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# Foreword

This Technical Specification (TS) 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:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document contains the description and definition of the measurements done at the UE and network in TDD mode in order to support operation in idle mode and connected mode.

# 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 TS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)".

[2] 3GPP TS 25.212: "Multiplexing and channel coding (FDD)".

[3] 3GPP TS 25.213: "Spreading and modulation (FDD)".

[4] 3GPP TS 25.214: "Physical layer procedures (FDD)".

[5] 3GPP TS 25.215: "Physical layer measurements (FDD)".

[6] 3GPP TS 25.221: "Physical channels and mapping of transport channels onto physical channels (TDD)".

[7] 3GPP TS 25.222: "Multiplexing and channel coding (TDD)".

[8] 3GPP TS 25.223: "Spreading and modulation (TDD)".

[9] 3GPP TS 25.224: "Physical layer procedures (TDD)".

[10] 3GPP TS 25.301: "Radio Interface Protocol Architecture".

[11] 3GPP TS 25.302: "Services provided by the Physical layer".

[12] 3GPP TS 25.303: "UE functions and interlayer procedures in connected mode".

[13] 3GPP TS 25.304: "UE procedures in idle mode".

[14] 3GPP TS 25.331: "RRC Protocol Specification".

[15] 3GPP TR 25.922: "Radio Resource Management Strategies".

[16] 3GPP TR 25.923: "Report on Location Services (LCS)".

[17] 3GPP TS 25.102: "UTRA (UE) TDD; Radio transmission and Reception"

[18] 3GPP TS 25.105: "UTRA (BS) TDD; Radio transmission and Reception"

[19] 3GPP TS 25.123: "Requirements for Support of Radio Resources Management (TDD)"

[20] 3GPP TS 36.211: "E-UTRA; Physical Channels and Modulation"

[21] 3GPP TS 36.214: "E-UTRA; Physical layer – Measurements"

[22] IEEE 802.11, Part 11: "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE Std.".

# 3 Abbreviations

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

BCH Broadcast Channel

BCCH Broadcast Control Channel (GSM)

BER Bit Error Rate

BLER Block Error Rate

CFN Connection Frame Number

CPICH Common Pilot Channel (FDD)

CRC Cyclic Redundancy Check

DCA Dynamic Channel Allocation

DCH Dedicated Channel

DPCH Dedicated Physical Channel

Ec/No Received energy per chip divided by the power density in the band

E-AGCH E-DCH Absolute Grant Channel

E-HICH E-DCH Hybrid ARQ Indicator Channel

E-UTRA Evolved Universal Terrestrial Radio Access

FACH Forward Access Channel

FCCH Frequency Correction Channel (GSM)

FDD Frequency Division Duplex

GSM Global System for Mobile Communication

GPS Global Positioning System

ISCP Interference Signal Code Power

P-CCPCH Primary Common Control Physical Channel

PCH Paging Channel

PLMN Public Land Mobile Network

PRACH Physical Random Access Channel

PDSCH Physical Downlink Shared Channel

PUSCH Physical Uplink Shared Channel

RACH Random Access Channel

RSCP Received Signal Code Power

RSRP Reference Signal Received Power

RSRQ Reference Signal Received Quality

RSSI Received Signal Strength Indicator

S-CCPCH Secondary Common Control Physical Channel

SCH Synchronisation Channel

SCTD Space Code Transmit Diversity

SF Spreading Factor

SFN System Frame Number

SIR Signal-to-Interference Ratio

TDD Time Division Duplex

TDMA Time Division Multiple Access

TrCH Transport Channel

TTI Transmission Time Interval

UE User Equipment

UMTS Universal Mobile Telecommunications System

USCH Uplink Shared Channel

UTRA UMTS Terrestrial Radio Access

UTRAN UMTS Terrestrial Radio Access Network

# 4 Control of UE/UTRAN measurements

In this clause the general measurement control concept of the higher layers is briefly described to provide an understanding on how L1 measurements are initiated and controlled by higher layers.

## 4.1 General measurement concept

L1 provides with the measurement specifications a toolbox of measurement abilities for the UE and the UTRAN. These measurements can be differentiated in different measurement types: intra-frequency, inter-frequency, inter-system, traffic volume, quality and internal measurements (see [14]).  
In the L1 measurement specifications the measurements are distinguished between measurements in the UE (the messages will be described in the RRC Protocol) and measurements in the UTRAN (the messages will be described in the NBAP and the Frame Protocol).

To initiate a specific measurement the UTRAN transmits a 'measurement control message' to the UE including a measurement ID and type, a command (setup, modify, release), the measurement objects and quantity, the reporting quantities, criteria (periodical/event-triggered) and mode (acknowledged/unacknowledged), see [14].  
When the reporting criteria is fulfilled the UE shall answer with a 'measurement report message' to the UTRAN including the measurement ID and the results.  
In idle mode the measurement control message is broadcast in a System Information.

Intra-frequency reporting events, traffic volume reporting events and UE internal measurement reporting events described in [14] define events which trigger the UE to send a report to the UTRAN. This defines a toolbox from which the UTRAN can choose the needed reporting events.

## 4.2 Measurements for cell selection/reselection

Whenever a PLMN has been selected the UE shall start to find a suitable cell to camp on, this is 'cell selection'.

When camped on cell the UE regularly searches for a better cell depending on the cell reselection criteria, this is called 'cell reselection'. The procedures for cell selection and reselection are described in [13] and the measurements carried out by the UE are explained in this specification.

## 4.3 Measurements for Handover

For the handover preparation the UE receives from the UTRAN a list of cells (e.g. TDD, FDD or GSM).which the UE shall monitor (see 'monitored set' in [14]) in its idle timeslots.

At the beginning of the measurement process the UE shall find synchronization to the cell to measure using the synchronization channel. This is described under 'cell search' in [9] if the monitored cell is a TDD cell and in [4] if it is an FDD cell.

For a TDD cell to monitor after this procedure the exact timing of the midamble of the P-CCPCH is known and the measurements can be performed. Depending on the UE implementation and if timing information about the cell to monitor is available, the UE may perform the measurements on the P-CCPCH directly without prior SCH synchronisation.

## 4.4 Measurements for DCA

DCA is used to optimise the resource allocation by means of a channel quality criteria or traffic parameters. The DCA measurements are configured by the UTRAN. The UE reports the measurements to the UTRAN.

For DCA no measurements are performed in idle mode in the serving TDD cell.

When connecting with the initial access the UE immediately starts measuring the ISCP of time slots which are communicated on the BCH. The measurements and the preprocessing are done while the UTRAN assigns an UL channel for the UE for signalling and measurement reporting.

In connected mode the UE performs measurements according to a measurement control message from the UTRAN.

## 4.5 Measurements for timing advance

To update timing advance of a moving UE the UTRAN measures 'Received Timing Deviation', i.e. the time difference of the received UL transmission (PRACH, DPCH, PUSCH) in relation to its timeslot structure that means in relation to the ideal case where an UL transmission would have zero propagation delay. The measurements are reported to higher layers, where timing advance values are calculated and signalled to the UE.

# 5 Measurement abilities for UTRA TDD

In this clause the physical layer measurements reported to higher layers. (this may also include UE internal measurements not reported over the air-interface) are defined.

