TSG-RAN Working Group 1 meeting #7bis **TSGR1#7bis(99)f84**

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Agenda Item : Ad hoc 14

Source : LG Information & Communications, Ltd.

Title : Text proposal for Secondary Collision Detection

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1. Text proposal for 25.211

Add to section 3.3 Abbreviations

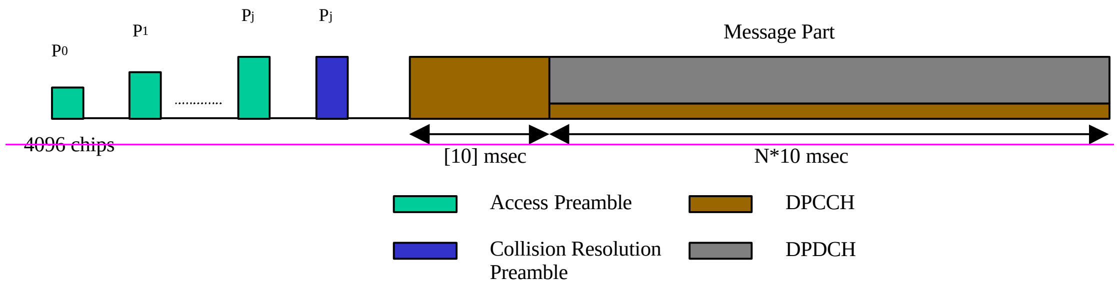
AP	Access Preamble
CD	Collision Detection
CPCH	Common Packet Channel
PCPCH	Physical Common Packet Channel
SCD	Secondary Collision Detection
SCDI	Secondary Collision Detection Indicator

5.2.2.2. Physical Common Packet Channel

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

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. The structure of the CPCH random access transmission is shown in of length 4096 chips, one Collision Detection Preamble (CD-P) of length 4096 chips, a [10] ms DPCCH Power Control Preamble (PC-P), one DPDCH Secondary Collision Detection Preamble (SCD-P) of 2*p slots, where p = 1, 2, 3 or 4 and a message of variable length Nx10 ms.



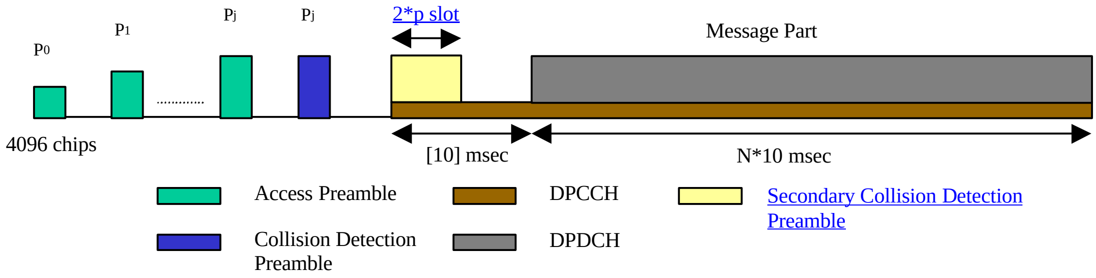


Figure 7: Structure of the CPCH random access transmission.

5.2.2.2.2. CPCH access preamble part

Similar to 5.2.2.1.2 (RACH preamble part). The RACH preamble signature sequences could be used. The number of sequences used could be less than the ones used in the RACH preamble. The scrambling code could either be chosen to be a different code segment of the Gold code used to form the scrambling code of the RACH preambles (see [4] for more details) or could be the same scrambling code in case the signature set is shared.

5.2.2.2.3. CPCH collision detection preamble part

Similar to 5.2.2.1.2 (RACH preamble part). The RACH preamble signature sequences are used. The scrambling code is chosen to be a different code segment of the Gold code used to form the scrambling code for the RACH and CPCH preambles (see [4] for more details).

5.2.2.2.4. CPCH power control preamble part

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

5.2.2.2.5. CPCH secondary collision detection preamble part

2*p slot DPDCH Secondary Collision Detection Preamble (SCD-P), where p = 1, 2, 3 or 4. PC-P and SCD-P are simultaneously transmitted. Figure 8 shows the structure of SCD-P. The spreading factor of DPDCH SCD-P is identical to the spreading factor of the data part of CPCH message part. For $N_{scd}=8*2^k$ bits, where k=1…6, SCD preamble signature of 16 bits is repeatedly 2^{k-1} times mapped onto each slot, where k=1…6. In case of N_{scd}=8 bits, the first half of SCD preamble signature is mapped onto every odd slot and the latter half of SCD preamble signature is mapped onto every even slot.

