

3GPP TSG RAN WG1#20

Tdoc R1-01-0354

Pusan, Korea, May 21st – May 25th , 2001

Agenda Item: Rel –99 CRs

Document for: Decision

Source: Nokia

Title: Power balancing algorithm accuracy description

Introduction

In our last meeting a Tdoc R1-01-284 dealing with power balancing algorithm accuracy was presented. Unfortunately, the equation in the document was erroneous. Thus, the purpose of this new CR is to correct the equation aligned with original thinking in WG4.

Proposal

According to the request in RAN WG4 liaison [1], we propose to introduce an accuracy definition for P_{bal} to TS25.214 and define it with respect to power control step size ΔTPC . The proposed CR edits partly the same section of TS25.214 as a previous CR144 [2] that was approved in WG1#18 meeting.

References

- [1] TSG-RAN WG4, "Liaison on power balancing accuracy requirement", R1-01-0197
- [2] NEC, "Removal of the power balancing algorithm", Tdoc R1-01-0052

5.2.1 DPCCH/DPDCH

5.2.1.1 General

The downlink transmit power control procedure controls simultaneously the power of a DPCCH and its corresponding DPDCHs. The power control loop adjusts the power of the DPCCH and DPDCHs with the same amount, i.e. the relative power difference between the DPCCH and DPDCHs is not changed.

The relative transmit power offset between DPCCH fields and DPDCHs is determined by the network. The TFCI, TPC and pilot fields of the DPCCH are offset relative to the DPDCHs power by PO1, PO2 and PO3 dB respectively. The power offsets may vary in time. The method for controlling the power offsets within UTRAN is specified in [6].

The power of CCC field in DL DPCCH for CPCH is the same as the power of the pilot field.

5.2.1.2 Ordinary transmit power control

5.2.1.2.1 UE behaviour

The UE shall generate TPC commands to control the network transmit power and send them in the TPC field of the uplink DPCCH. An example on how to derive the TPC commands is given in Annex B.2.

The UE shall check the downlink power control mode (DPC_MODE) before generating the TPC command:

- if DPC_MODE = 0 : the UE sends a unique TPC command in each slot and the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH;
- if DPC_MODE = 1 : the UE repeats the same TPC command over 3 slots and the new TPC command is transmitted such that there is a new command at the beginning of the frame.

The DPC_MODE parameter is a UE specific parameter controlled by the UTRAN.

The UE shall not make any assumptions on how the downlink power is set by UTRAN, in order to not prohibit usage of other UTRAN power control algorithms than what is defined in subclause 5.2.1.2.2.

5.2.1.2.2 UTRAN behaviour

Upon receiving the TPC commands UTRAN shall adjust its downlink DPCCH/DPDCH power accordingly. For DPC_MODE = 0, UTRAN shall estimate the transmitted TPC command TPC_{est} to be 0 or 1, and shall update the power every slot. If DPC_MODE = 1, UTRAN shall estimate the transmitted TPC command TPC_{est} over three slots to be 0 or 1, and shall update the power every three slots.

After estimating the k :th TPC command, UTRAN shall adjust the current downlink power $P(k-1)$ [dB] to a new power $P(k)$ [dB] according to the following formula:

$$P(k) = P(k-1) + P_{TPC}(k) + P_{bal}(k),$$

where $P_{TPC}(k)$ is the k :th power adjustment due to the inner loop power control, and $P_{bal}(k)$ [dB] is a correction according to the downlink power control procedure for balancing radio link powers towards a common reference power.

~~The power balancing procedure and control of the procedure is described in [6], and an example of how $P_{bal}(k)$ can be calculated is given in Annex B.3.~~

P_{bal} shall fulfill:

$$\left| (1-r)P_{init} - \sum_k P_{bal}(k) \right| \leq (1-r)P_{ref} \pm \Delta_{TPC}$$

where the sum is performed over an adjustment period corresponding to a number of frames equal to the value of the Adjustment Period IE, P_{ref} is the code channel power value indicated in DL Reference Power IE, P_{init} is the power value reported by the UTRAN code channel power measurement at the beginning of the adjustment period and r is given by the Adjustment Ratio IE.

$P_{TPC}(k)$ is calculated according to the following.

If the value of *Limited Power Raise Used* parameter is 'Not used', then

$$P_{TPC}(k) = \begin{cases} +\Delta_{TPC} & \text{if } TPC_{est}(k) = 1 \\ -\Delta_{TPC} & \text{if } TPC_{est}(k) = 0 \end{cases}, [\text{dB}]. \quad (1)$$

If the value of *Limited Power Raise Used* parameter is 'Used', then the k :th inner loop power adjustment shall be calculated as: