TSG-RAN Working Group 1 meeting No. 9 *TSGR1#9(99)j75*
Dresden, Germany
November 30 – December 3, 1999

Agenda Item: **Ad hoc 14**

Source: **Samsung and Philips**

Title: **Text Proposal for Channel assignment in CPCH**

Document for: **Approval**

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1. Introduction

The changes described here are only those needed to support the use of Channel Assignment in CPCH, as proposed in documents TSGR1#7(99)f49.

In this paper, we describes a channel assignment scheme for more enhanced CPCH procedure. And we also propose specific mappings between the signatures used for CD-AICH and the CPCH CD preamble, and also between the signature for CA-AICH and channel assignment for CPCH. These mappings are intended to minimise false detection probability and the complexity of UE.

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25.211	**CR**	**015**	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:	WG1	for approval	X	strategic		*(for SMG use only)*
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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: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: Samsung and Philips **Date:** 1999-11-27

Subject: Text proposal for Channel Assignment in CPCH.

Work item: CPCH

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

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
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: The changes described here are only those for TS 25.211 needed to support the use of Channel Assignment in CPCH.

Clauses affected: 3.3 Abbreviations, 5.3. timing relation 3.6 Acquisition Indication Channel, 7.4 PCPCH/AICH Timing relation

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	TS 25.213 CR 015 TS 25.214 CR 031
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:

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1. Text Proposal for 25.211

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AI	Acquisition Indicatior
AICH	Acquisition Indication Channel
AP	Access Preamble
BCH	Broadcast Channel
CA	Channel Assignment
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Collision Detection
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
DCH	Dedicated Channel
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
DSCH	Downlink Shared Channel
FACH	Forward Access Channel
FBI	Feedback Information
MUI	Mobile User Identifier
PCH	Paging Channel
P-CCPCH	Primary Common Control Physical Channel
PCPCH	Physical Common Packet Channel
PDSCH	Physical Downlink Shared Channel
PI	Page Indicatior
PICH	Page Indication Channel
PRACH	Physical Random Access Channel
PSC	Primary Synchronisation Code
RACH	Random Access Channel
RNC	Radio Network Controller
S-CCPCH	Secondary Common Control Physical Channel
SCH	Synchronisation Channel
SF	Spreading Factor
SFN	System Frame Number
SSC	Secondary Synchronisation Code
STTD	Space Time Transmit Diversity
TFCI	Transport Format Combination Indicator
TSTD	Time Switched Transmit Diversity
TPC	Transmit Power Control
UE	User Equipment
UTRAN	UMTS Terrestrial Radio Access Network

5.3.3.6 Acquisition Indication Channel (AICH)

The Acquisition Indicator channel (AICH) is a physical channel used to carry Acquisition Indicators (AI). Acquisition Indicator AI_i corresponds to signature *i* on the PRACH or PCPCH. Note that for PCPCH, the AICH is either in response to an access preamble or a CD preamble. The response corresponding to the access preamble ~~AICH~~ is the AP-AICH and thate corresponding to the CD preamble ~~AICH~~ is the CD-AICH and CA-AICH. The AP-AICH and CD-AICH use different channelization codes, while the CD-AICH and CA-AICH use the same channelization code, see further [4], Section 4.3.3.2.

Figure 1 illustrates the frame structure of the AICH. Two AICH frames of total length 20 ms consist of 15 *access slots* (AS), each of length 20 symbols (5120 chips). Each access slot consists of two parts, an *Acquisition-Indicator* (AI) part and an empty part.

The AI-part of the access slot is generated as described in Figure 21. The empty part of the access slot consists of 4 zeros. The phase reference for the AICH is the CPICH.

