Agenda Item:

Source: **Samsung Electronics**

Title: **Procedure of Gated DPCCH transmission associated with DSCH**

Document for :   Discussion

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1. Introduction

The teminal power saving feature was approved as a Working Item at the previous RAN plenary meetings RAN#7 and RAN#8 and Gated DPCCH transmission has been proposed as one of the solutions by Samsung Electronics [1,2,3].

At the TSG RAN WG1#13 meeting, Nokia presented a contribution discussing the gating operation in DCH+DSCH/DCH compared to DCH/DCH [4]. In the contribution, some beneficial aspect was noted with gating operation in DCH+DSCH/DCH.

This document is intended to introduce the operation procedure of uplink/downlink DPCCH gated transmission in DCH+DSCH/DCH.

2. Gated transmission of uplink/downlink DPCCH associated with DSCH

The fundamental concept of gated transmission of DPCCH is to reduce the power control rate of DPCCH in order to decrease the UE power consumption and interference and to increase system capacity.

2.1 Gating Parameters

The gating parameters (gating rate, gating pattern, and gating direction) can be negotiated between UTRAN and UE. The combinations of gating parameters needed to be negotiated between UTRAN and the UE are:

Table 1. Gating Parameters

Gating Rate	1	1/3	1/5

Gating Pattern	Random		Regular

| Direction	Downlink Only		Uplink and Downlink

The above gating parameters can be informed to UE and Node B when the associated PDSCH is set up.

The unit period of the gated transmission is 0.666ms (1 slot), with gating rate option of 1 (No gating), 1/3, and 1/5. The 1/3 gating means transmitting DPCCH by 3 unit periods (2ms) and the 1/5 by 5 unit periods (3.333ms). Figure 1 is an example of gated DPCCH transmission with regular gating pattern.
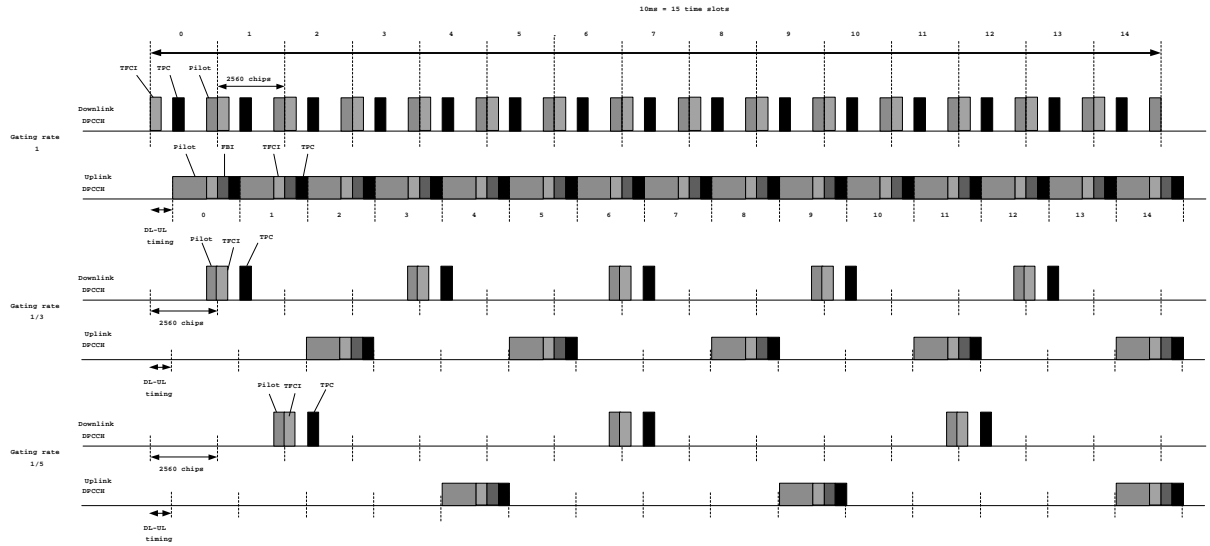
Figure 1. Example of gated transmission of uplink/downlink DPCCH (regular gating pattern)

