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**Agenda Item: Rel'00, Radio Link Performance Enhancements**

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# DSCH power control improvement in Soft Handover: Further elaboration of the proposal

## Introduction

This contribution provides further elaboration to the proposed enhancement for the DSCH (Downlink Shared Channel) fast power control (inner loop) operation combined with SSDT (Site Selection Diversity Transmission) in the case when soft handover (SHO) is possible. The DSCH as covered in [1-4] for the physical layer or generally explained in [5] has one area where the specifications do not cover all the details, namely power control, as raised in [6] based on the earlier discussions in 3GPP TSG RAN WG1.

## The problem

Basically the problem, as raised in the past during first discussions for Release 2000 studies, comes from the fact that the associated DCH (Dedicated Channel) may be in soft handover and the DSCH is not. This means that DSCH may be sent from such a Node B (cell) that is transmitting DCH with lower power than other cells. In such a case the fast power control is not taking into account the signal quality from the cell sending DSCH at this point and resulting DSCH power level is too low or excessive high power offset needs to be used with DSCH to avoid the situation.

## Proposed solution

The proposed method improves DSCH power control in soft handover by the use of the existing SSDT signalling in the uplink to determine whether DSCH power should follow the DCH (primary cell transmitting) or whether the DSCH power should be set with higher offset (or fixed value like for FACH (Forward Access Channel) for example) in case secondary cell is transmitting.

The SSDT has been specified in section 5.2.1.4 in TS 25.214 and according to the principle UE provides indication of the primary cell ID for in the uplink FBI field. This feature is considered as baseline feature and provided by all UEs (that can use dedicated channels) in the Release –99 as well. The intention is that only the primary cell sends the DPDCH part of the downlink DCH, while DPCCH part is sent by the all Node Bs in the active set.

In the proposed enhancement, the UTRAN may activate the uplink SSDT signalling even the SSDT transmission is not necessary used on the downlink DCH. The Node Bs are given power offset value that is used whether the DSCH is sent from the Node B determined to be the primary Node B (or cell) or whether the Node B sending the DSCH is the secondary one. The primary/secondary status would be determined with sliding

average for example over 10 frames with parameter given (over Iub) how many primary indications are needed to use the primary value power offset for DSCH.

The existing maximum/minimum power level values would be naturally valid, thus allowing to set the DSCH e.g. to be 6 dB over DCH but not to exceed the power level determined as being needed for example with FACH transmission.

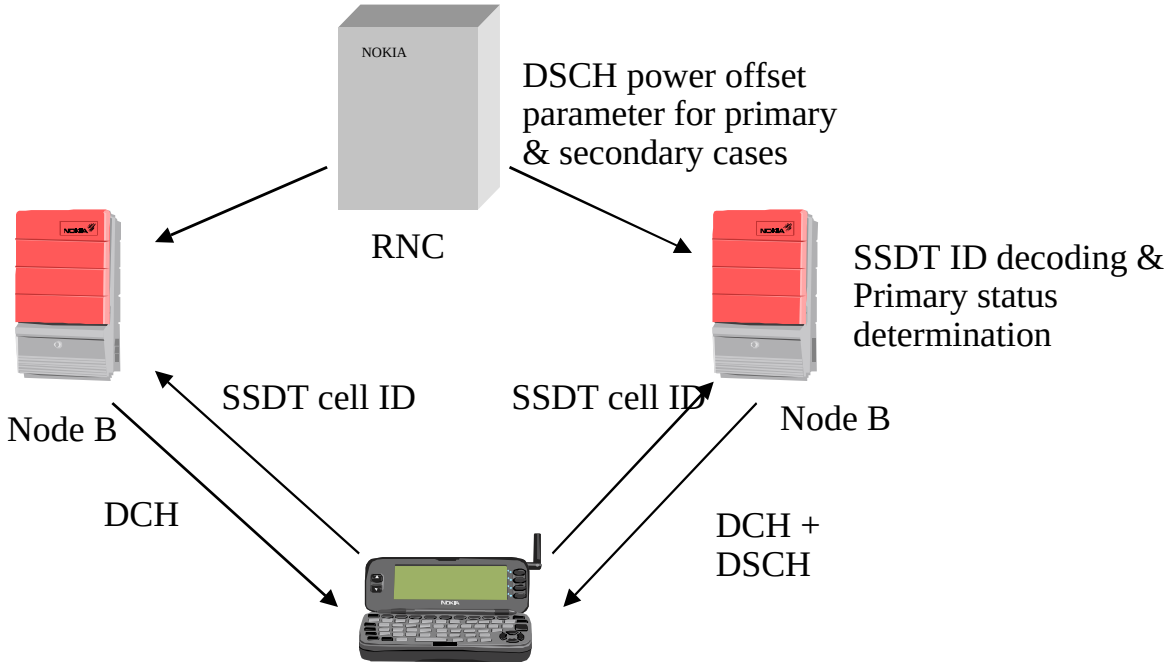


Figure 1. Concept of using SSDT signalling with DSCH power control.

