Universal Mobile Telecommunications System (UMTS);
Physical layer – Measurements (FDD)
(3G TS 25.215 version 3.1.1 Release 1999)
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Foreword

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

The present document may refer to technical specifications or reports using their 3GPP identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables. The mapping of document identities is as follows:

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\[
\text{3G TS | TR nn.nnn "<title>" (with or without the prefix 3G)}
\]

is equivalent to

\[
\text{ETSI TS | TR 1nn nnn \"[Digital cellular telecommunications system (Phase 2+) (GSM);] Universal Mobile Telecommunications System; <title>\"}
\]

For GSM document identities of type "GSM xx.yy", e.g. GSM 01.04, the corresponding ETSI document identity may be found in the Cross Reference List on www.etsi.org/key
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Foreword

This Technical Specification has been produced by the 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 this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

x  the first digit:
    1  presented to TSG for information;
    2  presented to TSG for approval;
    3  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 specification;
1 Scope

The present document contains the description and definition of the measurements for FDD done at the UE and network 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)"
[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)"
[11] 3G TS 25.302: "Services provided by the Physical layer"
[12] 3G TS 25.303: "UE functions and interlayer procedures in connected mode"
[16] 3G TR 25.923: "Report on Location Services (LCS)"

3 Abbreviations

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

BER  Bit Error Rate
BLER  Block Error Rate
Ec/No Received energy per chip divided by the power density in the band
ISCP  Interference Signal Code Power
RL   Radio Link
4 Control of UE/UTRAN measurements

In this chapter 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.

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, see chapter 5, 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.

5 Measurement abilities for UTRA FDD

In this chapter 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:
<table>
<thead>
<tr>
<th>Column field</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Contains the definition of the measurement.</td>
</tr>
<tr>
<td>Applicable for</td>
<td>States if a measurement shall be possible to perform in Idle mode and/or Connected mode. For connected mode also information of the possibility to perform the measurement on intra-frequency and/or inter-frequency are given. The following terms are used in the tables: Idle = Shall be possible to perform in idle mode Connected Intra = Shall be possible to perform in connected mode on an intra-frequency Connected Inter = Shall be possible to perform in connected mode on an inter-frequency</td>
</tr>
<tr>
<td>Range/mapping</td>
<td>Gives the range and mapping to bits for the measurements quantity.</td>
</tr>
</tbody>
</table>

### 5.1.1 CPICH RSCP

**Definition**
Received Signal Code Power, the received power on one code measured on the pilot bits of the Primary CPICH. The reference point for the RSCP is the antenna connector at the UE.

<table>
<thead>
<tr>
<th>Applicable for</th>
<th>Connected Intra, Connected Inter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range/mapping</td>
<td>CPICH RSCP is given with a resolution of 1 dB with the range [-115, ..., -25] dBm. CPICH RSCP shall be reported in the unit CPICH_RSCP_LEV where:</td>
</tr>
<tr>
<td></td>
<td>CPICH_RSCP_LEV _00: CPICH RSCP &lt; -115 dBm</td>
</tr>
<tr>
<td></td>
<td>CPICH_RSCP_LEV _01: -115 dBm ≤ CPICH RSCP &lt; -114 dBm</td>
</tr>
<tr>
<td></td>
<td>CPICH_RSCP_LEV _02: -114 dBm ≤ CPICH RSCP &lt; -113 dBm</td>
</tr>
<tr>
<td></td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>CPICH_RSCP_LEV _89: -27 dBm ≤ CPICH RSCP &lt; -26 dBm</td>
</tr>
<tr>
<td></td>
<td>CPICH_RSCP_LEV _90: -26 dBm ≤ CPICH RSCP &lt; -25 dBm</td>
</tr>
<tr>
<td></td>
<td>CPICH_RSCP_LEV _91: -25 dBm ≤ CPICH RSCP</td>
</tr>
</tbody>
</table>

### 5.1.2 PCCPCH RSCP

**Definition**
Received Signal Code Power, the received power on one code measured on the PCCPCH from a TDD cell. The reference point for the RSCP is the antenna connector at the UE.

Note:
The RSCP can either be measured on the data part or the midamble of a burst, since there is no power difference between these two parts. However, in order to have a common reference, measurement on the midamble is assumed.

