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Source: **Nortel Networks**

Title: **Text proposal for modification of downlink power control in soft handover in 25.214 and 25.211**

Document for: **Approval**

Introduction

This proposal for 25.214 and 25.211 is based on [1]. This description of downlink power control in soft handover has been taken as a working assumption by Ad Hoc 9.
The modified section in 25.214 is 5.2.3.2 "Ordinary transmit power control". In this paragrah, it is explained how the UE should send the TPC command :

- when the UE is not in soft handover, it sends one TPC command by slot
- when the UE is in soft handover and the DPC_MODE parameter is set to zero, the UE sends one TPC command per slot
- when the UE is in soft handover and the DPC_MODE parameter is set to 1, the UE repeats the same TPC command over three slots

The modified section in 25.211 is Appendix A.

References

[1] TSGR1#7(99)b15, "Downlink power control rate reduction during soft handover", Nortel Networks

Text proposal for 25.214

5.2.3.1 General

The downlink transmit power control procedure controls simultaneously the power of a DPCCH and its corresponding DPDCHs. The power control loop adjusts the power of the DPCCH and DPDCHs with the same amount, i.e. the relative power difference between the DPCCH and DPDCHs is not changed.
The relative transmit power offset between DPCCH fields and DPDCHs is determined by the network and signalled to the UE using higher layer signalling. The TFCI, TPC and pilot fields of the DPCCH are offset relative to the DPDCHs power by PO1, PO2 and PO3 dB respectively. < *Editor's note: The range and need for signaling with power offsets is FFS.*>

5.2.3.2 Ordinary transmit power control

The downlink closed-loop power control adjusts the network transmit power in order to keep the received downlink SIR at a given SIR target, SIR_{target}. An higher layer outer loop adjusts SIR_{target} independently for each connection.

The UE should estimate the received downlink DPCCH/DPDCH power of the connection to be power controlled. Simultaneously, the UE should estimate the received interference. The obtained SIR estimate SIR_{est} is then used by the UE to generate TPC commands according to the following rule: if $SIR_{est} > SIR_{target}$ then the TPC command to transmit is "0", requesting a transmit power decrease, while if $SIR_{est} < SIR_{target}$ then the TPC command to transmit is "1", requesting a transmit power increase.

When the ~~The~~UE is not in soft handover the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH.

When the UE is in soft handover it should check the downlink power control mode (DPC_MODE) before generating the TPC command

- if DPC_MODE = 0 : the UE sends a unique TPC command in each slot and the TPC command generated is transmitted in the first available TPC field in the uplink DPCCH

- if DPC_MODE = 1 : the UE repeats the same TPC command over 3 slots and the new TPC command is transmitted such that there is a new command at the beginning of the frame. As a response, the UTRAN may adjust its transmit power only after receiving the three TPC commands.

The DPC_MODE parameter is a UE specific parameter controlled by the UTRAN.

<Note : the introduction of the DPC_MODE parameter and its use are working assumptions>

< Note: It is not clear to what extent the UTRAN response to the received TPC commands should be specified. Until this has been clarified, the text in the paragraph below should be seen as an example of UTRAN behaviour. >

As a response to the received TPC commands, UTRAN may adjust the downlink DPCCH/DPDCH power. Such a change of power shall be a multiple of the minimum step size $\Delta_{TPC,min}$ dB. It is mandatory for UTRAN to support $\Delta_{TPC,min}$ of 1 dB, while support of 0.5 dB is optional.

< Note: It needs to be clarified if an upper limit on the downlink power step should be specified. >

'When SIR measurements cannot be performed due to downlink out-of-synchronisation, the TPC command transmitted shall be set as "1" during the period of out-of-synchronisation.

< Editor's note: In Volume 3 it is also described how the power should be controlled during link set-up. This should probably be described in the synchronisation clause, so that the information is not repeated in several places. >

