

Title: LS on power balancing accuracy requirement
From: TSG RAN WG4
To: TSG RAN WG1, TSG RAN WG3
contact: Sami Jokinen, Nokia (sami.a.jokinen@nokia.com)

1. INTRODUCTION

In liaison statement to RAN WG4, (R4-000810, R3-002576), titled 'Moving the accuracy requirement to WG4 specification', RAN WG3 proposes to move accuracy requirement related to power balancing algorithm from its specifications TS 25.423 (RNSAP) and TS 25.433 (NBAP) to RAN WG4 specification.

2. CURRENT STATUS

The existing description and accuracy requirement in **25.423** and **25.433** is:

Power Adjustment

The power balancing adjustment superimposed on the inner loop power control adjustment (see Ref. [10]) shall be such that:

$$\sum P_{bal} = (1 - r)(P_{ref} - P_{init}) \text{ with an accuracy of } \pm 0.5 \text{ dB}$$

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 value of the DL Reference Power IE, P_{init} is the power at the beginning of the adjustment period and r is given by the Adjustment Ratio IE.

The adjustment within one adjustment period shall in any case be performed with the constraints given by the Max Adjustment Step IE.

The power adjustments shall be repeated for every adjustment period, until a new DL POWER CONTROL REQUEST message is received or the RL is deleted.

In addition, RAN WG1 specification **25.214** describes the overall UTRAN downlink power control behaviour:

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:

$$P(k) = P(k - 1) + PTPC(k) + Pbal(k),$$

where $PTPC(k)$ is the k :th power adjustment due to the inner loop power control, and $Pbal(k)$ [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 $Pbal(k)$ can be calculated is given in Annex B.3.

3. PROPOSAL

As can be seen in the two attachments in the LS from RAN WG3, RAN WG3 would like to implement the change by replacing explicit accuracy requirement with a parameter α , and include a reference to relevant RAN WG4 specification where parameter α is defined.

RAN WG4 believes that the power balancing algorithm and the parameter α are very closely related to the implementation of regular downlink power control. Therefore RAN WG4 feels that it is unnecessary to define a new parameter α , for which to set an accuracy requirement. As an alternative approach RAN WG4 would like to propose RAN WG1 to modify algorithm description in 25.214 so that it would indirectly refer to existing requirement set for power control step sizes.

In addition, RAN WG4 feels that it is essential that P_{ref} and P_{init} are defined in more detail. DL Reference Power IE gives the code channel power as a value relative to CPICH power, whereas P_{ref} in the formula must be an absolute code channel power. P_{init} is further defined to be the reported value from UTRAN code channel power measurement so that the true code channel power and its allowed tolerance does not need to be taken into account separately. These clarifications should be reflected also in 25.423 and 25.433.

An example of possible new description is given below:

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.

P_{bal} shall fulfill:

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

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 value of 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.