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Base Station (BS) conformance testing

Part 1: Conducted conformance testing

(Release 15)

** 

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Contents

Foreword 5

Introduction 5

1 Scope 6

2 References 6

3 Definitions, symbols and abbreviations 6

3.1 Definitions 6

3.2 Symbols 9

3.3 Abbreviations 10

4 General conducted test conditions and declarations 11

4.1 Measurement uncertainties and test requirements 11

4.1.1 General 11

4.1.2 Acceptable uncertainty of Test System 11

4.1.2.1 General 11

4.1.2.2 Measurement of transmitter 12

4.1.2.3 Measurement of receiver 13

4.1.3 Interpretation of measurement results 15

4.2 Conducted requirement reference points 16

4.2.1 *BS type 1-C* 16

4.2.2 *BS type 1-H* 16

4.3 Base station classes 17

4.4 Regional requirements 18

4.5 BS configurations 18

4.5.1 *BS type 1-C* 18

4.5.1.1 Transmit configurations 18

4.5.1.1.1 General 18

4.5.1.1.2 Transmission with multiple transmitter antenna connectors 19

4.5.1.2 Receive configurations 19

4.5.1.2.1 General 19

4.5.1.2.2 Reception with multiple receiver antenna connectors, receiver diversity 19

4.5.1.3 Duplexers 20

4.5.1.4 Power supply options 20

4.5.1.5 Ancillary RF amplifiers 20

4.5.2 *BS type 1-H* 21

4.5.2.1 Transmit configurations 21

4.5.2.2 Receive configurations 21

4.5.2.3 Power supply options 22

4.6 Manufacturer declarations 22

4.7 Test configurations 27

4.8 Applicability of requirements 27

4.8.1 General 28

4.8.2 Requirement set applicability 28

4.8.3 Test configurations for multi-carrier 28

4.8.4 Test configurations for multi-band 28

4.9 RF channels and test models 28

[4.10 Relationship between SR and MSR] 28

4.11 Requirements for BS capable of multi-band operation 28

5 Operating bands and channel arrangement 29

6 Conducted transmitter characteristics 30

6.1 General 30

6.2 Base station output power 30

6.3 Output power dynamics 30

6.4 Transmit ON/OFF power 30

6.5 Transmitted signal quality 30

6.6 Unwanted emissions 30

6.6.1 General 30

6.6.2 Occupied bandwidth 30

6.6.3 Adjacent Channel Leakage Power Ratio (ACLR) 30

6.6.4 Operating band unwanted emissions 30

6.6.5 Transmitter spurious emissions 30

6.7 Transmitter intermodulation 30

7 Conducted receiver characteristics 31

7.1 General 31

7.2 Reference sensitivity level 31

7.3 Dynamic range 31

7.4 In-band selectivity and blocking 31

7.5 Out-of-band blocking 31

7.6 Receiver spurious emissions 31

7.7 Receiver intermodulation 31

7.8 In-channel selectivity 31

8 Conducted performance requirements 32

Annex A (normative): Characteristics of interfering signals 33

Annex B (normative): Environmental requirements for the BS equipment 34

Annex C (informative): Test tolerances and derivation of test requirements 35

Annex D (informative): Measurement system set-up 36

Annex E (informative): Change history 37

# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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where:

x the first digit:

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

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# Introduction

This clause is optional. If it exists, it is always the second unnumbered clause.

# 1 Scope

The present document specifies the Radio Frequency (RF) test methods and conformance requirements for NR Base Station (BS). These have been derived from, and are consistent with the NR BS specification defined in 3GPP TS 38.104 [2]. The technical specification 3GPP TS 38.141 is in 2 parts:

1. 3GPP TS 38.141-1 (the present document) covers conducted test requirements
2. 3GPP TS 38.141-2 [3] covers radiated requirements.

A *BS type 1-C* requires only conducted requirements so requires compliance to part 1 of the specification only.

As *BS type 1-H* has both conducted and radiated requirements so requires compliance to the applicable requirements of part 1 and part 2 of the specification.

BS *type 1-O* and *2-O* have only radiated requirements so require compliance to part 2 of the specification only.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications"

[2] 3GPP TS 38.104: "NR Base Station (BS) radio transmission and reception"

[3] 3GPP TS 38.141-2: “NR, Base Station (BS) conformance testing, Part 2: Radiated conformance testing”

[4] ITU-R Recommendation M.1545, “Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000”

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**aggregated BS channel bandwidth:** the RF bandwidth in which a Base Station transmits and receives multiple contiguously aggregated carriers. The *aggregated BS channel bandwidth* is measured in MHz

**antenna connector:** connector at the conducted interface of the *BS type 1-C*

**active transmitter unit:** transmitter unit which is ON, and has the ability to send modulated data streams that are parallel and distinct to those sent from other transmitter units to a *BS type 1-C* *antenna connector*, or to one or more *BS type 1-H* *TAB connectors* at the *transceiver array boundary*

**Base Station RF Bandwidth**: RF bandwidth in which a base station transmits and/or receives single or multiple carrier(s) within a supported *operating band*

NOTE: In single carrier operation, the *Base Station RF Bandwidth* is equal to the *BS channel bandwidth*.

**Base Station RF Bandwidth edge:** frequency of one of the edges of the *Base Station RF Bandwidth*

**basic limit:** emissions limit relating to the power supplied by a single transmitter to a single antenna transmission line in ITU-R SM.329 [2] used for the formulation of unwanted emission requirements for FR1

**BS channel bandwidth**: RF bandwidth supporting a single NR RF carrier with the transmission bandwidth configured in the uplink or downlink

NOTE 1: The *BS channel bandwidth* is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

NOTE 2: It is possible for the BS to transmit to and/or receive from one or more UE bandwidth parts that are smaller than or equal to the BS transmission bandwidth configuration, in any part of the BS transmission bandwidth configuration.

**BS type 1-C:** NR base station operating at FR1 with requirements set consisting only of conducted requirements defined at individual *antenna connectors*

**BS type 1-H:** NR base station operating at FR1 with a requirement set consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB

**BS type 1-O:** NR base station operating at FR1 with a requirement set consisting only of OTA requirements defined at the RIB

NOTE: *BS type 1-O* conformance requirements are captured in TS 38.141-2 [3] and are out of scope of this specification.

**BS type 2-O:** NR base station operating at FR2 with a requirement set consisting only of OTA requirements defined at the RIB

NOTE: *BS type 2-O* conformance requirements are captured in TS 38.141-2 [3] and are out of scope of this specification.

