3GPP TSG RAN WG1 ***TSGR1#10(00)0051***

January 18 – 21, 2000, Beijing, China

Agenda item:

Source: **Philips**

Title: **Clarification of description of power control in compressed mode**

Document for: **Decision**

Introduction

The proposed changes relate to current text in TS25.214 section 5.1.2.3 (“Transmit power control in compressed mode”).

This section describes Power Resume Mode 1 correctly for *uplink* compressed mode. However, a slight modification is needed to give the appropriate results when compressed mode is only used in the downlink.

Further, according to some comments received by email, the description of the recursive relation for computing the power offset in Power Resume Mode 1 may benefit from some clarification. A change of notation (of an editorial nature) is therefore proposed. Also, in order to allow for the possibility that during DCH activation, uplink transmission may start some significant time after downlink transmission, it is more precisely specified that the recursion is initialised when the uplink DPCCH begins.

In the description of the use of algorithm 2 in compressed mode, the reference to section 5.1.2.2.3.3.1 is incorrect and unnecessary, and is deleted. The behaviour of algorithm 2 is clarified to give a zero value for TPC_cmd when incomplete groups of power control commands are received.

The Change Request contained in this document makes the corrections described above and includes some minor clarifying editorial changes.

3GPP TSG RAN WG1 Meeting #10
Beijing, China, Jan 18 – 21, 2000

Document R1-00-0051
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.214	CR	049	Current Version:	3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN #7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Philips **Date:** 2000-01-10

Subject: Corrections to uplink power control in compressed mode

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Revised terminology to clarify meaning of $_{last}$ and resolve ambiguity, and correction to method of executing recursive relations to calculate $_{last}$.
Correction to cross-reference and correction to handling of incomplete sets of TPC commands.

Clauses affected: 5.1.2.3 Transmit power control in compressed mode

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

5.1.2.3 Transmit power control in compressed mode

The aim of uplink power control in downlink or/and uplink compressed mode is to recover as fast as possible a signal-to-interference ratio (SIR) close to the target SIR after each transmission gap.

In downlink compressed mode, no power control is applied during transmission gaps, since no downlink TPC command is sent. Thus, the transmit powers of the uplink DPDCH(s) and DPCCH are not changed during the transmission gaps.

In simultaneous downlink and uplink compressed mode, the transmission of uplink DPDCH(s) and DPCCH is stopped during transmission gaps.

The initial transmit power of each uplink DPDCH and DPCCH after the transmission gap is equal to the power before the gap, but with an offset Δ_{RESUME}. The value of Δ_{RESUME} (in dB) is determined according to the Power Resume Mode (PRM). The PRM is a UE specific parameter, which is signalled by the network with the other parameters of the downlink compressed mode (see TS 25.215). The different modes are summarised in table 1.

Table 1: Power control resume modes during compressed mode

Power Resume Mode	Description
0	$\Delta_{RESUME} = 0$
1	$\Delta_{RESUME} = \text{Int}[d_{last} / \Delta_{TPCmin}] \Delta_{TPCmin}$

Here Int[ ] means round to the nearest integer and Δ_{TPCmin} is the minimum power control step size supported by the UE. δ_{last} is equal to the value of δ ~~the power offset~~ computed ~~at~~in the last slot before the transmission gap. δ shall be updated according to the following recursive relations, which shall be~~are,~~ executed only in ~~every~~ slots ~~during~~ with simultaneous uplink and downlink DPCCH transmission:

$$\frac{d_{last} = 0.9375 d_{previous} - 0.96875 TPC\_cmd_{last} \Delta_{TPC}}{d_{previous} = d_{last}}$$

$$d_i = 0.9375 d_{i-1} - 0.96875 TPC\_cmd_i \Delta_{TPC}$$
$$d_{i-1} = d_i$$

TPC_cmd_i is the most recent power control command executed by the UE ~~in the last slot before the transmission gap~~. $\delta_{-1previous}$ is the ~~power offset~~value of δ computed for the previous slot. The value of $\delta_{-1previous}$ shall be initialised to zero when the uplink~~a~~ DPCCH is activated, ~~or~~ and also during the first slot after ~~a~~ each transmission gap.

After each transmission gap, 2 modes are possible for the power control algorithm. The power control mode (PCM) is fixed and signalled with the other parameters of the downlink compressed mode (see TS 25.215). The different modes are summarised in the table 2:

Table 2: Power control modes during compressed mode

Mode	Description
0	Ordinary transmit power control (see subclause 5.1.2.2) is applied with step size Δ_{TPC}
1	Ordinary transmit power control is applied using algorithm 1 (see subclause 5.1.2.2.2) with step size $\Delta_{RP\text{-}TPC}$ during RPL slots after each transmission gap.

