3GPP TSG RAN WG1 Meeting #17
Stockholm, Sweden

Document R1-00-1437
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CHANGE REQUEST

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25.214	CR	138r1	Current Version:	3.4.0

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

For submission to:	RAN #10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ?		for information		non-strategic		

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

Source: Vodafone Group, Ericsson **Date:** 2000-11-21

Subject: Corrections on power control preambles

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: The behavior of the power control preambles is inconsistent with the DL toggling scheme applied at the radio link initialisation stage.

Clauses affected: 5.1.2.4, 5.1.3.3

Other specs affected:

Other 3G core specifications	X	? List of CRs:	CR25211-088
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: This CR supersedes CR 131 to TS 25.214 from Philips in R1-00-1197. Note that in this new CR the following change approved in CR 131 is deleted, then it does not appear anymore in revision mark:
- the world “Initially” at the beginning of the sentence “TPC_cmd is derived according to algorithm 1 as described in sub clause 5.1.2.2.1, regardless of the value of PCA.” was added in CR 131 and then deleted in CR 138. So it does not appear anymore in this revision of CR 138.

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5.1.2.4 Transmit power control in DPCCH power control preamble

An UL DPCCH power control preamble is a period of UL DPCCH transmission prior to the start of the uplink DPDCH. ~~A power control preamble may be used for initialisation of a DCH. Both the UL and~~The DL DPCCH~~s~~ shall also be transmitted during ~~the~~ an uplink power control preamble. ~~The UL DPDCH shall not commence before the end of the power control preamble.~~

The length of the uplink power control preamble is a ~~UE-specific~~ higher layer parameter signalled by the network as defined in [5]~~, and can take the values 0 slots or 15 slots~~. The UL DPDCH shall not commence before the end of the power control preamble.

~~If the length of the power control preamble is greater than zero, the details of power control used during the power control preamble differ from the ordinary power control which is used afterwards. After the first slot of the~~ During the uplink power control preamble the change in uplink DPCCH transmit power shall ~~initially~~ be given by:

$$? \quad ?_{DPCCH} = ?_{TPC\text{-}init} ? \text{ TPC\_cmd.}$$

~~For PCA equal to 1 and 2, the value of $?_{TPC\ init}$ is set to $?_{TPC}$.~~

During the power control preamble TPC_cmd is derived according to algorithm 1 as described in sub clause 5.1.2.2.1, regardless of the value of PCA.

Ordinary power control (see subclause 5.1.2.2), with the power control algorithm determined by the value of PCA and step size $?_{TPC,}$ shall be used ~~as soon as the sign of TPC_cmd reverses for the first time, or at~~ after the end of the uplink 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 subclause 4.2.1 of [3]. The gain factors $?_c$ and $?_d$ 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:

?? $?_c$ and $?_d$ are signalled for the TFC, or

?? $?_c$ and $?_d$ 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 $?_c$ and $?_d$ values to all TFCs in the TFCS. The two methods are described in subclauses 5.1.2.5.2 and 5.1.2.5.3 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.

After applying the gain factors, the UE shall scale the total transmit power of the DPCCH and DPDCH(s), such that the DPCCH output power follows the changes required by the power control procedure with power adjustments of $?_{DPCCH}$ dB, subject to the provisions of sub-clause 5.1.2.6.

The gain factors during compressed frames are based on the nominal power relation defined in normal frames, as specified in subclause 5.1.2.5.4.

5.1.2.5.2 Signalled gain factors

When the gain factors $?_c$ and $?_d$ are signalled by higher layers for a certain TFC, the signalled values are used directly for weighting of DPCCH and DPDCH(s). The variable A_j, called the nominal power relation is then computed as:

$$A_j ? \frac{?_d}{?_c}.$$

5.1.3 PCPCH

5.1.3.1 General

The power control during the CPCH access procedure is described in clause 6.2. The inner loop power control for the PCPCH is described in the following sub-clauses.

5.1.3.2 Power control in the message part

The uplink transmit power control procedure simultaneously controls the power of a PCPCH control part and its corresponding PCPCH data part. The relative transmit power offset between the PCPCH control part and the PCPCH data part is determined by the network and is computed according to sub-clause 5.1.2.5 using the gain factors signalled to the UE using higher-layer signalling, with the difference that:

- $?_c$ is the gain factor for the PCPCH control part (similar to DPCCH);
- $?_d$ is the gain factor for the PCPCH data part (similar to DPDCH).

