TSG-RAN Working Group 1 ***TSGR1#8(99)h66***
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Source	:	TSG RAN WG1
Title	:	Liaison Statement on transmitting AMR Mode Command bits
To	:	TSG RAN WG2, TSG RAN SA WG4
Cc:	:	TSG RAN WG3

RAN WG1 has discussed the possibilities how to transmit AMR mode command bits in downlink. RAN WG1 is aware that RAN WG2 has also discussed this issue and concluded that there should be a separate transport channel for carrying the Mode command bits.

RAN WG1 has identified following possibilities for transmitting mode command bits in Layer1.

1) Separate block coding for the transport channel carrying Mode command bits
2) Introducing 1st multiplexing back to Layer 1
3) Applying convolutional coding to the TrCH containing 3 Mode command bits separately

The assumption here has been that a separate transport channel is reserved for Mode command bits, according to WG2's decision.

Following pros and cons have been identified for these methods:

1) separate block coding for the transport channel carrying Mode command bits

It has been proposed to use (5,15) TFCI encoding for encoding 1-5 bits and (10,30) TFCI encoding for encoding 6-10 bits. One benefit of this proposal is that this coding method already exists in Layer 1 so it does not increase hardware complexity. Another benefit is that the quality, i.e. FER, of the Mode Command bits is not dependent on the quality of some other TrCh.

There are two possible drawbacks with this method. One is that TFCI encoding does not allow puncturing in as flexible way as convolutional coding, which means that the transport channel which would use TFCI encoding, would require refinement in order to be compatible with compressed mode method A, where transmission gaps are created by puncturing. The other possible drawback is that the number of encoded output bits would then be fixed to 15 in case of AMR mode commands, corresponding to 1/5 coding rate for 3 bits. In spreading factor limited case, e.g. if it is desirable to fit AMR together with the signaling channel to SF=256 some modification of the scheme may be required in order to reduce the overhead.

2) Introducing 1st multiplexing back to layer 1.

By having the 1st multiplexing introduced back to layer 1, it would be possible to multiplex Mode command bits together with Class A bits and encode them together with convolutional coding.

One benefit of 1st multiplexing is that no special block coding is needed to be developed for this purpose. The other benefit is that it works also in compressed mode method A where transmission gaps are created by puncturing.

Comments have been given that a possible drawback of this method is that if AMR goes into DTX mode, then during the DTX mode the 3 Mode command bits are coded alone with convolutional coding, the performance of which might not be good if the number of bits to be coded is very small.However, no performance evaluation has not been done to compare the performance of TFCI encoding and convolutional coding, when coding this small number of bits, down to 3 bits.

Another drawback is that the quality of the TrCh containing Mode command bits can not be adjusted independently, instead, it is tied to the quality (i.e. FER) of the TrCH, with which it is coded together. Comments were also given, that the present TrCh multiplexing definition in Layer1 is already now quite complex, and it might not be desirable to further add the complexity.

3) Applying convolutional coding to the TrCH containing 3 Mode command bits separately

In this case a separate TrCH, containing 3 Mode command bits, is coded separately with convolutional coding. The benefits of this proposal are that the quality of the transport channel can then be adjusted separately, it works also in compressed mode method A where transmission gaps are created by puncturing, and the tools for this scheme already exist in Layer 1, so it does not add any complexity to the L1 specification. Comments have been given that convolutional coding may not have so good performance than block coding, when there is only 3 bits to be encoded. However, no performance evaluation has not been done to compare the performance of TFCI encoding and convolutional coding, when coding this small number of bits, down to 3 bits.

These are the possibilities presently seen in WG1, for transmitting AMR mode commands in downlink.

WG1 would like to ask what is the present status of this issue in WG2. Does WG2 have any comments or advice how to proceed with this issue in WG1, or some alternative solutions how to transmit the mode commands ? Could similar functionality to the former 1st multiplexing be handled at higher layers? Concerns have been raised in WG1 on the layer 1 multiplexing complexity.WG1 would also like to ask from SA WG4 and RAN WG2, whether there is some information available what should be the FER quality of the Mode command bits.