<table>
<thead>
<tr>
<th>Applicable for</th>
<th>Idle, Connected Inter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range/mapping</td>
<td>PCCPCH RSCP is given with a resolution of 1 dB with the range [-115, ..., -25] dBm. PCCPCH RSCP shall be reported in the unit PCCPCH_RSCP_LEV where:</td>
</tr>
<tr>
<td></td>
<td>PCCPCH_RSCP_LEV _00: PCCPCH RSCP &lt; -115 dBm</td>
</tr>
<tr>
<td></td>
<td>PCCPCH_RSCP_LEV _01: -115 dBm ≤ PCCPCH RSCP &lt; -114 dBm</td>
</tr>
<tr>
<td></td>
<td>PCCPCH_RSCP_LEV _02: -114 dBm ≤ PCCPCH RSCP &lt; -113 dBm</td>
</tr>
<tr>
<td></td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>PCCPCH_RSCP_LEV _89: -27 dBm ≤ PCCPCH RSCP &lt; -26 dBm</td>
</tr>
<tr>
<td></td>
<td>PCCPCH_RSCP_LEV _90: -26 dBm ≤ PCCPCH RSCP &lt; -25 dBm</td>
</tr>
<tr>
<td></td>
<td>PCCPCH_RSCP_LEV _91: -25 dBm ≤ PCCPCH RSCP</td>
</tr>
</tbody>
</table>

### 5.1.3 RSCP

**Definition**
Received Signal Code Power, the received power on one code measured on the pilot bits of the DPCCH after RL combination. The reference point for the RSCP is the antenna connector at the UE.

<table>
<thead>
<tr>
<th>Applicable for</th>
<th>Connected Intra</th>
</tr>
</thead>
</table>

5.1.4 SIR

**Definition**
Signal to Interference Ratio, defined as: \((RSCP/ISCP)\times(SF/2)\). The SIR shall be measured on DPCCH after RL combination. The reference point for the SIR is the antenna connector of the UE.

where:
- \(RSCP\) = Received Signal Code Power, the received power on one code measured on the pilot bits.
- \(ISCP\) = Interference Signal Code Power, the interference on the received signal measured on the pilot bits. Only the non-orthogonal part of the interference is included in the measurement.
- \(SF\) = The spreading factor used.

**Applicable for**
Connected Intra

**Range/mapping**
SIR is given with a resolution of 0.5 dB with the range \([-11, ..., 20]\) dB. SIR shall be reported in the unit \(UE\_SIR\) where:

- \(UE\_SIR\_00\): \(SIR < -11.0\) dB
- \(UE\_SIR\_01\): \(-11.0\) dB \(\leq SIR < -10.5\) dB
- \(UE\_SIR\_02\): \(-10.5\) dB \(\leq SIR < -10.0\) dB
- ...
- \(UE\_SIR\_61\): 19.0 dB \(\leq SIR < 19.5\) dB
- \(UE\_SIR\_62\): 19.5 dB \(\leq SIR < 20.0\) dB
- \(UE\_SIR\_63\): 20.0 dB \(\leq SIR\)

5.1.5 UTRA carrier RSSI

**Definition**
Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth. Measurement shall be performed on a UTRAN downlink carrier. The reference point for the RSSI is the antenna connector at the UE.

**Applicable for**
Idle, Connected Intra, Connected Inter

**Range/mapping**
UTRA carrier RSSI is given with a resolution of 1 dB with the range \([-94, ..., -32]\) dBm. UTRA carrier RSSI shall be reported in the unit \(UTRA\_carrier\_RSSI\_LEV\) where:

- \(UTRA\_carrier\_RSSI\_LEV\_00\): UTRA carrier RSSI \(< -94\) dBm
- \(UTRA\_carrier\_RSSI\_LEV\_01\): \(-94\) dBm \(\leq UTRA\) carrier RSSI \(< -93\) dBm
- \(UTRA\_carrier\_RSSI\_LEV\_02\): \(-93\) dBm \(\leq UTRA\) carrier RSSI \(< -92\) dBm
- ...
- \(UTRA\_carrier\_RSSI\_LEV\_61\): 32 dBm \(\leq UTRA\) carrier RSSI \(< -33\) dBm
- \(UTRA\_carrier\_RSSI\_LEV\_62\): 33 dBm \(\leq UTRA\) carrier RSSI \(< -32\) dBm
- \(UTRA\_carrier\_RSSI\_LEV\_63\): 32 dBm \(\leq UTRA\) carrier RSSI

