3GPP TSG RAN WG1 ***TSGR1#9(99j18***
November 30 – December 3, 1999, Dresden, Germany

Agenda item: **Ad hoc 14**

Source: **Philips**

Title: **Draft Text Proposals for CPCH status broadcast**

Document for: **Decision**

Introduction

This document contains text to add the definition of a CPCH status broadcast channel to 25.211 and 25.214. Following discussion the main features of the proposal (in 25.211) are as follows:

- A new physical channel (CSICH) is defined where information is transmitted in the unused parts of the AICH.
- The status information is assumed to be Layer 1 information
- The spreading code is the same as the AP-AICH, so no additional channelization code is required.
- The modulation/demodulation is the same as for the PICH, so there is minimal increase in UE complexity.
- In accordance with the current assumptions in WG1, one status indicator is transmitted for each CPCH. However, this could be easily modified to support channel assignment where one status indicator could be transmitted for each bit rate available.
- The binary signalling format is the optimum for continuous broadcast of status flags (like in the PICH).
- In a 20ms frame CSICH frame there are 120 bits which are filled by a combination of bit repetition and repetition of status indicators (up to a maximum of 4 per access slot). The bit repetition factor can be adjusted by the network to achieve a compromise between downlink power and update rate of the status information.
- Some limited time diversity is provided by separation between different repetitions of the status indicators

The changes to 25.214 include the requirement to monitor the status channel near the start of the access procedure, and again if there is no response to the transmission of the Access Preamble. In order to simplify the changes, the first two stages of the CPCH access procedure have been deleted, since they correspond to MAC layer processes which should not be part of the Layer 1 specifications, and replaced with new text.

The CR’s presented here address only issues connected with introduction of CPCH status broadcast and do not consider other CPCH related modifications

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

Document R1-99j18
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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3G25.211	**CR**	**013**	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: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio	X	Core Network	

Source:	Philips	**Date:**	1999-11-25
Subject:	Addition of a downlink channel indicating CPCH status		
Work item:			

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature	X		Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change:	Broadcast of status information significantly improves performance of CPCH
Clauses affected:	3.3, 5.3.3, 6

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:	

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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
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Collision Detection
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
CSICH	CPCH Status Indicator 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
SI	Status Indicator
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 Common downlink physical channels

5.3.3.1 Common Pilot Channel (CPICH)

The CPICH is a fixed rate (30 kbps, SF=256) downlink physical channel that carries a pre-defined bit/symbol sequence. Figure 13 shows the frame structure of the CPICH.

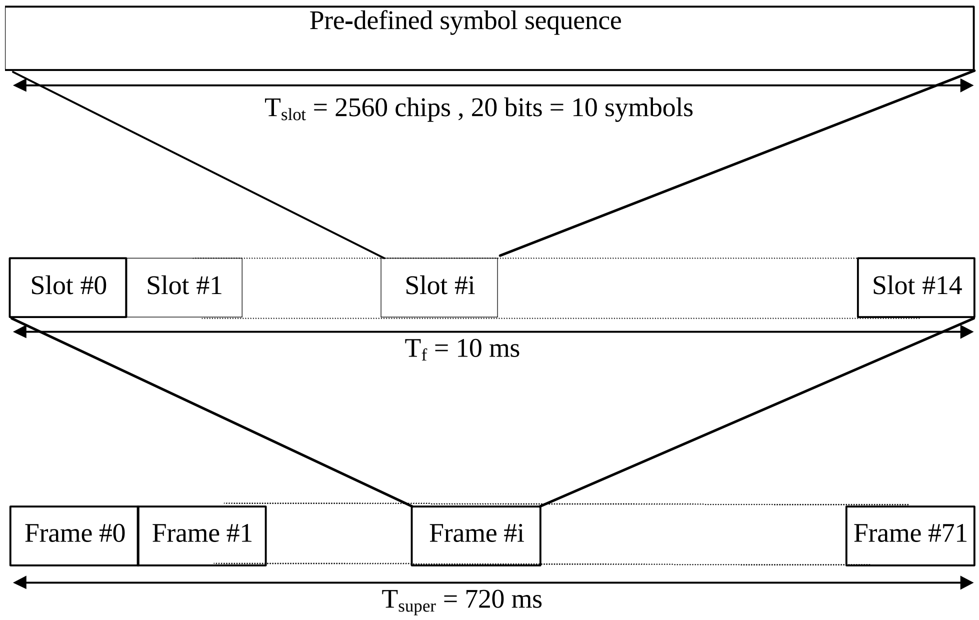

Figure 13: Frame structure for Common Pilot Channel

In case of Transmit Diversity (open or closed loop), the CPICH should be transmitted from both antennas using the same channelization and scrambling code. In this case, the pre-defined symbol sequence of the CPICH is different for Antenna 1 and Antenna 2, see figure 14. In case of no Transmit Diversity, the symbol sequence of Antenna 1 in figure 14 is used.

