TSG-RAN Working Group 1 meeting #7
Hanover, Germany, Aug. 28- Sep.3, 1999

TSGR1#7(99)d57

Agenda item: AH 14

Source: SAMSUNG Electronics Co., Philips

Title: Text proposal for CPCH channel assignment

Document for: Approval

1. Text proposal for 25.211

Add to section 3.3 Abbreviations

AP Access Preamble

CA Channel Assignment

CD Collision Detection

CPCH Common Packet Channel

PCPCH Physical Common Packet Channel

Add a new Section 4.2.5 CPCH – Common Packet Channel

The CPCH is an uplink transport channel that is used to carry small and medium sized packets. CPCH is a contention based random access channel used for transmission of bursty data traffic. CPCH is associated with a dedicated channel on the downlink which provides power control for the uplink CPCH.

Add a new Section 5.2.2.2 Physical Common Packet Channel

The Physical Common Packet Channel (PCPCH) is used to carry the CPCH.

Add a new Section 5.2.2.2.1 CPCH transmission

The CPCH transmission is based on DSMA-CD approach with fast acquisition indication. The UE can start transmission at a number of well-defined time-offsets, relative to the frame boundary of the received BCH of the current cell. The access slot timing and structure is identical to RACH in section 5.2.2.1.1 [Figure 2]. The structure of the CPCH random access transmission is shown in Figure 4. The CPCH random access transmission consists of one or several Access Preambles [A-P] of length 1 ms, one Collision Detection Preamble (CD-P) of length 1 ms, a [10] ms DPCCH Power Control Preamble (PC-P) and a message of length N x10 ms, where N < = N_Max_frames. **The value of N_Max_Frames is TBD. Editor's note: [The value of N is not known by UTRAN].**

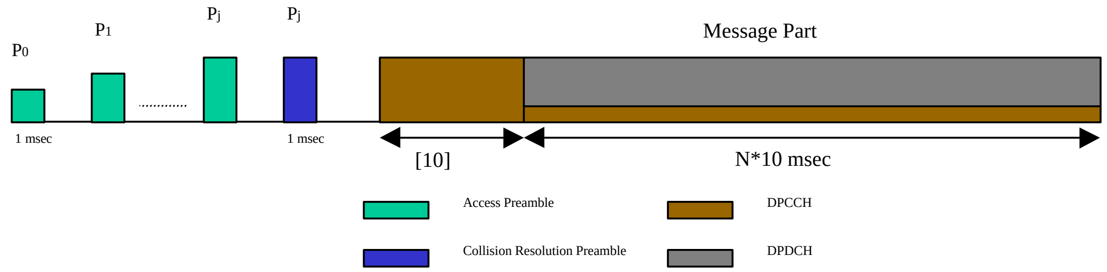

Figure 4: Structure of the CPCH random access transmission.

Add a new section 5.2.2.2.2 CPCH access preamble part

Identical to 5.2.2.1.2 (RACH preamble part). However N, the number of signature sequences is <= 16. Add a new Section 5.2.2.2.3 CPCH collision detection preamble part

The collision detection preamble part of the CPCH burst consists of a *signature* of length 16 complex symbols ±1(+j). Each preamble symbol is spread with a 256 chip real Orthogonal Gold code. This Code is different from the RACH/CPCH access preamble code. There are a total of 16 different signatures, based on an Orthogonal Gold code set of length 16.

Add a new section 5.2.2.2.4 CPCH power control preamble part

A 10 ms DPCCH Power Control Preamble (PC-P). Row 2 of Table 2 [section 5.2.1] is the recommended DPCCH fields which only includes Pilot and TPC bits. **Power Control Preamble length is ffs.**

Add a new section 5.2.2.2.5 CPCH message part

Editor's note [Use of TFCI for CPCH is ffs]

Figure 1 in section 5.2.1 shows the structure of the CPCH message part. Each message consists of N_Max_frames 10 ms frames. Each 10 ms frame is split into 15 slots, each of length T_{slot} = 0.666 ms. Each slot consists of two parts, a data part that carries Layer 2 information and a control part that carries Layer 1 control information. The data and control parts are transmitted in parallel.

The data part consists of $10*2^k$ bits, where k=2,3,4,5,6, corresponding to spreading factors of 64, and 32, 16,8, 4 respectively. . Note that various rates might be mapped to different signature sequences.

. The spreading factor for the DPCCH (message control part) will be 256. The entries in Table 1 [section 5.2.1] corresponding to 64 kbps and higher apply to the DPDCH fields for CPCH message part.

