

**Agenda Item:** 14.1

**Source:** Telecom Modus Ltd

**Title:** [Study Item] **SSDT impacts on Iub and Iur**

**Document for:** Approval

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## 1 INTRODUCTION

This contribution presents the result of study item 'Site Selection Diversity Transmit power control' (SSDT) impact on Iub and Iur.

### 1.1 Current Status

Site Selection Diversity (SSDT) is included in RAN WG1 and WG2, WG4, specifications as one of R99 features. In order to complete making the specifications required to entire RAN WGs, we presented Tdoc830 to justify the specifications of SSDT required to Node-B and RNC. The document indicated two solutions for SSDT signaling over Iur/Iub, namely using RNSAP/NBAP and using DCH FP. This document discusses the NBAP message use and Iub/Iur parameters for ssdt.

### Background

SSDT is a power control scheme for the UE in soft hand-over mode whereby the UE selects one of its cells cites from its active set to be 'primary' in the DL, and all others are classed as 'non-primary'.

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

The main objective is to transmit on the DL from the best cell, thus reducing the interference caused by multiple transmissions in a soft hand over mode. A second objective is to achieve fast site selection without network intervention, thus maintaining the advantage of the soft hand-over. In order to select a primary cell, each cell is assigned a temporary identification Coded ID label is transported across Iub/Iur. UE periodically informs a primary cell identification to the connecting cells. The non-primary cells selected by UE switch off the transmission power. The primary cell identity code is delivered via UL DPCCH FBI field.

There are three different lengths of coded ID (temp cell ID) available denoted as "long", "medium" and "short". The SRNC decides which length of coded ID is used and notifies it to Node-B and UE. Two FBI settings FBI with bit1 and FBI with bit2 are supported for UL DPCCH.

When the SRNC makes a decision to enable the SSDT it has to tell node-B which UL DPCCH structure to use. The use of FBI field in UL DPCCH may vary as the other diversity methods such as TxAA may be used in parallel with the SSDT.

Upon receipt of the primary cell ID by all the involved cells, the cells checks its minimum SSDT quality threshold (Min-Qth) value against the received UL quality. If it is above the minimum threshold value and the received Primary ID does not match its own Id (RL) then the non-primary cell switches the transmission power off. Otherwise if the received power is below the Qth then the cells continues to transmit normally. The Decoded temp Id is only validated / acted upon by the Node-B when the link quality is above the minimum SSDT threshold quality value. This minimum threshold value is used so reliable detection of a frame can be achieved.

For further information on SSDT, please refer to reference [1], section 5.2.3.4 and enclosed Annex A, B, C

## 1.2 Detail Discussion

### 1.1.1.2.1 Requirements for SSDT

- Requirement1:** The SSDT function is initiated/terminated in the SRNC.
- Requirement2:** SSDT once set in one state (ON or OFF) will remain in that state for a considerable period of time and will only be changed as the result of some signaling procedure (for ex. NBAP, RNSAP),
- Requirement3:** SSDT identifier is set by SRNC to 'on' in Node B for each radio link. This will be set only when UE has more than or equal to 2 RLs, as a power control mechanism.
- Requirement4:** SSDT can not be activated when number of active set member in UE exceeds 8. And SSDT should be switched off in case UTRAN reaches the number of active sets greater than 8 and may be switched on again.
- Requirement5:** SSDT should be on at Node B upon the SSDT activation at UE and SSDT should be off at UE upon the SSDT termination at Node B.

### 1.2.2 Criteria for Node-B action

Node B first checks the following and acts upon only if it satisfies all the conditions.

```
[if (SSDT on &
Qth<= UL RL Received Strength
& Its cell' id != Primary Id)] then switch the DL power off for the DL RL.] else
[if (SSDT on &
Qth<= UL RL Received Strength
& Its cell' id == Primary Id)] then do not switch the DL power off for the DL RL.]
```

### 1.2.3 Parameters across Iub/Iur

1. SSDT indicator (on/off)
2. activation time (CFN)
3. ID code length (long, medium, short)
4. UL DPCCH Structure Indicator: Default, 1bit FBI or 2 bit FBI in FBI field of UL DPCCH
5. ID label

### 1.1.1.2.3.1 SSDT activation time

This is required in order to change Cell state from SSDT off to SSDT on (or on to off) at exactly the same point in time (i.e. same radio frame number). This will avoid the problem of some Node-B's encountering the unexpected UL DPCCH bits rather than that they used to handle in the previous frame. For example, if Tx-AA was operated before SSDT and UE send the Primary ID and the SSDT is off at node B then the Node-B may decode FBI bits as Tx-AA weight. In another case, Node-B may handle the FBI bits as pilot bit.

