1..1000

Return values:
<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_StatistExpired> Reached statistical length in slots
Range: 0 to 1000

<4_OutOfTol> Percentage of measured subframes with failed limit check
Range: 0 % to 100 %
Default unit: %

<5_OBW> Occupied bandwidth
Range: 0 MHz to 40 MHz
Default unit: Hz

<6_TXpowerMin> Minimum total TX power in the slot
Range: -100 dBm to 55 dBm
Default unit: dBm

<7_TXpowerMax>	Maximum total TX power in the slot Range: -100 dBm to 55 dBm Default unit: dBm
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V2.0.10 V2.0.20: CALCulate command V2.1.25: increased maximum number of segments to 250 V2.1.30: increased maximum number of segments to 512 V3.0.50: increased maximum number of segments to 1000
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:ALL?

Return limit line margin values, i.e. vertical distances between the spectrum emission mask limit line and a trace, for segment <no> in list mode.

Suffix:

<no>	1..1000

Return values:

<1_Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<2_SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<3_StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<4_OutOfTol>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<5_CurrNeg1> ... <16_CurrNeg12> <17_CurrPos1> ... <28_CurrPos12>	Margin results for current trace Range: -160 dB to 160 dB Default unit: dB
<29_AvgNeg1> ... <40_AvgNeg12> <41_AvgPos1> ... <52_AvgPos12>	Margin results for average trace Range: -160 dB to 160 dB Default unit: dB
<53_MinNeg1> ... <64_MinNeg12> <65_MinPos1> ... <76_MinPos12>	Margin results for maximum trace (i.e. minimum margins) Range: -160 dB to 160 dB Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.2.80

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:CURRent:NEGativ?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:CURRent:POSitiv?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:AVERage:NEGativ?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:AVERage:POSitiv?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:MINimum:NEGativ?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:MINimum:POSitiv?

Return spectrum emission mask margin results for segment <no> in list mode.

The individual commands provide results for the `CURRent`, `AVERage` and maximum traces (resulting in `MINimum` margins) for `NEGative` and `POSitive` offset frequencies.

Suffix:

<no> 1..1000

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_StatistExpired> Reached statistical length in slots
Range: 0 to 1000

<4_OutOfTol> Percentage of measured subframes with failed limit check
Range: 0 % to 100 %
Default unit: %

<5_MarginX1> X-position of margin for area 1
Range: -35 MHz to 35 MHz
Default unit: Hz

<6_MarginY1> Y-value of margin for area 1
Range: -160 dB to 160 dB
Default unit: dB

<7_MarginX2> <8_MarginY2> ... <27_MarginX12> <28_MarginY12>	X-position and Y-value for area 2 to 12
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V2.0.10 V2.1.25: increased maximum number of segments to 250 V2.1.30: increased maximum number of segments to 512 V3.0.50: increased maximum number of segments to 1000 V3.2.80: increased number of areas to 12
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:AVERage?

Return ACLR single value results for segment <no> in list mode.

The values described below are returned by `FETCh` commands. The first four values (reliability to out-of-tolerance result) are also returned by `CALCulate` commands. The remaining values returned by `CALCulate` commands are limit check results, one value for each result listed below.

Suffix:

<no>	1..1000

Return values:

<1_Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<2_SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<3_StatistExpired>	Reached statistical length in slots Range: 0 to 1000
<4_OutOfTol>	Percentage of measured subframes with failed limit check Range: 0 % to 100 % Default unit: %
<5_UTRA2neg> <6_UTRA1neg>	ACLR for the second and first adjacent UTRA channels below the carrier frequency Range: 0 dB to 100 dB Default unit: dB

<7_EUTRAneg>	ACLR for the first adjacent E-UTRA channel below the carrier frequency Range: 0 dB to 100 dB Default unit: dB
<8_EUTRA>	Power in the allocated E-UTRA channel Range: -100 dBm to 55 dBm Default unit: dBm
<9_EUTRApos>	ACLR for the first adjacent E-UTRA channel above the carrier frequency Range: 0 dB to 100 dB Default unit: dB
<10_UTRA1pos> <11_UTRA2pos>	ACLR for the first and second adjacent UTRA channels above the carrier frequency Range: 0 dB to 100 dB Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.0.20: CALCulate commands
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:RMS?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:PEAK?

Return the power monitor results for segment <no> in list mode. The commands return one power result for each subframe of the segment for the measured carrier. The power values are RMS averaged over the subframe or represent the peak value within the subframe.

To configure the number of subframes within the segment see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup` on page 770.

Suffix:
<no> 1..1000

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<Power_1> ... <Power_n>	n power values, one per subframe, from first to last subframe of the segment For an inactive segment only one INV is returned, independent of the number of configured subframes. Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.20
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:SDEViation?

Return total TX power results for segment <no> in list mode.

To enable the calculation of the results, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer` on page 778.

Suffix:

<no>	1..1000

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<SegReliability>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<StatistExpired>	Reached statistical length in subframes Range: 0 to 1000
<OutOfTolerance>	Percentage of measured subframes with failed limit check Range: 0 % to 100 %
<TXpower>	Total TX power of all component carriers Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V3.5.50

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:DALLocation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:DALLocation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation: DALLocation?

Return the detected allocation for segment <no> in list mode.

The result is determined from the last measured slot of the statistical length. The individual measurements provide identical detected allocation results when measuring the same slot. However different statistical lengths can be defined for the measurements so that the measured slots and returned results can differ.

Suffix:
<no> 1..1000

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<NrResBlocks> Number of allocated resource blocks
Range: 1 to 100

<OffsetResBlocks> Offset of the first allocated resource block from the edge of the allocated UL transmission bandwidth
Range: 0 to 99

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation: DMODulation?

Return the detected modulation scheme for segment <no> in list mode.

The result is determined from the last measured slot of the statistical length.

If channel type PUCCH is detected, QPSK is returned as modulation type because the QPSK limits are applied in that case.

Suffix:

<no> 1..1000

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<Modulation> QPSK | Q16 | Q64
QPSK, 16-QAM, 64-QAM

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:DCHType?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:DCHType?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DCHType?

Return the detected channel type for segment <no> in list mode.

The result is determined from the last measured slot of the statistical length. The individual measurements provide identical detected channel type results when measuring the same slot. However different statistical lengths can be defined for the measurements so that the measured slots and returned results can differ.

Suffix:

<no> 1..1000

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<SegReliability> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<ChannelType> PUSCh | PUCCh

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

3.5.3.30 List Mode Results (All Segments, One Result)

Each of the following commands returns a selected list mode result for all measured segments. The number of returned results depends on the number of measured segments, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge` on page 768.

To configure the list mode use the commands described in Chapter 3.5.3.8, "List Mode Settings", on page 767.

For a description of the list mode see Chapter 3.2.3, "List Mode", on page 637.

Indicated ranges apply to all statistical results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

FETCh:LTE:MEAS<i>:MEValuation:LIST:SRELiability?

Returns the segment reliability for all measured list mode segments.

A common reliability indicator of zero indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments. If you get a non-zero common reliability indicator, you can use this command to retrieve the individual reliability values of all measured segments for further analysis.

Return values:

<Reliability> Reliability Indicator

<SegReliability> Comma-separated list of values, one per measured segment
The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:EXTReme?

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:EXTReme?

Return error vector magnitude RMS values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability>	Reliability Indicator
<EVM_RMS>	Comma-separated list of values, one per measured segment Range: 0 % to 100 % Default unit: %
Example:	See Retrieving Single Results for All Segments
Usage:	Query only
Firmware/Software:	V2.1.30
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:AVERage?

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:EXTReme?

Return error vector magnitude peak values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<EVMpeak> Comma-separated list of values, one per measured segment
Range: 0 % to 100 %
Default unit: %

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:EXTReme?

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:EXTReme?

Return error vector magnitude DMRS values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<EVM_DMRS> Comma-separated list of values, one per measured segment
Range: 0 % to 100 %
Default unit: %

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:SDEViation?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:EXTReme?

Return magnitude error RMS values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<MagErrorRMS> Comma-separated list of values, one per measured segment
Range: 0 % to 100 %
Default unit: %

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:CURRent?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:EXTReme?

Return magnitude error peak values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<MagErrPeak> Comma-separated list of values, one per measured segment

Range: -100 % to 100 % (AVERage: 0 % to 100 %, SDEViation: 0 % to 50 %)

Default unit: %

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:AVERage?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:EXTReme?

Return magnitude error DMRS values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability>	Reliability Indicator
<MagErrDMRS>	Comma-separated list of values, one per measured segment Range: 0 % to 100 % Default unit: %
Example:	See Retrieving Single Results for All Segments
Usage:	Query only
Firmware/Software:	V2.1.30
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:EXTReme?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:EXTReme?

Return phase error RMS values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<PhErrorRMS> Comma-separated list of values, one per measured segment
Range: 0 deg to 180 deg
Default unit: deg

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:CURRent?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:EXTReme?

Return phase error peak values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<PhErrorPeak> Comma-separated list of values, one per measured segment
Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg)
Default unit: deg

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:SDEViation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:EXTReme?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:CURRent?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:EXTReme?

Return phase error DMRS values for low and high EVM window position, for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<PhErrorDMRS> Comma-separated list of values, one per measured segment
Range: 0 deg to 180 deg
Default unit: deg

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:EXTReme?

Return I/Q origin offset values for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<IQOffset> Comma-separated list of values, one per measured segment
Range: -100 dBc to 0 dBc
Default unit: dBc

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:AVERage?

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:EXTReme?

Return carrier frequency error values for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<FrequencyError> Comma-separated list of values, one per measured segment
Range: -80000 Hz to 80000 Hz
Default unit: Hz

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:EXTReme?

Return transmit time error values for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<TimingError> Comma-separated list of values, one per measured segment
Range: -32000 Ts to 32000 Ts
Default unit: Ts (basic LTE time unit)

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:AVERage?

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MINimum?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MAXimum?

Return user equipment power values for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<TXpower> Comma-separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MINimum?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MAXimum?

Return user equipment peak power values for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<PeakPower> Comma-separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MINimum?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MAXimum?

Return RB power values (power spectral density) for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<PSD> Comma-separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:SDEViation?

Return the inband emission limit line margin results for all measured list mode segments.

The `CURRent` margins indicate the minimum (vertical) distance between the limit line and the current trace. A negative result indicates that the limit is exceeded.

The `AVERage`, `EXTReme` and `SDEViation` values are calculated from the current margins.

Return values:

<Reliability> Reliability Indicator

<Margin> Comma-separated list of values, one per measured segment
Range: -50 dB to 110 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:RBINdex:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:RBINdex:EXTReme?

Return resource block indices of the inband emission measurement for all measured list mode segments. At these RB indices, the `CURRent` and `EXTReme` margins have been detected.

Return values:

<Reliability> Reliability Indicator

<RBindex> Comma-separated list of values, one per measured segment
Range: 0 to 99

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:EXTReme?

Return equalizer spectrum flatness single value results (ripple 1 or ripple 2) for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Suffix:

<no> 1..2
Ripple 1 = max (range 1) - min (range 1)
Ripple 2 = max (range 2) - min (range 2)

Return values:

<Reliability> Reliability Indicator

<Ripple> Comma-separated list of values, one per measured segment
Range: 0 dB to 40 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:EXTReme?

Return equalizer spectrum flatness single value results (differences between ranges) for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Suffix:

<no> 1..2
`DIFFerence1` = Max (Range 1) - Min (Range 2)
`DIFFerence2` = Max (Range 2) - Min (Range 1)

Return values:

<Reliability> Reliability Indicator

<Difference> Comma-separated list of values, one per measured segment
Range: -40 dB to 40 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:EXTReme?

Return equalizer spectrum flatness single value results (minimum within a range) for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Suffix:
<no> 1..2
Selects the range for which the minimum is returned

Return values:
<Reliability> Reliability Indicator

<MinR> Comma-separated list of values, one per measured segment
Range: -20 dB to 20 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:EXTReme?

Return equalizer spectrum flatness single value results (maximum within a range) for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Suffix:
<no> 1..2
Selects the range for which the maximum is returned

Return values:
<Reliability> Reliability Indicator

<MaxR> Comma-separated list of values, one per measured segment
Range: -20 dB to 20 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:SCINdex:MINimum<no>:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:SCINdex:MAXimum<no>:CURRent?

Return subcarrier indices of the equalizer spectrum flatness measurement for all measured list mode segments.

At these SC indices, the current `MINimum` or `MAXimum` power of the equalizer coefficients has been detected within the selected range.

Suffix:

<no> 1..2
Selects the range

Return values:

<Reliability> Reliability Indicator

<Index> Comma-separated list of values, one per measured segment
Range: 0 to 1199

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:EXTReme?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:EXTReme?

Return the occupied bandwidth for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<OBW> Comma-separated list of values, one per measured segment
Range: 0 MHz to 40 MHz
Default unit: Hz

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:SDEViation?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MINimum?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MAXimum?

Return the total TX power in the slot for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<TXpower> Comma-separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:NEGativ:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:NEGativ:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:NEGativ:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:POSitiv:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:POSitiv:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:POSitiv:MINimum?

Return spectrum emission mask margin positions for all measured list mode segments.

The individual commands provide results for the `CURRent`, `AVERage` and maximum traces (resulting in `MINimum` margins) for `NEGative` and `POSitive` offset frequencies.

The results are returned as pairs per segment: `<Reliability>`, {`<MarginPosX>`, `<MarginPosY>`}$_{\text{Seg 1}}$, {`<MarginPosX>`, `<MarginPosY>`}$_{\text{Seg 2}}$, ...

Suffix:
<no> 1..12
Selects the emission mask area

Return values:
<Reliability> Reliability Indicator

<MarginPosX> X-position of margin for selected area
Range: -35 MHz to 35 MHz
Default unit: Hz

<MarginPosY> Y-position of margin for selected area
Range: -160 dB to 160 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30
V3.2.80: increased <no> of areas to 12

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:AVERage?

Return the power in the allocated E-UTRA channel for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:
<Reliability> Reliability Indicator

<EUTRA> Comma-separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:CURRent?

CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:AVERage?

Return the ACLR for the first adjacent E-UTRA channel above (`POSitiv`) or below (`NEGativ`) the carrier frequency for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<EUTRA> Comma-separated list of values, one per measured segment
Range: 0 dB to 100 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:AVERage?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:CURRent?
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:AVERage?

Return the ACLR for the first or second adjacent UTRA channel above (`POSitiv`) or below (`NEGativ`) the carrier frequency for all measured list mode segments.

The values described below are returned by `FETCh` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Suffix:

<no> 1..2
Selects first or second adjacent UTRA channel

Return values:

<Reliability> Reliability Indicator

<UTRA> Comma-separated list of values, one per measured segment
Range: 0 dB to 100 dB
Default unit: dB

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:PMONitor:RMS?
FETCh:LTE:MEAS<i>:MEValuation:LIST:PMONitor:PEAK?

Return the power monitor results for all measured segments in list mode. The commands return one power result per subframe for the measured carrier. The power values are RMS averaged over the subframe or represent the peak value within the subframe.

Related commands:

- To find out where the power results related to a certain subframe are located in the result list:
  `FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:ARRay:STARt?`
  `FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:ARRay:LENGth?`
- To configure which segments are measured:
  `CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge`
- To configure the number of subframes within a segment:
  `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup`
- To enable the calculation of the results:
  `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor`

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<Power_1> ... <Power_n> n power values, one per subframe, from first subframe of first measured segment to last subframe of last measured segment
For an inactive segment only one INV is returned, independent of the number of configured subframes.
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.0.20

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:ARRay: STARt?

Returns the offset of the first power monitor result for segment <no> within a result list for all measured segments. Such a result list is e.g. returned by the command `FETCh:LTE:MEAS<i>:MEValuation:LIST:PMONitor:RMS?`.

A returned <Start> value n indicates that the result for the first subframe of the segment is the (n+1)th result in the power result list over all segments.

Suffix:

<no>	1..1000

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<Start>	Range: 0 to 3999
Example:	See Retrieving Single Results for All Segments
Usage:	Query only
Firmware/Software:	V2.0.20 V2.1.25: increased maximum number of segments to 250 V2.1.30: increased maximum number of segments to 512 V3.0.50: increased maximum number of segments to 1000 V3.2.70: increased maximum start value to 3999
Options:	R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:ARRay: LENGth?

Returns the number of power monitor results for segment <no> contained in a result list for all measured segments. Such a result list is e.g. returned by the command `FETCh:LTE:MEAS<i>:MEValuation:LIST:PMONitor:RMS?`.

Suffix:

<no>	1..1000

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<Length>	Range: 0 to 2000
Example:	See Retrieving Single Results for All Segments
Usage:	Query only

Firmware/Software: V2.0.20
V2.1.25: increased maximum number of segments to 250
V2.1.30: increased maximum number of segments to 512
V3.0.50: increased maximum number of segments to 1000

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:CURRent?
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:AVERage?
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:MINimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:MAXimum?
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:SDEViation?

Return the total TX power of all component carriers, for all measured list mode segments.

To enable the calculation of the results, see `CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer` on page 778.

Return values:
<Reliability> Reliability Indicator

<TXpower> Comma-separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V3.5.50

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:DALLocation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:DALLocation?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:DALLocation?

Return the detected allocation for all measured list mode segments.

The result is determined from the last measured slot of the statistical length of a segment. The individual measurements provide identical detected allocation results when measuring the same slot. However different statistical lengths can be defined for the measurements so that the measured slots and returned results can differ.

The results are returned as pairs per segment: `<Reliability>`, {`<NrResBlocks>`, `<OffsetResBlocks>`}$_{Seg\ 1}$, {`<NrResBlocks>`, `<OffsetResBlocks>`}$_{Seg\ 2}$, ...

Return values:
<Reliability> Reliability Indicator

<NrResBlocks> Number of allocated resource blocks
Range: 1 to 100

<OffsetResBlocks> Offset of the first allocated resource block from the edge of the allocated UL transmission bandwidth

Range: 0 to 99

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:DMODulation?

Return the detected modulation scheme for all measured list mode segments.

The result is determined from the last measured slot of the statistical length of a segment.

If channel type PUCCH is detected, QPSK is returned as modulation type because the QPSK limits are applied in that case.

Return values:

<Reliability> Reliability Indicator

<Modulation> QPSK | Q16 | Q64

Comma-separated list of values, one per measured segment
QPSK, 16-QAM, 64-QAM

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:DCHType?
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:DCHType?
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:DCHType?

Return the detected channel type for all measured list mode segments.

The result is determined from the last measured slot of the statistical length of a segment. The individual measurements provide identical detected channel type results when measuring the same slot. However different statistical lengths can be defined for the measurements so that the measured slots and returned results can differ.

Return values:

<Reliability> Reliability Indicator

<ChannelType> PUSCh | PUCCh

Comma-separated list of values, one per measured segment

Example: See Retrieving Single Results for All Segments

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KM012

3.5.4 Combined Signal Path Commands

For some settings, the command to be used depends on the active scenario. While the combined signal path (CSP) scenario is active, these settings are configured via commands of the signaling application. While the standalone (SA) scenario is active, they are configured via measurement commands.

The following mapping tables provide an overview for general measurement settings and for multi-evaluation measurement commands.

Table 3-3: Mapping for general measurement settings

Setting	Commands for SA scenario	Commands for CSP scenario
Duplex mode	CONFigure:LTE:MEAS<i>:DMODe	CONFigure:LTE:SIGN<i>[:PCC]:DMODe CONFigure:LTE:SIGN<i>:SCC<c>:DMODe CONFigure:LTE:SIGN<i>[:PCC]:DMODe:UCSPecific
Use SCC uplink	No setting	CONFigure:LTE:SIGN<i>:SCC<c>:UUL
Connector, converter	ROUTe:LTE:MEAS<i>:SCENario:SALone	ROUTe:LTE:MEAS<i>:SCENario:CSPath ROUTe:LTE:SIGN<i>:SCENario:... See "Scenario" on page 128.
External attenuation	CONFigure:LTE:MEAS<i>:RFSettings:EATTenuation	CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:EATTenuation:INPut CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:EATTenuation:INPut
Carrier aggregation mode	CONFigure:LTE:MEAS<i>:CAGGregation:MODE	CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE
Band	CONFigure:LTE:MEAS<i>:BAND	CONFigure:LTE:SIGN<i>[:PCC]:BAND CONFigure:LTE:SIGN<i>:SCC<c>:BAND
Frequency, channel	CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency CONFigure:LTE:MEAS<i>:RFSettings:SCC<no>:FREQuency CONFigure:LTE:MEAS<i>:CAGGregation:SCC<no>:ACSPacing	CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:CHANnel:UL CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:CHANnel:UL CONFigure:LTE:SIGN<i>:SCC<c>:CAGGregation:MODE
Frequency offset	CONFigure:LTE:MEAS<i>:RFSettings:FOFFset	CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:FOFFset:UL CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:FOFFset:UL:UCSPecific

Setting	Commands for SA scenario	Commands for CSP scenario
Expected nominal power	CONFigure:LTE:MEAS<i>:RFSettings:ENPower	CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPMode CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:ENPower CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPMode CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:ENPower
User margin	CONFigure:LTE:MEAS<i>:RFSettings:UMARgin	CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:UMARgin CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:UMARgin
Mixer level offset	CONFigure:LTE:MEAS<i>:RFSettings:MLOFfset	CONFigure:LTE:SIGN<i>:RFSettings[:PCC]:MLOFfset CONFigure:LTE:SIGN<i>:RFSettings:SCC<c>:MLOFfset
Channel bandwidth	CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth CONFigure:LTE:MEAS<i>:SCC<no>:CBANdwidth	CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL CONFigure:LTE:SIGN<i>:CELL:BANDwidth:SCC<c>:DL

Table 3-4: Mapping for multi-evaluation measurement commands

Setting	Commands for SA scenario	Commands for CSP scenario
Measurement mode	CONFigure:LTE:MEAS<i>:MEValuation:MMODe	Fixed value TMODe
TPC mode settings	CONFigure:LTE:MEAS<i>:MEValuation:TMODe:SCOunt CONFigure:LTE:MEAS<i>:MEValuation:TMODe:ENPower CONFigure:LTE:MEAS<i>:MEValuation:TMODe:RLEVel?	Automatic configuration
UL-DL configuration	CONFigure:LTE:MEAS<i>:MEValuation:ULDL	CONFigure:LTE:SIGN<i>:CELL[:PCC]:ULDL CONFigure:LTE:SIGN<i>:CELL:SCC<c>:ULDL CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific
Special subframe	CONFigure:LTE:MEAS<i>:MEValuation:SSUBframe	CONFigure:LTE:SIGN<i>:CELL[:PCC]:SSUBframe CONFigure:LTE:SIGN<i>:CELL:SCC<c>:SSUBframe CONFigure:LTE:SIGN<i>:CELL:TDD:SPECific
Cyclic prefix	CONFigure:LTE:MEAS<i>:MEValuation:CPRefix	CONFigure:LTE:SIGN<i>:CELL:CPRefix

Setting	Commands for SA scenario	Commands for CSP scenario
Network signaled value	CONFigure:LTE:MEAS<i>:MEValuation:NSValue CONFigure:LTE:MEAS<i>:MEValuation:NSValue:CAGGregation	CONFigure:LTE:SIGN<i>:CONNection:ASEMission CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:ASEMission:CAGGregation
Multi-cluster on/off	CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster	CONFigure:LTE:SIGN<i>:CONNection[:PCC]:MCLuster:UL CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:MCLuster:UL
RBG multi-cluster allocation	CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:NRB<Number> CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:ORB<Number>	CONFigure:LTE:SIGN<i>:CONNection[:PCC]:RMC:MCLuster:UL CONFigure:LTE:SIGN<i>:CONNection[:PCC]:UDCHannels:MCLuster:UL CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:RMC:MCLuster:UL CONFigure:LTE:SIGN<i>:CONNection:SCC<c>:UDCHannels:MCLuster:UL
Physical cell ID	CONFigure:LTE:MEAS<i>:MEValuation[:PCC]:PLCid CONFigure:LTE:MEAS<i>:MEValuation:SCC<no>:PLCid	CONFigure:LTE:SIGN<i>:CELL[:PCC]:PCID CONFigure:LTE:SIGN<i>:CELL:SCC<c>:PCID
Group hopping	CONFigure:LTE:MEAS<i>:MEValuation:GHOPping	CONFigure:LTE:SIGN<i>:CONNection:GHOPping
Sounding RS	CONFigure:LTE:MEAS<i>:MEValuation:SRS:ENABle	CONFigure:LTE:SIGN<i>:CELL:SRS:ENABle modifies signaling and measurement setting CONFigure:LTE:MEAS<i>:MEValuation:SRS:ENABle modifies only measurement setting
High dynamic mode	CONFigure:LTE:MEAS<i>:MEValuation:POWer:HDMode	Fixed value OFF

3.6 List of Commands

ABORt:LTE:MEAS<i>:MEValuation....742
CALCulate:LTE:MEAS<i>:MEValuation:ACLR:AVERage?....824
CALCulate:LTE:MEAS<i>:MEValuation:ACLR:CURRent?....824
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?....817
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?....817
CALCulate:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?....817
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:AVERage?....877
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:CURRent?....877
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:AVERage?....878
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:CURRent?....877
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:AVERage?....878
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:CURRent?....878
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:AVERage?....878

CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:CURRent?.......... 878
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:AVERage?.......... 878
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:CURRent?.......... 878
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:AVERage?.......... 873
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:CURRent?.......... 873
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:EXTReme?.......... 873
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:AVERage?.......... 874
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:CURRent?.......... 874
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:EXTReme?.......... 874
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:AVERage?.......... 873
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:CURRent?.......... 873
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:EXTReme?.......... 873
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:AVERage?.......... 872
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:CURRent?.......... 872
CALCulate:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:EXTReme?.......... 872
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:AVERage?.......... 862
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:CURRent?.......... 862
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:EXTReme?.......... 862
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:AVERage?.......... 862
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:CURRent?.......... 862
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:EXTReme?.......... 862
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:AVERage?.......... 861
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:CURRent?.......... 861
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:EXTReme?.......... 861
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:AVERage?.......... 861
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:CURRent?.......... 861
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:EXTReme?.......... 861
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:AVERage?.......... 860
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:CURRent?.......... 860
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:EXTReme?.......... 860
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:AVERage?.......... 860
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:CURRent?.......... 860
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:EXTReme?.......... 860
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:AVERage?.......... 869
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:CURRent?.......... 869
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:EXTReme?.......... 869
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:AVERage?.......... 868
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:CURRent?.......... 868
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:EXTReme?.......... 868
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:AVERage?.......... 865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:CURRent?.......... 865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:EXTReme?.......... 865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:AVERage?.......... 864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:CURRent?.......... 864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:EXTReme?.......... 865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:AVERage?.......... 864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:CURRent?.......... 864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:EXTReme?.......... 864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:AVERage?.......... 864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:CURRent?.......... 863

CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:EXTReme?......................864
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:AVERage?........................863
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:CURRent?........................863
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:EXTReme?......................863
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:AVERage?........................863
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:CURRent?........................863
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:EXTReme?.......................863
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:AVERage?.....................868
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:CURRent?......................867
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:EXTReme?...................868
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:AVERage?......................867
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:CURRent?.....................867
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:EXTReme?....................867
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:AVERage?.....................867
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:CURRent?......................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:EXTReme?....................867
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:AVERage?.......................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:CURRent?......................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:EXTReme?.....................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:AVERage?........................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:CURRent?.......................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:EXTReme?......................866
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:AVERage?........................865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:CURRent?........................865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:EXTReme?........................865
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:AVERage?..870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:CURRent?...870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MAXimum?..870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MINimum?...870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:AVERage?..871
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:CURRent?..871
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MAXimum?...871
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MINimum?..871
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:AVERage?..869
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:CURRent?..869
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:EXTReme?...869
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:AVERage?...870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:CURRent?...870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MAXimum?..870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MINimum?...870
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:AVERage?...854
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:CURRent?...854
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:AVERage?..............................848
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent?..............................848
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:EXTReme?..............................848
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?...............................839
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?................................839
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:EXTReme?..............................841
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:AVERage?.....................................850
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:CURRent?.....................................850

CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:EXTReme?....851
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:AVERage?....875
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:CURRent?....875
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:EXTReme?....875
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:AVERage?....876
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:CURRent?....876
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MAXimum?....876
CALCulate:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MINimum?....876
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:AVERage?....831
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:CURRent?....831
CALCulate:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?....833
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?....830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?....830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?....830
CALCulate:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?....830
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:AVERage?....820
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:CURRent?....820
CALCulate:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?....820
CONFigure:LTE:MEAS<i>:BAND....736
CONFigure:LTE:MEAS<i>:CAGGregation:CBANdwidth:AGGRegated?....736
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:CENTer?....735
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:HIGH?....736
CONFigure:LTE:MEAS<i>:CAGGregation:FREQuency:AGGRegated:LOW?....735
CONFigure:LTE:MEAS<i>:CAGGregation:MCARrier....740
CONFigure:LTE:MEAS<i>:CAGGregation:MODE....735
CONFigure:LTE:MEAS<i>:CAGGregation:SCC<no>:ACSPacing....737
CONFigure:LTE:MEAS<i>:DMODe....731
CONFigure:LTE:MEAS<i>:FSTRucture?....731
CONFigure:LTE:MEAS<i>:MEValuation:BLER:SFRames....767
CONFigure:LTE:MEAS<i>:MEValuation:CPRefix....752
CONFigure:LTE:MEAS<i>:MEValuation:CTVFilter....754
CONFigure:LTE:MEAS<i>:MEValuation:CTYPe....752
CONFigure:LTE:MEAS<i>:MEValuation:DSSPusch....757
CONFigure:LTE:MEAS<i>:MEValuation:GHOPping....757
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>....798
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CAGGregation:OCOMbination....799
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:EUTRa:CBANdwidth<Band>....792
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>....797
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CAGGregation:OCOMbination....797
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:ACLR:UTRA<no>:CBANdwidth<Band>....792
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:PDYNamics:CBANdwidth<Band>....805
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:ESFLatness....791
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:EVMagnitude....786
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:FERRor....788
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IBE....789
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IBE:IQOFfset....790
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:IQOFfset....789
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:MERRor....787

CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QAM<ModOrder>:PERRor....788
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:ESFLatness....785
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:EVMagnitude....782
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:FERRor....783
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IBE....784
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IBE:IQOFfset....785
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:IQOFfset....784
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:MERRor....782
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:QPSK:PERRor....783
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:
CAGGregation:CBANdwidth<Band1>:CBANdwidth<Band2>....802
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:
CAGGregation:OCOMbination....803
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:ADDitional<Table>:
CBANdwidth<Band>....795
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:
CBANdwidth<Band1>:CBANdwidth<Band2>....800
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CAGGregation:OCOMbination....801
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:LIMit<no>:CBANdwidth<Band>....793
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:
CBANdwidth<Band1>:CBANdwidth<Band2>....799
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CAGGregation:OCOMbination....800
CONFigure:LTE:MEAS<i>:MEValuation:LIMit:SEMask:OBWLimit:CBANdwidth<Band>....793
CONFigure:LTE:MEAS<i>:MEValuation:LIST....768
CONFigure:LTE:MEAS<i>:MEValuation:LIST:CMWS:CMODe....769
CONFigure:LTE:MEAS<i>:MEValuation:LIST:LRANge....768
CONFigure:LTE:MEAS<i>:MEValuation:LIST:OSINdex....768
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR....776
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:ACSPacing....773
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CAGGregation:MCARrier....773
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:CMWS:CONNector....769
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation....774
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor....777
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer....778
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:RBALlocation....774
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SCC<c>....772
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask....776
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup....770
CONFigure:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:TDD....772
CONFigure:LTE:MEAS<i>:MEValuation:MMODe....749
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:CAGGregation:LLOCation....763
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUCCh....762
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:LAGGing....763
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EEPeriods:PUSCh:LEADing....762
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength....760
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:EWLength:CBANdwidth<Band>....761
CONFigure:LTE:MEAS<i>:MEValuation:MODulation:MSCHeme....759
CONFigure:LTE:MEAS<i>:MEValuation:MOEXception....750
CONFigure:LTE:MEAS<i>:MEValuation:MSLot....758
CONFigure:LTE:MEAS<i>:MEValuation:MSUBframes....758