5.1.6 GSM carrier RSSI
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 Ec/No is the antenna connector at the UE.

**Applicable for**
Idle, Connected Intra, Connected Inter

**Range/mapping**
CPICH Ec/No is given with a resolution of 1 dB with the range [-24, ..., 0] dB. CPICH Ec/No shall be reported in the unit CPICH_Ec/No where:

- CPICH_Ec/No_00: CPICH Ec/No < -24 dB
- CPICH_Ec/No_01: -24 dB ≤ CPICH Ec/No < -23 dB
- CPICH_Ec/No_02: -23 dB ≤ CPICH Ec/No < -22 dB
- ...
- CPICH_Ec/No_23: -2 dB ≤ CPICH Ec/No < -1 dB
- CPICH_Ec/No_24: -1 dB ≤ CPICH Ec/No < 0 dB
- CPICH_Ec/No_25: 0 dB ≤ CPICH Ec/No

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 after RL combination. BLER estimation is only required for transport channels containing CRC. In connected mode the BLER shall be possible to measure on any transport channel. If requested in idle mode it shall be possible to measure the BLER on transport channel PCH.

**Applicable for**
Idle, Connected Intra

**Range/mapping**
The Transport channel BLER shall be reported for 0 ≤ Transport channel BLER ≤ 1 in the unit BLER_dB where:

- BLER_dB_00: Transport channel BLER = 0
- BLER_dB_01: -∞ < Log10(Transport channel BLER) < -4.03
- BLER_dB_02: -4.03 ≤ Log10(Transport channel BLER) < -3.965
- BLER_dB_03: -3.965 ≤ Log10(Transport channel BLER) < -3.9
- ...
- BLER_dB_61: -0.195 ≤ Log10(Transport channel BLER) < -0.13
- BLER_dB_62: -0.13 ≤ Log10(Transport channel BLER) < -0.065
- BLER_dB_63: -0.065 ≤ Log10(Transport channel BLER) ≤ 0

5.1.9 Physical channel BER

**Definition**
The physical channel BER is an estimation of the average bit error rate (BER) before channel decoding of the DPDCH data after RL combination. At most it shall be possible to report a physical channel BER estimate at the end of each TTI for the transferred TrCh’s, e.g. for TrCh’s with a TTI of x ms a x ms averaged physical channel BER shall be possible to report every x ms.

**Applicable for**
Connected Intra
The Physical channel BER shall be reported for $0 \leq \text{Physical channel BER} \leq 1$ in the unit $\text{BER\_dB}$ where:

- $\text{BER\_dB\_00}$: Physical channel BER = 0
- $\text{BER\_dB\_01}$: $-\infty < \log_{10}\text{(Physical channel BER)} < -4.03$
- $\text{BER\_dB\_02}$: $-4.03 \leq \log_{10}\text{(Physical channel BER)} < -3.965$
- $\text{BER\_dB\_03}$: $-3.965 \leq \log_{10}\text{(Physical channel BER)} < -3.9$
- $\text{BER\_dB\_61}$: $-0.195 \leq \log_{10}\text{(Physical channel BER)} < -0.13$
- $\text{BER\_dB\_62}$: $-0.13 \leq \log_{10}\text{(Physical channel BER)} < -0.065$
- $\text{BER\_dB\_63}$: $-0.065 \leq \log_{10}\text{(Physical channel BER)} \leq 0$

<table>
<thead>
<tr>
<th>5.1.10 UE transmitted power</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td><strong>Applicable for</strong></td>
</tr>
<tr>
<td><strong>Range/mapping</strong></td>
</tr>
</tbody>
</table>

| UE\_TX\_POWER\_021: | $-50$ dBm $\leq$ UE transmitted power $< -49$ dBm |
| UE\_TX\_POWER\_022: | $-49$ dBm $\leq$ UE transmitted power $< -48$ dBm |
| UE\_TX\_POWER\_023: | $-48$ dBm $\leq$ UE transmitted power $< -47$ dBm |
| ... |
| UE\_TX\_POWER\_102: | $31$ dBm $\leq$ UE transmitted power $< 32$ dBm |
| UE\_TX\_POWER\_103: | $32$ dBm $\leq$ UE transmitted power $< 33$ dBm |
| UE\_TX\_POWER\_104: | $33$ dBm $\leq$ UE transmitted power $< 34$ dBm |