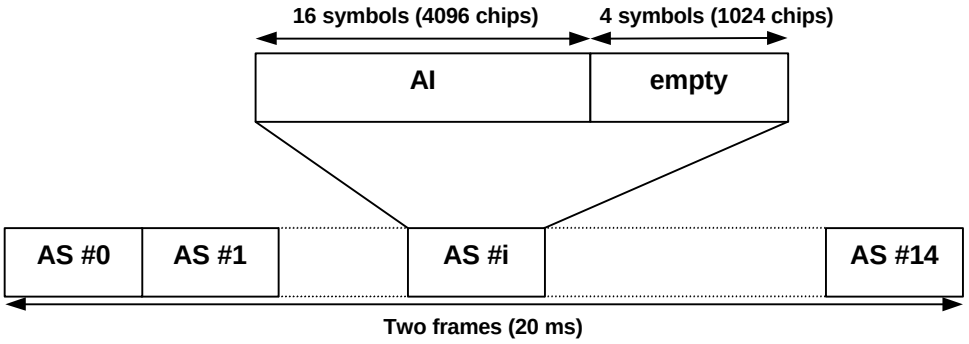

Figure 1: Structure of Acquisition Indicator Chanel (AICH)

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7.4 PCPCH/AICH timing relation

Everything in the previous section [PRACH/AICH] applies to this section as well. The timing relationship between preambles, AICH, and the message is the same as PRACH/AICH. Note that the collision resolution preambles follow the access preambles in PCPCH/AICH. However, the timing relationship~~s~~ between CD-Preamble and CD/CA-AICH is identical to that between RACH Preamble and AICH. The timing relationship between CD/CA-AICH and the Power Control Preamble in CPCH is identical to that between AICH and~~to~~ message in RACH. However, the set of values for T_{cpch} is TBD. As an example, when T_{cpch} is set to zero or one, the following PCPCH/AICH timing values apply:

Note that a1 corresponds to AP-AICH and a2 corresponds to CD/CA-AICH.

$\tau_{p\text{-}p}$ = Time to next available access slot, between Access Preambles.

Minimum time = 15360 chips + 5120 chips X Tcpch

Maximum time = 5120 chips X 12 = 61440 chips

Actual time is time to next slot (which meets minimum time criterion) in allocated access slot subchannel group.

$\tau_{p\text{-}a1}$ = Time between Access Preamble and AP-AICH has two alternative values: 7680 chips or 12800 chips, depending on T_{cpch}

$\tau_{a1\text{-}cdp}$ = Time between receipt of AP-AICH and transmission of the CD Preamble has one value: 7680 chips.

$\tau_{p\text{-}cdp}$ = Time between the last AP and CD Preamble. is either 3 or 4 access slots, depending on T_{cpch}

$\tau_{cdp\text{-}a2}$ = Time between the CD Preamble and the CD/CA-AICH has two alternative values: 7680 chips or 12800 chips, depending on T_{cpch}

$\tau_{cdp\text{-}pcp}$ = Time between CD Preamble and the start of the Power Control Preamble is either 3 or 4 access slots, depending on $T_{cpch.}$

Figure 27 illustrates the PCPCH/AICH timing relationship whenT_{cpch} is set to 0 and all access slot subchannels are available for PCPCH.

