

Agenda item: Ad hoc 14
Source: Philips
Title: Text proposal and Change Request for CPCH power control preamble
Document for: Decision

Introduction

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

The related procedure for rapid initialisation of the DCH uses a larger step size initially in the power control preamble than for the main part of the data transmission.

Simulation results in [1] (presented in Ad Hoc 9) 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-CR004 close this gap in the current description of the behaviour in the power control preamble.

Reference:

- [1] TSGR1#(99)g23
Philips, October 1999

3G 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 004

Current Version: **3.0.0**

3G specification number ↑

↑ CR number as allocated by 3G support team

For submission to TSG **RAN#6**
list TSG meeting no. here ↑

for approval (only one box should
for information be marked with an X)

Form: 3G CR cover sheet, version 1.0 The latest version of this form is available from: ftp://ftp.3gpp.org/Information/3GCRF-xx.rtf

Proposed change affects:

(at least one should be marked with an X)

USIM

ME

UTRAN

Core Network

Source:

Philips

Date:

14-Oct-99

Subject:

CPCH power control preamble

3G Work item:

Category:

(only one category shall be marked with an X)

- F Correction
- A Corresponds to a correction in a 2G specification
- B Addition of feature
- C Functional modification of feature
- D Editorial modification

X

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 2G 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.

- 7.2 Randomly selects a new signature from the available signatures within the ASC given by higher layers. Random function is TBD.
- 7.3 Increases the preamble transmission power with the specified offset ΔP_0 .
- 7.4 Decrease the Preamble Retransmission Counter by one.
- 7.5 If the Preamble Retransmission Counter > 0 , the UE repeats from step 6 otherwise an error indication is passed to the higher layers and the random-access procedure is exited.
8. If the UE detects the negative acquisition indicator corresponding to the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE:
- 8.1 Selects a new uplink access slot as in 7.1
- 8.2 Randomly selects a new signature from the available signatures within the ASC given by higher layers. Random function is TBD.
- 8.3 Modifies the preamble transmission power with the specified offset ΔP_1 .
- 8.4 Repeats from step 6
9. The UE transmits its random access message three or four uplink access slots after the uplink access slot of the last transmitted preamble depending on the AICH transmission timing parameter. Transmission power of the random access message is modified from that of the last transmitted preamble with the specified offset ΔP_{p-m} .
10. An indication of successful random-access transmission is passed to the higher layers.

Dynamic persistence is provided for managing interference and minimising delay by controlling access to the RACH channel. The system will publish a dynamic persistence value on the BCH, the value of which is dependent on the estimated backlog of users in the system.

Table 1 : The available access slots for different RACH sub-channels

	Sub-channel Number											
Frame number	0	1	2	3	4	5	6	7	8	9	10	11
SFN modulo 8=0	0	1	2	3	4	5	6	7				
SFN modulo 8=1	12	13	14						8	9	10	11
SFN modulo 8=2				0	1	2	3	4	5	6	7	
SFN modulo 8=3	9	10	11	12	13	14						8
SFN modulo 8=4	6	7					0	1	2	3	4	5
SFN modulo 8=5			8	9	10	11	12	13	14			
SFN modulo 8=6	3	4	5	6	7					0	1	2
SFN modulo 8=7						8	9	10	11	12	13	14

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)
- DPCCCH 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 function 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 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.
 - dd) 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 signature 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) ~~9-~~ If the UE receives a CD-AICH with a matching signature, the UE transmits the power control preamble $\tau_{cd-pc-p}$ ms later as measured from initiation of the CD Preamble. The transmission of the message portion of the burst starts immediately after the power control 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 $\Delta_{TPC-init}$, where $\Delta_{TPC-init}$ is equal to the minimum value out of 3 dB and $2\Delta_{TPC}$, 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.

- 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.