<table>
<thead>
<tr>
<th>5.1.11 CFN-SFN observed time difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Applicable for</strong></td>
</tr>
<tr>
<td><strong>Range/mapping</strong></td>
</tr>
</tbody>
</table>

| 5.1.12 SFN-SFN observed time difference |
### Definition

**Type 1:**
The SFN-SFN observed time difference to cell is defined as: \( \text{OFF} \times 38400 + T_m \), where:

\[
T_m = T_{\text{RxSFNi}} - T_{\text{RxSFNj}},
\]

\( T_m \) is the time at the beginning of a received neighbouring P-CCPCH frame from cell \( j \).

\( T_{\text{RxSFNj}} \) is time at the beginning of the next received neighbouring P-CCPCH frame from cell \( j \) after the time instant \( T_{\text{RxSFNj}} \) in the UE. If the next neighbouring P-CCPCH frame is received exactly at \( T_{\text{RxSFNj}} \) then \( T_{\text{RxSFNj}} = T_{\text{RxSFNi}} \) (which leads to \( T_m = 0 \)).

\( \text{OFF} = (\text{SFN}_j - \text{SFN}_i) \mod 256 \), given in number of frames with the range \([0, 1, \ldots, 255]\) frames.

\( \text{SFN}_j \) = the system frame number for downlink P-CCPCH frame from cell \( j \) in the UE at the time \( T_{\text{RxSFNj}} \).

\( \text{SFN}_i \) = the system frame number for the P-CCPCH frame from cell \( i \) received in the UE at the time \( T_{\text{RxSFNi}} \).

**Type 2:**
The relative timing difference between cell \( j \) and cell \( i \), defined as \( T_{\text{CPICHRxj}} - T_{\text{CPICHRxi}} \), where:

\( T_{\text{CPICHRxj}} \) is the time when the UE receives one Primary CPICH slot from cell \( j \).

\( T_{\text{CPICHRxi}} \) is the time when the UE receives the Primary CPICH slot from cell \( i \) that is closest in time to the Primary CPICH slot received from cell \( j \).

#### Applicable for
- Type 1: Idle, Connected Intra
- Type 2: Idle, Connected Intra, Connected Inter

#### Range/mapping
- **Type 1:** Time difference is given with a resolution of one chip with the range \([0, \ldots, 3060/4096 \times 13] \) chips.
- **Type 2:** Time difference is given with a resolution of 0.25 chip with the range \([-1279.75, \ldots, 1280] \) chips.

---

### 5.1.13 UE Rx-Tx time difference

**Definition**
The difference in time between the UE uplink DPCCH/DPDCH frame transmission and the first significant path, of the downlink DPCH frame from the measured radio link. Measurement shall be made for each cell included in the active set.

**Note:** The definition of "first significant path" needs further elaboration.

**Applicable for**
- Connected Intra

**Range/mapping**
The UE Rx-Tx time difference is given with the resolution of 0.25 chip with the range \([876, \ldots, 1172] \) chips.

---

### 5.1.14 Observed time difference to GSM cell

**Definition**
The Observed time difference to GSM cell is defined as: \( T_{\text{RxGSMj}} - T_{\text{RxSFNi}} \), where:

\( T_{\text{RxSFNi}} \) = the time at the beginning of the P-CCPCH frame with SFN=0 from cell \( i \).

\( T_{\text{RxGSMj}} \) = the time at the beginning of the GSM BCCH 51-multiframe from GSM frequency \( j \) received closest in time after the time \( T_{\text{RxSFNi}} \). If the next GSM multiframe is received exactly at \( T_{\text{RxSFNi}} \) then \( T_{\text{RxGSMj}} = T_{\text{RxSFNi}} \) (which leads to \( T_{\text{RxGSMj}} - T_{\text{RxSFNi}} = 0 \)). The timing measurement shall reflect the timing situation when the most recent (in time) P-CCPCH with SFN=0 was received in the UE.

**Applicable for**
- Idle, Connected Inter

**Range/mapping**
The Observed time difference to GSM cell is given with the resolution of \( 3060/(4096 \times 13) \) ms with the range \([0, \ldots, 3060/13-3060/(4096 \times 13)] \) ms.

