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Technical Specification

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Foreword

This Technical Specification has been produced by the 3GPP.

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x the first digit:

1 presented to TSG for information;

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

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1 Scope

This 3GPP Telecommunication Specification TS 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, subsequent revisions do apply.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3GPP RAN TS 25.211 Transport channels and physical channels (FDD)

[2] 3GPP RAN TS 25.212 Multiplexing and channel coding (FDD)

[3] 3GPP RAN TS 25.213 Spreading and modulation (FDD)

[4] 3GPP RAN TS 25.214 Physical layer procedures (FDD)

[5] 3GPP RAN TS 25.215 Physical layer measurements (FDD)

[6] 3GPP RAN TS 25.221 Transport channels and physical channels (TDD)

[7] 3GPP RAN TS 25.222 Multiplexing and channel coding (TDD)

[8] 3GPP RAN TS 25.223 Spreading and modulation (TDD)

[9] 3GPP RAN TS 25.224 Physical layer procedures (TDD)

[10] 3GPP RAN TS 25.301 Radio Interface Protocol Architecture

[11] 3GPP RAN TS 25.302 Services provided by the Physical layer

[12] 3GPP RAN TS 25.303 UE functions and interlayer procedures in connected mode

[13] 3GPP RAN TS 25.304 UE procedures in idle mode

[14] 3GPP RAN TS 25.331 RRC Protocol Specification

[15] 3GPP RAN TR 25.922 Radio Resource Management Strategies

[16] 3GPP RAN TR 25.923 Report on Location Services (LCS)

3 Definitions, symbols and abbreviations

3.1 Definitions

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

<defined term>: <definition>.

3.2 Symbols

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

<symbol> <Explanation>

3.3 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
RSCP	Received Signal Code Power

~~ISCP Interference Signal Code Power~~
RSSI Received Signal Strength Indicator
SIR Signal to Interference Ratio
~~Ec/N_0 Recieved energy per chip divided by the power density in the band~~
~~BLER BLock Error Rate~~
~~BER Bit Error Rate~~

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:

Column field	**Comment**
Definition	Contains the definition of the measurement.
Applicable for	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
Range/mapping	Gives the range and mapping to bits for the measurements quantity.

5.1.1 CPICH RSCP

Definition	Received Signal Code Power, the received power on one code after de-spreading measured on the pilot bits of the CPICH. The reference point for the RSCP is the antenna connector at the UE.
Applicable for	Idle, Connected Intra, Connected Inter
Range/mapping	

5.1.2 ~~DPCCH~~ RSCP

Definition	Received Signal Code Power, the received power on one code after de-spreading measured on the pilot bits of the DPCCH after RL combination. The reference point for the RSCP is the antenna connector at the UE.
Applicable for	Connected Intra
Range/mapping	

5.1.3 ISCP

Note that it is not a requirement that the ISCP shall be possible to report to higher layers. The ISCP is defined in this section be~~a~~cause it is included in the definition of SIR.

Definition	Interference Signal Code Power, the interference on the received signal after de-spreading. Only the non-orthogonal part of the interference is included in the measurement. The reference point for the ISCP is the antenna connector at the UE.

5.1.4 SIR

Definition	Signal to Interference Ratio, defined as the RSCP divided by ISCP. The SIR shall be measured on DPCCH after RL combination. The reference point for the SIR is the antenna connector of the UE.
Applicable for	Connected Intra
Range/mapping	

5.1.5 UTRA c~~C~~arrier RSSI

Definition	Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth. Measurement shall be performed on a UTRAN downlink~~DL~~ carrier. The reference point for the RSSI is the antenna connector at the UE.
Applicable for	Idle, Connected Intra, Connected Inter
Range/mapping	

5.1.6 GSM cCarrier 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 is the antenna connector at the UE.
Applicable for	Idle, Connected Inter
Range/mapping	According to the definition of RXLEV in GSM 05.08.

5.1.7 CPICH Ec/No0

Definition	The recieived 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 CPICH. The reference point for Ec/No is the antenna connector at the UE.
Applicable for	Idle, Connected Intra, Connected Inter
Range/mapping	

5.1.8 Transport channelCH 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	

5.1.9 Physical channelCH 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
Range/mapping	

5.1.10 UE transmittedTX Ppower

Definition	The total UE transmitted power on one carrier. The reference point for the UE transmittedTX pPower shall be the UE antenna connector.

Applicable for	Connected Intra
Range/mapping	

5.1.11 CFN-SFN observed time difference

Definition	The CFN-SFN observed time difference to cell is defined as: OFF×38400+ T_m, where: T_m= T_{RxSFN} - (T_{UETx}-T_0), given in chip units with the range [0, 1, …, 38399] chips T_{UETx} is the time when the UE transmits an uplink DPCCH/DPDCH frame. T_0 is defined in TS 25.211 section 7.1.3. T_{RxSFN} is time at the beginning of the next received neighbouring P-CCPCH frame after the time instant T_{UETx}-T_0in the UE. If the next neighbouring P-CCPCH frame is received exactly at T_{UETx}-T_0 then T_{RxSFN}=T_{UETx}-T_0 (which leads to T_m=0). and OFF=(CFN_{Tx}-SFN) mod 256, given in number of frames with the range [0, 1, …, 255] frames CFN_{Tx} is the connection frame number for the UE transmission of an uplink DPCCH/DPDCH frame at the time T_{UETx}. SFN = the system frame number for the neighbouring P-CCPCH frame received in the UE at the time T_{RxSFN}.
Applicable for	Connected Inter, Connected Intra
Range/mapping	Time difference is ~~G~~given with the resolution ~~in number~~ of one chip~~s~~ with the range ~~and has a range of~~ [0~~, 1~~, …, 9830399] chips.

5.1.12 SFN-SFN observed time difference

Definition	**Type 1:** The SFN-SFN observed time difference to cell is defined as: OFF×38400+ T_m, where: T_m= T_{RxSFNj} - T_{RxSFNi}, given in chip units with the range [0, 1, …, 38399] chips T_{RxSFNj} is the time at the beginning of a received neighbouring P-CCPCH frame from cell j. T_{RxSFNi} is time at the beginning of the next received neighbouring P-CCPCH frame from cell i after the time instant T_{RxSFNj} in the UE. If the next neighbouring P-CCPCH frame is received exactly at T_{RxSFNj} then T_{RxSFNj}= T_{RxSFNi} (which leads to T_m=0). and OFF=(SFN_j- SFN_i) mod 256, given in number of frames with the range [0, 1, …, 255] frames SFN_j = the system frame number for downlink P-CCPCH frame from cell j in the UE at the time T_{RxSFNj}. SFN_i = the system frame number for the P-CCPCH frame from cell i received in the UE at the time T_{RxSFNi}. **Type 2:** The relative timing difference between cell j and cell i, defined as $T_{CPICHRxj}$ - $T_{CPICHRxi}$, where: $T_{CPICHRxj}$ is the time when the UE receives one CPICH slot from cell j $T_{CPICHRxi}$ is the time when the UE receives the CPICH slot from cell i that is closest in time to the 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 ~~Given in number of chips and has a range of~~ [0, ~~1~~, …, 9830399] chips. **Type 2:** Time difference is given with a resolution of 0.5 chip with the range [-1279, …, 1280] chips.