## 5.1 UE measurement abilities

The structure of the table defining a UE measurement quantity is shown below.

|  |  |
| --- | --- |
| **Column field** | Comment |
| **Definition** | Contains the definition of the measurement. |
| **Applicable for** | States in which RRC state according to [14] a measurement shall be possible to be performed. For RRC connected mode states information is also given on the possibility to perform the measurement on intra-frequency and/or inter-frequency.  The following terms are used in the tables:  Idle = Shall be possible to perform in idle mode;  URA\_PCH = Shall be possible to perform in URA\_PCH;  CELL\_PCH = Shall be possible to perform in CELL\_PCH;  CELL\_FACH = Shall be possible to perform in CELL\_FACH;  CELL\_DCH = Shall be possible to perform in CELL\_DCH;  For all RRC connected mode states i.e. URA\_PCH, CELL\_PCH, CELL\_FACH and CELL\_DCH  Intra appended to the RRC state = Shall be possible to perform in the corresponding RRC state on an intra-frequency cell;  Inter appended to the RRC state = Shall be possible to perform in the corresponding RRC state on an inter-frequency cell.  Inter-RAT appended to the RRC state = Shall be possible to perform in the corresponding RRC state on an inter-RAT cell. |

NOTE 1: Measurements for TDD which are specified on the Primary CCPCH (P-CCPCH) are carried out on the P-CCPCH or on any other beacon channel, see [6].

NOTE 2: For the beacon channels [6], the received power measurements shall be based on the received power for midamble m(1) if no Space Code Transmit Diversity (SCTD) is applied to the P-CCPCH and on the sum of the received powers for midambles m(1) and m(2) if SCTD is applied to the P-CCPCH.

NOTE 3: The UTRAN has to take into account the UE capabilities when specifying the timeslots to be measured in the measurement control message.

NOTE 4: The line 'applicable for' indicates whether the measurement is applicable for inter-frequency and/or intra-frequency and furthermore for idle and/or connected mode.

NOTE 5: The Interference part of the SIR measurement will be dependent on the receiver implementation, and will normally be different from the Timeslot ISCP measurement.

NOTE 6: The measurement 'Timeslot ISCP' is only a measure of the intercell interference.

NOTE 7: The term "antenna connector of the UE" used in this sub-clause to define the reference point for the UE measurements is defined in [17].

NOTE 8: Performance and reporting requirements for the UE measurements are defined in [19].

### 5.1.1 P-CCPCH RSCP

|  |  |
| --- | --- |
| **Definition** | Received Signal Code Power, the received power on P-CCPCH of own or neighbour cell. The reference point for the RSCP shall be the antenna connector of the UE. If receiver diversity is in use by the UE, the reported value shall not be lower than the corresponding P-CCPCH RSCP of any of the individual diversity branches. |
| **Applicable for** | Idle,  URA\_PCH intra, URA\_PCH inter,  CELL\_PCH intra, CELL\_PCH inter,  CELL\_FACH intra, CELL\_FACH inter,  CELL\_DCH intra, CELL DCH inter |

### 5.1.2 CPICH RSCP

|  |  |
| --- | --- |
| **Definition** | Received Signal Code Power, the received power on one code measured on the Primary CPICH. The reference point for the RSCP shall be the antenna connector of the UE. (This measurement is used in TDD for monitoring FDD cells while camping on a TDD cell).  If Tx diversity is applied on the Primary CPICH the received code power from each antenna shall be separately measured and summed together in [W] to a total received code power on the Primary CPICH. |
| **Applicable for** | Idle,  URA\_PCH inter,  CELL\_PCH inter,  CELL\_FACH inter,  CELL\_DCH inter |

### 5.1.3 Timeslot ISCP

|  |  |
| --- | --- |
| **Definition** | Interference Signal Code Power, the interference on the received signal in a specified timeslot measured on the midamble. The reference point for the ISCP shall be the antenna connector of the UE. |
| **Applicable for** | CELL\_FACH intra,  CELL\_DCH intra |

### 5.1.4 UTRA carrier RSSI

|  |  |
| --- | --- |
| **Definition** | The received wide band power, including thermal noise and noise generated in the receiver, within the bandwidth defined by the receiver pulse shaping filter, for TDD within a specified timeslot. The reference point for the measurement shall be the antenna connector of the UE. If receiver diversity is in use by the UE, the reported value shall not be lower than the corresponding UTRA carrier RSSI of any of the individual diversity branches. |
| **Applicable for** | CELL\_DCH intra, CELL\_DCH inter |

### 5.1.5 GSM carrier RSSI

|  |  |
| --- | --- |
| **Definition** | Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth Measurement shall be performed on a GSM BCCH carrier. The reference point for the RSSI shall be the antenna connector of the UE. |
| **Applicable for** | Idle,  URA\_PCH inter-RAT,  CELL\_PCH inter-RAT,  CELL\_FACH inter-RAT,  CELL\_DCH inter-RAT |

### 5.1.6 SIR

|  |  |
| --- | --- |
| **Definition** | Signal to Interference Ratio, defined as: (RSCP/Interference)xSF.  Where:  RSCP = Received Signal Code Power, the received power on the code of a specified DPCH or PDSCH.  Interference = The interference on the received signal in the same timeslot which can't be eliminated by the receiver.  SF = The used spreading factor.  The reference point for the SIR shall be the antenna connector of the UE.  If receiver diversity is in use by the UE, the reported SIR value shall not be lower than the corresponding SIR of any of the individual diversity branches. |
| **Applicable for** | CELL\_FACH intra,  CELL\_DCH intra |

### 5.1.7 CPICH Ec/No

|  |  |
| --- | --- |
| **Definition** | The received energy per chip divided by the power density in the band. The CPICH Ec/No is identical to CPICH RSCP/UTRA Carrier RSSI. The measurement shall be performed on the Primary CPICH. The reference point for the CPICH Ec/No shall be the antenna connector of the UE. (This measurement is used in TDD for monitoring FDD cells while camping on a TDD cell)  If Tx diversity is applied on the Primary CPICH the received energy per chip (Ec) from each antenna shall be separately measured and summed together in [Ws] to a total received chip energy per chip on the Primary CPICH, before calculating the Ec/No. |
| **Applicable for** | Idle,  URA\_PCH inter,  CELL\_PCH inter,  CELL\_FACH inter,  CELL\_DCH inter |

### 5.1.8 Transport channel BLER

|  |  |
| --- | --- |
| **Definition** | Estimation of the transport channel block error rate (BLER). The BLER estimation shall be based on evaluating the CRC on each transport block. |
| **Applicable for** | CELL\_DCH intra |

### 5.1.9 UE transmitted power

|  |  |
| --- | --- |
| **Definition** | The total UE transmitted power on all carriers in a specified timeslot. The reference point for the UE transmitted power shall be the antenna connector of the UE. |
| **Applicable for** | CELL\_FACH intra, CELL\_DCH intra |

