3GPP TSG RAN WG1#19 **Tdoc R1-01-0354**

Las Vegas, USA, February 27th – March 2nd , 2001

Agenda Item: Rel –99 CRs

Document for: Decision

Source: Nokia

Title: Power balancing algorithm accuracy description

Introduction

As stated in RAN WG4 liaison [1] to RAN WG1 and RAN WG3 on power balancing accuracy requirement, some changes are expected to TS25.214. In their liaison statement to WG4 [2], RAN WG3 expressed that the accuracy requirement would be removed from TS25.433 and TS25.423. WG3 was proposing to change the explicit accuracy requirement with a parameter ?, and include a reference to a relevan RAN WG4 specification where this ? would be defined.

However, as RAN WG4 replies in the liaison, power balancing algorithm is very closely related to regular downlink power control. Thus, the accuracy requirement can be directly tied to the existing requirement set for power control step size.

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 ?TPC. The proposed CR edits partly the same section of TS25.214 as a previous CR144 [1] that was approved in WG1#18 meeting.

References

[1] TSG-RAN WG4, "Liaison on power balancing accuracy requirement", R1-01-0197

[2] TSG-RAN WG3, "Moving the accuracy requirement to WG4 specification", R3-00-2576

[3] NEC, "Removal of the power balancing algorithm", Tdoc R1-01-0052

3GPP TSG-RAN WG1 Meeting #19
Las Vegas, NV, USA, 27 February – 2 March 2001

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CR-Form-v3

CHANGE REQUEST

25.214	CR	157	rev	1	Current version:	3.5.0

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ✍ symbols.*

Proposed change affects: ✍ (U)SIM ☐ ME/UE ☐ Radio Access Network [X] Core Network ☐

Title: ✍	Power balancing accuracy	
Source: ✍	Nokia	
Work item code: ✍		***Date:*** ✍
Category: ✍	**F**	***Release:*** ✍ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ✍	Power balancing algorithm was removed both from WG1 and WG3 specification. According to RAN WG4 request it is reintroduced to 25.214 and the accuracy requirement is inherently tied to existing requirement set for power control step sizes.
Summary of change: ✍	A description for radio link power balancement is added
Consequences if not approved: ✍	Power balancing adjustment accuracy is not described anywhere

Clauses affected: ✍	5.2.1.2.2	
Other specs affected: ✍	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	✍
Other comments: ✍	This CR affects partly the same section than CR144 approved in WG1#18	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ✍ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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 in 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 $P(k\text{-}1)$ [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:

$$\left|(1 - r)(P_{ref} - P_{init}) - \sum_{k} P_{bal}(k)\right| \le \Delta_{TPC}$$

where the sum is performed over an adjustment period corresponding to a number of frames equal to the value of the *Adjustment Period*, *Pref* is the code channel power (relative to P-CPICH power level) value indicated in *DL Reference Power* , *Pinit* 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*.

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

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

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

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