

Agenda item: AH 16
Source: Ericsson
Title: Definition of measurements in UTRA/FDD
Document for: Approval

1 Introduction

At WG1#7 TS 25.231 was split into two documents, 25.215 (FDD) and 25.225 (TDD). Also several measurement quantities were incorporated. The aim of this document is to modify the definition of some of the measurements to make them clearer and more consistent.

2 Measurements in 25.215

2.1 Physical CH BER

There has been some unclearness with the definition of the physical channel BER in TS 25.215. In figure 1 below the mapping TrCHs to PhCHs is shown.

Some assumptions are:

1. There is no predefined mapping between dedicated TrCHs (DCHs) and PhCHs (DPDCHs).
2. All DPDCH's used to carry DCH's to one UE are using the same SF. This is valid in both DL & UL.

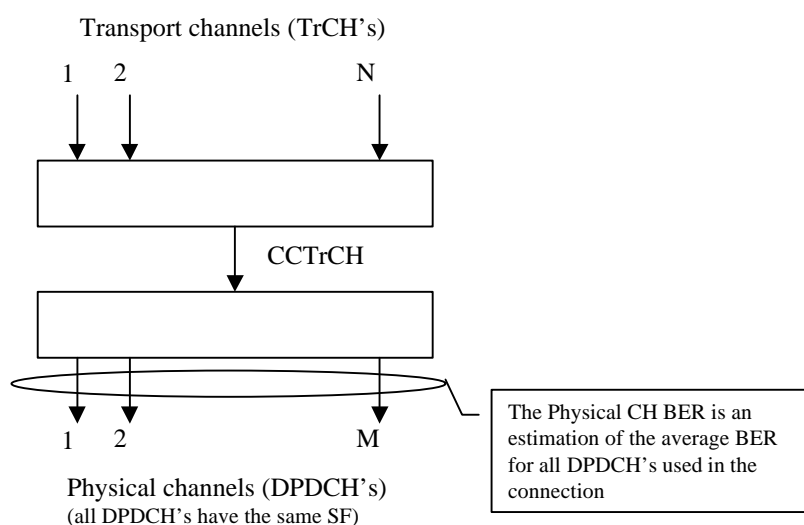


Figure 1 Mapping of TrCh's to PhCh's

The physical CH BER is a characteristic of the physical channel given all present system features.

The purpose of the physical channel BER is to reflect the average BER on the DPDCH's used in the connection, see figure 1. The measure could be based on decoding and re-coding of transport blocks. This means that it is only possible to estimate a physical CH BER at time instances when at least one transport block has been received.

In the Iub DCH frame protocol there is a field that shall contain a quality estimate for the transferred transport block. It has been decided by WG3 that the field shall contain the physical channel BER estimate.

Therefore the physical CH BER shall be possible to calculate and report at the end of each TTI of the transferred TrCh's. The period over which the physical channel BER is estimated shall be the same as the TTI for the TrCh's transferred. If TrCh's with different TTIs are transferred a physical channel BER per TTI shall be estimated.

The physical CH BER estimate at a certain time instance could be based on all transport blocks received at that instance independent of the transmission time interval (TTI) for the different TrCHs. By doing the estimation in this way it will be based on as much data as possible and by that with as good accuracy as possible.

For example consider three transport channels TrCh1 and TrCh2 with TTI=10ms and TrCh3 with TTI=40ms. A physical channel BER shall then be possible to report every:

- 10ms (average BER over the 10ms TTI)
- 40ms (average BER over the 40ms TTI)

In this case TrCh1 and 2 could be used to estimate the 10ms average BER and all three TrCh's could be used to estimate the 40ms BER.

Which TrCh's (or transport blocks) that shall be used for the BER estimation shall not be specified. Only accuracy requirements will be specified and the accuracy requirements will depend on the combination of TrCh, etc.

2.2 Transport CH BLER

In the current definition the Transport CH BLER is defined for the DCH only. As the BLER estimation is based on an evaluation on the CRC for each transport block the complexity of the measurement is very low. In the WG2 specification 25.302 it is not explicitly stated on which transport channels this estimation shall be possible.

The BLER on DCH can be used for the outer loop power control, but there may be reasons to measure BLER on other transport channels, for example the BLER on the PCH could be used to trigger a cell re-selection in the UE.

To align with the definition of Transport CH BLER in TS 25.302 it is therefore proposed to allow the transport channel BLER to be measured on any transport channel, both for the UE and UTRAN.