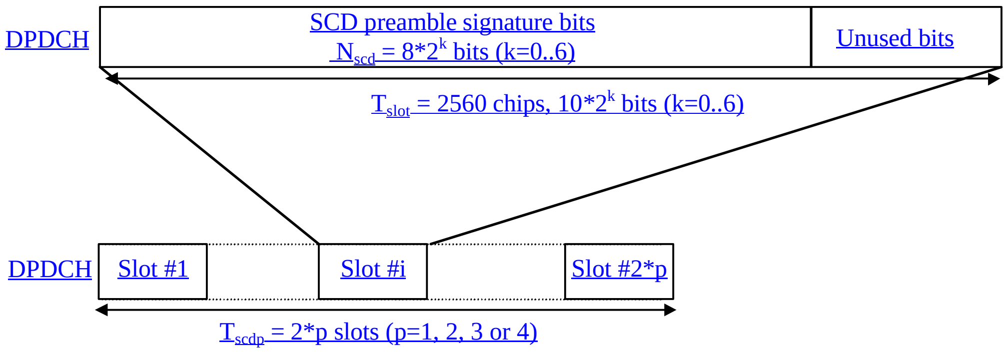


Figure 8: Structure of the Secondary Collision Detection Preamble.

Figure 9 shows the slot structure of the downlink dedicated physical channel carrying Secondary Collision Detection Indicator (SCDI) signature. SCD preamble signature corresponds to SCDI signature. 8-bit SCDI signature is split into SCDI fields in pre-designated consecutive 2 slots on the downlink dedicated physical channel.

SCDI 2 bits	TPC 2 bits	SCDI 2 bits	Pilot 4 bits

T_{slot} = 2560 chips, 10 bits

Figure 9: Slot structure of the downlink dedicated physical channel carrying Secondary Collision Detection Indicator

~~5.2.2.2.5.~~5.2.2.2.6. CPCH message part

Figure 1 in 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} = 2560 chips. 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, 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 corresponding to spreading factors of 64 and below and Table 2 [both in section 5.2.1] apply to the DPDCH and DPCCH fields respectively for the CPCH message part.

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 relationships between CD-Preamble and CD-AICH is identical to RACH Preamble and AICH. The timing relationship between CD-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 zero or one, the following PCPCH/AICH timing values apply:

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

τ_{p-p} = Time between Access Preamble (AP) to the next AP. is either 3 or 4 access slots, depending on T_{cpch}.

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

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

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

τ_{cdp-a2} = Time between the CD Preamble and the CD-AICH has two alternative values: 7680 chips or 12800 chips, depending on T_{cpch}

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

$\tau_{pcp-dpcch}$ = Time between the start of the Power Control Preamble and the SCD Preamble and the start of the DL-DPCCH is ffs.

$\tau_{pcp-scdi}$ = Time between the start of the Power Control Preamble and the SCD Preamble and the start of transmission of SCDI on DL-DPCCH is ffs.

$\tau_{scdi-cpch}$ = Time between the start of the subsequent slot to the last slot carrying SCDI on DL-DPCCH and the start of transmission of packet on CPCH is ffs.

Figure 26 shows the timing of the CPCH uplink transmission with the associated DPCCH control channel in the downlink.

