TSG-RAN Working Group 1 meeting No. 11 *TSGR1-00-0274*
February 29 – March 3, Sandiego, USA

Source: NTT DoCoMo
Title: Change proposals for range and mapping of physical channel BER

Document for: Decision

Introduction

This document proposes to change the range/mapping of physical channel BER in 25.215.

Concerns on mapping of physical channel BER specified in 25.215.

Figure 1 shows BER performance of physical channel BER and BER after decoding.

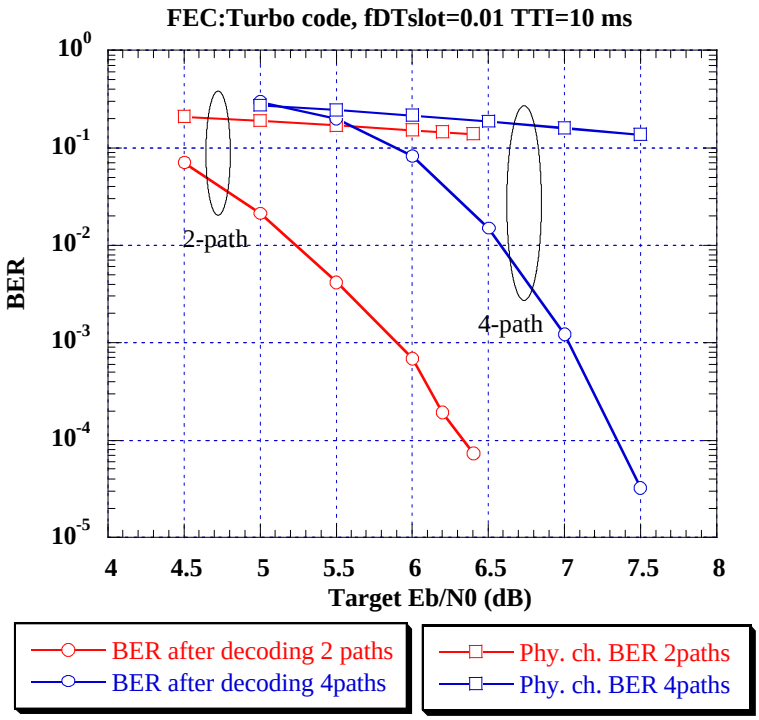

Figure 1 BER performance of physical channel BER and BER after decoding

As shown in Figure 1, the physical channel BER is very insensitive to target Eb/Io compared with BER after decoding. Range of BER after decoding from 10^{-4} to 10^{-2} is corresponding to range of the physical channel BER from 0.12 to 0.18. Similar simulation results were shown in [1].

Current mapping of physical channel BER specified in 25.215 is assigned 6 bits as following. (Note: In 25.215, log values are used. Followings are shown in real value.)

BER LOG00: error free
BER LOG01: error free < physical ch. BER < 9.33e-5
: : : :
BER LOG49: 0.106 < physical ch. BER < 0.123
BER LOG50: 0.123 < physical ch. BER < 0.143
BER LOG51: 0.143 < physical ch. BER < 0.166
BER LOG52: 0.166 < physical ch. BER < 0.193
: : : :

BER LOG63: 0.861 < physical ch. BER < 1.00

In the range of physical channel BER from 0.12 to 0.18, step size of the mapping is around 0.02 in physical channel BER. As shown in figure 1, fluctuations of 0.02 in physical channel BER is corresponding to fluctuations of TEN-TIMES in BER after decoding. It is clear that current step size of the the physical channel BER mapping specified in 25.215 is too big to achieve good outer loop TPC performance. It is needed to shorten the step size of the mapping of the physical channel BER.
The range of the current mapping, ie. from 9.33e-5 to 1.00 seems to be unnecessarily wide for the physical channel BER to be used for outer loop TPC even if convolutional coding is used.

Proposals

In order to achieve smaller step size of the mapping, this document proposes;
1) To change the range of the mapping to “around 0.01 – 1.00”.
2) To use 8 bits for the mapping

If my understanding is correct, the range of the mapping should be corresponding to bit size of "Quality estimate" information on Iub. However, I found that it might be possible to use additional 2 bits for "quality estimate" because 2 bits neighboring "quality estimate" are "space". So, it might be possible to use total 8 bits for the mapping as stated in above 2).