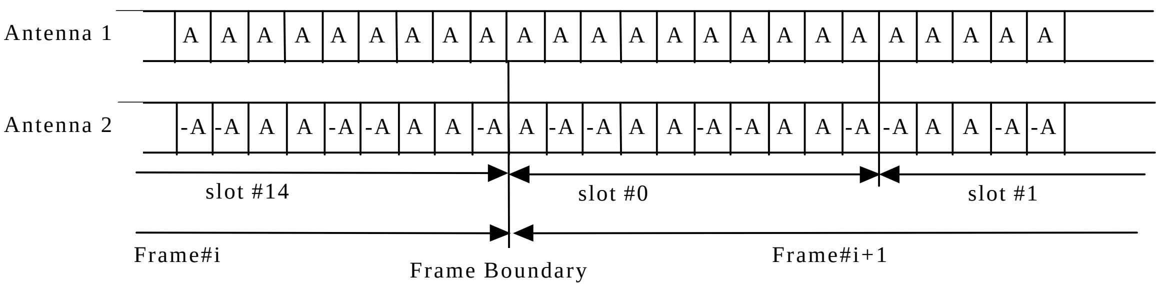

Figure 14: Modulation pattern for Common Pilot Channel (with A = 1+j)

There are two types of Common pilot channels, the Primary and Secondary CPICH. They differ in their use and the limitations placed on their physical features.

5.3.3.1.1 Primary Common Pilot Channel

The Primary Common Pilot Channel has the following characteristics:

- The same channelization code is always used for this channel, see [4]
- Scrambled by the primary scrambling code, see [4]
- One per cell

- Broadcast over the entire cell

The Primary CPICH is the phase reference for the following downlink channels: SCH, Primary CCPCH, AICH, PICH. The Primary CPICH is also the *default* phase reference for all other downlink physical channels.

5.3.3.1.2 Secondary Common Pilot Channel

A Secondary Common Pilot Channel the following characteristics:

- Can use an arbitrary channelization code of SF=256, see [4]
- Scrambled by either the primary or a secondary scrambling code, see [4]
- Zero, one, or several per cell
- May be transmitted over only a part of the cell
- A Secondary CPICH may be the reference for the Secondary CPCCH and the downlink DPCH. If this is the case, the UE is informed about this by higher-layer signalling.

5.3.3.2 Primary Common Control Physical Channel (P-CCPCH)

The Primary CCPCH is a fixed rate (30 kbps, SF=256) downlink physical channels used to carry the BCH.

Figure 15 shows the frame structure of the Primary CCPCH. The frame structure differs from the downlink DPCH in that no TPC commands, no TFCI and no pilot bits are transmitted The Primary CCPCH is not transmitted during the first 256 chips of each slot. Instead, Primary SCH and Secondary SCH are transmitted during this period (see section 5.3.3.4).

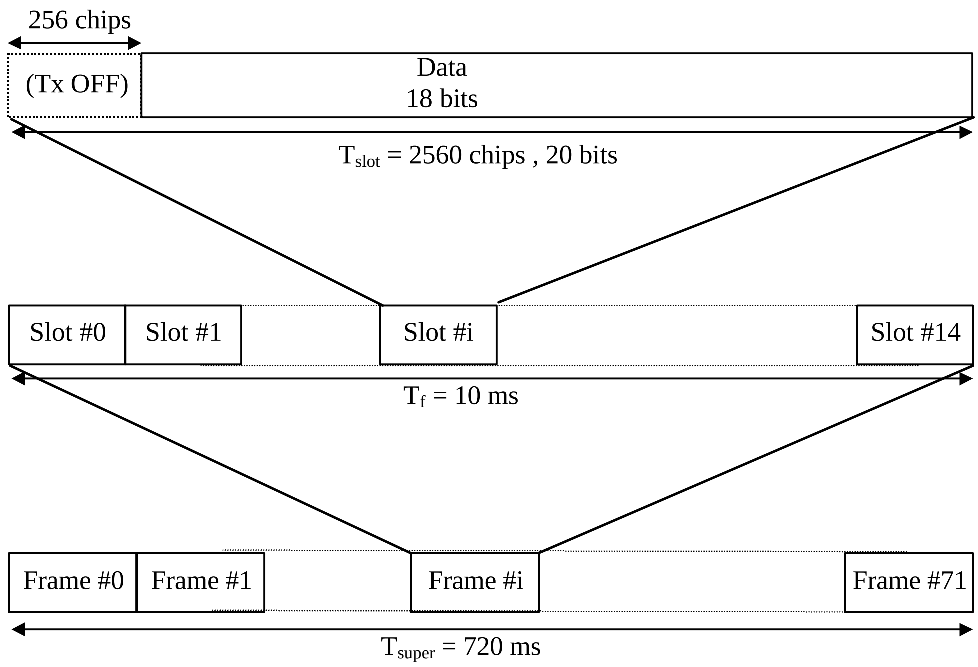

Figure 15: Frame structure for Primary Common Control Physical Channel

5.3.3.2.1 Primary CCPCH structure with STTD encoding

In case the diversity antenna is present in UTRAN and the P-CCPCH is to be transmitted using open loop transmit diversity, the data symbols of the P-CCPCH are STTD encoded as given in section 5.3.1.1.1, figure 7 and figure 8. The last odd data symbol in every frame (10 ms) is not STTD encoded and the same symbol is transmitted with equal power from the two antennas. Higher layers signal whether STTD encoding is used for the P-CCPCH or not. In addition, higher layer signalling indicates the presence/absence of STTD encoding on P-CCPCH, by modulating the

SCH. During power on and hand over between cells the UE determines the presence of STTD encoding on the P-CCPCH, by either receiving the higher layer message, by demodulating the SCH channel or by a combination of the above two schemes.