5.1.13 UE Rx-Tx time~~ing~~ 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	Always positive.

~~5.1.14Relative Timing Difference Between Cells for LCS~~

~~Definition~~	~~The relative timing difference between cell j and cell i. T_{LCSji} is defined as $T_{LCSji} = T_{CPICHRxj} - T_{CPICHRxi}$, where:~~ ~~$T_{CPICHRxj}$ is the time when the UE receives one CPICH slot from cell j~~ ~~$T_{CPICHRxi}$ is the time when the UE receives the CPICH slot from cell i that is closest in time to the CPICH slot received from cell j~~
~~Applicable for~~	~~Idle, Connected Intra, Connected Inter~~
~~Range/mapping~~	~~T_{LCS} is a signed value. The resolution of T_{LCS} is 0.5 chip and the range is [-1279…1280] chips.~~

5.2 UTRAN measurement abilities

The structure of the table defining a UTRAN measurement quantity is shown below:

Column field	**Comment**
Definition	Contains the definition of the measurement.
Range/mapping	Gives the range and mapping to bits for the measurements quantity.

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	

5.2.2 SIR

Definition	Signal to Interference Ratio, is defined as the RSCP divided by the ISCP. 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.
Range/mapping	

5.2.3 ~~Total~~ Transmitted carrier ~~P~~power

Definition	~~Total~~ Transmitted carrier ~~P~~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.
Range/mapping	

5.2.4 Transmitted ~~C~~code ~~P~~power

Definition	Transmitted ~~C~~code ~~P~~power, is the transmitted power on one carrier, one scrambling code and one channelisation code. Measurement shall be possible on any channelisation code transmitted from the UTRAN access point. 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	

5.2.5 Transport channel~~CH~~ 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	

5.2.6 Physical channel~~CH~~ 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 in Node B. 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.
Range/mapping	

5.2.7 Round ~~T~~trip ~~T~~time~~ (RTT)~~

Note: The relation between this measurement and the TOA measurement defined by WG2 needs clarification.

Definition	Round ~~T~~trip ~~Delay~~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. Measurement shall be possible on DPCH for each RL transmitted from an UTRAN access point and DPDCH/DPCCH for each RL received in the same UTRAN access point.
Range/mapping	

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 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 (e.g. used for switching frequency, monitoring).
- 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 (*).
- TGL : 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
- 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 TS 25.214.

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.

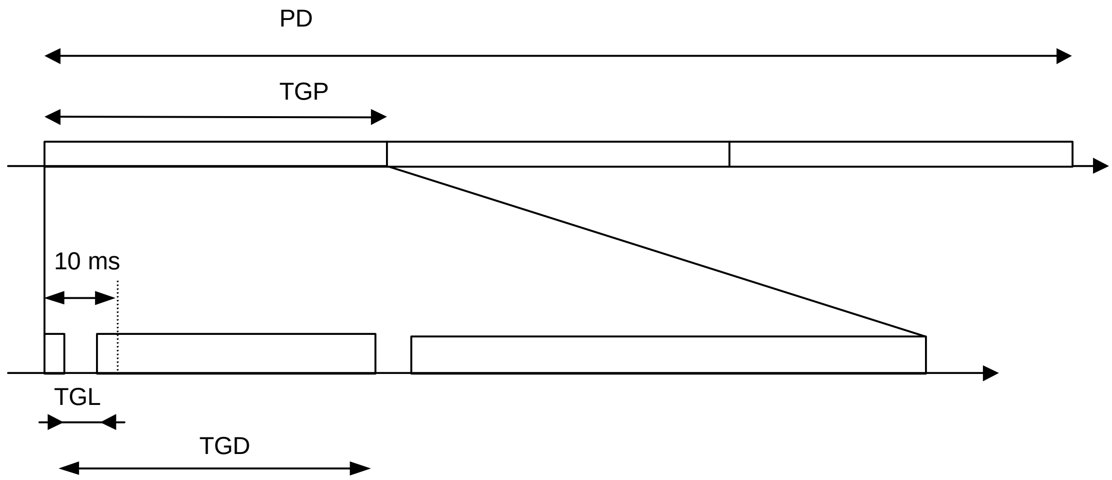

Figure 1 : illustration of compressed mode pattern parameters

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.

Compressed mode patterns for handover monitoring are recommended in “Annex A: Measurements for Handover (Informative)”.

