

3GPP TSG RAN Meeting #14  
Kyoto, Japan, 11<sup>th</sup>-14<sup>th</sup>, December, 2001

**R1-01-0935**

CR-Form-v4

## CHANGE REQUEST

⌘ **25.214 CR** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Clarification of TPC procedure in UE for controlling downlink Tx power		
<b>Source:</b>	⌘ Fujitsu, NEC		
<b>Work item code:</b>	⌘	<b>Date:</b>	⌘ Dec.13 <sup>th</sup> , 2001
<b>Category:</b>	⌘ <b>A</b>	<b>Release:</b>	⌘ REL4
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	<b>F</b> (correction)	<b>R96</b> (Release 1996)	<b>2</b> (GSM Phase 2)
	<b>A</b> (corresponds to a correction in an earlier release)	<b>R97</b> (Release 1997)	
	<b>B</b> (addition of feature),	<b>R98</b> (Release 1998)	
	<b>C</b> (functional modification of feature)	<b>R99</b> (Release 1999)	
	<b>D</b> (editorial modification)	<b>REL-4</b> (Release 4)	
	Detailed explanations of the above categories can be found in 3GPP <u>TR 21.900</u> .		<b>REL-5</b> (Release 5)

<b>Reason for change:</b>	⌘ To clarify TPC procedure in UE in Site Selection Diversity Transmission.
<b>Summary of change:</b>	⌘ Ambiguous text in sections 5.2.1.4 is replaced by two clear options that can be used for determining TPC command in UE for control of downlink transmit power.  Permitted combination of Primary Cell ID type with TPC DPC MODE 1 is clarified.  <b>Isolated Impact Analysis:</b>  This is a clarification of the UE behaviour in SSDT mode. Concerning the two options for determining TPC command there must be no impact on existing UE implementations. However, existing UE implementations may allow inappropriate combination of Primary Cell ID types with TPC DPC MODE 1. Nevertheless, the choice of Primary Cell ID type is under the network control and therefore the combination could be limited by the network.
<b>Consequences if not approved:</b>	⌘ There will be ambiguity in the spec and it may lead differing interpretation of the specification.

<b>Clauses affected:</b>	⌘ 5.2.1.4.2, 5.2.1.4.3	
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications	⌘
	<input type="checkbox"/> Test specifications	
	<input type="checkbox"/> O&M Specifications	
<b>Other comments:</b>	⌘	

### How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.htm). Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://www.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

#### 5.2.1.4.2 TPC procedure in UE

The UE shall generate TPC commands to control the network transmit power based on one or both of the following:

- (a) the downlink DPCH of the cell which is assumed to be in primary state according to the primary cell selection reported by the UE. The Timing relation difference between the primary cell ID reporting period and primary/non-primary state update in the cell is described in Section 5.2.1.4.4.
- (b) the downlink DPCH of cells which are detected by the UE to be in primary state

and send them in the TPC field of the uplink DPCCCH, ~~based on the downlink signals from the primary cell only.~~ An example on how to derive the TPC commands is given in Annex B.2.

In case of TPC DPC MODE=1, only the temporary cell ID types are permitted:

- 1 FBI bit and "long" ID code length
- 2 FBI bits and "short" ID code length

#### 5.2.1.4.3 Selection of primary cell

The UE selects ~~a~~ the primary cell periodically by measuring the RSCP of P-CPICHs transmitted by the active cells. The cell with the highest P-CPICH RSCP is selected ~~detected~~ as a ~~the~~ primary cell.

#### 5.2.1.4.4 Delivery of primary cell ID

The UE periodically sends the ID code of the primary cell via portion of the uplink FBI field assigned for SSDT use (FBI S field). A cell recognises its state as non-primary if the following conditions are fulfilled simultaneously:

- The received ID code does not match with the own ID code.
- The received uplink signal quality satisfies a quality threshold,  $Q_{th}$ , a parameter defined by the network.
- If uplink compressed mode is used, and less than  $\lfloor N_{ID}/3 \rfloor$  bits are lost from the ID code (as a result of uplink compressed mode), where  $N_{ID}$  is the number of bits in the ID code (after puncturing according to clause 5.2.1.4.1.1, if puncturing has been done).

Otherwise the cell recognises its state as primary.

The state of the cells (primary or non-primary) in the active set is updated synchronously. If a cell receives the last portion of the coded ID in uplink slot  $j$ , the state of cell is updated in downlink slot  $(j+1+T_{os}) \bmod 15$ , where  $T_{os}$  is defined as a constant of 2 time slots. The updating of the cell state is not influenced by the operation of downlink compressed mode.

At the UE, the primary ID code to be sent to the cells is segmented into a number of portions. These portions are distributed in the uplink FBI S-field. The cell in SSDT collects the distributed portions of the primary ID code and then detects the transmitted ID. The period of the primary cell update depends on the settings of the code length and the number of FBI bits assigned for SSDT use as shown in table 5.

**Table 5: Period of primary cell update**

code length	The number of FBI bits per slot assigned for SSDT	
	1	2
"long"	1 update per frame	2 updates per frame
"medium"	2 updates per frame	4 updates per frame
"short"	3 updates per frame	5 updates per frame

#### 5.2.1.4.5 TPC procedure in the network

In SSDT, a non-primary cell can switch off its DPDCH output (i.e. no transmissions).

The cell manages two downlink transmission power levels, P1, and P2. Power level P1 is used for downlink DPCCH transmission power level and this level is updated in the same way with the downlink DPCCH power adjustment specified in 5.2.1.2.2 (for normal mode) and 5.2.1.3 (for compressed mode) regardless of the selected state (primary or non-primary). The actual transmission power of TFCI, TPC and pilot fields of DPCCH is set by adding P1 and the offsets PO1, PO2 and PO3, respectively, as specified in 5.2.1.1. P2 is used for downlink DPDCH transmission power level and this level is set to P1 if the cell is selected as primary, otherwise P2 is switched off. The cell updates P1 first and P2 next, and then the two power settings P1 and P2 are maintained within the power control dynamic range. Table 6 summarizes the updating method of P1 and P2.

**Table 6: Updating of P1 and P2**

State of cell	P1 (DPCCH)	P2 (DPDCH)
non primary	Updated in the same way with the downlink DPCCH power adjustment specified in 5.2.1.2.2 and 5.2.1.3	Switched off
primary		= P1

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## B.2 Example of implementation in the UE

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 and calculate the signal-to-interference ratio,  $SIR_{est}$ .  $SIR_{est}$  can be calculated as  $RSCP/ISCP$ , where RSCP refers to the received signal code power on one code and ISCP refers to the non-orthogonal interference signal code power of the received signal on one code. Note that due to the specific SIR target offsets described in [5] that can be applied during compressed frames, the spreading factor shall not be considered in the calculation of  $SIR_{est}$ .

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 in soft handover and SSDT is not activated, the UE should estimate  $SIR_{est}$  from the downlink signals of all cells in the active set.

When SSDT is activated, the UE should estimate  $SIR_{est}$  from the downlink signals of the primary cell. If the state of the cells (primary or non-primary) in the active set is changed and the UE sends the last portion of the coded ID in uplink slot  $j$ , the UE should change the basis for the estimation of  $SIR_{est}$  at the beginning of downlink slot  $(j+1+T_{os}) \bmod 15$ , where  $T_{os}$  is defined as a constant of 2 time slots.