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| **Agenda Item:** | 14.1 |
| **Source:** | NTT DoCoMo |
| **Title:** | Proposal of revival of "Normal mode" in UL Iur/Iub FP |
| **Document for:** | Approval |

## 1. Abstract

At the R3 #6 meeting in Sophia Antipolis, it has been agreed that the silent mode will always be applied and normal mode has been abolished in both DL and UL DCH FP.

This contribution discusses that the applying silent mode in UL direction to speech service is not appropriate, causing wrong combining in DHO and will result in "noisy" voice.

## 2. Discussion

In R3, the current assumption is that the silent mode will always be applied to DCH FP in both directions.

In DL, when NodeB receives no FP data from SRNC, the NodeB assumes that the length of TB is 0bit for a certain DCH. NodeB will not send any TBs to the Air
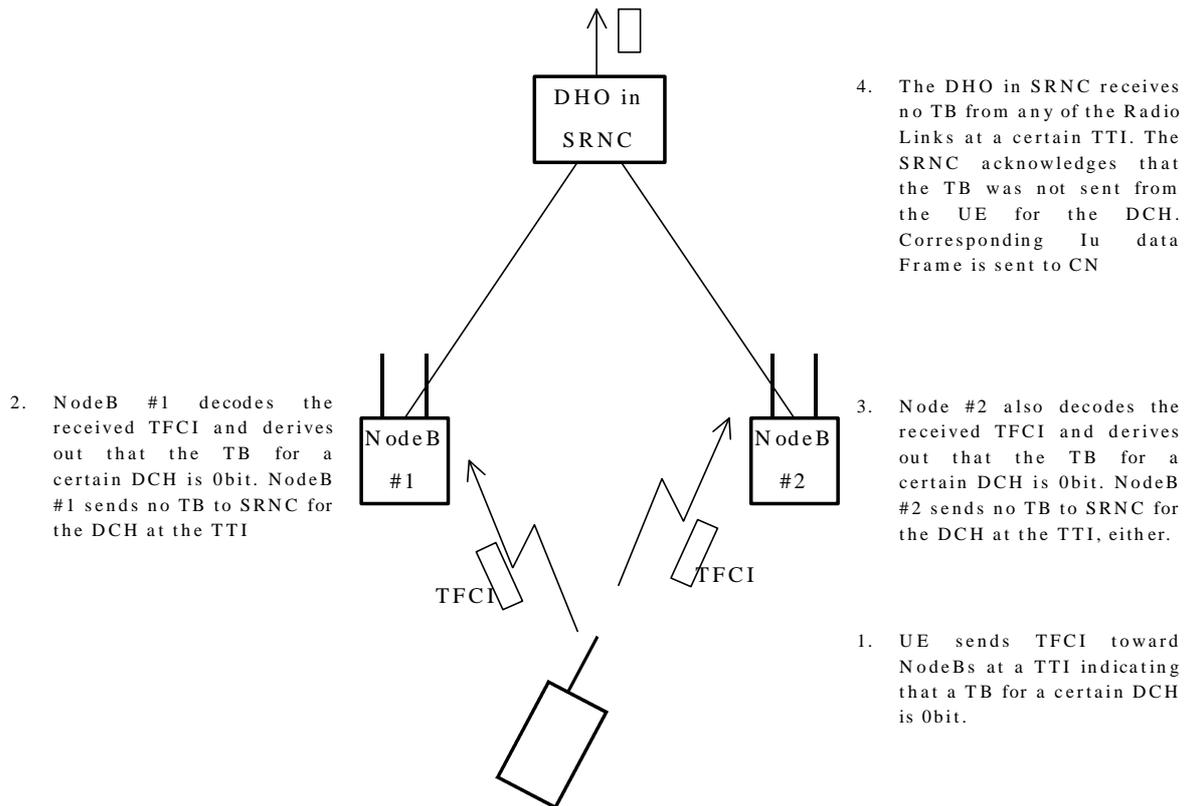
In UL, when NodeB receives DPCH from UE and the TFI indicates that the length of TB is 0bit, the NodeB does not send any FP to the SRNC for the DCH. Up on reception of NO TB from any of Radio Link for a certain DCH, The SRNC assumes that no data (TBS) for a certain DCH was transferred to the SRNC and will not send any TBs for the DCH assuming that the length of TBS is zero.

