**3GPP TSG RAN WG1 Meeting #17**
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*e.g. for 3GPP use the format TP-99xxx*
*or for SMG, use the format P-99-xxx*

# CHANGE REQUEST

*Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

| 25.225 | CR | 018r2 | Current Version: | 3.4.0 |
|---|---|---|---|---|

*GSM (AA.BB) or 3G (AA.BBB) specification number ?* *? CR number as allocated by MCC support team*

| For submission to: | RAN #10 | for approval | X | strategic | | *(for SMG use only)* |
|---|---|---|---|---|---|---|
| *list expected approval meeting # here ?* | | for information | | non-strategic | | |

*Form: CR cover sheet, version 2 for 3GPP and SMG* *The latest version of this form is available from:* ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

**Proposed change affects:** *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

**Source:** Siemens AG **Date:** 22/11/00

**Subject:** Corrections and Clarifications to 25.225

**Work item:**

**Category:** *(only one category shall be marked with an X)*

| | | | | | |
|---|---|---|---|---|---|
| F | Correction | X | **Release:** | Phase 2 | |
| A | Corresponds to a correction in an earlier release | | | Release 96 | |
| B | Addition of feature | | | Release 97 | |
| C | Functional modification of feature | | | Release 98 | |
| D | Editorial modification | | | Release 99 | X |
| | | | | Release 00 | |

**Reason for change:**
The fact that the SIR measurement is receiver implementation dependent is clarified.
The reference point for timing measurements on received signals is clarified to be the first detected path (in time).
In 25.225 the term “antenna connector” is used to define the reference point for UE/UTRAN measurements. This CR clarifies what is meant with that term by adding a reference to the relevant WG4 specifications.

**Clauses affected:** 3, 5.1, 5.2

**Other specs affected:**

| | | | |
|---|---|---|---|
| Other 3G core specifications | | ? | List of CRs: |
| Other GSM core specifications | | ? | List of CRs: |
| MS test specifications | | ? | List of CRs: |
| BSS test specifications | | ? | List of CRs: |
| O&M specifications | | ? | List of CRs: |

**Other comments:**

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# 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.

[1] 3G TS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)".

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[18] 3G TS 25.102: “UTRA (UE) TDD; Radio transmission and Reception”

[19] 3G TS 25.105: “UTRA (BS) TDD; Radio transmission and Reception”

# 3 Abbreviations

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

| | |
|---|---|
| BER | Bit Error Rate |
| BLER | Block Error Rate |
| CPICH | Common Pilot Channel (FDD) |
| DCH | Dedicated Channel |
| DPCH | Dedicated Physical Channel |
| Ec/No | Received energy per chip divided by the power density in the band |
| FACH | Forward Access Channel |
| 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 |
| RACH | Random Access Channel |
| RSCP | Received Signal Code Power |
| RSSI | Received Signal Strength Indicator |
| S-CCPCH | Secondary Common Control Physical Channel |
| SCH | Synchronisation Channel |
| SIR | Signal-to-Interference Ratio |
| UE | User Equipment |

# 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

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 sum of the received powers for midambles $m^{(1)}$ and $m^{(2)}$ if Block-STTD 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 RSCP can either be measured on the data part or the midamble of a burst, since there is no power offset between both. However, in order to have a common reference, the measurement on the midamble is assumed.

NOTE 5: 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 6: 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 7: The measurement 'Timeslot ISCP' is only a measure of the inter-cell interference.

NOTE 8: The term “antenna connector of the UE” used in this sub-clause to define the reference point for the UE measurements is defined in [18].

### 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 is the antenna connector ofat the UE. |
| **Applicable for** | idle mode, connected mode (intra-frequency & inter-frequency) |

### 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 beis the antenna connector ofat the UE. (This measurement is used in TDD for monitoring FDD cells while camping on a TDD cell).<br>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 mode, connected mode (inter-frequency) |

### 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 is shall be the antenna connector ofat the UE. |
| **Applicable for** | connected mode (intra-frequency). |

### 5.1.4 UTRA carrier RSSI

| | |
|---|---|
| **Definition** | Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth in a specified timeslot. Measurement shall be performed on a UTRAN DL carrier. The reference point for the RSSI is shall be the antenna connector ofat the UE. |
| **Applicable for** | idle mode, connected mode (intra- & inter-frequency) |

