TSG-RAN Working Group 1 meeting #9
Dresden, Germany
November 30 – December 3, 1999

TSGR1#9(99)j77

Agenda item: AH16
Source: NTT DoCoMo
Title: New quality indication for outer loop TPC during DPDCH ON
Document for: Decision

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1. Introduction

It was accepted in the WG1 that BLER and physical channel BER on DPDCH is used for outer loop TPC during DPDCH ON and that physical channel BER is used for outer loop TPC in high quality services, especially. This document describes that physical channel BER is not suitable for outer loop TPC, and proposes new quality indication, "Intermediate BLER".

2. The problem in the physical channel BER for outer loop TPC

Figure 1 shows correspondences between the physical channel BER and BER&BLER after decoding. Simulation conditions are as following:

- Antenna space diversity: 2-branch
- Rake combining: n-finger/branch
- Channel estimation: 3-slot averaging with power weighting i.e. 0.4:1:0.4
- Channel coding: Turbo coding (R=1/3, k=4)
- Transmit Power Control (TPC): Slot base closed loop power control (1-slot control delay, 1dB step size, no-control command error)
- Channel model: N-path Rayleigh fading channel (each path with equal average power).

As figure 1 shows, BER and BLER after decoding are very sensitive to the physical channel BER. This means that accuracy of the physical channel BER affects performance of outer loop TPC, seriously. Consequently, the physical channel BER seems not to be appropriate as quality indication for outer-loop TPC. Quality indication other than physical channel BER, which can be measured in short time, is needed for outer loop TPC in high quality services.

3. Proposal

This document proposes "Intermediate BLER" as the quality indication for outer loop TPC in high quality services. The intermediate BLER is BLER of decoding output from turbo decoder at less iteration number than maximum iteration number in a receiver. In this document, the less iteration number is not proposed. It should be an implementation matter since it should be determined according to implemented maximum iteration number in a receiver.

4. Simulation results

Figure 2 and 3 shows correspondences between BLERs at the iteration number of 3 and BLERs at the iteration number of 6. Correspondences between BLER at the iteration number of 3 and BER at the iteration number of 6 are shown, also. The parameter of figure 2 and 3 are the number of path and fDT, respectively. Simulation conditions are similar to those in section 2.
As figure 2 shows, BLER and BER at the iteration number of 6 are much insensitive to BLER at the iteration number of 3 compared with the physical channel BER. The correspondence is almost stable against the number of path and fDT. For high quality service, which requires BER of 10^{-6}, target BLER at iteration number of 3 is around 10^{-2}. This means that the proposed intermediate BLER can be measured in short time similar to the case of normal quality service which target quality is

conventional BLER=10^{-2}.
Consequently, if maximum iteration number of 6 is assumed, BLER at the iteration number of 3 can be an appropriate quality indication for outer loop TPC in high quality services.

5. Complexity of the proposal

Additional processing is only CRC checksum of decoding output from turbo decoder at the less iteration number. No additional coding or decoding processing is needed. No other additional processing or functions are needed. Therefore, additional complexity to measure the proposed BLER can be negligible.

6. Conclusion

In this document, simulation results of correspondences between the physical channel BER and BER&BLER after decoding is presented. From these results, this document explains that the physical channel BER is not appropriate for outer loop TPC in high quality services. Instead of the physical channel BER, "intermediate BLER" is proposed with simulation results. The less iteration number should be an implementation matter.

In attached text proposal, it is proposed to add "intermediate BLER" in TS25.215 as measurement abilities at UE and network..
This document does not propose to delete the physical channel BER from chapter 5.2 of TS25.215 at this moment because the physical channel BER measured at network can be used for selective combining. However, R1 should better to reconsider SIR measurement for selective combining.
It is proposed to delete the physical channel BER measured at UE since there is no other usage of the physical channel BER in UE if the proposed BLER is used for outer loop TPC.

A LS to R3 is needed to inform this measurement ability if this proposal is approved. It is needed to transmit the result of CRC checksum of decoding output from turbo decoder at the less iteration number. 1 bit is enough to transmit this information on Iub interface.

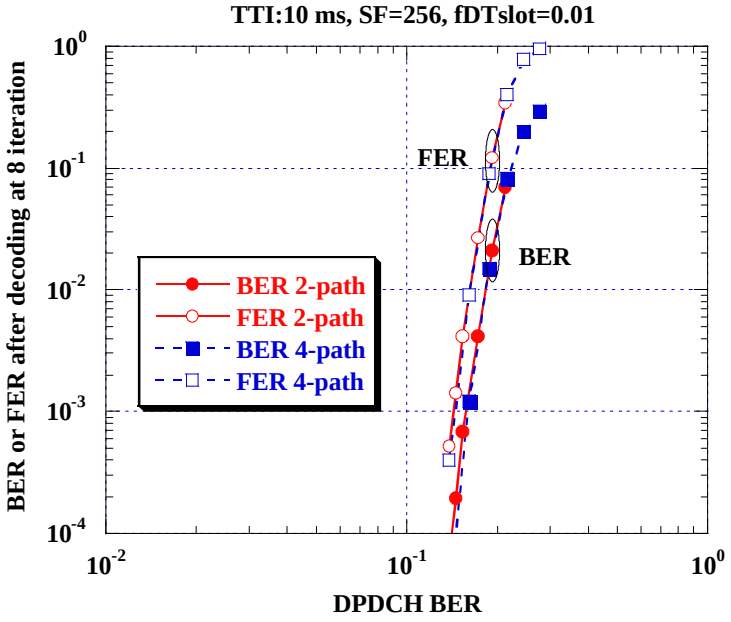

Figure 1: Correspondences between the physical channel BER and BER&BLER after decoding