The STTD encoding for the data symbols of the slots 0 and 1 of a P-CCPCH frame is given in the figure 16. The same procedure is used for the data symbols of slots 2 and 3, 4 and 5 and henceforth, respectively.

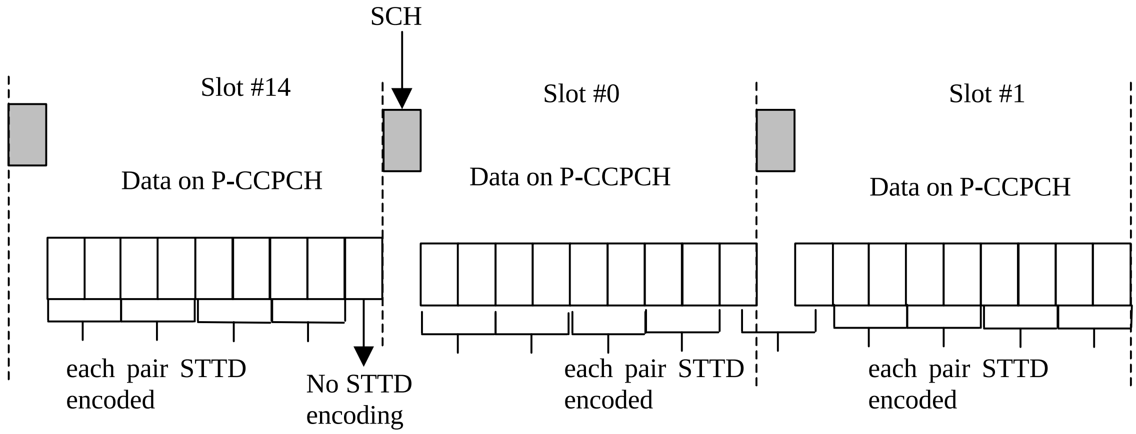

Figure 16: STTD encoding for the data symbols of the P-CCPCH

5.3.3.3 Secondary Common Control Physical Channel (S-CCPCH)

The Secondary CCPCH is used to carry the FACH and PCH. There are two types of Secondary CCPCH: those that include TFCI and those that do not include TFCI. It is the UTRAN that determines if a TFCI should be transmitted, hence making it mandatory for all UEs to support the use of TFCI. The set of possible rates is the same as for the downlink DPCH, see section 5.3.2. The frame structure of the Secondary CCPCH is shown in figure 17.

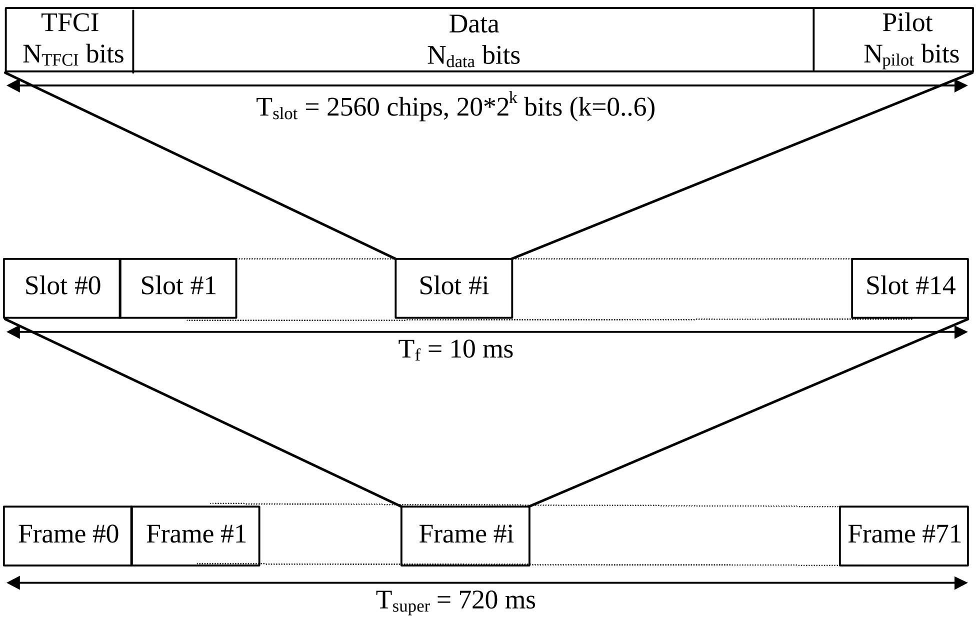

Figure 17: Frame structure for Secondary Common Control Physical Channel

The parameter k in figure 17 determines the total number of bits per downlink Secondary CCPCH slot. It is related to the spreading factor SF of the physical channel as $SF = 256/2^k$. The spreading factor range is from 256 down to 4.

The values for the number of bits per field are given in table 16 and table 17. The channel bit and symbol rates given in table 16 are the rates immediately before spreading. The pilot patterns are given in table 18.