Note: Table to be inserted

Add to the end of section 5.3.3.6 AICH [**the bold parts]**

The acquisition indication channel (AICH) carries the acquisition indicators. The acquisition indicator AI_i corresponding to signature *i* is transmitted on the downlink, as a response to the detection of signature *i* on a PRACH **or PCPCH. Note that for PCPCH, the AICH is either in response to an Access Preamble or a CD-Preamble. The AICH responding to the access preamble and CD-Preamble use different channelization codes.** AI_i is equal to signature +*i or* -*i*. The phase reference for the detection of AI_i is the downlink PCCPCH.

Figure 1 illustrates the structure of the AICH.

- The AICH consists of access slots, each of length 1.25 ms.

- The AICH access slots are transmitted time aligned with the PCCPCH frame boundary

- The acquisition indicator is transmitted time aligned with the AICH access slots

- Up to 16 different acquisition indicators can be transmitted simultaneously within one access slot on one AICH in response to a PRACH access preamble. **This number is limited to 1 for positive AICH in case of response to PCPCH Access Preamble ~~or Collision Detection Preambles~~. This number is limited to 16 in case of negative AICH in response to PCPCH Access Preambles. CD-AICH and CA-AICH are transmitted simultaneously in case of response to PCPCH Collision Detection Preamble.**

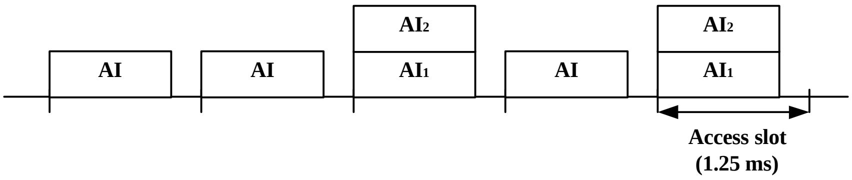

Figure 1: AICH structure

The AICH is transmitted on an ordinary downlink channel using a spreading factor of 256. Note that three different channelization codes of length 256 chips shall be allocated to three AICH channels:

1. AICH associated to PRACH access preambles.

2. AICH associated with PCPCH access preambles [This channelization code may be shared with PRACH AICH code if the PRACH and PCPCH share the same spreading code and the signature sequence space. Note that the AP-AICH channelization code and the AP spreading code may be shared when the Access Slots are segregated between PRACH and PCPCH].

3. AICH associated with PCPCH collision detection preambles have a unique downlink channelization code with length of 256 chips.

Figure 2 summarises the mapping of transport channels to physical channels.

Transport Channels	**Physical Channels**
BCH	Primary Common Control Physical Channel (Primary CCPCH)
FACH	Secondary Common Control Physical Channel (Secondary CCPCH)
PCH	
RACH	Physical Random Access Channel (PRACH)
[FAUSCH]	
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)
DSCH control channel	Physical Shared Channel Control Channel (PSCCCH)
	Acquisition Indication Channel (AICH)

Figure 2: Transport-channel to physical-channel mapping.

Add to the end of section 7 titled "timing relationship between physical channels"

PCPCH/CPCH timing relation:

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

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

[CPCH timing values associated with T_{cpch}]

τ_{p-p} = Time between Access Preamble (AP) to the next AP.

= 3.75ms + 1.25ms X Tcpch (CPCH timing parameter)

τ_{p-a1} = Time between Access Preamble and AP-AICH

= 1.75 ms + 1.25ms X Tcpch

τ_{a1-cdp} = Time between receipt of AP-AICH and transmission of the CD Preamble.

= τ_{a2-pcp}

= 2.0 ms

τ_{p-cdp} = Time between the last AP and CD Preamble.

= τ_{p-p}

= 3.75ms + 1.25ms X Tcpch

τ_{cdp-a2} = Time between the CD Preamble and the CD/CA-AICH

= τ_{p-a1}

= 1.75 ms + 1.25ms X Tcpch

$\tau_{cdp-pcp}$= Time between CD Preamble and the start of the Power Control Preamble

= τ_{p-p}

= 3.75ms + 1.25ms X Tcpch

T_a = fixed offset value between uplink and downlink access slots.

= 0.5 ms

Figure 30 shows the timing of the CPCH uplink transmission with the associated DPCCH control channel in the downlink.