However, we believe that applying silent mode in UL will cause a serious problem in speech service.
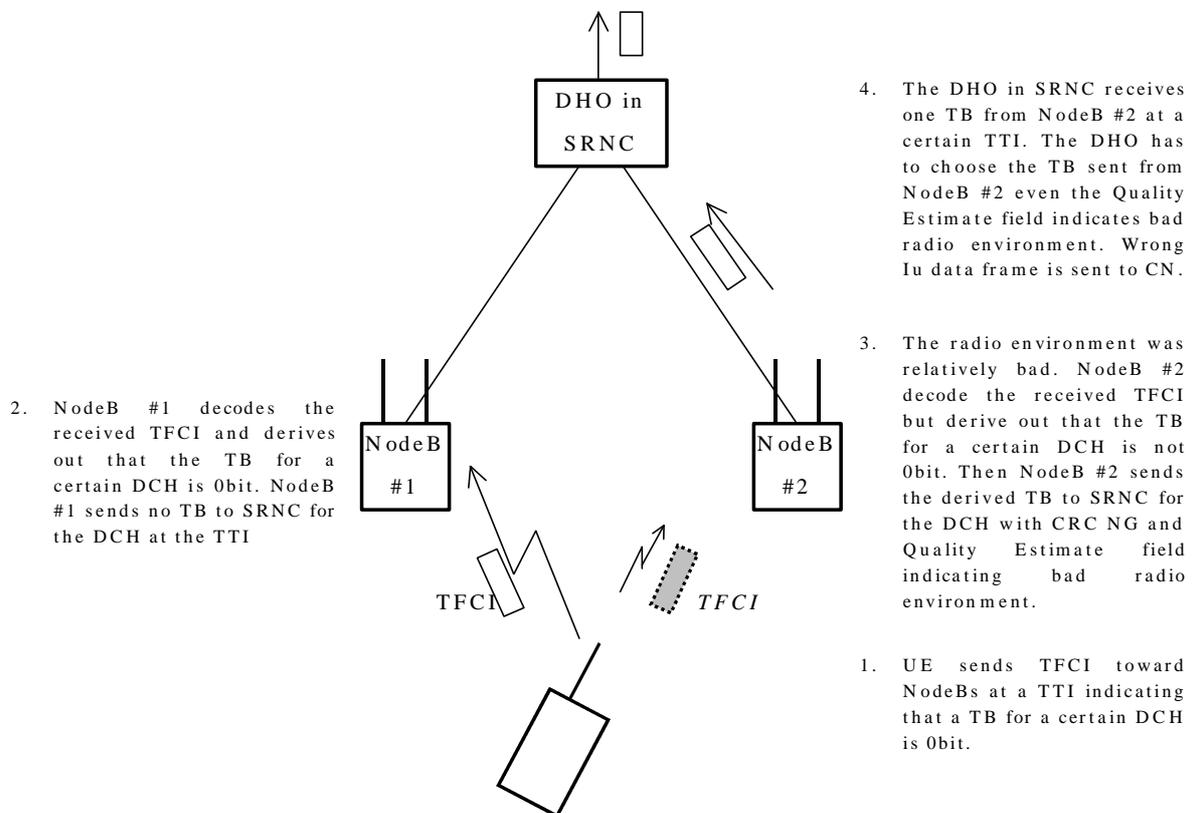
In MDC case, the DHO in the SRNC performs MDC based on the Quality Estimate in FP and the CRC indicator. The DHO selects a TB of which CRC is OK. If all the TBs are with CRC NG, then the DHO selects the most likely TB based on the Quality Estimate.

Supposed that a UE sends a TB of which length is 0bit at a certain TTI. Then the several NodeBs are expected to receive the TFCI. Based on the received TFCI, the NodeB derives out the TFI and finds out the length of TB. If the length of TB is 0bit, the NodeB would decide not to send a TB for the certain DCH at the TTI. The SRNC will acknowledge the "0bit" TB at a certain TTI by not receiving any TB from any of the Radio links.

The case above faces no contradiction when radio environment for all Radio Links is in good condition (i.e. TFCIs are all correctly received in the NodeBs), as in Figure 1.

4. The DHO in SRNC receives no TB from any of the Radio Links at a certain TTI. The SRNC acknowledges that the TB was not sent from the UE for the DCH. Corresponding Iu data Frame is sent to CN

DHO in SRNC

2. NodeB #1 decodes the received TFCI and derives out that the TB for a certain DCH is 0bit. NodeB #1 sends no TB to SRNC for the DCH at the TTI

3. Node #2 also decodes the received TFCI and derives out that the TB for a certain DCH is 0bit. NodeB #2 sends no TB to SRNC for the DCH at the TTI, either.

NodeB #1

NodeB #2

TFCI

TFCI

1. UE sends TFCI toward NodeBs at a TTI indicating that a TB for a certain DCH is 0bit.

**Figure 1 When the environment for all Radio Links is good**

DHO in SRNC

4. The DHO in SRNC receives one TB from NodeB #2 at a certain TTI. The DHO has to choose the TB sent from NodeB #2 even the Quality Estimate field indicates bad radio environment. Wrong Iu data frame is sent to CN.

2. NodeB #1 decodes the received TFCI and derives out that the TB for a certain DCH is 0bit. NodeB #1 sends no TB to SRNC for the DCH at the TTI

NodeB #1

NodeB #2

3. The radio environment was relatively bad. NodeB #2 decode the received TFCI but derive out that the TB for a certain DCH is not 0bit. Then NodeB #2 sends the derived TB to SRNC for the DCH with CRC NG and Quality Estimate field indicating bad radio environment.