---

### 5.1.15 UE GPS Timing of Cell Frames for LCS

**Definition**
The timing between cell \( j \) and GPS Time Of Week. \( T_{\text{UE-GPSj}} \) 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 multipath of the cell \( j \) CPICH, where cell \( j \) is a cell within the active set.

**Applicable for**
- Connected Intra, Connected Inter

**Range/mapping**
The resolution of \( T_{\text{UE-GPSj}} \) is \( 1 \mu \text{S} \). The range is from \( 0 \) to \( 6.04 \times 10^{11} \mu \text{S} \).
5.2 UTRAN measurement abilities

The structure of the table defining a UTRAN measurement quantity is shown below:
<table>
<thead>
<tr>
<th>Column field</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Contains the definition of the measurement.</td>
</tr>
<tr>
<td>Range/mapping</td>
<td>Gives the range and mapping to bits for the measurements quantity.</td>
</tr>
</tbody>
</table>

### 5.2.1 RSSI

**Definition**
Received Signal Strength Indicator, the wide-band received power within the UTRAN uplink carrier channel bandwidth in an UTRAN access point. The reference point for the RSSI measurements shall be the antenna connector.

**Range/mapping**
RSSI is given with a resolution of 0.5 dB with the range \([-105, ..., -74]\) dBm. RSSI shall be reported in the unit RSSI\(_{LEV}\) where:

- \(\text{RSSI\(_{LEV}\)_00}: \text{RSSI} < -105.0\, \text{dBm}\)
- \(\text{RSSI\(_{LEV}\)_01}: -105.0\, \text{dBm} \leq \text{RSSI} < -104.5\, \text{dBm}\)
- \(\text{RSSI\(_{LEV}\)_02}: -104.5\, \text{dBm} \leq \text{RSSI} < -104.0\, \text{dBm}\)
- ... 
- \(\text{RSSI\(_{LEV}\)_61}: -73.0\, \text{dBm} \leq \text{RSSI} < -73.5\, \text{dBm}\)
- \(\text{RSSI\(_{LEV}\)_62}: -73.5\, \text{dBm} \leq \text{RSSI} < -74.0\, \text{dBm}\)
- \(\text{RSSI\(_{LEV}\)_63}: -74.0\, \text{dBm} \leq \text{RSSI}\)

### 5.2.2 SIR

**Definition**
Signal to Interference Ratio, is defined as: \(\frac{\text{RSCP}}{\text{ISCP}}\times\text{SF}\). Measurement shall be performed on the DPCCH after RL combination in Node B. The reference point for the SIR measurements shall be the antenna connector.

where:
- \(\text{RSCP} = \text{Received Signal Code Power, the received power on one code.}\)
- \(\text{ISCP} = \text{Interference Signal Code Power, the interference on the received signal. Only the non-orthogonal part of the interference is included in the measurement.}\)
- \(\text{SF} = \text{The spreading factor used on the DPCCH.}\)

**Range/mapping**
SIR is given with a resolution of 0.5 dB with the range \([-11, ..., 20]\) dB. SIR shall be reported in the unit UTRAN\(_{SIR}\) where:

- \(\text{UTRAN\(_{SIR}\)_00}: \text{SIR} < -11.0\, \text{dB}\)
- \(\text{UTRAN\(_{SIR}\)_01}: -11.0\, \text{dB} \leq \text{SIR} < -10.5\, \text{dB}\)
- \(\text{UTRAN\(_{SIR}\)_02}: -10.5\, \text{dB} \leq \text{SIR} < -10.0\, \text{dB}\)
- ... 
- \(\text{UTRAN\(_{SIR}\)_61}: 19.0\, \text{dB} \leq \text{SIR} < 19.5\, \text{dB}\)
- \(\text{UTRAN\(_{SIR}\)_62}: 19.5\, \text{dB} \leq \text{SIR} < 20.0\, \text{dB}\)
- \(\text{UTRAN\(_{SIR}\)_63}: 20.0\, \text{dB} \leq \text{SIR}\)

### 5.2.3 Transmitted carrier power

**Definition**
Transmitted carrier power, is the total transmitted power on one carrier from one UTRAN access point. Measurement shall be possible on any carrier transmitted from the UTRAN access point. The reference point for the total transmitted power measurement shall be the antenna connector. In case of Tx diversity the total transmitted power for each branch shall be measured.
5.2.4 Transmitted code power

**Definition**
Transmitted code power, i.e., the transmitted power on one channelisation code on one given scrambling code on one given carrier. Measurement shall be possible on any DPCH transmitted from the UTRAN access point and shall reflect the power on the pilot bits of the DPCH. The reference point for the transmitted code power measurement shall be the antenna connector. In case of Tx diversity the transmitted code power for each branch shall be measured.