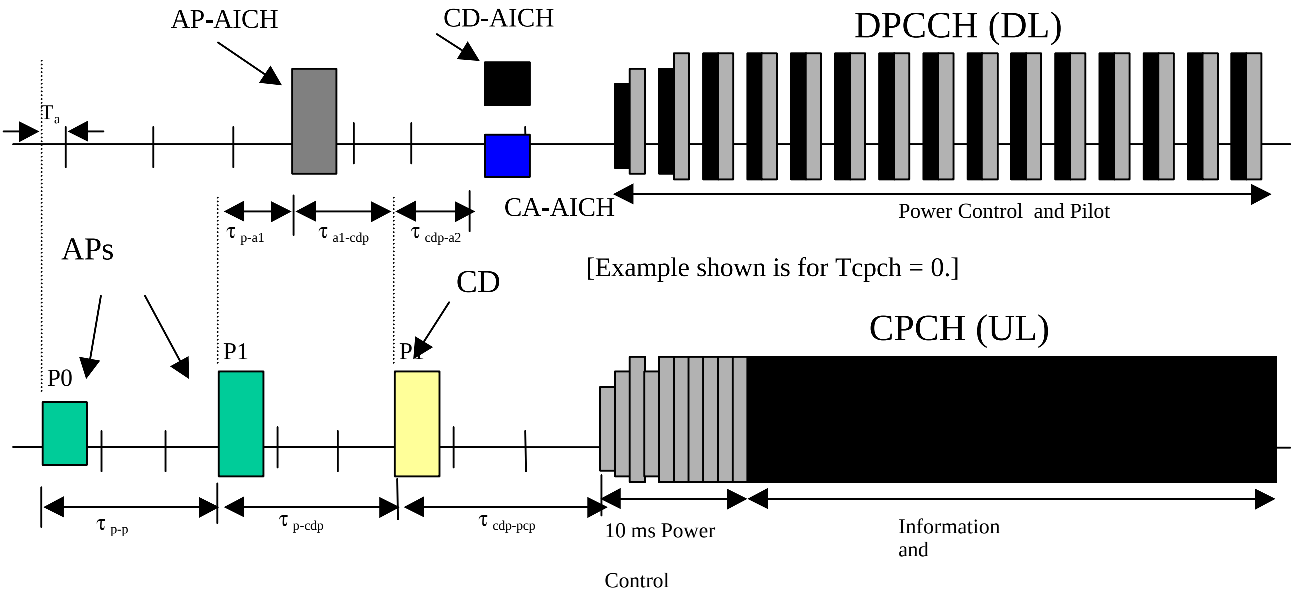

Figure 30: Timing of PCPCH and AICH transmission as seen by the UE, with AICH transmission

2. Text proposal for 25.214

Section 3.3 Abbreviations:
Add the following abbreviations:

AP	Access Preamble
CA	Channel Assignment
CD	Collision Detection
CPCH	Common Packet Channel
PCPCH	Physical Common Packet Channel

Add a new section 4.6 PCPCH Synchronisation

Transmission of random access bursts on the PCPCH is done aligned with access slot times. The timing of the access slots is derived from the received Primary CCPCH timing The transmit timing of access slot n starts $n \times 10/N$ ms after the frame boundary of the received Primary CCPCH, where n=0, 1, N-1, and N is the number of access slots per 10 ms.

Move all of existing section 6, Random access Procedure, into a new section named:

6.1 RACH Random Access Procedures

Add a new section 6.2 titled: "CPCH Physical Layer Access Procedures":

6.2 CPCH Access Procedures (new section)

The following temporal description is normal access procedure and entails both the UE and UTRAN side.

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) code (256 chip)
- AP- AICH preamble code (256 chip)
- UL CD preamble code (256 chip)
- CD/CA-AICH preamble code (256 chip)
- CPCH UL scrambling code (40,960 chip)
- CPCH UL channelization code (variable, data rate dependant)
- DPCCH DL channelization code (256, 512 chip)
-

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. DP_0 = Power step size for each successive CPCH access preamble.

[RACH/CPCH parameter]

4. DP_1 = Power step size for each successive RACH/CPCH access preamble in case of negative AICH

[RACH/CPCH]

5. T_{cpch} = CPCH transmission timing parameter: The range of T_{cpch} values is TBD. This parameter is similar to PRACH/AICH transmission timing parameter.

The CPCH -access procedure in the physical layer is:

1 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.

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

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

4. 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 a new uplink access slot. This new access slot must be one of the available access slots. There must be also a 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. The selection scheme of this new access slot is TBD.

b. Increases the preamble transmission power with the specified offset ΔP_0.

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.

5. 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 aborts the access attempt and sends a failure message to the MAC layer.

6. Upon reception of AP-AICH, the access segment ends and the contention resolution segment begins. In this segment, the UE randomly selects one of 16 signatures and transmits a CD Preamble, then waits for a CD/CA-AICH from the base Node.

7. 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.

8. 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.

9. If the UE receives a CD-AICH with a matching signature, UE decodes the channel assignment information from CA-AICH. Then, UE transmits the power control preamble $\tau_{cd\text{-}p\text{-}pc\text{-}p}$ ms later as measured from initiation of the CD Preamble in the assigned CPCH. The transmission of the message portion of the burst starts immediately after the power control preamble.

During CPCH Packet Data transmission, the UE and UTRAN perform closed loop power control on both the assigned CPCH UL and the DPCCH DL.

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.

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