A. Annex A: Measurements for Handover (Informative)

A.1 Monitoring of FDD cells on the same frequency

During the measurement process of cells on the same frequencies, the UE shall find the necessary synchronisation to the cells to measure using the primary and secondary synchronisation channels and also the knowledge of the possible scrambling codes in use by the neighbouring cells.

A.2 Monitoring cells on different frequencies

A.2.1 Monitoring of FDD cells on a different frequency

Upper layers may ask FDD UE to perform preparation of inter-frequency handover to FDD. In such case, the UTRAN signals to the UE the handover monitoring set, and if needed, the compressed mode parameters used to make the needed measurements. Setting of the compressed mode parameters defined in section 6.1.1.2 for the preparation of handover from UTRA FDD to UTRA FDD is indicated in the following section. The compressed mode for IFHO preparation from UTRA-FDD to UTRA-FDD has two different modes. One is "selection-mode". The UE must identify the cell during this mode. The other is "reselection-mode". The UE measures signal strength by the scrambling code already known. Selection mode / reselection mode parameter sets are described in section A.2.1.1 / A.2.1.2 respectively.

Measurements to be performed by the physical layer is defined in section 6.

A.2.1.1 Setting of the compressed mode parameters for selection mode

During the transmission gaps, the UE shall perform measurements so as to be able to report to the UTRAN the frame timing, the scrambling code and the Ec/Io of Primary CCPCH of up FDD cells in the handover monitoring set.

When compressed mode is used for cell acquisition at each target FDD frequency, the parameters of compressed mode pattern are fixed to be :

	TGL	TGD	TGP1	TGP2	PD
Pattern1	7	24/15	4	20	M
Pattern2	7	24/15	4	140	M
Pattern3	7	2	4	Not Used	M
Pattern4	7	2	4	20	M
Pattern5	7	2	4	140	M
Pattern6	14	3	6	18	M
Pattern7	14	3	6	138	M

<Note2: The frequency switching time required for UE is assumed to be 666us (equal to the slot duration) which includes implementation margin. This assumption means UE will consume 1slot of TGL for frequency switching (go and return) time.>

A.2.1.2 Setting of the compressed mode parameters for reselection mode

This parameter sets are used for UE which already know the downlink scrambling code. UTRAN indicate which pattern will be used by UE. According to the result during reselection mode, If needed, UTRAN will indicate the transition back to the selection mode.

	TGL	TGD	TGP1	TGP2	PD
Pattern8	7	0	72	Not Used	M
Pattern9	7	0	144	Not Used	M

A.2.2 Monitoring of TDD cells

Upper layers may ask dual mode FDD/TDD UE to perform preparation of inter-frequency handover to TDD. In such case, the UTRAN signals to the UE the handover monitoring set, and if needed, the compressed mode parameters used to make the needed measurements. Setting of the compressed mode parameters defined in 6.1.1.2 for the preparation of handover from UTRA FDD to UTRA TDD is indicated in the following section. Measurements to be performed by the physical layer are defined in section 5.

A.2.2.1 Setting of the compressed mode parameters

When compressed mode is used for cell acquisition at each target TDD frequency, the parameters of compressed mode pattern are fixed to be:

TGL	TGD	TGP	PD

A.2.2.2 Setting of compressed mode parameters with prior timing information between FDD serving cell and TDD target cells

When UTRAN or UE have this prior timing information, the compressed mode shall be scheduled by upper layers with the intention that SCH on the specific TDD basestation can be decoded at the UE during the transmission gap.

TGL	SFN	SN
4	(calculated by UTRAN)	(calculated by UTRAN)

A.2.3 Monitoring of GSM cells

Upper layers may ask dual mode FDD/GSM UE to perform preparation of inter-frequency handover to GSM. In such case, the UTRAN signals to the UE the handover monitoring set, and if needed, the compressed mode parameters used to make the needed measurements.