The FACH and PCH can be mapped to the same or to separate Secondary CCPCHs. If FACH and PCH are mapped to the same Secondary CCPCH, they can be mapped to the same frame. The main difference between a CCPCH and a downlink dedicated physical channel is that a CCPCH is not inner-loop power controlled. The main difference between the Primary and Secondary CCPCH is that the Primary CCPCH has a fixed predefined rate while the Secondary CCPCH can support variable rate with the help of the TFCI field included. Furthermore, a Primary CCPCH is continuously transmitted over the entire cell while a Secondary CCPCH is only transmitted when there is data available and may be transmitted in a narrow lobe in the same way as a dedicated physical channel (only valid for a Secondary CCPCH carrying the FACH).

Table 16: Secondary CCPCH fields with pilot bits

Slot Format #i	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{data}	N_{pilot}	N_{TFCI}
0	30	15	256	300	20	12	8	0
1	30	15	256	300	20	10	8	2
2	60	30	128	600	40	32	8	0
3	60	30	128	600	40	30	8	2
4	120	60	64	1200	80	64	8	8*
5	240	120	32	2400	160	144	8	8*
6	480	240	16	4800	320	296	16	8*
7	960	480	8	9600	640	616	16	8*
8	1920	960	4	19200	1280	1256	16	8*

* If TFCI bits are not used, then DTX shall be used in TFCI field.

Table 17: Secondary CCPCH fields without pilot bits

Slot Format #i	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{data}	N_{pilot}	N_{TFCI}
0	30	15	256	300	20	20	0	0
1	30	15	256	300	20	18	0	2
2	60	30	128	600	40	40	0	0
3	60	30	128	600	40	38	0	2
4	120	60	64	1200	80	72	0	8*
5	240	120	32	2400	160	152	0	8*
6	480	240	16	4800	320	312	0	8*
7	960	480	8	9600	640	632	0	8*
8	1920	960	4	19200	1280	1272	0	8*

* If TFCI bits are not used, then DTX shall be used in TFCI field.

The pilot symbol pattern is described in table 18. The shadowed part can be used as frame synchronization words. (The symbol pattern of pilot symbols other than the frame synchronization word shall be “11”). In table 18, the transmission order is from left to right. (Each two-bit pair represents an I/Q pair of QPSK modulation.)

Table 18: Pilot Symbol Pattern

	N_{pilot} = 8				N_{pilot} = 16							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #0	11	11	11	10	11	11	11	10	11	11	11	10
1	11	00	11	10	11	00	11	10	11	11	11	00
2	11	01	11	01	11	01	11	01	11	10	11	00
3	11	00	11	00	11	00	11	00	11	01	11	10
4	11	10	11	01	11	10	11	01	11	11	11	11
5	11	11	11	10	11	11	11	10	11	01	11	01
6	11	11	11	00	11	11	11	00	11	10	11	11
7	11	10	11	00	11	10	11	00	11	10	11	00
8	11	01	11	10	11	01	11	10	11	00	11	11
9	11	11	11	11	11	11	11	11	11	00	11	11
10	11	01	11	01	11	01	11	01	11	11	11	10
11	11	10	11	11	11	10	11	11	11	00	11	10
12	11	10	11	00	11	10	11	00	11	01	11	01
13	11	00	11	11	11	00	11	11	11	00	11	00
14	11	00	11	11	11	00	11	11	11	10	11	01

For slot formats using TFCI, the TFCI value in each radio frame corresponds to a certain transport format combination of the FACHs and/or PCHs currently in use. This correspondence is (re-)negotiated at each FACH/PCH addition/removal. The mapping of the TFCI bits onto slots is described in [3].

5.3.3.3.1 Secondary CCPCH structure with STTD encoding

In case the diversity antenna is present in UTRAN and the S-CCPCH is to be transmitted using open loop transmit diversity, the data symbols of the S-CCPCH are STTD encoded as given in Section 5.3.1.1.1, figure 7 and figure 8. The diversity antenna pilot symbol pattern for the S-CCPCH is given in table 19 below.

Table 19: Pilot symbol pattern for the diversity antenna when STTD encoding is used on the S-CCPCH

	N_{pilot} = 8				N_{pilot} = 16							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #0	11	00	00	10	11	00	00	10	11	00	00	10
1	11	00	00	01	11	00	00	01	11	10	00	10
2	11	11	00	00	11	11	00	00	11	10	00	11
3	11	10	00	01	11	10	00	01	11	00	00	00
4	11	11	00	11	11	11	00	11	11	01	00	10
5	11	00	00	10	11	00	00	10	11	11	00	00
6	11	10	00	10	11	10	00	10	11	01	00	11
7	11	10	00	11	11	10	00	11	11	10	00	11
8	11	00	00	00	11	00	00	00	11	01	00	01
9	11	01	00	10	11	01	00	10	11	01	00	01
10	11	11	00	00	11	11	00	00	11	00	00	10
11	11	01	00	11	11	01	00	11	11	00	00	01
12	11	10	00	11	11	10	00	11	11	11	00	00
13	11	01	00	01	11	01	00	01	11	10	00	01
14	11	01	00	01	11	01	00	01	11	11	00	11

5.3.3.4 Synchronisation Channel (SCH)

The Synchronisation Channel (SCH) is a downlink signal used for cell search. The SCH consists of two sub channels, the Primary and Secondary SCH. The 10 ms radio frames of the Primary and Secondary SCH are divided into 15 slots, each of length 2560 chips. Figure 18 illustrates the structure of the SCH radio frame.