**Specification changes**:

The specification changes are rather small:

- In the physical layer specifications, the SSDT signalling is allowed to be used even if the SSDT is not activated in the downlink. This would require small changes in 25.214 SSDT section referring to the possibility to activate only signalling part but not necessary the downlink transmission. This would not impact the current SSDT operation possibilities.
- The same option needs to reflect in the SSDT information elements in RRC specification. This means adding one additional parameter in addition to the ID lengths currently covered in RRC specification (25.331 in TSG RAN WG2). The SSDT code word parameters would remain unchanged. Similar minor parameter updates would be needed for the TSG RAN WG3 specifications.
- The DSCH power control section in 25.214 should be elaborated to indicate this possibility and for the Iub/Iur (NBAP/RNSAP) specifications (25.433&25.432 in WG3) the power offset parameters for the primary and secondary cases as well as the averaging window parameter for the primary/secondary status determination from the SSDT commands sent in the uplink FBI (Feedback Information) field, would need to be added.

**Backwards compatibility**

The proposal is backwards compatible with Release –99 UEs. Release –99 terminals can operate in Release 2000 network and respectively Release 2000 terminals may operate

with Release –99 Node Bs where this feature is not available This is simple to justify as the proposal uses existing SSDT signalling in the uplink which is used to improve the performance in setting the power offset for DSCH frame for particular UE. The form of the downlink transmission in case of DCH (is SSDT applied or not), which is not causing any issues between UEs and occurs in Release –99 as well between different UEs as well.

**Impacts to the Release –99 based hardware**

From the UE point of view the hardware is not impacted, the same slot structures are kept; the DCH power control algorithm is unchanged. The only issue is the case of doing the normal soft handover combining even sending in the uplink the SSDT commands. This should typically involved only changes to control hardware for selecting amongst the existing SHO combining methods Adding new information elements for the RRC messages should not involve hardware changes.

From the NodeB point of view, the changes are expected to be related to the setting the power offset for the DSCH and is impacting the DSCH power control algorithm and adding a few new signalling elements for the software dealing with Iub signalling. The existing channel etc. hardware structures based from Release –99 are not impacted.

**Performance impacts**

The performance improvements can be considered coming from the following case:
With the proposed method, The DSCH would be sent with more accurate power level, as UTRAN would utilise the information from the SSDT to see if the Node B/cell sending the DSCH is the strongest one. In the worst case with DSCH being sent from the weakest Node B, the DSCH power level could be 6-10dB below the desired power level. This corresponds also to a more or less non-power controlled case or random power controlled case as the associated DCH is not the basis for the power control commands generated by the UE.

**Summary of the proposal**

- The SSDT commands sent by the UE in the uplink could be used to improve DSCH power control at UTRAN side
- The SSDT transmission use on the downlink would not follow automatically from the SSDT command transmission in the uplink, but would be parameterised by higher layers (RRC parameter)

**Suggested action**

If RAN WG1 can agree to proceed with the method for CR creation for Release 2000 specifications, it is suggested that a LS is sent to the other RAN working groups enquiring do they want to cover their part in a TR of their own or not, in this case mainly RAN WG2 and RAN WG3. In RAN WG4 the SSDT signalling has performance requirements for Release –99 included, thus there no clear need for actions with this aspect.

The outline of the required RAN WG1 TR is presented in the separate document for providing information to other TSG RAN WGs as well as pointing out the expected changes in WG1 specifications. See [7] for the proposed draft TR.

The TR is suggested to be provided for the TSG RAN for information, sourced TSG RAN WG1.

According to the TSG RAN schedule, the final versions of the CRs would then need to be available for TSG RAN#10 for all TSG RAN WGs impacted  For the WG1 the CRs would be produced for WG1#16 (or at the latest for) WG1#17.

Also a WI description is provided in a separate document which lists all the affected specs and the proposed feature is under a study item and separate WI sheet needs to be created. (According to the information in the last TSG RAN, a WG can source a WI description sheet.)

**References:**


[1] 3GPP TS 25.211
[2] 3GPP TS 25-212
[3] 3GPP TS 25.213
[4] 3GPP TS 25.214
[5] Holma,H. and Toskala,A., "WCDMA for UMTS", John Wiley & Sons, 2000
[6] 3GPP TSG RAN WG1 Tdoc R1-00-0844, July 2000, Source Nokia
[7] 3GPP TSG RAN WG1 Tdoc R1-00-1026, "  Proposed draft TR for the DSCH power control improvement in SHO", August 2000, Source Nokia