

TSG-RAN Working Group 1 Meeting #20  
Busan, Korea  
May 21<sup>st</sup>-25<sup>th</sup> , 2001

***TSGR1#20(01)0463***

**Agenda item:** CRs for Rel -99/4  
**Source:** Nokia  
**Title:** Limited power raise: aligning terminology with TS25.433  
**Document for:** Decision

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Originally when limited power raise was reflected in RAN WG1 specifications by request of RAN WG3 colleagues, there was an accidental change in the terminology. The concept has always been called "limited power increase" in TS25.433 and consequently the RAN WG3 terminology is proposed to be adopted in RAN WG1 specifications.

3GPP TSG-RAN WG1 Meeting #20  
Busan, Korea, May 21<sup>st</sup> – 25<sup>th</sup> 2001

Tdoc R1-01-0463

CR-Form-v4

## CHANGE REQUEST

⌘ 25.214 CR 165 ⌘ ev - ⌘ Current version: 3.6.0 ⌘

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  Core Network

<b>Title:</b>	⌘ Limited power raise: aligning of terminology with TS25.433		
<b>Source:</b>	⌘ Nokia		
<b>Work item code:</b>	⌘	<b>Date:</b>	⌘ 15.05.2001
<b>Category:</b>	⌘ D	<b>Release:</b>	⌘ R99
Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:	
F (correction)		2 (GSM Phase 2)	
A (corresponds to a correction in an earlier release)		R96 (Release 1996)	
B (addition of feature),		R97 (Release 1997)	
C (functional modification of feature)		R98 (Release 1998)	
D (editorial modification)		R99 (Release 1999)	
Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .		REL-4 (Release 4)	
		REL-5 (Release 5)	

<b>Reason for change:</b>	⌘ RAN WG3 uses a term "limited power increase" in TS25.433. As this parameter was originally added to TS25.214 to be in line with TS25.433 the name should be aligned.
<b>Summary of change:</b>	⌘ "Limited power raise" is changed into "Limited power increase" throughout TS25.214
<b>Consequences if not approved:</b>	⌘

<b>Clauses affected:</b>	⌘ 5.2.1.2.2
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘

### 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](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://ftp.3gpp.org/specs/>. For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 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 Downlink power control

The transmit power of the downlink channels is determined by the network. In general the ratio of the transmit power between different downlink channels is not specified and may change with time. However, regulations exist as described in the following subclauses.

Higher layer power settings shall be interpreted as setting of the total power, i.e. the sum of the power from the two antennas in case of transmit diversity.

### 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:

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

where  $P_{TPC}(k)$  is the  $k$ :th power adjustment due to the inner loop power control, and  $P_{ba}(k)$  [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].

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

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

$$P_{TPC}(k) = \begin{cases} +\Delta_{TPC} & \text{if } TPC_{est}(k) = 1 \text{ and } \Delta_{sum}(k) + \Delta_{TPC} < \text{Power\_Raise\_Limit} \\ 0 & \text{if } TPC_{est}(k) = 1 \text{ and } \Delta_{sum}(k) + \Delta_{TPC} \geq \text{Power\_Raise\_Limit} \\ -\Delta_{TPC} & \text{if } TPC_{est}(k) = 0 \end{cases}, [\text{dB}] \quad (2)$$

where

$$\Delta_{sum}(k) = \sum_{i=k-DL\_Power\_Averaging\_Window\_Size}^{k-1} P_{TPC}(i)$$

is the temporary sum of the last *DL\_Power\_Averaging\_Window\_Size* inner loop power adjustments (in dB).

For the first (*DL\_Power\_Averaging\_Window\_Size* – 1) adjustments after the activation of the limited power *raise/increase* method, formula (1) shall be used instead of formula (2). *Power\_Raise/Increase\_Limit* and *DL\_Power\_Averaging\_Window\_Size* are parameters configured in the UTRAN.

The power control step size  $\Delta_{TPC}$  can take four values: 0.5, 1, 1.5 or 2 dB. It is mandatory for UTRAN to support  $\Delta_{TPC}$  of 1 dB, while support of other step sizes is optional.

In addition to the above described formulas on how the downlink power is updated, the restrictions below apply.

In case of congestion (commanded power not available), UTRAN may disregard the TPC commands from the UE.

The average power of transmitted DPDCH symbols over one timeslot shall not exceed *Maximum\_DL\_Power* (dB), nor shall it be below *Minimum\_DL\_Power* (dB). Transmitted DPDCH symbol means here a complex QPSK symbol before spreading which does not contain DTX. *Maximum\_DL\_Power* (dB) and *Minimum\_DL\_Power* (dB) are power limits for one channelisation code, relative to the primary CPICH power [6].

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