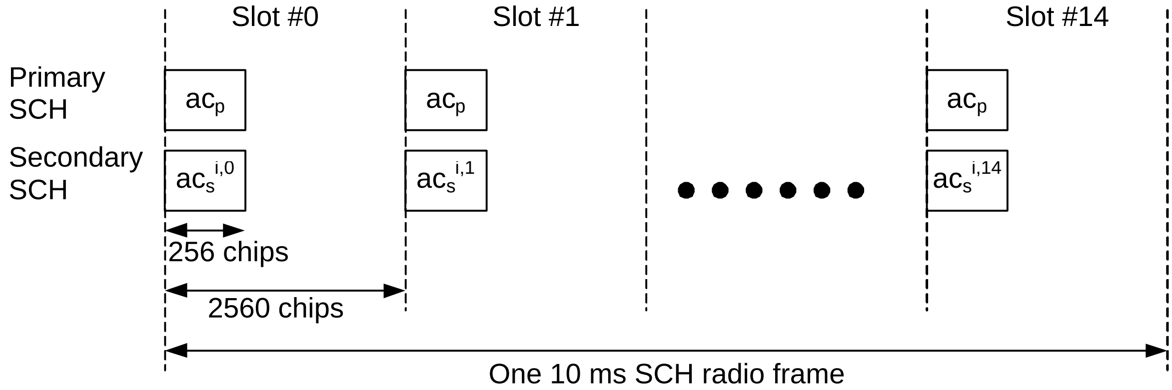

Figure 18: Structure of Synchronisation Channel (SCH)

The Primary SCH consists of a modulated code of length 256 chips, the Primary Synchronisation Code (PSC) denoted c_p in figure 18, transmitted once every slot. The PSC is the same for every cell in the system.

The Secondary SCH consists of repeatedly transmitting a length 15 sequence of modulated codes of length 256 chips, the Secondary Synchronisation Codes (SSC), transmitted in parallel with the Primary SCH. The SSC is denoted $c_s^{i,k}$ in figure 18, where i = 1, 2, …, 64 is the number of the scrambling code group, and k = 0, 1, …, 14 is the slot number. Each SSC is chosen from a set of 16 different codes of length 256. This sequence on the Secondary SCH indicates which of the code groups the cell's downlink scrambling code belongs to.

The primary and secondary synchronization codes are modulated by the symbol a shown in figure 18, which indicates the presence/ absence of STTD encoding on the P-CCPCH and is given by the following table:

P-CCPCH STTD encoded	a = +1
P-CCPCH not STTD encoded	a = -1

5.3.3.4.1 SCH transmitted by TSTD

Figure 19 illustrates the structure of the SCH transmitted by the TSTD scheme. In even numbered slots both PSC and SSC are transmitted on antenna 1, and in odd numbered slots both PSC and SSC are transmitted on antenna 2.

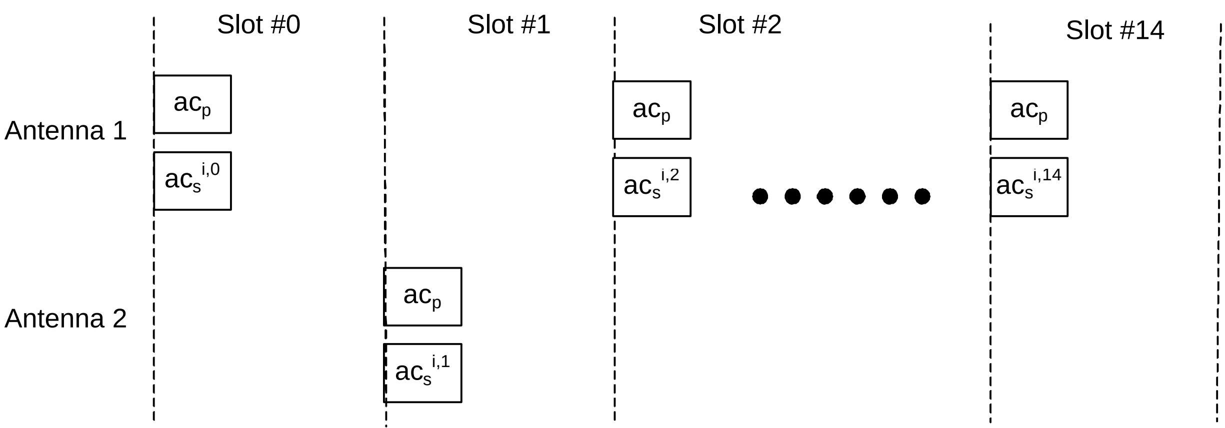

Figure 19: Structure of SCH transmitted by TSTD scheme

5.3.3.5 Physical Downlink Shared Channel (PDSCH)

The Physical Downlink Shared Channel (PDSCH), used to carry the Downlink Shared Channel (DSCH), is shared by users based on code multiplexing. As the DSCH is always associated with a DCH, the PDSCH is always associated with a downlink DPCH.