2.3 UE Tx Power

The current definition of the UE Tx Power is:

The total UE transmitted power on one carrier measured on DPCCCH/DPDCH. The reference point for the UE TX Power shall be the UE antenna connector.

It is not necessary to mention on which physical channels that the power measurement shall be performed since it is the total transmitted power that shall be measured.

Therefore the definition is proposed to be changed to:

The total UE transmitted power on one carrier. The reference point for the UE TX Power shall be the UE antenna connector.

2.4 Reference point for UTRAN measurements

The reference point for UTRAN measurements is:

The antenna connector on the UTRAN access point cabinet

In WG4 the UTRAN reference point is called: At the antenna connector.

The exact definition of the term "at the antenna connector" for UTRAN will be handled within WG4.

To align with WG4 it is proposed to change the definition of the UTRAN reference point to:

The antenna connector.

2.5 Relative Timing Difference Between Cells for LCS

The UE should be able to get location information anytime when it is switched on and has coverage. However, this depends on the service offered by the operator.

As some connection is necessary to exchange LCS messages between the UE and UTRAN the whole LCS procedure will need a connection for some time, but not necessary for the whole time the measurements are accumulated. A UE which only uses the LCS will generate less interference and consume less power if the actual measurement can be done in idle mode.

Of course the LCS measurement shall also be allowed when the UE is already in connected mode.

Therefore this measurement is proposed to be possible in both idle and connected mode.

The term "serving cell" used in the definition has no real meaning in SHO. It is proposed to allow the measurement to be possible to perform for any cells, therefore it is proposed to change the term "serving cell" to "cell j".

2.6 UE RSCP, SIR and E_c/N_0

All three UE measurements are in the current definitions possible to measure on the DPCCH both for each radio link and after radio link combination.

There is no need, as far as we know, for reporting neither of the quantities per radio link. Therefore it is proposed to remove the requirement to report the quantities for each radio link. However the measurement quantities shall still be possible after to measure and report after radio link combination in the UE.

2.7 Round Trip Delay (RTD)

The current definition of on which physical channels the measurement shall be possible is:

DPCH for each RL transmitted from an UTRAN access point and DPDCH/DPCCH for each RL received in an UTRAN access point.

To make is clearer it is proposed to be changed to:

DPCH for each RL transmitted from an UTRAN access point and DPDCH/DPCCH for each RL received in **the same** UTRAN access point.

The naming of the measurement is inconsistent with what is used in the LCS-discussions. It is proposed to change the name to "Round Trip Time" for the following reasons:

- 1) It would be in line with the LCS report 25.923.
- 2) RTD is used for Relative Time Difference in the LCS "world".

3 Proposal

It is proposed incorporate the changes mentioned in section 2.

Text proposals for the proposed changes are found in section 4.

4 Text Proposal for TS 25.215

6 Measurement abilities for UTRA/FDD

6.1 UE measurement abilities

Measurement ability	Measurement target on which the measurement shall be possible (Idle mode= I / Connected mode = C)

	Intra-frequency	Inter-frequency
RSCP	CPICH (I/C), DPCH measured on DPCCH for each RL and after RL combination (C)	CPICH (I/C)
SIR	DPCH measured on DPCCH for each RL and after RL combination (C)	n.a.
RSSI	UTRAN DL carrier (I/C)	UTRAN DL carrier (I/C), GSM BCCH carrier (I/C).
Ec/No	CPICH (I/C), DPCH measured on DPCCH for each RL and after RL combination (C)	CPICH (I/C)
Transport CH BLER	Any (Transport channel DCH carried by physical channel DPCH after RL combination (I/C)	n.a.
Physical CH BER	Transport channel DCH carried by physical channel DPCH after RL combination (C)	n.a.
UE TX Power	DPCCH/DPDCH (C) UL carrier (C)	n.a.
Relative Timing Difference Between Cells	CPICH (C)	n.a.
UE RxTx timing	DPCH (C)	n.a.
Relative Timing Difference Between Cells for LCS	CPICH (TBD-I/C)	CPICH (TBD-I/C)

6.1.7 Physical CH BER

Definition	The physical channel BER is an estimation of the average bit error rate (BER) before channel decoding of the <u>DPDCH</u> data. <u>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.</u>
Purpose	Outer loop power control (DPCH).
Range/mapping	TBD.

6.1.8 UE TX Power

Definition	The total UE transmitted power on one carrier measured on DPCCH/DPDCH . The reference point for the UE TX Power shall be the UE antenna connector.
Purpose	Monitoring if the average Tx power is reaching an upper or lower power limit, either connected to the UE capability or set by the network (DPCCH/DPDCH UL carrier).
Range/mapping	TBD.

