Agenda item:	**WG1 Plenary**
Source:	**Philips**
Title:	**Revised Text Proposal and Change Request for CPCH power control preamble**
Document for:	**Decision**

Introduction

This paper is a resubmission of R1-99h03, including the editorial modification to CR25214-004 which was agreed in the adhoc 14 meeting at WG1#8.

The current description of the CPCH power control preamble in 25.214 leaves the inner loop power control step size during the preamble undefined.

Simulation results in [1] (presented in Ad Hoc 9 at WG1#8) have confirmed that a larger initial step size in the power control preamble is beneficial in reducing the required Eb/No and assisting the UE transmit power to converge to the required level as quickly as possible.

The attached Text Proposal and Change Request 25.214-CR004rev2 close this gap in the current description of the behaviour in the power control preamble.

Reference:

[1]   TSGR1#(99)g23 *Further simulation results on power control on initialisation (DCH and CPCH),"* Philips, October 1999

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 **004rev2**   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*
list expected approval meeting # here ↑   for information ☐   non-strategic ☐   *use only)*

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:** 1999-11-18

Subject: CPCH power control preamble

Work item:

Category: F   Correction
(only one category   A   Corresponds to a correction in an earlier release
shall be marked   B   Addition of feature
with an X)   C   Functional modification of feature   **X**
     D   Editorial modification

Release: Phase 2 ☐
     Release 96 ☐
     Release 97 ☐
     Release 98 ☐
     Release 99 **X**
     Release 00

Reason for change: Feature not fully defined at present.

Clauses affected: 6.2 "CPCH Access Procedures"

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.

6.2   CPCH Access Procedures

For each CPCH physical channel in a CPCH set allocated to a cell the following physical layer parameters are included in the System Information message:

-    UL Access Preamble (AP) scrambling code.

-    UL Access Preamble signature set

-    The Access preamble slot sub-channels group

-    AP- AICH preamble channelization code.

-    UL Collision Detection(CD) preamble scrambling code.

-    CD Preamble signature set

-    CD preamble slot sub-channels group

-    CD-AICH preamble channelization code.

-    CPCH UL scrambling code.

-    CPCH UL channelization code. (variable, data rate dependant)

-    DPCCH DL channelization code.([512] chip)

    NOTE: There may be some overlap between the AP signature set and CD signature set if they correspond to the same scrambling code.

The following are access, collision detection/resolution and CPCH data transmission parameters:

Power ramp-up, Access and Timing parameters (Physical layer parameters)

1) N_AP_retrans_max = Maximum Number of allowed consecutive access attempts (retransmitted preambles) if there is no AICH response. This is a CPCH parameter and is equivalent to Preamble_Retrans_Max in RACH.

2) $P_{RACH} = P_{CPCH}$ = Initial open loop power level for the first CPCH access preamble sent by the UE.

    [RACH/CPCH parameter]

3) ΔP_0 = Power step size for each successive CPCH access preamble.

    [RACH/CPCH parameter]

4) ΔP_1 = Power step size for each successive RACH/CPCH access preamble in case of negative AICH. A timer is set upon receipt of a negative AICH. This timer is used to determine the period after receipt of a negative AICH when ΔP_1 is used in place of ΔP_0.

    [RACH/CPCH parameter]

5) T_{cpch} = CPCH transmission timing parameter: This parameter is identical to PRACH/AICH transmission timing parameter.

    [RACH/CPCH parameter]

    NOTE: It is FFS if ΔP_0 for the CPCH access may be different from ΔP_0 for the RACH access as defined in section 6.1.

The CPCH -access procedure in the physical layer is:

1) The UE MAC function selects a CPCH transport channel from the channels available in the assigned CPCH set The CPCH channel selection includes a dynamic persistence algorithm (similar to RACH) for the selected CPCH channel.

2) The UE MAC function builds a transport block set for the next TTI using transport formats which are assigned to the logical channel with data to transmit. The UE MAC funtion sends this transport block set to the UE PHY function for CPCH access and uplink transmission on the selected CPCH transport channel.

3) The UE sets the preamble transmit power to the value $P_{CPCH\_}$ which is supplied by the MAC layer for initial power level for this CPCH access attempt.

4) The UE sets the AP Retransmission Counter to N_AP_Retrans_Max (value TBD).

5) The UE randomly selects a CPCH-AP signature from the signature set for this selected CPCH channel. The random function is TBD.

6) The UE Derives the available CPCH-AP access slots in the next two frames, defined by SFN and SFN+1 in the AP access slot sub-channel group with the help of SFN and table 7 in section 6.1. The UE randomly selects one access slot from the available access slots in the next frame, defined by SFN, if there is one available. If there is no access slot available in the next frame, defined by SFN then, randomly selects one access slot from the available access slots in the following frame, defined by SFN+1. Random function is TBD

7) The UE transmits the AP using the MAC supplied uplink access slot, signature, and initial preamble transmission power.