The frame and slot structure of the PDSCH are shown on figure 20.

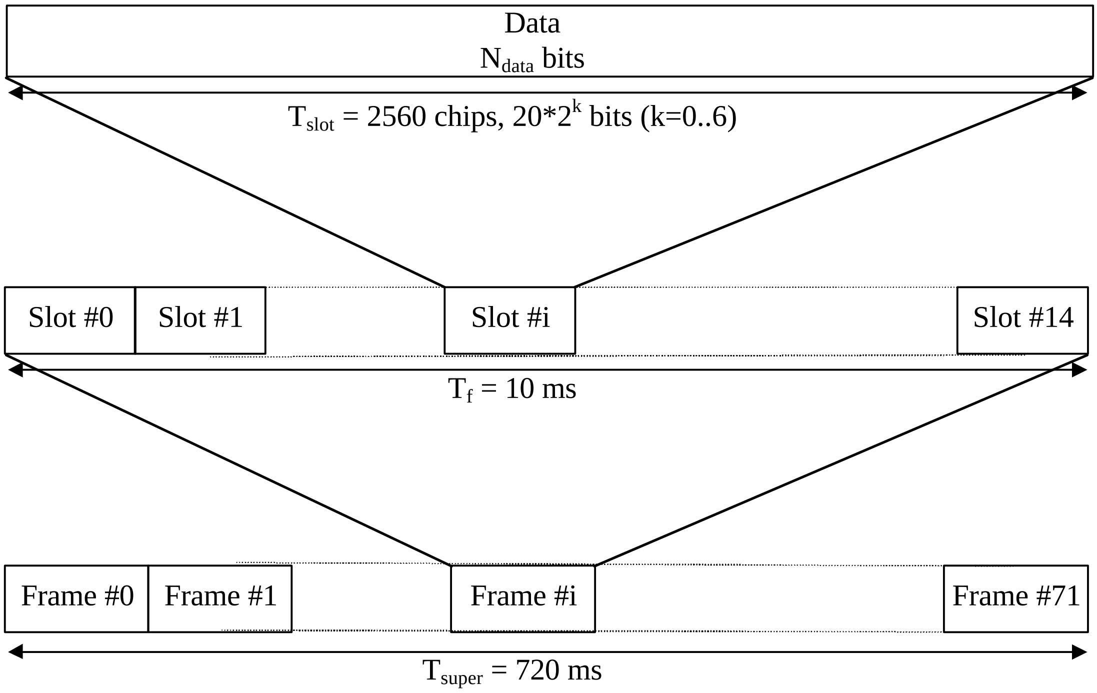

Figure 20: Frame structure for the PDSCH

To indicate for UE that there is data to decode on the DSCH, two signalling methods are possible, either using the TFCI field, or higher layer signalling.

The PDSCH transmission with associated DPCH is a special case of multicode transmission. The PDSCH and DPCH do not have necessary the same spreading factors and for PDSCH the spreading factor may vary from frame to frame. The relevant Layer 1 control information is transmitted on the DPCCH part of the associated DPCH, the PDSCH does not contain physical layer information. The channel bit and symbol rates for PDSCH are given in table 20.

For PDSCH the allowed spreading factors may vary from 256 to 4.

If the spreading factor and other physical layer parameters can vary on a frame-by-frame basis, the TFCI shall be used to inform the UE what are the instantaneous parameters of PDSCH including the channelisation code from the PDSCH OVSF code tree.

A DSCH may be mapped to multiple parallel PDSCHs as well, as negotiated at higher layer prior to starting data transmission. In such a case the parallel PDSCHs shall be operated with frame synchronization between each other.

Table 20: PDSCH fields

Slot format #i	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{data}
0	30	15	256	300	20	20
1	60	30	128	600	40	40
2	120	60	64	1200	80	80
3	240	120	32	2400	160	160
4	480	240	16	4800	320	320
5	960	480	8	9600	640	640
6	1920	960	4	19200	1280	1280

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 corresponding to the access preamble AICH is the AP-AICH and the corresponding to the CD preamble AICH is the CD-AICH. The AP-AICH and CD-AICH use different channelization codes, see further[4], Section 4.3.3.2.

Figure 21 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 [4]. The empty part of the access slot consists of 4 zeros. The phase reference for the AICH is the CPICH.

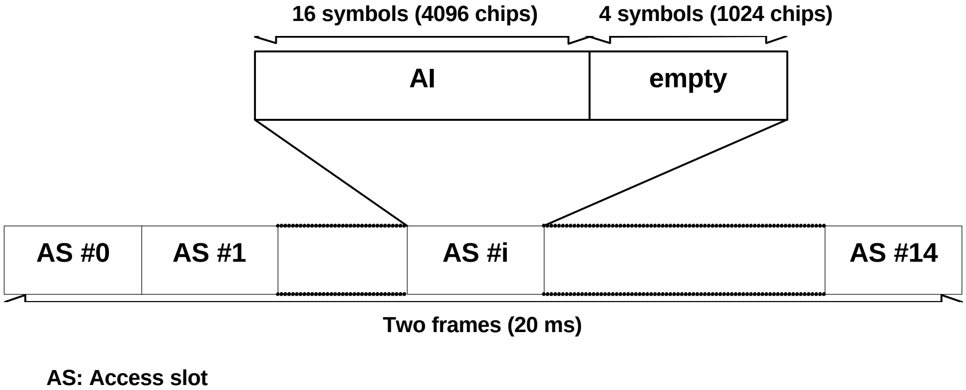

Figure 21: Structure of Acquisition Indicator Channel (AICH)

5.3.3.7 Page Indication Channel (PICH)

The Page Indicator Channel (PICH) is a fixed rate (SF=256) physical channel used to carry the Page Indicators (PI). The PICH is always associated with an S-CCPCH to which a PCH transport channel is mapped.

