

4.2.2 Uplink Control

4.2.2.1 General Limits

By means of higher layer signalling, the Maximum_Allowed_UL_TX_ power for uplink may be set to a value lower than what the terminal power class is capable of. The total transmit power shall not exceed the allowed maximum. If this would be the case, then the transmit power of all uplink physical channels in a timeslot is reduced by the same amount in dB.

4.2.2.2 PRACH

The transmit power for the PRACH is set by higher layers based on open loop power control as described in [TS 25.331](#) ~~(F5)~~.

4.2.2.3 DPCH, PUSCH

After the synchronisation between UTRAN and UE is established, the UE transits into open-loop transmitter power control (TPC).

The transmitter power of UE shall be calculated by the following equation:

$$P_{UE} = \alpha L_{P-CCPCH} + (1-\alpha)L_0 + I_{BTS} + SIR_{TARGET} + \text{Constant value}$$

where

P_{UE} : Transmitter power level in dBm,

$L_{P-CCPCH}$: Measure representing path loss in dB (reference transmit power is broadcast on BCH).

L_0 : Long term average of path loss in dB

I_{BTS} : Interference signal power level at cell's receiver in dBm, which is broadcast on BCH

α : α is a weighting parameter which represents the quality of path loss measurements. α may be a function of the time delay between the uplink time slot and the most recent down link time slot containing a physical channel that provides the beacon function, see [8]. α is calculated at the UE. An example for calculating α as a function of the time delay is given in Annex 1.

SIR_{TARGET} : Target SNR in dB. A higher layer outer loop adjusts the target SIR.

Constant value: This value shall be set by higher Layer (operator matter). and is broadcast on BCH.

If the midamble is used in the evaluation of $L_{P-CCPCH}$ and L_0 , and the Tx diversity scheme used for the P-CCPCH involves the transmission of different midambles from the diversity antennas, the received power of the different midambles from the different antennas shall be combined prior to evaluation of these variables.

4.2.2.3.1 Out of synchronisation handling

UE shall shut off the uplink transmission if the following criteria is fulfilled:

- The UE estimates the received dedicated channel burst quality over the last [160] ms period to be worse than a threshold Q_{out} . This criterion is never fulfilled during the first [160] ms of the dedicated channel's existence. Q_{out} is defined implicitly by the relevant tests in TS 25.102
- If the UE detect the beacon channel reception level [10 dBm] above the handover triggering level, then the UE uses [320] ms estimation period for the burst quality evaluation.

UE shall resume the uplink transmission if the following criteria is fulfilled:

- The UE estimates the burst reception quality over the last [160] ms period to be better than a threshold Q_{in} . This criterion is always fulfilled during the first [160] ms of the dedicated channel's existence. Q_{in} is defined implicitly by the relevant tests in TS 25.102.

4.2.3 Downlink Control

4.2.3.1 P-CCPCH, PICH

The Primary CCPCH transmit power is set by higher layer signalling and can be changed based on network determination on a slow basis. The reference transmit power of the P-CCPCH is signalled on the BCH. The PICH is transmitted with the same power as the P-CCPCH.

4.2.3.2 S-CCPCH

The relative transmit power of the Secondary CCPCH compared to the P-CCPCH transmit power is set by higher layer signalling.

4.2.3.3 Dedicated Physical Channel, [PDSCH](#)

The initial transmission power of the downlink Dedicated Physical Channel [and the PDSCH](#) is set by the network. After the initial transmission, the UTRAN transits into SIR-based inner loop power control.

The measurement of received SIR shall be carried out periodically at the UE. When the measured value is higher than the target SIR value, TPC command = "down". When this is lower than or equal to the target SIR value, TPC command = "up".

As a response to the received TPC command, UTRAN may adjust the transmit power of all downlink DPCHs [and PDSCHs](#) of this radio link. When the TPC command is judged as "down", the transmission power may be reduced by one step, whereas if judged as "up", the transmission power may be raised by one step. The transmission power of one DPCH [or PDSCH](#) shall not exceed the limits set by higher layer signalling by means of Maximum_DL_Power (dB) and Minimum_DL_Power (dB). The transmission power is defined as the average power of the complex QPSK symbols of a single DPCH before spreading.

The total downlink transmission power at the nodeB within one timeslot shall not exceed Maximum_Transmission_Power set by higher layer signalling. In case the total power of the sum of all transmissions would exceed this limit, then the transmission power of all downlink DPCHs is reduced by the amount that allows fulfilling the requirement. The same amount of power reduction is applied to all DPCHs

A higher layer outer loop adjusts the target SIR.

4.2.3.3.1 Out of synchronisation handling

When the dedicated physical channel out of sync criteria based on the received burst quality is as given in the section 4.4.2 then the UE shall set the uplink TPC bit = „1,, . The CRC based criteria shall not be taken into account in TPC bit value setting.