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Agenda Item: 5 AH 14
Source: Golden Bridge Technology
Title: Idle-AICH for CPCH
Document for: Discussion and Approval

Problem

The use of N_Frames_Max to estimate when CPCH is idle is inefficient and leads to long CPCH delays. being idle if the packet length is less than the allowed maximum level. It should be noted that currently the monitoring of AP-AICH is not a requirement either due to the complexity that will be introduced in receiving DPCCH/FACH/AICH simultaneously at the UE. So, currently, the UE will construct a recency table (manufacturer implementation dependent) where it estimates the availability of various CPCH channels. The UE will not be able to monitor the reception of AP-AICH when it is transmitting over the CPCH in the uplink direction

Proposal

Discussion

Use of idle-AICH

In order to improve the accuracy of the entries in the recency table, GBT proposes addition of idle-AICH in the downlink direction. The Base Node upon completion of the message reception transmits this message. The idle-AICH will be the equivalent of idle indication in DSMA, whereas AP-AICH will be the implementation of busy indication in this protocol.

Figure 1 shows the timing of the CPCH uplink transmission with the associated DPCCH control channel in the downlink.

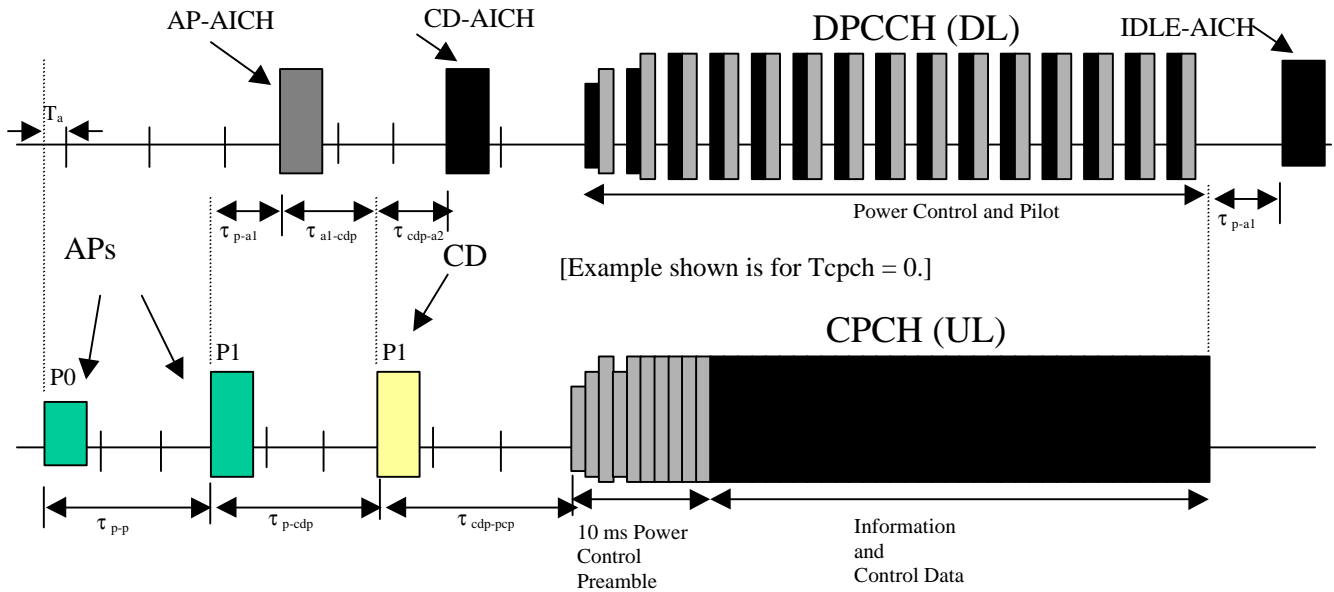


Figure 1. Common Packet Channel (CPCH) Timing Diagram

τ_{p-p} = Time between Access Preamble (AP) to the next AP.
 = $3.75\text{ms} + 1.25\text{ms} \times T_{cpch}$ (CPCH timing parameter)

τ_{p-al} = Time between Access Preamble and AP-AICH or end of packet to IDLE-AICH
 = $1.75 \text{ ms} + 1.25\text{ms} \times T_{cpch}$

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}
 = $3.75\text{ms} + 1.25\text{ms} \times T_{cpch}$

τ_{cdp-a2} = Time between the CD Preamble and the CD-AICH
 = τ_{p-al}
 = $1.75 \text{ ms} + 1.25\text{ms} \times T_{cpch}$

$\tau_{cdp-pcp}$ = Time between CD Preamble and the start of the Power Control Preamble
 = τ_{p-p}
 = $3.75\text{ms} + 1.25\text{ms} \times T_{cpch}$

T_a = fixed offset value between uplink and downlink access slots.
 = 0.5 ms

IDLE-AICH:

Code: the DL CD-AICH channelisation code specified for this CPCH set.

Signature: selected by PHY in Node B to match the signature of the requesting AP, maps to the requested CPCH channel in this CPCH set. This is the CPCH channel which has just finished the packet transmission and is now idle.

PHASE: IDLE-AICHs always uses the NAK phase.

UEs which are not accessing CPCH resources (but are assigned to use the CPCH set) may monitor the AICH broadcasts from Node B to assess the availability of the CPCH channels in the CPCH set. Node B broadcasts an AP-AICH_ack when a CPCH channel becomes busy. Node B may broadcast AP-AICH_naks while a channel is being used. Node B broadcasts an IDLE-AICH when a CPCH channel becomes idle. These broadcasts allow all UEs to have busy/idle status indicators on the CPCH channels in the CPCH set.

Broadcast CPCH channel BUSY/IDLE indicators:

BUSY: any AP-AICH with a signature that maps to a CPCH channel in the CPCH set indicates that the CPCH channel is busy. The AP-AICH may be an ack or a nak phase.

IDLE: any IDLE-AICH with a signature that maps to a CPCH channel in the CPCH set indicates that the CPCH channel is idle. The IDLE-AICH always uses nak phase.

Proposed text

Add to 25.214;new section 6.2:

CPCH Physical layer procedure section between steps 11 and 12:

11. When the UTRAN Node B detects the end of the UL packet transmission, it sends an IDLE-AICH using a signature, which maps to the CPCH channel in use. This serves as a broadcast indication to all UEs that this CPCH channel is now idle and available for access.

Changes to S25.211

Replace figure 30 in S25.211 by Figure 1 in this document.