Figure 22 illustrates the frame structure of the PICH. One PICH frame of length 10 ms consists 300 bits. Of these, 288 bits are used to carry Page Indicators. The remaining 12 bits are not used.

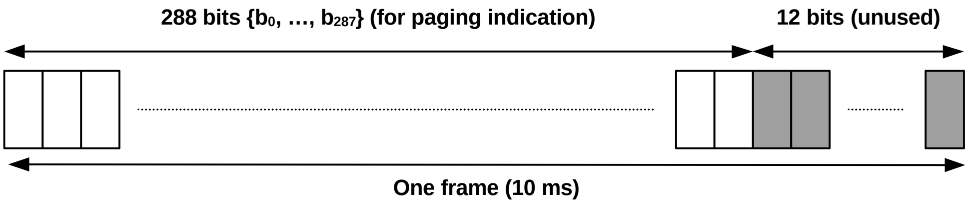

Figure 22: Structure of Page Indicator Channel (PICH)

N Page Indicators $\{PI_0, \ldots, PI_{N-1}\}$ are transmitted in each PICH frame, where N=18, 36, 72, or 144. The mapping from $\{PI_0, \ldots, PI_{N-1}\}$ to the PICH bits $\{b_0, \ldots, b_{287}\}$ are according to table 21.

Table 21: Mapping of Page Indicators (PI) to PICH bits

Number of PI per frame (N)	$PI_i = 1$	$PI_i = 0$
N=18	$\{b_{16i}, \ldots, b_{16i+15}\} = \{1,1,\ldots,1\}$	$\{b_{16i}, \ldots, b_{16i+15}\} = \{0,0,\ldots,0\}$
N=36	$\{b_{8i}, \ldots, b_{8i+7}\} = \{1,1,\ldots,1\}$	$\{b_{8i}, \ldots, b_{8i+7}\} = \{0,0,\ldots,0\}$
N=72	$\{b_{4i}, \ldots, b_{4i+3}\} = \{1, 1,\ldots,1\}$	$\{b_{4i}, \ldots, b_{4i+3}\} = \{0, 0,\ldots,0\}$
N=144	$\{b_{2i}, b_{2I+1}\} = \{1,1\}$	$\{b_{2i}, b_{2i+1}\} = \{0,0\}$

If a Paging Indicator in a certain frame is set to "1" it is an indication that UEs associated with this Page Indicator should read the corresponding frame of the associated S-CCPCH.

5.3.3.8 CPCH Status Indicator Channel (CSICH)

The CPCH Status Indicator Channel (CSICH) is a fixed rate (SF=256) physical channel used to carry CPCH status information.

The CSICH is always associated with the physical channel used for transmission of CPCH AP-AICH and uses the same channelization and scrambling codes.

Figure 23 illustrates the frame structure of the CSICH. The CSICH frame consists of 15 consecutive access slots (AS) each of length 40 bits. Each access slot consists of two parts, an unused part of 32 bits a0,….a31 and a Status Indicator (SI) part consisting of 8 bits a32,….a39. The phase reference for the CSICH is the CPICH.

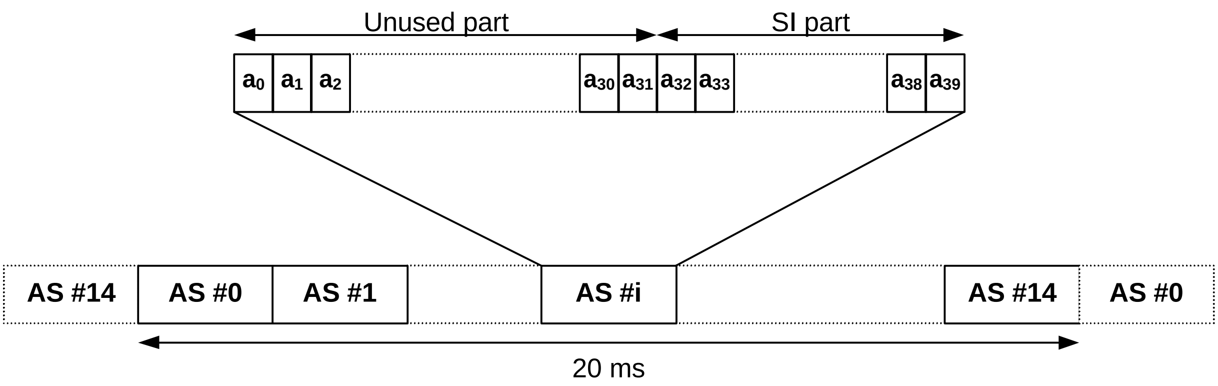

Figure 23: Structure of CPCH Status Indicator Channel (CSICH)

The bits in the SI part of each access slot are mapped to 120 bits in the complete CSICH frame the following way:

$b_k = a_{m,i}$

where the bit number in the CSICH frame is k= m*8+j-32, m is the access slot number and j is the bit number {32…..39} in the SI part of the access slot.