TFCI

TFCI

1. UE sends TFCI toward NodeBs at a TTI indicating that a TB for a certain DCH is 0bit.

**Figure 2 When one of the NodeB cannot correctly decode TFCI due to bad radio environment**

However, Figure 2 shows a case when one NodeB could not receive TFCI correctly due to bad radio environment. In this case, it is likely for the NodeB to send the wrong TB to the DHO in SRNC.

If the correct TB is with length of 0bit, the NodeB, which receives TFCI correctly, will not send TB to the SRNC. However, the NodeB, which could not receive TFCI correctly, *do* send out the TB based on the received TFCI.

The problem is that the DHO in SRNC will select the TB based on the Quality Estimate in the FP that is actually received. The DHO will select a TB of which quality estimate is the best of the received TBs (even in CRC NG case). The "phantom" TB, which is not sent from NodeB to SRNC, is not treated as a candidate of selection in DHO and thus never selected in DHO. Even if there is no substantial data to be decoded in the vocoder (i.e. TB length is 0bit), there is a possibility that the vocoder may create "noise" based on the wrong selection in DHO.

### 3. Proposal

It is proposed that, in Iur/Iub DCH FP in UL, "normal mode" shall be applied to coordinated set of DCHs which carries GSM AMR PDUs. NodeB shall send FP regardless of length of the TB.

It is proposed to make the following changes to [1].

# 8.1 Data transfer

Editor's Note: this chapter describes when and how often a DCH data frame is transferred. Handling of DTX and loss of synchronisation in Node B is described as well.

When there is some data to be transmitted, DCH data frames are transferred every transmission time interval between the SRNC and the Node B for downlink transfer, and between Node B and SRNC for uplink transfer.

## 8.1.1 Uplink

In silent mode, Whenwhen Node B receives zero bits for all the DCHs in a set of coordinated DCHs, node B shall not send an UL data frame to the RNC for this set of coordinated DCHs.
In normal mode, NodeB shall always send an UL data frame to the RNC for all the DCHs in a set of coordinated DCHs regardless of length of Transport Block of DCHs.

When UL synchronisation is lost of not yet achieved, UL data frames are not sent to the SRNC.

## 8.1.2 Downlink

If the Node B does not receive a valid FP frame in a TTI, it assumes that there is no data to be transmitted in that TTI for this transport channel.

At each frame, the Node B shall build the TFCI value of each CCTrCH, according to the TFI of the DCH data frames multiplexed on this CCTrCH and scheduled for that frame. In case the Node receives an unknown combination of DCH data frames, it shall transmit only the DPCCH without TFCI bits.

Editor's note: LS sent to WG1 to verify the possibility to transmit DPCCH without TFCI.

In addition, it is also proposed to add a new information element *UL FP mode* to "RADIO LINK SETUP REQUEST for FDD", "RADIO LINK RECONFIGURATION PREPARE", and "RADIO LINK RECONFIGURATION REQUEST" messages in [2] and [3] as an element of "DCH Information". The

following example shows how the proposal is reflected to RNSAP: RADIO LINK SETUP REQUEST message contents.

[RNSAP]
9.1.2. RADIO LINK SETUP REQUEST

9.1.2.1. FDD Message

| Information Element | Reference | Type |
|---|---|---|
| Message Type | | M |
| Transaction ID | | M |
| S-RNTI | | M |
| D-RNTI | | O |
| Allowed Queuing Time | | O |
| DCH Information | | M |
|    DCH ID | | M |
|    DCH Combination Indicator | | O |
|    UL FP mode | | M |
|    DCH Allocation/Retention Priority | | M |
|    DCH Frame Handling Priority | | M |
|    Transport Format Set (DL) | | M |
|    Transport Format Set (UL) | | M |
| TFCS (UL) | | M |
| TFCS (DL) | | M |
| Uplink Scrambling Code | | M |
| UL Channelisation Codes | | M |
|   Channelisation Code Length (UL) | | M |
| DL Channelisation Codes | | M |
|   Channelisation Code Length (DL) | | M |
| RL Information | | M |
|   RL-ID | | M |
|   UTRAN Cell Identifier (UC-Id) | | M |
|   Frame Offset | | M |
|   Chip offset | | M |
|   Diversity Control Field | | C2 |
|   Primary CCPCH Ec/Io | | M |
|   Propagation Delay | | O |
| Uplink Eb/No Target | | M |
| Maximum Uplink Eb/No | | M |
| Minimum Uplink Eb/No | | M |

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|---|---|---|
| DL Reference Power | | O |
| DSCH Information | | O |
|   RL ID | | M |
|   MACd-MACsh Transport Format Set | | M |

## 4. Reference

[1] TS 25.427 Iur/Iub User plane protocol for DCH data streams, v.0.4.1

[2] TS 25.423 UTRAN Iur Interface RNSAP Signalling v1.3.1

[3] TS 25.433 UTRAN Iub Interface NBAP Signalling v1.2.1