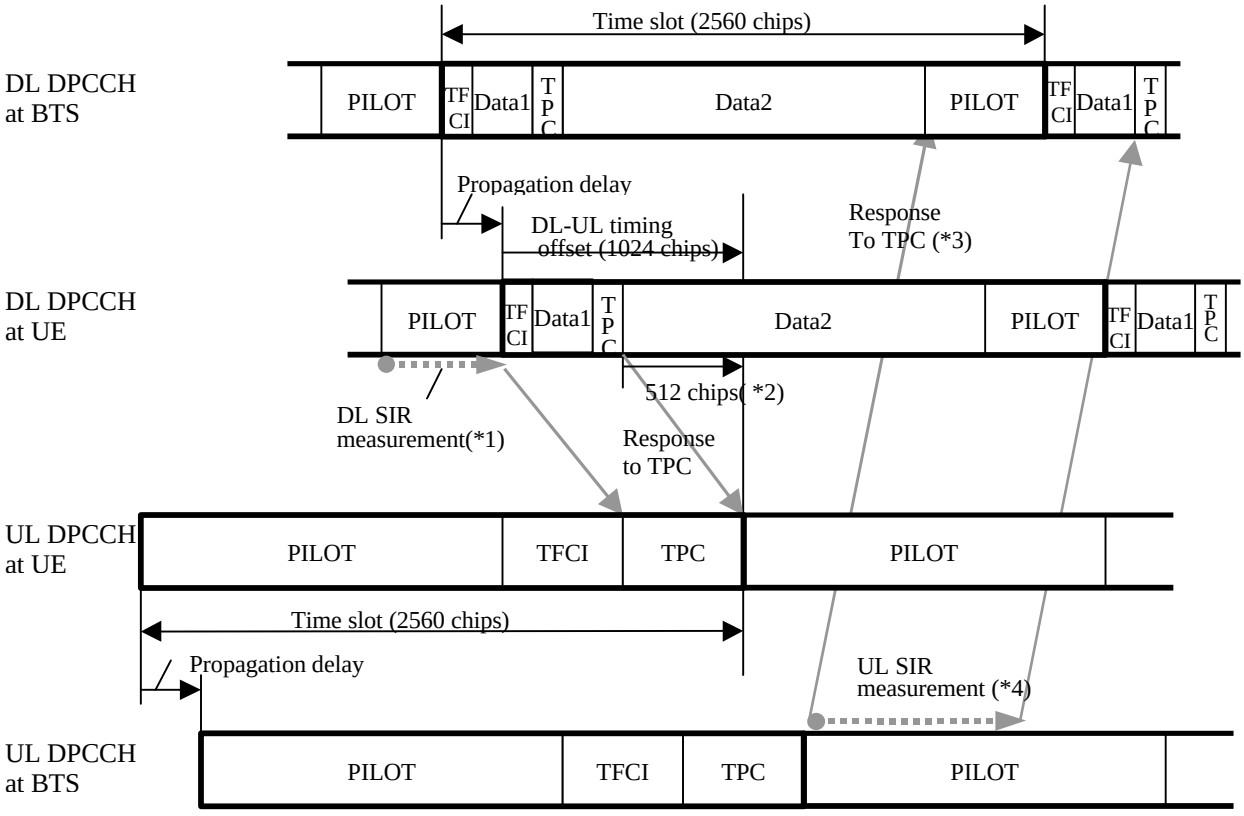
Text proposal for 25.211

Appendix A: Power Control Timing

<Editors note: The Power control timing described in this appendix should be seen as an example on how the control bits have to be placed in order to permit a short TPC delay. It seems appropriate to move this part later.>

In order to maximize the BTS-UE distance within which one-slot control delay is achieved, the frame timing of an uplink DPCH is delayed by 1024 chips from that of the corresponding downlink DPCH measured at the UE antenna.
Responding to a downlink TPC command, the UE shall change its uplink DPCH output power at the beginning of the first uplink pilot field after the TPC command reception. Responding to an uplink TPC command, BTS shall change its DPCH output power at the beginning of the next downlink pilot field after the reception of the whole TPC command ~~reception~~. Note that in soft handover, the TPC command is sent over one slot when DPC_MODE is 0 and over three slots when DPC_MODE is 1. Note also that the delay from the uplink TPC command reception to the power change timing is not specified for BTS. The UE shall decide and send TPC commands on the uplink based on the downlink SIR measurement. The TPC command field on the uplink starts, when measured at the UE antenna, 512 chips after the end of the downlink pilot field. BTS shall decide and send TPC commands based on the uplink SIR measurement. However, the SIR measurement periods are not specified either for UE nor BTS.

Fig. A-1 illustrates an example of transmitter power control timings.



*1,4 The SIR measurement periods illustrated here are examples. Other ways of measurement are allowed to achieve accurate SIR estimation.
*2 Except the case of DL symbol rate=7.5ksps.
*3 If there is not enough time for BTS to respond to the TPC, the action can be delayed until the next slot.

Fig. A-1 Transmitter power control Timing