N Status Indicators $\{SI_0, \ldots, SI_{N-1}\}$ should be transmitted in each CSICH frame. The mapping from $\{SI_0, \ldots, SI_{N-1}\}$ to the CSICH bits $\{b_0, \ldots, b_{119}\}$ is according to table 22. The Status Indicators should be transmitted in all the access slots of the CSICH frame, even if some signatures and/or access slots are shared between CPCH and RACH.

Table 22: Mapping of Status Indicators (SI) to CSICH bits

Number of SI per frame (N)	$SI_i = 1$	$SI_i = 0$
N=1	$\{b_0, \ldots, b_{119}\} = \{1,1,\ldots,1\}$	$\{b_0, \ldots, b_{119}\} = \{0,0,\ldots,0\}$
N=3	$\{b_{40i}, \ldots, b_{40i+39}\} = \{1,1,\ldots,1\}$	$\{b_{40i}, \ldots, b_{40i+39}\} = \{0,0,\ldots,0\}$
N=5	$\{b_{24i}, \ldots, b_{24i+23}\} = \{1,1,\ldots,1\}$	$\{b_{24i}, \ldots, b_{24i+23}\} = \{0,0,\ldots,0\}$
N=15	$\{b_{8i}, \ldots, b_{8i+7}\} = \{1,1,\ldots,1\}$	$\{b_{8i}, \ldots, b_{8i+7}\} = \{0,0,\ldots,0\}$
N=30	$\{b_{4i}, \ldots, b_{4i+3}\} = \{1, 1, 1, 1\}$	$\{b_{4i}, \ldots, b_{4i+3}\} = \{0, 0, 0, 0\}$
N=60	$\{b_{2i}, b_{2i+1}\} = \{1,1\}$	$\{b_{2i}, b_{2i+1}\} = \{0,0\}$

If a Status Indicator is set to "1" it is an indication that the CPCH associated with that Status Indicator is not available, otherwise it is an indication that the channel is free.

The mapping between CPCH and the Status Indicators is as follows: SI_i is associated with CPCH number (i mod N_{CPCH}), where the number of CPCH's is N_{CPCH} and N must be greater than or equal to N_{CPCH}. Note that the status of some CPCH may be transmitted less frequently than others.

6 Mapping of transport channels onto physical channels

Figure 24~~3~~ summarises the mapping of transport channels onto physical channels.

Transport Channels	Physical Channels
BCH	Common Pilot Channel (CPICH) Primary Common Control Physical Channel (P-CCPCH)
FACH	Secondary Common Control Physical Channel (S-CCPCH)
PCH	
RACH	Physical Random Access Channel (PRACH)
CPCH	Physical Common Packet Channel (PCPCH)
DCH	Dedicated Physical Data Channel (DPDCH)
	Dedicated Physical Control Channel (DPCCH)
	Synchronisation Channel (SCH)
DSCH	Physical Downlink Shared Channel (PDSCH)
	Page Indication Channel (PICH)
	Acquisition Indication Channel (AICH)
	CPCH Status Indicator Channel (CSICH)

Figure 24~~3~~: Transport-channel to physical-channel mapping

The DCHs are coded and multiplexed as described in [3] , and the resulting data stream is mapped sequentially (first-in-first-mapped) directly to the physical channel(s). The mapping of BCH and FACH/PCH is equally straightforward, where the data stream after coding and interleaving is mapped sequentially to the Primary and Secondary CCPCH respectively. Also for the RACH, the coded and interleaved bits are sequentially mapped to the physical channel, in this case the message part of the random access burst on the PRACH.

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

Document R1-99j18
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**	**022**	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: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio	X	Core Network	

Source:	Philips	**Date:**	1999-11-25
Subject:	Inclusion of CPCH status monitoring in CPCH access procedure		
Work item:			

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature	X		Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	
					Release 00	

Reason for change:	In order to make use of broadcast CPCH status information, some changes are needed to the CPCH access procedure
Clauses affected:	6.2

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.~~

1) The UE MAC function shall provide the identity of the CPCH transport channel which is to be used for this access attempt.

2) The UE shall test the value of the most recent transmission of the Status Indicator corresponding to the identified channel. If this indicates that the channel is 'not available' the UE shall abort the access attempt and send a failure message to the MAC layer.

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~~:~~ shall test the value of the most recent transmission of the Status Indicator corresponding to the identified CPCH transport channel. If this indicates that the channel is 'not available' the UE shall abort the access attempt and send a failure message to the MAC layer. Otherwise the following steps shall be executed:

   a) Select~~s~~ 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) Increase~~s~~ 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 $\tau_{cd\text{-}p\text{-}pc\text{-}p}$ 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 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.