Agenda item: AH 16

Source: Ericsson

Title: Physical CH BER on DPCCH in UTRA/FDD

Document for: Approval

1   Introduction

The aim of this document is to incorporate one new measurement, "Physical CH BER on DPCCH" for UTRAN in the layer 1 specification 25.215.

2   Measurements

2.1   Physical CH BER on DPCCH (UTRAN)

2.1.1   Description of the problem

One usage of the physical CH BER on the DPDCH is to set the SIRtarget in the outer loop power control. Consider a situation while there is dedicated data on the uplink. In that case it is possible for the outer loop power control algorithm to regulate the SIR target every time a quality report is received, e.g. CRC and physical CH BER sent to the RNC in the Iub DCH frame protocol. Considering a TrCh with TTI=20ms, this can mean that the SIR target could be updated 50 times a second while there is data on the uplink.

When no uplink data is sent on the uplink (uplink DTX) there will be periods where no physical CH BER or CRC for BLER calculation is available for the outer loop power control. The rate of update of the SIR target then drops from 50 updates/sec to zero.

When uplink transmission resumes it is likely that the SIR target is either too high (capacity penalty) or too low (quality penalty). There is a gain in regulating the SIR target during the silent period which is that the capacity penalty or the quality penalty at transmission resumption is minimised. Further more the probability of dropping the link during DTX is reduced.

The regulation of the SIR target during DTX should be slower at least for the following reasons, there may be more,

- The physical CH BER on the DPCCH is not as good a quality estimate for the link compared to the physical CH BER and CRC calculated from the DPDCH. Therefore the outer loop power control algorithm can not regulate as aggressively when it has the DPCCH BER as input.

- The Physical CH BER on DPCCH should be filtered over a longer time period to improve its accuracy.

- During the DTX the quality control is of less importance. The goal for the outer loop during DTX should be to prepare the SIR target for the next transmission of data (and to some extent the goal is maintain the link), so it tracks the SIR target less aggressively compared to when there is uplink data.

As the regulation during silent periods is not that critical the reporting of physical CH BER on DPCCH could be much slower than for DPDCH, for example 5 times/sec. To compensate for the small amount of bits available for BER estimation the averaging period could therefore be longer, e.g. will lead to a more accurate BER estimate.

The physical CH BER on DPCCH could be estimated using the pilot bits and/or the TFCI bits (which are coded).

2.1.2 How to transfer the DPCCH BER to the RNC?

To support the algorithms the physical CH BER on DPCCH has to be transported to the RNC. There are at least two possibilities to do that:

1. Inband reporting. Inclusion of "heart-beat" frames, regularly sent over Iub during silent periods. In the heart-beat frames a field containing a physical CH BER on DPCCH estimate could be inserted in the same way as for the dedicated Iub frames sent when data is available.

2. Outband reporting, controlled by higher layers, e.g. using the measurement control. The reporting of the DPCCH BER could for example be set up as periodic reporting with an 200ms interval.

To minimise the load over Iub it is preferred that some kind of regular "heart-beat" frames is introduced on Iub to carry the physical CH BER on DPCCH for silent periods.

3   Proposal

It is proposed that UTRAN layer 1 shall be able to measure and report the following quantities:

1. Physical CH BER on DPCCH

to higher layers.

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

4   Text Proposal for TS 25.215

6 Radio link measurements

6.2 UTRAN measurement abilities

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	Transport channel DCH carried by physical channel DPDCH after RL combination in Node B (C)	n.a.
Physical CH BER	Transport channel DCH carried by physical channel DPDCH after RL combination in Node B (C), DPCCH after RL combination in Node B (C)	n.a.
Round Trip Delay (RTD)	DPCH for each RL transmitted from an UTRAN access point and DPDCH/DPCCH for each RL received in an UTRAN access point (C)	n.a.

6.2.6 Physical CH BER

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

5   References

[1] TS 25.302 v2.4.0 Services provided by the Physical Layer

[2] TS 25.215 v0.1.0 Physical Layer - Measurements (FDD)