CONFigure:LTE:MEAS<i>:MEValuation:NSValue....753
CONFigure:LTE:MEAS<i>:MEValuation:NSValue:CAGGregation....753
CONFigure:LTE:MEAS<i>:MEValuation:NVFilter....753
CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LAGGing....766
CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:AEOPower:LEADing....765
CONFigure:LTE:MEAS<i>:MEValuation:PDYNamics:TMASk....765
CONFigure:LTE:MEAS<i>:MEValuation:PFORmat....752
CONFigure:LTE:MEAS<i>:MEValuation:POWer:HDMode....766
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:AUTO....754
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster....754
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:NRB<Number>....755
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:MCLuster:ORB<Number>....756
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:NRB....755
CONFigure:LTE:MEAS<i>:MEValuation:RBALlocation:ORB....756
CONFigure:LTE:MEAS<i>:MEValuation:REPetition....748
CONFigure:LTE:MEAS<i>:MEValuation:RESult:ACLR....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:BLER....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:ESFLatness....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMagnitude:EVMSymbol....747
CONFigure:LTE:MEAS<i>:MEValuation:RESult:EVMC....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:IEMissions....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:IQ....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:MERRor....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PDYNamics....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PERRor....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:PMONitor....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:RBATable....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:SEMask....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult:TXM....746
CONFigure:LTE:MEAS<i>:MEValuation:RESult[:ALL]....744
CONFigure:LTE:MEAS<i>:MEValuation:SCC<no>:PLCid....757
CONFigure:LTE:MEAS<i>:MEValuation:SCONdition....749
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:MODulation....759
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:POWer....766
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:ACLR....764
CONFigure:LTE:MEAS<i>:MEValuation:SCOunt:SPECtrum:SEMask....764
CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:ACLR:ENABle....764
CONFigure:LTE:MEAS<i>:MEValuation:SPECtrum:SEMask:MFILter....764
CONFigure:LTE:MEAS<i>:MEValuation:SRS:ENABle....760
CONFigure:LTE:MEAS<i>:MEValuation:SSUBframe....751
CONFigure:LTE:MEAS<i>:MEValuation:TMODe:ENPower....750
CONFigure:LTE:MEAS<i>:MEValuation:TMODe:RLEVel?....750
CONFigure:LTE:MEAS<i>:MEValuation:TMODe:SCOunt....749
CONFigure:LTE:MEAS<i>:MEValuation:TOUT....748
CONFigure:LTE:MEAS<i>:MEValuation:ULDL....751
CONFigure:LTE:MEAS<i>:MEValuation[:PCC]:PLCid....756
CONFigure:LTE:MEAS<i>:RFSettings:EATTenuation....734
CONFigure:LTE:MEAS<i>:RFSettings:ENPower....738
CONFigure:LTE:MEAS<i>:RFSettings:FOFFset....738

CONFigure:LTE:MEAS<i>:RFSettings:MLOFfset........ 739
CONFigure:LTE:MEAS<i>:RFSettings:SCC<no>:FREQuency........737
CONFigure:LTE:MEAS<i>:RFSettings:UMARgin........739
CONFigure:LTE:MEAS<i>:RFSettings[:PCC]:FREQuency........737
CONFigure:LTE:MEAS<i>:SCC<no>:CBANdwidth........741
CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth........740
FETCh:LTE:MEAS<i>:MEValuation:ACLR:AVERage?........824
FETCh:LTE:MEAS<i>:MEValuation:ACLR:CURRent?........ 824
FETCh:LTE:MEAS<i>:MEValuation:ACLR:DALLocation?........807
FETCh:LTE:MEAS<i>:MEValuation:ACLR:DCHType?........806
FETCh:LTE:MEAS<i>:MEValuation:BLER?........836
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?........816
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent:SCINdex?........818
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?........ 816
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?........816
FETCh:LTE:MEAS<i>:MEValuation:ESFLatness:SDEViation?........ 816
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:AVERage?........808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:CURRent?........ 808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:MAXimum?........808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:AVERage?........ 808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:CURRent?........808
FETCh:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:MAXimum?........808
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:AVERage?........835
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:CURRent?........835
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:MAXimum?........835
FETCh:LTE:MEAS<i>:MEValuation:EVMC:PEAK:SDEViation?........835
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:AVERage?........813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent:RBINdex?........814
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:CURRent?........813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:EXTReme:RBINdex?........ 814
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:EXTReme?........813
FETCh:LTE:MEAS<i>:MEValuation:IEMission:SCC<no>:MARGin:SDEViation?........813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:AVERage?........813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent:RBINdex?........814
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:CURRent?........ 813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:EXTReme:RBINdex?........814
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:EXTReme?........813
FETCh:LTE:MEAS<i>:MEValuation:IEMission[:PCC]:MARGin:SDEViation?........ 813
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:DALLocation?........881
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:DCHType?........ 882
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:AVERage?........877
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:CURRent?........877
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:AVERage?........ 877
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:NEGativ:CURRent?........877
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:AVERage?........877
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:EUTRa:POSitiv:CURRent?........877
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:AVERage?........878
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:NEGativ:CURRent?........ 878
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:AVERage?........ 878
FETCh:LTE:MEAS<i>:MEValuation:LIST:ACLR:UTRA<no>:POSitiv:CURRent?........878

FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:AVERage?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:CURRent?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:EXTReme?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:DIFFerence<no>:SDEViation?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:AVERage?..... 874
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:CURRent?..... 874
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:EXTReme?..... 874
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MAXR<no>:SDEViation?..... 874
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:AVERage?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:CURRent?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:EXTReme?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:MINR<no>:SDEViation?..... 873
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:AVERage?..... 872
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:CURRent?..... 872
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:EXTReme?..... 872
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:RIPPle<no>:SDEViation?..... 872
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:SCINdex:MAXimum<no>:CURRent?..... 875
FETCh:LTE:MEAS<i>:MEValuation:LIST:ESFLatness:SCINdex:MINimum<no>:CURRent?..... 875
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:AVERage?..... 871
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:CURRent?..... 871
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:EXTReme?..... 871
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:RBINdex:CURRent?..... 872
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:RBINdex:EXTReme?..... 872
FETCh:LTE:MEAS<i>:MEValuation:LIST:IEMission:MARGin:SDEViation?..... 871
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:DALLocation?..... 881
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:DCHType?..... 882
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:DMODulation?..... 882
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:AVERage?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:CURRent?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:EXTReme?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:HIGH:SDEViation?..... 862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:AVERage?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:CURRent?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:EXTReme?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:DMRS:LOW:SDEViation?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:AVERage?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:CURRent?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:EXTReme?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:HIGH:SDEViation?..... 861
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:AVERage?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:CURRent?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:EXTReme?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:LOW:SDEViation?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:AVERage?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:CURRent?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:EXTReme?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:HIGH:SDEViation?..... 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:AVERage?..... 859
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:CURRent?..... 859
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:EXTReme?..... 859

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:LOW:SDEViation?................................ 860
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:AVERage?..868
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:CURRent?... 868
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:EXTReme?... 869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:FERRor:SDEViation?.. 869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:AVERage?... 868
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:CURRent?..868
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:EXTReme?..868
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:SDEViation?...868
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:AVERage?..........................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:CURRent?..........................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:EXTReme?.........................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:HIGH:SDEViation?.......................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:AVERage?.......................... 864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:CURRent?...........................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:EXTReme?..........................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:DMRS:LOW:SDEViation?........................864
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:AVERage?...........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:CURRent?...........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:EXTReme?..........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:HIGH:SDEViation?........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:AVERage?.......................... 863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:CURRent?...........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:EXTReme?..........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:LOW:SDEViation?.........................863
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:AVERage?........................... 862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:CURRent?............................862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:EXTReme?.......................... 862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:HIGH:SDEViation?..........................862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:AVERage?............................862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:CURRent?............................ 862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:EXTReme?........................... 862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:LOW:SDEViation?.......................... 862
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:AVERage?.......................... 867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:CURRent?...........................867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:EXTReme?......................... 867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:HIGH:SDEViation?........................867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:AVERage?...........................867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:CURRent?........................... 867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:EXTReme?.......................... 867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:DMRS:LOW:SDEViation?........................ 867
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:AVERage?........................... 866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:CURRent?............................866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:EXTReme?.......................... 866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:HIGH:SDEViation?.........................866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:AVERage?............................866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:CURRent?............................ 866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:EXTReme?........................... 866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:LOW:SDEViation?......................... 866
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:AVERage?.............................865

FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:CURRent?............................ 865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:EXTReme?............................865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:HIGH:SDEViation?.......................... 865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:AVERage?..............................865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:CURRent?.............................. 865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:EXTReme?.............................865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:LOW:SDEViation?...........................865
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:AVERage?...870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:CURRent?... 870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MAXimum?..870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:MINimum?... 870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PPOWer:SDEViation?.. 870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:AVERage?...871
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:CURRent?..871
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MAXimum?..871
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:MINimum?..871
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:PSD:SDEViation?..871
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:AVERage?..869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:CURRent?... 869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:EXTReme?... 869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TERRor:SDEViation?.. 869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:AVERage?..869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:CURRent?.. 869
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MAXimum?... 870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:MINimum?.. 870
FETCh:LTE:MEAS<i>:MEValuation:LIST:MODulation:TPOWer:SDEViation?... 870
FETCh:LTE:MEAS<i>:MEValuation:LIST:PMONitor:PEAK?.. 879
FETCh:LTE:MEAS<i>:MEValuation:LIST:PMONitor:RMS?..879
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:AVERage?.. 881
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:CURRent?...881
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:MAXimum?...881
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:MINimum?...881
FETCh:LTE:MEAS<i>:MEValuation:LIST:POWer:TXPower:SDEViation?..881
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:AVERage?...854
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:CURRent?...854
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:DALLocation?..857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ACLR:DCHType?...858
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:AVERage?....................................846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent:SCINdex?......................849
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:CURRent?....................................846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:EXTReme?...................................846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:ESFLatness:SDEViation?.................................846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:AVERage?..........................843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:CURRent:RBINdex?............844
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:CURRent?.......................... 843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:EXTReme:RBINdex?...........844
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:EXTReme?......................... 843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:MARGin:SDEViation?....................... 843
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:AVERage?............ 845

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:CURRent:RBINdex?....846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:CURRent?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:EXTReme:RBINdex?....846
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:EXTReme?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:IEMission:SCC<c>:MARGin:SDEViation?....845
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?....839
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?....839
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DALLocation?....857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DCHType?....858
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:DMODulation?....857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:EXTReme?....841
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:SDEViation?....839
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:ARRay:LENGth?....880
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:ARRay:STARt?....880
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:PEAK?....855
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:PMONitor:RMS?....855
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:AVERage?....856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:CURRent?....856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:MAXimum?....856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:MINimum?....856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:POWer:SDEViation?....856
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:AVERage?....850
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:CURRent?....850
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:DALLocation?....857
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:DCHType?....858
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:EXTReme?....851
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:ALL?....852
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:AVERage:NEGativ?....853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:AVERage:POSitiv?....853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:CURRent:NEGativ?....853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:CURRent:POSitiv?....853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:MINimum:NEGativ?....853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:MARGin:MINimum:POSitiv?....853
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEGMent<no>:SEMask:SDEViation?....850
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:DALLocation?....881
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:DCHType?....882
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:NEGativ:AVERage?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:NEGativ:CURRent?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:NEGativ:MINimum?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:POSitiv:AVERage?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:POSitiv:CURRent?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:MARGin:AREA<no>:POSitiv:MINimum?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:AVERage?....875
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:CURRent?....875
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:EXTReme?....875
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:OBW:SDEViation?....875
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:AVERage?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:CURRent?....876

FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MAXimum?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:MINimum?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SEMask:TXPower:SDEViation?....876
FETCh:LTE:MEAS<i>:MEValuation:LIST:SRELiability?....859
FETCh:LTE:MEAS<i>:MEValuation:MERRor:AVERage?....810
FETCh:LTE:MEAS<i>:MEValuation:MERRor:CURRent?....810
FETCh:LTE:MEAS<i>:MEValuation:MERRor:MAXimum?....810
FETCh:LTE:MEAS<i>:MEValuation:MODulation:AVERage?....831
FETCh:LTE:MEAS<i>:MEValuation:MODulation:CURRent?....831
FETCh:LTE:MEAS<i>:MEValuation:MODulation:DALLocation?....807
FETCh:LTE:MEAS<i>:MEValuation:MODulation:DCHType?....806
FETCh:LTE:MEAS<i>:MEValuation:MODulation:DMODulation?....806
FETCh:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?....833
FETCh:LTE:MEAS<i>:MEValuation:MODulation:SDEViation?....831
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?....830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?....830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?....830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?....830
FETCh:LTE:MEAS<i>:MEValuation:PDYNamics:SDEViation?....830
FETCh:LTE:MEAS<i>:MEValuation:PERRor:AVERage?....811
FETCh:LTE:MEAS<i>:MEValuation:PERRor:CURRent?....811
FETCh:LTE:MEAS<i>:MEValuation:PERRor:MAXimum?....811
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:AVERage?....828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:CURRent?....828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:MAXimum?....828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:MINimum?....828
FETCh:LTE:MEAS<i>:MEValuation:PMONitor:SDEViation?....828
FETCh:LTE:MEAS<i>:MEValuation:SEMask:AVERage?....820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:CURRent?....820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:DALLocation?....807
FETCh:LTE:MEAS<i>:MEValuation:SEMask:DCHType?....806
FETCh:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?....820
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:ALL?....821
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:AVERage:NEGativ?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:AVERage:POSitiv?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:CURRent:NEGativ?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:CURRent:POSitiv?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:MINimum:NEGativ?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:MARGin:MINimum:POSitiv?....822
FETCh:LTE:MEAS<i>:MEValuation:SEMask:SDEViation?....820
FETCh:LTE:MEAS<i>:MEValuation:STATe:ALL?....743
FETCh:LTE:MEAS<i>:MEValuation:STATe?....743
FETCh:LTE:MEAS<i>:MEValuation:TRACe:ACLR:AVERage?....823
FETCh:LTE:MEAS<i>:MEValuation:TRACe:ACLR:CURRent?....823
FETCh:LTE:MEAS<i>:MEValuation:TRACe:ESFLatness?....815
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMC?....809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:AVERage?....809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:CURRent?....809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:MAXimum?....809
FETCh:LTE:MEAS<i>:MEValuation:TRACe:IEMissions:SCC<no>?....812

FETCh:LTE:MEAS<i>:MEValuation:TRACe:IEMissions[:PCC]?....812
FETCh:LTE:MEAS<i>:MEValuation:TRACe:IQ:HIGH?....825
FETCh:LTE:MEAS<i>:MEValuation:TRACe:IQ:LOW?....825
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:AVERage?....829
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:CURRent?....829
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:MAXimum?....829
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PMONitor:SCC<no>?....828
FETCh:LTE:MEAS<i>:MEValuation:TRACe:PMONitor[:PCC]?....827
FETCh:LTE:MEAS<i>:MEValuation:TRACe:RBATable:SCC<no>?....826
FETCh:LTE:MEAS<i>:MEValuation:TRACe:RBATable[:PCC]?....825
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:AVERage?....819
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:CURRent?....819
FETCh:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:MAXimum?....819
FETCh:LTE:MEAS<i>:MEValuation:VFTHroughput?....807
INITiate:LTE:MEAS<i>:MEValuation....742
READ:LTE:MEAS<i>:MEValuation:ACLR:AVERage?....824
READ:LTE:MEAS<i>:MEValuation:ACLR:CURRent?....824
READ:LTE:MEAS<i>:MEValuation:BLER?....836
READ:LTE:MEAS<i>:MEValuation:ESFLatness:AVERage?....816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:CURRent?....816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:EXTReme?....816
READ:LTE:MEAS<i>:MEValuation:ESFLatness:SDEViation?....816
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:AVERage?....808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:CURRent?....808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:MAXimum?....808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:AVERage?....809
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:CURRent?....808
READ:LTE:MEAS<i>:MEValuation:EVMagnitude:PEAK:MAXimum?....809
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:AVERage?....835
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:CURRent?....835
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:MAXimum?....836
READ:LTE:MEAS<i>:MEValuation:EVMC:PEAK:SDEViation?....836
READ:LTE:MEAS<i>:MEValuation:MERRor:AVERage?....810
READ:LTE:MEAS<i>:MEValuation:MERRor:CURRent?....810
READ:LTE:MEAS<i>:MEValuation:MERRor:MAXimum?....810
READ:LTE:MEAS<i>:MEValuation:MODulation:AVERage?....831
READ:LTE:MEAS<i>:MEValuation:MODulation:CURRent?....831
READ:LTE:MEAS<i>:MEValuation:MODulation:EXTReme?....833
READ:LTE:MEAS<i>:MEValuation:MODulation:SDEViation?....831
READ:LTE:MEAS<i>:MEValuation:PDYNamics:AVERage?....830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:CURRent?....830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:MAXimum?....830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:MINimum?....830
READ:LTE:MEAS<i>:MEValuation:PDYNamics:SDEViation?....830
READ:LTE:MEAS<i>:MEValuation:PERRor:AVERage?....811
READ:LTE:MEAS<i>:MEValuation:PERRor:CURRent?....811
READ:LTE:MEAS<i>:MEValuation:PERRor:MAXimum?....811
READ:LTE:MEAS<i>:MEValuation:PMONitor:AVERage?....828
READ:LTE:MEAS<i>:MEValuation:PMONitor:CURRent?....828
READ:LTE:MEAS<i>:MEValuation:PMONitor:MAXimum?....828

READ:LTE:MEAS<i>:MEValuation:PMONitor:MINimum?.....828
READ:LTE:MEAS<i>:MEValuation:PMONitor:SDEViation?.....828
READ:LTE:MEAS<i>:MEValuation:SEMask:AVERage?.....820
READ:LTE:MEAS<i>:MEValuation:SEMask:CURRent?.....820
READ:LTE:MEAS<i>:MEValuation:SEMask:EXTReme?.....820
READ:LTE:MEAS<i>:MEValuation:SEMask:SDEViation?.....820
READ:LTE:MEAS<i>:MEValuation:TRACe:ACLR:AVERage?.....823
READ:LTE:MEAS<i>:MEValuation:TRACe:ACLR:CURRent?.....823
READ:LTE:MEAS<i>:MEValuation:TRACe:ESFLatness?.....815
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMC?.....809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:AVERage?.....809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:CURRent?.....809
READ:LTE:MEAS<i>:MEValuation:TRACe:EVMSymbol:MAXimum?.....809
READ:LTE:MEAS<i>:MEValuation:TRACe:IEMissions:SCC<no>?.....812
READ:LTE:MEAS<i>:MEValuation:TRACe:IEMissions[:PCC]?.....812
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:AVERage?.....829
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:CURRent?.....829
READ:LTE:MEAS<i>:MEValuation:TRACe:PDYNamics:MAXimum?.....829
READ:LTE:MEAS<i>:MEValuation:TRACe:PMONitor:SCC<no>?.....828
READ:LTE:MEAS<i>:MEValuation:TRACe:PMONitor[:PCC]?.....827
READ:LTE:MEAS<i>:MEValuation:TRACe:RBATable:SCC<no>?.....826
READ:LTE:MEAS<i>:MEValuation:TRACe:RBATable[:PCC]?.....825
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:AVERage?.....819
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:CURRent?.....819
READ:LTE:MEAS<i>:MEValuation:TRACe:SEMask:RBW<kHz>:MAXimum?.....819
ROUTe:LTE:MEAS<i>:SCENario:CSPath.....732
ROUTe:LTE:MEAS<i>:SCENario:MAPRotocol.....733
ROUTe:LTE:MEAS<i>:SCENario:SALone.....732
ROUTe:LTE:MEAS<i>:SCENario?.....733
ROUTe:LTE:MEAS<i>?.....733
STOP:LTE:MEAS<i>:MEValuation.....742
TRIGger:LTE:MEAS<i>:MEValuation:AMODe.....781
TRIGger:LTE:MEAS<i>:MEValuation:CATalog:SOURce?.....779
TRIGger:LTE:MEAS<i>:MEValuation:DELay.....780
TRIGger:LTE:MEAS<i>:MEValuation:LIST:MODE.....778
TRIGger:LTE:MEAS<i>:MEValuation:MGAP.....781
TRIGger:LTE:MEAS<i>:MEValuation:SLOPe.....779
TRIGger:LTE:MEAS<i>:MEValuation:SMODe.....781
TRIGger:LTE:MEAS<i>:MEValuation:SOURce.....779
TRIGger:LTE:MEAS<i>:MEValuation:THReshold.....780
TRIGger:LTE:MEAS<i>:MEValuation:TOUT.....780

4 LTE PRACH Measurement

The LTE PRACH measurement provides quick and flexible tests on LTE FDD and TDD random access preambles. The tests cover the following UE transmitter properties:

- Modulation accuracy for each PRACH subcarrier (EVM, magnitude error, phase error)
- Transmit OFF power, transmit ON power and power ramping between them (power dynamics)
- I/Q constellation diagram

The PRACH measurement requires option R&S CMW-KM500 for FDD signals and R&S CMW-KM550 for TDD signals.

4.1 What's New in This Revision

This revision describes version 3.5.40 and later of the LTE PRACH measurement application. Compared to version 3.5.20, it provides the following new features:

- For signals with carrier aggregation, you can measure PCC and SCC, one carrier at a time.

4.2 General Description

The LTE PRACH measurement captures an uplink (UL) LTE PRACH signal and provides TX measurement results for the random access preambles. Both FDD signals (option R&S CMW-KM500) and TDD signals (option R&S CMW-KM550) can be measured.

The following sections describe how to perform and configure the measurement.

- Test Setup....................899
- How to Measure an Uplink PRACH Signal....................900
- Defining the Scope of the Measurement....................900
- Parallel Signaling and Measurement....................902
- Trigger Modes....................902
- Calculation of Modulation Results....................903
- LTE PRACH UL Signal Properties....................904
- Limit Settings and Conformance Requirements....................906
- Measurement Results....................908

4.2.1 Test Setup

Connect the external RF signal source (mobile station, signal generator etc.) to one of the bidirectional RF connectors on the front panel of the R&S CMW.

See also: "RF Connectors" in the R&S CMW base unit manual, chapter "Getting Started"

4.2.2 How to Measure an Uplink PRACH Signal

The measurement expects an LTE PRACH UL signal. Any other signals do not yield measurement results (e.g. an LTE UL signal for an established connection).

After connecting your LTE UE to the R&S CMW, you have to adjust at least the following analyzer settings to the properties of the analyzed PRACH signal:

- Duplex mode
- Analyzer "Frequency"
- "Expected Nominal Power"
  Optionally "User Margin" and "External Attenuation (Input)"

  Recommended values:
  - "Expected Nominal Power" = peak power of the UE signal during the measurement
  - "User Margin" = 0 dB

  The smallest possible value of the "Expected Nominal Power" plus the "User Margin" ensures the maximum dynamic range.

Some "Measurement Control" settings in the configuration dialog must be in accordance with the measured signal, the transmitted preambles and especially the used Zadoff-Chu sequence. The settings are required for synchronization to the received signal and proper decoding. Ensure that the following parameters match up:

- "Channel Bandwidth"
- "PRACH Configuration Index"
- "High Speed Flag": This software version supports only the value FALSE, i.e. the unrestricted set of N_{CS} must be used.
- "Logical Root Sequence Index"
- "Zero Correlation Zone Config"

The R&S CMW can auto-detect the location of the used resource blocks in the frequency domain ("PRACH Frequency Offset"). It can also auto-detect which of the 64 preamble sequences defined by the parameters above is used ("Sequence Index").

Non-matching "Measurement Control" settings generally result in large EVM results and/or a "Sequence Correlation" much smaller than 1 (result presented in each view).

The default trigger settings are often suitable, see Chapter 4.2.5, "Trigger Modes", on page 902.

4.2.3 Defining the Scope of the Measurement

A single-shot LTE PRACH measurement comprises one measurement cycle which comprises a configurable number of measurement intervals (statistic count).

In this context, two types of result views must be distinguished:

- **Single-preamble measurements** evaluate one preamble per measurement interval. The related views display results for the current measurement interval (one preamble). They also provide a statistical evaluation for the already measured preambles (e.g. average within measurement cycle, extreme value since start of measurement).
Examples for single-preamble result views are "Error Vector Magnitude" and "Power Dynamics".
- **Multi-preamble measurements** evaluate up to 32 consecutive preambles per measurement interval. The related views present the results per preamble, for all preambles of the current measurement interval. No statistical evaluation over several measurement intervals is performed.
The preambles captured within one measurement interval are labeled 1 to n, with n ≤ 32. Single-preamble measurements evaluate the preamble labeled 1.
The time between two captured preambles is configurable (10 ms or 20 ms). If no preamble is found, the measurement continues and there are no demodulation results for that label.
Examples for multi-preamble result views are "EVM vs Preamble" and "Power vs Preamble".

The scope of the measurement is configured in section "Measurement Control" of the configuration tree. The most important parameters are:

- "Repetition" on page 919
- "Number of Preambles" on page 920
- "Period of Preambles" on page 921
- "Statistic Count" on page 922
- "Dynamics > Statistic Count" on page 924

Example: Limited sequence of preambles with increasing power

Scenario: A sequence of 10 preambles with a period of 20 ms and increasing power is measured. Main result of interest is the TX power of the individual preambles (verify correct ramping up of preamble power by UE).

Used view: "Power vs Preamble"

Settings: statistic count = 1, number of preambles = 10, period of preambles = 20 ms, repetition = single shot

Example: Statistical evaluation for preambles with constant power

Scenario: The EVM is measured for 100 preambles, so that the average and the maximum value can be evaluated.

Used view: "EVM"

Settings: statistic count = 100, number of preambles = 1, repetition = single shot

Example: Multi-preamble measurement with irregular periodicity

Scenario: The EVM is measured for a sequence of 5 preambles with a periodicity of 20 ms. But the third and fourth preambles are missing (not transmitted by UE).

Used view: "EVM vs Preamble"

Settings: statistic count = 1, number of preambles = 5, period of preambles = 20 ms, repetition = single shot

Results: The result diagram and table contain the labels 1 to 5 as for a measurement without missing preambles. For the label 3 and 4, there are no demodulation results.

4.2.4 Parallel Signaling and Measurement

The PRACH measurement can be used in parallel to the LTE signaling application (option R&S CMW-KS500/-KS550). The signaling application emulates an LTE cell signal so that the UE tries to attach and sends random access preambles. These preambles can then be measured using the PRACH measurement. You can configure the signaling application so that it does not answer the received preambles.

To use both applications in parallel, the combined signal path scenario must be activated (see "Scenario = Combined Signal Path" on page 680). Most signal routing and analyzer settings and some measurement control settings are then configured by the signaling application. The PRACH measurement displays the corresponding signaling settings instead of its own settings. These signaling settings can be configured both in the measurement GUI and in the GUI of the signaling application.

To configure these settings via remote commands, the commands of the signaling application must be used. For a command mapping table, see Chapter 4.5.4, "Combined Signal Path Commands", on page 968.

The most important signaling parameters not relevant for standalone measurements can nevertheless be configured both in the measurement GUI and in the GUI of the signaling application. In the measurement GUI, they can be accessed via hotkeys.

Whenever the combined signal path scenario is activated or the controlling application is changed, the PRACH trigger signal provided by the controlling signaling application is selected automatically as trigger source.

4.2.5 Trigger Modes

The LTE PRACH measurement requires a trigger event for each preamble to be measured. It can be performed in the following trigger modes:

- "IF Power" (default mode): With an internal IF power trigger, the measurement is triggered by the power ramp of the received preambles. The minimum trigger gap must be large enough to ensure that the measurement is not retriggered within a preamble. It must be small enough to ensure that the trigger system is rearmed before the next preamble starts. The default value is often appropriate.
- "External Trigger A/B": External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument (availability depends on instrument model).
- Additional trigger modes: Other firmware applications, e.g. the LTE signaling application (option R&S CMW-KS500/-KS550) or the GPRF generator provide additional trigger modes. Refer to the documentation of the corresponding firmware application for a description of these trigger modes.

For configuration, see Chapter 4.3.2.5, "Trigger Settings", on page 925.

4.2.6 Calculation of Modulation Results

Modulation results are based on a comparison between the measured signal, corrected by the average frequency and timing offset for each measured subframe, and an ideal reference waveform.

See also: "Modulation Accuracy" in the R&S CMW base unit manual, chapter "System Overview"

3GPP TS 36.101, annex F, specifies the following additional conditions:

- The I/Q origin offset must be removed from the evaluated signal before calculating the EVM.
- The EVM calculation must be based on two different FFT processing windows in time domain, separated by the "EVM window length" W. The minimum test requirement applies to the larger of the two obtained EVM values.

The definition of the EVM window and the two FFT processing windows is shown below.

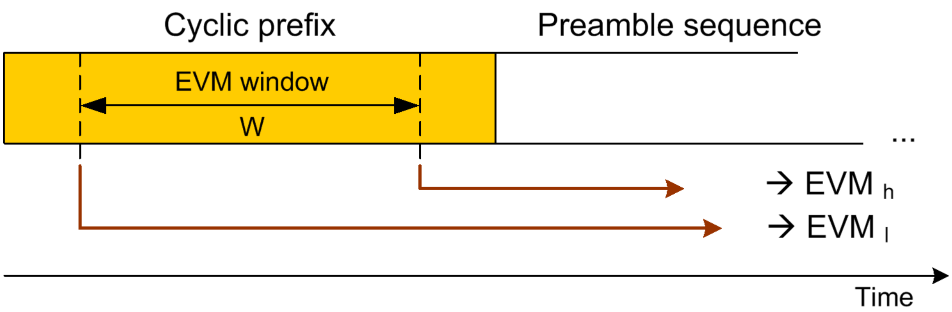


Figure 4-1: EVM window definition

The EVM window is centered on the cyclic prefix (CP) at the beginning of the preamble. Its length is specified in the standard, depending on the preamble format (see 3GPP TS 36.101, table F.5.5-1).

The CP is a cyclic extension of the preamble sequence. As a consequence the EVM for a signal with good modulation accuracy is expected to be largely independent of the EVM window size. Differences between EVM_h and EVM_l arise e.g. due to the effects of time domain windowing of FIR pulse shaping.