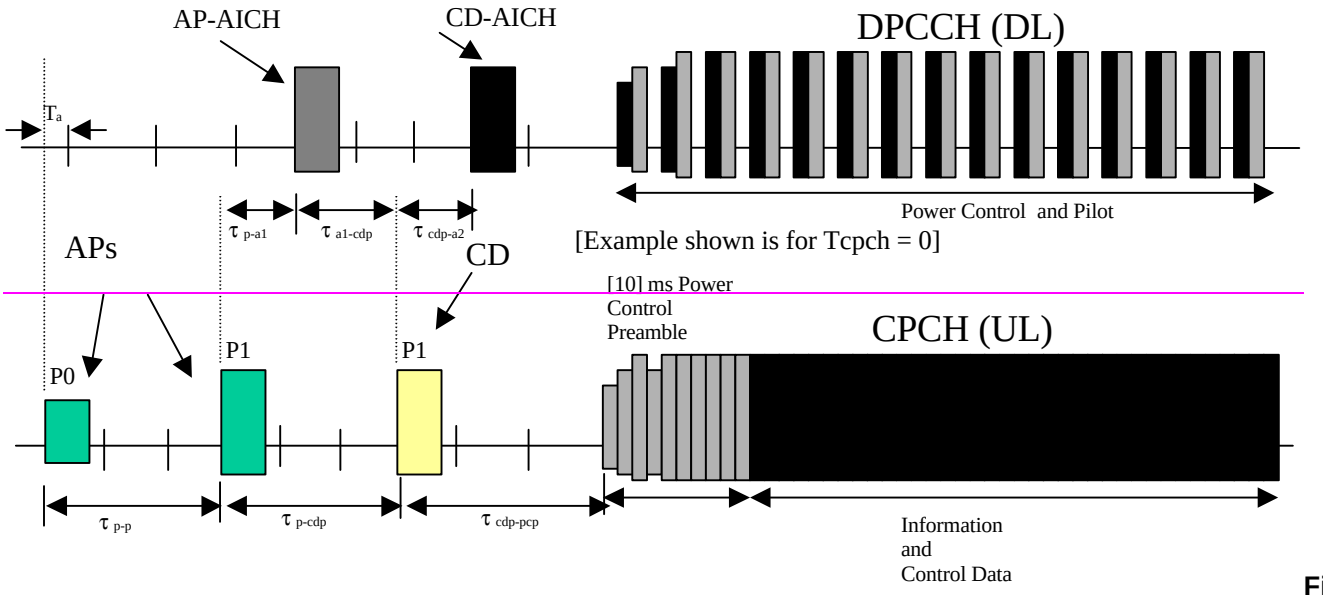
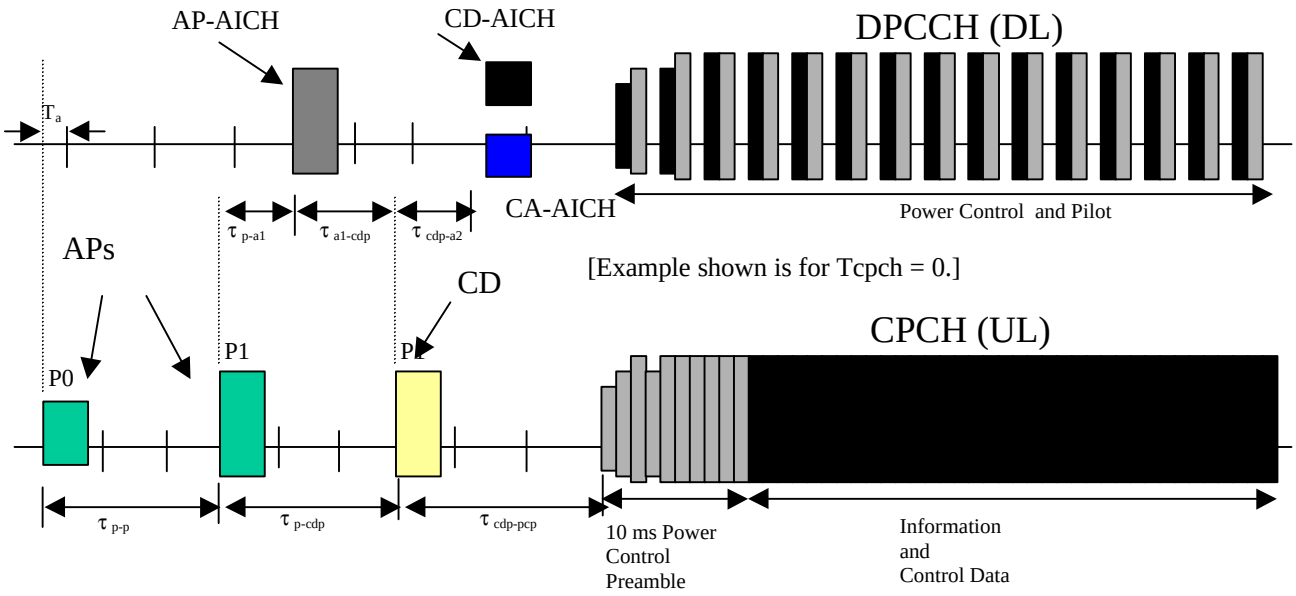


Figure 27: Timing of PCPCH and AICH transmission as seen by the UE, with T_{cpch}= 0.