### 1.1.1.2.3.2 UL DPCCH Structure :

The UL DPCCH structure is carried out on NBAP / RNSAP RL Setup Message/ RL addition Message, in order to set the FBI field at the time of establishing the Radio Links.

RL Set Up Request		
UL DPCCH Structure	Default/1/2 bit FBI	O

<b>RL Addition Response</b>		
UL DPCCCH Structure	Default/1/2 Bit FBI	O

### 1.1.1.31.2.3.3 Radio Cell Capabilities

The Node-B SSDT support capability of Node-B can be indicated in the following NBAP message RL Set Up Response or RL Addition Response across lub and lur. So SRNC has the *prior knowledge* of ssdt support by node-B. If say for ex. A UE has two RL across NodeB1 and NodeB2, and say NodeB1 supports SSDT and NodeB2 does not. SRNC will not set the ssdt on in this scenario, knowing one of its Node-B does not support the SSDT.

<b>RL Set Up Response</b>		
SSDT supported	Yes/no	M

<b>RL Addition Response</b>		
SSDT supported	Yes/no	M

## 1.2.4 Parameter Related with O&M

- Quality Threshold values.

### 1.1.1.1.2.4.1 Quality Threshold

In the WG3 meeting5 it was agreed that the 'Quality threshold' values to be chosen by the network operators. This values would be chosen with respect to the code word length, such as

- "long" ID code word -> Qth long -> low quality level;
- "medium" ID code word -> Qth medium; -> medium quality level;
- "short" ID code word -> Qth short -> high quality level

The idea being that errors in decoding a short ID code word are more likely to occur, than when decoding a long code word. So when using a "long" code word the quality threshold can be set to a low value.

### 1.1.1.21.2.4.2 Parameters related with O&M

Qth: Range of Quality Values as discussed above

ID code and associated Quality level		
"Long ID code"	"Medium ID code"	"Short ID code"
Low Quality Level	Medium Quality Level	Large Quality Level

## 1.2.5 SSdT Realization

To realize the ssdt in SRNC following two solutions are listed in section 1.2.5.1 and 1.2.5.2

### 4.4.4.1.2.5.1 NBAP / RNSAP USE with existing procedure

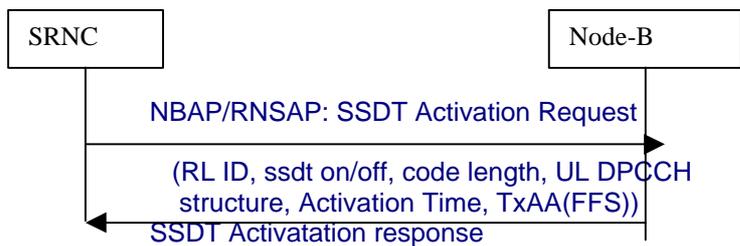
NBAP, RNSAP Messages: The following messages have SSdT impact. The required IE's for these messages, , RL Reconfiguration Prepare, And RL Reconfiguration Commit is shown in the following tables.

RL Reconfiguration Prepare		
SSdT Information		O
SSdT Indication	On/off	M
Coded ID label.		M
ID code length	Short / Long / Medium	M
UL DPCCH Structure Information		O
UL DPCCH Structure Indicator	Default /1 Bit /2 Bit FBI	M

RL Reconfiguration commit		
SSdT Information		O
Activation Time	CFN	M

### 1.2.8.2 Transmit Diversity Method Procedure across lub/lur

This procedure is used to activate or terminate SSdT (Site Selection Diversity Transmission Power Control) which is a Layer 1 procedure at Node-B. The SRNC may wish to initiate the ssdt procedure using logical NBAP and or RNSAP messages by sending an SSdT ACTIVATION REQUEST NBAP/RNSAP message, which contains RL ID, SSdT initiation, Code Word Length and UL DPCCH Structure, Activation Time, and TxAA (FFS) to node-B's.



