TSG-RAN Working Group 3, meeting # 6 ***TSGR3#6(99)A06***

Sophia Antipolis, 23-27 August 1999

Agenda Item: 14.3

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Title: Clarification on the quality indicator parameter in DCH FP.

Document for: Approval

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1. Introduction

This paper defines the quality estimate parameter in UL DCH frames, and proposes that two different qualty estimate are used, to support different channel coding scheme.

2. Discussion

The quality indicator parameter is currently included in the payload of the UL DCH FP frame, but the use and definition is marked FFS. As noted during the discussion in WG3#4, the quality estimate is needed for two reasons:

Macrodiversity Combining: in case the CRC of one TB fails in all the RL, there may be the need to select the best of the TB as result of the diversity combining. This shall be done accordingly to a quality estimate different than the CRC check..

Outer Loop Power Control: The outer loop power control is normally based of the number of erroneous frames (TB) received, but for high quality services (turbo coded services with BER around 10^{-5}), the outer loop power control shall be able to react to a decreased quality of the transmission in advance to transmission errors, in order to prevent them. Thus the outer loop power control algorithm shall be based (also) on a separate quality estimate that indicates the quality level of the TB/TBS even if they have a correct CRC checksum.

2.1 Definition and use of the quality estimate

Due to the interleaving, the quality estimate is the same for all the transport blocks in the transport block set. In case of coordinated DCH, an unique quality estimate is used.

Either one of two quality estimates are proposed to be used in one FP connection, accordingly to the characteristic of the DCH:

> **Type I, Received Eb/No value:** This value shall indicate the averaged Eb/No measured during the reception of the radio frames carrying the transport block set. This quality estimate cannot be used for outer loop power control, but only for MDC combining, and it is typically used for convolutional coded DCH (that does not have a low bit error rate requirement).
>
> *Note that the Eb/No is measured in any case, for the inner loop power control.*
>
> **Type II, Bit errors after the first iteration of the turbo decoder:** This value indicates the bit errors after the first iteration of the turbo decoder on the Transport block set. This quality estimate is suitable to be used for outer loop power control, because it indicated the errors before the (possible) correction operated by the turbo decoding, and can be use to monitor the downgrading of the link before the error cannot be corrected anymore. This quality estimate is typically used with turbo coded DCH.

Note that this is not the optimum value to be used for the MDC combining (the bit errors in the last iteration is a more suitable parameter), because it does not shown the quality after the decoding. Anyway the approximation in using this value is largely acceptable compared to the complexity in adding a second quality indicator in the frame (the bit errors during the last iteration cannot be used for the outer loop power control).

The selection of the quality estimate to be used is done by the serving RNC and communicated to the Node B(s) via RNSAP/NBAP signalling at the setup of the RL. SRNC can also decide not to use any quality estimate, and in this case the quality estimate field contains a constant value.

If the result of the CRC checksum in air interface is the same for two or more branches, MDC combining selects always the TB whose TBS has the higher quality estimate. The quality estimate of the combined frame is normally the higher quality estimate of the frames before the combining.

3. Proposals

- To include section 2.1 of this paper (except text in *Italic*) in section 7.1 of [25.427]. The sentence: '*The use and definition of the quality estimate is FFS*' shall be removed.
- To include the 'Quality Estimate Type' as a DCH parameter in the RNSAP/NBAP RL SETUP, RL ADDITION, RL RECONFIGURATION and RL RECONFIGURATION messages ([25.423] and [25.427]), with the following definition:

  Quality Estimate type

  The parameter defines the type of the quality estimate to be included in the UL data frames. It is unique for coordinated DCHs, and has the following values:

  - *No quality estimate: the quality estimate field in the FP frames contains a constant value*
  - *Received Eb/No value*
  - *Indicator of the bit errors after the first iteration of the Turbo decoder*