### 5.1.10 SFN-SFN observed time difference

|  |  |
| --- | --- |
| **Definition** | SFN-SFN observed time difference is the time difference of the reception times of frames from two cells (serving and target) measured in the UE and expressed in chips. It is distinguished by two types. Type 2 applies if the serving and the target cell have the same frame timing.  The reference point for the SFN-SFN observed time difference type 1 and 2 shall be the antenna connector of the UE.  **Type 1:**  SFN-SFN observed time difference =  where:  Tm = TRxSFNi  - TRxSFNk, given in chip units  with the range  TRxSFNi = time of start (defined by the first detected path in time) of the received frame SFNi of the serving TDD cell i.  TRxSFNk = time of start (defined by the first detected path in time) of the received frame SFNk of the target UTRA cell k received most recently in time before the time instant TRxSFNi in the UE. If this frame SFNk of the target UTRA cell is received exactly at TRxSFNi then TRxSFNk= TRxSFNi (which leads to Tm=0).  OFF = (SFNi- SFNk) mod 256, given in number of frames with the range [0, 1, …, 255] frames  SFNi = system frame number for downlink frame from serving TDD cell i in the UE at the time TRxSFNi.  SFNk = system frame number for downlink frame from target UTRA cell k received in the UE at the time TRxSFNk.(for FDD: the P-CCPCH frame)  The reference point for the SFN-SFN observed time difference type 1 shall be the antenna connector of the UE.  **Type 2:**  SFN-SFN observed time difference = TRx\_Frame\_cell k - TRx\_Frame\_cell i, in chips, where  TRx\_Frame\_cell i: time of start (defined by the first detected path in time) of the frame boundary from the serving TDD cell i.  TRx\_Frame\_cell k: time of start (defined by the first detected path in time) of the frame boundary from the target UTRA cell k that is closest in time to the frame boundary of the serving TDD cell i.  The reference point for the SFN-SFN observed time difference type 2 shall be the antenna connector of the UE. |
| **Applicable for** | **Type 1:** CELL\_FACH intra  **Type 2:**  Idle,  URA\_PCH intra, URA\_PCH inter,  CELL\_PCH intra, CELL\_PCH inter,  CELL\_FACH intra, CELL\_FACH inter,  CELL\_DCH intra, CELL\_DCH inter |

### 5.1.11 SFN-CFN observed time difference

|  |  |
| --- | --- |
| **Definition** | The SFN-CFN observed time difference is defined as:  Tm for an FDD neighbour cell (i.e. the value is reported in chips),  OFF for a TDD neighbour cell (i.e the value is reported in frames),  where:  Tm = TUETx - TRxSFN, given in chip units with the range [0, 1, …, 38399] chips.  TUETx = the time at the beginning of the frame with the connection frame number CFNTX considering the transmission from the UE in the serving TDD cell.  TRxSFN = the time (defined by the first detected path in time) at the beginning of the frame with the system frame number SFN (for FDD neighbour cells: P-CCPCH frame is considered) received at the UE from a neighbour cell. TRxSFN is the time instant most recent in time before the time instant TUETx  OFF = (SFN-CFNTX) mod 256, given in number of frames with the range [0, 1, …, 255] frames.  CFNTx = the connection frame number for the UE transmission.  SFN = is the system frame number for the neighbouring cell frame (for FDD neighbour cells: P-CCPCH frame) received in the UE at the time instant TRxSFN.  The reference point for the SFN-CFN observed time difference shall be the antenna connector of the UE. |
| **Applicable for** | CELL\_DCH intra, CELL\_DCH inter |

### 5.1.12 Observed time difference to GSM cell

|  |  |
| --- | --- |
| **Definition** | Observed time difference to GSM cell is reported as the time difference Tm in ms, where  Tm= TRxGSMk - TRxSFN0i  TRxSFN0i : time of start (defined by the first detected path in time) of the received frame SFN=0 of the serving TDD cell i  TRxGSMk.: time of start of the GSM BCCH 51-multiframe of the considered target GSM frequency k received closest in time after the time TRxSFN0i. If the next GSM BCCH 51-multiframe is received exactly at TRxSFN0i then TRxGSMk = TRxSFN0i (which leads to Tm=0). The beginning of the GSM BCCH 51-multiframe is defined as the beginning of the first tail bit of the frequency correction burst in the first TDMA-frame of the GSM BCCH 51-multiframe, i.e. the TDMA-frame following the IDLE-frame.  The reference point for the Observed time difference to GSM cell shall be the antenna connector of the UE.  The reported time difference is calculated from the actual measurement in the UE. The actual measurement shall be based on:  TMeasGSM,j: The start of the first tail bit of the most recently received GSM SCH on frequency j  TMeasSFN,i: The start of the last frame received in TDD cell i before receiving the GSM SCH on frequency j  For calculating the reported time difference, the frame lengths are always assumed to be 10 ms for UTRA and (60/13) ms for GSM. |
| **Applicable for** | Idle, URA PCH inter-RAT, CELL PCH inter-RAT, CELL\_DCH Inter-RAT |

### 5.1.13 UE GPS Timing of Cell Frames for UE positioning

|  |  |
| --- | --- |
| **Definition** | TUE-GPSj is defined as the time of occurrence of a specified UTRAN event according to GPS Time Of Week. The specified UTRAN event is the beginning of a particular frame (identified through its SFN) in the first detected path (in time) of the cell j P-CCPCH. The reference point for TUE-GPSj shall be the antenna connector of the UE. |
| **Applicable for** | CELL\_FACH intra, CELL\_DCH intra |

### 5.1.14 Timing Advance (TADV) for 1.28Mcps TDD

|  |  |
| --- | --- |
| **Definition** | The 'timing advance (TADV)' is the time difference  TADV = TRX - TTX  Where  TRX: calculated beginning time of the first uplink time slot in the first subframe used by the UE with the UE timing according to the reception of start (defined by the first detected path in time) of a certain downlink time slot (for the timing it is assumed that the time slots within a sub-frame are scheduled like given in the frame structure described in 25.221 chapter5A.1)  TTX: time of the beginning of the same uplink time slot by the UE (for the timing it is assumed that the time slots within a sub-frame are scheduled like given in the frame structure described in 25.221 chapter5A.1)  The reference point for the Timing Advance (TADV) shall be the antenna connector of the UE. |
| **Applicable for** | CELL FACH intra, CELL DCH intra |

### 5.1.15 UE GPS code phase

|  |  |
| --- | --- |
| **Definition** | The whole and fractional phase of the spreading code of the ith GPS satellite signal. The reference point for the GPS code phase shall be the antenna connector of the UE. |
| **Applicable for** | Void (this measurement is not related to UTRAN/GSM signals; its applicability is therefore independent of the UE RRC state.) |

### 5.1.16 UE transmission power headroom (1.28Mcps option only)

|  |  |
| --- | --- |
| **Definition** | UE transmission power headroom (UPH) in reference to a carrier is the ratio of the maximum UE transmission power and the product of Pe-base power of this carrier and serving cell path loss, and shall be calculated as following:  where:  *Pmax,tx*= min {*Maximum allowed UL TX Power*, *Pmax*} is the UE maximum transmission power;  *Maximum allowed UL TX Power* is set by UTRAN and defined in [14];  *Pmax* is the UE nominal maximum output power according to the UE power class and specified in [17] table 6.2;  *Pe-base* is a closed-loop quantity of this carrier defined in [9] and *LPath\_loss* is the serving cell path loss.  The reference point for the UE transmission power headroom shall be the antenna connector of the UE. |
| **Applicable for** | CELL\_DCH intra |

### 5.1.17 UE transmission power headroom (3.84Mcps and 7.68Mcps options)

|  |  |
| --- | --- |
| **Definition** | UE transmission power headroom (UPH) is the ratio of the maximum UE transmission power and a value Pe,norm, and shall be calculated as per the following:  where:  *Pmax,tx*= min {*Maximum allowed UL TX Power*, *Pmax*} is the UE maximum transmission power;  *Maximum allowed UL TX Power* is set by UTRAN and defined in [14];  *Pmax* is the UE nominal maximum output power according to the UE power class and specified in [17] table 6.1;  *Pe,norm is equal to the calculated E-PUCH transmission power as defined in [9] for the case in which βe = 0.*  The reference point for the UE transmission power headroom shall be the antenna connector of the UE. |
| **Applicable for** | CELL\_DCH intra |

### 5.1.18 E-UTRA RSRP

|  |  |
| --- | --- |
| **Definition** | Reference signal received power (RSRP), is defined as the linear average over the power contributions (in [W]) of the resource elements that carry cell-specific reference signals within the considered measurement frequency bandwidth.  For RSRP determination the cell-specific reference signals R0 according to TS 36.211 [20] shall be used. If the UE can reliably detect that R1 is available it may use R1 in addition to R0 to determine RSRP.  The reference point for the RSRP shall be the antenna connector of the UE.  If receiver diversity is in use by the UE, the reported value shall not be lower than the corresponding RSRP of any of the individual diversity branches. |
| **Applicable for** | Idle,  URA\_PCH inter-RAT  CELL\_PCH inter-RAT  CELL\_DCH inter-RAT |

NOTE 1: The number of resource elements within the considered measurement frequency bandwidth and within the measurement period that are used by the UE to determine RSRP is left up to the UE implementation with the limitation that corresponding measurement accuracy requirements have to be fulfilled.