8) If the UE does not detect the positive or negative acquisition indicator corresponding to the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE:

   a) Selects the next uplink access slot from among the access slots in the CPCH-AP sub-channel group, as selected in 4.1. There must be a minimum distance of three or four access slots from the uplink access slot in which the last preamble was transmitted depending on the CPCH/AICH transmission timing parameter. [NOTE: Use of random function here to select access slot is FFS for RACH and CPCH.].

   b) Increases the preamble transmission power with the specified offset ΔP . Power offset ΔP_0 s is used unless the negative AICH timer is running, in which case ΔP_1 is used instead..

   c) Decrease the Preamble Retransmission Counter by one.

   d) If the Preamble Retransmission Counter < 0, the UE aborts the access attempt and sends a failure message to the MAC layer.

9) If the UE detects the AP-AICH_nak (negative acquisition indicator) corresponding to the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE aborts the access attempt and sends a failure message to the MAC layer. The UE sets the negative AICH timer to indicate use of ΔP_1 use as the preamble power offset until timer expiry

10) Upon reception of AP-AICH, the access segment ends and the contention resolution segment begins. In this segment, the UE randomly selects a CD signautre from the signature set and also select one-CD access slot sub-channel from the CD sub-channel group supported in the cell.and transmits a CD Preamble, then waits for a CD-AICH from the Node B.

11) If the UE does not receive a CD-AICH in the designated slot, the UE aborts the access attempt and sends a failure message to the MAC layer.

12) If the UE receives a CD-AICH in the designated slot with a signature that does not match the signature used in the CD Preamble, the UE aborts the access attempt and sends a failure message to the MAC layer.

13) If the UE receives a CD-AICH with a matching signature, the UE transmits the power control preamble τ $_{\text{cd-p-pc-p}}$ ms later as measured from initiation of the CD Preamble.

The UE commences the power control preamble using the same power level as was used for the CD preamble.

The initial power control step size used in the power control preamble differs from that used in the message part: if inner loop power control algorithm 1 is to be used in the message part, then the initial step size in the power control preamble is $\Delta_{\text{TPC-init}}$, where $\Delta_{\text{TPC-init}}$ is equal to the minimum value out of 3 dB and $2\Delta_{\text{TPC}}$, where Δ_{TPC} is the power control step size used for the message part. If inner loop power control algorithm 2 is to be used in the message part, then inner loop power control algorithm 1 is used initially in the power control preamble, with a step size of 2dB. In either case, the power control algorithm and step size revert to those used for the message part as soon as the sign of the TPC commands reverses for the first time.

The transmission of the message portion of the burst starts immediately after the power control preamble.

14) During CPCH Packet Data transmission, the UE and UTRAN perform inner-loop power control on both the CPCH UL and the DPCCH DL.

15) If the UE detects loss of DPCCH DL during transmission of the power control preamble or the packet data, the UE halts CPCH UL transmission, aborts the access attempt and sends a failure message to the MAC layer.

16) If the UE completes the transmission of the packet data, the UE sends a success message to the MAC layer.

7 Procedures in Packet Data Transfer

7.1 Rapid Initialization of DCH for Packet Data Transfer

A rapid initialization procedure for establishing a DCH is defined to support bursting packet data transfer. The rapid initialization may be invoked for downlink packet data transfer on the DSCH or uplink packet data transfer on the DCH. The procedure may also be invoked to resume a recently discontinued DCH connection.

7.1.1 Rapid Initialization of DCH for Packet Data Transfer using DSCH

The synchronization of the DSCH/DCH pair may be expedited so that data transmission using DSCH can commence in slightly over 10 ms following the FACH burst assigning the TFCI using DCH. Figure 3 shows the timing diagram of RACH/FACH to DCH/DCH+DSCH state transition. The parameter T_A specifies the RACH/FACH response time. The parameters T_B, T_C and T_D are referenced relative to the FACH frame. T_B specifies the time period when the downlink DPCCH is started. The parameter T_C specifies the period at which the UE will start the uplink DPCCH. Finally, T_D specifies the period that the DCH will be stable and the first frame of data may arrive. The parameters T_B, T_C, and T_D have the following relationship:

$$T_B < T_C << T_D$$

$$T_D = T_B + N_{slots}*0.666$$

where N_{slots} is a positive integer.

In order to initialise fast uplink link power control loop, searcher and channel estimator at the Node B, the UE will adhere to the following:

- The transmission of uplink link DPCCH will start at N_{slots} slots (1 to 15 slots) prior to the scheduled downlink packet data transmission using DSCH.

- The DPCCH will be transmitted with an additional negative power offset P_{offset} from the computed open loop estimate.