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Agenda item: Ad Hoc 14 discussions

Source: Nokia

Title: OVSF allocation limitations with variable rate DSCH operation

Document for: Discussion & Decision

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1 Introduction

In connection with the variable rate operation with OVSF codes it has been earlier discussed that from the implementation point it is beneficial to have the different spreading factors from the same branch of the code tree to avoid chip level buffering. This has especially been the case in the uplink where the topic has been raised, but this is also relevant for the DSCH operation. Currently nothing is said regarding the different spreading factors and code allocation with DSCH in the specification although the issues like code tree usage where also widely discussed during DSCH refinement phase. This contribution proposes to ad more text for the specification to ensure that UE does not need to do chip level buffering for DSCH reception in case more than one possible data rate is indicated with TFCI. Naturally the exact receiver is implementation issue, but there simple rules ensure that higher layer protocols do not make arbitrary code allocations resulting to extra complexity requirements for UE having to be prepared for such a case as well.

2 UE implementation impacts for variable rate DSCH

On the DSCH, the receiving operation goes basically as follows (some implementation choices exists naturally as well) when rate may vary per frame basis based on TFCI indication. Let's assume two possible spreading factors for the OVSF codes for DSCH, 16 and 32.

- Despreading DCH and respective DSCH frame & store despread samples

(Despreading for DSCH with spreading factor of 16)

- Detect and decode DPCCH and check TFCI information
- Detect respective service(s) on DPDCH from DCH
  - (if any according to TFCI indication)
- Detect respective service(s) on PDSCH from DSCH

(If existing according to TFCI indication)

- If TFCI indicates data rate according to SF 16 then proceed with decoding as usual
- If TFCI indicates data rate according to SF 32, then UE shall sum two samples corresponding to spreading factor 16 and then proceed with the decoding..

Now problem arises if the SF 16 OVSF code would not be from the branch above SF 32 OVSF code, bit from a parallel branch. As higher layers will take care of the allocation of the codes it is important to give the appropriate restrictions in the physical layer specifications to ensure that what is expected from the implementation is inline what higher layers are allowed to do.

Thus following is proposed to be added to the 25.211 with respect to DSCH operation.

3 Text proposal for 25.211

The following modifications are proposed to section 5.3.3.5.1in 25.211, DSCH associated with DCH

(Modifications indicated with revision marks)

5.3.3.5.1 DSCH associated with a DCH

The frame structure of the DSCH, when associated with a DCH, is shown on Figure 1.

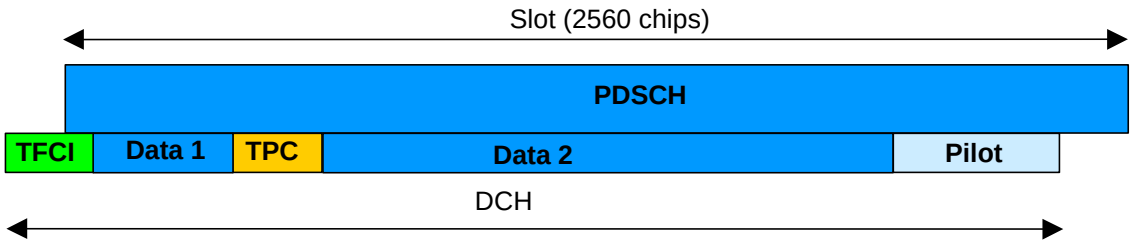

Figure 1: Frame structure for the DSCH when associated to a DCH.

To indicate for UE that there is data to decode on the DSCH, two signalling methods are possible, either using the TFCI field, or higher layer signalling.

The DSCH transmission with associated DCH is a special case of multicode transmission. The channels do not have necessary the same spreading factor and for DSCH the spreading factor may vary from frame to frame. The relevant Layer 1 control information is transmitted on DCH, the PDSCH does not contain DPCCH information.

For DSCH the allowed spreading factors may vary from 256 to 4. DSCH may consist of multiple parallel codes as well as negotiated at higher layer prior to starting data transmission. In such a case the parallel codes shall be operated with frame synchronization between each other.

In case the OVSF code on the PDSCH varies from frame to frame, the OVSF codes shall be allocated such a way that the OVSF code(s) below the smallest spreading factor will be from the branch of the code tree pointed by the smallest spreading factor used for the connection. This means that all the codes for UE for the PDSCH connection can be generated according to the OVSF code generation principle from smallest spreading factor code used by the UE on PDSCH.

In case of multicode PDSCH allocation, the same rule applies, but all of the branches identified by the multiple codes, corresponding to the smallerst spreading factor, may be used for higher spreading factor allocation.