For mode 0, the step size is not changed and the ordinary transmit power control is still applied during compressed mode (see subclause 5.1.2.2), using the same algorithm for processing TPC commands as in normal mode (see section 5.1.2.2.2 and 5.1.2.2.3).

For mode 1, during RPL slots after each transmission gap, called the recovery period, power control algorithm 1 is applied with a step size $\Delta_{RP\text{-}TPC}$ instead of Δ_{TPC}.

$\Delta_{RP\text{-}TPC}$ is called recovery power control step size and is expressed in dB. If algorithm 1 (section 5.1.2.2.2) is used in normal mode, $\Delta_{RP\text{-}TPC}$ is equal to the minimum value of 3 dB and $2\Delta_{TPC}$. If algorithm 2 (section 5.1.2.2.3) is used in normal mode, $\Delta_{RP\text{-}TPC}$ is equal to 1 dB.

RPL is called recovery period length and is expressed in number of slots. RPL is fixed and equal to the minimum value of TGL and 7 slots.

After the recovery period, ordinary transmit power control resumes using the same algorithm and step size as used in normal mode before the transmission gap.

If algorithm 2 (section 5.1.2.2.3) is being used in normal mode, the sets of slots over which the TPC commands are processed ~~(in section 5.1.2.2.2.3.1)~~ shall remain aligned to the frame boundaries in the compressed frame. In both mode 0 or mode 1, if the transmission gap or the recovery period results in any incomplete sets of TPC commands, ~~no TPC_temp$_i$ command will be determined~~TPC_cmd shall be set to zero for those sets of slots which are incomplete, and there will be no change in transmit power level for those sets of slots.

During compressed mode and the recovery period after compressed mode, regardless of the offset Δ_{RESUME} and the step size $\Delta_{RP\text{-}TPC}$, the UE transmit power shall not exceed the maximum allowed transmission power set by higher layer signalling.

5.1.2.4 Transmit power control in DPCCH power control preamble

A power control preamble may be used for initialisation of a DCH. Both the UL and DL DPCCHs shall be transmitted during the uplink power control preamble. The UL DPDCH shall not commence before the end of the power control preamble.

The length of the power control preamble is a UE-specific parameter signalled by the network, and can take the values 0 slots or 8 slots.

The inner power control loop acts on the UL DPCCH during the preamble in the same way as described in section 5.1.2.2.1.

The initial power control step size used in the power control preamble differs from that used after the preamble in the following way. If algorithm 1 is to be used after the preamble to calculate the value of TPC_cmd, then the initial step size in the power control preamble is $\Delta_{TPC\text{-}init}$, where $\Delta_{TPC\text{-}init}$ is equal to the minimum value out of 3 dB and $2\Delta_{TPC}$. If algorithm 2 is to be used after the preamble to calculate the value of TPC_cmd, then initially in the power control preamble algorithm 1 is used with a step size of 2dB. In either case, the power control algorithm and step size revert to those used for the main part of the transmission as soon as the sign of TPC_cmd reverses for the first time, or at the end of the power control preamble if the power control preamble ends first.

5.1.2.5 Setting of the uplink DPCCH/DPDCH power difference

5.1.2.5.1 General

The uplink DPCCH and DPDCH(s) are transmitted on different codes as defined in section 4.2.1 of TS 25.213. The gain factors β_c and β_d may vary for each TFC. There are two ways of controlling the gain factors of the DPCCH code and the DPDCH codes for different TFCs in normal (non-compressed) frames:

- b_c and b_d are signalled for the TFC, or
- b_c and b_d is computed for the TFC, based on the signalled settings for a reference TFC.

Combinations of the two above methods may be used to associate b_c and b_d values to all TFCs in the TFCS. The two methods are described in sections 5.1.2.4.2 and 5.1.2.4.3 respectively. Several reference TFCs may be signalled from higher layers.

The gain factors may vary on radio frame basis depending on the current TFC used. Further, the setting of gain factors is independent of the inner loop power control. This means that at the start of a frame, the gain factors are determined and the inner loop power control step is applied on top of that.

Appropriate scaling of the output power shall be performed by the UE, so that the output DPCCH power follows the inner loop power control with power steps of $\pm\Delta_{TPC}$ dB.