Proposed new mapping is as following;

BER_dB_00: Physical channel BER = 0
BER_dB_01: $-\infty$ < Log10(Physical channel BER) < -2.06375
BER_dB_02: -2.06375 ≤ Log10(Physical channel BER) < -2.055625
BER_dB_03: -2.055625 ≤ Log10(Physical channel BER) < -2.0475
...
BER_dB_253: -0.024375 ≤ Log10(Physical channel BER) < -0.01625
BER_dB_254: -0.01625 ≤ Log10(Physical channel BER) < -0.008125
BER_dB_255: -0.008125 ≤ Log10(Physical channel BER) ≤ 0

Conclusion

This document clarified that the current mapping of physical channel BER specified in 25.215 is too wide and the step size of the mapping is too big to achieve good performance of outer loop TPC. And this document proposed to change the mapping of physical channel BER.
In the RRM adhoc report, it was recommended to change physical channel BER into transport channel BER, and to delete the physical channel BER from UE measurement abilities. If this recommendation is approved in R1, this proposal can be applied to the transport channel BER as UTRAN measurement abilities.
If this proposal is approved in R1, this new mapping should be liaised to R3 to avoid inconsistency between 25.215 and the Iub interface specification of R3.

Reference

[1] R1-99i17, Nokia, “Deleting physical channel BER measurement from TS 25.215”

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San Diego, USA, Feb. 29th – March 3, 2000

Document R1-00-0274
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.

25.215	CR	046	Current Version:	3.1.1

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

For submission to:	TSG RAN #7	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 [ ] UTRAN / Radio [X] Core Network [ ]

Source: NTT DoCoMo **Date:** 2000-02-29

Subject: Change proposals for range and mapping of physical channel BER

Work item:

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

F	Correction		**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	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: According to simulation results, the current mapping of physical channel BER specified in 25.215 is too wide and rough to achieve good performance of outer loop TPC. In order to solve this problems, this document proposed to change the mapping of physical channel BER described in TS 25.215.

Clauses affected: 5.2.6.

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:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

Range/mapping	Transmitted carrier power is given with a resolution of 0.5 dB with the range [0, ..., 50] dBm Transmitted carrier power shall be reported in the unit UTRAN_TX_POWER where: UTRAN_TX_POWER _016: 0.0 dBm ≤ Transmitted carrier power < 0.5 dBm UTRAN_TX_POWER _017: 0.5 dBm ≤ Transmitted carrier power < 1.0 dBm UTRAN_TX_POWER _018: 1.0 dBm ≤ Transmitted carrier power < 1.5 dBm ... UTRAN_TX_POWER _114: 49.0 dBm ≤ Transmitted carrier power < 49.5 dBm UTRAN_TX_POWER _115: 49.5 dBm ≤ Transmitted carrier power < 50.0 dBm UTRAN_TX_POWER _116: 50.0 dBm ≤ Transmitted carrier power < 50.5 dBm

5.2.4 Transmitted code power

Definition	Transmitted code power, is 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 UTRAN_CODE_POWER where: UTRAN_CODE_POWER _010: -10.0 dBm ≤ Transmitted code power < -9.5 dBm UTRAN_CODE_POWER _011: -9.5 dBm ≤ Transmitted code power < -9.0 dBm UTRAN_CODE_POWER _012: -9.0 dBm ≤ Transmitted code power < -8.5 dBm ... UTRAN_CODE_POWER _120: 45.0 dBm ≤ Transmitted code power < 45.5 dBm UTRAN_CODE_POWER _121: 45.5 dBm ≤ Transmitted code power < 46.0 dBm UTRAN_CODE_POWER _122: 46.0 dBm ≤ Transmitted code power < 46.5 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 ≤ 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

5.2.6 Physical channel BER

Definition	Type 1: Measured on the DPDCH: 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. Type 2: Measured on the DPCCH: The Physical channel BER is an estimation of the average bit error rate (BER) on the DPCCH after RL combination in Node B. It shall be possible to report a physical channel BER estimate of type 1 or of type 2 or of both types 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	The Physical channel BER shall be reported for 0 ≤ Physical channel BER ≤ 1 in the unit BER_dB where: BER_dB_00: Physical channel BER = 0 BER_dB_01: -∞ < Log10(Physical channel BER) < -2.06375~~4.03~~ BER_dB_02: -2.06375~~4.03~~ ≤ Log10(Physical channel BER) < -2.0556253~~.965~~ BER_dB_03: -2.0556253~~.965~~ ≤ Log10(Physical channel BER) < -2.04753~~.9~~ ... BER_dB_253~~61~~: -0.0243751~~95~~ ≤ Log10(Physical channel BER) < -0.016251~~3~~ BER_dB_254~~62~~: -0.016251~~3~~ ≤ Log10(Physical channel BER) < -0.0081256~~5~~ BER_dB_255~~63~~: -0.0081256~~5~~ ≤ Log10(Physical channel BER) ≤ 0

5.2.7 Round trip time

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

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. 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	The Round trip time is given with the resolution of 0.25 chip with the range [876, …, 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. $T_{UTRAN-GPSj}$ 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 $T_{UTRAN-GPSj}$ is 1μS. The range is from 0 to 6.04×10^{11} μS.