**channel edge:** lowest or highest frequency of the NR carrier, separated by the *BS channel bandwidth*

**carrier aggregation:** aggregation of two or more component carriers in order to support wider transmission bandwidths

**carrier aggregation configuration:** a set of one or more *operating bands* across which the BS aggregates carriers with a specific set of technical requirements

**contiguous carriers:** set of two or more carriers configured in a spectrum block where there are no RF requirements based on co-existence for un-coordinated operation within the spectrum block

**contiguous spectrum:** spectrum consisting of a contiguous block of spectrum with no sub-block gap(s)

**highest carrier:** The carrier with the highest carrier frequency transmitted/received in a specified frequency band

**inter-band carrier aggregation:** carrier aggregation of component carriers in different operating bands

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

**intra-band contiguous carrier aggregation:** *contiguous carriers* aggregated in the same operating band

**intra-band non-contiguous carrier aggregation:** non-contiguous carriers aggregated in the same operating band

**[Inter RF Bandwidth gap:** frequency gap between two consecutive Base Station RF Bandwidths that are placed within two supported *operating bands*]

**lowest carrier:** the carrier with the lowest carrier frequency transmitted/received in a specified frequency band

**lower sub-block edge:** frequency at the lower edge of one *sub-block*

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

**maximum carrier output power:** mean power level measured per carrier at the indicted interface, during the *transmitter ON period* in a specified reference condition

**maximum total output power:** mean power level measured within the *operating band* at the indicated interface, during the *transmitter ON period* in a specified reference condition

**measurement bandwidth**: RF bandwidth in which an emission level is specified

**multi-band connector**: *antenna* connector of the *BS type 1-C* or *TAB connector* of the *BS type 1-H* associated with a transmitter or receiver that is characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different *operating band* than the other carrier(s) and where this different *operating band* is not a sub-band or superseding-band of another supported operating band

**multi-carrier transmission configuration:** set of one or more contiguous or non-contiguous carriers that a BS is able to transmit simultaneously according to the manufacturer’s specification

**non-contiguous spectrum:** spectrum consisting of two or more sub-blocks separated by *sub-block gap*(s)

**operating band:** frequency range in which NR operates (paired or unpaired), that is defined with a specific set of technical requirements

NOTE: The *operating band*(s) for a BS is declared by the manufacturer according to the designations in tables 5.2-1 and 5.2-2.

**Radio Bandwidth:** frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier

**rated carrier output power:** mean power level associated with a particular carrier the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition

**rated total output power:** mean power level associated with a particular *operating band* the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition

**requirement set:** one of the NR base station requirement’s set as defined for *BS type 1-C*, *BS type 1-H*, *BS type 1-O*, and *BS type 2-O*

**single-band connector:** *antenna connector* of the *BS type 1-C* or *TAB connector* of the *BS type 1-H* supporting operation either in a single *operating band* only, or in multiple *operating bands* but does not meet the conditions for a *multi-band connector*

**sub-block:** one contiguous allocated block of spectrum for transmission and reception by the same base station

NOTE: There may be multiple instances of sub-blocks within a Base Station RF Bandwidth.

**sub-block gap:** frequency gap between two consecutive sub-blocks within a Bae Station RF Bandwidth, where the RF requirements in the gap are based on co-existence for un-coordinated operation

**TAB connector:** *transceiver array boundary* connector

**TAB connector RX min cell group:** *operating band* specific declared group of *TAB connectors* to which *BS type 1-H* conducted RX requirements are applied

NOTE: Within this definition, the group corresponds to the group of *TAB connectors* which are responsible for receiving a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells with reception on all *TAB connectors* supporting an *operating band*, but its existence is not limited to that condition

**TAB connector TX min cell group:** *operating band* specific declared group of *TAB connectors* to which *BS type 1-H* conducted TX requirements are applied.

NOTE: Within this definition, the group corresponds to the group of *TAB connectors* which are responsible for transmitting a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells with transmission on all *TAB connectors* supporting an *operating band*, but its existence is not limited to that condition

**transceiver array boundary:** conducted interface between the transceiver unit array and the composite antenna

**transmitter OFF period:** time period during which the BS transmitter is not allowed to transmit

**transmitter ON period:** time period during which the BS transmitter is transmitting data and/or reference symbols

**transmitter transient period:** time period during which the transmitter is changing from the OFF period to the ON period or vice versa

**upper sub-block edge:** frequency at the upper edge of one *sub-block*

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

 Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel

BWChannel *BS channel bandwidth*

BWChannel\_CA *Aggregated BS Channel Bandwidth*, expressed in MHz. BWChannel\_CA= Fedge\_high- Fedge\_low.

BWChannel,block Sub-block bandwidth, expressed in MHz. BWChannel,block= Fedge,block,high- Fedge,block,low.

BWConfig Transmission bandwidth configuration, expressed in MHz, where BWConfig = *N*RB x SCS x 12 kHz

Δf Separation between the channel edge frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency

Δfmax f\_offsetmax minus half of the bandwidth of the measuring filter

ΔFGlobal Global frequency raster granularity

ΔfOBUE Maximum offset of the *operating band* unwanted emissions mask from the downlink *operating band* edge

ΔfOOB Maximum offset of the out-of-band boundary from the uplink *operating band* edge

ΔFRaster Channel raster granularity

ΔSUL Channel raster offset for SUL

FC *RF reference frequency* on the channel raster

FC,block, high Fc of the highest transmitted/received carrier in a sub-block

FC,block, low Fc of the lowest transmitted/received carrier in a sub-block

FC\_low The Fc of the lowest carrier, expressed in MHz

FC\_high The Fc of the highest carrier, expressed in MHz

Fedge\_low The lower edge of *Aggregated BS Channel Bandwidth*, expressed in MHz. Fedge\_low = FC\_low - Foffset\_low

Fedge\_high The upper edge of *Aggregated BS Channel Bandwidth*, expressed in MHz. Fedge\_high = FC\_high + Foffset\_high.

Fedge,block,low The lower sub-block edge, where Fedge,block,low = FC,block,low - Foffset\_low

Fedge,block,high The upper sub-block edge, where Fedge,block,high = FC,block,high + Foffset\_high

Foffset\_high Frequency offset from FC\_high to the upper *Base Station RF Bandwidth edge*, or from F C,block, high to the upper sub-block edge

Foffset\_low Frequency offset from FC\_low to the lower *Base Station RF Bandwidth edge*, or from FC,block, low to the lower sub-block edgeFDL\_low The lowest frequency of the downlink *operating band*

FDL\_high The highest frequency of the downlink *operating band*

f\_offset Separation between the channel edge frequency and the centre of the measuring filter

f\_offsetmax The offset to the frequency ΔfOBUE outside the downlink *operating band*

FREF RF reference frequency

FREF,SUL  RF reference frequency for Supplementary Uplink (SUL) bands

FDL\_low The lowest frequency of the downlink *operating band*

FDL\_high The highest frequency of the downlink *operating band*

FUL\_low The lowest frequency of the uplink *operating band*

FUL\_high The highest frequency of the uplink *operating band*

Ncells The declared number corresponding to the minimum number of cells that can be transmitted by an *BS type 1-H* in a particular *operating band*

NRB Transmission bandwidth configuration, expressed in resource blocks

NREF NR Absolute Radio Frequency Channel Number (NR-ARFCN)

NRXU,active The number of active receiver units. The same as the number of *demodulation branches* to which compliance is declared for chapter 8 performance requirements

NRXU,counted The number of active receiver units that are taken into account for conducted Rx spurious emission scaling, as calculated in subclause 7. 6.1