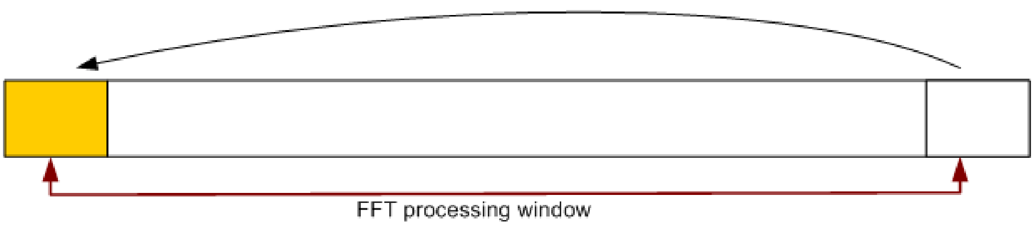


Figure 4-2: Cyclic prefix

EVM window settings

Use the settings in the section "Config... > Measurement Control > Modulation > EVM Window Length" to adjust the length of the EVM window (see "EVM Window Length" on page 923). The minimum value of one FFT symbol actually corresponds to a window of zero length so that $EVM_h = EVM_l$.

Use the setting "Config... > Measurement Control > Modulation > EVM Window Position" to select whether the result diagrams (traces) are calculated for low or high EVM window position, see "EVM Window Position" on page 924. Statistical tables provide results for both window positions.

4.2.7 LTE PRACH UL Signal Properties

This section describes the following selected topics related to LTE UL PRACH signal properties. For a description of the frequency bands, see Chapter 3.2.4.3, "Frequency Bands", on page 646.

- Preambles in the Frequency Domain..904
- Preambles in the Time Domain..905
- Preamble Sequences..905

4.2.7.1 Preambles in the Frequency Domain

There are five preamble formats defined by 3GPP, see table below. For preamble format 0 to 3, a preamble occupies 839 adjacent subcarriers with a spacing of 1.25 kHz, in total 1.04875 MHz. For preamble format 4, there are 139 subcarriers with a spacing of 7.5 kHz, in total 1.0425 MHz. In both cases, six resource blocks (RB) are reserved in the frequency domain for the preamble.

Table 4-1: Preambles in the frequency domain

Preamble format	Subcarriers (SC)	SC spacing
0 to 3	839	1.25 kHz
4	139	7.5 kHz

The location of the 6 RBs within the channel bandwidth, i.e. the number of the first RB to be used, is determined by higher layers. For FDD, it equals a parameter called PRACH frequency offset, for TDD it is calculated from this parameter and the parameter frequency resource index (determined by the PRACH configuration index). For details, see 3GPP TS 36.211 section 5.7.1 "Time and frequency structure". Both the PRACH frequency offset and the PRACH configuration index can be configured for the PRACH measurement.

The total number of resource blocks available per channel depends on the channel bandwidth as shown in the following table.

Channel bandwidth / MHz	1.4	3	5	10	15	20
Resource blocks (RB)	6	15	25	50	75	100

4.2.7.2 Preambles in the Time Domain

In the time domain, a preamble consists of a cyclic prefix (CP) and the preamble sequence.

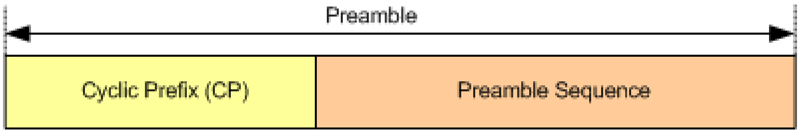


Figure 4-3: Preamble structure

The length of CP and preamble sequence depend on the preamble format as shown in the following table. T_s is the basic LTE time unit (1 T_s = 1/30.72 MHz ≈ 32.55 ns).

Table 4-2: Preambles in the time domain

Preamble format	CP length / T_s	Sequence length / T_s	Preamble length / T_s
0	3168	24576	27744
1	21024	24576	45600
2	6240	2*24576	55392
3	21024	2*24576	70176
4	448	4096	4544

Thus a preamble with format 0 to 3 requires 2 to 6 UL timeslots for transmission. A preamble with format 4 is only relevant for TDD and is transmitted in uplink pilot timeslots (UpPTS).

The time resources allowed for transmission of preambles are restricted by 3GPP. There are 64 configurations for FDD and 58 configurations for TDD, identified via the PRACH configuration index. The index defines which radio frames, subframes etc. can be used and which preamble format is used. For details, refer to 3GPP TS 36.211 section 5.7.1.

4.2.7.3 Preamble Sequences

Random access preambles are generated from Zadoff-Chu sequences with zero correlation zone. For each cell, a set of 64 preamble sequences is generated from one or several root Zadoff-Chu sequences via cyclic shift. The UE decides which of these 64 preamble sequences it uses for the PRACH procedure.

A logical root sequence index is broadcasted within the system information as RACH_ROOT_SEQUENCE. The UE uses the logical root sequence index to determine the physical root sequence number u as defined in table 5.7.2-4 and 5.7.2-5 in 3GPP TS 36.211.

From the u^{th} root Zadoff-Chu sequence, random access preambles with zero correlation zones of length $N_{CS}-1$ are generated by cyclic shift. The parameter N_{CS} depends on the parameters "Zero Correlation Zone Config" and "High Speed Flag", both provided by higher layers. It is also used for calculation of the cyclic shift.

If the root sequence allows less than 64 cyclic shifts, the next root sequence is used to generate additional preambles via cyclic shift. This process is repeated until the set of 64 preambles is complete.

To allow the R&S CMW to determine the used preamble sequence, the parameters "Logical Root Sequence Index" and "Zero Correlation Zone Config" must be configured correctly. In this software version, the "High Speed Flag" is fix so that only the unrestricted set of N_{CS} values can be used. Which of the 64 preamble sequences has been selected by the UE can be determined automatically by the R&S CMW or configured manually as "Sequence Index".

For a detailed mathematical description of preamble sequence generation, refer to 3GPP TS 36.211 section 5.7.2 "Preamble sequence generation".

4.2.8 Limit Settings and Conformance Requirements

Conformance requirements for LTE transmitter tests are specified in 3GPP TS 36.521, section 6, "Transmitter Characteristics".

The following sections give an overview of the PRACH measurement limit settings and the related test requirements.

● Transmit Modulation Limits....................906
● Power Dynamics Limits....................907

4.2.8.1 Transmit Modulation Limits

A poor modulation accuracy of the UE transmitter increases the transmission errors in the uplink channel of the LTE network and decreases the system capacity. The error vector magnitude (EVM) is the critical quantity to assess the modulation accuracy of an LTE UE.

According to 3GPP, the EVM measured at UE output powers ≥ −40 dBm and under normal operating conditions must not exceed 17.5 % for random access preambles.

The EVM limits can be set in the configuration dialog, depending on the modulation scheme and along with limits for the other measured quantities.

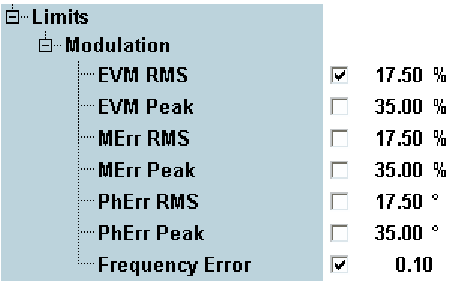


Figure 4-4: Modulation limit settings

Characteristics	Refer to 3GPP TS 36.521 V9.3.0, section...	Specified limit
EVM (RMS)	6.5.2.1 Error Vector Magnitude (EVM)	≤ 17.5 %

4.2.8.2 Power Dynamics Limits

Transmission at excessive uplink power increases interference to other channels while a too low uplink power increases transmission errors. For PRACH transmission, 3GPP defines a time mask. The mask contains limits for the UL power during preamble transmission (transmit ON power), the UL power in the adjacent subframes (transmit OFF power) and the power ramping in-between.

The ON power is specified as the mean UE output power over the preamble (more exactly, over the PRACH measurement period, see Table 4-3). For the OFF power, the mean power has to be measured both in the preceding subframe and in the subsequent subframe. A transient period of 20 µs next to the PRACH measurement period is excluded.

The following figure provides a summary of the time periods relevant for ON and OFF power limits.

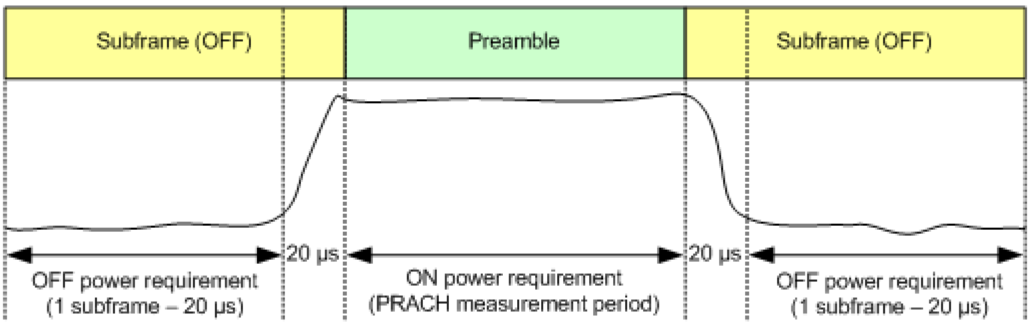


Figure 4-5: Measurement periods ON/OFF power

The OFF power must not exceed -48.5 dBm. The ON power must be in the range -8.5 dBm to 6.5 dBm. The limits for ON and OFF power can be set in the configuration dialog.

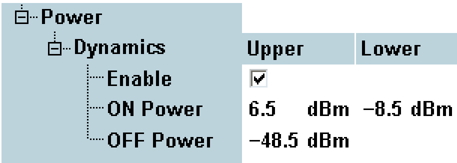


Figure 4-6: Power dynamics limit settings

Characteristics	Refer to 3GPP TS 36.521 V9.3.0, section...	Specified limit
ON power	6.3.4.2 PRACH and SRS Time Mask	≥ -8.5 dBm, ≤ 6.5 dBm
OFF power	6.3.4.2 PRACH and SRS Time Mask	≤ -48.5 dBm

4.2.9 Measurement Results

The results of the LTE PRACH measurement are displayed in several different views. Use the "Display" parameters to select the views and to change the appearance and contents of the views. The views are described in the following sections.

- Overview......908
- Views EVM, Magnitude Error, Phase Error......909
- Views EVM vs Preamble, Power vs Preamble......910
- View I/Q Constellation Diagram......912
- View Power Dynamics......912
- View TX Measurement......914
- Selecting and Modifying Views......915
- Using Markers......915
- Common View Elements......916

4.2.9.1 Overview

In the overview a selection of the following results can be displayed:

- Error vector magnitude
- Magnitude error
- Phase error
- Error vector magnitude vs preamble
- Power vs preamble
- I/Q constellation diagram
- Power dynamics
- Most important results of the view "TX Measurement"

See also: "TX Measurements" in the R&S CMW base unit manual, chapter "System Overview"

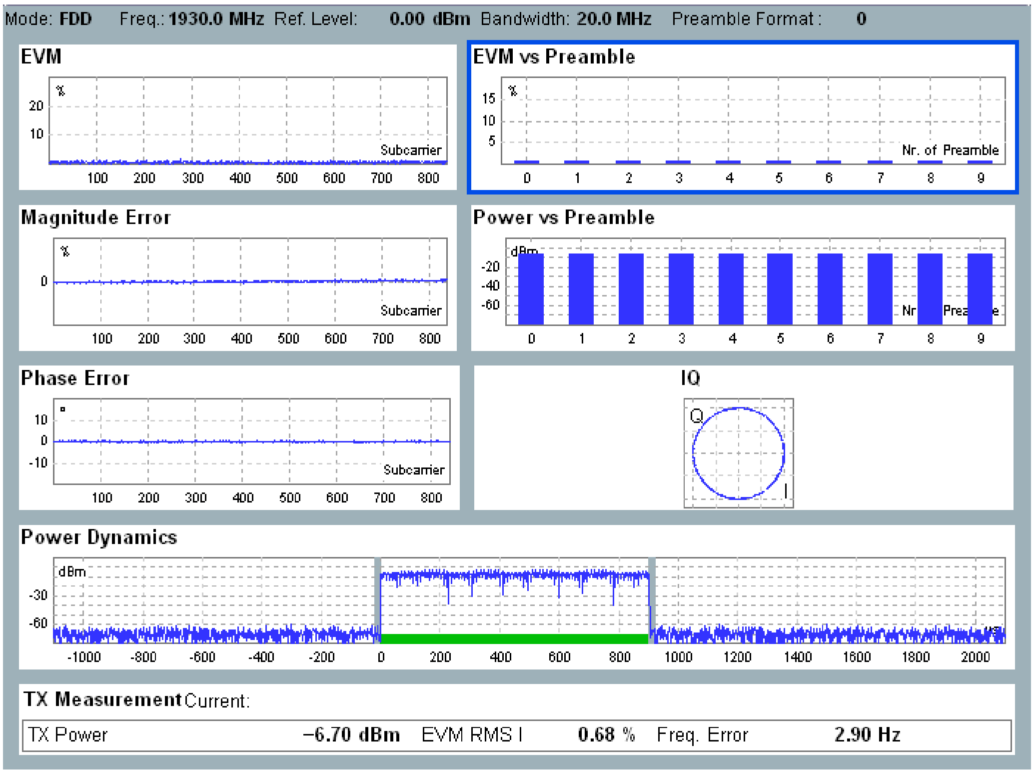


Figure 4-7: PRACH result overview

The results to be measured and displayed in the overview can be limited using the hot-key "Assign Views", see Chapter 3.3.9, "Additional Softkeys and Hotkeys", on page 707.

You can enlarge one of the diagrams in the overview and show a detailed view with additional measurement results, see Chapter 4.2.9.7, "Selecting and Modifying Views", on page 915. The traces are described in the following sections.

4.2.9.2 Views EVM, Magnitude Error, Phase Error

This section applies to the following detailed views:

- "Error Vector Magnitude"
- "Magnitude Error"
- "Phase Error"

Each of these single-preamble views shows a diagram and a statistical overview of results.

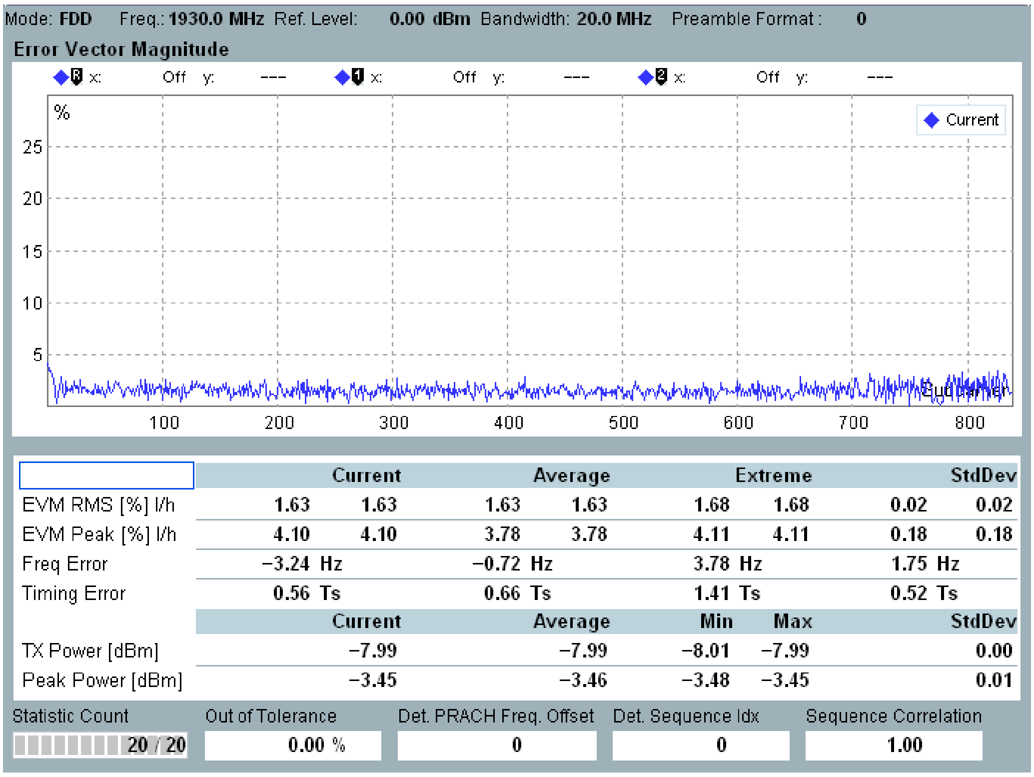


Figure 4-8: Error Vector Magnitude view

The diagram shows the EVM / magnitude error / phase error in all preamble subcarriers. For preamble format 0 to 3, there are 839 subcarriers with a spacing of 1.25 kHz. For preamble format 4, there are 139 subcarriers with a spacing of 7.5 kHz. The values are RMS-averaged over the samples in each subcarrier.

For a description of the table rows, see Chapter 4.2.9.6, "View TX Measurement", on page 914.

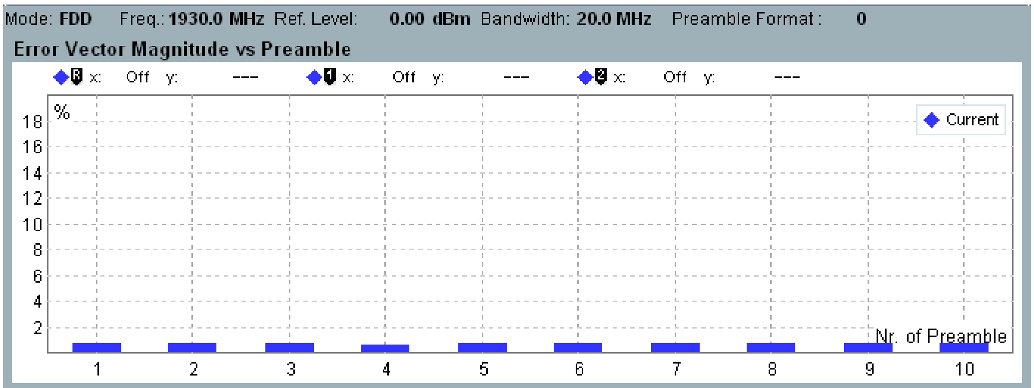
For table columns and other elements, refer to Chapter 4.2.9.9, "Common View Elements", on page 916.

4.2.9.3 Views EVM vs Preamble, Power vs Preamble

This section applies to the following detailed views:

- "Error Vector Magnitude vs Preamble"
- "Power vs Preamble"

Each of these multi-preamble views shows a diagram and a statistical overview of results.



Nr of Preambles	1	2	3	4	5	6
EVM RMS [%] low	0.73	0.71	0.66	0.63	0.64	0.68
EVM RMS [%] high	0.74	0.71	0.66	0.63	0.65	0.69
EVM Peak [%] low	1.76	1.71	1.87	1.47	1.81	1.88
EVM Peak [%] high	1.72	1.70	1.74	1.71	1.92	1.75
Freq Error [Hz]	−0.34	−0.92	−1.72	−2.02	−0.08	−2.14
Timing Error [Ts]	0.61	0.56	0.56	0.56	0.56	0.61
Det. PRACH Freq. Offset	19	19	19	19	19	19
Det. Sequence Idx	0	0	0	0	0	0
Sequence Correlation	1.00	1.00	1.00	1.00	1.00	1.00
Reliability	0	0	0	0	0	0

Figure 4-9: EVM vs preamble view

The diagram shows results for a configurable number of preambles (up to 32), labeled 1 to n. The preambles are captured within one measurement interval, using a configurable periodicity. A preamble is captured every 10 ms or every 20 ms.

- "Error Vector Magnitude vs Preamble":
  The diagram displays EVM RMS values. For each preamble, either the result determined for low EVM window position or the result determined for high EVM window position is shown - whichever is the higher. So for this diagram, the setting EVM Window Position is ignored.
- "Power vs Preamble":
  The diagram displays TX power values (received power, RMS averaged over all samples within the preamble duration).

Table

The table below the diagram shows additional results. Each column corresponds to one preamble with the preamble label indicated as column title.

The upper rows correspond to the results presented in the "TX Measurement" view. For a description, see Chapter 4.2.9.6, "View TX Measurement", on page 914.

The row "Reliability" provides a reliability indicator for each preamble. For a description of the individual values, see Chapter 4.5.1.5, "Reliability Indicator", on page 936.

For a description of the lower rows, see Chapter 4.2.9.9, "Common View Elements", on page 916.

4.2.9.4 View I/Q Constellation Diagram

This single-preamble view shows the modulation symbols as points in the I/Q plane.

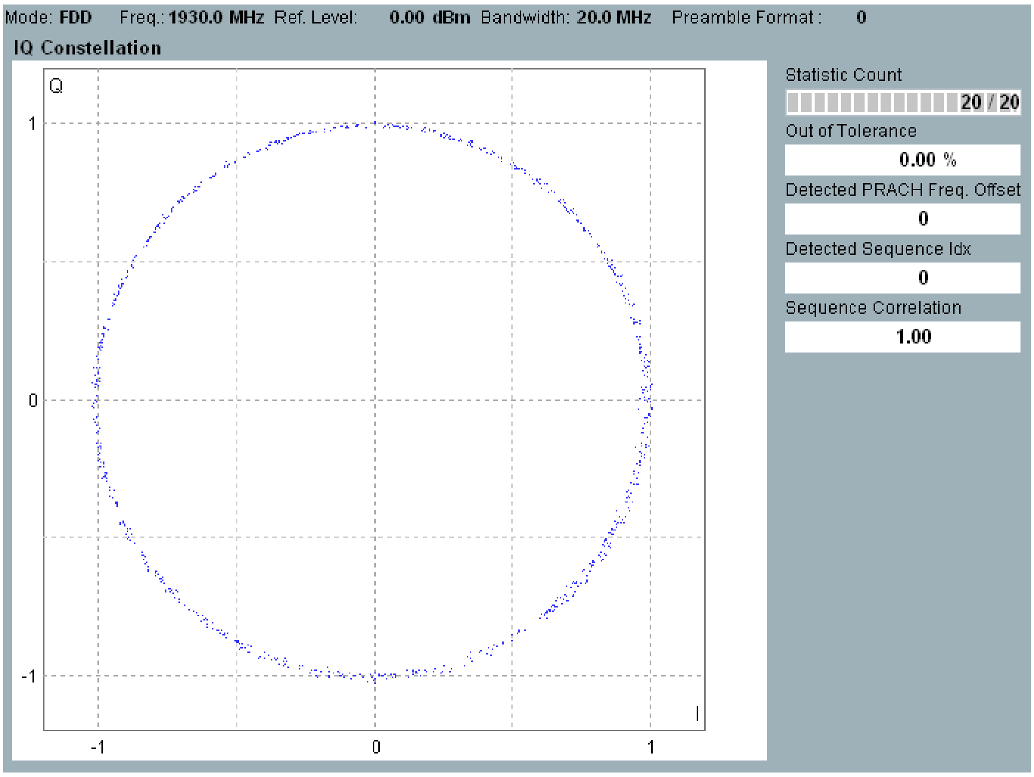


Figure 4-10: I/Q constellation diagram

The typical constellation diagram of a random access preamble shows 839 points (preamble format 4: 139 points) evenly distributed on a circle around the origin. The I/Q amplitudes correspond to the values that the R&S CMW uses for the EVM calculation: A possible I/Q origin offset is already subtracted out.

See also: "I/Q Constellation Diagram" in the R&S CMW base unit manual, chapter "System Overview"

For additional information, refer to Chapter 4.2.9.9, "Common View Elements", on page 916.

4.2.9.5 View Power Dynamics

This single-preamble view shows a diagram and a statistical overview of related power results.

Figure 4-11: Power Dynamics view

The diagram shows the UE output power vs. time, sampled with 48 T_s (1.5625 µs). The trace covers the range from -1100 µs to +2098.4375 µs relative to the start of the preamble.

The table below the diagram shows ON power and OFF power values. According to 3GPP, the ON power is the mean UE output power over the preamble, i.e. over the PRACH measurement period - see Table 4-3. In addition to this value, the table lists also the peak power within the measurement period. The ON power measurement period is marked by a green horizontal bar in the diagram.

The OFF power is the mean power in one subframe (1 ms) before and after the ON power measurement period. A transient period of 20 µs next to the ON power measurement period is excluded. The transient period is indicated by gray vertical bars in the diagram.

Table 4-3: Measurement period for ON power

Preamble format	Measurement period ON power (µs)
0	903.1
1	1484.4
2	1803.1
3	2284.4
4	147.9

Signal configuration

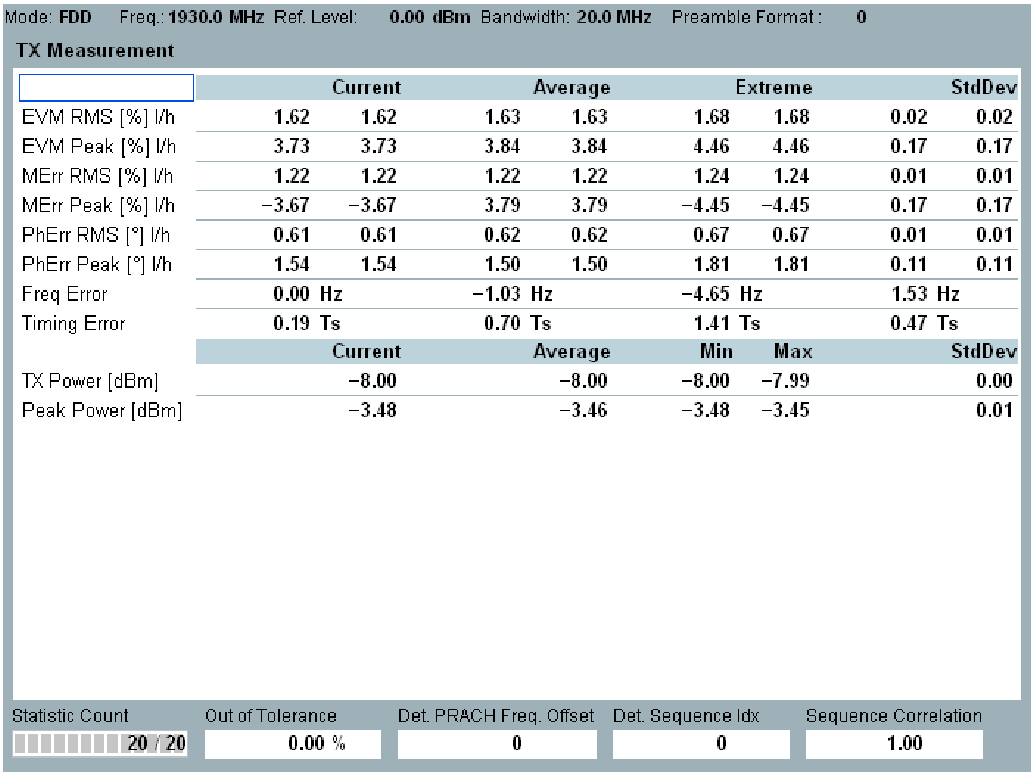
Ensure that two subframes before and after the preamble are off (OFF, OFF, preamble, OFF, OFF). This configuration guarantees that the measured "OFF Power (before)" is not falsified by power contributions of a preceding ON subframe ramped down too slowly. And that the "OFF Power (after)" is not falsified by a subsequent ON subframe ramped up too early.

You can check the first 100 µs of the trace to ensure that the second subframe before the preamble is off. For preamble formats 0 and 4, you can also check the end of the trace to ensure that the second subframe after the preamble is off.

For additional information, refer to Chapter 4.2.9.9, "Common View Elements", on page 916.

4.2.9.6 View TX Measurement

This single-preamble view contains tables of statistical results for the PRACH measurement.



	Current		Average		Extreme		StdDev	
EVM RMS [%] l/h	1.62	1.62	1.63	1.63	1.68	1.68	0.02	0.02
EVM Peak [%] l/h	3.73	3.73	3.84	3.84	4.46	4.46	0.17	0.17
MErr RMS [%] l/h	1.22	1.22	1.22	1.22	1.24	1.24	0.01	0.01
MErr Peak [%] l/h	−3.67	−3.67	3.79	3.79	−4.45	−4.45	0.17	0.17
PhErr RMS [°] l/h	0.61	0.61	0.62	0.62	0.67	0.67	0.01	0.01
PhErr Peak [°] l/h	1.54	1.54	1.50	1.50	1.81	1.81	0.11	0.11
Freq Error	0.00 Hz		−1.03 Hz		−4.65 Hz		1.53 Hz	
Timing Error	0.19 Ts		0.70 Ts		1.41 Ts		0.47 Ts	
	Current		Average		Min	Max	StdDev	
TX Power [dBm]		−8.00		−8.00	−8.00	−7.99		0.00
Peak Power [dBm]		−3.48		−3.46	−3.48	−3.45		0.01

Figure 4-12: TX measurement

The table provides an overview of statistical values obtained from the measured preamble. Other detailed views provide a subset of these values.

- EVM, magnitude error ("MErr"), phase error ("PhErr"):
  The R&S CMW calculates RMS and peak values for low and high EVM window position (l/h); see Chapter 4.2.6, "Calculation of Modulation Results", on page 903.

- Carrier frequency error: offset between the measured carrier frequency and the nominal RF frequency of the measured radio channel
- Timing error: Difference between the actual timing and the expected timing. The timing error measurement requires an "external" trigger signal to derive the expected timing.
  Suitable trigger signals are e.g. the PRACH trigger signal provided by the signaling application or an external trigger fed in at the TRIG A or TRIG B connector.
  The unit T_s stands for the basic LTE time unit, see Chapter 4.2.7.2, "Preambles in the Time Domain", on page 905.
- TX power: received power, RMS averaged over all samples within the preamble duration
- Peak power: peak power of all samples within the preamble duration

For additional information, refer to Chapter 4.2.9.9, "Common View Elements", on page 916.

4.2.9.7 Selecting and Modifying Views

Press the "Display" softkey to show hotkeys for view configuration. They change the appearance and contents of the active view. The following hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Select View ..."	Switch to a certain detailed view or overview. Alternatively select a diagram in the overview and press ENTER or the rotary knob.
"Select Trace ..."	Select the trace types to be displayed in the view.
"X Scale... / Y Scale..."	Modify the ranges of the X-axis and the Y-axis.

Additional options are available in the "Measurement Control" section of the configuration dialog.

4.2.9.8 Using Markers

Press the "Marker" softkey to show hotkeys for marker configuration. They activate markers and modify their position. The following hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Ref. Marker ..."	Enable or disable the reference marker and select the marker position. If several traces can be displayed, a trace can also be selected.
"Marker 1 /2 ..."	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker). Depending on the trace mode, a trace can also be selected.
"Select Trace Mode"	Define whether markers 1 and 2 are set to the same trace as the reference marker (collective) or to selectable individual traces.

See also: "Markers" in the R&S CMW base unit manual, chapter "System Overview"

4.2.9.9 Common View Elements

This section describes elements that are displayed in most views.

Tables

Most detailed views show tables providing a statistical evaluation of results obtained from the measured preamble. The statistical values in the tables are calculated as follows:

- **"Current":** Value of the result obtained in the last measurement interval. For some modulation results, an RMS value and a peak value are available. They are calculated as the average and peak of all samples in the measured preamble.
- **"Average":** Average of all "Current" values referenced to the last statistics cycle.
- **"Extreme", "Min", "Max":** Largest or smallest "Current" value that the R&S CMW obtained since the start of the measurement.
- **"StdDev":** Standard deviation of all "Current" values since the start of the measurement.

All statistical results (statistical tables and "Average" or "Max" traces) are calculated according to the general rules for statistical results.

See also: "Statistical Results" in the R&S CMW base unit manual, chapter "System Overview"

For description of individual table rows, see Chapter 4.2.9.5, "View Power Dynamics", on page 912.