NOTE 2: The power per resource element is determined from the energy received during the useful part of the symbol, excluding the CP.

### 5.1.19 E-UTRA RSRQ

|  |  |
| --- | --- |
| **Definition** | Reference Signal Received Quality (RSRQ) is defined as the ratio *N*×RSRP/(E-UTRA carrier RSSI), where *N* is the number of resource blocks of the E-UTRA carrier RSSI measurement bandwidth. The measurements in the numerator and denominator shall be made over the same set of resource blocks.  E-UTRA Carrier Received Signal Strength Indicator (RSSI), comprises the linear average of the total received power (in [W]) observed only in certain OFDM symbols of measurement subframes, in the measurement bandwidth, over *N* number of resource blocks by the UE from all sources, including co-channel serving and non-serving cells, adjacent channel interference, thermal noise etc.  Unless indicated otherwise by higher layers, RSSI is measured only from OFDM symbols containing reference symbols for antenna port 0 of measurement subframes. If higher layers indicate all OFDM symbols for performing RSRQ measurements, then RSSI is measured from all OFDM symbols of the DL part of measurement subframes.  The reference point for the RSRQ shall be the antenna connector of the UE.  If receiver diversity is in use by the UE, the reported value shall not be lower than the corresponding RSRQ of any of the individual diversity branches. |
| **Applicable for** | Idle,  URA\_PCH inter-RAT  CELL\_PCH inter-RAT  CELL\_DCH inter-RAT |

### 5.1.20 IEEE 802.11 Beacon RSSI

|  |  |
| --- | --- |
| **Definition** | The IEEE 802.11 Beacon RSSI is defined in [22]. |
| **Applicable for** | Idle,  URA\_PCH inter-RAT  CELL\_PCH inter-RAT  CELL\_FACH inter-RAT  CELL\_DCH inter-RAT |

## 5.2 UTRAN measurement abilities

NOTE 1: If the UTRAN supports multiple frequency bands then the measurements apply for each frequency band individually.

NOTE 2: The Interference part of the SIR measurement will be dependent on the receiver implementation, and will normally be different from the Timeslot ISCP measurement

NOTE 3: The term "antenna connector" used in this sub-clause to define the reference point for the UTRAN measurements refers to the "BS antenna connector" test port A and test port B as described in [18]. The term "antenna connector" refers to Rx or Tx antenna connector as described in the respective measurement definitions.

### 5.2.1 RSCP

|  |  |
| --- | --- |
| **Definition** | Received Signal Code Power, the received power on one DPCH, PRACH, PUSCH, HS-SICH or E-PUCH code. The reference point for the RSCP shall be the Rx antenna connector. When Cell Portions are defined in the cell, the RSCP for each Cell Portion can be measured and reported to higher layers. |

### 5.2.2 Timeslot ISCP

|  |  |
| --- | --- |
| **Definition** | Interference Signal Code Power, the interference on the received signal in a specified timeslot measured on the midamble. The reference point for the ISCP shall be the Rx antenna connector.  In the case of RX antenna diversity, the average of the linear values [W] of the ISCP values measured for each antenna branch shall be reported. When Cell Portions are defined in the cell, the Timeslot ISCP for each Cell Portion can be measured and reported to higher layers. |

### 5.2.3 Received total wide band power

|  |  |
| --- | --- |
| **Definition** | The received wide band power in a specified timeslot including the noise generated in the receiver, within the bandwidth defined by the receiver pulse shaping filter. The reference point for the measurement shall be the Rx antenna connector. In case of receiver diversity the reported value shall be the linear average of the power in [W] in the diversity branches. When Cell Portions are defined in the cell, the received total wide band power for each Cell Portion can be measured and reported to higher layers. |

### 5.2.4 SIR

|  |  |
| --- | --- |
| **Definition** | Signal to Interference Ratio, defined as: (RSCP/Interference)xSF.  Where:  RSCP = Received Signal Code Power, the received power on the code of a specified DPCH, PRACH, PUSCH, HS-SICH or E-PUCH.  Interference = The interference on the received signal in the same timeslot which can't be eliminated by the receiver.  SF = The used spreading factor.  The reference point for the SIR shall be the Rx antenna connector. |

### 5.2.5 Transport channel BER

|  |  |
| --- | --- |
| **Definition** | The transport channel BER is an estimation of the average bit error rate (BER) of DCH or USCH data. The transport channel (TrCH) BER is measured from the data considering only non-punctured bits at the input of the channel decoder in Node B.  It shall be possible to report an estimate of the transport channel BER for a TrCH after the end of each TTI of the TrCH. The reported TrCH BER shall be an estimate of the BER during the latest TTI for that TrCH. Transport channel BER is only required to be reported for TrCHs that are channel coded. |

### 5.2.6 Transmitted carrier power

|  |  |
| --- | --- |
| **Definition** | Transmitted carrier power, is the ratio between the total transmitted power and the maximum transmission power.  Total transmission power is the power [W] transmitted on one DL carrier in a specific timeslot from one UTRAN access point.  Maximum transmission power is the power [W] on the same carrier when transmitting at the configured maximum transmission power for the cell.  The measurement shall be possible on any carrier transmitted from the UTRAN access point. The reference point for the transmitted carrier power measurement shall be the Tx antenna connector.  In case of Tx diversity the transmitted carrier power is the ratio between the sum of the total transmitted powers of all branches and the maximum transmission power. When Cell Portions are defined in the cell, the transmitted carrier power for each Cell Portion can be measured and reported to higher layers. |

### 5.2.7 Transmitted code power

|  |  |
| --- | --- |
| **Definition** | Transmitted Code Power, is the transmitted power on one carrier and one channelisation code in one timeslot. The reference point for the transmitted code power measurement shall be the Tx antenna connector.  In the case of Tx diversity the transmitted code power for each branch shall be measured and the linear sum of the values shall be reported to higher layers, i.e. only one value will be reported to higher layers. |

### 5.2.8 RX Timing Deviation

|  |  |
| --- | --- |
| **Definition** | 'RX Timing Deviation' is the time difference TRXdev = TTS – TRXpath in chips, with  TRXpath: time of the reception in the Node B of the first detected uplink path (in time) to be used in the detection process. The reference point for TRXpath shall be the Rx antenna connector. For 1.28 Mcps TDD only the first UL timeslot in the first subframe used by the UE is used for the calculation of TRXpath.  TTS: time of the beginning of the respective slot according to the Node B internal timing |

NOTE: This measurement can be used for timing advance calculation or location services.