NRXU,countedpercell The number of active receiver units that are taken into account for conducted RX spurious emissions scaling per cell, as calculated in subclause 7.6.1

NTXU,counted The number of *active transmitter units* as calculated in subclause 6.1, that are taken into account for conducted TX output power limit in subclause 6.2.1, and for unwanted TX emissions scaling

NTXU,countedpercell The number of *active transmitter units* that are taken into account for conducted TX emissions scaling per cell, as calculated in subclause 6.1

Pmax,c,AC*Maximum carrier output power* measuredper *antenna connector*

Pmax,c,cell The *maximum carrier output power* per *TAB connector TX min cell group*

Pmax,c,TABC The *maximum carrier output power per TAB connector*

Prated,c,AC The *rated carrier output power per antenna connector*

Prated,c,sys The sum of Prated,c,TABC for all *TAB connectors* for a single carrier

Prated,c,TABC The *rated carrier output power per TAB connector*

Prated,t,AC The *rated total output power* declared at the antenna connector

Prated,t,TABC The *rated total output power* declared at *TAB connector*

PREFSENS Conducted Reference Sensitivity power level

SSREF SS block reference frequency position

Wgap Sub-block gap or Inter RF Bandwidth gap size

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AAS Active Antenna System

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

AWGN Additive White Gaussian Noise

BS Base Station

BW Bandwidth

CA Carrier Aggregation

CACLR Cumulative ACLR

CW Continuous Wave

E-UTRA Evolved UTRA

EVM Error Vector Magnitude

FDD Frequency Division Duplex

FR Frequency Range

GSCN Global Synchronization Channel Number

GSM Global System for Mobile communications

ITU‑R Radiocommunication Sector of the International Telecommunication Union

ICS In-Channel Selectivity

LA Local Area

LNA Low Noise Amplifier

MR Medium Range

NR New Radio

NR-ARFCN NR Absolute Radio Frequency Channel Number

OBUE Operating Band Unwanted Emissions

OTA Over The Air

RDN Radio Distribution Network

REFSENS Reference Sensitivity

RF Radio Frequency

RIB Radiated Interface Boundary

RMS Root Mean Square (value)

RX Receiver

SCS Sub-Carrier Spacing

SDL Supplementary Downlink

SUL Supplementary Uplink

TAB Transceiver Array Boundary

TAE Time Alignment Error

TDD Time division Duplex

TX Transmitter

# 4 General conducted test conditions and declarations

## 4.1 Measurement uncertainties and test requirements

Editor’s note: Detailed structure of the subclause and the ones below is TBD.

### 4.1.1 General

The requirements of this clause apply to all applicable tests in part 1 of this specification, i.e. to all conducted tests.

The minimum requirements are given in TS 38.104 [2] and the references therein. Test Tolerances for the conducted test requirements explicitly stated in the present document are given in annex C of the present document.

Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the minimum requirements to create test requirements.

When a test requirement differs from the corresponding minimum requirement, then the Test Tolerance applied for the test is non-zero. The Test Tolerance for the test and the explanation of how the minimum requirement has been relaxed by the Test Tolerance are given in annex C.

### 4.1.2 Acceptable uncertainty of Test System

#### 4.1.2.1 General

The maximum acceptable uncertainty of the Test System is specified below for each test defined explicitly in the present specification, where appropriate. The maximum acceptable uncertainty of the Test System for test requirements included by reference is defined in the respective referred test specification.

For *BS type 1-H* when a requirement is applied per *TAB connector* then the test uncertainty is applied to the measured value. When a requirement is applied for a group of *TAB connectors* then the test uncertainty is applied to sum of the measured power on each *TAB connector* in the group.

The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified tolerance and the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests, it should be noted that the uncertainties in subclause 4.1.2 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

#### 4.1.2.2 Measurement of transmitter

Table 4.1.2.2-1: Maximum Test System uncertainty for transmitter tests

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| --- | --- | --- |
| 6.2 Base Station output power | ±0.7 dB, f ≤ 3.0 GHz  ±1.0 dB, 3.0 GHz < f ≤ 4.2 GHz  ±1.5 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.4 Transmit ON/OFF power | ±2.0 dB , f ≤ 3.0 GHz  ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.6.6 Transmitter spurious emissions, Mandatory Requirements | 9 kHz < f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 19 GHz: ±4.0 dB  19 GHz < f ≤ 26 GHz: TBD |  |
| 6.6.6 Transmitter spurious emissions, Additional BC2 Requirement | 9 kHz < f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 12.75 GHz: ±4.0 dB  12.75 GHz < f ≤ 26 GHz: TBD |  |
| 6.6.6 Transmitter spurious emissions, Protection of BS receiver | ±3.0 dB |  |
| 6.6.6 Transmitter spurious emissions, Additional spurious emission requirements | ±2.0 dB for > -60 dBm , f ≤ 3.0 GHz  ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.0 dB, 4.2 GHz < f ≤ 6.0 GHz  [TBD, 6 GHz < f ≤ 26.0 GHz]  ±3.0 dB for ≤ -60 dBm , f ≤ 3.0 GHz  ±3.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±4.0 dB, 4.2 GHz < f ≤ 6.0 GHz  TBD, 6 GHz < f ≤ 26.0 GHz |  |
| 6.6.6 Transmitter spurious emissions, Co-location | ±3.0 dB |  |
| 6.6.5 Operating band unwanted emissions | ±1.5 dB , f ≤ 3.0 GHz  ±1.8 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.2 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.6.2 Occupied bandwidth |  |  |
| 6.6.3 Adjacent Channel Leakage power Ratio (ACLR) | ACLR ±[0.8] dB  Absolute power ±2.0 dB, f ≤ 3.0 GHz  Absolute power ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  Absolute power ±3.0 dB, 4.2 GHz < f ≤ 6.0 GHz  CACLR ±[0.8] dB  CACLR absolute power ±2.0 dB , f ≤ 3.0 GHz  CACLR absolute power ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  CACLR absolute power ±3.0 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.7 Transmitter intermodulation  (interferer requirements)  This tolerance applies to the stimulus and not the measurements defined in 6.6.6, 6.6.5 and 6.6.3 | The value below applies only to the interfering signal and is unrelated to the measurement uncertainty of the tests (6.6.1, 6.6.2 and 6.6.4) which have to be carried out in the presence of the interferer.  ±1.0 dB | The uncertainty of interferer has double the effect on the result due to the frequency offset |