Statistic Count

Progress bar for the measurement. During the first single shot after the start of the measurement, the bar shows the number of measured preambles relative to the configured "Statistic Count". A filled progress bar indicates that the first shot is complete and the statistical depth has been reached.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "System Overview"

Out of Tolerance

Percentage of measurement intervals (preambles) that were failed because they exceeded the limits in the diagram.

Detected PRACH Frequency Offset

The PRACH frequency offset determines the position of the six preamble RBs within the channel bandwidth. It is either detected automatically or selected manually, see "PRACH Frequency Offset" on page 921.

Detected Sequence Index

The sequence index identifies which of the 64 preamble sequences defined for the cell is used by the UE. It is either detected automatically or selected manually, see "Sequence Index" on page 923.

Sequence Correlation
The sequence correlation indicates the correlation between the ideal preamble sequence determined from the parameter settings and the measured preamble sequence. A value of 1 corresponds to perfect correlation. A value much smaller than 1 indicates that the searched preamble sequence was not found. In the latter case, check the parameter settings related to the preamble, see also Chapter 4.2.2, "How to Measure an Uplink PRACH Signal", on page 900.

4.3 GUI Reference

The following sections provide detailed reference information on the graphical user interface (GUI) and the parameters of the LTE PRACH measurement.

- Measurement Control..917
- Parameters and Settings..917
- Measurement Results..928

4.3.1 Measurement Control

To turn the measurement on or off, select the control softkey and press ON | OFF or RESTART | STOP. Alternatively, right-click the control softkey.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "System Overview"

PRACH (Softkey)
The softkey shows the current measurement state. Additional measurement substates can be retrieved via remote control.

Remote command:
`INITiate:LTE:MEAS<i>:PRACh`
`STOP:LTE:MEAS<i>:PRACh`
`ABORt:LTE:MEAS<i>:PRACh`
`FETCh:LTE:MEAS<i>:PRACh:STATe?`
`FETCh:LTE:MEAS<i>:PRACh:STATe:ALL?`

4.3.2 Parameters and Settings

The most important settings of the "LTE PRACH" measurement are displayed at the top of the measurement dialog.

All settings are defined via softkeys and hotkeys or using the main configuration dialog. The configuration dialog is described in the following sections. To open the dialog, select the "PRACH" tab and press the "Config" hotkey.

4.3.2.1 Signal Routing and Analyzer Settings

The following parameters configure the RF input path. All parameters are common measurement settings, i.e. they have the same value in all measurements (for example PRACH measurement and multi-evaluation measurement).

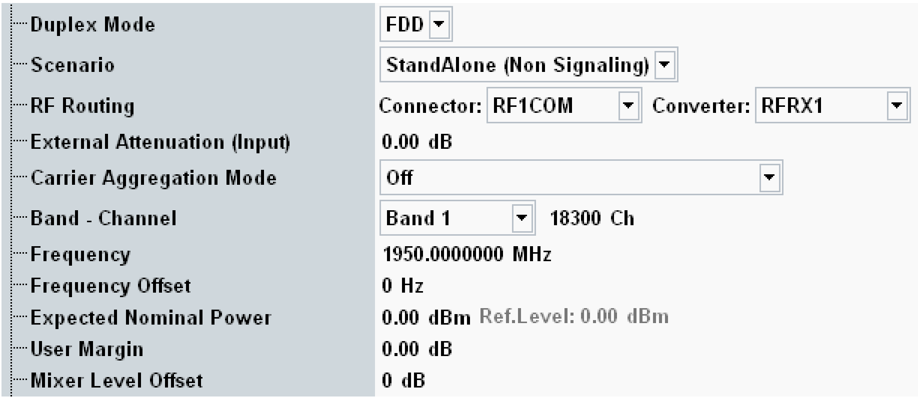


Figure 4-13: Signal routing and analyzer settings

For a description of the settings, see Chapter 3.3.3, "Signal Routing and Analyzer Settings", on page 679.

4.3.2.2 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the LTE PRACH measurement and inform the measurement about preamble-related signal properties normally determined by higher layers.

The "Measurement Control" section consists of a general part (see below), a part with Modulation Settings and a part with Power Settings.

While the combined signal path scenario is active, some of the measurement control parameters display values determined by the controlling signaling application. For these parameters, a hint is given in the parameter description. See also "Scenario = Combined Signal Path" on page 680.

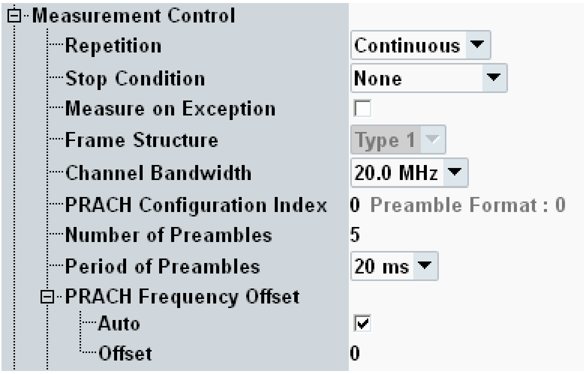


Figure 4-14: Measurement Control settings - general part

Repetition....919
Stop Condition....919
Measure on Exception....920
Frame Structure....920
Channel Bandwidth....920
PRACH Configuration Index....920
Number of Preambles....920
Period of Preambles....921
PRACH Frequency Offset....921

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

`CONFigure:LTE:MEAS<i>:PRACh:REPetition`

Stop Condition

Specifies the conditions for an early termination of the measurement:

- **"None":** The measurement is performed according to its "Repetition" mode and "Statistic Count", irrespective of the limit check results.
- **"On Limit Failure":** The measurement is stopped when one of the limits is exceeded, irrespective of the repetition mode set. If no limit failure occurs, it is performed according to its "Repetition" mode and "Statistic Count". Use this setting for measurements that are intended for checking limits, e.g. production tests.

Remote command:

`CONFigure:LTE:MEAS<i>:PRACh:SCONdition`

Measure on Exception

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected. A faulty result occurs e.g. when an overload is detected. In remote control, the cause of the error is indicated by the "reliability indicator".

- **Off:** Faulty results are rejected. The measurement is continued; the statistical counters are not reset. Use this mode to ensure that a single faulty result does not affect the entire measurement.
- **On:** Results are never rejected. Use this mode e.g. for development purposes, if you want to analyze the reason for occasional wrong transmissions.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:MOEXception`

Frame Structure

Displays the frame structure of the uplink signal as defined in 3GPP TS 36.211. The value is set implicitly via the Duplex Mode ("Type 1" = FDD, "Type 2" = TDD).

Remote command:
`CONFigure:LTE:MEAS<i>:FSTRucture?`

Channel Bandwidth

Channel bandwidth in the range 1.4 MHz to 20 MHz. Set the bandwidth in accordance with the measured LTE signal.

The parameter is a common measurement setting, i.e. it has the same value in all measurements (e.g. PRACH measurement and multi-evaluation measurement).

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth` (SA)
`CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL` (CSP)

PRACH Configuration Index

Specifies the PRACH configuration used by the UE. The PRACH configuration defines the preamble format and other signal properties, e.g. which resources in the time domain are allowed for transmission of preambles. The resulting preamble format is displayed for information.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

For background information, see Chapter 4.2.7, "LTE PRACH UL Signal Properties", on page 904.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:PCINdex` (SA)
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD` (CSP)
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD` (CSP)

Number of Preambles

Specifies the number of preambles to be captured per measurement interval for multi-preamble result views, e.g. "EVM vs Preamble" and "Power vs Preamble".

Single-preamble views evaluate only one preamble per measurement interval. To achieve maximum measurement speed for these views, set this parameter to 1.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:NOPReambles`

Period of Preambles
Specifies the periodicity of preambles to be captured for multi-preamble result views.

See also Chapter 4.2.3, "Defining the Scope of the Measurement", on page 900.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:POPReambles`

PRACH Frequency Offset
Enable "Auto" to detect the frequency offset automatically or disable "Auto" and specify the frequency offset used by the UE. A manual configuration of the frequency offset can speed up the measurement.

The frequency offset is required to calculate the location of the six preamble resource blocks (RB) within the channel bandwidth. For FDD, the number of the first RB equals the offset. For TDD, it is calculated from this parameter and the parameter frequency resource index as described in 3GPP TS 36.211 section 5.7.1 "Time and frequency structure".

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

For background information, see Chapter 4.2.7.1, "Preambles in the Frequency Domain", on page 904.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:PFOFfset:AUTO`
`CONFigure:LTE:MEAS<i>:PRACh:PFOFfset` (SA)
`CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset` (CSP)

4.3.2.3 Modulation Settings

The following parameters configure the modulation settings of the LTE PRACH measurement.

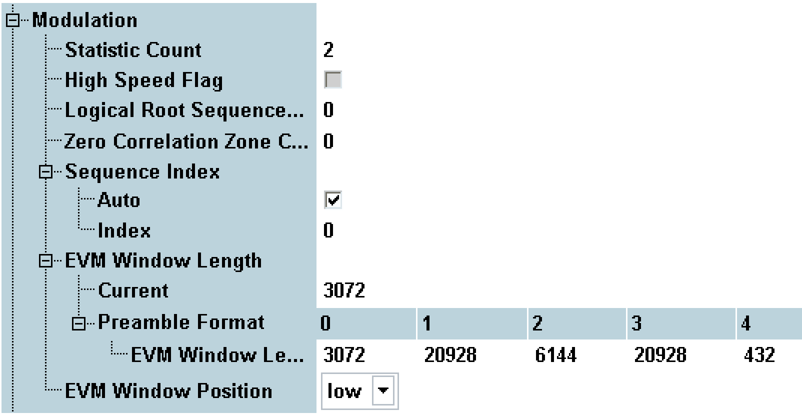


Figure 4-15: Modulation settings

Statistic Count...922
High Speed Flag...922
Logical Root Sequence Index...923
Zero Correlation Zone Config...923
Sequence Index...923
EVM Window Length...923
EVM Window Position...924

Statistic Count

Defines the number of measurement intervals per measurement cycle (statistics cycle, single-shot measurement). This value is also relevant for continuous measurements, because the averaging procedures depend on the statistic count.

For single-preamble modulation measurements, the measurement interval is completed when the R&S CMW has measured one full preamble (cyclic prefix + preamble sequence). The preamble length depends on the preamble format, see Chapter 4.2.7.2, "Preambles in the Time Domain", on page 905.

For multi-preamble measurements, the measurement interval is completed when the configured number of preambles has been measured, see "Number of Preambles" on page 920.

The measurement provides independent statistic counts for modulation results and power dynamics results. In single-shot mode and with a shorter modulation statistic count, the modulation evaluation is stopped while the R&S CMW still continues providing new power dynamics results.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:SCOunt:MODulation`

High Speed Flag

Determines whether the restricted or the unrestricted set of N_{CS} values is used for preamble generation. This software version supports only the unrestricted set (high-speed flag disabled).

For background information, see Chapter 4.2.7.3, "Preamble Sequences", on page 905.

Remote command:
n/a

Logical Root Sequence Index
Specifies the logical root sequence index to be used for generation of the preamble sequence. Set this parameter to the value used by the UE.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

For background information, see Chapter 4.2.7.3, "Preamble Sequences", on page 905.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:MODulation:LRSindex` (SA)
`CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex` (CSP)

Zero Correlation Zone Config
This parameter determines which N_{CS} value of an N_{CS} set is used for generation of the preamble sequence. Set this parameter to the value used by the UE.

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

For background information, see Chapter 4.2.7.3, "Preamble Sequences", on page 905.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:MODulation:ZCZConfig` (SA)
`CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig` (CSP)

Sequence Index
Enable "Auto" to detect the sequence index automatically or disable "Auto" and specify the sequence index used by the UE. A manual configuration of the sequence index can speed up the measurement.

The sequence index specifies which of the 64 preamble sequences of the cell is used by the UE.

For background information, see Chapter 4.2.7.3, "Preamble Sequences", on page 905.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex:AUTO`
`CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex`

EVM Window Length
Length of the EVM window in samples. The standard (3GPP TS 36.101, annex F) specifies the window length as a function of the preamble format.

The R&S CMW uses the "Current" value. This value is linked to the value in the table, corresponding to the current preamble format.

The window length defines the two sets of "l / h" modulation quantities in the result tables; see Chapter 4.2.6, "Calculation of Modulation Results", on page 903.

The minimum value of one FFT symbol actually corresponds to a window of zero length so that $EVM_h = EVM_l$.

Remote command:
CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWLength

EVM Window Position
Position of the EVM window used for calculation of the trace results. While result tables show both the results for low and high EVM window position, the diagram results are only determined for the selected window position.

Remote command:
CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWPosition

4.3.2.4 Power Settings

The following parameters configure the power settings of the LTE PRACH measurement.

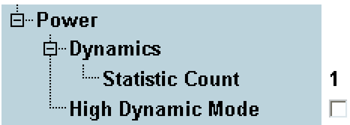


Figure 4-16: Power settings

Dynamics > Statistic Count
Defines the number of measurement intervals per measurement cycle (statistics cycle, single-shot measurement). This value is also relevant for continuous measurements, because the averaging procedures depend on the statistic count.

For power dynamics measurements, the measurement interval is completed when the R&S CMW has measured one preamble plus the preceding and the following power OFF time.

The measurement provides independent statistic counts for modulation results and power dynamics results. In single-shot mode and with a shorter modulation statistic count, the modulation evaluation is stopped while the R&S CMW still continues providing new power dynamics results.

Remote command:
CONFigure:LTE:MEAS<i>:PRACh:SCOunt:PDYNamics

High Dynamic Mode
Enables or disables the high dynamic mode.

The high dynamic mode is suitable for power dynamics measurements involving high ON powers. In that case, the dynamic range of the R&S CMW is eventually not sufficient to measure both the high ON powers and the low OFF powers accurately.

In high dynamic mode, the dynamic range is increased by measuring the results in two shots. One shot uses the configured settings to measure the ON power. The other shot uses a lower "Expected Nominal Power" value to measure the OFF power results.

Disable the high dynamic mode to optimize the measurement speed. Disable it especially if you are not interested in power dynamics results or if you measure low ON powers using a low "Expected Nominal Power" setting.

While the combined signal path scenario is active, this parameter is not configurable.

Remote command:
`CONFigure:LTE:MEAS<i>:PRACh:POWer:HDMode`

4.3.2.5 Trigger Settings

The "Trigger" parameters configure the trigger system for the LTE PRACH measurement.

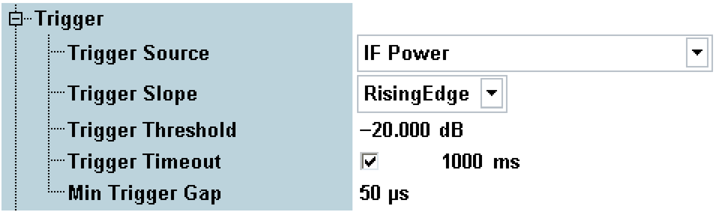


Figure 4-17: Trigger settings

Trigger Source.......925
Trigger Slope.......925
Trigger Threshold.......926
Trigger Timeout.......926
Min Trigger Gap.......926

Trigger Source

Selects the source of the trigger event. Some of the trigger sources require additional options.

"IF Power" The measurement is triggered by the power of the received signal, converted into an IF signal. The trigger event coincides with the rising or falling edge of the detected LTE burst (i.e. the start or end of the preamble for a PRACH UL signal). Parameter Min Trigger Gap is also relevant.

"…External…" External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument (availability depends on instrument model).

Remote command:
`TRIGger:LTE:MEAS<i>:PRACh:SOURce`
`TRIGger:LTE:MEAS<i>:PRACh:CATalog:SOURce?`

Trigger Slope

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse. This setting has no influence on the evaluation of trigger pulses provided by other firmware applications.

Remote command:
`TRIGger:LTE:MEAS<i>:PRACh:SLOPe`

Trigger Threshold
Defines the input signal power where the trigger condition is satisfied and a trigger event is generated. The trigger threshold is valid for power trigger sources. It is a dB value, relative to the reference level minus the external attenuation ("<Ref. Level> – <External Attenuation (Input)> – <Frequency Dependent External Attenuation>"). If the reference level equals the maximum output power of the DUT and the external attenuation settings are correct, the trigger threshold is relative to the maximum input power.

A low threshold can be required to ensure that the R&S CMW can always detect the input signal. A higher threshold can prevent unintended trigger events.

Remote command:
`TRIGger:LTE:MEAS<i>:PRACh:THReshold`

Trigger Timeout
Sets a time after which an initiated measurement must have received a trigger event. If no trigger event is received, a trigger timeout is indicated in manual operation mode. In remote control mode, the measurement is automatically stopped. The parameter can be disabled so that no timeout occurs.

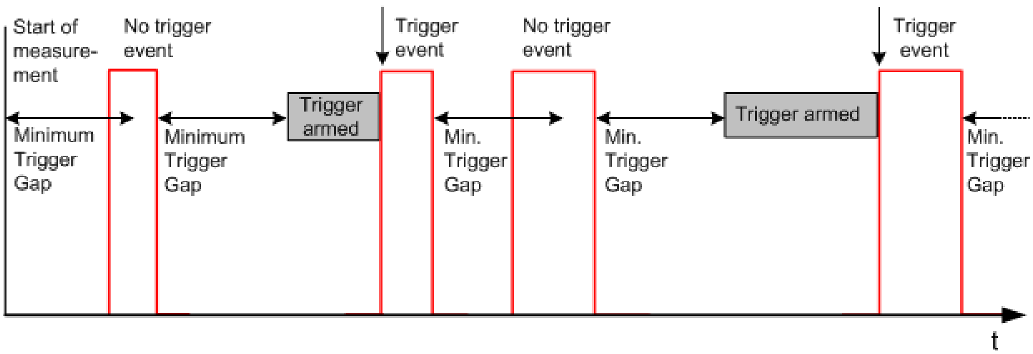
Remote command:
`TRIGger:LTE:MEAS<i>:PRACh:TOUT`

Min Trigger Gap
Defines a minimum duration of the power-down periods (gaps) between two triggered power pulses. This setting is valid for an "(IF) Power" trigger source.

The trigger system is controlled by a timer which is reset to zero in the following instances:

- At the IF power-down ramp of each triggered or untriggered pulse, even if the previous counter has not yet elapsed. A power-down ramp is detected when the signal power falls below the trigger threshold.
- At the beginning of each measurement. The minimum gap defines the minimum time between the start of the measurement and the first trigger event.

The trigger system is rearmed when the timer has reached the specified minimum gap.



This parameter can be used to prevent unwanted trigger events due to fast power variations within a preamble.

The minimum trigger gap must be large enough to ensure that the measurement is not retriggered within a preamble. It must be small enough to ensure that the trigger system is rearmed before the next preamble starts. The default value is often appropriate.

Remote command:
TRIGger:LTE:MEAS<i>:PRACh:MGAP

4.3.2.6 Limit Settings

The "Limits" section in the "LTE PRACH Configuration" dialog defines upper limits for the modulation and power results.

For details, see Chapter 4.2.8, "Limit Settings and Conformance Requirements", on page 906.

Figure 4-18: Limit settings

Limits
The limits can be configured via the following remote commands.

Remote command:
CONFigure:LTE:MEAS<i>:PRACh:LIMit:EVMagnitude
CONFigure:LTE:MEAS<i>:PRACh:LIMit:MERRor
CONFigure:LTE:MEAS<i>:PRACh:LIMit:PERRor
CONFigure:LTE:MEAS<i>:PRACh:LIMit:FERRor
CONFigure:LTE:MEAS<i>:PRACh:LIMit:PDYNamics

4.3.2.7 Shortcut Configuration

This section configures a shortcut softkey that provides a fast way to access the GPRF generator from the measurement.

The setting is a common measurement setting. It has the same value in all measurements (e.g. PRACH measurement and multi-evaluation measurement).

Figure 4-19: Shortcut configuration

Generator Shortcut
Selects a GPRF generator instance. Softkeys for the selected instance are added to the softkey panel.

4.3.2.8 Additional Softkeys and Hotkeys

See Chapter 3.3.9, "Additional Softkeys and Hotkeys", on page 707

4.3.3 Measurement Results

The results of the LTE PRACH measurement are displayed in several different views.

For a detailed description, see Chapter 4.2.9, "Measurement Results", on page 908.

The PRACH measurement provides an overview dialog and a detailed view for each diagram in the overview. The overview dialog shows modulation and I/Q constellation results as diagrams. A selection of statistical results is also shown.

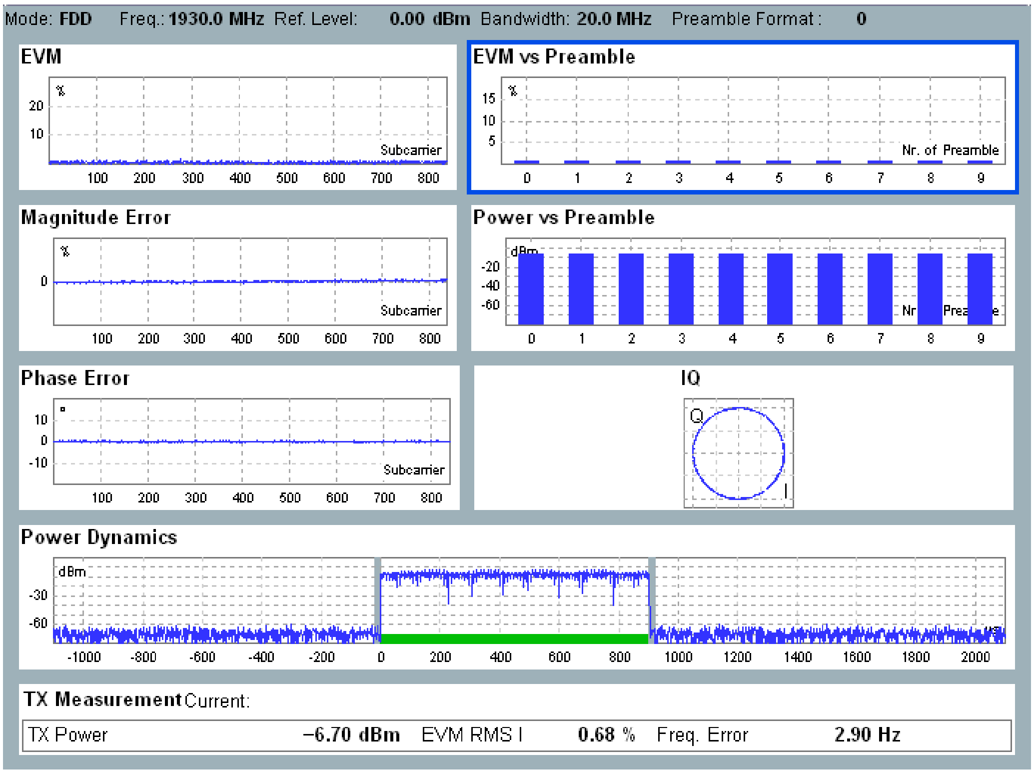


Figure 4-20: LTE PRACH: Overview

Most of the detailed views show a diagram and a statistical overview of single-slot results.

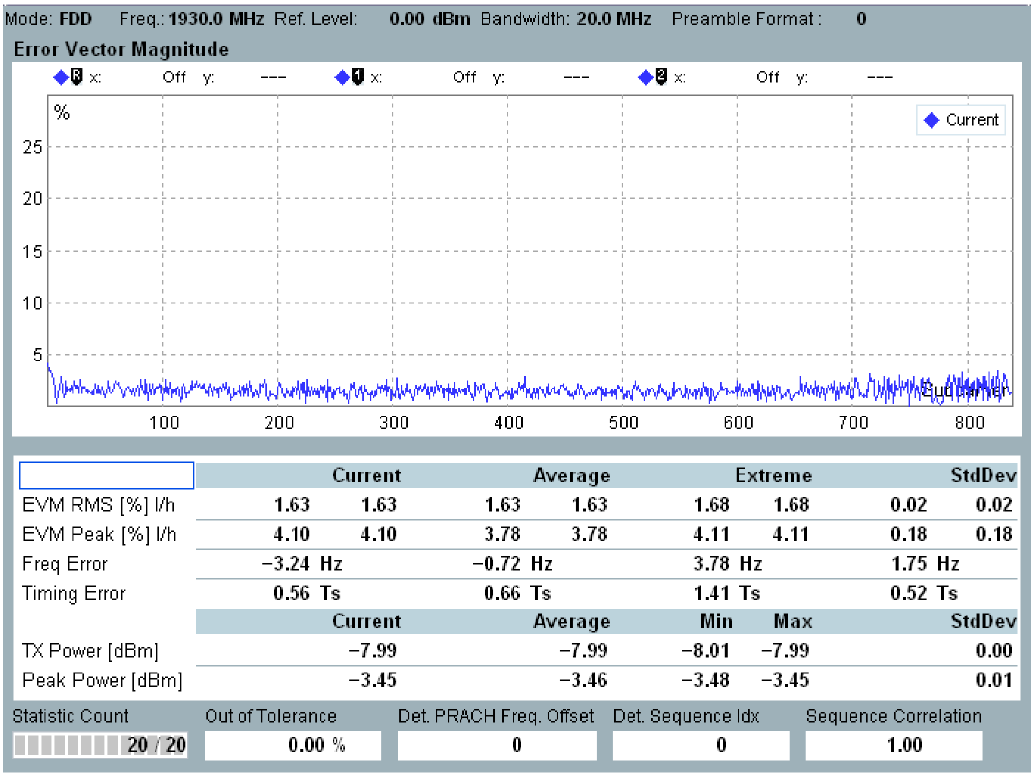


Figure 4-21: LTE PRACH: EVM

Traces and Bar Graphs

The results can be retrieved via the following remote commands.

Remote command:
`FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:CURRent?` etc.
`FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:CURRent?` etc.
`FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:CURRent?` etc.
`FETCh:LTE:MEAS<i>:PRACh:TRACe:EVPReamble?` etc.
`FETCh:LTE:MEAS<i>:PRACh:TRACe:PVPReamble?` etc.
`FETCh:LTE:MEAS<i>:PRACh:TRACe:IQ?`
`FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:CURRent?` etc.

Statistical Overviews and other Single Values

The results can be retrieved via the following remote commands.

Remote command:
`FETCh:LTE:MEAS<i>:PRACh:MODulation:CURRent?` etc.
`FETCh:LTE:MEAS<i>:PRACh:MODulation:EXTReme?` etc.
`FETCh:LTE:MEAS<i>:PRACh:MODulation:PREamble<Number>?` etc.
`FETCh:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?` etc.
`FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset?`
`FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex?`
`FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation?`
`FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset:PREamble<Number>?`

FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex:PREamble<Number>?
FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation:
PREamble<Number>?

4.4 Programming

The following sections provide programming examples for the LTE PRACH measurement.

See also: "Remote Control" in the R&S CMW base unit manual

- Key Features....930
- Specifying General and Common Measurement Settings....930
- Specifying Required PRACH Settings....931
- Specifying Measurement-Specific Settings....931
- Configuring the Trigger System....932
- Specifying Limits....932
- Performing Single-Shot Measurements....933
- Single-Shot and Continuous Measurements....934

4.4.1 Key Features

The LTE PRACH measurement is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...LTE:MEAS:PRACh...`
- Use general commands of the type `...:LTE:MEAS...` (no `:PRACh` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off. Use `READ:LTE:MEAS:PRACh...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:LTE:MEAS:PRACh` and retrieve the results using `FETCh:LTE:MEAS:PRACh...?`.
- For synchronization and proper decoding, some UE signal settings must be in accordance with the measured signal; see Chapter 4.4.3, "Specifying Required PRACH Settings", on page 931.

