TSG-RAN Working Group 1 meeting #9 ***TSGR1#9(99)k69***
Dresden, Germany
November 30 – December 3, 1999

Agenda item:

Title: CR 25.214-023: Maximum TX power at uplink compressed mode, rev 1.

Source: Telia AB

Document for: Decision

Background

RAN-2 has defined a Layer 2 Information Element (IE) "Maximum allowed UL TX power" in their specifications. Nevertheless, there is no mentioning of this upper limit in any of the PC algorithms in TS 25.214 v3.0.0, hence the specification needs to be updated.

In R1-99i66 CR 25214-012, it is proposed how to deal with the information element in section 5.1.2.2 on ordinary transmit power control. In this document, a way forward for the handling of the information element in compressed mode is proposed.

Revision history

The difference between the original CR and revision 1 is that the word “allowed” has been inserted between “maximum” and “transmission power” in the last sentence of the CR.

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Document ***R1#9(99)k69***
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.214	**CR**	**023r1**	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-RAN #6 *list expected approval meeting # here ↑*

for approval [X] for information [ ]

strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: Telia AB **Date:** 1999-12-01

Subject: Maximum Tx power at uplink compressed mode

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	[X]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[ ]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change: RAN WG2 has in the RRC specifications defined an information element "Maximum allowed UL TX power". However the use of this parameter is not reflected in the current version of TS 25.214.

Clauses affected: 5.1.2.3

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments: This CR is a follow up to CR 25.214-012 with the difference that it deals with compressed mode.

The UE first determines one temporary TPC command, TPC_temp_i, for each of the N sets of 3 TPC commands as follows:

- If all 3 hard decisions within a set are "1", $TPC\_temp_i = 1$
- If all 3 hard decisions within a set are "0", $TPC\_temp_i = -1$
- Otherwise, $TPC\_temp_i = 0$

Finally, the UE derives a combined TPC command for the third slot, TPC_cmd, as a function γ of all the N temporary power control commands TPC_temp_i:

TPC_cmd(3^{rd} slot) = γ (TPC_temp_1, TPC_temp_2, …, TPC_temp_N), where TPC_cmd(3^{rd} slot) can take the values 1, 0 or –1.

5.1.2.2.3.3.2 Example of the scheme

A particular example of the scheme is obtained when using the following definition of the function γ:

TPC_cmd is set to 1 if $\frac{1}{N}\sum_{i=1}^{N} TPC\_temp_i > 0.5$.

TPC_cmd is set to -1 if $\frac{1}{N}\sum_{i=1}^{N} TPC\_temp_i < -0.5$.

Otherwise, TPC_cmd is set to 0.

5.1.2.3 Transmit power control in compressed mode

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

In downlink compressed mode, no power control is applied during transmission gaps, since no downlink TPC command is sent. Thus, the transmit powers of the uplink DPDCH(s) and DPCCH are not changed during the transmission gaps.

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

The initial transmit power of each uplink DPDCH and DPCCH after the transmission gap is equal to the power before the gap, but with an offset Δ_{RESUME}. The value of Δ_{RESUME} (in dB) is determined according to the Power Resume Mode (PRM). The PRM is a UE specific parameter, which is signalled by the network with the other parameters of the downlink compressed mode (see TS 25.215). The different modes are summarised in table 1.

Table 1: Power control resume modes during compressed mode

Power Resume Mode	Description
0	$\Delta_{RESUME} = 0$
1	$\Delta_{RESUME} = \text{Int}[d_{last} / \Delta_{TPCmin}]\ \Delta_{TPCmin}$

Here Int[ ] means round to the nearest integer and Δ_{TPCmin} is the minimum power control step size supported by the UE. δ_{last} is the power offset computed at the last slot before the transmission gap according to the following recursive relations, which are, executed every slot during uplink transmission:

$$d_{last} = 0.9375 d_{previous} - 0.96875 TPC\_cmd_{last} \Delta_{TPC}$$

$$d_{previous} = d_{last}$$

TPC_cmd is the power control command executed by the UE in the last slot before the transmission gap. $\delta_{previous}$ is the power offset computed for the previous slot. The value of $\delta_{previous}$ shall be initialised to zero when a DCH is activated, or during the first slot after a transmission gap.

After each transmission gap, 2 modes are possible for the power control algorithm. The power control mode (PCM) is fixed and signalled with the other parameters of the downlink compressed mode (see TS 25.215). The different modes are summarised in the table 2:

Table 2: Power control modes during compressed mode

Mode	Description
0	Ordinary transmit power control is applied with step size Δ_{TPC}
1	Ordinary transmit power control is applied with step size $\Delta_{RP\text{-}TPC}$ during RPL slots after each transmission gap.

For mode 0, the step size is not changed and the ordinary transmit power control is still applied during compressed mode (see subclause 5.1.2.2), using the same algorithm for processing TPC commands as in normal mode (see section 5.1.2.2.2 and 5.1.2.2.3).

For mode 1, during RPL slots after each transmission gap, called the recovery period, the same power control algorithm is applied but with a step size $\Delta_{RP\text{-}TPC}$ instead of Δ_{TPC}.

$\Delta_{RP\text{-}TPC}$ is called recovery power control step size and is expressed in dB. If algorithm 1 (section 5.1.2.2.2) is used in normal mode, $\Delta_{RP\text{-}TPC}$ is equal to the minimum value of 3 dB and $2\Delta_{TPC}$. If algorithm 2 (section 5.1.2.2.3) is used in normal mode, $\Delta_{RP\text{-}TPC}$ is equal to 1 dB.

RPL is called recovery period length and is expressed in number of slots. RPL is fixed and equal to the minimum value of TGL and 7 slots.

After the recovery period transmit power control resumes using the same algorithm and step size as used in normal mode before the transmission gap.

If algorithm 2 (section 5.1.2.2.3) is being used in normal mode, the sets of slots over which the TPC commands are processed (in section 5.1.2.2.2.3.1) shall remain aligned to the frame boundaries in the compressed frame. In both mode 0 or mode 1, if the transmission gap or the recovery period results in any incomplete sets of TPC commands, no TPC_temp_i command will be determined for those sets of slots which are incomplete, and there will be no change in transmit power level for those sets of slots.

During compressed mode and the recovery period after compressed mode, regardless of the offset Δ_{RESUME} and the step size $\Delta_{RP\text{-}TPC}$, the UE transmit power shall not exceed the maximum allowed transmission power set by higher layer signalling.