### 5.2.9 UTRAN GPS Timing of Cell Frames for UE positioning

|  |  |
| --- | --- |
| **Definition** | TUTRAN-GPS is defined as the time of occurrence of a specified UTRAN event according to GPS Time Of Week. The specified UTRAN event is the beginning of the transmission of a particular frame (identified through its SFN) transmitted in the cell. The reference point for TUTRAN-GPSj shall be the Tx antenna connector. |

### 5.2.10 SFN-SFN observed time difference

|  |  |
| --- | --- |
| **Definition** | SFN-SFN observed time difference = TRx\_Frame\_cell k - TRx\_Frame\_cell i, in chips, where  TRx\_Frame\_cell i: time of start (defined by the first detected path in time) of the frame boundary from the TDD cell i.  TRx\_Frame\_cell k: time of start (defined by the first detected path in time) of the frame boundary from the cell k that is closest in time to the frame boundary of the TDD cell i. |

### 5.2.11 Cell Sync Burst Timing

|  |  |
| --- | --- |
| **Definition** | Cell sync burst timing is the time of start (defined by the first detected path in time) of the cell sync burst of a neighbouring cell. This measurement is applicable for 3.84Mcps TDD and 1.28Mcps TDD. For 1.28 Mcps TDD the DwPCH represents the cell sync burst. Type 1 is used for the initial phase of Node B synchronization. Type 2 is used for the steady-state phase of Node B synchronization. Both have different range.  The reference point for the cell sync burst timing measurement shall be the Rx antenna connector.  **Type 1:**  Cell sync burst timing = TRx  - Tslot in chips, where  Tslot : time of start of the cell sync timeslot in the frame, where the cell sync burst was received.  TRX : time of start (defined by the first detected path in time) of a cell sync burst received from the target UTRA cell.  **Type 2:**  Cell sync burst timing = TRx  - Tslot, in chips, where  Tslot : time of start of the cell sync timeslot in the frame, where the cell sync burst was received.  TRX : time of start (defined by the first detected path in time) of a cell sync burst received from the target UTRA cell. |

### 5.2.12 Cell Sync Burst SIR

|  |  |
| --- | --- |
| **Definition** | Signal to Interference Ratio for the cell sync burst, defined as: RSCP/Interference, where:  RSCP = Received Signal Code Power, the received power on the code and code offset of a cell sync burst.  Interference = The interference on the received signal in the same timeslot which can't be eliminated by the receiver  This measurement is applicable for 3.84Mcps TDD and 1.28Mcps TDD.  The reference point for the cell sync burst SIR shall be the Rx antenna connector. For 1.28 Mcps TDD the DwPCH represents the cell sync burst. |

### 5.2.13 Received SYNC-UL Timing Deviation for 1.28Mcps TDD

|  |  |
| --- | --- |
| **Definition** | 'Received SYNC-UL Timing Deviation' is the time difference  UpPCHPOS = UpPCHRxpath – UpPCHTS  Where  UpPCHRxpath: time of the reception in the Node B of the SYNC-UL to be used in the uplink synchronization process  UpPCHTS: time instance 128 chips prior to the start of the UpPCH according to the Node B internal timing  UE can calculate Round Trip Time (RTT) towards the UTRAN after the reception of the FPACH containing UpPCHPOS transmitted from the UTRAN.  Round Trip Time RTT is defined by  RTT = UpPCHAVD + UpPCHPOS – 8\*16 TC  Where  UpPCHADV: the amount of time by which the transmission of UpPCH is advanced in time relative to the end of the guard period according to the UE Rx timing. |

### 5.2.14 Angle of Arrival (AOA) for 1.28Mcps TDD

|  |  |
| --- | --- |
| **Definition** | AOA defines the estimated angle of a user with respect to a reference direction. The reference direction for this measurement shall be the North, positive in a counter-clockwise direction.  The AOA is determined at the BS antenna for an UL channel corresponding to this UE. When Cell Portions are defined in the cell, the AOA for cell portion can be measured if possible. |

### 5.2.15 HS-SICH reception quality

|  |  |
| --- | --- |
| **Definition** | The HS-SICH reception quality is defined via the following quantities. Each quantity is measured over the defined reporting period per UE:  - the number of expected HS-SICH transmissions from a given UE, and  - the number of unsuccessful HS-SICH receptions for this same UE in the Node B.  The number of expected HS-SICH transmissions from any given UE shall correspond to the number of scheduled HS-SCCH transmissions to the same UE.  Unsuccessful HS-SICH receptions shall be further divided into two categories;  - the number of failed HS-SICH receptions, and  - the number of missed HS-SICH receptions  for a given UE counted during the reporting period.  A failed HS-SICH reception is defined as an HS-SICH estimated to have been transmitted by the UE, but deemed not to have been received successfully by the Node B. A missed HS-SICH reception is defined as an HS-SICH estimated not to have been transmitted by the UE, if an HS-SICH transmission occasion was scheduled for the UE.  For the HS-SICH reception quality measurement, only HS-SICH transmission occasions for the respective UE during the reporting period shall be taken into account. |

### 5.2.16 Transmitted carrier power of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH, or E-HICH transmission

|  |  |
| --- | --- |
| **Definition** | Transmitted carrier power of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission is the ratio between the total transmitted power of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission in a specified timeslot on one DL carrier from one UTRAN access point, and the maximum transmission power possible to use on that DL carrier in the timeslot. Total transmission power of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission is the sum of the mean power levels [W] of each of the codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission in the specified timeslot on one carrier from one UTRAN access point. Maximum transmission power is the mean power [W] in the specified timeslot on one carrier from one UTRAN access point when transmitting at the configured maximum power for the cell. The measurement shall be possible on any timeslot and carrier transmitted from the UTRAN access point. The reference point for the transmitted carrier power measurement of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission shall be the Tx antenna connector. In case of Tx diversity the transmitted carrier power of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission is the ratio between the sum of the total transmitted powers of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission of all branches and the maximum transmission power. When Cell Portions are defined in the cell, the transmitted carrier power of all codes not used for HS-PDSCH, HS-SCCH, E-AGCH or E-HICH transmission for each Cell Portion can be measured and reported to higher layers. |

### 5.2.17 UpPTS interference (1.28Mcps TDD)

|  |  |
| --- | --- |
| **Definition** | The level of interference in the UpPTS, defined as the difference between the mean received power in the UpPTS and the sum of the estimated mean power levels of all detected UpPCH transmissions. In the case of antenna diversity, the linear average of the UpPTS interference levels calculated for each antenna branch shall be calculated. The reference point for the UpPTS interference measurement shall be the Rx antenna connector. When Cell Portions are defined in the cell, the UpPTS interference for each Cell Portion can be measured and reported to higher layers. |

Annex A (informative):  
Monitoring GSM from TDD: Calculation Results

## A.1 Low data rate traffic using 1 uplink and 1 downlink slot (for the 3.84 Mcps option)

NOTE: The section evaluates the time to acquire the FCCH if all idle slots are devoted to the tracking of a FCCH burst, meaning that no power measurements is done concurrently. The derived figures are better than those for GSM. The section does not derive though any conclusion. A conclusion may be that the use of the idle slots is a valid option. An alternative conclusion may be that this is the only mode to be used, removing hence the use of the slotted frames for low data traffic or the need for a dual receiver, if we were to considering the monitoring of GSM cells only, rather than GSM, TDD and FDD.

If a single synthesiser UE uses only one uplink and one downlink slot, e.g. for speech communication, the UE is not in transmit or receive state during 13 slots in each frame. According to the timeslot numbers allocated to the traffic, this period can be split into two continuous idle intervals A and B as shown in the figure below.



Figure A.1: Possible idle periods in a frame with two occupied timeslots

A is defined as the number of idle slots between the Tx and Rx slots and B the number of idle slots between the Rx and Tx slots. It is clear that A+B=13 time slots.

In the scope of low cost terminals, a [0.8] ms period is supposed to be required to perform a frequency jump from UMTS to GSM. This lets possibly two free periods of A\*Ts-1.6 ms and B\*Ts-1.6 ms during which the mobile station can monitor GSM, Ts being the slot period.