4.4.2 Specifying General and Common Measurement Settings

```
// *****************************************************************************
// Initial system-reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing and perform RF and analyzer settings:
```

```
// Carrier center frequency 1850 MHz, frequency offset 1 kHz, peak power 7 dBm,
// 5 dB user margin and 1 dB mixer level offset.
// *****************************************************************************
ROUTe:LTE:MEAS:SCENario:SALone RF1C, RX1
CONFigure:LTE:MEAS:RFSettings:EATTenuation 2
CONFigure:LTE:MEAS:RFSettings:FREQuency 1850E+6
CONFigure:LTE:MEAS:RFSettings:FOFFset 1000
CONFigure:LTE:MEAS:RFSettings:ENPower 7
CONFigure:LTE:MEAS:RFSettings:UMARgin 5
CONFigure:LTE:MEAS:RFSettings:MLOFfset 1

// *****************************************************************************
// Set duplex mode TDD and query the resulting frame structure type (T2).
// Specify channel bandwidth 1.4 MHz.
// *****************************************************************************
CONFigure:LTE:MEAS:DMODe TDD
CONFigure:LTE:MEAS:FSTRucture?
CONFigure:LTE:MEAS:CBANdwidth B014
```

4.4.3 Specifying Required PRACH Settings

```
// *****************************************************************************
// Specify required UE signal settings: PRACH configuration index 1,
// logical root sequence index 50, zero correlation zone config 3.
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:PCINdex 1
CONFigure:LTE:MEAS:PRACh:MODulation:LRSindex 50
CONFigure:LTE:MEAS:PRACh:MODulation:ZCZConfig 3
```

4.4.4 Specifying Measurement-Specific Settings

```
// *****************************************************************************
// Define stop condition (stop on limit failure), statistic counts (20 cycles),
// error handling, number and period of preambles. Enable high dynamic mode.
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:SCONdition SLFail
CONFigure:LTE:MEAS:PRACh:SCOunt:MODulation 20
CONFigure:LTE:MEAS:PRACh:SCOunt:PDYNamics 20
CONFigure:LTE:MEAS:PRACh:MOEXception ON
CONFigure:LTE:MEAS:PRACh:TOUT 3600
CONFigure:LTE:MEAS:PRACh:NOPReambles 10
CONFigure:LTE:MEAS:PRACh:POPReambles MS20
CONFigure:LTE:MEAS:PRACh:POWer:HDMode ON

// *****************************************************************************
// Disable automatic detection of the PRACH frequency offset and
// specify it manually.
// *****************************************************************************
```

```
CONFigure:LTE:MEAS:PRACh:PFOFfset:AUTO OFF
CONFigure:LTE:MEAS:PRACh:PFOFfset 0

// *****************************************************************************
// Disable automatic detection of the preamble sequence index and
// specify it manually.
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:MODulation:SINDex:AUTO OFF
CONFigure:LTE:MEAS:PRACh:MODulation:SINDex 5

// *****************************************************************************
// Specify EVM window length for all preamble formats.
// Correct EVM window length for preamble format 2.
// Specify the EVM window position for traces.
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:MODulation:EWLength 1500,10000,3000,10000,200
CONFigure:LTE:MEAS:PRACh:MODulation:EWPosition HIGH
```

4.4.5 Configuring the Trigger System

```
// *****************************************************************************
// Set trigger source, slope, threshold, timeout and minimum trigger gap.
// *****************************************************************************
TRIGger:LTE:MEAS:PRACh:SOURce 'IF Power'
TRIGger:LTE:MEAS:PRACh:SLOPe FEDGe
TRIGger:LTE:MEAS:PRACh:THReshold -30
TRIGger:LTE:MEAS:PRACh:TOUT 1
TRIGger:LTE:MEAS:PRACh:MGAP 0.00006
```

4.4.6 Specifying Limits

```
// *****************************************************************************
// Define modulation limits.
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:LIMit:EVMagnitude 20, 40
CONFigure:LTE:MEAS:PRACh:LIMit:MERRor 20, OFF
CONFigure:LTE:MEAS:PRACh:LIMit:PERRor 20, OFF
CONFigure:LTE:MEAS:PRACh:LIMit:FERRor 150

// *****************************************************************************
// Define power dynamics limits.
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:LIMit:PDYNamics ON,6.8,-8.8,-48.8
```

4.4.7 Performing Single-Shot Measurements

```
// ****************************************************************************
// Enable all measurements.
// ****************************************************************************
CONFigure:LTE:MEAS:PRACh:RESult:ALL ON,ON,ON,ON,ON,ON,ON,ON

// ****************************************************************************
// Start single-shot measurement, return average EVM trace.
// Query the measurement state (should be "RDY").
// ****************************************************************************
READ:LTE:MEAS:PRACh:TRACe:EVM:AVERage?
FETCh:LTE:MEAS:PRACh:STATe?

// ****************************************************************************
// Retrieve detected PRACH frequency offset, sequence index and
// sequence correlation for single-preamble measurements and for
// preamble number four of multi-preamble measurements.
// ****************************************************************************
FETCh:LTE:MEAS:PRACh:MODulation:DPFoffset?
FETCh:LTE:MEAS:PRACh:MODulation:DSINdex?
FETCh:LTE:MEAS:PRACh:MODulation:SCORrelation?
FETCh:LTE:MEAS:PRACh:MODulation:DPFoffset:PREamble4?
FETCh:LTE:MEAS:PRACh:MODulation:DSINdex:PREamble4?
FETCh:LTE:MEAS:PRACh:MODulation:SCORrelation:PREamble4?

// ****************************************************************************
// Read other traces obtained in the last
// measurement without re-starting the measurement.
// ****************************************************************************
FETCh:LTE:MEAS:PRACh:TRACe:MERRor:AVERage?
FETCh:LTE:MEAS:PRACh:TRACe:MERRor:MAXimum?
FETCh:LTE:MEAS:PRACh:TRACe:PERRor:AVERage?
FETCh:LTE:MEAS:PRACh:TRACe:PERRor:MAXimum?
FETCh:LTE:MEAS:PRACh:TRACe:EVPReamble?
FETCh:LTE:MEAS:PRACh:TRACe:PVPReamble?
FETCh:LTE:MEAS:PRACh:TRACe:IQ?
FETCh:LTE:MEAS:PRACh:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS:PRACh:TRACe:PDYNamics:MAXimum?

// ****************************************************************************
// Read single value results obtained in the last measurement
// without re-starting the measurement.
// ****************************************************************************
FETCh:LTE:MEAS:PRACh:MODulation:AVERage?
FETCh:LTE:MEAS:PRACh:MODulation:EXTReme?
FETCh:LTE:MEAS:PRACh:MODulation:PREamble4?
FETCh:LTE:MEAS:PRACh:PDYNamics:AVERage?
FETCh:LTE:MEAS:PRACh:PDYNamics:MINimum?
FETCh:LTE:MEAS:PRACh:PDYNamics:MAXimum?
```

```
// *****************************************************************************
// Read limit check results obtained in the last measurement
// without re-starting the measurement.
// *****************************************************************************
CALCulate:LTE:MEAS:PRACh:MODulation:AVERage?
CALCulate:LTE:MEAS:PRACh:MODulation:EXTReme?
CALCulate:LTE:MEAS:PRACh:PDYNamics:AVERage?
CALCulate:LTE:MEAS:PRACh:PDYNamics:MINimum?
CALCulate:LTE:MEAS:PRACh:PDYNamics:MAXimum?
```

4.4.8 Single-Shot and Continuous Measurements

```
// *****************************************************************************
// Start single-shot measurement, return magnitude error trace,
// return phase error trace (without repeating the measurement).
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:LTE:MEAS:PRACh
FETCh:LTE:MEAS:PRACh:TRACe:MERRor:AVERage?
FETCh:LTE:MEAS:PRACh:TRACe:PERRor:AVERage?
FETCh:LTE:MEAS:PRACh:STATe?

// *****************************************************************************
// Start continuous measurement and wait for 5 ms.
// Return average EVM trace.
// Query measurement state and substates (should be "RUN,ADJ,ACT").
// *****************************************************************************
CONFigure:LTE:MEAS:PRACh:REPetition CONTinuous
INIT:LTE:MEAS:PRACh
Pause 5000
FETCh:LTE:MEAS:PRACh:TRACe:EVM:AVERage?
FETCh:LTE:MEAS:PRACh:STATe:ALL?
```

4.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the "LTE PRACH" measurement.

- Conventions and General Information... 935
- General Measurement Settings.. 939
- PRACH Measurement Commands.. 939
- Combined Signal Path Commands..968

4.5.1 Conventions and General Information

The following sections describe the most important conventions and general information concerning the command reference.

4.5.1.1 MEAS<i>

MEAS<i> is used as abbreviation of "MEASurement<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW base unit manual, chapter "Remote Control"

4.5.1.2 FETCh, READ and CALCulate Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.
- `CALCulate...` returns one limit check result per `FETCh` result:
  - **OK**: The `FETCh` result is located within the limits or no limit has been defined/ enabled for this result.
  - **ULEU** ("User limit exceeded upper"): An upper limit is violated. The `FETCh` result is located above the limit.
  - **ULEL** ("User limit exceeded lower"): A lower limit is violated. The `FETCh` result is located below the limit.

See also: "Retrieving Measurement Results" in the R&S CMW base unit manual, chapter "Remote Control"

4.5.1.3 Current and Statistical Results

The R&S CMW repeats measurements according to the selected statistic count and repetition mode. Consecutive measurement values are stored and used to calculate statistical results, e.g. average, minimum, maximum and standard deviation.

See also: "Statistical Results" in the R&S CMW base unit manual, chapter "System Overview"

4.5.1.4 Keywords

Selected keywords used in the command description are described in the following.

- **Command usage**
  If the usage is not explicitly stated, the command allows you to set parameters and query parameters. Otherwise the command usage is stated as follows:
  – "Setting only": Command can only be used to set parameters.
  – "Query only": Command can only be used to query parameters.
  – "Event": Command initiates an event.
- **Parameter usage**
  The parameter usage is indicated by the keyword preceding the parameters:
  – "Parameters" are sent with a setting or query command and are returned as the result of a query
  – "Setting parameters" are only sent with a setting command
  – "Query parameters" are only sent with a query command (to refine the query)
  – "Return values" are only returned as the result of a query
- **Firmware/Software:**
  Indicates the lowest software version supporting the command. Command enhancements in later software versions are also indicated.

4.5.1.5 Reliability Indicator

The first value in the output arrays of `FETCh...?`, `READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 ("OK")**:
  Measurement values available, no error detected.
- **1 ("Measurement Timeout")**:
  The measurement has been stopped after the configured measurement timeout. Measurement results can be available. However, at least a part of the measurement provides only `INValid` results or has not completed the full statistic count.
- **2 ("Capture Buffer Overflow")**:
  The measurement configuration results in a capture length that exceeds the available memory.
- **3 ("Overdriven") / 4 ("Underdriven")**:
  The accuracy of measurement results can be impaired because the input signal level was too high / too low.
- **6 ("Trigger Timeout")**:
  The measurement could not be started or continued because no trigger event was detected.
- **7 ("Acquisition Error")**:
  The R&S CMW could not properly decode the RF input signal.

- **8 ("Sync Error")**:
  The R&S CMW could not synchronize to the RF input signal.
- **9 ("Uncal")**:
  Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 ("Reference Frequency Error")**:
  The instrument has been configured to use an external reference signal. But the reference oscillator could not be phase-locked to the external signal (for example signal level too low, frequency out of range or reference signal not available at all).
- **16 ("RF Not Available")**:
  The measurement could not be started because the configured RF input path was not active. This problem can occur for example if a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 ("RF Level not Settled") / 18 ("RF Frequency not Settled")**:
  The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 ("Call not Established")**:
  For measurements: The measurement could not be started because no signaling connection to the DUT was established.
  For DAU IMS service: Establishing a voice over IMS call failed.
- **20 ("Call Type not Usable")**:
  For measurements: The measurement could not be started because the established signaling connection had wrong properties.
  For DAU IMS service: The voice over IMS settings could not be applied.
- **21 ("Call Lost")**:
  For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
  For DAU IMS service: The voice over IMS call was lost.
- **23 ("Missing Option")**:
  The ARB file cannot be played by the GPRF generator due to a missing option.
- **24 ("Invalid RF Setting")**:
  The desired RF TX level or RF RX reference level could not be applied.
- **26 ("Resource Conflict")**:
  The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
  Stop the application that has allocated the conflicting resources and try again.
- **27 ("No Sensor Connected")**:
  The GPRF external power sensor measurement could not be started due to missing power sensor.
- **28 ("Unexpected Parameter Change")**:
  One or more measurement configuration parameters were changed while the measurement completed. The results were not obtained with these new parameter values. Repeat the measurement. This situation can only occur in remote single-shot mode.

- **30 ("File not Found")**:
  The specified file could not be found.
- **31 ("No DTM reply")**:
  The EUT did not reply to the direct test mode (DTM) command.
- **32 ("ACL Disconnected")**:
  The ACL connection has been disconnected or lost.
- **40 ("ARB File CRC Error")**:
  The cyclic redundancy check of the ARB file failed. The ARB file is corrupt and not reliable.
- **42 ("ARB Header Tag Invalid")**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 ("ARB Segment Overflow")**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 ("ARB File not Found")**:
  The selected ARB file could not be found.
- **45 ("ARB Memory Overflow")**:
  The ARB file length is greater than the available memory.
- **46 ("ARB Sample Rate out of Range)"**:
  The clock rate of the ARB file is either too high or too low.
- **47 ("ARB Cycles out of Range")**:
  The repetition mode equals "Single Shot" and the playback length is greater than 40 s. Reduce the playback length or set the repetition mode to "Continuous".
  *<Length> = (<Cycles> * <Samples> + <Additional Samples>) / <Clock Rate>*
- **50 ("Startup Error")**:
  The data application unit (DAU), a DAU service or a DAU measurement could not be started. Execute a DAU selftest.
- **51 ("No Reply")**:
  The DAU has received no response, for example for a ping request.
- **52 ("Connection Error")**:
  The DAU could not establish a connection to internal components. Restart the instrument.
- **53 ("Configuration Error")**:
  The current DAU configuration is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 ("Filesystem Error")**:
  The hard disk of the DAU is full or corrupt. Execute a DAU selftest.
- **60 ("Invalid RF-Connector Setting")**
  The individual segments of a list mode measurement with R&S CMWS use different connector benches. All segments must use the same bench.
  Check the "Info" dialog for the relevant segment numbers.
- **93 ("OCXO Oven Temperature too low")**:
  The accuracy of measurement results can be impaired because the oven-controlled crystal oscillator has a too low temperature. After switching-on the instrument, the OCXO requires a warm-up phase to reach its operating temperature.
- **101 ("Firmware Error")**:

Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.

If the error occurs again, consider the following hints:

– Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.
– If a software package (update) has not been properly installed, this failure is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".
– Check for software updates correcting the error. Updates are for example provided in the CMW customer web on GLORIS (registration required): https://extranet.rohde-schwarz.com.

If you get firmware errors even with the properly installed latest software version, send a problem report including log files to Rohde & Schwarz.

- **102 ("Unidentified Error")**:
  Indicates an error not covered by other reliability values. For troubleshooting, follow the steps described for "101 (Firmware Error)".
- **103 ("Parameter Error")**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.
  If you need assistance to localize the conflicting parameter settings, contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).
- **104 ("Not Functional")**:
  The application could not be started with the configured parameter set.

4.5.2 General Measurement Settings

The commands valid for all LTE measurements are described here: Chapter 3.5.2, "General Measurement Settings", on page 731

4.5.3 PRACH Measurement Commands

The commands for the "LTE PRACH" measurement are divided into the groups listed below.

- Measurement Control and States....940
- Enabling Results and Views....942
- Measurement Parameters - General Part....944
- Modulation Measurement Settings....947
- Power Measurement Settings....950
- Trigger Settings....951
- Limits (Modulation)....953
- Limits (Power)....955

- Detected Signal Configuration....955
- EVM vs. Subcarrier Results (Traces)....958
- Magnitude Error Results (Traces)....959
- Phase Error Results (Traces)....959
- EVM vs. Preamble Results (Traces)....960
- Power vs. Preamble Results (Traces)....961
- I/Q Constellation Results (Traces)....961
- Power Dynamics Results (Traces)....962
- "TX Measurement" Results (Single Values)....962
- EVM / Power vs. Preamble Results (Single Values)....966
- Power Dynamics Results (Single Values)....967

4.5.3.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:LTE:MEAS<i>:PRACh....940
STOP:LTE:MEAS<i>:PRACh....940
ABORt:LTE:MEAS<i>:PRACh....940
FETCh:LTE:MEAS<i>:PRACh:STATe?....941
FETCh:LTE:MEAS<i>:PRACh:STATe:ALL?....941

INITiate:LTE:MEAS<i>:PRACh
STOP:LTE:MEAS<i>:PRACh
ABORt:LTE:MEAS<i>:PRACh

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement. The measurement enters the "RUN" state.
- `STOP...` halts the measurement immediately. The measurement enters the "RDY" state. Measurement results are kept. The resources remain allocated to the measurement.
- `ABORt...` halts the measurement immediately. The measurement enters the "OFF" state. All measurement values are set to NAV. Allocated resources are released.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Example: See Single-Shot and Continuous Measurements

Usage: Event

Firmware/Software: V2.0.10

Manual operation: See "PRACH (Softkey)" on page 917

FETCh:LTE:MEAS<i>:PRACh:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MeasState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "PRACH (Softkey)" on page 917

FETCh:LTE:MEAS<i>:PRACh:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MainState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: adjustments finished, measurement running ("adjusted")
INV: not applicable, <MainState> OFF or RDY ("invalid")

<ResourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable, <MainState> OFF or RDY ("invalid")

Example: See Single-Shot and Continuous Measurements

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "PRACH (Softkey)" on page 917

4.5.3.2 Enabling Results and Views

The following commands select the evaluated results and the displayed views.

CONFigure:LTE:MEAS<i>:PRACh:RESult[:ALL]....942
CONFigure:LTE:MEAS<i>:PRACh:RESult:EVMagnitude....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:MERRor....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:PERRor....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:IQ....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:PDYNamics....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:TXM....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:EVPReamble....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:PVPReamble....943

CONFigure:LTE:MEAS<i>:PRACh:RESult[:ALL] <EVM>, <MagnitudeError>, <PhaseError>, <IQ>, <PowerDynamics>, <TXMeasurement>[, <EVMvsPreamble>, <PowervsPreamble>]

Enables or disables the evaluation of results and shows or hides the views in the PRACH measurement. This command combines all other `CONFigure:LTE:MEAS<i>:PRACh:RESult...` commands.

Parameters:

<EVM> OFF | ON

Error vector magnitude
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

<MagnitudeError> OFF | ON

Magnitude error

*RST: OFF

<PhaseError> OFF | ON

Phase error

*RST: OFF

<IQ>	OFF | ON I/Q constellation diagram *RST: OFF
<PowerDynamics>	OFF | ON Power dynamics *RST: ON
<TXMeasurement>	OFF | ON Statistical overview *RST: ON
<EVMvsPreamble>	OFF | ON Error vector magnitude vs preamble *RST: OFF
<PowervsPreamble>	OFF | ON Power vs preamble *RST: OFF

Example: See Performing Single-Shot Measurements

Firmware/Software: V2.0.10
V2.1.20: added <EVMvsPreamble> and <PowervsPreamble>

Manual operation: See "Multi Evaluation, PRACH > Assign Views" on page 707

CONFigure:LTE:MEAS<i>:PRACh:RESult:EVMagnitude <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:MERRor <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:PERRor <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:IQ <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:PDYNamics <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:TXM <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:EVPReamble <Enable>
CONFigure:LTE:MEAS<i>:PRACh:RESult:PVPReamble <Enable>

Enables or disables the evaluation of results and shows or hides the views in the PRACH measurement.

The mnemonic after "RESult" denotes the view type: error vector magnitude, magnitude error, phase error, I/Q constellation diagram, power dynamics, TX measurement statistical overview, error vector magnitude vs preamble, power vs preamble

For reset values, see `CONFigure:LTE:MEAS<i>:PRACh:RESult[:ALL]`.

Parameters:

<Enable>	OFF | ON **OFF:** Do not evaluate results, hide the view **ON:** Evaluate results and show the view *RST: Depends on measurement

Firmware/Software: V2.0.10
V2.1.20: `...:EVPReamble` and `...:PVPReamble` added

Manual operation: See "Multi Evaluation, PRACH > Assign Views" on page 707

4.5.3.3 Measurement Parameters - General Part

The following commands define general measurement control parameters for the PRACH measurement.

CONFigure:LTE:MEAS<i>:PRACh:TOUT....944
CONFigure:LTE:MEAS<i>:PRACh:REPetition....944
CONFigure:LTE:MEAS<i>:PRACh:SCONdition....945
CONFigure:LTE:MEAS<i>:PRACh:MOEXception....945
CONFigure:LTE:MEAS<i>:PRACh:PCINdex....946
CONFigure:LTE:MEAS<i>:PRACh:NOPReambles....946
CONFigure:LTE:MEAS<i>:PRACh:POPReambles....946
CONFigure:LTE:MEAS<i>:PRACh:PFOFfset:AUTO....947
CONFigure:LTE:MEAS<i>:PRACh:PFOFfset....947

CONFigure:LTE:MEAS<i>:PRACh:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY`. The reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results, there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:
<Timeout> Default unit: s

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

CONFigure:LTE:MEAS<i>:PRACh:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:...:MEAS<i>:...:SCOunt` to determine the number of measurement intervals per single shot.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Single-Shot and Continuous Measurements

Firmware/Software: V2.0.10

Manual operation: See "Repetition" on page 919

CONFigure:LTE:MEAS<i>:PRACh:SCONdition <StopCondition>

Qualifies whether the measurement is stopped after a failed limit check or continued. `SLFail` means that the measurement is stopped and reaches the `RDY` state when one of the results exceeds the limits.

Parameters:

<StopCondition> NONE | SLFail

NONE: Continue measurement irrespective of the limit check
SLFail: Stop measurement on limit failure

*RST: NONE

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "Stop Condition" on page 919

CONFigure:LTE:MEAS<i>:PRACh:MOEXception <MeasOnException>

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected.

Parameters:

<MeasOnException> OFF | ON

OFF: Faulty results are rejected
ON: Results are never rejected

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "Measure on Exception" on page 920

CONFigure:LTE:MEAS<i>:PRACh:PCINdex <PRACHconfIndex>

The PRACH configuration index identifies the PRACH configuration used by the UE (preamble format, which resources in the time domain are allowed for transmission of preambles etc.).

For the combined signal path scenario, use:

- `CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD`
- `CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD`

Parameters:

<PRACHconfIndex> Range: 0 to 63 for FDD / 57 for TDD
*RST: 0

Example: See Specifying Required PRACH Settings

Firmware/Software: V2.0.10

Manual operation: See "PRACH Configuration Index" on page 920

CONFigure:LTE:MEAS<i>:PRACh:NOPReambles <NumberPreamble>

Specifies the number of preambles to be captured per measurement interval.

Parameters:

<NumberPreamble> Range: 1 to 32
*RST: 1

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.20, V3.5.20 maximum increased

Manual operation: See "Number of Preambles" on page 920

CONFigure:LTE:MEAS<i>:PRACh:POPReambles <PeriodPreamble>

Specifies the periodicity of preambles to be captured for multi-preamble result views.

Parameters:

<PeriodPreamble> MS05 | MS10 | MS20

MS05: 5 ms
MS10: 10 ms
MS20: 20 ms

*RST: MS20

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V3.5.10, V3.5.20 added MS05

Manual operation: See "Period of Preambles" on page 921

CONFigure:LTE:MEAS<i>:PRACh:PFOFfset:AUTO <PRACHfreqAuto>

Enables or disables automatic detection of the PRACH frequency offset. To configure the offset manually for disabled automatic detection, see `CONFigure:LTE:MEAS<i>:PRACh:PFOFfset` on page 947.

Parameters:

<PRACHfreqAuto> OFF | ON
*RST: ON

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "PRACH Frequency Offset" on page 921

CONFigure:LTE:MEAS<i>:PRACh:PFOFfset <PRACHfreqOffset>

Specifies the PRACH frequency offset. This setting is only relevant if automatic detection is disabled, see `CONFigure:LTE:MEAS<i>:PRACh:PFOFfset:AUTO`.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset`.

Parameters:

<PRACHfreqOffset> Range: 0 to <Total RB - 6> depending on channel bandwidth, see table below
*RST: 0

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "PRACH Frequency Offset" on page 921

Table 4-4: Maximum input value depending on channel bandwidth

Channel bandwidth / MHz	1.4	3	5	10	15	20
<Total RB - 6>	0	9	19	44	69	94

4.5.3.4 Modulation Measurement Settings

The following commands specify settings for the modulation measurements.

CONFigure:LTE:MEAS<i>:PRACh:SCOunt:MODulation.. 948
CONFigure:LTE:MEAS<i>:PRACh:MODulation:LRSindex...948
CONFigure:LTE:MEAS<i>:PRACh:MODulation:ZCZConfig... 948
CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex:AUTO..949
CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex..949
CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWLength..949
CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWPosition... 950

CONFigure:LTE:MEAS<i>:PRACh:SCOunt:MODulation <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals

Range: 1 to 1000
*RST: 2

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "Statistic Count" on page 922

CONFigure:LTE:MEAS<i>:PRACh:MODulation:LRSindex <LogRootSeqIndex>

Specifies the logical root sequence index to be used for generation of the preamble sequence.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex`.

Parameters:

<LogRootSeqIndex> Range: 0 to 837 (for preamble format 4: 0 to 137)
*RST: 0

Example: See Specifying Required PRACH Settings

Firmware/Software: V2.0.10

Manual operation: See "Logical Root Sequence Index" on page 923

CONFigure:LTE:MEAS<i>:PRACh:MODulation:ZCZConfig <ZeroCorrZoneCon>

Specifies the zero correlation zone config, i.e. which N_{CS} value of an N_{CS} set is used for generation of the preamble sequence.

For the combined signal path scenario, use `CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig`.

Parameters:

<ZeroCorrZoneCon> Range: 0 to 15 (for preamble format 4: 0 to 6)
*RST: 0

Example: See Specifying Required PRACH Settings

Firmware/Software: V2.0.10

Manual operation: See "Zero Correlation Zone Config" on page 923

CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex:AUTO <SeqIndexAuto>

Enables or disables automatic detection of the sequence index. To configure the index manually for disabled automatic detection, see `CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex` on page 949.

Parameters:

<SeqIndexAuto> OFF | ON
*RST: ON

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "Sequence Index" on page 923

CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex <SequenceIndex>

Specifies the sequence index, i.e. which of the 64 preamble sequences of the cell is used by the UE. This setting is only relevant if automatic detection is disabled, see `CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex:AUTO`.

Parameters:

<SequenceIndex> Range: 0 to 63
*RST: 0

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "Sequence Index" on page 923

CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWLength <LengthFormat0>, <LengthFormat1>, <LengthFormat2>, <LengthFormat3>, <LengthFormat4>

Specifies the EVM window length in samples for all preamble formats.

Parameters:

<LengthFormat0> Length for preamble format 0
Range: 1 to 3168
*RST: 3072

<LengthFormat1> Length for preamble format 1
Range: 1 to 21024
*RST: 20928

<LengthFormat2> Length for preamble format 2
Range: 1 to 6240
*RST: 6144

<LengthFormat3> Length for preamble format 3
Range: 1 to 21024
*RST: 20928

<LengthFormat4> Length for preamble format 4

Range: 1 to 448
*RST: 432

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10
V2.0.20: *RST values modified

Manual operation: See "EVM Window Length" on page 923

CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWPosition <EVMwindowPos>

Specifies the position of the EVM window used for calculation of the trace results.

Parameters:

<EVMwindowPos> LOW | HIGH

*RST: LOW

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "EVM Window Position" on page 924

4.5.3.5 Power Measurement Settings

The following commands specify settings for power dynamics measurements.

CONFigure:LTE:MEAS<i>:PRACh:SCOunt:PDYNamics <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals

Range: 1 to 1000
*RST: 1

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.10

Manual operation: See "Dynamics > Statistic Count" on page 924

CONFigure:LTE:MEAS<i>:PRACh:POWer:HDMode <HighDynamicMode>

Enables or disables the high dynamic mode for power dynamics measurements.

Parameters:

<HighDynamicMode> OFF | ON

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.25

Manual operation: See "High Dynamic Mode" on page 924

4.5.3.6 Trigger Settings

The following commands define the trigger parameters.

TRIGger:LTE:MEAS<i>:PRACh:CATalog:SOURce?....951
TRIGger:LTE:MEAS<i>:PRACh:SOURce....951
TRIGger:LTE:MEAS<i>:PRACh:SLOPe....952
TRIGger:LTE:MEAS<i>:PRACh:THReshold....952
TRIGger:LTE:MEAS<i>:PRACh:TOUT....952
TRIGger:LTE:MEAS<i>:PRACh:MGAP....953

TRIGger:LTE:MEAS<i>:PRACh:CATalog:SOURce?

Lists all trigger source values that can be set using `TRIGger:LTE:MEAS<i>:PRACh:SOURce`.

Return values:

<Sourcelist> Comma-separated list of all supported values. Each value is represented as a string.

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Trigger Source" on page 925

TRIGger:LTE:MEAS<i>:PRACh:SOURce <Source>

Selects the source of the trigger events. Some values are always available in this firmware application. They are listed below. Depending on the installed options, additional values are available. A complete list of all supported values can be displayed using `TRIGger:...:CATalog:SOURce?`.

Parameters:

<Source> **'IF Power':** Power trigger (received RF power)

*RST: 'IF Power'

Example: See Configuring the Trigger System

Firmware/Software: V2.0.10

Manual operation: See "Trigger Source" on page 925

TRIGger:LTE:MEAS<i>:PRACh:SLOPe <Slope>

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse (valid for external and power trigger sources).

Parameters:

<Slope> REDGe | FEDGe

REDGe: Rising edge
FEDGe: Falling edge

*RST: REDG

Example: See Configuring the Trigger System

Firmware/Software: V2.0.10

Manual operation: See "Trigger Slope" on page 925

TRIGger:LTE:MEAS<i>:PRACh:THReshold <TrigThreshold>

Defines the trigger threshold for power trigger sources.

Parameters:

<TrigThreshold> Range: -50 dB to 0 dB
*RST: -20 dB
Default unit: dB (full scale, i.e. relative to reference level minus external attenuation)

Example: See Configuring the Trigger System

Firmware/Software: V2.0.10

Manual operation: See "Trigger Threshold" on page 926

TRIGger:LTE:MEAS<i>:PRACh:TOUT <TriggerTimeOut>

Selects the maximum time that the R&S CMW waits for a trigger event before it stops the measurement in remote control mode or indicates a trigger timeout in manual operation mode. This setting has no influence on "Free Run" measurements.

Parameters:

<TriggerTimeOut> Range: 0.01 s to 167772.15 s
*RST: 0.1 s
Default unit: s
Additional parameters: OFF | ON (disables | enables the timeout)

Example: See Configuring the Trigger System

Firmware/Software: V2.0.10

Manual operation: See "Trigger Timeout" on page 926

TRIGger:LTE:MEAS<i>:PRACh:MGAP <MinTrigGap>

Sets a minimum time during which the IF signal must be below the trigger threshold before the trigger is armed so that an IF power trigger event can be generated.

Parameters:

<MinTrigGap> Range: 0 s to 1E-3 s
*RST: 50E-6 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V2.0.10

Manual operation: See "Min Trigger Gap" on page 926

4.5.3.7 Limits (Modulation)

The following commands define limits for results which characterize the modulation accuracy of the PRACH signal.

CONFigure:LTE:MEAS<i>:PRACh:LIMit:EVMagnitude 953
CONFigure:LTE:MEAS<i>:PRACh:LIMit:MERRor 953
CONFigure:LTE:MEAS<i>:PRACh:LIMit:PERRor 954
CONFigure:LTE:MEAS<i>:PRACh:LIMit:FERRor 954

CONFigure:LTE:MEAS<i>:PRACh:LIMit:EVMagnitude <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the error vector magnitude (EVM).

Parameters:

<RMS> Range: 0 % to 100 %
*RST: 17.5 %, ON
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 % to 100 %
*RST: 35 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V2.0.10

Manual operation: See "Limits" on page 927

CONFigure:LTE:MEAS<i>:PRACh:LIMit:MERRor <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the magnitude error.

Parameters:

<RMS> Range: 0 % to 100 %
*RST: 17.5 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 % to 100 %
*RST: 35 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V2.0.10

Manual operation: See "Limits" on page 927

CONFigure:LTE:MEAS<i>:PRACh:LIMit:PERRor <RMS>, <Peak>

Defines symmetric limits for the RMS and peak values of the phase error. The limit check fails if the absolute value of the measured phase error exceeds the specified values.

Parameters:

<RMS> Range: 0 deg to 180 deg
*RST: 17.5 deg, OFF
Default unit: deg
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 deg to 180 deg
*RST: 35 deg, OFF
Default unit: deg
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V2.0.10

Manual operation: See "Limits" on page 927

CONFigure:LTE:MEAS<i>:PRACh:LIMit:FERRor <FrequencyError>

Defines an upper limit for the carrier frequency error.

Parameters:

<FrequencyError> Range: 0 ppm to 1000 ppm
*RST: 0.1 ppm, ON
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V2.0.10

Manual operation: See "Limits" on page 927

4.5.3.8 Limits (Power)

The following command defines limits for results which characterize the power dynamics of the PRACH signal.

CONFigure:LTE:MEAS<i>:PRACh:LIMit:PDYNamics <Enable>, <OnPowerUpper>, <OnPowerLower>, <OffPowerUpper>

Defines limits for the ON power and OFF power determined with the power dynamics measurement.

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<OnPowerUpper> Upper limit for the ON power

Range: -256 dBm to 256 dBm
*RST: 6.5 dBm
Default unit: dBm

<OnPowerLower> Lower limit for the ON power

Range: -256 dBm to 256 dBm
*RST: -8.5 dBm
Default unit: dBm

<OffPowerUpper> Upper limit for the OFF power

Range: -256 dBm to 256 dBm
*RST: -48.5 dBm
Default unit: dBm

Example: See Specifying Limits

Firmware/Software: V2.0.10

Manual operation: See "Limits" on page 927

4.5.3.9 Detected Signal Configuration

The following commands return the detected PRACH frequency offset, sequence index and sequence correlation.

FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset?..956
FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex?...956
FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation?...956

FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset:PREamble<Number>?......................957
FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex:PREamble<Number>?........................957
FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation:PREamble<Number>?................ 958

FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset?

Returns the automatically detected or manually configured PRACH frequency offset for single-preamble measurements.

Return values:

<Reliability>	Reliability Indicator
<PRACHfreqOffset>	Range: 0 to 94
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V2.0.10
Manual operation:	See "Statistical Overviews and other Single Values" on page 929

FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex?

Returns the automatically detected or manually configured sequence index for single-preamble measurements.

Return values:

<Reliability>	Reliability Indicator
<SequenceIndex>	Range: 0 to 63
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V2.0.10
Manual operation:	See "Statistical Overviews and other Single Values" on page 929

FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation?