The involved measurements are GSM BCCH power measurements (Section A.2.3.1), initial GSM SCH or FCCH acquisition (Section A.2.3.2), acquisition/tracking of GSM SCH or FCCH when timing information between UTRA serving cells and the target GSM cell is available (Section A.2.3.3), and BSIC reconfirmation (Section A.2.3.4).

A.2.3.1 Setting of compressed mode parameters for Power measurements

When compressed mode is used for GSM BCCH power measurements, the parameters of compressed mode pattern are fixed to be :

Pattern No.	TGL	TGD	TGP	PD
1	3	0	8	128

Pattern 1 allows measuring all the adjacent cell signal levels even with the maximum of 32 frequencies, if two measurements are done during each transmission gap. The pattern can be repeated by sending the measurement request again, if more measurement data is desired.

In order to fulfil the expected GSM power measurements requirement, the UE can get effective measurements samples during a time window of length Tmeas, equal to the transmission gap length reduced by an implementation margin of [2*500 µs + 200 µs], which includes the maximum allowed delay for a UE's synthesizer to switch from one FDD frequency to one GSM frequency and switch back to FDD frequency, plus some additional implementation margin.

A.2.3.2 Setting of compressed mode parameters for first SCH decoding without prior knowledge of timing information

The setting of the compressed mode parameters is described in this section when used for first SCH decoding of one cell when there is no knowledge about the relative timing between the current FDD cells and the neighbouring GSM cell.

On upper layers command, UE shall pre-synchronise to the each of GSM cells in the handover monitoring set and decode their BSIC, see GSM 05-series.

When compressed mode is used to perform initial FCCH/SCH acquisition, the compressed mode pattern belongs to the list of patterns in table .

In order to fulfill the expected GSM SCH speed requirement, the UE can get effective measurements samples during a time window of length Tmeas, equal to the transmission gap length reduced by an implementation margin of [2*500 µs + 200 µs], that includes the maximum allowed delay for a UE's synthesizer to switch from one FDD frequency to one GSM frequency and switch back to FDD frequency, plus some additional implementation margin.

	TGL	TGD	TGP	PD parallel search / serial search
Pattern 1	7	0	2	40/64
Pattern 2	7	0	3	39/63
Pattern 3	7	2	9	63/252
Pattern 4	7	3	12	99/123
Pattern 5	14	0	2	12/26
Pattern 6	14	2	6	24/48
Pattern 7	14	2	8	34/58
Pattern 8	14	2	12	60/84
Pattern 9	10	12	48	108/828
Pattern 10	10	0	48	240/1440

Table .- List of compressed mode patterns used for initial GSM FCCH/SCH acquisition without timing information

The pattern duration for the parallel search (time until a GSM FCCH or SCH burst is found) and for the serial search (time until a FCCH burst is found) is given.

The patterns 5…8 should mainly be used in such cases where the present signal level suddenly drops and very little time to execute the handover is available. Patterns 1…4 are significantly more optimal from the point of view of the transmission power control than the other ones, while patterns 5…8 consume less slots for the measurements on the average.

Patterns 1…4 may use any pattern described in specification 25.212 chapter 4.4.3.1. Patterns 5…10 must use the double frame method.

The patterns 9 and 10 are optimised for least consumption of slots for the measurements on the average using the parallel search. The patterns 9 and 10 achieve about the same or half the speed of the synchronisation to GSM from GSM.

Each pattern corresponds to a different compromise between speed of GSM SCH search and rate of use of compressed frames. On upper layers command, the repetition of the selected pattern can be stopped and/or replaced by one of the other listed patterns. Upper layers may also decide to alternate the use of different patterns periods.

Depending on the UE's capabilities, the search procedure may be sequential (tracking of FCCH burst before decoding of the first SCH) or parallel (parallel tracking of FCCH and SCH bursts). The latter solution achieves SCH decoding faster than the first one, thus decreasing the needed number of repeated patterns.

Once the UE has completed the search it signals the UTRAN with FCCH-found or SCH-found, both with the timing of the associated SCH burst, or with FCCH/SCH-not-found (see GSM 05-series).