Following table evaluates the average synchronisation time and maximum synchronisation time, where the announced synchronisation time corresponds to the time needed to find the FCCH. The FCCH is supposed to be perfectly detected meaning that the FCCH is found if it is entirely present in the monitoring window. The FCCH being found the SCH location is unambiguously known from that point. All the 13 idle slots are assumed to be devoted to FCCH tracking and the UL traffic is supposed to occupy the time slot 0.

Table A.1: example- of average and maximum synchronisation time with two busy timeslots per frame and with 0.8 ms switching time (\*)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Downlink time slot number | Number of free TS in A | Number of free TS in B | Average synchronisation time (ms) | Maximum synchronisation time (ms) |
| 1 | 0 | 13 | 44 | 140 |
| 2 | 1 | 12 | 50 | 187 |
| 3 | 2 | 11 | 58 | 188 |
| 4 | 3 | 10 | 66 | 189 |
| 5 | 4 | 9 | 70 | 233 |
| 6 | 5 | 8 | 77 | 234 |
| 7 | 6 | 7 | 75 | 189 |
| 8 | 7 | 6 | 75 | 189 |
| 9 | 8 | 5 | 75 | 235 |
| 10 | 9 | 4 | 67 | 235 |
| 11 | 10 | 3 | 63 | 186 |
| 12 | 11 | 2 | 56 | 186 |
| 13 | 12 | 1 | 49 | 186 |
| 14 | 13 | 0 | 43 | 132 |

(\*) All simulations have been performed with a random initial delay between GSM frames and UMTS frames.

Each configuration of TS allocation described above allows a monitoring period sufficient to acquire synchronisation.

### A.1.1 Higher data rate traffic using more than 1 uplink and/or 1 downlink TDD timeslot

The minimum idle time to detect a complete FCCH burst for all possible alignments between the GSM and the TDD frame structure (called 'guaranteed FCCH detection'), assuming that monitoring happens every TDD frame, can be calculated as follows (tFCCH = one GSM slot):



- (e.g for tsynth =0ms: 3 TDD **consecutive** idle timeslots needed, for tsynth =0,3ms: 3 slots, for tsynth =0,5ms: 4 slots, for tsynth =0,8ms: 5 slots). Under this conditions the FCCH detection time can never exceed the time of 660ms.

- (For a more general consideration tsynth may be considered as a sum of all delays before starting monitoring is possible).

- For detecting SCH instead of FCCH (for a parallel search) the same equation applies.

- In the equation before the dual synthesiser UE is included if the synthesiser switching time is 0ms.

Table A.2: FCCH detection time for a dual synthesizer UE monitoring GSM from TDD every TDD frame

|  |  |  |  |
| --- | --- | --- | --- |
| occupied slots=  15-idle slots | cases | FCCH detection time in ms | |
| Average | maximum |
| 2 | 105 | 37 | 189 |
| 3 | 455 | 46 | 327 |
| 4 | 1365 | 58 | 419 |
| 5 | 3003 | 72 | 501 |
| 6 | 5005 | 90 | 646 |
| 7 | 6435 | 114 | 660 |
| 8 | 6435 | 144 | 660 |
| 9 | 5005 | 175 | 660 |
| 10 | 3003 | 203 | 660 |
| 11 | 1365 | 228 | 660 |
| 12 | 455 | 254 | 660 |
| 13 | 105 | - | - |
| 14 | 15 | - | - |
|  |  |  |  |

In the table above for a given number of occupied slots in the TDD mode all possible cases of distributions of these occupied TDD slots are considered (see 'cases'). For every case arbitrary alignments of the TDD and the GSM frame structure are taken into account for calculating the average FCCH detection time (only these cases are used which guarantee FCCH detection for all alignments; only the non-parallel FCCH search is reflected by the detection times in the table 2).

The term 'occupied slots' means that the UE is not able to monitor in these TDD slots.

For a synthesiser switching time of one or one half TDD timeslot the number of needed consecutive idle TDD timeslots is summarized in the table below:

Table A.3: Link between the synthesiser performance and the number of free consecutive TSs for guaranteed FCCH detection, needed for GSM monitoring

|  |  |
| --- | --- |
| One-way switching time for the synthesiser | Number of free consecutive TDD timeslots needed in the frame for a guaranteed FCCH detection |
| 1 TS (=2560 chips) | 5 |
| 0.5 TS (=1280 chips) | 4 |
| 0 (dual synthesiser) | 3 |

## A.2 Low data rate traffic using 1 uplink and 1 downlink slot (for the 1.28 Mcps option)

NOTE: The section evaluates the time to acquire the FCCH if all idle slots are devoted to the tracking of a FCCH burst, meaning that no power measurements is done concurrently. The derived figures are better than those for GSM. The section does not derive though any conclusion. A conclusion may be that the use of the idle slots is a valid option. An alternative conclusion may be that this is the only mode to be used, removing hence the use of the slotted frames for low data traffic or the need for a dual receiver, if we were to considering the monitoring of GSM cells only, rather than GSM, TDD and FDD.

If a single synthesiser UE uses only one uplink and one downlink slot, e.g. for speech communication, the UE is not in transmit or receive state during 5 slots in each frame. According to the timeslot numbers allocated to the traffic, this period can be split into two continuous idle intervals A and B as shown in the figure below.



Figure A.2: Possible idle periods in a subframe with two occupied timeslots

A is defined as the number of idle slots between the Tx and Rx slots and B the number of idle slots between the Rx and Tx slots. It is clear that A+B=5 time slots and C is equal to the DwPTS+GP+UpPTS.

In the scope of low cost terminals, a [0.5] ms period is supposed to be required to perform a frequency jump from 1.28Mcps TDD to GSM and vice versa. This lets possibly two free periods of A\*Timeslots-1 ms and B\*Timeslots+C-1 ms during which the mobile station can monitor GSM, Timeslots being the slot period.

Following table evaluates the average synchronisation time and maximum synchronisation time, where the announced synchronisation time corresponds to the time needed to find the FCCH. The FCCH is supposed to be perfectly detected which means that it is entirely present in the monitoring window. The FCCH being found the SCH location is unambiguously known from that point. All the 5 idle slots and the DwPTS+GP+UpPTS are assumed to be devoted to FCCH tracking and the UL traffic is supposed to occupy the time slot 1.

Table A.4: example- of average and maximum synchronisation time with two busy timeslots per sub-frame and with 0.5 ms switching time

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Downlink time slot number | Number of free Timeslots in A | Number of free Timeslots in B | Average synchronisation time (ms) | Maximum synchronisation time (ms) |
| 0 | 5 | 0 | 83 | 231 |
| 2 | 0 | 5 | 75 | 186 |
| 3 | 1 | 4 | 98 | 232 |
| 4 | 2 | 3 | 185 | 558 |
| 5 | 3 | 2 | 288 | 656 |
| 6 | 4 | 1 | 110 | 371 |

(\*) All simulations have been performed with a random initial delay between GSM frames and 1.28Mcps TDD sub-frames.

Each configuration of Timeslots allocation described above allows a monitoring period sufficient to acquire synchronisation.

NOTE: Considering about the frame structure of 1.28Mcps TDD, there are total 7 timeslots in each sub-frame that can be used as data traffic. If more than 1 uplink and/or 1 downlink TDD timeslot are used for data traffic, that means it will occupy at least 3 time slots, equal to 0.675\*3=2.205ms. And more time slots for traffic data means more switching point are needed to switch between the GSM and the 1.28Mcps TDD. As it was mentioned above, each switching will take 0.5ms. As a result, the idle time left for monitoring the GSM will be very little. So monitoring GSM from 1.28Mcps TDD under this situation will be considered in the future. It will need more carefully calculation and simulation.