Returns the sequence correlation for single-preamble measurements.

It indicates the correlation between the ideal preamble sequence determined from the parameter settings and the measured preamble sequence. A value of 1 corresponds to perfect correlation. A value much smaller than 1 indicates that the searched preamble sequence was not found.

Return values:

<Reliability>	Reliability Indicator
<SeqCorrelation>	Range: 0 to 1
Example:	See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Statistical Overviews and other Single Values" on page 929

FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset:PREamble<Number>?

Returns the automatically detected or manually configured PRACH frequency offset for a selected preamble of multi-preamble measurements.

Suffix:

<Number> 1..32
Number of the preamble for which the results are queried

Return values:

<Reliability> Reliability Indicator

<PRACHfreqOffset> Range: 0 to 94

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Statistical Overviews and other Single Values" on page 929

FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex:PREamble<Number>?

Returns the automatically detected or manually configured sequence index for a selected preamble of multi-preamble measurements.

Suffix:

<Number> 1..32
Number of the preamble for which the results are queried

Return values:

<Reliability> Reliability Indicator

<SequenceIndex> Range: 0 to 63

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Statistical Overviews and other Single Values" on page 929

FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation:PREamble<Number>?

Returns the sequence correlation for a selected preamble of multi-preamble measurements.

It indicates the correlation between the ideal preamble sequence determined from the parameter settings and the measured preamble sequence. A value of 1 corresponds to perfect correlation. A value much smaller than 1 indicates that the searched preamble sequence was not found.

Suffix:

<Number> 1..32
Number of the preamble for which the results are queried

Return values:

<Reliability> Reliability Indicator

<SeqCorrelation> Range: 0 to 1

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Statistical Overviews and other Single Values" on page 929

4.5.3.10 EVM vs. Subcarrier Results (Traces)

The following commands return the EVM vs. subcarrier traces of the PRACH measurement.

FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:CURRent?
FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:AVERage?
FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:MAXimum?
READ:LTE:MEAS<i>:PRACh:TRACe:EVM:CURRent?
READ:LTE:MEAS<i>:PRACh:TRACe:EVM:AVERage?
READ:LTE:MEAS<i>:PRACh:TRACe:EVM:MAXimum?

Return the values of the EVM vs. subcarrier traces. Each value is averaged over the samples in one preamble subcarrier. The results of the current, average and maximum traces can be retrieved.

See also Chapter 4.2.9.2, "Views EVM, Magnitude Error, Phase Error", on page 909.

Return values:

<Reliability> Reliability Indicator

<Results> The number of results depends on the preamble format.
Format 0 to 3: 839 EVM values, format 4: 139 EVM values

Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.11 Magnitude Error Results (Traces)

The following commands return the magnitude error vs. subcarrier traces of the PRACH measurement.

FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:CURRent?
FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:AVERage?
FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:MAXimum?
READ:LTE:MEAS<i>:PRACh:TRACe:MERRor:CURRent?
READ:LTE:MEAS<i>:PRACh:TRACe:MERRor:AVERage?
READ:LTE:MEAS<i>:PRACh:TRACe:MERRor:MAXimum?

Return the values of the magnitude error traces. Each value is averaged over the samples in one preamble subcarrier. The results of the current, average and maximum traces can be retrieved.

See also Chapter 4.2.9.2, "Views EVM, Magnitude Error, Phase Error", on page 909.

Return values:

<Reliability> Reliability Indicator

<Results> The number of results depends on the preamble format.
Format 0 to 3: 839 EVM values, format 4: 139 EVM values

Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.12 Phase Error Results (Traces)

The following commands return the phase error vs. subcarrier traces of the PRACH measurement.

FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:CURRent?
FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:AVERage?
FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:MAXimum?
READ:LTE:MEAS<i>:PRACh:TRACe:PERRor:CURRent?

READ:LTE:MEAS<i>:PRACh:TRACe:PERRor:AVERage?
READ:LTE:MEAS<i>:PRACh:TRACe:PERRor:MAXimum?

Return the values of the phase error traces. Each value is averaged over the samples in one preamble subcarrier. The results of the current, average and maximum traces can be retrieved.

See also Chapter 4.2.9.2, "Views EVM, Magnitude Error, Phase Error", on page 909.

Return values:

<Reliability> Reliability Indicator

<Results> The number of results depends on the preamble format. Format 0 to 3: 839 EVM values, format 4: 139 EVM values

Range: 0 deg to 180 deg
Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.13 EVM vs. Preamble Results (Traces)

The following commands return the EVM vs. preamble trace of the PRACH measurement.

FETCh:LTE:MEAS<i>:PRACh:TRACe:EVPReamble?
READ:LTE:MEAS<i>:PRACh:TRACe:EVPReamble?

Return the values of the EVM vs. preamble traces.

See also Chapter 4.2.9.3, "Views EVM vs Preamble, Power vs Preamble", on page 910.

Return values:

<Reliability> Reliability Indicator

<Results> 32 EVM values, for preamble 1 to 32 (NCAP for not measured preambles)

Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.1.20, V3.5.20 increased number of results

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.14 Power vs. Preamble Results (Traces)

The following commands return the power vs. preamble trace of the PRACH measurement.

FETCh:LTE:MEAS<i>:PRACh:TRACe:PVPReamble?
READ:LTE:MEAS<i>:PRACh:TRACe:PVPReamble?

Return the values of the power vs. preamble traces.

See also Chapter 4.2.9.3, "Views EVM vs Preamble, Power vs Preamble", on page 910.

Return values:

<Reliability> Reliability Indicator

<Results> 32 power values, for preamble 1 to 32 (NCAP for not measured preambles)
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.1.20, V3.5.20 increased number of preambles

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.15 I/Q Constellation Results (Traces)

The following command returns the results in the I/Q constellation diagram.

FETCh:LTE:MEAS<i>:PRACh:TRACe:IQ?

Returns the results in the I/Q constellation diagram.

See also Chapter 4.2.9.4, "View I/Q Constellation Diagram", on page 912.

Return values:

<Reliability> Reliability Indicator

<I_Phase_1>
<Q_Phase_1> ...
<I_Phase_139/839>
<Q_Phase_139/839>
Normalized I and Q amplitudes, one value pair per modulation symbol.
For preamble format 4, there are 139 symbols.
For preamble format 0 to 3, there are 839 symbols.
Range: -2 to 2

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Traces and Bar Graphs" on page 929

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.16 Power Dynamics Results (Traces)

The following commands return the results in the power dynamics diagram.

FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:CURRent?
FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:MAXimum?
READ:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:CURRent?
READ:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:AVERage?
READ:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:MAXimum?

Return the values of the power dynamics traces. Each value is sampled with 48 T_s, corresponding to 1.5625 µs. The results of the current, average and maximum traces can be retrieved.

See also Chapter 4.2.9.5, "View Power Dynamics", on page 912.

Return values:

<Reliability> Reliability Indicator

<Power> 2048 power values, from -1100 µs to +2098.4375 µs relative to the start of the preamble. The values have a spacing of 1.5625 µs. The 705th value is at the start of the preamble (0 µs).

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.17 "TX Measurement" Results (Single Values)

The following commands return the statistical modulation results as presented in the "TX Measurement" view.

FETCh:LTE:MEAS<i>:PRACh:MODulation:CURRent? 963
FETCh:LTE:MEAS<i>:PRACh:MODulation:AVERage? 963
FETCh:LTE:MEAS<i>:PRACh:MODulation:SDEViation? 963
READ:LTE:MEAS<i>:PRACh:MODulation:CURRent? 963
READ:LTE:MEAS<i>:PRACh:MODulation:AVERage? 963
READ:LTE:MEAS<i>:PRACh:MODulation:SDEViation? 963
CALCulate:LTE:MEAS<i>:PRACh:MODulation:CURRent? 963
CALCulate:LTE:MEAS<i>:PRACh:MODulation:AVERage? 963

FETCh:LTE:MEAS<i>:PRACh:MODulation:EXTReme?..964
READ:LTE:MEAS<i>:PRACh:MODulation:EXTReme?...964
CALCulate:LTE:MEAS<i>:PRACh:MODulation:EXTReme?..964

FETCh:LTE:MEAS<i>:PRACh:MODulation:CURRent?
FETCh:LTE:MEAS<i>:PRACh:MODulation:AVERage?
FETCh:LTE:MEAS<i>:PRACh:MODulation:SDEViation?
READ:LTE:MEAS<i>:PRACh:MODulation:CURRent?
READ:LTE:MEAS<i>:PRACh:MODulation:AVERage?
READ:LTE:MEAS<i>:PRACh:MODulation:SDEViation?
CALCulate:LTE:MEAS<i>:PRACh:MODulation:CURRent?
CALCulate:LTE:MEAS<i>:PRACh:MODulation:AVERage?

Return the current, average and standard deviation single value results.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_OutOfTol> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count (`CONFigure:LTE:MEAS<i>:PRACh:SCOunt:MODulation`) exceeding the specified modulation limits.

Range: 0 % to 100 %
Default unit: %

<3_EVM_RMSlow>
<4_EVM_RMShigh>
<5_EVMpeakLow>
<6_EVMpeakHigh>
Error vector magnitude RMS and peak values for low and high EVM window position

Range: 0 % to 100 %
Default unit: %

<7_MErr_RMSlow>
<8_MErr_RMShigh>
Magnitude error RMS value for low and high EVM window position

Range: 0 % to 100 %
Default unit: %

<9_MErrPeakLow>
<10_MErrPeakHigh>
Magnitude error peak value for low and high EVM window position

Range: -100 % to 100 % (AVERage: 0 % to 100 %, SDEViation: 0 % to 50 %)
Default unit: %

<11_PErr_RMSlow> <12_PErr_RMSh>	Phase error RMS value for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<13_PErrPeakLow> <14_PErrPeakHigh>	Phase error peak value for low and high EVM window position Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg) Default unit: deg
<15_FreqError>	Carrier frequency error Range: -80000 Hz to 80000 Hz Default unit: Hz
<16_TimingError>	Transmit time error Range: -32000 Ts to 32000 Ts Default unit: Ts (basic LTE time unit)
<17_TXpower>	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<18_PeakPower>	User equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

FETCh:LTE:MEAS<i>:PRACh:MODulation:EXTReme?
READ:LTE:MEAS<i>:PRACh:MODulation:EXTReme?
CALCulate:LTE:MEAS<i>:PRACh:MODulation:EXTReme?

Returns the extreme single value results.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:
<1_Reliability> Reliability Indicator

<2_OutOfTol>	Out of tolerance result, i.e. percentage of measurement intervals of the statistic count (CONFigure:LTE:MEAS<i>:PRACh:SCOunt:MODulation) exceeding the specified modulation limits. Range: 0 % to 100 % Default unit: %
<3_EVM_RMSlow> <4_EVM_RMShigh> <5_EVMpeakLow> <6_EVMpeakHigh>	Error vector magnitude RMS and peak values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<7_MErr_RMSlow> <8_MErr_RMShigh>	Magnitude error RMS value for low and high EVM window position Range: 0 % to 100 % Default unit: %
<9_MErrPeakLow> <10_MErrPeakHigh>	Magnitude error peak value for low and high EVM window position Range: -100 % to 100 % Default unit: %
<11_PErr_RMSlow> <12_PErr_RMSh>	Phase error RMS value for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<13_PErrPeakLow> <14_PErrPeakHigh>	Phase error peak value for low and high EVM window position Range: -180 deg to 180 deg Default unit: deg
<15_FreqError>	Carrier frequency error Range: -80000 Hz to 80000 Hz Default unit: Hz
<16_TimingError>	Transmit time error Range: -32000 Ts to 32000 Ts Default unit: Ts (basic LTE time unit)
<17_TXpowerMin> <18_TXpowerMax>	Minimum and maximum user equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<19_PeakPowMin> <20_PeakPowMax>	Minimum and maximum user equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.18 EVM / Power vs. Preamble Results (Single Values)

The following commands return the single value modulation results as presented in the "EMV vs Preamble" and "Power vs Preamble" views.

For additional commands, see Chapter 4.5.3.9, "Detected Signal Configuration", on page 955.

FETCh:LTE:MEAS<i>:PRACh:MODulation:PREamble<Number>?
READ:LTE:MEAS<i>:PRACh:MODulation:PREamble<Number>?

Return the single value results of the "EVM vs Preamble" and "Power vs Preamble" views, for a selected preamble.

See also Chapter 4.2.9.3, "Views EVM vs Preamble, Power vs Preamble", on page 910.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<Number>	1..32 Number of the preamble for which the results are queried

Return values:

<1_Reliability>	Reliability Indicator
<2_PreambleRel>	Reliability indicator for the preamble. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<3_EVM_RMSlow> <4_EVM_RMShigh> <5_EVMpeakLow> <6_EVMpeakHigh>	Error vector magnitude RMS and peak values for low and high EVM window position Range: 0 % to 100 % Default unit: %
<7_MErr_RMSlow> <8_MErr_RMShigh>	Magnitude error RMS value for low and high EVM window position Range: 0 % to 100 % Default unit: %
<9_MErrPeakLow> <10_MErrPeakHigh>	Magnitude error peak value for low and high EVM window position Range: -100 % to 100 % Default unit: %
<11_PErr_RMSlow> <12_PErr_RMSh>	Phase error RMS value for low and high EVM window position Range: 0 deg to 180 deg Default unit: deg
<13_PErrPeakLow> <14_PErrPeakHigh>	Phase error peak value for low and high EVM window position Range: -180 deg to 180 deg Default unit: deg

<15_FreqError>	Carrier frequency error Range: -80000 Hz to 80000 Hz Default unit: Hz
<16_TimingError>	Transmit time error Range: -32000 Ts to 32000 Ts Default unit: Ts (basic LTE time unit)
<17_TXpower>	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<18_PeakPower>	User equipment peak power Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.1.20

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.3.19 Power Dynamics Results (Single Values)

The following commands return the statistical results of the power dynamics measurement.

FETCh:LTE:MEAS<i>:PRACh:PDYNamics:CURRent?
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:MINimum?
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:MAXimum?
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:SDEViation?
READ:LTE:MEAS<i>:PRACh:PDYNamics:CURRent?
READ:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?
READ:LTE:MEAS<i>:PRACh:PDYNamics:MINimum?
READ:LTE:MEAS<i>:PRACh:PDYNamics:MAXimum?
READ:LTE:MEAS<i>:PRACh:PDYNamics:SDEViation?
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:CURRent?
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:MINimum?
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:MAXimum?

Return the current, average, minimum, maximum and standard deviation single value results of the power dynamics measurement.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count (CONFigure:LTE:MEAS<i>:PRACh:SCOunt:PDYNamics) exceeding the specified power dynamics limits.

Range: 0 % to 100 %
Default unit: %

<OffPowerBefore> OFF power mean value for subframe before preamble without transient period

Range: -100 dBm to 55 dBm
Default unit: dBm

<OnPowerRMS> ON power mean value over preamble

Range: -100 dBm to 55 dBm
Default unit: dBm

<OnPowerPeak> ON power peak value within preamble

Range: -100 dBm to 55 dBm
Default unit: dBm

<OffPowerAfter> OFF power mean value for subframe after preamble without transient period

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.10

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

4.5.4 Combined Signal Path Commands

For some settings, the command to be used depends on the active scenario. While the combined signal path (CSP) scenario is active, these settings are configured via commands of the signaling application. While the standalone (SA) scenario is active, they are configured via measurement commands.

The following table provides the mapping for PRACH measurement commands. For general measurement settings, see Table 3-3.

Table 4-5: Mapping for PRACH measurement commands

Setting	Commands for SA scenario	Commands for CSP scenario
PRACH configuration index	CONFigure:LTE:MEAS<i>:PRACh:PCINdex	CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:FDD CONFigure:LTE:SIGN<i>:CELL:PRACh:PCINdex:TDD
PRACH frequency offset	CONFigure:LTE:MEAS<i>:PRACh:PFOFfset	CONFigure:LTE:SIGN<i>:CELL:PRACh:PFOFfset
Logical root sequence index	CONFigure:LTE:MEAS<i>:PRACh:MODulation:LRSindex	CONFigure:LTE:SIGN<i>:CELL:PRACh:LRSindex
Zero correlation zone config	CONFigure:LTE:MEAS<i>:PRACh:MODulation:ZCZConfig	CONFigure:LTE:SIGN<i>:CELL:PRACh:ZCZConfig
High dynamic mode	CONFigure:LTE:MEAS<i>:PRACh:POWer:HDMode	Fixed value OFF

4.6 List of Commands

ABORt:LTE:MEAS<i>:PRACh....940
CALCulate:LTE:MEAS<i>:PRACh:MODulation:AVERage?....963
CALCulate:LTE:MEAS<i>:PRACh:MODulation:CURRent?....963
CALCulate:LTE:MEAS<i>:PRACh:MODulation:EXTReme?....964
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?....967
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:CURRent?....967
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:MAXimum?....967
CALCulate:LTE:MEAS<i>:PRACh:PDYNamics:MINimum?....967
CONFigure:LTE:MEAS<i>:PRACh:LIMit:EVMagnitude....953
CONFigure:LTE:MEAS<i>:PRACh:LIMit:FERRor....954
CONFigure:LTE:MEAS<i>:PRACh:LIMit:MERRor....953
CONFigure:LTE:MEAS<i>:PRACh:LIMit:PDYNamics....955
CONFigure:LTE:MEAS<i>:PRACh:LIMit:PERRor....954
CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWLength....949
CONFigure:LTE:MEAS<i>:PRACh:MODulation:EWPosition....950
CONFigure:LTE:MEAS<i>:PRACh:MODulation:LRSindex....948
CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex....949
CONFigure:LTE:MEAS<i>:PRACh:MODulation:SINDex:AUTO....949
CONFigure:LTE:MEAS<i>:PRACh:MODulation:ZCZConfig....948
CONFigure:LTE:MEAS<i>:PRACh:MOEXception....945
CONFigure:LTE:MEAS<i>:PRACh:NOPReambles....946
CONFigure:LTE:MEAS<i>:PRACh:PCINdex....946
CONFigure:LTE:MEAS<i>:PRACh:PFOFfset....947
CONFigure:LTE:MEAS<i>:PRACh:PFOFfset:AUTO....947
CONFigure:LTE:MEAS<i>:PRACh:POPReambles....946
CONFigure:LTE:MEAS<i>:PRACh:POWer:HDMode....950
CONFigure:LTE:MEAS<i>:PRACh:REPetition....944
CONFigure:LTE:MEAS<i>:PRACh:RESult:EVMagnitude....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:EVPReamble....943

CONFigure:LTE:MEAS<i>:PRACh:RESult:IQ....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:MERRor....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:PDYNamics....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:PERRor....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:PVPReamble....943
CONFigure:LTE:MEAS<i>:PRACh:RESult:TXM....943
CONFigure:LTE:MEAS<i>:PRACh:RESult[:ALL]....942
CONFigure:LTE:MEAS<i>:PRACh:SCONdition....945
CONFigure:LTE:MEAS<i>:PRACh:SCOunt:MODulation....948
CONFigure:LTE:MEAS<i>:PRACh:SCOunt:PDYNamics....950
CONFigure:LTE:MEAS<i>:PRACh:TOUT....944
FETCh:LTE:MEAS<i>:PRACh:MODulation:AVERage?....963
FETCh:LTE:MEAS<i>:PRACh:MODulation:CURRent?....963
FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset:PREamble<Number>?....957
FETCh:LTE:MEAS<i>:PRACh:MODulation:DPFoffset?....956
FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex:PREamble<Number>?....957
FETCh:LTE:MEAS<i>:PRACh:MODulation:DSINdex?....956
FETCh:LTE:MEAS<i>:PRACh:MODulation:EXTReme?....964
FETCh:LTE:MEAS<i>:PRACh:MODulation:PREamble<Number>?....966
FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation:PREamble<Number>?....958
FETCh:LTE:MEAS<i>:PRACh:MODulation:SCORrelation?....956
FETCh:LTE:MEAS<i>:PRACh:MODulation:SDEViation?....963
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?....967
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:CURRent?....967
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:MAXimum?....967
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:MINimum?....967
FETCh:LTE:MEAS<i>:PRACh:PDYNamics:SDEViation?....967
FETCh:LTE:MEAS<i>:PRACh:STATe:ALL?....941
FETCh:LTE:MEAS<i>:PRACh:STATe?....941
FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:AVERage?....958
FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:CURRent?....958
FETCh:LTE:MEAS<i>:PRACh:TRACe:EVM:MAXimum?....958
FETCh:LTE:MEAS<i>:PRACh:TRACe:EVPReamble?....960
FETCh:LTE:MEAS<i>:PRACh:TRACe:IQ?....961
FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:AVERage?....959
FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:CURRent?....959
FETCh:LTE:MEAS<i>:PRACh:TRACe:MERRor:MAXimum?....959
FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:AVERage?....962
FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:CURRent?....962
FETCh:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:MAXimum?....962
FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:AVERage?....959
FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:CURRent?....959
FETCh:LTE:MEAS<i>:PRACh:TRACe:PERRor:MAXimum?....959
FETCh:LTE:MEAS<i>:PRACh:TRACe:PVPReamble?....961
INITiate:LTE:MEAS<i>:PRACh....940
READ:LTE:MEAS<i>:PRACh:MODulation:AVERage?....963
READ:LTE:MEAS<i>:PRACh:MODulation:CURRent?....963
READ:LTE:MEAS<i>:PRACh:MODulation:EXTReme?....964
READ:LTE:MEAS<i>:PRACh:MODulation:PREamble<Number>?....966
READ:LTE:MEAS<i>:PRACh:MODulation:SDEViation?....963

READ:LTE:MEAS<i>:PRACh:PDYNamics:AVERage?....967
READ:LTE:MEAS<i>:PRACh:PDYNamics:CURRent?....967
READ:LTE:MEAS<i>:PRACh:PDYNamics:MAXimum?....967
READ:LTE:MEAS<i>:PRACh:PDYNamics:MINimum?....967
READ:LTE:MEAS<i>:PRACh:PDYNamics:SDEViation?....967
READ:LTE:MEAS<i>:PRACh:TRACe:EVM:AVERage?....958
READ:LTE:MEAS<i>:PRACh:TRACe:EVM:CURRent?....958
READ:LTE:MEAS<i>:PRACh:TRACe:EVM:MAXimum?....958
READ:LTE:MEAS<i>:PRACh:TRACe:EVPReamble?....960
READ:LTE:MEAS<i>:PRACh:TRACe:MERRor:AVERage?....959
READ:LTE:MEAS<i>:PRACh:TRACe:MERRor:CURRent?....959
READ:LTE:MEAS<i>:PRACh:TRACe:MERRor:MAXimum?....959
READ:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:AVERage?....962
READ:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:CURRent?....962
READ:LTE:MEAS<i>:PRACh:TRACe:PDYNamics:MAXimum?....962
READ:LTE:MEAS<i>:PRACh:TRACe:PERRor:AVERage?....960
READ:LTE:MEAS<i>:PRACh:TRACe:PERRor:CURRent?....959
READ:LTE:MEAS<i>:PRACh:TRACe:PERRor:MAXimum?....960
READ:LTE:MEAS<i>:PRACh:TRACe:PVPReamble?....961
STOP:LTE:MEAS<i>:PRACh....940
TRIGger:LTE:MEAS<i>:PRACh:CATalog:SOURce?....951
TRIGger:LTE:MEAS<i>:PRACh:MGAP....953
TRIGger:LTE:MEAS<i>:PRACh:SLOPe....952
TRIGger:LTE:MEAS<i>:PRACh:SOURce....951
TRIGger:LTE:MEAS<i>:PRACh:THReshold....952
TRIGger:LTE:MEAS<i>:PRACh:TOUT....952

5 LTE SRS Measurement

The LTE SRS measurement provides quick and flexible tests on LTE FDD and TDD sounding reference signals. The tests cover the following UE transmitter properties:

- Transmit OFF power, transmit ON power and power ramping between them (power dynamics)

The SRS measurement requires option R&S CMW-KM500 for FDD signals and R&S CMW-KM550 for TDD signals.

5.1 What's New in This Revision

This revision describes version 3.5.40 and later of the LTE SRS measurement application. Compared to version 3.0.10, it provides the following new features:

- For signals with carrier aggregation, you can measure PCC and SCC, one carrier at a time.

5.2 General Description

The LTE SRS measurement captures an uplink LTE sounding reference signal (SRS) and provides power dynamics measurement results. The signal to be measured must not contain any additional components, e.g. a PUSCH or PUCCH.

Both FDD signals (option R&S CMW-KM500) and TDD signals (option R&S CMW-KM550) can be measured.

The following sections describe how to perform and configure the measurement.

- Test Setup....................972
- How to Measure an Uplink SRS Signal....................973
- Parallel Signaling and Measurement....................973
- Trigger Modes....................974
- Limit Settings and Conformance Requirements....................974
- Measurement Results....................975

5.2.1 Test Setup

Connect the external RF signal source (mobile station, signal generator etc.) to one of the bidirectional RF connectors on the front panel of the R&S CMW.

See also: "RF Connectors" in the R&S CMW base unit manual, chapter "Getting Started"

5.2.2 How to Measure an Uplink SRS Signal

The measurement expects a pure LTE SRS UL signal. Any other signals, e.g. an LTE SRS UL signal with additional PUSCH does not yield correct measurement results.

After connecting your LTE UE to the R&S CMW, you have to adjust at least the following analyzer settings to the properties of the analyzed SRS signal:

- Duplex mode
- Analyzer "Frequency"
- "Expected Nominal Power"
  Optionally "User Margin" and "External Attenuation (Input)"

  Recommended values:
  - "Expected Nominal Power" = peak power of the UE signal during the measurement
  - "User Margin" = 0 dB

  The smallest possible value of the "Expected Nominal Power" plus the "User Margin" ensures the maximum dynamic range.

The "Channel Bandwidth" must also be in accordance with the measured signal. For configuration, refer to the "Measurement Control" section of the configuration dialog.

The default trigger settings are often suitable, see Chapter 5.2.4, "Trigger Modes", on page 974.

5.2.3 Parallel Signaling and Measurement

You can use the SRS measurement in parallel to the LTE signaling application (option R&S CMW-KS500/-KS550). Set up a connection to the UE with the signaling application. Then measure the sounding reference signal with the SRS measurement.

To use both applications in parallel, the combined signal path scenario must be activated (see "Scenario = Combined Signal Path" on page 680). Most signal routing and analyzer settings and some measurement control settings are then configured by the signaling application. The SRS measurement displays the corresponding signaling settings instead of its own settings. These signaling settings can be configured both in the measurement GUI and in the GUI of the signaling application.

To configure these settings via remote commands, the commands of the signaling application must be used. For a command mapping table, see Chapter 5.5.4, "Combined Signal Path Commands", on page 1003.

The most important signaling parameters not relevant for standalone measurements can nevertheless be configured both in the measurement GUI and in the GUI of the signaling application. In the measurement GUI, they can be accessed via hotkeys.

5.2.4 Trigger Modes

The LTE SRS measurement requires a trigger event for each SRS symbol to be measured. It can be performed in the following trigger modes:

- "IF Power" (default mode): With an internal IF power trigger, the measurement is triggered by the power ramp of the received SRS symbol. The minimum trigger gap must be large enough to ensure that the measurement is not retriggered within an SRS symbol. It must be small enough to ensure that the trigger system is rearmed for the next measurement interval. The default value is often appropriate.
- "External Trigger A/B": External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument (availability depends on instrument model).
- Additional trigger modes: Other firmware applications, e.g. the LTE signaling application (option R&S CMW-KS500/-KS550) or the GPRF generator provide additional trigger modes. Refer to the documentation of the corresponding firmware application for a description of these trigger modes.

For configuration, see Chapter 5.3.2.3, "Trigger Settings", on page 982.

5.2.5 Limit Settings and Conformance Requirements

Conformance requirements for LTE transmitter tests are specified in 3GPP TS 36.521, section 6, "Transmitter Characteristics".

The following section gives an overview of the SRS measurement limit settings and the related test requirements.

5.2.5.1 Power Dynamics Limits

Transmission at excessive uplink power increases interference to other channels while a too low uplink power increases transmission errors. For SRS transmission, 3GPP defines a time mask. The mask contains limits for the UL power during SRS symbol transmission (ON power), the UL power in the adjacent SC-FDMA symbols (OFF power) and the power ramping in-between.

The ON power is specified as the mean UE output power over the SRS symbols, excluding transient periods of 20 µs. For the OFF power, the mean power has to be measured both in the preceding symbols and in the subsequent subframe, excluding transient periods of 20 µs.

The following figures provide a summary of the time periods relevant for ON and OFF power limits for FDD and TDD. The transient periods between the two TDD SRS symbols are only defined for signal configurations with frequency hopping or power change between the two symbols. The measurement assumes that this condition is fulfilled and excludes these transient periods for result calculation.

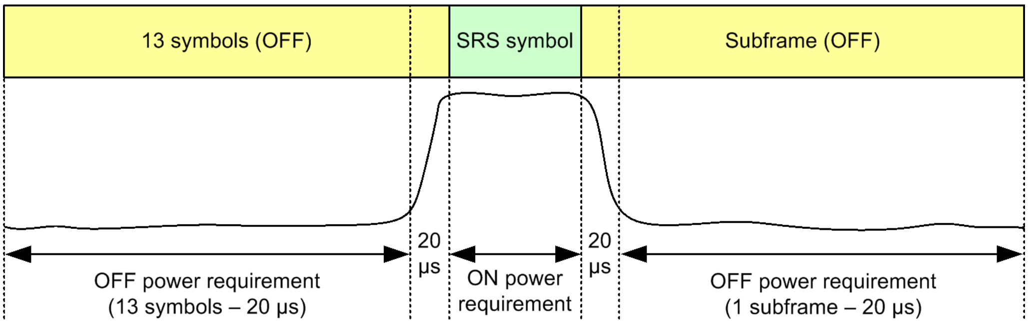


Figure 5-1: Measurement periods ON/OFF power, FDD SRS signal

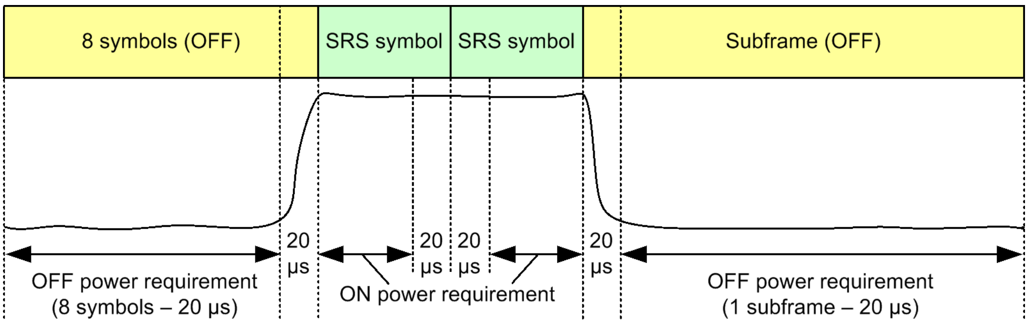


Figure 5-2: Measurement periods ON/OFF power, TDD SRS signal

According to 3GPP, the OFF power must not exceed -48.5 dBm. The ON power must be in the range -10.1 dBm to 4.9 dBm. The limits for ON and OFF power can be set in the configuration dialog.