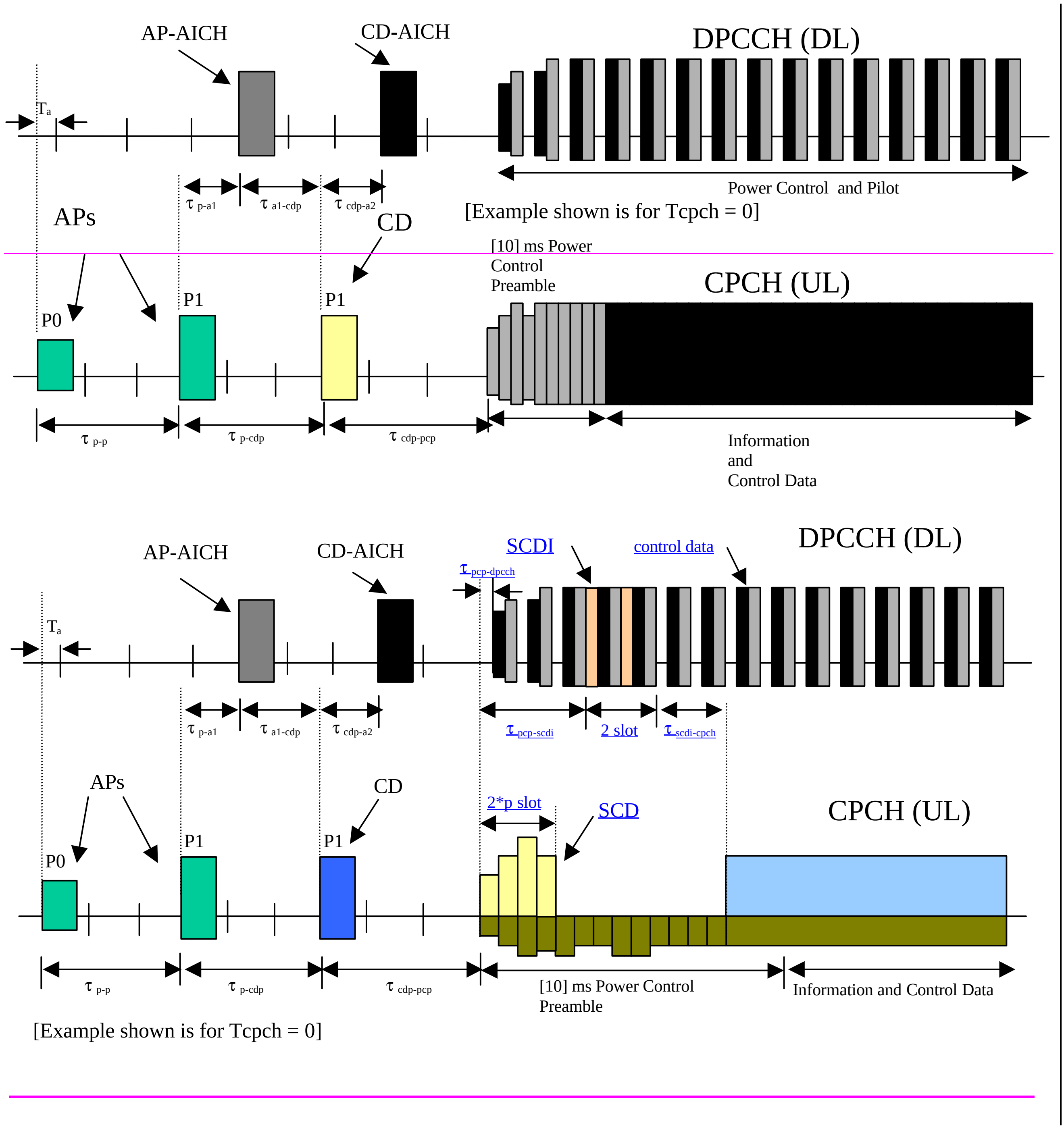


Figure 26: Timing of PCPCH and AICH transmission as seen by the UE, with T_{cpch}= 0.

2. Text proposal for 25.213

Section 3.3 Abbreviations:

Add the following abbreviations:

AP	Access Preamble
CD	Collision Detection
CPCH	Common Packet Channel

PCPCH	Physical Common Packet Channel
SCD	Secondary Collision Detection
SCDI	Secondary Collision Detection Indicator

4.3.4. Common packet channel codes

4.3.4.1 Access preamble scrambling code

The access preamble scrambling code generation is done in the same way as for the PRACH with a difference of the initialisation of the x m-sequence. The long code $c_{1,257}$ (see 4.3.3.2) for the in-phase component is used directly on both in phase and quadrature branches without offset between branches.

4.3.4.2 CD preamble spreading code

The scrambling code for the access preamble is also used as the CD preamble spreading code. The 4096 chips from 4096 to 8191 of the code are used for the CD preamble spreading with the chip rate of 3.84 Mchip/s. The long code c_{257} for the in-phase component is used directly on both in phase and quadrature branches without offset between branches.

