**3GPP TSG-RAN Meeting#14**
**Kyoto, Japan, 11-14 December 2001**

***RP-01-0933***

*CR-Form-v5*

# CHANGE REQUEST

⌘ **25.214** **CR** **228** ⌘ **rev** **-** ⌘ Current version: **3.8.0** ⌘

*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 ☐

| | | |
|---|---|---|
| ***Title:*** | ⌘ | Restriction to SSDT and closed loop mode transmit diversity combination |
| ***Source:*** | ⌘ | Nokia, Panasonic |
| ***Work item code:*** | ⌘ | ***Date:*** ⌘ 12.12.2001 |
| ***Category:*** | ⌘ | **F** ***Release:*** ⌘ R99 |

*Use one of the following categories:*
***F*** *(correction)*
***A*** *(corresponds to a correction in an earlier release)*
***B*** *(addition of feature),*
***C*** *(functional modification of feature)*
***D*** *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

*Use one 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)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | Due to interoperability problems of SSDT and closed loop mode TX diversity it is proposed that features in question are not combined together. |
| ***Summary of change:*** | ⌘ | SSDT and closed loop mode TX diversity are not used together |
| ***Consequences if not approved:*** | ⌘ | Interoperability problems with SSDT and closed loop mode TX diversity |

| | | |
|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.2.1.4.1, A2 |
| ***Other specs affected:*** | ⌘ | ☐ Other core specifications ⌘<br>☐ Test specifications<br>☐ O&M Specifications |
| ***Other comments:*** | ⌘ | This CR is considered to have isolated impact. This would not affect implementations behaving like indicated in the CR, but would affect implementations supporting the corrected functionality. |

**How to create CRs using this form:**
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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
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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.

- ΔP1coding = DeltaSIRafter1 if the current frame just follows a frame containing the start of the first transmission gap in the transmission gap pattern.
- ΔP2_coding = DeltaSIR2 if the start of the second transmission gap in the transmission gap pattern is within the current frame.
- ΔP2_coding = DeltaSIRafter2 if the current frame just follows a frame containing the start of the second transmission gap in the transmission gap pattern.
- ΔP1_coding = 0 dB and ΔP2_coding = 0 dB in all other cases.

and ΔPi_compression is defined by :

- ΔPi_compression = 3 dB for downlink frames compressed by reducing the spreading factor by 2.
- ΔPi_compression = 10 log ($15*F_i$ / ($15*F_i$ - $TGL_i$)) if there is a transmission gap created by puncturing method within the current TTI of length $F_i$ frames, where $TGL_i$ is the gap length in number of slots (either from one gap or a sum of gaps) in the current TTI of length $F_i$ frames.
- ΔPi_compression = 0 dB in all other cases.

In case several compressed mode patterns are used simultaneously, a δP offset is computed for each compressed mode pattern and the sum of all δP offsets is applied to the frame.

For all time slots except those in transmissions gaps, the average power of transmitted DPDCH symbols over one timeslot shall not exceed Maximum_DL_Power (dB) by more than $P_{SIR}$, nor shall it be below Minimum_DL_Power (dB). Transmitted DPDCH symbol means here a complex QPSK symbol before spreading which does not contain DTX. Maximum_DL_Power (dB) and Minimum_DL_Power (dB) are power limits for one channelisation code, relative to the primary CPICH power [6].

### 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.

SSDT is only supported~~can only be used~~ when the P-CPICH is used as the downlink phase reference and closed loop mode transmit diversity is not used simultaneously.

##### 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.

## A.2 Computation of feedback information for closed loop transmit diversity

In non-soft handover case, the computation of feedback information can be accomplished by e.g. solving for weight vector, $\underline{w}$, that maximises.

$$P=\underline{w}^H H^H H\underline{w} \quad (1)$$

where

$H=[\underline{h_1}\ \ \underline{h_2}]$ and $\underline{w} = [\ w_1, w_2\ ]^T$

and where the column vectors $\underline{h_1}$ and $\underline{h_2}$ represent the estimated channel impulse responses for the transmission antennas 1 and 2, of length equal to the length of the channel impulse response. The elements of $\underline{w}$ correspond to the adjustments computed by the UE.

During soft handover ~~or SSDT power control~~, the antenna weight vector, $\underline{w}$ can be, for example, determined so as to maximise the criteria function:

$$P = \underline{w}^H(H_1{}^H H_1 + H_2{}^H H_2 + \cdots)\underline{w} \quad (2)$$

where $H_i$ is an estimated channel impulse response for BS#i. In regular SHO, the set of BS#i corresponds to the active set. ~~With SSDT, the set of BS#i corresponds to the primary base station(s).~~

# Annex B (informative): Downlink power control

## B.1 Power control timing

The power control timing described in this annex should be seen as an example on how the control bits have to be placed in order to permit a short TPC delay.

In order to maximise the cell radius distance within which one-slot control delay is achieved, the frame timing of an uplink DPCH is delayed by 1024 chips from that of the corresponding downlink DPCH measured at the UE antenna.

Responding to a downlink TPC command, the UE shall change its uplink DPCH output power at the beginning of the first uplink pilot field after the TPC command reception. Responding to an uplink TPC command, the UTRAN access point shall change its DPCH output power at the beginning of the next downlink pilot field after the reception of the whole TPC command. Note that in soft handover, the TPC command is sent over one slot when DPC_MODE is 0 and over three slots when DPC_MODE is 1. Note also that the delay from the uplink TPC command reception to the power change timing is not specified for UTRAN. The UE shall decide and send TPC commands on the uplink based on the downlink SIR measurement. The TPC command field on the uplink starts, when measured at the UE antenna, 512 chips after the end of the downlink pilot field. The UTRAN access point shall decide and send TPC commands based on the uplink SIR measurement. However, the SIR measurement periods are not specified either for UE nor UTRAN.

Figure B.1 illustrates an example of transmitter power control timings.

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| ***Work item code:*** | ⌘ | ***Date:*** ⌘ 11.12.2001 |
| ***Category:*** | ⌘ | **A** ***Release:*** ⌘ REL-4 |

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SSDT is only supported~~can only be used~~ when the P-CPICH is used as the downlink phase reference and closed loop mode transmit diversity is not used simultaneously.

UTRAN may also command UE to use SSDT signalling in the uplink although cells would transmit the downlink as without SSDT active. In case SSDT is used in the uplink direction only, the processing in the UE for the radio links received in the downlink is as with macro diversity in non-SSDT case. The downlink operation mode for SSDT is set by higher layers. UTRAN may use the SSDT information for the PDSCH power control as specified in section 5.2.2.

NOTE: This feature of SSDT limited to uplink only applies to terminals that are DSCH capable.

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