**Range/mapping**
Transmitted code power is given with a resolution of 0.5 dB with the range [-10, ..., 46] dBm. Transmitted code power shall be reported in the unit $\text{UTRAN\_CODE\_POWER}$ where:

- $\text{UTRAN\_CODE\_POWER\_010}$: $-10.0 \text{ dBm} \leq \text{Transmitted code power} < -9.5 \text{ dBm}$
- $\text{UTRAN\_CODE\_POWER\_011}$: $-9.5 \text{ dBm} \leq \text{Transmitted code power} < -9.0 \text{ dBm}$
- $\text{UTRAN\_CODE\_POWER\_012}$: $-9.0 \text{ dBm} \leq \text{Transmitted code power} < -8.5 \text{ dBm}$
- ...
- $\text{UTRAN\_CODE\_POWER\_120}$: $45.0 \text{ dBm} \leq \text{Transmitted code power} < 45.5 \text{ dBm}$
- $\text{UTRAN\_CODE\_POWER\_121}$: $45.5 \text{ dBm} \leq \text{Transmitted code power} < 46.0 \text{ dBm}$
- $\text{UTRAN\_CODE\_POWER\_122}$: $46.0 \text{ dBm} \leq \text{Transmitted code power} < 46.5 \text{ dBm}$

5.2.5 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. Measurement shall be possible to perform on any transport channel after RL combination in Node B. BLER estimation is only required for transport channels containing CRC.

**Range/mapping**
The Transport channel BLER shall be reported for $0 \leq \text{Transport channel BLER} \leq 1$ in the unit $\text{BLER\_dB}$ where:

- $\text{BLER\_dB\_00}$: $\text{Transport channel BLER} = 0$
- $\text{BLER\_dB\_01}$: $\ll \log_{10}(\text{Transport channel BLER}) < -4.03$
- $\text{BLER\_dB\_02}$: $-4.03 \leq \log_{10}(\text{Transport channel BLER}) < -3.965$
- $\text{BLER\_dB\_03}$: $-3.965 \leq \log_{10}(\text{Transport channel BLER}) < -3.9$
- ...
- $\text{BLER\_dB\_61}$: $-0.195 \leq \log_{10}(\text{Transport channel BLER}) < -0.13$
- $\text{BLER\_dB\_62}$: $-0.13 \leq \log_{10}(\text{Transport channel BLER}) < -0.065$
- $\text{BLER\_dB\_63}$: $-0.065 \leq \log_{10}(\text{Transport channel BLER}) < 0$

5.2.6 Physical channel BER
### 5.2.7 Round trip time

**Definition**

Round trip time (RTT), is defined as

\[ RTT = T_{RX} - T_{TX}, \]

where

- \( T_{TX} \): The time of transmission of the beginning of a downlink DPCH frame to a UE.
- \( T_{RX} \): The time of reception of the beginning (the first significant path) of the corresponding uplink DPCCH/DPDCH frame from the UE.

Note: The definition of "first significant path" needs further elaboration.

**Range/mapping**

The Round trip time is given with the resolution of 0.25 chip with the range \([876, \ldots, 2923.75]\) chips.

### 5.2.8 UTRAN GPS Timing of Cell Frames for LCS

**Definition**

The timing between cell \( j \) and GPS Time Of Week, \( T_{UTRAN-GPS}^{j} \), 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 multipath of the cell \( j \) CPICH, where cell \( j \) is a cell within the active set.

**Applicable for**

Connected Intra, Connected Inter

**Range/mapping**

The resolution of \( T_{UTRAN-GPS}^{j} \) is 1\( \mu \)S. The range is from 0 to 6.04\( \times 10^{11} \)\( \mu \)S.
6 Measurements for UTRA FDD

6.1 UE measurements

6.1.1 Compressed mode

6.1.1.1 Use of compressed mode/dual receiver for monitoring

A UE shall, on upper layers commands, monitor cells on other frequencies (FDD, TDD, GSM). To allow the UE to perform measurements, upper layers shall command that the UE enters in compressed mode, depending on the UE capabilities.