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25.213	CR	015	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:	WG1	for approval	X	strategic		(for SMG use only)
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Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Samsung and Philips **Date:** 1999-11-27

Subject: Text proposal for Channel Assignment in CPCH.

Work item: CPCH

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: The changes described here are only those for TS 25.213 needed to support the use of Channel Assignment in CPCH.

Clauses affected: 3.3 Abbreviations, 5.1 Spreading

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	TS 25.211 CR 015 TS 25.214 CR 031
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:

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3. Text Proposal for 25.213

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AICH Acquisition Indicator Channel
AP Access Preamble
BCH Broadcast Control Channel
CA Channel Assignment
CCPCH Common Control Physical Channel
CD Collision Detection
CPCH Common Packet Channel
DCH Dedicated Channel
DPCH Dedicated Physical Channel
DPCCH Dedicated Physical Control Channel
DPDCH Dedicated Physical Data Channel
FDD Frequency Division Duplex
Mcps Mega Chip Per Second
OVSF Orthogonal Variable Spreading Factor (codes)
PDSCH Physical Dedicated Shared Channel
PICH Page Indication Channel
PRACH Physical Random Access Channel
PSC Primary Synchronization Code
RACH Random Access Channel
SCH Synchronisation Channel
SSC Secondary Synchronization Code
SF Spreading Factor
UE User Equipment

5.1 Spreading

…SNIP….

Figure 10 illustrates the detailed generation of an AICH access slot. Note that this is an example implementation.

The AI-part of the access slot consists of the symbol-wise sum of up to 16 orthogonal code words w1-w16, multiplied by the value of the corresponding acquisition indicator AIi. The orthogonal code words w1,...,w16 are shown in Table 4.