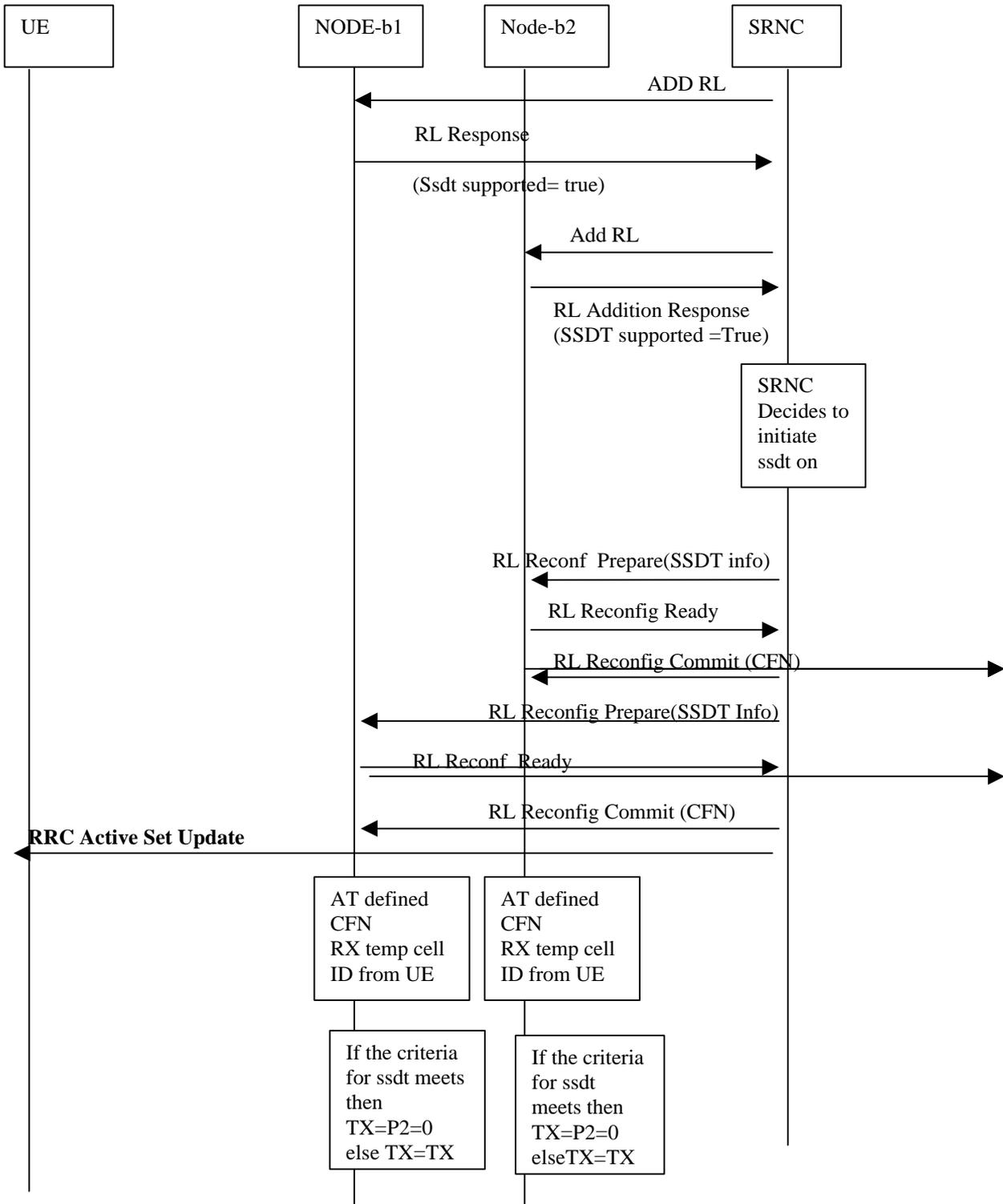
#### SSdT ACTIVATION REQUEST

Information element	Reference:	Type
SSdT Information		M
RL ID		M
SSdT Initiation	On/Off	M
Code Word Length	Long / Medium / Short	M
Activation Time	CFN	M
UL DPCCH Structure	Default, 1 bit FBI or 2 Bit FBI	M

## 2 REFERENCES

- [1] 3GPP RAN TS 25.214v1.30, Physical layer Procedures
- [2] 3GPP RAN TS 25.427v, UTRAN Iub/Iur Interface User Plane Protocol for DCH Data Streams
- [3] 3GPP RAN TS 25.433V131 NBAP SPECIFICATIONS
- [4] 3GPP RAN TS 25.423V131, RNSAP SPECIFICATIONS
- [5] 3GPP RAN TS 25.211v, Physical Channel and Mapping of Transport channel onto Physical channel.
- [6] ***TSGR4#7(99)491*** UE active set size simulation result

# ANNEX A: Basic Signalling procedure: Using existing NBAP/RNSAP messages



# ANNEX B: Basic Signalling procedure: with new ssdt activation procedure