### 5.1.5 GSM carrier RSSI

| | |
|---|---|
| **Definition** | Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth in a specified timeslot. Measurement shall be performed on a GSM BCCH carrier. The reference point for the RSSI is shall be the antenna connector at the UE. |
| **Applicable for** | idle mode, connected mode (inter-frequency) |

## 5.1.6 SIR

| | |
|---|---|
| **Definition** | Signal to Interference Ratio, defined as: (RSCP/~~ISCP~~Interference)xSF.<br>Where:<br>RSCP = Received Signal Code Power, the received power on the code of a specified DPCH or PDSCH.<br>~~ISCP~~ Interference = ~~Interference Signal Code Power, t~~The interference on the received signal in the same timeslot which can't be eliminated by the receiver.<br>SF = The used spreading factor.<br><br>The reference point for the SIR ~~is~~ shall be the antenna connector of the UE. |
| **Applicable for** | connected mode (intra-frequency) |

## 5.1.7 CPICH Ec/No

| | |
|---|---|
| **Definition** | The received energy per chip divided by the power density in the band. The Ec/No is identical to RSCP/RSSI. Measurement shall be performed on the Primary CPICH. The reference point for the CPICH Ec/No shall be~~is~~ the antenna connector of~~at~~ the UE. (This measurement is used in TDD for monitoring FDD cells while camping on a TDD cell)<br>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 mode, connected mode (inter-frequency) |

## 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** | connected mode (intra-frequency) |

## 5.1.9 UE transmitted power

| | |
|---|---|
| **Definition** | The total UE transmitted power on one carrier ~~measured~~ in a specified timeslot. The reference point for the UE transmitted power shall be the ~~UE~~ antenna connector of the UE. |
| **Applicable for** | connected mode (intra-frequency). |

## 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 ~~in~~ by two types. Type 2 applies if the serving and the target cell have the same frame timing.<br><br>The reference point for the SFN-SFN observed time difference type 1 and 2 shall be the antenna connector of the UE.<br><br>**Type 1:**<br>SFN-SFN observed time difference = OFF*38400 + $T_m$ in chips, where:<br><br>$T_m$ = $T_{RxSFNk}$ - $T_{RxSFNi}$, given in chip units with the range [0, 1, …, 38399] chips<br><br>$T_{RxSFNi}$ := time of start (defined by the first detected path in time) of the received frame $SFN_i$ of the serving TDD cell i.<br><br>$T_{RxSFNk}$ := time of start (defined by the first detected path in time) of the received frame $SFN_k$ of the target UTRA cell k received most recently in time before the time instant $T_{RxSFNi}$ in the UE. If this frame $SFN_k$ of the target UTRA cell is received exactly at $T_{RxSFNi}$ then $T_{RxSFNk}$= $T_{RxSFNi}$ (which leads to $T_m$=0).<br><br>OFF = ($SFN_i$ - $SFN_k$) mod 256, given in number of frames with the range [0, 1, …, 255] frames.<br><br>$SFN_i$ := system frame number for downlink frame from serving TDD cell i in the UE at the time $T_{RxSFNi}$.<br><br>$SFN_k$ := system frame number for downlink frame from target UTRA cell k received in the UE at the time $T_{RxSFNk}$ (for FDD: the P-CCPCH frame)<br><br>**Type 2:**<br>SFN-SFN observed time difference = $T_{RxTSk}$ - $T_{RxTSi}$, in chips, where<br><br>$T_{RxTSi}$ : time of start (defined by the first detected path in time) of a timeslot received ~~of~~ from the serving TDD cell i.<br><br>$T_{RxTSk}$ : time of start (defined by the first detected path in time) of a timeslot received from the target UTRA cell k that is closest in time to the start of the timeslot of the serving TDD cell i. |
| **Applicable for** | idle mode, connected mode (intra-frequency), connected mode (inter-frequency) |

## 5.1.11 SFN-CFN observed time difference

| | |
|---|---|
| **Definition** | The SFN-CFN observed time difference is defined as:<br>$T_m$ for an FDD neighbour cell (i.e. the value is reported in chips),<br>OFF for a TDD neighbour cell (i.e. the value is reported in frames),<br>where:<br><br>$T_m$ = $T_{UETx} - T_{RxSFN}$, given in chip units with the range [0, 1, …, 38399] chips.<br><br>$T_{UETx}$ = the time at the beginning of the frame with the connection frame number $CFN_{TX}$ considering the transmission from the UE in the serving TDD cell.<br><br>$T_{RxSFN}$ = 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. $T_{RxSFN}$ is the time instant most recent in time before the time instant $T_{UETx}$<br><br>OFF = (SFN-$CFN_{TX}$) mod 256, given in number of frames with the range [0, 1, …, 255] frames.<br><br>$CFN_{Tx}$ = the connection frame number for the UE transmission.<br><br>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 $T_{RxSFN}$.<br><br>The reference point for the SFN-CFN observed time difference shall be the antenna connector of the UE. |
| **Applicable for** | connected mode (inter-frequency), connected mode (intra-frequency) |