In case of FCCH-found, the UTRAN can continue the current pattern until also SCH is found or stop it and schedule a single, properly aligned gap for SCH search as described in A.2.3.3.

Whenever UE receives a new neighbour cell with a sufficiently high power level (see GSM 05-series), it shall perform a new SCH search procedure.

When a compressed mode pattern is available, then it is up to the UE to trigger this search procedure with the available transmission gaps. In this case, no specific signalling is needed between the UE and the UTRAN.

When a compressed mode pattern is not available, the UE shall initiate the search procedure by sending a "request new cell search" message to the UTRAN. Based on the UE's capabilities for serial or parallel search as described above, the UTRAN then determines a suitable compressed mode pattern and signals this to the UE. The upper layers can delay the onset of this pattern depending on the timing priority the Network Operator has set for new BSIC identification.

A.2.3.3 Setting of compressed mode parameters for first SCH decoding with prior timing information between UTRAN serving cells and GSM target cells

UTRAN or UE may have some prior knowledge of timing difference between some FDD cells in UE's active set and some GSM cells in the handover monitoring set. When this information is acquired by the UE (e.g. after initial FCCH/SCH detection) and on upper layers command, the UE shall report it to the upper layers for verification of UTRAN's information, and feedback of this information from UTRAN to the other UE.

When UTRAN or UE have this prior timing information, the compressed mode shall be scheduled by upper layers with the intention that SCH (or FCCH if needed) on a specific GSM band can be decoded at the UE during the transmission gap.

The transmission gap parameters used for GSM FCCH/SCH tracking with prior timing information are :

TGL	SFN	SN
4	(calculated by UTRAN)	(calculated by UTRAN)

In addition to normal compressed mode parameters, UTRAN signals the following information to the UE :

- The GSM carrier for which the particular compressed frame is intended (BS ID, carrier no, etc.)

Once the UE has completed the search, it signals the UTRAN with the timing of the associated SCH burst or with SCH-not-found.

A.2.3.4 Setting of compressed mode parameters for SCH decoding for BSIC reconfirmation and procedure at the UE

In this paragraph it is assumed that the UE has successfully decoded one SCH burst of a given neighbouring GSM cell during the call.

When a compressed mode pattern is available, then it is up to the UE to trigger and perform the BSIC reconfirmation procedure with the available transmission gaps. In this case, no specific signalling is needed between the UE and the UTRAN for BSIC reconfirmation procedure.

When no compressed mode pattern is available then it is up to the UE to trigger and perform the BSIC reconfirmation procedure. In that case, UE indicates to the upper layers the schedule of the SCH burst of that cell, and the size of the necessary transmission gap necessary to capture one SCH burst. The Network Operator decides the target time for BSIC reconfirmation and the upper layers uses this and the schedule indicated by the UE to determine the appropriate compressed mode parameters.

The compressed mode parameters shall be one of those described in section 8.2.3.3.

A.2.3.5 Parametrisation of the compressed mode for handover preparation to GSM

Whereas section A.2.3.2 described the compressed mode parametrisation for the initial synchronisation tracking or reconfirmation for one cell and the compressed mode parameters for power measurement for one of multiple cells, there is a need to define the global compressed mode parameters when considering the monitoring of all GSM cells.

History

V0.0.1	02.09.1999	First version of ‘TS 25.215 Physical Layer – Measurements (FDD)’ based on ‘TS 25.231 Physical Layer – Measurements’ V0.3.1 of 11.08.1999 approved in RAN WG1#6. Included contributions from WG1#7 are: B22, B23, B24, B25, C97, B14, B98, D18, 901
V0.1.0	03.09.1999	Approved at WG1#7. Updated according to comments and inclusion of Tdoc A39 that was previously agreed for TS 25.231 but not included.
V0.1.1	05.10.1999	Updated version created by drafting group on WG1#7bis.
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