In case of compressed mode decision, UTRAN shall communicate to the UE the parameters of the compressed mode, described in reference [2], 25.212.

A UE with a single receiver shall support downlink compressed mode.

Every UE shall support uplink compressed mode, when monitoring frequencies which are close to the uplink transmission frequency (i.e. frequencies in the TDD or GSM 1800/1900 bands).

All fixed-duplex UE shall support both downlink and uplink compressed mode to allow inter-frequency handover within FDD and inter-mode handover from FDD to TDD.

< WG1’s note : the use of uplink compressed mode for single receiver UE when monitoring frequencies outside TDD and GSM 1800/1900 bands is for further study >

UE with dual receivers can perform independent measurements, with the use of a "monitoring branch" receiver, that can operate independently from the UTRA FDD receiver branch. Such UE do not need to support downlink compressed mode.

The UE shall support one single measurement purpose within one compressed mode transmission gap. The measurement purpose of the gap is signalled by upper layers.

The following section provides rules to parametrise the compressed mode.

6.1.1.2 Parameterisation of the compressed mode

In response to a request from upper layers, the UTRAN shall signal to the UE the compressed mode parameters.

The following parameters characterize a transmission gap :

- TGL: Transmission Gap Length is the duration of no transmission, expressed in number of slots.
- SFN: The system frame number when the transmission gap starts
- SN: The slot number when the transmission gap starts

With this definition, it is possible to have a flexible position of the transmission gap in the frame, as defined in [2].

The following parameters characterize a compressed mode pattern :

- TGP: Transmission Gap Period is the period of repetition of a set of consecutive frames containing up to 2 transmission gaps (*).
- TGD: As defined above
- TGD: Transmission Gap Distance is the duration of transmission between two consecutive transmission gaps within a transmission gap period, expressed in number of frames. In case there is only one transmission gap in the transmission gap period, this parameter shall be set to zero.
- PD: Pattern duration is the total time of all TGPs expressed in number of frames.
- SFN: The system frame number when the first transmission gap starts
- UL/DL compressed mode selection: This parameter specifies whether compressed mode is used in UL only, DL only or both UL and DL.
- Compressed mode method: The method for generating the downlink compressed mode gap can be puncturing, reducing the spreading factor or upper layer scheduling and is described in [2].
- Transmit gap position mode: The gap position can be fixed or adjustable. This is defined in [2].
- Downlink frame type: This parameter defines if frame structure type ‘A’ or ‘B’ shall be used in downlink compressed mode. This is defined in [2].
- Scrambling code change: This parameter indicates whether the alternative scrambling code is used for compressed mode method ‘SF/2’. Alternative scrambling codes are described in [3].
- PCM: Power Control Mode specifies the uplink power control algorithm applied during recovery period after each transmission gap in compressed mode. PCM can take 2 values (0 or 1). The different power control modes are described in [4].
- PRM: Power Resume Mode selects the uplink power control method to calculate the initial transmit power after the gap. PRM can take two values (0 or 1) and is described in [4].

In a compressed mode pattern, the first transmission gap starts in the first frame of the pattern. The gaps have a fixed position in the frames, and start in the slot position defined in [2].

(*) Optionally, the set of parameters may contain 2 values TGP1 and TGP2, where TGP1 is used for the 1st and the consecutive odd gap periods and TGP2 is used for the even ones. Note if TGP1=TGP2 this is equivalent to using only one TGP value.

In all cases, upper layers has control of individual UE parameters. The repetition of any pattern can be stopped on upper layers command.

The UE shall support [8] simultaneous compressed mode patterns which can be used for different measurements. Upper layers will ensure that the compressed mode gaps do not overlap and are not scheduled within the same frame. Patterns causing an overlap or too long gaps will not be processed by the UE and interpreted as a faulty message.

![Figure 1: Illustration of compressed mode pattern parameters](image)

6.1.1.3 Parameterisation limitations

In the table below the supported values for the TGL parameter is shown.
Measurements performed on | Supported TGL values
--- | ---
FDD inter-frequency cell | 7, 14
TDD cell | 4
GSM cell | 3, 4, 7, 10, 14

Multi-mode terminals shall support the union of TGL values for the supported modes.

Further limitations on transmission gap position is given in TS 25.212.
Annex A (informative):
Change history

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