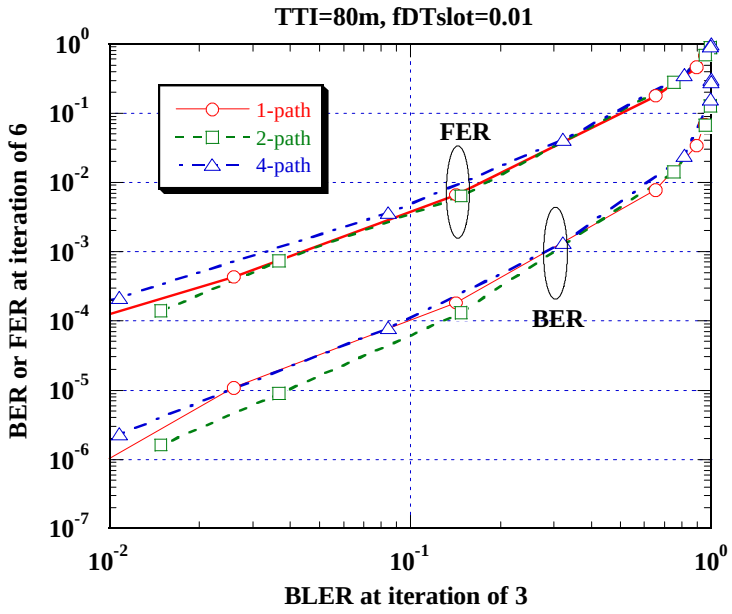

Figure 2: Correspondences between BLER and BER&BLER at the iteration number of 3 and 6

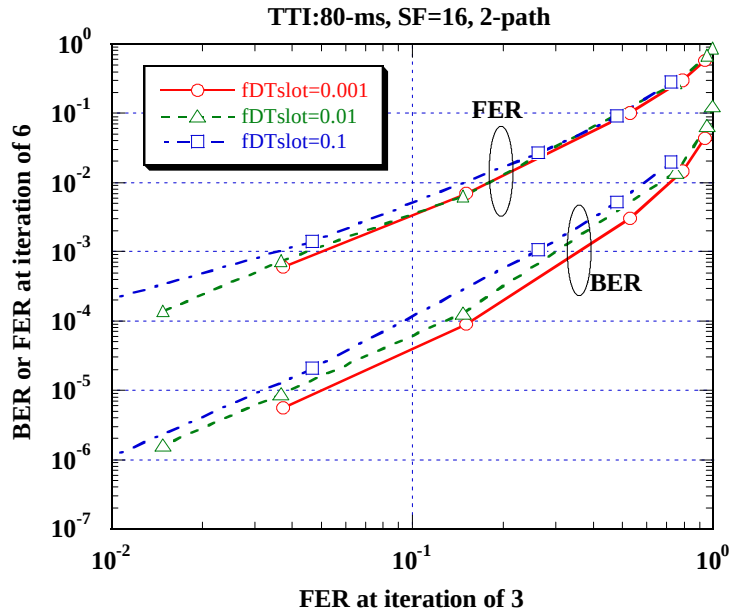

Figure 3: Correspondences between BLER and BER&BLER at the iteration number of 3 and 6

3GPP/SMG Meeting #?
Location, Country, DD-DD MMM YYYY

Document ????99???
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	016	Current Version:	3.0.0

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

For submission to:	TSG RAN #6	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: NTT DoCoMo **Date:** 1999-11-26

Subject: New quality indication for outer loop TPC during DPDCH ON

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	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Simulation results of correspondences between the physical channel BER and BER&BLER after decoding showed that the physical channel BER is not appropriate for outer loop TPC in high quality services. Instead of the physical channel BER, it is proposed to add "intermediate BLER" as a measurement ability for outer-loop TPC.

Clauses affected:

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.

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	

5.1.6 GSM carrier 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/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 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 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	

5.1.9 ~~Physical channel BER~~Intermediate transport channel BLER

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.~~ Estimation of the transport channel block error rate (BLER) of decoding output from turbo decoder at less iteration number than the maximum iteration number implemented in a receiver. The intermediate BLER estimation is only required for transport channels containing CRC. In connected mode the intermediate BLER shall be possible to measure on any transport channel.
Applicable for	Connected Intra
Range/mapping	

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 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.
Range/mapping	

5.2.4 Transmitted code power

Definition	Transmitted code 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 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 Intermediate transport channel BLER

Definition	Estimation of the transport channel block error rate (BLER) of decoding output from turbo decoder at less iteration number than the maximum iteration number implemented in a receiver. The intermediate BLER estimation is only required for transport channels containing CRC. In connected mode the intermediate BLER shall be possible to measure on any transport channel.
Range/mapping	

5.2.7~~6~~ 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 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	