Figure 2 shows an example of Gated DPCCH Transmission associated DSCH, where there are five UEs sharing a PDSCH. When there are data to be transmitted to the UEs, UTRAN will schedule the transmission of the data. As in the Figure 2, each UE has idle interval between data transmission. UTRAN can determine gated DPCCH transmission during the idle interval of each UE.
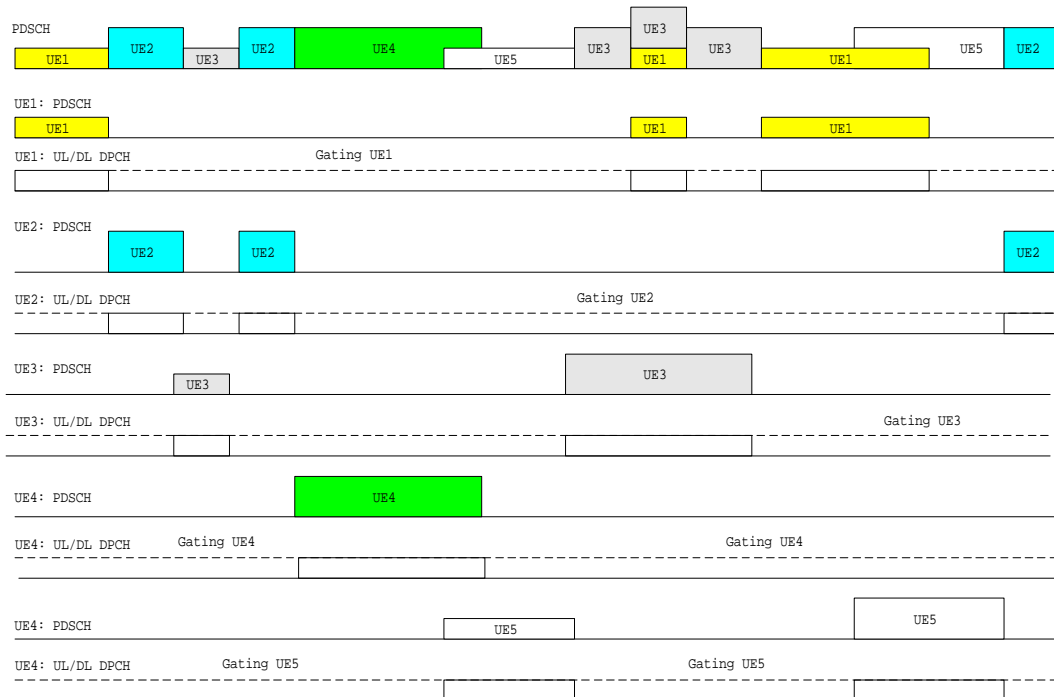
Figure 2. Example of Gated DPCCH Transmission associated DSCH

2.2 Gating Initiation and Termination

When there is long idle interval between transmission of data for a UE, UTRAN can determine initiation of gating operation. For example, UTRAN can initiate the gating operation about T seconds after the last packet is transmitted, where T could be, e.g., 1 second [4].

When there are data to be transmitted using PDSCH (and/or DCH), UTRAN can stop the gating operation. To inform UE of the termination of gating, signalling message can be used.

2.3 Transmission of DPDCH during Gating

When there are urgent signalling messages to be transmitted during gating, the signalling message is transmitted on DPDCH without returning to non-gating mode. UE and UTRAN increase the transmission power of DPDCH in order to compensate the effect of degraded power control loop. In addition, during DPDCH transmission in gated mode, the UTRAN fully transmits TPC, TFCI and Pilot signals in downlink DPCCH without gating to assist demodulation process of DPDCH being performed at receiver. However, the UE receiver ignores TPC transmitted in gating off slots. Similarly, during DPDCH transmission in gated mode, the UE fully transmits TPC, TFCI, Pilot, and FBI in uplink DPCCH, but UTRAN receiver ignores the FBI and TPC during gating off slots.

4. CONCLUSION

The intention of this document is to introduce the operation procedure of uplink/downlink DPCCH gated transmission associated with DSCH.

5. REFERENCE

[1] R1-00-0656 "Procedure for DPCCH Gated transmission", Samsung Electronics

[2] R1-00-0557 "Performance evaluation of gated DPCCH transmission", Samsung Electronics

[3] R1-00-0684 "Further clarification of Gated DPCCH transmission", Samsung Electronics

[4] R1-00-0686   "Discussion paper on DPCCH gating   benefits", Nokia

[5] R1-00-0691   "Power Control Issues for Gated DPCCH", Philips

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