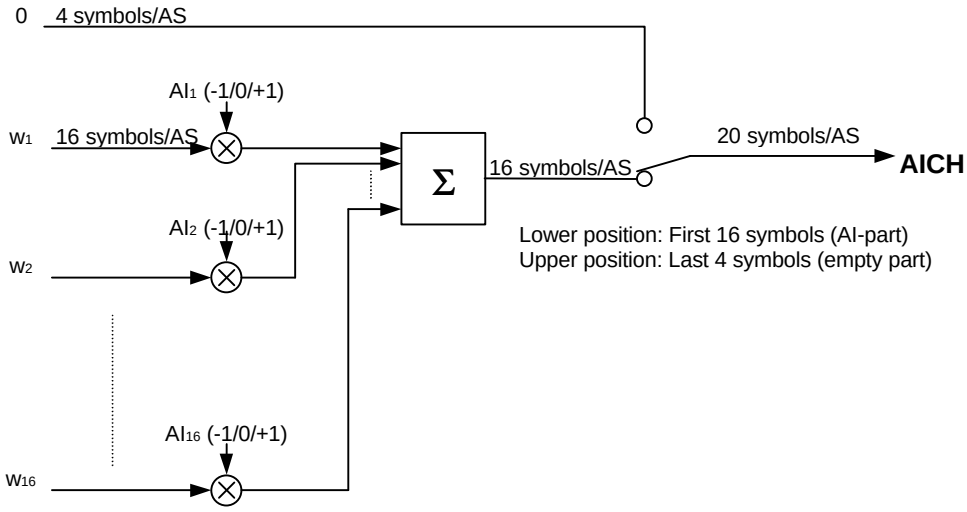

Figure 10 Schematic generation of AICH

I	w_I															
1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
2	A	-A	A	-A	A	-A	A	-A	A	-A	A	-A	A	-A	A	-A
3	A	A	-A	-A	A	A	-A	-A	A	A	-A	-A	A	A	-A	-A
4	A	-A	-A	A	A	-A	-A	A	A	-A	-A	A	A	-A	-A	A
5	A	A	A	A	-A	-A	-A	-A	A	A	A	A	-A	-A	-A	-A
6	A	-A	A	-A	-A	A	-A	A	A	-A	A	-A	-A	A	-A	A
7	A	A	-A	-A	-A	-A	A	A	A	A	-A	-A	-A	-A	A	A
8	A	-A	-A	A	-A	A	A	-A	A	-A	-A	A	-A	A	A	-A
9	A	A	A	A	A	A	A	A	-A	-A	-A	-A	-A	-A	-A	-A
10	A	-A	A	-A	A	-A	A	-A	-A	A	-A	A	-A	A	-A	A
11	A	A	-A	-A	A	A	-A	-A	-A	-A	A	A	-A	-A	A	A
12	A	-A	-A	A	A	-A	-A	A	-A	A	A	-A	-A	A	A	-A
13	A	A	A	A	-A	-A	-A	-A	-A	-A	-A	-A	A	A	A	A
14	A	-A	A	-A	-A	A	-A	A	-A	A	-A	A	A	-A	A	-A
15	A	A	-A	-A	-A	-A	A	A	-A	-A	A	A	A	A	-A	-A
16	A	-A	-A	A	-A	A	A	-A	-A	A	A	-A	A	-A	-A	A

Table 4 Definition of orthogonal vectors w1-w16 used in AICH; A = (1+j)

When a CA AICH is transmitted as a response to a CPCH CD preamble, the mapping between the signature for the CA-AICH and the Channel assignment for CPCH is as shown in Table 5 (where the negative sign indicates that the corresponding signature sequence is inverted.) Only one CA-AICH can be sent in an AICH slot.

CPCH assignment	CD-AICH signature
1	1
2	-1
3	9
4	-9
5	5
6	-5
7	13
8	-13
9	3
10	-3
11	7
12	-7
13	11
14	-11
15	15

16	-15

Table 5 Mapping between CA-AICH signature and channel assignment for CPCH.

When a CD AICH is transmitted as a response to a CPCH CD preamble, the mapping between signatures for the CD-AICH and the CD preamble is as shown in Table 6 (where the negative sign indicates that the corresponding signature sequence is inverted).

CD preamble signature	CD-AICH signature
1	2
2	-2
3	4
4	-4
5	6
6	-6
7	8
8	-8
9	10
10	-10
11	12
12	-12
13	14
14	-14
15	16
16	-16

Table 6 Mapping between CD-AICH signatures and CD preamble signatures.

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25.214	CR	031	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:	WG1	for approval	X	strategic		(for SMG use only)
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Source: Samsung and Philips **Date:** 1999-11-27

Subject: Text proposal for Channel Assignment in CPCH.

Work item: CPCH

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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: The changes described here are only those for TS 25.214 needed to support the use of Channel Assignment in CPCH.

Clauses affected: 3.3 Abbreviations, 6.2 CPCH Access Procedure

Other specs affected:	Other 3G core specifications	X	→ List of CRs:	TS 25.211 CR 015 TS 25.213 CR 015
	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:

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3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASC	Access Service Class
AP	Access Preamble
BCH	Broadcast Channel
CA	Channel Assignment
CCPCH	Common Control Physical Channel
CD	Collision Detection
CPCH	Common Packet Channel
DCH	Dedicated Channel
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
FACH	Forward Access Channel
MUI	Mobile User Identifier
PCH	Paging Channel
PCPCH	Physical Common Packet Channel
PI	Paging Indication
PRACH	Physical Random Access Channel
RACH	Random Access Channel
SCH	Synchronisation Channel
SIR	Signal-to-Interference Ratio
SSDT	Site Selection Diversity TPC
TPC	Transmit Power Control
UE	User Equipment

….SNIP….

6.2 CPCH Access Procedures

<Editor's note: This clause is W.A., not agreement, Contents are to be determined in WG1#7bis>

For each CPCH physical channel 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/CA-AICH ~~preamble~~ channelization code.
- CPCH UL scrambling code.
- CPCH UL channelization code. (variable, data rate dependant)
- DPCCH DL channelization code.([512] chip)

The following are access, collision detection/resolution, channel assignment 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/CA-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 decodes the channel assignment information in the CA-AICH. The CPCH UL and DPCCH DL are assigned by the CA-AICH. Then, the UE transmits the power control preamble $\tau_{\text{cd-p-pc-p}}$ 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.

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