6.1.11 Relative Timing Difference Between Cells for LCS

Definition	The relative timing difference between the serving cell j and cell i. T_{LCSji} is defined as $T_{LCSji} = T_{CPICHRxji} - T_{CPICHRxj0}$, where: $T_{CPICHRxj0}$ is the time when the UE receives one CPICH slot from the serving 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 the serving cell j
Purpose	Location services (CPICH of own and neighbour cells)
Range/mapping	T_{LCS} is a signed value. The resolution of T_{LCS} is 0.5 chip and the range is [-1279...1280] chips.

6.2 UTRAN measurement abilities

The following table provides an overview of the ~~UE~~ UTRAN measurement abilities:

Note: The term “Measurement target” refers to either physical channel(s), carrier, transport channel, channelisation code, etc.

Measurement ability	Measurement target on which the measurement shall be possible (Idle mode= I / Connected mode = C)	
	Intra-frequency	Inter-frequency
RSSI	UTRAN UL carrier	
SIR	DPCCH/DPDCH measured on DPCCH after RL combination in Node B (C)	n.a.
Total Transmitted Power	Any carrier transmitted from an UTRAN access point	
Transmitted Code Power	Any channelisation code transmitted from an UTRAN access point	
Transport CH BLER	Any transport channel DCH carried by physical channel DPDCH after RL combination in Node B (I/C)	n.a.
Physical CH BER	Transport channel DCH carried by physical channel DPDCH after RL combination in Node B (C)	n.a.
Round Trip Time Delay (RTT D)	DPCH for each RL transmitted from an UTRAN access point and DPDCH/DPCCH for each RL received in an <u>the same</u> UTRAN access point (C)	n.a.

6.2.1 RSSI

Definition	Received Signal Strength Indicator, the wide-band received power within the UTRAN uplink channel bandwidth in an UTRAN access point. The reference point for the RSSI measurements shall be the antenna connector on the UTRAN access point cabinet .
Purpose	Load control (UTRAN uplink carrier), initial power setting of uplink physical channels (UTRAN uplink carrier).

Range/mapping	TBD.
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6.2.2 SIR

Definition	Signal to Interference Ratio, is defined as the RSCP divided by the ISCP. The reference point for the SIR measurements shall be the antenna connector on the UTRAN access point cabinet.
Purpose	Power control (DPCCH), macro diversity evaluation (DPCCH).
Range/mapping	TBD.

6.2.3 Total Transmitted Power

Definition	Total Transmitted Power, is the total transmitted power on one carrier from one UTRAN access point. The reference point for the total transmitted power measurement shall be the antenna connector at the UTRAN access point cabinet.
Purpose	Load control (any carrier transmitted from an UTRAN access point).
Range/mapping	TBD.

6.2.4 Transmitted Code Power

Definition	Transmitted Code Power, is the transmitted power on one carrier and one channelisation code. The reference point for the transmitted code power measurement shall be the antenna connector at the UTRAN access point cabinet.
Purpose	Power balancing between different radio links (any channelisation code transmitted from an UTRAN access point).
Range/mapping	TBD.

6.2.6 Physical CH BER

Definition	The physical channel BER is an estimation of the average bit error rate (BER) before channel decoding of the DPDCH data. <u>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.</u>
Purpose	Macrodiversity combining (DPDCH), outer loop power control (DPDCH).
Range/mapping	TBD.

6.2.6 Round Trip ~~Time~~Delay (RTT~~D~~)

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

Definition	<p>Round Trip TimeDelay (RTTD), is defined as</p> <p>$RTT\cancel{D} = T_{RX} - T_{TX}$, where</p> <p>$T_{TX}$ = The time of transmission of the beginning of a downlink DPCH frame to a UE.</p> <p>T_{RX} = The time of reception of the beginning (the first significant path) of the corresponding uplink DPCCCH/DPDCH frame from the UE.</p> <p>Note: The definition of "first significant path" needs further elaboration.</p>
Purpose	<p>Estimation of the path delay and the distance between a UTRAN access point and the UE (DPCH, DPDCH/DPCCCH).</p>
Range/mapping	<p>TBD.</p>

5 References

- [1] TS 25.215 v0.1.0 Physical Layer - Measurements (FDD)
- [2] TS 25.212 v.2.2.0 Multiplexing and channel coding (FDD)