#### 4.1.2.3 Measurement of receiver

Table 4.1.2.3-1: Maximum Test System Uncertainty for receiver tests

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| --- | --- | --- |
| 7.4 Adjacent channel selectivity and narrowband blocking | ±1.4 dB , f ≤ 3.0 GHz  ±1.8 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.5 dB, 4.2 GHz < f ≤ 6.0 GHz | Overall system uncertainty comprises three quantities:  1. Wanted signal level error  2. Interferer signal level error  3. Additional impact of interferer leakage  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer leakage effect is systematic, and is added arithmetically.  Test System uncertainty = [SQRT (wanted\_level\_error2 + interferer\_level\_error2)] + leakage effect.  f ≤ 3.0 GHz  Wanted signal level ±0.7 dB  Interferer signal level ±0.7 dB  3.0 GHz < f ≤ 4.2 GHz  Wanted signal level ±1.0 dB  Interferer signal level ±1.0 dB  f ≤ 4.2 GHz  Impact of interferer leakage 0.4 dB |
| 7.5 Blocking | 1 MHz ≤ finterferer ≤ 3 GHz: ±1.3 dB  3 GHz < finterferer ≤ 12.75 GHz: ±3.2 dB | Overall system uncertainty comprises three quantities:  1. Wanted signal level error  2. Interferer signal level error  3. Interferer broadband noise  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer Broadband noise effect is systematic, and is added arithmetically.  Test System uncertainty = [SQRT (wanted\_level\_error2 + interferer\_level\_error2)] + Broadband noise effect.  Out of band blocking, using CW interferer:  Wanted signal level:  ±0.7 dB up to 3 GHz  ±1.0 dB up to 4.2 GHz  Interferer signal level:  ±1.0 dB up to 3 GHz  ±3.0 dB up to 12.75 GHz  Impact of interferer Broadband noise 0.1 dB |
| 7.6 Receiver spurious emissions | 30 MHz ≤ f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 19 GHz: ±4.0 dB  19 GHz < f ≤ 26 GHz: TBD |  |
| 7.7 Receiver intermodulation (General requirements) | ±1.8 dB , f ≤ 3.0 GHz  ±2.4 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.3 dB, 4.2 GHz < f ≤ 6.0 GHz | Overall system uncertainty comprises four quantities:  1. Wanted signal level error  2. CW Interferer level error  3. Modulated Interferer level error  4. Impact of interferer ACLR  The effect of the closer CW signal has twice the effect.  Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals. The interferer ACLR effect is systematic, and is added arithmetically.  Test System uncertainty = SQRT [(2 x CW\_level\_error)2 +(mod interferer\_level\_error)2 +(wanted signal\_level\_error)2] + ACLR effect.  f ≤ 3.0 GHz  Wanted signal level ± 0.7dB  CW interferer level ± 0.5 dB  Mod interferer level ± 0.7 dB  3.0 GHz < f ≤ 4.2 GHz  Wanted signal level ± 1.0 dB  CW Interferer level ± 0.7 dB  Mod Interferer level ± 1.0 dB  f ≤ 4.2 GHz  Impact of interferer ACLR 0.4 dB |
| 7.7 Receiver intermodulation (Narrowband requirements) | ±1.8 dB , f ≤ 3.0 GHz  ±2.4 dB, 3.0 GHz < f ≤ 4.2 GHz  TBD, 4.2 GHz < f ≤ 6.0 GHz | Same as Receiver intermodulation (General requirements). |
| NOTE: Unless otherwise noted, only the Test System stimulus error is considered here. The effect of errors in the throughput measurements or the BER/FER due to finite test duration is not considered. | | |

### 4.1.3 Interpretation of measurement results

Square brackets on the Shared Risk text to be removed or the text to be changed once the OTA test procedures and MU for BS type 1-O and BS type 2-O are stable enough.

[The measurement results returned by the Test System are compared - without any modification - against the test requirements as defined by the Shared Risk principle.

The Shared Risk principle is defined in Recommendation ITU-R M.1545 [4].]

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in subclause 4.1.2 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in subclause 4.1.2, it is still permitted to use this apparatus provided that an adjustment is made as follows.

Any additional uncertainty in the Test System over and above that specified in subclause 4.1.2 shall be used to tighten the test requirement, making the test harder to pass. For some tests e.g. receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with subclause 4.1.2 does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with subclause 4.1.2 had been used.

## 4.2 Conducted requirement reference points

### 4.2.1 *BS type 1-C*

*BS type 1-C* requirements are applied at the BS *antenna connector* (port A) for a single transmitter or receiver with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as an amplifier, a filter or the combination of such devices is used, requirements apply at the far end *antenna connector* (port B).



Figure 4.2.1-1: *BS type 1-C* transmitter interface



Figure 4.2.1-2: *BS type 1-C* receiver interface

### 4.2.2 *BS type 1-H*

*BS type 1-H* requirements are defined for two points of reference, signified by radiated requirements and conducted requirements.

****

Figure 4.2.2-1: Radiated and conducted reference points for *BS type 1-H*

Radiated characteristics are defined over the air (OTA), where the *operating band* specific radiated interface is referred to as the *Radiated Interface Boundary* (RIB). Radiated requirements are also referred to as OTA requirements. The (spatial) characteristics in which the OTA requirements apply are detailed for each requirement.

NOTE: Radiated conformance requirements are captured in TS 38.141-2 [3] and are out of scope of this specification.

Conducted characteristics are defined at individual or groups of *TAB connectors* at the *transceiver array boundary*, which is the conducted interface between the transceiver unit array and the composite antenna.

The transceiver unit array is part of the composite transceiver functionality generating modulated transmit signal structures and performing receiver combining and demodulation.

The transceiver unit array contains an implementation specific number of transmitter units and an implementation specific number of receiver units. Transmitter units and receiver units may be combined into transceiver units. The transmitter/receiver units have the ability to transmit/receive parallel independent modulated symbol streams.

The composite antenna contains a radio distribution network (RDN) and an antenna array. The RDN is a linear passive network which distributes the RF power generated by the transceiver unit array to the antenna array, and/or distributes the radio signals collected by the antenna array to the transceiver unit array, in an implementation specific way.

How a conducted requirement is applied to the *transceiver array boundary* is detailed in the respective requirement subclause.

## 4.3 Base station classes

The requirements in this specification apply to Wide Area Base Stations, Medium Range Base Stations and Local Area Base Stations unless otherwise stated.

BS classes for *BS type 1-C* and 1-H are defined as indicated below:

- Wide Area Base Stations are characterised by requirements derived from Macro Cell scenarios with a BS to UE minimum coupling loss equal to 70 dB.

- Medium Range Base Stations are characterised by requirements derived from Micro Cell scenarios with a BS to UE minimum coupling loss equals to 53 dB.

- Local Area Base Stations are characterised by requirements derived from Pico Cell scenarios with a BS to minimum coupling loss equal to 45 dB.

## 4.4 Regional requirements

Some requirements in the present document may only apply in certain regions either as optional requirements, or as mandatory requirements set by local and regional regulation. It is normally not stated in the 3GPP specifications under what exact circumstances the regional requirements apply, since this is defined by local or regional regulation.

Table 4.4-1 lists all requirements in the present specification that may be applied differently in different regions.

Table 4.4-1: List of regional requirements

| Clause number | Requirement | Comments |
| --- | --- | --- |
|  | Operating bands | Some NR operating bands may be applied regionally. |
|  | Occupied bandwidth | The requirement may be applied regionally. There may also be regional requirements to declare the occupied bandwidth according to the definition in present specification. |
|  | Absolute ACLR | The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  | Limits in FCC Title 47 | The BS may have to comply with the additional requirements, when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer. |
|  | Operating band unwanted emissions | The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  | Tx spurious emissions | Category A or Category B spurious emission limits, as defined in ITU-R Recommendation SM.329 [2], may apply regionally.  The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  | Tx spurious emissions: additional requirements | These requirements may be applied for the protection of system operating in frequency ranges other than the BS operating band. |
|  | Rx spurious emissions | The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  |  |  |

## 4.5 BS configurations

### 4.5.1 *BS type 1-C*

#### 4.5.1.1 Transmit configurations

Further consideration needed whether to reuse subclause 4.5.7 from 36.141 (i.e. “BS using antenna arrays”).

