

Agenda item:

Source: Ericsson

Title: Use of multiple scrambling codes in compressed mode: text proposal

Document for: Decision

1 Text proposal for TS 25.212 V2.0.1

4.4.2.3 Method B: By reducing the spreading factor by 2

During compressed mode, the spreading factor (SF) can be reduced by 2 to enable the transmission of the information bits in the remaining time slots of a compressed frame. This can accommodate up to 50% idle slots per frame which is the maximum compression factor required. Additional rate matching is required if there are less than 50% idle slots. Reducing the spreading factor will normally be used if rate matching alone is not sufficient to transmit all information bits in compressed mode. ~~Decrease of the spreading factor could involve change of the scrambling code, but when such an option could be used is for further study.~~ Use of this method for uplink compressed mode is for further study.

On the downlink, UTRAN can also order the UE to use a different scrambling code in compressed mode than in normal mode. If the UE is ordered to use a different scrambling code in compressed mode, then there is a one-to-one mapping between the scrambling code used in normal mode and the one used in compressed mode, as described in TS 25.213 section 5.2.1.

2 Text proposal for TS 25.213 V2.1.2

5.2.1 Channelization codes

The channelization codes of **Error! Reference source not found.** and **Error! Reference source not found.** are the same codes as used in the uplink, namely Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between downlink channels of different rates and spreading factors. The OVSF codes are defined in **Error! Reference source not found.** in Section 4.3.1. The same restriction on code allocation applies as for the uplink, but for a cell and not a UE as in the uplink. Hence, in the downlink, a specific combination of channelization code and scrambling code can be used in a cell if and only if no other channelization code on the path from the specific code to the root of the tree or in the sub-tree below the specific code is used in the same cell with the same scrambling code.

When compressed mode is implemented by reducing the spreading factor by 2, the OVSF code of right spreading factor on the path to the root of the code tree from the OVSF code assigned for normal frames is used in the compressed frames. For the case where the scrambling code is changed during compressed frames, an even numbered OVSF code used in normal mode results in using the even alternative scrambling code during compressed frames, while an odd numbered OVSF code used in normal mode results in using the odd alternative scrambling code during compressed frames. The even and odd alternative scrambling codes are described in the next section.

The channelization code for the BCH is a predefined code which is the same for all cells within the system.

The channelization code(s) used for the Secondary Common Control Physical Channel is broadcast on the BCH.

<Editor's note: the above sentence may not be within the scope of this document.>

5.2.2 Scrambling code

~~There are a total of $512 \times 512 = 262,144$ scrambling codes, numbered $0, \dots, 262,143$, can be generated. However, not all of the scrambling codes are used.~~ The scrambling codes are divided into 512 sets each of a primary scrambling code and ~~1544~~ secondary scrambling codes.

The primary scrambling codes consist of scrambling codes $i=0 \dots 511$. The i :th set of secondary scrambling codes consists of scrambling codes $i+k \times 512$, where $k=1 \dots$ ~~1544~~.

There is a one-to-one mapping between each primary scrambling code and ~~1544~~ secondary scrambling codes in a set such that i :th primary scrambling code corresponds to i :th set of scrambling codes.

Hence, according to the above, scrambling codes $k = 0, 1, \dots, 8191$ are used. Each of these codes are associated with an even alternative scrambling code and an odd alternative scrambling code, that may be used for compressed frames. The even alternative scrambling code corresponding to scrambling code k is scrambling code number $k + 8192$, while the odd alternative scrambling code corresponding to scrambling code k is scrambling code number $k + 16384$.

The set of primary scrambling codes is further divided into 32 scrambling code groups, each consisting of 16 primary scrambling codes. The j :th scrambling code group consists of scrambling codes $j \times 16, \dots, j \times 16 + 15$, where $j=0, \dots, 31$.

Each cell is allocated one and only one primary scrambling code. The primary CCPCH is always transmitted using the primary scrambling code. The other downlink physical channels can be transmitted with either the primary scrambling code or a secondary scrambling code from the set associated with the primary scrambling code of the cell.

~~<Editor's note: There may be a need to limit the actual number of codes used in each set of secondary scrambling codes, in order to limit the signalling requirements.>~~

<Editor's note: it is not standardised how many scrambling codes a UE must decode in parallel.>