

Agenda item: AH 09
Source: Nokia
Title: CR 25.214-026: downlink power control
Document for: Decision

In TS 25.214, section 5.2.1.2, which describes the ordinary transmit power control in downlink, there are still some Notes left, which should be deleted from the final specification. The proposed action for each note is given below.

Note 1:

As a response to the received TPC commands, UTRAN may adjust the downlink DPCCH/DPDCH power. The transmitted DPCCH/DPDCH power may not exceed Maximum_DL_Power, nor may it be below Minimum_DL_Power.

< Note: It should be clarified with WG3 if Maximum_DL_Power and Minimum_DL_Power are given as absolute values or relative. >

Proposal: In last WG1 meeting a liaison was received from WG3 where they replied that these parameters are given as absolute values. Thus we propose to add (dBm) after both of these parameters. In addition to this we propose to define that these parameters are limits to the DPDCH data symbols, not containing DTX.

Note 2:

< 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. >

Changes of power shall be a multiple of the minimum step size $\Delta_{\text{TPC,min}}$ dB. It is mandatory for UTRAN to support $\Delta_{\text{TPC,min}}$ of 1 dB, while support of 0.5 dB is optional.

Proposal: Our opinion is that nothing else is needed to be specified for downlink power control. The text covers all the cases, also the 0 dB step, meaning that downlink tx power level does not have to be changed in each slot. Thus the Note can be deleted.

Note 3:

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

Proposal: We propose that we don't specify the upper limit. We did not specify any upper limit for the downlink DPCCH power offsets either. Thus the Note can be deleted.

The relative transmit power offset between DPCCH fields and DPDCHs is determined by the network. The TFCI, TPC and pilot fields of the DPCCH are offset relative to the DPDCHs power by PO1, PO2 and PO3 dB respectively. The power offsets may vary in time.

5.2.1.2 Ordinary transmit power control

The downlink inner-loop power control adjusts the network transmit power in order to keep the received downlink SIR at a given SIR target, SIR_{target} . A 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 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.

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

As a response to the received TPC commands, UTRAN may adjust the downlink DPCCH/DPDCH power. The power of each transmitted DPCCH/DPDCH symbol power, which does not contain DTX, shall may not exceed Maximum_DL_Power (dBm), nor shall may it be below Minimum_DL_Power (dBm).

~~<Note: It should be clarified with WG3 if Maximum_DL_Power and Minimum_DL_Power are given as absolute values or relative.>~~

~~<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.>~~

Changes 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.

5.2.1.3 Power control in compressed mode

The aim of downlink power control in uplink or/and downlink compressed mode is to recover as fast as possible a signal-to-interference ratio (SIR) close to the target SIR after each transmission gap.

The UE behaviour is the same in compressed mode as in normal mode, described in subclause 5.2.1.2, i.e. TPC commands should be generated based on the estimated received SIR.

The UTRAN behaviour during compressed mode is not specified. As an example, the algorithm can be similar to uplink power control in downlink compressed mode as described in sub-clause 5.1.2.3.

In downlink compressed mode or in simultaneous downlink and uplink compressed mode, the transmission of downlink DPCCH and DPDCH(s) is stopped.