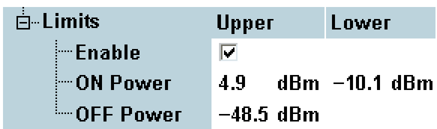


Figure 5-3: Power dynamics limit settings

Characteristics	Refer to 3GPP TS 36.521 V9.3.0, section...	Specified limit
ON power	6.3.4.2 PRACH and SRS Time Mask	≥ -10.1 dBm, ≤ 4.9 dBm
OFF power	6.3.4.2 PRACH and SRS Time Mask	≤ -48.5 dBm

5.2.6 Measurement Results

The results of the LTE SRS measurement are displayed in the view "Power Dynamics".

It shows a diagram and a statistical overview of related power results.

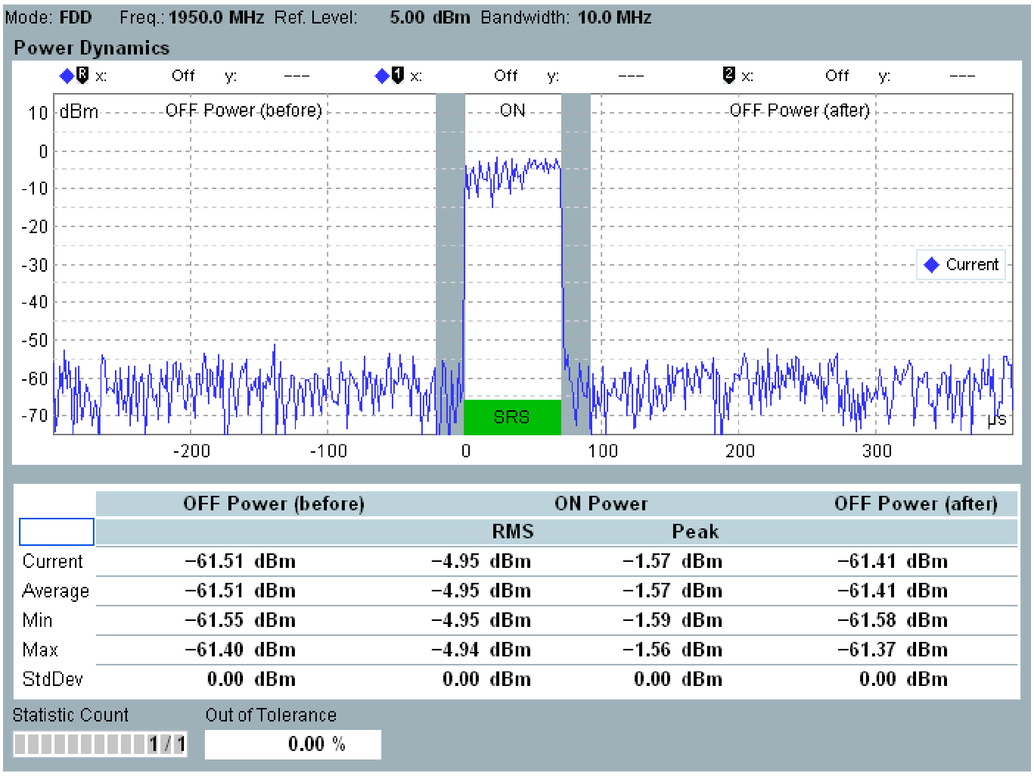


Figure 5-4: LTE SRS measurement result view, FDD

The diagram shows the UE output power vs. time, sampled with 48 T_s (1.5625 µs). The trace covers the range from -1100 µs to +1298.4375 µs relative to the start of the SRS symbol.

Transient periods are indicated by gray vertical bars in the diagram. They are excluded from the measurement and have a width of 20 µs each. For TDD signals, there are two exclusion periods between the two SRS symbols.

The table below the diagram shows ON power and OFF power values:

- **ON power**:
  The ON power is the mean UE output power over the SRS symbol, i.e. over the measurement period marked by a green horizontal bar in the diagram. In addition to the mean value, the table lists also the peak power within the measurement period.
  For TDD signals two SRS symbols are measured and separate RMS and peak ON power results are provided for each SRS symbol.
- **OFF power**:
  The OFF power represents a mean power value. It is determined before and after the SRS symbols within the following measurement periods:
  – "OFF Power (before)": 13 SC-FDMA symbols for FDD, 8 SC-FDMA symbols for TDD
  – "OFF Power (after)": one subframe (FDD and TDD)

5.2.6.1 Result View Elements

Statistical results
The statistical values in the table are calculated as follows:

- **"Current":** Value of the result obtained in the last measurement interval.
- **"Average":** Average of all "Current" values referenced to the last statistics cycle.
- **"Min", "Max":** Largest or smallest "Current" value that the R&S CMW obtained since the start of the measurement.
- **"StdDev":** Standard deviation of all "Current" values since the start of the measurement.

All statistical results (statistical tables and "Average" or "Max" traces) are calculated according to the general rules for statistical results.

See also: "Statistical Results" in the R&S CMW base unit manual, chapter "System Overview"

Statistic Count
Progress bar for the measurement. During the first single shot after the start of the measurement, the bar shows the number of completed measurement intervals relative to the "Statistic Count". A filled progress bar indicates that the first shot is complete and the statistical depth has been reached.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "System Overview"

Out of Tolerance
Percentage of measurement intervals (SRS symbols) that were failed because they exceeded the limits in the diagram.

5.2.6.2 Modifying Views

Press the "Display" softkey to show hotkeys for view configuration. They change the appearance and contents of the active view. The following hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Select Trace ..."	Select the trace types to be displayed in the view.
"X Scale... / Y Scale..."	Modify the ranges of the X-axis and the Y-axis.

5.2.6.3 Using Markers

Press the "Marker" softkey to show hotkeys for marker configuration. They activate markers and modify their position. The following hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Ref. Marker ..."	Enable or disable the reference marker and select the marker position. If several traces can be displayed, a trace can also be selected.
"Marker 1/2 ..."	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker). Depending on the trace mode, a trace can also be selected.
"Select Trace Mode"	Define whether markers 1 and 2 are set to the same trace as the reference marker (collective) or to selectable individual traces.

See also: "Markers" in the R&S CMW base unit manual, chapter "System Overview"

5.3 GUI Reference

The following sections provide detailed reference information on the graphical user interface (GUI) and the parameters of the LTE SRS measurement.

- Measurement Control....................978
- Parameters and Settings....................979
- Measurement Results....................984

5.3.1 Measurement Control

To turn the measurement on or off, select the control softkey and press ON | OFF or RESTART | STOP. Alternatively, right-click the control softkey.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "System Overview"

SRS (Softkey)
The softkey shows the current measurement state. Additional measurement substates can be retrieved via remote control.

Remote command:

```
INITiate:LTE:MEAS<i>:SRS
STOP:LTE:MEAS<i>:SRS
ABORt:LTE:MEAS<i>:SRS
FETCh:LTE:MEAS<i>:SRS:STATe?
FETCh:LTE:MEAS<i>:SRS:STATe:ALL?
```

5.3.2 Parameters and Settings

The most important settings of the "LTE SRS" measurement are displayed at the top of the measurement dialog.

All settings are defined via softkeys and hotkeys or using the main configuration dialog. The configuration dialog is described in the following sections. To open the dialog, select the "SRS" tab and press the "Config" hotkey.

5.3.2.1 Signal Routing and Analyzer Settings

The following parameters configure the RF input path. All parameters are common measurement settings, i.e. they have the same value in all measurements (for example SRS measurement and multi-evaluation measurement).

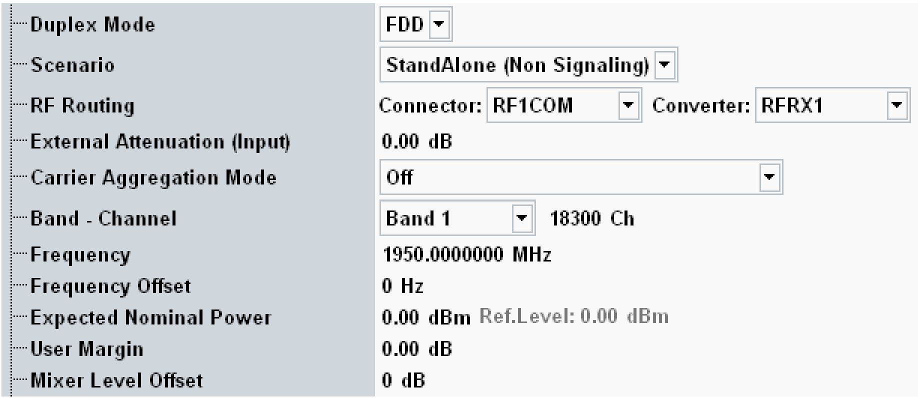


Figure 5-5: Signal routing and analyzer settings

For a description of the settings, see Chapter 3.3.3, "Signal Routing and Analyzer Settings", on page 679.

5.3.2.2 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the LTE SRS measurement.

While the combined signal path scenario is active, some of the measurement control parameters display values determined by the controlling signaling application. For these parameters, a hint is given in the parameter description. See also "Scenario = Combined Signal Path" on page 680.

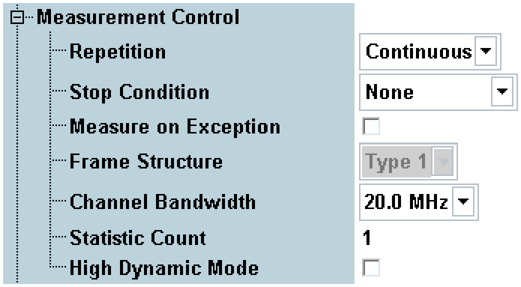


Figure 5-6: Measurement Control settings

Repetition..980
Stop Condition..980
Measure on Exception..980
Frame Structure..981
Channel Bandwidth..981
Statistic Count..981
High Dynamic Mode..981

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

`CONFigure:LTE:MEAS<i>:SRS:REPetition`

Stop Condition

Specifies the conditions for an early termination of the measurement:

- **"None":** The measurement is performed according to its "Repetition" mode and "Statistic Count", irrespective of the limit check results.
- **"On Limit Failure":** The measurement is stopped when one of the limits is exceeded, irrespective of the repetition mode set. If no limit failure occurs, it is performed according to its "Repetition" mode and "Statistic Count". Use this setting for measurements that are intended for checking limits, e.g. production tests.

Remote command:

`CONFigure:LTE:MEAS<i>:SRS:SCONdition`

Measure on Exception

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected. A faulty result occurs e.g. when an overload is detected. In remote control, the cause of the error is indicated by the "reliability indicator".

- **Off:** Faulty results are rejected. The measurement is continued; the statistical counters are not reset. Use this mode to ensure that a single faulty result does not affect the entire measurement.
- **On:** Results are never rejected. Use this mode e.g. for development purposes, if you want to analyze the reason for occasional wrong transmissions.

Remote command:
`CONFigure:LTE:MEAS<i>:SRS:MOEXception`

Frame Structure
Displays the frame structure of the uplink signal as defined in 3GPP TS 36.211. The value is set implicitly via the Duplex Mode ("Type 1" = FDD, "Type 2" = TDD).

Remote command:
`CONFigure:LTE:MEAS<i>:FSTRucture?`

Channel Bandwidth
Channel bandwidth in the range 1.4 MHz to 20 MHz. Set the bandwidth in accordance with the measured LTE signal.

The parameter is a common measurement setting, i.e. it has the same value in all measurements (e.g. SRS measurement and multi-evaluation measurement).

In the standalone (SA) scenario, this parameter is controlled by the measurement. In the combined signal path (CSP) scenario, it is controlled by the signaling application.

Remote command:
`CONFigure:LTE:MEAS<i>[:PCC]:CBANdwidth` (SA)
`CONFigure:LTE:SIGN<i>:CELL:BANDwidth[:PCC]:DL` (CSP)

Statistic Count
Defines the number of measurement intervals per measurement cycle (statistics cycle, single-shot measurement). This value is also relevant for continuous measurements, because the averaging procedures depend on the statistic count.

For SRS measurements, the measurement interval is completed when the R&S CMW has measured a full trace, including one or two SRS symbols and the preceding and following OFF time.

Remote command:
`CONFigure:LTE:MEAS<i>:SRS:SCOunt:PDYNamics`

High Dynamic Mode
Enables or disables the high dynamic mode.

The high dynamic mode is suitable for power dynamics measurements involving high ON powers. In that case, the dynamic range of the R&S CMW is eventually not sufficient to measure both the high ON powers and the low OFF powers accurately.

In high dynamic mode, the dynamic range is increased by measuring the results in two shots. One shot uses the configured settings to measure the ON power. The other shot uses a lower "Expected Nominal Power" value to measure the OFF power results.

Disable the high dynamic mode to optimize the measurement speed. Disable it especially if you measure low ON powers using a low "Expected Nominal Power" setting, so that the normal dynamic range is sufficient.

While the combined signal path scenario is active, this parameter is not configurable.

Remote command:
CONFigure:LTE:MEAS<i>:SRS:HDMode

5.3.2.3 Trigger Settings

The "Trigger" parameters configure the trigger system for the LTE SRS measurement.

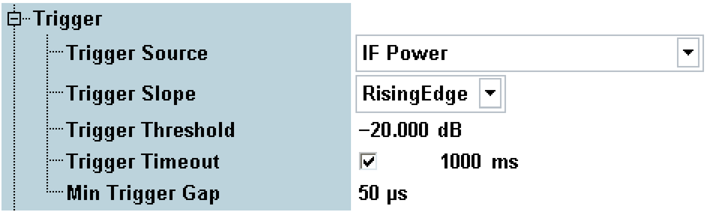


Figure 5-7: Trigger settings

Trigger Source 982
Trigger Slope 982
Trigger Threshold 983
Trigger Timeout 983
Min Trigger Gap 983

Trigger Source

Selects the source of the trigger event. Some of the trigger sources require additional options.

"IF Power" The measurement is triggered by the power of the received signal, converted into an IF signal. The trigger event coincides with the rising or falling edge of the detected LTE burst (i.e. for an SRS signal, the start or end of an SRS symbol). Parameter Min Trigger Gap is also relevant.

"…External…" External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument (availability depends on instrument model).

Remote command:
TRIGger:LTE:MEAS<i>:SRS:SOURce
TRIGger:LTE:MEAS<i>:SRS:CATalog:SOURce?

Trigger Slope

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse. This setting has no influence on the evaluation of trigger pulses provided by other firmware applications.

Remote command:
TRIGger:LTE:MEAS<i>:SRS:SLOPe

Trigger Threshold
Defines the input signal power where the trigger condition is satisfied and a trigger event is generated. The trigger threshold is valid for power trigger sources. It is a dB value, relative to the reference level minus the external attenuation ("<Ref. Level> – <External Attenuation (Input)> – <Frequency Dependent External Attenuation>"). If the reference level equals the maximum output power of the DUT and the external attenuation settings are correct, the trigger threshold is relative to the maximum input power.

A low threshold can be required to ensure that the R&S CMW can always detect the input signal. A higher threshold can prevent unintended trigger events.

Remote command:
TRIGger:LTE:MEAS<i>:SRS:THReshold

Trigger Timeout
Sets a time after which an initiated measurement must have received a trigger event. If no trigger event is received, a trigger timeout is indicated in manual operation mode. In remote control mode, the measurement is automatically stopped. The parameter can be disabled so that no timeout occurs.

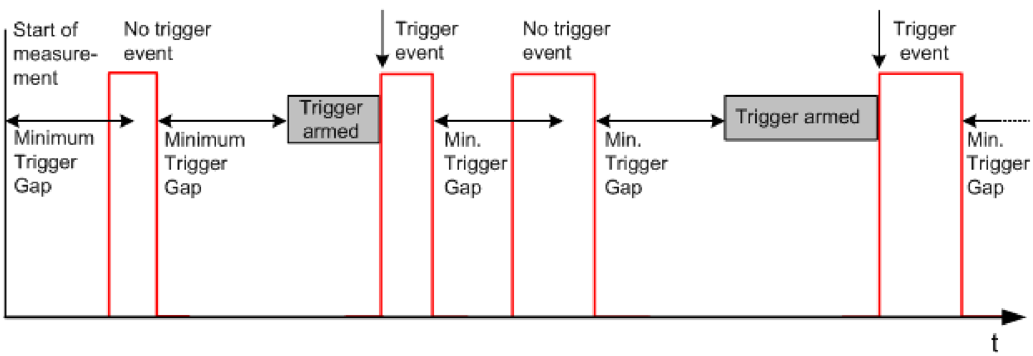
Remote command:
TRIGger:LTE:MEAS<i>:SRS:TOUT

Min Trigger Gap
Defines a minimum duration of the power-down periods (gaps) between two triggered power pulses. This setting is valid for an "(IF) Power" trigger source.

The trigger system is controlled by a timer which is reset to zero in the following instances:

- At the IF power-down ramp of each triggered or untriggered pulse, even if the previous counter has not yet elapsed. A power-down ramp is detected when the signal power falls below the trigger threshold.
- At the beginning of each measurement. The minimum gap defines the minimum time between the start of the measurement and the first trigger event.

The trigger system is rearmed when the timer has reached the specified minimum gap.



This parameter can be used to prevent unwanted trigger events due to fast power variations.

Remote command:
TRIGger:LTE:MEAS<i>:SRS:MGAP

5.3.2.4 Limit Settings

The "Limits" section in the "LTE SRS Configuration" dialog defines upper limits for the power results.

For details, see Chapter 5.2.5, "Limit Settings and Conformance Requirements", on page 974.

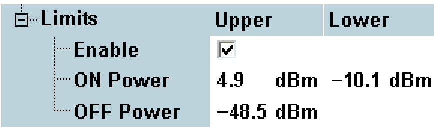


Figure 5-8: Limit settings

Limits
The limits can be configured via the following remote commands.

Remote command:
CONFigure:LTE:MEAS<i>:SRS:LIMit:PDYNamics

5.3.2.5 Shortcut Configuration

This section configures a shortcut softkey that provides a fast way to access the GPRF generator from the measurement.

The setting is a common measurement setting. It has the same value in all measurements (e.g. PRACH measurement and multi-evaluation measurement).

Figure 5-9: Shortcut configuration

Generator Shortcut
Selects a GPRF generator instance. Softkeys for the selected instance are added to the softkey panel.

5.3.2.6 Additional Softkeys and Hotkeys

See Chapter 3.3.9, "Additional Softkeys and Hotkeys", on page 707

5.3.3 Measurement Results

All results of the LTE SRS measurement are displayed in a single view.

For a detailed description, see Chapter 5.2.6, "Measurement Results", on page 975.

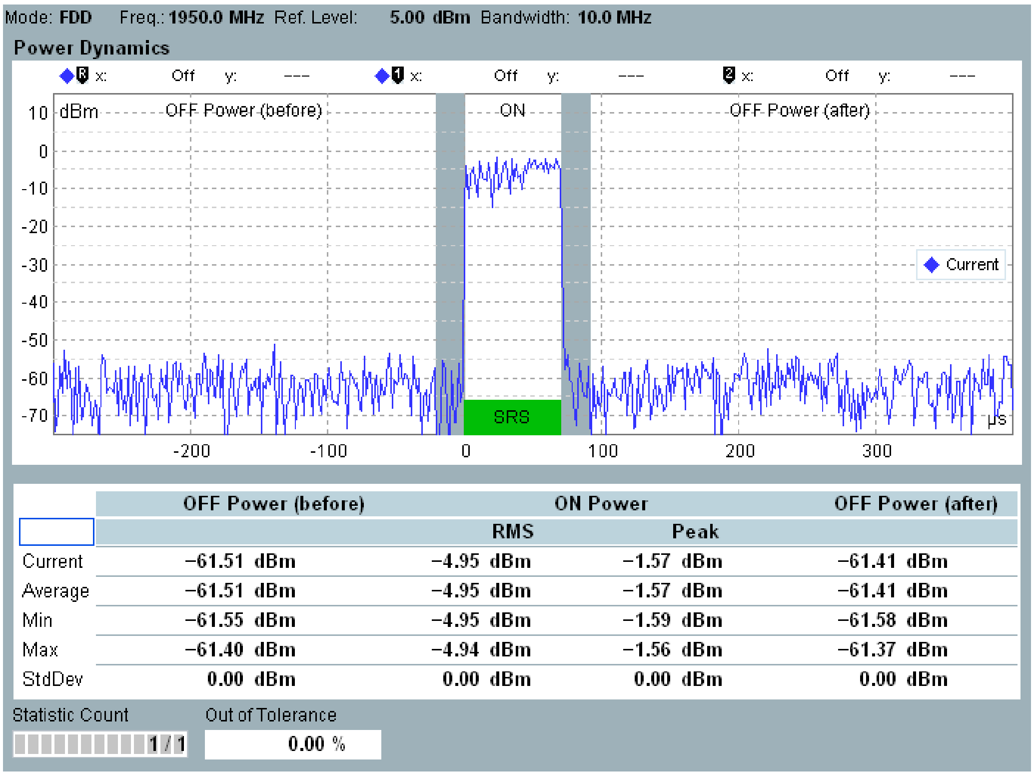


Figure 5-10: Power dynamics results

Traces

The results can be retrieved via the following remote commands.

Remote command:

FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:CURRent? etc.
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:AVERage? etc.
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:MAXimum? etc.

Single Values

The results can be retrieved via the following remote commands.

Remote command:

FETCh:LTE:MEAS<i>:SRS:PDYNamics:CURRent? etc.
FETCh:LTE:MEAS<i>:SRS:PDYNamics:AVERage? etc.
FETCh:LTE:MEAS<i>:SRS:PDYNamics:MINimum? etc.
FETCh:LTE:MEAS<i>:SRS:PDYNamics:MAXimum? etc.
FETCh:LTE:MEAS<i>:SRS:PDYNamics:SDEViation? etc.

5.4 Programming

The following sections provide programming examples for the LTE SRS measurement.

See also: "Remote Control" in the R&S CMW base unit manual

- Key Features....986
- Specifying General and Common Measurement Settings....986
- Specifying Measurement-Specific Settings....987
- Configuring the Trigger System....987
- Specifying Limits....987
- Performing Single-Shot Measurements....987
- Single-Shot and Continuous Measurements....988

5.4.1 Key Features

The LTE SRS measurement is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...LTE:MEAS:SRS...`
- Use general commands of the type `...:LTE:MEAS...` (no `:SRS` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off. Use `READ:LTE:MEAS:SRS...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:LTE:MEAS:SRS` and retrieve the results using `FETCh:LTE:MEAS:SRS...?`.

5.4.2 Specifying General and Common Measurement Settings

```
// *****************************************************************************
// Initial system-reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing and perform RF and analyzer settings:
// Carrier center frequency 1850 MHz, frequency offset 1 kHz, peak power 7 dBm,
// 5 dB user margin and 1 dB mixer level offset.
// *****************************************************************************
ROUTe:LTE:MEAS:SCENario:SALone RF1C, RX1
CONFigure:LTE:MEAS:RFSettings:EATTenuation 2
CONFigure:LTE:MEAS:RFSettings:FREQuency 1850E+6
CONFigure:LTE:MEAS:RFSettings:FOFFset 1000
CONFigure:LTE:MEAS:RFSettings:ENPower 7
CONFigure:LTE:MEAS:RFSettings:UMARgin 5
CONFigure:LTE:MEAS:RFSettings:MLOFfset 1

// *****************************************************************************
// Set duplex mode TDD and query the resulting frame structure type (T2).
// Specify channel bandwidth 1.4 MHz.
// *****************************************************************************
CONFigure:LTE:MEAS:DMODe TDD
```

```
CONFigure:LTE:MEAS:FSTRucture?
CONFigure:LTE:MEAS:CBANdwidth B014
```

5.4.3 Specifying Measurement-Specific Settings

```
// *****************************************************************************
// Define stop condition (stop on limit failure), statistic count (20 cycles)
// and error handling. Enable the high dynamic mode.
// *****************************************************************************
CONFigure:LTE:MEAS:SRS:SCONdition SLFail
CONFigure:LTE:MEAS:SRS:SCOunt:PDYNamics 20
CONFigure:LTE:MEAS:SRS:MOEXception ON
CONFigure:LTE:MEAS:SRS:TOUT 3600
CONFigure:LTE:MEAS:SRS:HDMode ON
```

5.4.4 Configuring the Trigger System

```
// *****************************************************************************
// Set trigger source, slope, threshold, timeout and minimum trigger gap.
// *****************************************************************************
TRIGger:LTE:MEAS:SRS:SOURce 'IF Power'
TRIGger:LTE:MEAS:SRS:SLOPe FEDGe
TRIGger:LTE:MEAS:SRS:THReshold -30
TRIGger:LTE:MEAS:SRS:TOUT 1
TRIGger:LTE:MEAS:SRS:MGAP 0.00006
```

5.4.5 Specifying Limits

```
// *****************************************************************************
// Define power dynamics limits.
// *****************************************************************************
CONFigure:LTE:MEAS:SRS:LIMit:PDYNamics ON,5.1,-10.3,-48.8
```

5.4.6 Performing Single-Shot Measurements

```
// *****************************************************************************
// Start single-shot measurement, return average power dynamics trace.
// Query the measurement state (should be "RDY").
// *****************************************************************************
READ:LTE:MEAS:SRS:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS:SRS:STATe?

// *****************************************************************************
// Read other traces obtained in the last
// measurement without re-starting the measurement.
// *****************************************************************************
```

```
FETCh:LTE:MEAS:SRS:TRACe:PDYNamics:CURRent?
FETCh:LTE:MEAS:SRS:TRACe:PDYNamics:MAXimum?

// *****************************************************************************
// Read statistical results obtained in the last measurement
// without re-starting the measurement.
// *****************************************************************************
FETCh:LTE:MEAS:SRS:PDYNamics:CURRent?
FETCh:LTE:MEAS:SRS:PDYNamics:AVERage?
FETCh:LTE:MEAS:SRS:PDYNamics:MINimum?
FETCh:LTE:MEAS:SRS:PDYNamics:MAXimum?
FETCh:LTE:MEAS:SRS:PDYNamics:SDEViation?

// *****************************************************************************
// Read limit check results obtained in the last measurement
// without re-starting the measurement.
// *****************************************************************************
CALCulate:LTE:MEAS:SRS:PDYNamics:CURRent?
CALCulate:LTE:MEAS:SRS:PDYNamics:AVERage?
CALCulate:LTE:MEAS:SRS:PDYNamics:MINimum?
CALCulate:LTE:MEAS:SRS:PDYNamics:MAXimum?
CALCulate:LTE:MEAS:SRS:PDYNamics:SDEViation?
```

5.4.7 Single-Shot and Continuous Measurements

```
// *****************************************************************************
// Start single-shot measurement, return current power dynamics trace,
// return average trace (without repeating the measurement).
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:LTE:MEAS:SRS
FETCh:LTE:MEAS:SRS:TRACe:PDYNamics:CURRent?
FETCh:LTE:MEAS:SRS:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS:SRS:STATe?

// *****************************************************************************
// Start continuous measurement and wait for 5 ms.
// Return average trace.
// Query measurement state and substates (should be "RUN,ADJ,ACT").
// *****************************************************************************
CONFigure:LTE:MEAS:SRS:REPetition CONTinuous
INIT:LTE:MEAS:SRS
Pause 5000
FETCh:LTE:MEAS:SRS:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS:SRS:STATe:ALL?
```

5.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the "LTE SRS" measurement.

- Conventions and General Information....................989
- General Measurement Settings....................993
- SRS Measurement Commands....................993
- Combined Signal Path Commands....................1003

5.5.1 Conventions and General Information

The following sections describe the most important conventions and general information concerning the command reference.

5.5.1.1 MEAS<i>

MEAS<i> is used as abbreviation of "MEASurement<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW base unit manual, chapter "Remote Control"

5.5.1.2 FETCh, READ and CALCulate Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.
- `CALCulate...` returns one limit check result per `FETCh` result:
  – **OK**: The `FETCh` result is located within the limits or no limit has been defined/ enabled for this result.
  – **ULEU** ("User limit exceeded upper"): An upper limit is violated. The `FETCh` result is located above the limit.
  – **ULEL** ("User limit exceeded lower"): A lower limit is violated. The `FETCh` result is located below the limit.

See also: "Retrieving Measurement Results" in the R&S CMW base unit manual, chapter "Remote Control"

5.5.1.3 Current and Statistical Results

The R&S CMW repeats measurements according to the selected statistic count and repetition mode. Consecutive measurement values are stored and used to calculate statistical results, e.g. average, minimum, maximum and standard deviation.

See also: "Statistical Results" in the R&S CMW base unit manual, chapter "System Overview"

5.5.1.4 Keywords

Selected keywords used in the command description are described in the following.

- **Command usage**
  If the usage is not explicitly stated, the command allows you to set parameters and query parameters. Otherwise the command usage is stated as follows:
  – "Setting only": Command can only be used to set parameters.
  – "Query only": Command can only be used to query parameters.
  – "Event": Command initiates an event.
- **Parameter usage**
  The parameter usage is indicated by the keyword preceding the parameters:
  – "Parameters" are sent with a setting or query command and are returned as the result of a query
  – "Setting parameters" are only sent with a setting command
  – "Query parameters" are only sent with a query command (to refine the query)
  – "Return values" are only returned as the result of a query
- **Firmware/Software:**
  Indicates the lowest software version supporting the command. Command enhancements in later software versions are also indicated.

5.5.1.5 Reliability Indicator

The first value in the output arrays of `FETCh...?`, `READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 ("OK")**:
  Measurement values available, no error detected.
- **1 ("Measurement Timeout")**:
  The measurement has been stopped after the configured measurement timeout. Measurement results can be available. However, at least a part of the measurement provides only `INValid` results or has not completed the full statistic count.
- **2 ("Capture Buffer Overflow")**:
  The measurement configuration results in a capture length that exceeds the available memory.

- **3 ("Overdriven") / 4 ("Underdriven")**:
  The accuracy of measurement results can be impaired because the input signal level was too high / too low.
- **6 ("Trigger Timeout")**:
  The measurement could not be started or continued because no trigger event was detected.
- **7 ("Acquisition Error")**:
  The R&S CMW could not properly decode the RF input signal.
- **8 ("Sync Error")**:
  The R&S CMW could not synchronize to the RF input signal.
- **9 ("Uncal")**:
  Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 ("Reference Frequency Error")**:
  The instrument has been configured to use an external reference signal. But the reference oscillator could not be phase-locked to the external signal (for example signal level too low, frequency out of range or reference signal not available at all).
- **16 ("RF Not Available")**:
  The measurement could not be started because the configured RF input path was not active. This problem can occur for example if a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 ("RF Level not Settled") / 18 ("RF Frequency not Settled")**:
  The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 ("Call not Established")**:
  For measurements: The measurement could not be started because no signaling connection to the DUT was established.
  For DAU IMS service: Establishing a voice over IMS call failed.
- **20 ("Call Type not Usable")**:
  For measurements: The measurement could not be started because the established signaling connection had wrong properties.
  For DAU IMS service: The voice over IMS settings could not be applied.
- **21 ("Call Lost")**:
  For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
  For DAU IMS service: The voice over IMS call was lost.
- **23 ("Missing Option")**:
  The ARB file cannot be played by the GPRF generator due to a missing option.
- **24 ("Invalid RF Setting")**:
  The desired RF TX level or RF RX reference level could not be applied.
- **26 ("Resource Conflict")**:
  The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
  Stop the application that has allocated the conflicting resources and try again.