### A.2.1 Higher data rate traffic using more than 1 uplink and/or 1 downlink TDD timeslot (for 1.28Mcps TDD)

The minimum idle time to detect a complete FCCH burst for all possible alignments between the GSM and the 1.28Mcps TDD frame structure (called 'guaranteed FCCH detection'), assuming that monitoring happens every sub-frame, can be calculated as follows (tFCCH = one GSM slot):

- (e.g for tsynth =0ms: 2 1.28Mcps TDD **consecutive** idle timeslots needed, for tsynth =0.3ms: 3 slots (or 2 slots and the DwPTS+GP+UpPTS), for tsynth =0.5ms: 3 slots, for tsynth =0.8ms: 4 slots). Under this conditions the FCCH detection time can never exceed the time of 660ms.

- (For a more general consideration tsynth may be considered as a sum of all delays before starting monitoring is possible).

- For detecting SCH instead of FCCH (for a parallel search) the same equation applies.

- In the equation before the dual synthesiser UE is included if the synthesiser switching time is 0ms.

Table A.5 : FCCH detection time for a single synthesizer UE monitoring GSM from 1.28Mcps TDD every sub-frame

|  |  |  |  |
| --- | --- | --- | --- |
| Occupied Slots | Cases | AVERAGE FCCH detection time in ms | MAXIMUM FCCH detection time in ms |
| 2 | 21 | 136.625 | 660.785 |
| 3 | 35 | 188.451 | 660.785 |
| 4 | 35 | 231.115 | 660.785 |
| 5 | 21 | - | - |
| 6 | 7 | - | - |
| 7 | 1 | - | - |

The result in the above table is based on the following assumption:

- A single synthesizer is used.

- A [0.5] ms period is supposed to be required to perform a frequency jump from 1.28Mcps TDD to GSM and vice versa.

- For a given number of occupied slots in the TDD mode all possible cases of distributions of these occupied TDD slots are considered (see 'cases'). For every case arbitrary alignments of the TDD and the GSM frame structure are taken into account for calculating the average FCCH detection time (only these cases are used which guarantee FCCH detection for all alignments; only the non-parallel FCCH search is reflected by the detection times in the above table).

The term 'occupied slots' means that the UE is not able to monitor in these TDD slots.

For a synthesiser switching time of one or one half TDD timeslot the number of needed consecutive idle TDD timeslots is summarized in the table below:

Table A.6 : Link between the synthesiser performance and the number of free consecutive Timeslots for guaranteed FCCH detection, needed for GSM monitoring

|  |  |
| --- | --- |
| One-way switching time for the synthesiser | Number of free consecutive 1.28Mcps TDD timeslots needed in the sub-frame for a guaranteed FCCH detection |
| 1 Timeslot (=864 chips) | 4 |
| 0.5 Timeslot (=432 chips) | 3 |
| 0 (dual synthesiser) | 2 |

