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Agenda item: **6.7**
Source: **Golden Bridge Technology**
Title: **CPCH Physical Layer Procedures**
Document for: **Information and Discussion**

Abstract: This document is the latest version of the physical layer procedures proposed by GBT on WG1 ad-hoc 14. The basic principles of the operation are intact. However, some refinements are introduced to minimize changes as compared to RACH.

Introduction

GBT has modified the CPCH proposal to simplify the design, retain some of the advantages, and use the existing structures not necessitate a new physical channel. We will need two transport channels, i.e, CPCH and CPCCH transport channels. The following changes are proposed:

1. Fast TPC rates is removed (although feasible but will slow the process)
2. The pilot followed by TPC after the preamble is removed. That was a new structure, we used an existing DPCCH channel to be the PC training sequence before the transmission of data.
3. We removed the CD from the message body and are using the CD preamble just like the access preambles (different base code). This way, we have the capability of collision resolution as well.
4. The power control of the AICH could be done by the Base Node simply by distance measurement. However, when the AICH is sent out in full power, the information can be used in CPCH channel selection in the MAC/RRC.

Description of the CPCH physical layer Procedures

We again have the power up preambles, with powers increasing from P_0 to P_1 etc …The power used to transmit the preamble is eventually high enough to be detected by the Base Station. When the preamble is detected, the Base Station transmits back an acknowledgement (L1 ACK). The Mobile Station is always tuned to receive an acknowledgement signal every time it transmits a preamble. The acknowledgement signifies that a transmission of a preamble was received by the Base Station.

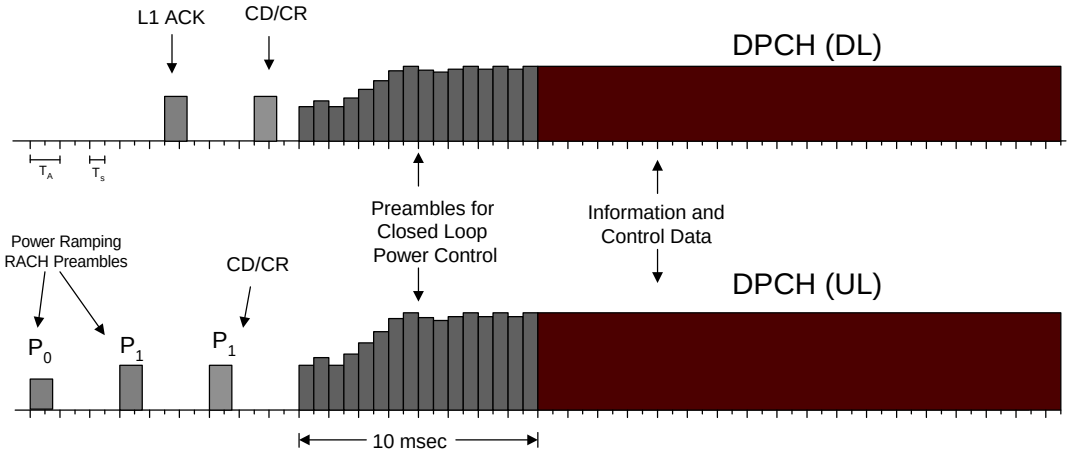

FIG 1. Common Packet Channel (CPCH) Timing Diagram with its Associated Downlink Dedicated Physical Channel.

