

CR-Formv3	
CHANGE REQUEST	
✎ 25.214 CR 161 ✎ rev 1 ✎ Current version: 3.5.0 ✎	

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

Title:	✎ Correction of the UE behaviour in SSDT mode	
Source:	✎ Vodafone Group, Nokia	
Work item code:	✎	Date: ✎ 27 February, 2001
Category:	✎ F	Release: ✎ R99
	Use <u>one</u> of the following categories: F (essential correction) A (corresponds to a correction in an earlier release) B (Addition of feature), C (Functional modification of feature) D (Editorial modification)	Use <u>one</u> of the following releases: 2 (GSM Phase 2) R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) REL-4 (Release 4) REL-5 (Release 5)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900.	

Reason for change:	✎ Currently, along the specifications UE could derive the uplink TPC commands in different ways during SSDT. There is an example of potential implementation proposed in annex B.2 but no actual behaviour specified for the derivation of TPC commands within the UE in SSDT. Since SSDT will be supported by all Release 99 UE, it is essential for the good operation of the network to rely on the same behaviour from all UE in SSDT. The specifications must therefore mandate that the derivation of the TPC commands are based on the primary cell signals only.
Summary of change:	✎ The example of UE behaviour in SSDT from Annex B.2 is moved into the section describing the derivation of the TPC commands in the UE. The term "should" is then replaced by "shall" in order to mandate the behaviour.
Consequences if not approved:	✎ If not approved, variations in UE implementation may undermine the performance of a network operating SSDT.

Clauses affected:	✎ 5.2.1.4.2, Annex B.2	
Other specs affected:	✎ <input type="checkbox"/> Other core specifications ✎ <input type="checkbox"/> Test specifications ✎ <input type="checkbox"/> O&M Specifications ✎	
Other comments:	✎	

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. 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 reques

5.2.1.4 Site selection diversity transmit power control

5.2.1.4.1 General

Site selection diversity transmit power control (SSDT) is another macro diversity method in soft handover mode. This method is optional in UTRAN.

Operation is summarised as follows. The UE selects one of the cells from its active set to be 'primary', all other cells are classed as 'non primary'. The main objective is to transmit on the downlink from the primary cell, thus reducing the interference caused by multiple transmissions in a soft handover mode. A second objective is to achieve fast site selection without network intervention, thus maintaining the advantage of the soft handover. In order to select a primary cell, each cell is assigned a temporary identification (ID) and UE periodically informs a primary cell ID to the connecting cells. The non-primary cells selected by UE switch off the transmission power. The primary cell ID is delivered by UE to the active cells via uplink FBI field. SSDT activation, SSDT termination and ID assignment are all carried out by higher layer signalling.

5.2.1.4.1.1 Definition of temporary cell identification

Each cell is given a temporary ID during SSDT and the ID is utilised as site selection signal. The ID is given a binary bit sequence. There are three different lengths of coded ID available denoted as "long", "medium" and "short". The network decides which length of coded ID is used. Settings of ID codes for 1-bit and 2-bit FBI are exhibited in table 3 and table 4, respectively.

Table 3: Settings of ID codes for 1 bit FBI

ID label	ID code		
	"long"	"medium"	"short"
a	0000000000000000	(0)0000000	00000
b	101010101010101	(0)1010101	01001
c	011001100110011	(0)0110011	11011
d	110011001100110	(0)1100110	10010
e	000111100001111	(0)0001111	00111
f	101101001011010	(0)1011010	01110
g	011110000111100	(0)0111100	11100
h	110100101101001	(0)1101001	10101

Table 4: Settings of ID codes for 2 bit FBI

ID label	ID code (Column and Row denote slot position and FBI-bit position.)		
	"long"	"medium"	"short"
a	(0)0000000	(0)000	000
	(0)0000000	(0)000	000
b	(0)0000000	(0)000	000
	(1)1111111	(1)111	111
c	(0)1010101	(0)101	101
	(0)1010101	(0)101	101
d	(0)1010101	(0)101	101
	(1)0101010	(1)010	010
e	(0)0110011	(0)011	011
	(0)0110011	(0)011	011
f	(0)0110011	(0)011	011
	(1)1001100	(1)100	100
g	(0)1100110	(0)110	110
	(0)1100110	(0)110	110
h	(0)1100110	(0)110	110
	(1)0011001	(1)001	001

The ID code bits shown in table 3 and table 4 are transmitted from left to right. The ID code(s) are transmitted aligned to the radio frame structure (i.e. ID codes shall be terminated within a frame). If FBI space for sending the last ID code within a frame cannot be obtained, the first bit(s) from that ID code are punctured. The bit(s) to be punctured are shown in brackets in table 3 and table 4.

The alignment of the ID codes to the radio frame structure is not affected by transmission gaps resulting from uplink compressed mode.

5.2.1.4.2 TPC procedure in UE

The UE shall generate TPC commands to control the network transmit power and send them in the TPC field of the uplink DPCCH 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.

5.2.1.4.3 Selection of primary cell

The UE selects a primary cell periodically by measuring the RSCP of CPICHs transmitted by the active cells. The cell with the highest CPICH RSCP is detected as a 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 primary 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;
- and when the use of uplink compressed mode does not result in excessive levels of puncturing on the coded ID. The acceptable level of puncturing on the coded ID is less than $\frac{N_{ID}}{3}$ symbols in the coded ID, where N_{ID} is the length of the coded ID.

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

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 DPCCCH/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 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.