The gain factors are applied as shown in sub clause 4.2.3.2 of 25.213.

The operation of the inner power control loop adjusts the power of the PCPCH control part and PCPCH data part by the same amount, provided there are no changes in gain factors.

Any change in the uplink PCPCH control part transmit power shall take place immediately before the start of the pilot field on the control part of the message part. The change in PCPCH control part power with respect to its value in the previous slot is derived by the UE and is denoted by $?_{PCPCH-CP}$ (in dB).

During the operation of the uplink power control procedure the UE transmit power shall not exceed a maximum allowed value which is the lower out of the maximum output power of the terminal power class and a value which may be set by higher layer signalling.

Uplink power control shall be performed while the UE transmit power is below the maximum allowed output power.

The provisions for power control at the maximum allowed value and below the required minimum output power (as defined in [7]) are described in sub-clause 5.1.2.6.

The uplink inner-loop power control adjusts the UE transmit power in order to keep the received uplink signal-to-interference ratio (SIR) at a given SIR target, SIR_{target}, which is set by the higher layer outer loop.

The network should estimate the signal-to-interference ratio SIR_{est} of the received PCPCH . The network should then generate TPC commands and transmit the commands once per slot according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "0", while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "1".

The UE derives a TPC command, TPC_cmd, for each slot. Two algorithms shall be supported by the UE for deriving a TPC_cmd. Which of these two algorithms is used is determined by a higher-layer parameter, "PowerControlAlgorithm", and is under the control of the UTRAN. If "PowerControlAlgorithm" indicates "algorithm1", then the layer 1 parameter PCA shall take the value 1 and if "PowerControlAlgorithm" indicates "algorithm2" then PCA shall take the value 2.

If PCA has the value 1, Algorithm 1, described in subclause 5.1.2.2.2, shall be used for processing TPC commands.

If PCA has the value 2, Algorithm 2, described in subclause 5.1.2.2.3, shall be used for processing TPC commands.

The step size $?_{TPC}$ is a layer 1 parameter which is derived from the higher-layer parameter "TPC-StepSize" which is under the control of the UTRAN. If "TPC-StepSize" has the value "dB1", then the layer 1 parameter $?_{TPC}$ shall take the value 1 dB and if "TPC-StepSize" has the value "dB2", then $?_{TPC}$ shall take the value 2 dB.

After deriving the TPC command TPC_cmd using one of the two supported algorithms, the UE shall adjust the transmit power of the uplink PCPCH control part with a step of $?_{PCPCH-CP}$ (in dB) which is given by:

$?_{PCPCH-CP} = ?_{TPC} ?$ TPC_cmd

5.1.3.3 Power control in the power control preamble

A PCPCH power control preamble ~~may be used for initialisation of a PCPCH~~is a period when~~.~~ ~~B~~both the UL PCPCH control part and the associated DL DPCCH ~~shall be~~are transmitted ~~during the uplink power control preamble~~prior to the start of the uplink PCPCH data part. ~~The uplink PCPCH data part shall not commence before the end of the power control preamble.~~

The length of the power control preamble is a higher layer parameter, $L_{pc\text{-}preamble}$ (see section 6.2), and can take the value 0 slots or 8 slots. The uplink PCPCH data part shall not commence before the end of the power control preamble.

If $L_{pc\text{-}preamble} > 0$, the details of power control used during the power control preamble differ from the ordinary power control which is used afterwards. After the first slot of the power control preamble the change in uplink PCPCH control part transmit power shall initially be given by:

$?_{PCPCH\text{-}CP} = ?_{TPC\text{-}init} ?$ TPC_cmd

If the value of PCA is 1 then $?_{TPC\text{-}init}$ is equal to the minimum value out of 3 dB and $2?_{TPC}$.

If the value of PCA is 2 then $?_{TPC\text{-}init}$ is equal to 2dB.

TPC_cmd is derived according to algorithm 1 as described in sub clause 5.1.2.2.2, regardless of the value of PCA.

Power control as defined for the message part (see sub-clause 5.1.3.2), with the power control algorithm determined by the value of PCA and step size $?_{TPC,}$ shall be used 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.

5.2 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 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;