3GPP TSG RAN WG1 *TSGR1#9(99)i15*

November 30 – December 3, 1999, Dresden, Germany

Agenda item: **Ad hoc 14, Adhoc 9**

Source: **Philips**

Title: **Text Proposal for Uplink Power Control for PCPCH**

Document for: **Decision**

Introduction

This text proposal was originally presented as part of TSGR1#8(99)g52.

Following discussion on the email reflector, this paper contains a more concise version of just the text from TSGR1#8(99)g52 which related to the uplink power control for the PCPCH.

The proposal is to create a new sub-section for PCPCH uplink power control, in a similar way to the current sections for the PRACH and DPCCH/DPDCH.

After the preambles, the CPCH uses channels analagous to the DPCCH and DPDCH. Much of the text in the proposed new section is therefore the same as for the DPCCH/DPDCH.

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, 30 Nov –3 Dec 1999

Document R1-99i15
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.

3G25.214	**CR**	**017**	Current Version:	3.0.0

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

For submission to:	TSG RAN #6	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:** 1999-11-11

Subject: Uplink power control for PCPCH

Work item:

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

F	Correction		**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	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Power control for PCPCH not yet specified.

Clauses affected: 5.1 Uplink Power Control

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: New section 5.1.3 inserted.

help.doc

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5.1.2.4.2 Signalled gain factors

When the gain factors b_c and b_d are signalled by higher layers for a certain TFC, the signalled values are used directly for weighting of DPCCH and DPDCH(s).

5.1.2.4.3 Computed gain factors

The gain factors b_c and b_d may also be computed for certain TFCs, based on the signalled settings for a reference TFC.

Let $b_{c,ref}$ and $b_{d,ref}$ denote the signalled gain factors for the reference TFC. Further, let $b_{c,j}$ and $b_{d,j}$ denote the gain factors used for the TFC in the *j*:th radio frame.

Define the variable

$$K_{ref} = \sum_i RM_i \cdot N_i ,$$

where RM_i is the semi-static rate matching attribute for transport channel *i* (defined in TS 25.212 section 4.2.7), N_i is the number of bits output from the radio frame segmentation block for transport channel *i* (defined in TS 25.212 section 4.2.6.1), and the sum is taken over all the transport channels *i* in the reference TFC.

Similarly, define the variable

$$K_j = \sum_i RM_i \cdot N_i ,$$

where the sum is taken over all the transport channels *i* in the TFC used in the *j*:th frame.

The variable A_j is then computed as:

$$A_j = \frac{b_{d,ref}}{b_{c,ref}} \cdot \sqrt{\frac{K_j}{K_{ref}}} .$$

The gain factors for the TFC in the *j*:th radio frame are then computed as follows:

If $A_j > 1$, then $b_{d,j} = 1.0$ and $b_{c,j} = \lfloor 1/A_j \rfloor$, where $\lfloor \bullet \rfloor$ means rounding to closest lower quantized β–value.

If $A_j \leq 1$, then $b_{d,j} = \lfloor A_j \rfloor$ and $b_{c,j} = 1.0$, where $\lceil \bullet \rceil$ means rounding to closest higher quantized β-value.

The quantized β-values is defined in TS 25.213 section 4.2.1, table 1.

5.1.3 PCPCH

This section describes the power control procedures for the PCPCH. The CPCH access procedure is described in section 6.2.

5.1.3.1 Power control in the message part

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 then generates TPC commands and transmits 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, as described in subclauses 5.1.2.2.2.1 and 5.1.2.2.3.1. Which of these two algorithms is used is a higher-layer parameter under the control of the UTRAN.

The step size Δ_{TPC} is a higher-layer parameter under the control of the UTRAN, that can have the values 1 dB or 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 with a step of Δ_{TPC} dB according to the TPC command. If TPC_cmd equals 1 then the transmit power of the uplink PCPCH shall be increased by Δ_{TPC} dB. If TPC_cmd equals -1 then the transmit power of the uplink PCPCH shall be decreased by Δ_{TPC} dB. If TPC_cmd equals 0 then the transmit power of the uplink PCPCH shall be unchanged.

Any power increase or decrease shall take place immediately before the start of the pilot field on the PCPCH control channel.

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.

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.

5.2.1.2 Ordinary transmit power control

The downlink inner-loop power control adjusts the network transmit power in order to keep the received downlink SIR at a given SIR target, SIR_{target}. A higher layer outer loop adjusts SIR_{target} independently for each connection.

The UE should estimate the received downlink DPCCH/DPDCH power of the connection to be power controlled. Simultaneously, the UE should estimate the received interference. The obtained SIR estimate SIR_{est} is then used by the UE to generate TPC commands according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "0", requesting a transmit power decrease, while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "1", requesting a transmit power increase.

When the UE is not in soft handover the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH.

When the UE is in soft handover it should 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.