##### 4.5.1.1.1 General

Unless otherwise stated, the transmitter characteristics in clause 6 are specified at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a TX amplifier, a filter or the combination of such devices is used, requirements apply at the far end antenna connector (test port B).



Figure 4.5.1.1.1-1: Transmitter test ports

##### 4.5.1.1.2 Transmission with multiple transmitter antenna connectors

Unless otherwise stated, for the tests in clause 6 of the present document, the requirement applies for each transmitter *antenna connector* in the case of transmission with multiple transmitter *antenna connectors*.

Transmitter requirements are tested at the *antenna connector*, with the remaining *antenna connector(s)* being terminated. If the manufacturer has declared the transmitter paths to be equivalent, it is sufficient to measure the signal at any one of the transmitter *antenna connectors*.

#### 4.5.1.2 Receive configurations

##### 4.5.1.2.1 General

Unless otherwise stated, the receiver characteristics in clause 7 are specified at the BS *antenna connector* (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a RX amplifier, a filter or the combination of such devices is used, requirements apply at the far end *antenna connector* (test port B).



Figure 4.5.1.2.1-1: Receiver test ports

##### 4.5.1.2.2 Reception with multiple receiver antenna connectors, receiver diversity

For the tests in clause 7 of the present document, the requirement applies at each receiver *antenna connector* for receivers with antenna diversity or in the case of multi-carrier reception with multiple receiver *antenna connectors*.

Receiver requirements are tested at the *antenna connector*, with the remaining receiver(s) disabled or their *antenna connector(s)* being terminated. If the manufacturer has declared the receiver paths to be equivalent, it is sufficient to apply the specified test signal at any one of the receiver *antenna connectors*.

For a *BS type 1-C* supporting multi-band operation, multi-band tests for [ACS, blocking and intermodulation] are performed with the interferer(s) applied to each *antenna connector* mapped to the receiver for the wanted signal(s), however only to one *antenna connector* at a time. *Antenna connectors* to which no signals are applied are terminated.

#### 4.5.1.3 Duplexers

The requirements of the present document shall be met with a duplexer fitted, if a duplexer is supplied as part of the BS. If the duplexer is supplied as an option by the manufacturer, sufficient tests should be repeated with and without the duplexer fitted to verify that the BS meets the requirements of the present document in both cases.

The following tests shall be performed with the duplexer fitted, and without it fitted if this is an option:

1) subclause 6.2, base station output power, for the highest static power step only, if this is measured at the antenna connector;

2) subclause 6.6, unwanted emissions; outside the BS transmit band;

3) subclause 6.6.4.5.3, protection of the BS receiver;

4) subclause 6.7, transmit intermodulation; for the testing of conformance, the carrier frequencies should be selected to minimize intermodulation products from the transmitters falling in receive channels.

The remaining tests may be performed with or without the duplexer fitted.

NOTE 1: When performing receiver tests with a duplexer fitted, it is important to ensure that the output from the transmitters does not affect the test apparatus. This can be achieved using a combination of attenuators, isolators and filters.

NOTE 2: When duplexers are used, intermodulation products will be generated, not only in the duplexer but also in the antenna system. The intermodulation products generated in the antenna system are not controlled by 3GPP specifications, and may degrade during operation (e.g. due to moisture ingress). Therefore, to ensure continued satisfactory operation of a BS, an operator will normally select NR-ARFCNs to minimize intermodulation products falling on receive channels. For testing of complete conformance, an operator may specify the NR-ARFCNs to be used.

#### 4.5.1.4 Power supply options

If the BS is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

This applies particularly if a BS contains a DC rail which can be supplied either externally or from an internal mains power supply. In this case, the conditions of extreme power supply for the mains power supply options can be tested by testing only the external DC supply option. The range of DC input voltages for the test should be sufficient to verify the performance with any of the power supplies, over its range of operating conditions within the BS, including variation of mains input voltage, temperature and output current.

#### 4.5.1.5 Ancillary RF amplifiers

The requirements of the present document shall be met with the ancillary RF amplifier fitted. At tests according to clauses 6 and 7 for TX and RX respectively, the ancillary amplifier is connected to the BS by a connecting network (including any cable(s), attenuator(s), etc.) with applicable loss to make sure the appropriate operating conditions of the ancillary amplifier and the BS. The applicable connecting network loss range is declared by the manufacturer. Other characteristics and the temperature dependence of the attenuation of the connecting network are neglected. The actual attenuation value of the connecting network is chosen for each test as one of the applicable extreme values. The lowest value is used unless otherwise stated.

Sufficient tests should be repeated with the ancillary amplifier fitted and, if it is optional, without the ancillary RF amplifier to verify that the BS meets the requirements of the present document in both cases.

When testing, the following tests shall be repeated with the optional ancillary amplifier fitted according to the table below, where x denotes that the test is applicable:

Table 4.5.1.5-1: Tests applicable to Ancillary RF Amplifiers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Receiver Tests | Subclause | TX amplifier only | RX amplifier only | TX/RX amplifiers combined (Note) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Transmitter Tests |  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

NOTE: Combining can be by duplex filters or any other network. The amplifiers can either be in RX or TX branch or in both. Either one of these amplifiers could be a passive network.

In test according to subclauses 6.2 and 7.2 highest applicable attenuation value is applied.

### 4.5.2 *BS type 1-H*

#### 4.5.2.1 Transmit configurations

Unless otherwise stated, the conducted transmitter characteristics in clause 6 are specified at the *transceiver array boundary* at the *TAB connector(s)* antenna connector with a full complement of transceiver units for the configuration in normal operating conditions.



Figure 4.5.2.1-1: Transmitter test ports

Unless otherwise stated, for the tests in clause 6 of the present document, the requirement applies for each transmit *TAB connector.*

#### 4.5.2.2 Receive configurations

Unless otherwise stated, the conducted receiver characteristics in clause 7 are specified at the *TAB connector* with a full complement of transceiver units for the configuration in normal operating conditions.



Figure 4.5.2.2-1: Receiver test ports

For the tests in clause 7 of the present document, the requirement applies at each receive *TAB connector*.

Conducted receive requirements are tested at the *TAB connector*, with the remaining receiver units(s) disabled or their *TAB connector*(s) being terminated.

#### 4.5.2.3 Power supply options

If the *BS type 1-H* is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

## 4.6 Manufacturer declarations

The following BS declarations listed in table 4.6-1 are required to be provided by the manufacturer for the conducted requirements testing of the *BS type 1-C* and *BS type 1-H*.

For the *BS type 1-H* declarations required for the radiated requirements testing, refer to 3GPP TS 38.141-2 [3].