- **27 ("No Sensor Connected")**:
  The GPRF external power sensor measurement could not be started due to missing power sensor.
- **28 ("Unexpected Parameter Change")**:
  One or more measurement configuration parameters were changed while the measurement completed. The results were not obtained with these new parameter values. Repeat the measurement. This situation can only occur in remote single-shot mode.
- **30 ("File not Found")**:
  The specified file could not be found.
- **31 ("No DTM reply")**:
  The EUT did not reply to the direct test mode (DTM) command.
- **32 ("ACL Disconnected")**:
  The ACL connection has been disconnected or lost.
- **40 ("ARB File CRC Error")**:
  The cyclic redundancy check of the ARB file failed. The ARB file is corrupt and not reliable.
- **42 ("ARB Header Tag Invalid")**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 ("ARB Segment Overflow")**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 ("ARB File not Found")**:
  The selected ARB file could not be found.
- **45 ("ARB Memory Overflow")**:
  The ARB file length is greater than the available memory.
- **46 ("ARB Sample Rate out of Range)"**:
  The clock rate of the ARB file is either too high or too low.
- **47 ("ARB Cycles out of Range")**:
  The repetition mode equals "Single Shot" and the playback length is greater than 40 s. Reduce the playback length or set the repetition mode to "Continuous".
  *<Length> = (<Cycles> * <Samples> + <Additional Samples>) / <Clock Rate>*
- **50 ("Startup Error")**:
  The data application unit (DAU), a DAU service or a DAU measurement could not be started. Execute a DAU selftest.
- **51 ("No Reply")**:
  The DAU has received no response, for example for a ping request.
- **52 ("Connection Error")**:
  The DAU could not establish a connection to internal components. Restart the instrument.
- **53 ("Configuration Error")**:
  The current DAU configuration is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 ("Filesystem Error")**:
  The hard disk of the DAU is full or corrupt. Execute a DAU selftest.
- **60 ("Invalid RF-Connector Setting")**

The individual segments of a list mode measurement with R&S CMWS use different connector benches. All segments must use the same bench.
Check the "Info" dialog for the relevant segment numbers.

- **93 ("OCXO Oven Temperature too low")**:
The accuracy of measurement results can be impaired because the oven-controlled crystal oscillator has a too low temperature. After switching-on the instrument, the OCXO requires a warm-up phase to reach its operating temperature.
- **101 ("Firmware Error")**:
Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.

  If the error occurs again, consider the following hints:
  - Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.
  - If a software package (update) has not been properly installed, this failure is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".
  - Check for software updates correcting the error. Updates are for example provided in the CMW customer web on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, send a problem report including log files to Rohde & Schwarz.
- **102 ("Unidentified Error")**:
Indicates an error not covered by other reliability values. For troubleshooting, follow the steps described for "101 (Firmware Error)".
- **103 ("Parameter Error")**:
Indicates that the measurement could not be performed due to internal conflicting parameter settings.
A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.
If you need assistance to localize the conflicting parameter settings, contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).
- **104 ("Not Functional")**:
The application could not be started with the configured parameter set.

5.5.2 General Measurement Settings

The commands valid for all LTE measurements are described here: Chapter 3.5.2, "General Measurement Settings", on page 731

5.5.3 SRS Measurement Commands

The commands for the "LTE SRS" measurement are divided into the groups listed below.

- Measurement Control and States......994
- Measurement Parameters......996
- Trigger Settings......998
- Limits......1000
- Power Dynamics Results (Traces)......1001
- Power Dynamics Results (Single Values)......1002

5.5.3.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:LTE:MEAS<i>:SRS......994
STOP:LTE:MEAS<i>:SRS......994
ABORt:LTE:MEAS<i>:SRS......994
FETCh:LTE:MEAS<i>:SRS:STATe?......994
FETCh:LTE:MEAS<i>:SRS:STATe:ALL?......995

INITiate:LTE:MEAS<i>:SRS
STOP:LTE:MEAS<i>:SRS
ABORt:LTE:MEAS<i>:SRS

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement. The measurement enters the "RUN" state.
- `STOP...` halts the measurement immediately. The measurement enters the "RDY" state. Measurement results are kept. The resources remain allocated to the measurement.
- `ABORt...` halts the measurement immediately. The measurement enters the "OFF" state. All measurement values are set to NAV. Allocated resources are released.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Example: See Single-Shot and Continuous Measurements

Usage: Event

Firmware/Software: V2.0.20

Manual operation: See "SRS (Softkey)" on page 978

FETCh:LTE:MEAS<i>:SRS:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MeasState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.20

Manual operation: See "SRS (Softkey)" on page 978

FETCh:LTE:MEAS<i>:SRS:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW base unit manual, chapter "Remote Control"

Return values:

<MainState> OFF | RUN | RDY

OFF: measurement off, no resources allocated, no results
RUN: measurement running, synchronization pending or adjusted, resources active or queued
RDY: measurement terminated, valid results can be available

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: adjustments finished, measurement running ("adjusted")
INV: not applicable, <MainState> OFF or RDY ("invalid")

<ResourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable, <MainState> OFF or RDY ("invalid")

Example: See Single-Shot and Continuous Measurements

Usage: Query only

Firmware/Software: V2.0.20

Manual operation: See "SRS (Softkey)" on page 978

5.5.3.2 Measurement Parameters

The following commands define measurement control parameters for the SRS measurement.

CONFigure:LTE:MEAS<i>:SRS:TOUT....................996
CONFigure:LTE:MEAS<i>:SRS:REPetition....................996
CONFigure:LTE:MEAS<i>:SRS:SCONdition....................997
CONFigure:LTE:MEAS<i>:SRS:MOEXception....................997
CONFigure:LTE:MEAS<i>:SRS:SCOunt:PDYNamics....................998
CONFigure:LTE:MEAS<i>:SRS:HDMode....................998

CONFigure:LTE:MEAS<i>:SRS:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY`. The reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results, there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:
<Timeout> Default unit: s

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

CONFigure:LTE:MEAS<i>:SRS:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:...:MEAS<i>:...:SCOunt` to determine the number of measurement intervals per single shot.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Single-Shot and Continuous Measurements

Firmware/Software: V2.0.20

Manual operation: See "Repetition" on page 980

CONFigure:LTE:MEAS<i>:SRS:SCONdition <StopCondition>

Qualifies whether the measurement is stopped after a failed limit check or continued. `SLFail` means that the measurement is stopped and reaches the `RDY` state when one of the results exceeds the limits.

Parameters:

<StopCondition> NONE | SLFail

NONE: Continue measurement irrespective of the limit check
SLFail: Stop measurement on limit failure

*RST: NONE

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "Stop Condition" on page 980

CONFigure:LTE:MEAS<i>:SRS:MOEXception <MeasOnException>

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected.

Parameters:

<MeasOnException> OFF | ON

OFF: Faulty results are rejected
ON: Results are never rejected

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "Measure on Exception" on page 980

CONFigure:LTE:MEAS<i>:SRS:SCOunt:PDYNamics <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW base unit manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals

Range: 1 to 1000
*RST: 1

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.0.20

Manual operation: See "Statistic Count" on page 981

CONFigure:LTE:MEAS<i>:SRS:HDMode <HighDynamicMode>

Enables or disables the high dynamic mode for power dynamics measurements.

Parameters:

<HighDynamicMode> OFF | ON

*RST: OFF

Example: See Specifying Measurement-Specific Settings

Firmware/Software: V2.1.25

Manual operation: See "High Dynamic Mode" on page 981

5.5.3.3 Trigger Settings

The following commands define the trigger parameters.

TRIGger:LTE:MEAS<i>:SRS:CATalog:SOURce?....998
TRIGger:LTE:MEAS<i>:SRS:SOURce....999
TRIGger:LTE:MEAS<i>:SRS:SLOPe....999
TRIGger:LTE:MEAS<i>:SRS:THReshold....999
TRIGger:LTE:MEAS<i>:SRS:TOUT....1000
TRIGger:LTE:MEAS<i>:SRS:MGAP....1000

TRIGger:LTE:MEAS<i>:SRS:CATalog:SOURce?

Lists all trigger source values that can be set using `TRIGger:LTE:MEAS<i>:SRS:SOURce`.

Return values:

<Sourcelist> Comma-separated list of all supported values. Each value is represented as a string.

Usage: Query only

Firmware/Software: V2.0.20

Manual operation: See "Trigger Source" on page 982

TRIGger:LTE:MEAS<i>:SRS:SOURce <Source>

Selects the source of the trigger events. Some values are always available in this firmware application. They are listed below. Depending on the installed options, additional values are available. A complete list of all supported values can be displayed using `TRIGger:...:CATalog:SOURce?`.

Parameters:

<Source> **'IF Power':** Power trigger (received RF power)

*RST: 'IF Power'

Example: See Configuring the Trigger System

Firmware/Software: V2.0.20

Manual operation: See "Trigger Source" on page 982

TRIGger:LTE:MEAS<i>:SRS:SLOPe <Slope>

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse (valid for external and power trigger sources).

Parameters:

<Slope> REDGe | FEDGe

REDGe: Rising edge
FEDGe: Falling edge

*RST: REDG

Example: See Configuring the Trigger System

Firmware/Software: V2.0.20

Manual operation: See "Trigger Slope" on page 982

TRIGger:LTE:MEAS<i>:SRS:THReshold <TrigThreshold>

Defines the trigger threshold for power trigger sources.

Parameters:

<TrigThreshold> Range: -50 dB to 0 dB
*RST: -20 dB
Default unit: dB (full scale, i.e. relative to reference level minus external attenuation)

Example: See Configuring the Trigger System

Firmware/Software: V2.0.20

Manual operation: See "Trigger Threshold" on page 983

TRIGger:LTE:MEAS<i>:SRS:TOUT <TriggerTimeOut>

Selects the maximum time that the R&S CMW waits for a trigger event before it stops the measurement in remote control mode or indicates a trigger timeout in manual operation mode. This setting has no influence on "Free Run" measurements.

Parameters:

<TriggerTimeOut> Range: 0.01 s to 167772.15 s
*RST: 0.1 s
Default unit: s
Additional parameters: OFF | ON (disables | enables the timeout)

Example: See Configuring the Trigger System

Firmware/Software: V2.0.20

Manual operation: See "Trigger Timeout" on page 983

TRIGger:LTE:MEAS<i>:SRS:MGAP <MinTrigGap>

Sets a minimum time during which the IF signal must be below the trigger threshold before the trigger is armed so that an IF power trigger event can be generated.

Parameters:

<MinTrigGap> Range: 0 s to 1E-3 s
*RST: 50E-6 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V2.0.20

Manual operation: See "Min Trigger Gap" on page 983

5.5.3.4 Limits

The following command defines limits for results which characterize the power dynamics of the SRS signal.

CONFigure:LTE:MEAS<i>:SRS:LIMit:PDYNamics <Enable>, <OnPowerUpper>, <OnPowerLower>, <OffPowerUpper>

Defines limits for the ON power and OFF power determined with the power dynamics measurement.

Parameters:

<Enable> OFF | ON

OFF: disables the limit check
ON: enables the limit check

*RST: ON

<OnPowerUpper> Upper limit for the ON power

Range: -256 dBm to 256 dBm
*RST: 4.9 dBm
Default unit: dBm

<OnPowerLower> Lower limit for the ON power

Range: -256 dBm to 256 dBm
*RST: -10.1 dBm
Default unit: dBm

<OffPowerUpper> Upper limit for the OFF power

Range: -256 dBm to 256 dBm
*RST: -48.5 dBm
Default unit: dBm

Example: See Specifying Limits

Firmware/Software: V2.0.20

Manual operation: See "Limits" on page 984

5.5.3.5 Power Dynamics Results (Traces)

The following commands return the results in the power dynamics diagram.

FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:CURRent?
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:AVERage?
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:MAXimum?
READ:LTE:MEAS<i>:SRS:TRACe:PDYNamics:CURRent?
READ:LTE:MEAS<i>:SRS:TRACe:PDYNamics:AVERage?
READ:LTE:MEAS<i>:SRS:TRACe:PDYNamics:MAXimum?

Return the values of the power dynamics traces. Each value is sampled with 48 T_s, corresponding to 1.5625 µs. The results of the current, average and maximum traces can be retrieved.

Note that the GUI shows only the beginning of the trace returned via remote command. The last 800 µs cannot be displayed at the GUI.

See also Chapter 5.2.6, "Measurement Results", on page 975.

Return values:

<Reliability> Reliability Indicator

<Power> 2048 power values, from -1100 µs to +2098.4375 µs relative to the start of the SRS symbol. The values have a spacing of 1.5625 µs. The 705th value is at the start of the SRS symbol (0 µs).

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.20

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

5.5.3.6 Power Dynamics Results (Single Values)

The following commands return the statistical results of the power dynamics measurement.

FETCh:LTE:MEAS<i>:SRS:PDYNamics:CURRent?
FETCh:LTE:MEAS<i>:SRS:PDYNamics:AVERage?
FETCh:LTE:MEAS<i>:SRS:PDYNamics:MINimum?
FETCh:LTE:MEAS<i>:SRS:PDYNamics:MAXimum?
FETCh:LTE:MEAS<i>:SRS:PDYNamics:SDEViation?
READ:LTE:MEAS<i>:SRS:PDYNamics:CURRent?
READ:LTE:MEAS<i>:SRS:PDYNamics:AVERage?
READ:LTE:MEAS<i>:SRS:PDYNamics:MINimum?
READ:LTE:MEAS<i>:SRS:PDYNamics:MAXimum?
READ:LTE:MEAS<i>:SRS:PDYNamics:SDEViation?
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:CURRent?
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:AVERage?
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:MINimum?
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:MAXimum?

Return the current, average, minimum, maximum and standard deviation single value results of the power dynamics measurement.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

Return values:

<Reliability> Reliability Indicator

<OutOfTolerance> Out of tolerance result, i.e. percentage of measurement intervals of the statistic count (`CONFigure:LTE:MEAS<i>:SRS:SCOunt:PDYNamics`) exceeding the specified power dynamics limits.

Range: 0 % to 100 %
Default unit: %

<OffPowerBefore> OFF power mean value for time period before SRS symbol

Range: -100 dBm to 55 dBm
Default unit: dBm

<OnPowerRMS1> ON power mean value over the first SRS symbol

Range: -100 dBm to 55 dBm
Default unit: dBm

<OnPowerPeak1>	ON power peak value for the first SRS symbol Range: -100 dBm to 55 dBm Default unit: dBm
<OnPowerRMS2>	ON power mean value over the second SRS symbol (NCAP returned for FDD) Range: -100 dBm to 55 dBm Default unit: dBm
<OnPowerPeak2>	ON power peak value for the second SRS symbol (NCAP returned for FDD) Range: -100 dBm to 55 dBm Default unit: dBm
<OffPowerAfter>	OFF power mean value for subframe after SRS symbol Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V2.0.20

For additional information concerning syntax elements and returned values, refer to Conventions and General Information.

5.5.4 Combined Signal Path Commands

For some settings, the command to be used depends on the active scenario. While the combined signal path (CSP) scenario is active, these settings are configured via commands of the signaling application. While the standalone (SA) scenario is active, they are configured via measurement commands.

The following table provides the mapping for SRS measurement commands. For general measurement settings, see Table 3-3.

Table 5-1: Mapping for SRS measurement commands

Setting	Commands for SA scenario	Commands for CSP scenario
High dynamic mode	`CONFigure:LTE:MEAS<i>:SRS:HDMode`	Fixed value `OFF`

5.6 List of Commands

ABORt:LTE:MEAS<i>:SRS....994
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:AVERage?....1002
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:CURRent?....1002
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:MAXimum?....1002
CALCulate:LTE:MEAS<i>:SRS:PDYNamics:MINimum?....1002
CONFigure:LTE:MEAS<i>:SRS:HDMode....998

CONFigure:LTE:MEAS<i>:SRS:LIMit:PDYNamics....1000
CONFigure:LTE:MEAS<i>:SRS:MOEXception....997
CONFigure:LTE:MEAS<i>:SRS:REPetition....996
CONFigure:LTE:MEAS<i>:SRS:SCONdition....997
CONFigure:LTE:MEAS<i>:SRS:SCOunt:PDYNamics....998
CONFigure:LTE:MEAS<i>:SRS:TOUT....996
FETCh:LTE:MEAS<i>:SRS:PDYNamics:AVERage?....1002
FETCh:LTE:MEAS<i>:SRS:PDYNamics:CURRent?....1002
FETCh:LTE:MEAS<i>:SRS:PDYNamics:MAXimum?....1002
FETCh:LTE:MEAS<i>:SRS:PDYNamics:MINimum?....1002
FETCh:LTE:MEAS<i>:SRS:PDYNamics:SDEViation?....1002
FETCh:LTE:MEAS<i>:SRS:STATe:ALL?....995
FETCh:LTE:MEAS<i>:SRS:STATe?....994
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:AVERage?....1001
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:CURRent?....1001
FETCh:LTE:MEAS<i>:SRS:TRACe:PDYNamics:MAXimum?....1001
INITiate:LTE:MEAS<i>:SRS....994
READ:LTE:MEAS<i>:SRS:PDYNamics:AVERage?....1002
READ:LTE:MEAS<i>:SRS:PDYNamics:CURRent?....1002
READ:LTE:MEAS<i>:SRS:PDYNamics:MAXimum?....1002
READ:LTE:MEAS<i>:SRS:PDYNamics:MINimum?....1002
READ:LTE:MEAS<i>:SRS:PDYNamics:SDEViation?....1002
READ:LTE:MEAS<i>:SRS:TRACe:PDYNamics:AVERage?....1001
READ:LTE:MEAS<i>:SRS:TRACe:PDYNamics:CURRent?....1001
READ:LTE:MEAS<i>:SRS:TRACe:PDYNamics:MAXimum?....1001
STOP:LTE:MEAS<i>:SRS....994
TRIGger:LTE:MEAS<i>:SRS:CATalog:SOURce?....998
TRIGger:LTE:MEAS<i>:SRS:MGAP....1000
TRIGger:LTE:MEAS<i>:SRS:SLOPe....999
TRIGger:LTE:MEAS<i>:SRS:SOURce....999
TRIGger:LTE:MEAS<i>:SRS:THReshold....999
TRIGger:LTE:MEAS<i>:SRS:TOUT....1000

Index

A

Accept multiple default bearer
LTE signaling ... 196
Add LTE signaling to logging ... 231
Add. excl. OFF power
LTE multi-evaluation measurement ... 701
Additional spectrum emission
LTE signaling ... 177
Antenna configuration
LTE signaling ... 182
Application cards ... 10
Application notes ... 10
Application sheet
LTE combined signal path measurement ... 88
LTE IP-based data tests ... 92
AS security
LTE signaling ... 168
Assign views
LTE measurement ... 707
Authentication
LTE signaling ... 167
AWGN
LTE signaling ... 147
AWGN fading module
LTE signaling ... 142

B

Band
LTE measurement ... 681
LTE signaling ... 135
Baseband level
LTE signaling ... 131
Baseband PEP
LTE signaling ... 131
Beamforming model TM 7
LTE signaling ... 183
Beamforming model TM 8
LTE signaling ... 184
BLER
LTE multi-evaluation measurement ... 636
LTE signaling ... 74
Brochure ... 10

C

CB message ID
LTE signaling ... 229
CBS data source
LTE signaling ... 229
CBS file selection
LTE signaling ... 230
Cell identifier
LTE signaling ... 167
Cell reselection
LTE signaling ... 165
Channel
LTE measurement ... 681
LTE signaling ... 135
Channel bandwidth
LTE multi-evaluation measurement ... 691
LTE PRACH measurement ... 920
LTE signaling ... 155
LTE SRS measurement ... 981
Channel matrix
LTE signaling ... 189
Channel type
LTE multi-evaluation measurement ... 692
Clear
LTE signaling ... 227
Codewords / layers
LTE signaling ... 187
Coding group
LTE signaling ... 225
Combined signal path commands
LTE multi-evaluation measurement ... 883
LTE PRACH measurement ... 968
LTE SRS measurement ... 1003
Connected DRX
LTE signaling ... 199
Connection control hotkeys
LTE signaling ... 121
Connection states
LTE signaling ... 31
Connection type
LTE signaling ... 177
CQI channels
LTE signaling ... 62
CQI/PMI config index
LTE signaling ... 219
Crest factor
LTE signaling ... 131
CS fallback
LTE signaling ... 196
CSI-RS antenna ports
LTE signaling ... 188
CSI-RS configuration
LTE signaling ... 188
CSI-RS power
LTE signaling ... 146, 188
Cyclic prefix
LTE multi-evaluation measurement ... 691
LTE signaling ... 155

D

Data coding / character set
LTE signaling ... 224, 227
Data coding scheme
LTE signaling ... 229
Data sheet ... 10
DCI format
LTE signaling ... 181
Default IMSI
LTE signaling ... 169
Default paging cycle
LTE signaling ... 176
Delta seq. shift PUSCH
LTE multi-evaluation measurement ... 696
DL HARQ
LTE signaling ... 197
Documentation overview ... 9
Doppler frequency
LTE signaling ... 141

Downlink MAC error insertion
LTE signaling ... 180
Downlink MAC padding
LTE signaling ... 180
Downlink power levels
LTE signaling ... 143
DRX short cycle
LTE signaling ... 201
Duplex mode
LTE measurement ... 680
LTE signaling ... 128

E

Effective signal BW
LTE signaling ... 143
Emergency bearer service indicator
LTE signaling ... 172
Enable
LTE signaling ... 229
Enable CQI reporting
LTE signaling ... 218
EPS network feature support
LTE signaling ... 172
Event log
LTE signaling ... 110
EVM exclusion periods
LTE multi-evaluation measurement ... 698
EVM window length
LTE multi-evaluation measurement ... 698
LTE PRACH measurement ... 923
EVM window position
LTE PRACH measurement ... 924
Expected nominal power
LTE measurement ... 682
LTE signaling ... 137
External attenuation
LTE signaling ... 133
External attenuation (input)
LTE measurement ... 681
External DAU
LTE signaling ... 178
External delay compensation
LTE signaling ... 133
External fading ... 28

F

Fading ... 28
Fading profile
LTE signaling ... 139
Fading simulator
LTE signaling ... 138
Features & functions ... 9
Fixed CQI
LTE signaling ... 208
Fixed CQI channels
LTE signaling ... 62
Follow WB CQI
LTE signaling ... 208
Follow WB CQI channels
LTE signaling ... 62
Follow WB CQI-PMI-RI
LTE signaling ... 208
Follow WB PMI
LTE signaling ... 208
Format indicator
LTE signaling ... 218
Frame structure
LTE multi-evaluation measurement ... 690
LTE PRACH measurement ... 920
LTE SRS measurement ... 981
Frequency
LTE measurement ... 681
LTE signaling ... 135
Frequency change
LTE signaling ... 195
Frequency offset
LTE measurement ... 682
LTE signaling ... 135

G

Getting started manual ... 9
Go to
LTE signaling ... 126
Group hopping
LTE multi-evaluation measurement ... 696
LTE signaling ... 176

H

Handover ... 35
HARQ DL
LTE signaling ... 197
HARQ UL
LTE signaling ... 196
High dynamic mode
LTE multi-evaluation measurement ... 702
LTE PRACH measurement ... 924
LTE SRS measurement ... 981
High-speed flag
LTE PRACH measurement ... 922

I

IMS voice over PS session indicator
LTE signaling ... 172
Inactivity timer
LTE signaling ... 201
Insertion loss
LTE signaling ... 140
Integrity algorithm
LTE signaling ... 168
Inter/intra-RAT hotkey
LTE signaling ... 123

J

Joint UL power
LTE signaling ... 147

K

Keep RRC connection
LTE signaling ... 179

L

Large SMS handling
LTE signaling ... 223

Limits
LTE multi-evaluation measurement 647
LTE PRACH measurement 906
LTE SRS measurement 974
List mode
LTE multi-evaluation measurement 637
LO location
LTE multi-evaluation measurement 699
Location service indicator in CS
LTE signaling 172
Location service indicator in EPC
LTE signaling 172
Logging PC IPv4 address
LTE signaling 231
Logical root sequence index
LTE PRACH measurement 923
Long DRX cycle
LTE signaling 201
LTE multi-evaluation measurement
Command reference 724
GUI reference 678
Limits 647
Measurement description 630
Programming 710
Results 657
LTE PRACH measurement
Command reference 934
GUI reference 917
Limits 906
Measurement description 899
Programming 930
Results 908
LTE signaling
Command reference 299
General description 14
GUI reference 107
Programming 262
Softkey 120
LTE SRS measurement
Command reference 989
GUI reference 978
Limits 974
Measurement description 972
Programming 985
Results 975

M

Margin
LTE signaling 137
Marker
LTE multi-evaluation measurement 676
LTE PRACH measurement 915
LTE SRS measurement 977
Max throughput
LTE signaling 193
Max. allowed power P-Max
LTE signaling 148
MCC
LTE signaling 166
Measure on exception
LTE multi-evaluation measurement 690
LTE PRACH measurement 920
LTE SRS measurement 980
Measurement cycle SCell
LTE signaling 222
Measurement filter (emission mask)
LTE multi-evaluation measurement 700
Measurement gaps
LTE signaling 221
Measurement mode
LTE multi-evaluation measurement 689
Measurement subframe
LTE multi-evaluation measurement 696
Message class
LTE signaling 225
Message ID
CBS 229
Message length
LTE signaling 227
Message text
LTE signaling 227
MIMO
LTE signaling 42
Minimum noise/system BW ratio
LTE signaling 142
Mixer level offset
LTE measurement 683
LTE signaling 138
MNC
LTE signaling 166
Mobility mode
LTE signaling 123
Modulation scheme
LTE multi-evaluation measurement 697

N

NAS security
LTE signaling 168
NAS signaling
LTE signaling 171
Neighbor cell
LTE signaling 162
Network signaled value
LTE multi-evaluation measurement 693
No. of subframes (BLER)
LTE multi-evaluation measurement 702
Noise
LTE signaling 141
Noise bandwidth
LTE signaling 143
Number of preambles
LTE PRACH measurement 920
Number TX antennas TM9
LTE signaling 187

O

OCNG
LTE signaling 145
On duration timer
LTE signaling 201
Online help 9
Open loop nominal power
LTE signaling 149
Open source acknowledgment 10
Operating band change
LTE signaling 195
Originating address
LTE signaling 225
Originator SMSC address
LTE signaling 225

Out of sync
LTE signaling ... 169
Outgoing message handling
LTE signaling ... 224
Outgoing SMS
LTE signaling ... 224
Outgoing SMS binary
LTE signaling ... 224

P

Period of preambles
LTE PRACH measurement ... 921
Physical cell ID
LTE multi-evaluation measurement ... 695
LTE signaling ... 155
Physical cell setup
LTE signaling ... 154
PRACH configuration index
LTE PRACH measurement ... 920
PRACH frequency offset
LTE PRACH measurement ... 921
PRACH settings
LTE signaling ... 159
Precoding matrix
LTE signaling ... 182, 188
Programming
LTE multi-evaluation measurement ... 710
LTE PRACH measurement ... 930
LTE signaling ... 262
LTE SRS measurement ... 985
Protocol identifier
LTE signaling ... 224
PUCCH format
LTE multi-evaluation measurement ... 692

Q

Quick start guide ... 9

R

RAND value
LTE signaling ... 169
RB allocation
LTE multi-evaluation measurement ... 694
Reject cause
LTE signaling ... 171
Release notes ... 10
Repetition
LTE multi-evaluation measurement ... 688
LTE PRACH measurement ... 919
LTE SRS measurement ... 980
Reporting interval
LTE signaling ... 221
Restart event
LTE signaling ... 140
Results
LTE multi-evaluation measurement ... 657
LTE PRACH measurement ... 908
LTE SRS measurement ... 975
Retransmission timer
LTE signaling ... 201
RF routing
LTE measurement ... 681
RLC mode
LTE signaling ... 179
RLC throughput measurement
LTE signaling ... 86
RMC
LTE signaling ... 47
RMC connection settings
LTE signaling ... 202
Routing
LTE signaling ... 133
RS EPRE
LTE signaling ... 144
RX tests
LTE multi-evaluation measurement ... 636

S

Safety instructions ... 10
Sample rate
LTE signaling ... 130
SCC activation mode
LTE signaling ... 129
Scenario
LTE measurement ... 680
LTE signaling ... 128
Scheduled subframes/frame (BLER)
LTE multi-evaluation measurement ... 702
Scheduling type
LTE signaling ... 191
Scheduling type fixed CQI
LTE signaling ... 62
Scheduling type follow WB CQI
LTE signaling ... 62
Scheduling type RMC
LTE signaling ... 47
Scheduling type SPS
LTE signaling ... 66
Scheduling type user-defined
LTE signaling ... 59
Secret key
LTE signaling ... 168
Select as fixed target
LTE signaling ... 126, 231
Select menu
LTE signaling ... 126, 231
Send DNS PCO
LTE signaling ... 171
Sequence index
LTE PRACH measurement ... 923
Serial number
LTE signaling ... 229
Service center time stamp
LTE signaling ... 225
Short cycle timer
LTE signaling ... 202
Short DRX cycle
LTE signaling ... 201
SIB reconfiguration
LTE signaling ... 179
Signal to noise ratio
LTE signaling ... 143
Signaling parameter
LTE measurement ... 708
SMS file selection
LTE signaling ... 226, 227
Sounding RS
LTE signaling ... 156
Sounding RS (modulation)
LTE multi-evaluation measurement ... 698

Special subframe
LTE multi-evaluation measurement 691
LTE signaling 158
SRS
LTE signaling 156
Start offset (DRX)
LTE signaling 201
Start seed
LTE signaling 140
Static channel model
LTE signaling 182
Statistic count
LTE SRS measurement 981
Statistic count (ACLR, emission mask)
LTE multi-evaluation measurement 700
Statistic count (dynamics)
LTE PRACH measurement 924
Statistic count (modulation)
LTE multi-evaluation measurement 697
LTE PRACH measurement 922
Statistic count (power)
LTE multi-evaluation measurement 701
Stop condition
LTE multi-evaluation measurement 688
LTE PRACH measurement 919
LTE SRS measurement 980

T

T3402
LTE signaling 169
T3412
LTE signaling 169
TAC
LTE signaling 167
Test mode
LTE signaling 178
Test setups
LTE signaling 17
Time mask
LTE multi-evaluation measurement 701
Transmission mode
LTE signaling 181
Transmission scheme
LTE signaling 182
Trigger settings
LTE multi-evaluation measurement 703
LTE PRACH measurement 925
LTE SRS measurement 982
Trigger signals
LTE signaling 70
TX power control (TPC)
LTE signaling 151

U

UE capabilities
LTE signaling 113
UE category
LTE signaling 176
UE info
LTE signaling 114
UE meas. filter coefficient
LTE signaling 177
UE measurement report
LTE signaling 111
UL dynamic scheduling
LTE signaling 202
UL HARQ
LTE signaling 196
Uplink downlink
LTE multi-evaluation measurement 691
Uplink downlink configuration
LTE signaling 158
Use UL
LTE signaling 129
User data header
LTE signaling 224
User manual 9
User margin
LTE measurement 683
User-defined bands
LTE signaling 136
User-defined channels
LTE signaling 59, 205
User-defined TTI-based channels
LTE signaling 207, 208

V

View filter
LTE multi-evaluation measurement 694

W

WCDMA measurement quantity
LTE signaling 221
White papers 10

Z

Zero correlation zone config
LTE PRACH measurement 923
Zero power CSI-RS
LTE signaling 189