4.3.4.3 CPCH preamble

4.3.4.3.1 Access preamble signature

The access preamble part of the CPCH-access burst carries one of the sixteen different orthogonal complex signatures identical to the ones used by the preamble part of the random-access burst.

4.3.4.3.2 CD preamble signature

The CD-preamble part of the CPCH-access burst carries one of sixteen different orthogonal complex signatures identical to the ones used by the preamble part of the random-access burst.

4.3.4.3.3 SCD preamble signature and SCDI signature

The SCD-preamble part of the CPCH-access burst once or more than once carries one of sixteen different orthogonal signatures identical to the ones used by the preamble part of the random-access burst.

The SCDI fields carries one of sixteen different code words of the bi-orthogonal (8, 4) code. Figure 4 shows the mapping between SCD preamble signatures and SCDI signatures.

SCD signature	Code words for SCDI signature
1	$C_{8,0}$
2	$\overline{C_{8,0}}$
3	$C_{8,1}$
…	…
14	$\overline{C_{8,6}}$
15	$C_{8,7}$
16	$\overline{C_{8,7}}$

Figure 4. mapping between SCD preamble signatures and SCDI signatures

4.3.4.4 Channelization codes for the CPCH message part

The signature in the preamble specifies one of the 16 nodes in the code-tree that corresponds to channelization codes of length 16. The sub-tree below the specified node is used for spreading of the message part. The control part is always spread with a channelization code of spreading factor 256. The code is chosen from the lowest branch of the sub-tree. The data part may use channelization codes from spreading factor 4 to 64. A UE is allowed to increase its spreading factor during the message transmission by choosing any channelization code from the uppermost branch of the sub-tree code. For channelization codes with spreading factors less that 16, the node is located on the same sub-tree as the channelization code of the access preamble.

4.3.4.5 Scrambling code for the CPCH message part

In addition to spreading, the message part is also subject to scrambling. The scrambling code is cell-specific and has a one-to-one correspondence to the spreading code used for the preamble part.

The scrambling codes used are from the same set of codes as is used for the other dedicated uplink channels when the long scrambling codes are used for these channels. The long scrambling codes (c_{257} to c_{512}) of the uplink long scrambling code set are used for the CPCH message part (see section 4.3.2.2). The phases 8192 and above of the codes are used for the message part (phases 0 to 4095 of c_{257} are used in the access preamble spreading and phases 4096 to 8191 for the CD preamble) with the chip rate of 3.84 Mchips/s.

The mapping of these codes to provide a complex scrambling code is also the same as for the other dedicated uplink channels and is described in Section 4.3.2.

3. Text proposal for 25.214

Section 3.3 Abbreviations:

Add the following abbreviations:

AP	Access Preamble
CD	Collision Detection
CPCH	Common Packet Channel
PCPCH	Physical Common Packet Channel
SCD	Secondary Collision Detection
SCDI	Secondary Collision Detection Indicator

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 codeset.
- AP- AICH preamble channelization code set.
- UL CD preamble scrambling code set.
- CD-AICH preamble channelization code set.
- CPCH UL scrambling code set.
- CPCH UL channelization code set. (variable, data rate dependant)
- DPCCH DL channelization code set.([256] 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. 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

[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 P $_0$.

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-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. 9. If the UE receives a CD-AICH with a matching signature, the UE randomly selects one of 16 signatures and transmits the power control preamble and the SCD preamble $\tau_{cd\text{-}p\text{-}pc\text{-}p}$ ms later as measured from initiation of the CD Preamble, then waits for SCDI from the base Node. ~~The transmission of the message portion of the burst starts immediately after the power control preamble.~~
10. If the UE does not receive SCDI in the designated slot on DPCCH DL, the UE aborts the access attempt and sends a failure message to the MAC layer.
11. If the UE receives SCDI in the designated slot with a signature that does not match the signature

used in the SCD Preamble, the UE aborts the access attempt and sends a failure message to the MAC layer.

12. . If the UE receives SCDI with a matching signature, the transmission of the message portion of the burst starts immediately after the power control preamble.

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

~~11.~~14. 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.~~15. If the UE completes the transmission of the packet data, the UE sends a success message to the MAC layer.