Table 4.6-1 Manufacturer declarations for *BS type 1-C* and *BS type 1-H* conducted test requirements

| Declaration identifier | Declaration | Description | Applicability | |
| --- | --- | --- | --- | --- |
| *BS type 1-C* | *BS type 1-H* |
| D6.1 | NR operating bands | NR operating bands supported by each *single band connector* or *multi-band connector.* | x | x |
| D6.2 | BS requirements set | Declaration of one of the NR base station *requirement’s set* as defined for *BS type 1-C*, or *BS type 1-H*. | x | x |
| D6.3 | Spurious emission category | Declare the BS spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [x]. | x | x |
| D6.4 | Geographic area support | The manufacturer shall declare the regions the BS may operate in. e.g. CEPT. | x | x |
| [D6.5] | [Band n20 support, operating in geographical areas allocated to broadcasting (DTT)] | *Editor’s note: this declaration is subject to technical discussion on the applicability of the DTT protection from NR BS.*  [If the BS has *single band connector(s)* or *multi-band connector(s)* declared to support Band n20 the manufacturer shall declare if the BS may operate in geographical areas allocated to broadcasting (DTT).] | [x] | [x] |
| [D6.6] | [Band n20 support, emission level for channel N (PEM,N)] | *Editor’s note: this declaration is subject to technical discussion on the applicability of the DTT protection from NR BS.*  [If the BS has *sin single band connector(s)* or *multi-band connector(s)* declared to support Band n20 and has been declared to operate in geographical areas allocated to broadcasting (DTT), the emission level for channel N (Annex G of 3GPP TS 36.104 [x]) shall be declared.] | [x] | [x] |
| [D6.7] | [Band n20 support, Maximum output Power in [10] MHz (P10MHz)] | *Editor’s note: this declaration is subject to technical discussion on the applicability of the DTT protection from NR BS.*  [If the BS has *single band connector(s)* or *multi-band connector(s)* declared to support Band n20 and has been declared to operate in geographical areas allocated to broadcasting (DTT), the maximum output power in [10] MHz (Annex G of 3GPP TS 36.104 [11]) shall be declared.] | [x] | [x] |
| D6.10 | Co-existence with other systems | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA, PHS and/or NR operating in another band are deployed. | x | x |
| D6.11 | Co-location with other base stations | The manufacturer shall declare whether the BS under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or NR operating in another band. | x | x |
| D6.12 | Conducted NR capability set (CSNR) | The manufacturer shall declare the supported NR capability set(s) according to table [conducted NR capability sets in TS38.141-1] for all *single band connector(s)* or *multi-band connector(s)* and supported operating band. | x | x |
| D6.13 | *Single band connector* or *multi-band connector* | Declaration of the single band or multi-band capability of *single band connector(s)* or *multi-band connector(s),* declared for every connector. | x | x |
| [D6.14] | [Contiguous or non-contiguous spectrum] | *Editor’s note: MSR related*  [Ability to support contiguous or non-contiguous (or both) frequency distribution of carriers when operating multi-carrier, per *single band connector* or *multi-band connector*, per *operating band*, per RAT.] | [x] | [x] |
| D6.15 | Contiguous and non-contiguous parameters identical | If contiguous and non-contiguous operation is possible then parameters are the same. | x | x |
| D6.16 | Maximum *Radio Bandwidth* of the *multi-band connector* | Largest *radio bandwidth* that can be supported by the *multi-band connector*. May be different for transmit and receive.  Declared for each supported *operating band* and operating band combination (D6.41) supported for every *multi-band connector.* | x | x |
| D6.17 | Maximum *Base Station RF Bandwidth* | Largest *Base Station RF Bandwidth* in the *operating band*, declared for each supported *operating band* for every *single band connector* or *multi-band connector.* | x | x |
| D6.18 | Maximum *Base Station RF Bandwidth* for contiguous operation | Largest *Base Station RF Bandwidth* for contiguous spectrum operation, declared for each supported *operating band* and CSNR for every *single band connector* or *multi-band connector.* | x | x |
| D6.19 | Maximum *Base Station RF Bandwidth* for non- contiguous operation | Largest *Base Station RF Bandwidth* for non-contiguous spectrum operation, declared for each supported *operating band* and CSNR for every *single band connector* or *multi-band connector.* | x | x |
| D6.20 | NR supported channel bandwidths and SCS | NR *channel bandwidth* and SCS supported for each supported *operating band f*or every *single band connector* or *multi-band connector.* | x | x |
| D6.21 | *single band connector* / *multi-band connector* supported *operating bands* | List of *operating bands* and band combinations supported by each *single band connector* or *multi-band connector*. | x | x |
| D6.22 | CA only operation | Declaration of CA-only operation, declared per *single band connector* or *multi-band connector*. | x | x |
| D6.23 | Single or multiple carrier | Capable of operating with a single carrier (only) or multiple carriers per *operating band*, per RAT, for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| D6.24 | Maximum number of supported carriers per operating band | Maximum number of supported carriers per supported *operation band*, declared per operating band, per RAT, for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| D6.25 | Total maximum number of supported carriers | Maximum number of supported carriers for all supported *operating bands*, declared for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| [D6.26] | [Reduced number of supported carriers at the rated total output power in multi-RAT operations ] | *Editor’s note: MSR related*  [Declared for each supported *operating band* for all *single band connector(s)* or *multi-band connector(s).]* | [x] | [x] |
| [D6.27] | [Reduced total output power at the total number of supported carriers in multi-RAT operations] | *Editor’s note: MSR related*  [Declared for each supported *operating band* for all *single band connector(s)* or *multi-band connector(s).]* | [x] | [x] |
| D6.28 | Other band combination multi-band restrictions | Declare any other limitations under simultaneous operation in the declared band combinations (D6.41) for each *multi-band connector* which have any impact on the test configuration generation.  Declared for every *multi-band connector*. | x | x |
| [D6.30] | [Rated carrier output power(Prated,c,AC, or Prated,c,TABC)] | *Editor’s note: MSR related*  [Conducted rated carrier output power, per *single band connector* or *multi-band connector.*  Declared per supported *operating band*, per supported RAT, for all *single band connector(s)* or *multi-band connector(s)*.] | [x] | [x] |
| D6.31 | Rated carrier output power for contiguous spectrum operation | Conducted rated carrier output power for contiguous spectrum operation, per *single band connector* or *multi-band connector.*  Declared for each supported *operating band* and CSNR, for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| D6.32 | Rated carrier output power for non-contiguous spectrum operation | Conducted rated carrier output power for non-contiguous spectrum operation, per *single band connector* or *multi-band connector.*  Declared for each supported *operating band* and CS, for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| [D6.33] | [Rated output power per RAT (Prated,RAT,TABC)] | *Editor’s note: MSR related; leave FFS to see if “per RAT” rated power declarations and definitions (*Prated,RAT,AC, Prated,RAT,TABC*) is necessary.*  [PRated,RAT,TABC is declared per supported operating band, per supported RAT for all *single band connector(s)* or *multi-band connector(s)*.] | [x] | [x] |
| D6.34 | R*ated total output power* (Prated,t,AC, or Prated,t,TABC) | Conducted total rated output power, per *single band connector* or *multi-band connector.*  Declared for supported *operating band*, for all *single band connector(s)* or *multi-band connector(s).*  For *multi-band connectors* declared for each supported *operating band* in each supported band combination. | x | x |
| D6.35 | R*ated total output power* for contiguous spectrum operation | Conducted total rated output power for contiguous spectrum operation, per *single band connector* or *multi-band connector.*  Declared for each supported *operating band* and CSNR, for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| D6.36 | R*ated total output power* for non-contiguous spectrum operation | Conducted total rated output power for non-contiguous spectrum operation, per *single band connector* or *multi-band connector.*  Declared for each supported *operating band* and CSNR, for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| [D6.37] | [Rated multi-band total output power, Prated,MB,TABC] | *Editor’s note: FFS until the needs for Prated,MB,TABC in the specification is confirmed.*  [Conducted multi-band rated total output power, per *multi-band connector.*  Declared for all declared operating band combinations for every *multi-band connector*.] | [x] | [x] |
| D6.38 | Ncells | Number corresponding to the minimum number of cells that can be transmitted by a BS in a particular operating band with transmission on all *TAB connectors* supporting the *operating band*. |  | x |
| D6.39 | Maximum supported power difference between carriers | Maximum supported power difference between carriers in each supported *operating band*, declared for all *single band connector(s)* or *multi-band connector(s).* | x | x |
| D6.40 | Maximum supported power difference between carriers is different *operating bands* | Supported power difference between any two carriers in any two different supported *operating bands*, for all declared operating band combination, declared for every *multi-band connector.* | x | x |
| D6.41 | Operating band combination support | List of operational bands combinations supported by the BS. | x | x |
| D6.42 | Total number of supported carriers for the declared band combinations of BS | Total number of supported carriers for the declared band combinations (D6.41) of the BS. | x | x |
| D6.43 | Intra-system interfering signal declaration list | List of *single band connector(s)* or *multi-band connector(s)* for which an intra-system interfering signal level is required to be declared. Declaration is required if the intra-system interfering signal level is larger than the co-location interfering signal level. | x | x |
| D6.44 | Intra-system interfering signal level | The interfering signal level in dBm per *single band connector(s)* or *multi-band connector(s)* declared for each supported *operating band*, for all *single band connector(s)* or *multi-band connector(s)* covered by D6.43. | x | x |
| D6.54 | [DL RS transmission groups] | [Groups of *single band connector(s)* or *multi-band connector(s)* which are declared to transmit DL RS. Declared per *operating band*.] | x | x |
| D6.58 | TAE groups | Set of declared *TAB connector beam forming groups* on which the TAE requirements apply.  *All TAB connectors* belong to at least one *TAB connector beam forming group* (even if it's a *TAB connector beam forming group* consisting of one connector).  The smallest possible number of *TAB connector beam forming groups* need to be declared such that there is no *TAB connector* not contained in at least one of the declared *TAB connector beam forming groups*.  Declared for each supported RAT and *operating band*. |  | x |
| D6.59 | Inter-band CA | Band combinations declared to support inter-band CA (per CA capable *multi-band connector(s)*, as in D6.22).  Declared for every *multi-band connector* which support CA. | x | x |
| D6.60 | Intra-band contiguous CA | Bands declared to support intra-band contiguous CA (per CA capable *single band connector(s)* or *multi-band connector(s)*, as in D6.22).  Declared for every *single band connector(s)* or *multi-band connector(s)*. | x | x |
| D6.61 | Intra-band non-contiguous | Bands declared to support intra-band non-contiguous CA (per CA capable *single band connector(s)* or *multi-band connector(s)*, as in D6.22).  Declared for every *single band connector(s)* or *multi-band connector(s)*. | x | x |
| D6.70 | Equivalent connectors | List of *single band connector(s)* or *multi-band connector(s)*, which have been declared equivalent.  Equivalent connectors imply that the *single band connector(s)* or *multi-band connector(s)*, are expected to behave in the same way when presented with identical signals under the same operating conditions. All declarations made for the *single band connector(s)* or *multi-band connector(s)* are identical and the transmitter unit and/or receiver unit driving the *single band connector/ multi-band connector* are of identical design. | x | x |
| D6.71 | BS class | BS class of the BS, declared as Wide Area BS, Medium Range BS, or Local Area BS. | x | x |
| D6.72 | *TAB connector RX min cell group* | Declared as a group of *TAB connectors* to which RX requirements are applied. This declaration corresponds to group of *TAB connectors* which are responsible for receiving a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells (Ncells) with transmission on all *TAB connectors* supporting an operating band. |  | x |
| D6.73 | *TAB connector TX min cell group* | Declared group of *TAB connectors* to which TX requirements are applied. This declaration corresponds to group of *TAB connectors* which are responsible for transmitting a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells (Ncells) with transmission on all *TAB connectors* supporting an operating band. |  | x |