Annex B (informative):  
Change history

| **Change history** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Subject/Comment** | **Old** | **New** |
| 14/01/00 | RAN\_05 | RP-99595 | - |  | Approved at TSG RAN #5 and placed under Change Control | - | 3.0.0 |
| 14/01/00 | RAN\_06 | RP-99700 | 001 | 1 | Primary and Secondary CCPCH in TDD | 3.0.0 | 3.1.0 |
| 14/01/00 | RAN\_06 | RP-99701 | 002 | 1 | Block STTD capability for P-CCPCH, TDD component | 3.0.0 | 3.1.0 |
| 14/01/00 | RAN\_06 | RP-99700 | 003 | 1 | Update concerning measurement definitions, ranges and mappings | 3.0.0 | 3.1.0 |
| 14/01/00 | - | - | - |  | Change history was added by the editor | 3.1.0 | 3.1.1 |
| 31/03/00 | RAN\_07 | RP-000071 | 004 | 1 | Correction of CPICH measurements and 'RX Timing Deviation' range | 3.1.1 | 3.2.0 |
| 31/03/00 | RAN\_07 | RP-000071 | 005 | 2 | Editorial modifications to 25.225 | 3.1.1 | 3.2.0 |
| 31/03/00 | RAN\_07 | RP-000071 | 006 | 1 | Corrections to 25.225 Measurements for TDD | 3.1.1 | 3.2.0 |
| 26/06/00 | RAN\_08 | RP-000275 | 009 | - | Clarifications on TxDiversity for UTRA TDD | 3.2.0 | 3.3.0 |
| 26/06/00 | RAN\_08 | RP-000275 | 010 | - | Removal of Range/mapping | 3.2.0 | 3.3.0 |
| 26/06/00 | RAN\_08 | RP-000275 | 011 | - | Removal of transport channel BLER | 3.2.0 | 3.3.0 |
| 23/09/00 | RAN\_09 | RP-000348 | 012 | 1 | Alignment of TDD measurements with FDD : GPS related measurements | 3.3.0 | 3.4.0 |
| 23/09/00 | RAN\_09 | RP-000348 | 013 | 1 | Alignment of TDD measurements with FDD :SFN-CFN observed time difference | 3.3.0 | 3.4.0 |
| 23/09/00 | RAN\_09 | RP-000348 | 014 | - | Clarification of the Timeslot ISCP measurements | 3.3.0 | 3.4.0 |
| 23/09/00 | RAN\_09 | RP-000348 | 015 | - | Terminology regarding the beacon function | 3.3.0 | 3.4.0 |
| 23/09/00 | RAN\_09 | RP-000348 | 016 | - | Removal of Physical Channel BER | 3.3.0 | 3.4.0 |
| 23/09/00 | RAN\_09 | RP-000348 | 017 | - | Update of TS25.225 due to recent change for FDD: Reporting of UTRAN TX carrier power | 3.3.0 | 3.4.0 |
| 15/12/00 | RAN\_10 | RP-000545 | 018 | 2 | Corrections and Clarifications to 25.225 | 3.4.0 | 3.5.0 |
| 15/12/00 | RAN\_10 | RP-000545 | 019 | 1 | Corrections and Clarifications to 25.225 | 3.4.0 | 3.5.0 |
| 15/12/00 | RAN\_10 | RP-000545 | 020 | 1 | Clarification of measurement reference points | 3.4.0 | 3.5.0 |
| 15/12/00 | RAN\_10 | RP-000545 | 021 | - | Removal of incorrect note relating to RSCP measurements | 3.4.0 | 3.5.0 |
| 16/03/01 | RAN\_11 | - | - | - | Approved as Release 4 specification (v4.0.0) at TSG RAN #11 | 3.5.0 | 4.0.0 |
| 16/03/01 | RAN\_11 | RP-010066 | 023 | - | Correction of the observed time difference to GSM measurement | 3.5.0 | 4.0.0 |
| 16/03/01 | RAN\_11 | RP-010073 | 022 | - | Measurements for Node B synchronisation | 3.5.0 | 4.0.0 |
| 16/03/01 | RAN\_11 | RP-010071 | 024 | 1 | Inclusion of 1.28Mcps TDD in TS 25.225 | 3.5.0 | 4.0.0 |
| 16/03/01 | RAN\_11 | RP-010072 | 025 | - | RTD measurement in UTRAN for UP-TDD | 3.5.0 | 4.0.0 |
| 15/06/01 | RAN\_12 | RP-010339 | 029 | - | Renaming of LCS measurements | 4.0.0 | 4.1.0 |
| 15/06/01 | RAN\_12 | RP-010339 | 030 | - | Addition to the abbreviation list | 4.0.0 | 4.1.0 |
| 21/09/01 | RAN\_13 | RP-010526 | 034 | - | Clarification of the Beacon Measurement in TS25.225 | 4.1.0 | 4.2.0 |
| 21/09/01 | RAN\_13 | RP-010707 | 031 | 1 | RxTiming Deviation for 1.28 Mcps TDD | 4.1.0 | 4.2.0 |
| 21/09/01 | RAN\_13 | RP-010532 | 032 | - | SFN-SFN type 1 for 1.28 Mcps TDD | 4.1.0 | 4.2.0 |
| 14/12/01 | RAN\_14 | RP-010743 | 036 | 1 | Removal of references to Block STTD | 4.2.0 | 4.3.0 |
| 14/12/01 | RAN\_14 | RP-010743 | 040 | - | Correction of measurement definition for UTRA Carrier RSSI and CPICH\_Ec/No | 4.2.0 | 4.3.0 |
| 14/12/01 | RAN\_14 | RP-010750 | 038 | 1 | Introduction of new "UE GPS code phase" measurement | 4.2.0 | 4.3.0 |
| 14/12/01 | RAN\_14 | RP-010750 | 042 | - | Corrections in annex A.2 in TS 25.225 | 4.2.0 | 4.3.0 |
| 08/03/02 | RAN\_15 | RP-020055 | 041 | 1 | Introduction of "Node B synchronization for 1.28 Mcps TDD" | 4.3.0 | 5.0.0 |
| 08/03/02 | RAN\_15 | RP-020057 | 043 | - | Introduction of "UE Positioning Enhancements for 1.28 Mcps TDD" | 4.3.0 | 5.0.0 |
| 07/06/02 | RAN\_16 | RP-020312 | 050 | 2 | Clarification of UE measurements Applicability | 5.0.0 | 5.1.0 |
| 20/09/02 | RAN\_17 | RP-020578 | 053 | - | Correction to SFN-SFN Type 2 measurement | 5.1.0 | 5.2.0 |
| 20/09/02 | RAN\_17 | RP-020558 | 061 | - | Correction of UE SFN-SFN type 1 measurement for TDD | 5.1.0 | 5.2.0 |
| 22/12/02 | RAN\_18 | RP-020844 | 064 | - | Received Total Wide Band Power Measurement Definition | 5.2.0 | 5.3.0 |
| 24/03/03 | RAN\_19 | RP-030080 | 065 | 2 | Addition of HS-SICH quality measurement for UTRA TDD | 5.3.0 | 5.4.0 |
| 24/06/03 | RAN\_20 | RP-030366 | 070 | 1 | Power Measurement in non HSDPA codes for TDD | 5.4.0 | 5.5.0 |
| 24/06/03 | RAN\_20 | RP-030365 | 074 | - | Correction of transmitted carrier power definition in case of Tx diversity | 5.4.0 | 5.5.0 |
| 06/01/04 | RAN\_22 | RP-030651 | 071 | 4 | Definition of Transmitted Code Power and ISCP measurements in the case of antenna diversity for TDD | 5.5.0 | 5.6.0 |
| 13/01/04 | RAN\_22 | - | - | - | created for M.1457 update | 5.6.0 | 6.0.0 |
| 23/03/04 | RAN\_23 | RP-040088 | 069 | 1 | Interference measurement in UpPTS for 1.28Mcps TDD | 6.0.0 | 6.1.0 |
| 23/03/04 | RAN\_23 | RP-040084 | 078 | 1 | Clarification of TA definition for 1.28Mcps TDD | 6.0.0 | 6.1.0 |
| 20/03/06 | RAN\_31 | RP-060079 | 0079 | - | Introduction of 7.68Mcps TDD option | 6.1.0 | 7.0.0 |
| 12/06/06 | RAN\_32 | RP-060294 | 0081 | - | Clarify the reference point for LCR TDD TA | 7.0.0 | 7.1.0 |
| 29/09/06 | RAN\_33 | RP-060492 | 0083 | - | Introduction of E-DCH for 3.84Mcps and 7.68Mcps TDD | 7.1.0 | 7.2.0 |
| 07/03/07 | RAN\_35 | RP-070120 | 087 | - | Physical layerspecification of UE Power Headroom measurement | 7.2.0 | 7.3.0 |
| 07/03/07 | RAN\_35 | RP-070118 | 086 | - | Introduction of E-DCH for 1.28Mcps TDD | 7.2.0 | 7.3.0 |
| 13/03/07 | RAN\_35 | RP-070113 | 085 | 1 | Modification on the HS-SICH reception quality of HS-SICH for LCR TDD | 7.2.0 | 7.3.0 |
| 11/09/07 | RAN\_37 | RP-070650 | 088 | - | Introduction of multi-frequency operation for 1.28Mcps TDD | 7.3.0 | 7.4.0 |
| 04/03/08 | RAN\_39 | - | - | - | Creation of Release 8 further to RAN\_39 decision | 7.4.0 | 8.0.0 |
| 09/09/08 | RAN\_41 | RP-080667 | 0089 | - | E-UTRA measurements for UTRA TDD – E-UTRA interworking | 8.0.0 | 8.1.0 |
| 03/03/09 | RAN\_43 | RP-090232 | 0091 | 2 | RSRP and RSRQ Measurement Definitions | 8.1.0 | 8.2.0 |
| 15/09/09 | RAN\_45 | RP-090888 | 0092 | - | Clarification on reference point of RSRP and RSRQ for EUTRA | 8.2.0 | 8.3.0 |
| 15/09/09 | RAN\_45 | RP-090891 | 0093 | - | Clarification of UE measurement definitions for RX diversity of LCR TDD | 8.2.0 | 8.3.0 |
| 01/12/09 | RAN\_46 | RP-091175 | 0094 | 3 | Introduction of Cell Portion for 1.28 Mcps TDD | 8.3.0 | 9.0.0 |
| 16/03/10 | RAN\_47 | RP-100205 | 0095 | 1 | Modification of RSRQ definition | 9.0.0 | 9.1.0 |
| 01/06/10 | RAN\_48 | RP-100584 | 0098 | - | Correction to the reference table number for nominal maximum output power for 1.28Mcps TDD | 9.1.0 | 9.2.0 |
| 07/12/10 | RAN\_50 | RP-101317 | 0099 | 2 | Introduction of MC-HSUPA for 1.28Mcps TDD | 9.2.0 | 10.0.0 |
| 01/06/11 | RAN\_52 | RP-110817 | 0101 | 2 | Introduction of Cell Portion in AOA measurement for LCR TDD | 10.0.0 | 10.1.0 |
| 2012-09 | SP\_57 | - | - | - | Update to Rel-11 version (MCC) | 10.1.0 | 11.0.0 |
| 10/09/14 | RAN\_65 | RP-141484 | 0104 | - | Inclusion of definition of WLAN Beacon RSSI in UMTS specifications | 11.0.0 | 12.0.0 |
| 09/03/15 | RAN\_67 | RP-150361 | 0103 | 3 | New E-UTRA RSRQ measurement definition | 12.0.0 | 12.1.0 |
| 07/12/15 | SP\_70 | - | - | - | Creation of Release 13 further to SP\_70 decision | 12.1.0 | 13.0.0 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2017-03 | RP-75 | - | - | - | - | Promotion to Release 14 without technical change (MCC) | 14.0.0 |
| 2018-06 | RP-80 | - | - | - | - | Promotion to Release 15 without technical change (MCC) | 15.0.0 |
| 2020-07 | RP-88e | - | - | - | - | Upgrade to Rel-16 version without technical change | 16.0.0 |