There is a good possibility that two or more UEs transmit the same preamble at about the same time. When the BS acknowledges the reception of the preamble, it is not clear to a UE that receives an acknowledgement of its transmission that it is the only UE transmitting those preambles. If all UEs which receive the acknowledgement signal starts the transmission of their data, their transmission will collide and they will not be received correctly. This event will happen when two or more RSs are trying to access the BS at the same time using the same preamble. To reduce the possibility of that event, a collision detection/collision resolution (CD/CR) mechanism is used. After the receipt of the acknowledgement, each RS transmits a different preamble (called here CD/CR_Preamble) picked at random from a new set of preambles. The Base Station is tuned to receive all CD/CR preambles of the new set of preambles. The strongest received CD/CR_Preamble is acknowledged by the Base Station. UEs which do not receive a second acknowledgement refrain from further transmission of their access burst. By this mechanism, only UEs which have received the second acknowledgement will transmit the remainder of their burst. If there are N different preambles in the second set of preambles, the possibility that two UEs will pick the same preamble to transmit is 1/N. Since the probability of two or more UEs trying to access the BS at the same time using the same preamble might be small; the probability that two or more UEs transmissions will collide could be made to be very small. Once a UE has been acknowledged for second time, it starts the transmission of a UE-Closed-Loop-Power-Control-Preamble (UE-CLPC-Preamble). At a predetermined time instant, after the transmission of the CD/CR-Preamble, the BS also start the transmission of a BS-Closed-Loop-Power-Control-Preamble. (BS-CLPC-Preamble). The UE-CLPC-Preamble and the BS-CLPC-Preamble are transmitted at about the same time. The received by the BS RS-CLPC-Preamble is used by the BS to determine the power of the received UE-CLPC-Preamble. Additionally, the BS retrieves from the received UE-CLPC-Preamble power control information to be used by the BS to adjust the power of it's own transmitted BS-CLPC-Preamble. The UE, when receiving the BS-CLPC-Preamble, functions the same way as the BS. That is it uses the received BS-CLPC-Preamble to determine the received power from the BS-CLPC-Preamble. Also, the RS retrieves from the received BS-CLPC-Preamble power control information to be used by the UE to adjust the power of it's own transmitted UE-CLPC-Preamble. Both BS and RS insert power control information in their likewise transmitted BS-CLPC-Preamble and UE-CLPC-Preamble signals.

Possible Structures of CLPC-Preamble Signals.

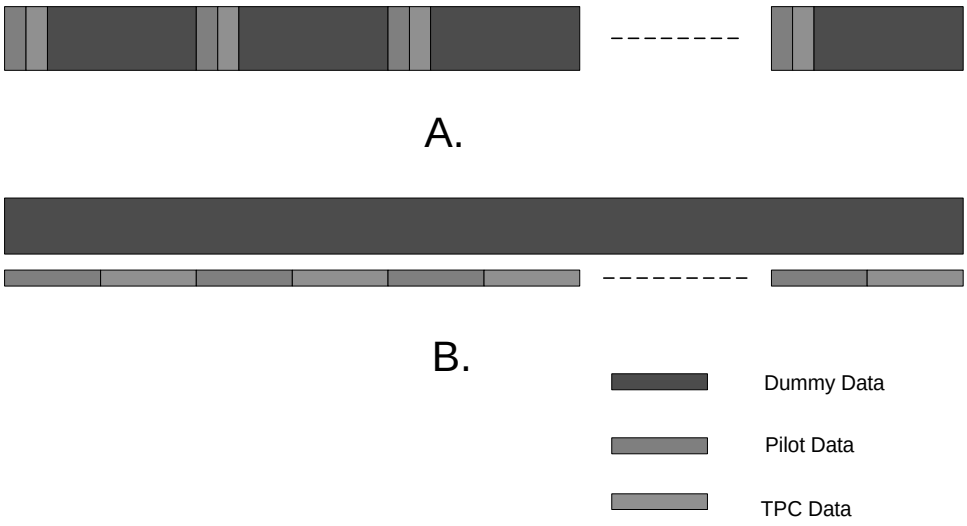

FIG 2 (A.) BS-CLPC-Preamble, (B) RS-CLPC-Preamble

The BS-CLPC-Preamble shown in Fig 2A, consists of a repetition of Pilot bits, transmitted Power Control (TPC) bits and known dummy data. The UE-CLPC-Preamble shown in Fig 2B, consists of known dummy data bits I/Q multiplexed with pilot and TPC bits. Both BS-CLPC-Preamble and UE-CLPC-Preamble are spread by known channelization and scrambling codes.

The transmission of BS_CLPC_Preamble should enable the BS and RS to bring their transmitting power levels to a point (region) of acceptable Bit-Error-Rate (BER). After the completion of the BS-CLPC-Preamble and UE-CLPC-Preamble, both the BS and UE start transmission of information and other necessary control data. In case information data is not available for transmission from either the BS or UE, only control data is transmitted. TPC data are transmitted during the transmission of information and control data, is used to closed loop power control both the BS and RS signal transmissions.