## 4.7 Test configurations

*Editor’s note: to capture multi-carrier/CA operation, contiguous/non-contiguous operation*

## 4.8 Applicability of requirements

*Editor’s note: this section contains the tables which show which test configurations are applied to each of the test requirements.*

*These tables could be expanded to also capture which TM and which channels are to be tested.*

### 4.8.1 General

### 4.8.2 Requirement set applicability

*Editor’s note: this section contains the tables which show which is applicable for which BS type.*

In table 4.8.2-1, the requirement applicability for each requirement set is defined. For each requirement, the applicable requirement subclause in the specification is identified.

**Table 4.8.2-1: Requirement set applicability**

| **Requirement** | **Requirement set** | | |
| --- | --- | --- | --- |
|  | **1-C** | **1-H** |
| BS output power | 6.2.2.5.1 | 6.2.2.5.2 |
| Output power dynamics | 6.3 | 6.3 |
| Transmit ON/OFF power | 6.4 | 6.4 |
| Transmitted signal quality | 6.5 | 6.5 |
| Occupied bandwidth | 6.6.2 | 6.6.2 |
| ACLR | 6.6.3.5.3 | 6.6.3.5.4 |
| Operating band unwanted  emissions | 6.6.4.5.3 | 6.6.4.5.4 |
| Transmitter spurious emissions | 6.6.5.5.3 | 6.6.5.5.4 |
| Transmitter intermodulation | 6.7.5.1 | 6.7.5.2 |
| Reference sensitivity level | 7.2 | 7.2 |
| Dynamic range | 7.3 | 7.3 |
| In-band selectivity and blocking | 7.4 | 7.4 |
| Out-of-band blocking | 7.5 | 7.5 |
| Receiver spurious emissions | 7.6.5.2 | 7.6.5.3 |
| Receiver intermodulation | 7.7 | 7.7 |
| In-channel selectivity | 7.8 | 7.8 |
| Performance requirements | 8 | 8 |

### 4.8.3 Test configurations for multi-carrier

*Editor’s note: this section contains the applicability table for the text configuration for each requirement for multi-carrier (contiguous and non-contiguous cases).*