## 5.1.12 Observed time difference to GSM cell

| | |
|---|---|
| **Definition** | Observed time difference to GSM cell is the time difference $T_m$ in ms, where<br>$T_m = T_{RxGSMk} - T_{RxSFN0i}$<br>$T_{RxSFN0i}$: time of start (defined by the first detected path in time) of the received frame SFN=0 of the serving TDD cell i<br>$T_{RxGSMk}$: time of start (defined by the first detected path in time) of the GSM BCCH 51-multiframe of the considered target GSM frequency k received closest in time after the time $T_{RxSFN0i}$.<br>If the next GSM BCCH 51-multiframe is received exactly at $T_{RxSFN0i}$ then $T_{RxGSMk} = T_{RxSFN0i}$ (which leads to $T_m$=0).<br>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.<br><br>The reference point for the observed time difference to GSM cell shall be the antenna connector of the UE. |
| **Applicable for** | Idle mode, connected mode (inter-frequency) |

## 5.1.13 UE GPS Timing of Cell Frames for LCS

| | |
|---|---|
| **Definition** | The timing between cell j and GPS Time Of Week. $T_{UE-GPSj}$ is defined as the time of occurrence of a specified UTRAN event according to GPS time. The specified UTRAN event is the beginning of a particular frame (identified through its SFN) in the first significant detected multipath (in time) of the cell j P-CCPCH measured in the UE. |
| **Applicable for** | connected mode (intra-frequency, inter-frequency) |

## 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 RSCP can either be measured on the data part or the midamble of a burst, since there is no power offset between both. However, in order to have a common reference, the measurement on the midamble is assumed.

NOTE 3: 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 4: 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 [19]. 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 or PUSCH code. The reference point for the RSCP shall be the antenna connector. |

### 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 antenna connector. |

### 5.2.3 RSSI

| | |
|---|---|
| **Definition** | Received Signal Strength Indicator, the wide-band received power within the UTRAN UL carrier channel bandwidth in a specified timeslot. The reference point for the RSSI shall be the antenna connector. |

### 5.2.4 SIR

| | |
|---|---|
| **Definition** | Signal to Interference Ratio, defined as: (RSCP/~~ISCP~~Interference)xSF.<br>Where:<br>RSCP = Received Signal Code Power, the received power on the code of a specified DPCH,<br>PRACH or PUSCH.<br>~~ISCP~~ Interference = ~~Interference Signal Code Power, t~~The interference on the received signal in the<br>same timeslot which can't be eliminated by the receiver~~.~~<br>SF = ~~–~~The used spreading factor.<br><br>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.<br>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.<br>Total transmission power is the power [W] transmitted on one DL carrier in a specific timeslot from one UTRAN access point.<br>Maximum transmission power is the power [W] on the same carrier when transmitting at the configured maximum transmission power for the cell.<br>The measurement shall be possible on any carrier transmitted from the UTRAN access point.<br>The reference point for the transmitted carrier power measurement shall be the Tx antenna connector.<br>In case of Tx diversity the transmitted carrier power for each branch shall be measured and the maximum of the two values shall be reported to higher layers, i.e. only one value will be 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 ~~at the UTRAN access point cabinet~~. |

## 5.2.8 RX Timing Deviation

| | |
|---|---|
| **Definition** | 'RX Timing Deviation' is the time difference TRXdev = TTS – TRXpath in chips, with<br>TRXpath: time of the reception in the Node B of the first ~~significant~~ detected uplink path (in time) to be used in the detection process<br>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 LCS

| | |
|---|---|
| **Definition** | The time difference between the timing of the cell and GPS Time Of Week. $T_{UTRAN-GPS}$ is defined as the time of occurrence of a specified UTRAN event according to GPS time. The specified UTRAN event is the beginning of a particular frame (identified through its SFN) transmitted in the cell. |