### 4.8.4 Test configurations for multi-band

*Editor’s note: this section contains the applicability table for the text configurations for each requirement for multi-band*

## 4.9 RF channels and test models

*Editor’s note: to capture multi-carrier/CA operation, contiguous/non-contiguous operation*

## [4.10 Relationship between SR and MSR]

*Editor’s note: whether this subclause is needed will depend on the MSR specification work*

## 4.11 Requirements for BS capable of multi-band operation

For *multi-band connector* the conducted test requirements in clause 6 and 7 apply separately to each supported *operating band* unless otherwise stated. For some conducted test requirements, it is explicitly stated that specific additions or exclusions to the requirement apply at *multi-band connector(s)* as detailed in the requirement subclause. For *BS type 1-C* capable of multi-band operation, various structures in terms of combinations of different transmitter and receiver implementations (multi-band or single band) with mapping of transceivers to one or more *antenna* *connectors* for *BS type 1-C* or *TAB connectors* for *BS type 1-H* in different ways are possible. For *multi-band connector(s)* the exclusions or provisions for multi-band apply. For *single-band antenna connector(s)*, the following applies:

- Single-band transmitter spurious emissions, *operating band* unwanted emissions, ACLR, transmitter intermodulation and receiver spurious emissions requirements apply to this *antenna connector* that is mapped to single-band.

- If the BS is configured for single-band operation, single-band requirements shall apply to this *antenna connector* configured for single-band operation and no exclusions or provisions for multi-band capable BS are applicable. Single-band requirements are tested separately at the *antenna connector* configured for single-band operation, with all other *antenna connectors* terminated.

A *BS type 1-H* may be capable of supporting operation in multiple *operating bands* with one of the following implementations of *TAB connectors* in the *transceiver array boundary*:

- All *TAB connectors* are *single-band connectors*.

- Different sets of *single-band connectors* support different *operating bands*, but each *TAB connector* supports only operation in one single *operating band*.

- Sets of *single-band connectors* support operation in multiple *operating bands* with some *single-band connectors* supporting more than one *operating band*.

- All *TAB connectors* are multi-band *connectors*.

- A combination of single-band sets and multi-band sets of *TAB connectors* provides support of the type *BS type 1-H* capability of operation in multiple *operating bands*.

Unless otherwise stated all conducted test requirements specified for an *operating band* apply only to the set of *TAB connectors* supporting that *operating band*.

In the case of an *operating band* being supported only by *single-band connectors* in a *TAB connector TX min cell group* or a *TAB connector RX min cell group*, *single-band requirements* apply to that set of *TAB connectors*.

In the case of an *operating band* being supported only by *multi-band connector*s supporting the same *operating band* combination in a *TAB connector TX min cell group* or a *TAB connector RX min cell group*, *multi-band requirements* apply to that set of *TAB connectors*.

The case of an *operating band* being supported by both *multi-band connectors* and *single-band connectors* in a *TAB connector TX min cell group* or a *TAB connector RX min cell group* is FFS and is not covered by the present release of this specification.

The case of an *operating band* being supported by *multi-band connectors* which are not all supporting the same *operating band* combination in a *TAB connector TX min cell group* or a *TAB connector RX min cell group* is FFS and is not covered by the present release of this specification.

For *multi-band connectors* supporting the bands for TDD, the RF requirements in the present specification assume no simultaneous uplink and downlink occur between the bands.

The conducted test requirements for *multi-band connectors* supporting bands for both FDD and TDD are FFS and are not covered by the present release of this specification.

# 5 Operating bands and channel arrangement

Detailed structure of the subclause is TBD.

# 6 Conducted transmitter characteristics

This subclause describes any general aspects of conducted transmitter characteristics and relations between requirements.

## 6.1 General

Detailed structure of the subclause is TBD.

## 6.2 Base station output power

Detailed structure of the subclause is TBD.

## 6.3 Output power dynamics

Detailed structure of the subclause is TBD.

## 6.4 Transmit ON/OFF power

Detailed structure of the subclause is TBD.

## 6.5 Transmitted signal quality

Detailed structure of the subclause is TBD.

## 6.6 Unwanted emissions

### 6.6.1 General

This subclause describes relations between unwanted emissions requirements.

### 6.6.2 Occupied bandwidth

Detailed structure of the subclause is TBD.

### 6.6.3 Adjacent Channel Leakage Power Ratio (ACLR)

Detailed structure of the subclause is TBD.

### 6.6.4 Operating band unwanted emissions

Detailed structure of the subclause is TBD.

### 6.6.5 Transmitter spurious emissions

Detailed structure of the subclause is TBD.

## 6.7 Transmitter intermodulation

Detailed structure of the subclause is TBD.

# 7 Conducted receiver characteristics

## 7.1 General

This subclause describes any general aspects of conducted receiver characteristics and relations between requirements.

## 7.2 Reference sensitivity level

Detailed structure of the subclause is TBD.

## 7.3 Dynamic range

Detailed structure of the subclause is TBD.

## 7.4 In-band selectivity and blocking

Detailed structure of the subclause is TBD.

## 7.5 Out-of-band blocking

Detailed structure of the subclause is TBD.

## 7.6 Receiver spurious emissions

Detailed structure of the subclause is TBD.

## 7.7 Receiver intermodulation

Detailed structure of the subclause is TBD.

## 7.8 In-channel selectivity

Detailed structure of the subclause is TBD.

# 8 Conducted performance requirements

Detailed structure of the subclause is TBD.

Annex A (normative):  
Characteristics of interfering signals

Annex B (normative):  
Environmental requirements for the BS equipment

Annex C (informative):  
Test tolerances and derivation of test requirements

Annex D (informative):  
Measurement system set-up

Annex E (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2017/11 | R4-84bis | R4-1711982 | - | - | - | TS skeleton | 0.0.1 |
| 2018/04 | R4-86bis | R4-1803913 | - | - | - | R4-1803410 Draft CR to TS 38.141-1: Addition of applicability table in sub-clause 4.7  R4-1803411 TP to TS 38.141-1 Applicability of requirements sub-clause (4.7) | 0.1.0 |
| 2018/04 | R4-86bis | R4-1805424, R4-1806022 | - | - | - | Implementation of TPs agreed during RAN4#86bis, on top of the agreed R4-1803913:  - R4-1805424 TP to TS 38.141-1 v0.1.0 Sections 1-3  - R4-1806022 TP to TS 38.141-1 v0.1.0 Section 4 | 0.2.0 |
| 2018/06 | R4-87 | R4-1808321, R4-1808322, R4-1808324, R4-1808326, R4-1808482 | - | - | - | Implementation of TPs agreed during RAN4#87, on top of R4-1807254:  - R4-1808321 TP to TS 38.141-1: conducted manufacturers declarations for NR BS (4.6)  - R4-1808322 TP to TS 38.141-1: removal of OTA terms and definitions  - R4-1808324 TP to TS 38.141-1: NR channel numbering correction  - R4-1808326 TP to TS 38.141-1: Correction of the BS type 1-H architecture figure  - R4-1808482 TP to TS 38.141-1: multi-band operation | 0.3.0 |
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