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Source(s)	Apostolos Papathanassiou Ron Murias HARQ Rapp Group Chairs	apostolos.papathanassiou@intel.com ron@murias.ca
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Abstract	Contribution for TGm from the HARQ Rapporteur Group	
Purpose	Discuss and adopt the text proposed in this document.	
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HARQ Rapporteur Group Contribution

Apostolos Papathanassiou, Ron Murias
HARQ Rapp Group Chairs

11.x.1 Channel coding and HARQ

11.x.1.1 Channel coding

11.x.1.1.1 Block diagram

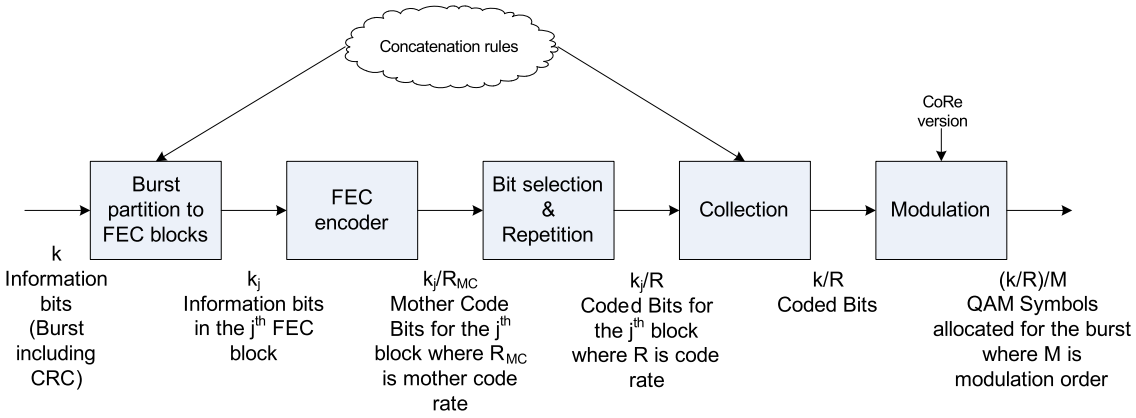

Figure 11.x.1.1.1-1 Channel coding block diagram

11.x.1.1.2 Partition into FEC blocks

When the burst size exceeds the maximum FEC block size, the burst is partitioned into a number of smaller blocks, each of which is encoded separately. The maximum FEC block size is TBD. Concatenation rules are based on the number of information bits and do not depend on the structure of the resource allocation (number of LRUs and their size). The concatenation rules are FFS. Error detection is provided at the end of the burst by appending a Cyclic Redundancy Check (CRC).

11.x.1.1.3 FEC encoding

IEEE 802.16m uses the CTC (convolutional turbo code) of code rate 1/3 defined in the IEEE 802.16e standard. The code rate of the "FEC Encoder" block in Figure 11.x.1.1.1-1 is termed mother code rate (RMC). The use of other coding schemes like CC and LDPC are FFS.

The CTC scheme is extended to support additional FEC block sizes. FEC block sizes larger than the legacy ones are supported. The FEC block sizes are FFS and they are independent of the transmission format, including code rate, modulation order, and resource allocation. Further, the FEC block sizes are regularly increased with pre-determined block size resolutions. The FEC block sizes which are multiple of 7 shall be removed for the tail-biting encoding structure with the detailed mechanism being FFS.

The encoder block depicted in Figure 11.x.1.1.1-1 includes the sub-block interleavers. The interleaving details are FFS.

11.x.1.1.4 Bit selection and repetition

Bit selection and repetition are used in 802.16m to achieve rate matching. Bit selection adapts the number of coded bits to the size of the resource allocation (in QAM symbols) which may vary depending on the LRU and subframe type. The Mother Code Bits after the FEC are considered as a circular buffer. Repetition is performed when the number of transmitted bits is larger than the number of Mother Code Bits (total number of information and parity bits generated by FEC encoder). The selection of coded bits is done cyclically over the buffer.

11.x.1.1.5 Modulation

Modulation constellations of QPSK, 16 QAM, and 64 QAM are supported as defined for the legacy system. The mapping of bits to the constellation point depends on the constellation-rearrangement (CoRe) version used for HARQ re-transmission as described in Section 11.x.1.2.2 and may depend on the MIMO stream. QAM Symbols are mapped to the input of the MIMO encoder. The use of Hierarchical Modulation is FFS.

11.x.1.2 HARQ

11.x.1.2.1 HARQ type

Incremental redundancy Hybrid-ARQ (HARQ IR) is used in 802.16m by determining the starting position of the bit selection for HARQ retransmissions. The rule for determining the starting position is FFS.

11.x.1.2.2 Constellation re-arrangement

Constellation re-arrangement (Co-Re) is supported in 802.16m. For each transmitted bit, the CoRe-version is selected by the transmission number of this bit. The specific selection mechanism is FFS.

11.x.1.2.3 Adaptive HARQ

The resource allocation in each retransmission in both downlink and uplink can be fixed or adaptive according to control signaling. The support of adaptive HARQ and the specific mechanism for adaptive HARQ are FFS, while the reduction of signaling overhead should be considered as an important criterion for those studies.

11.x.1.2.4 Exploitation of frequency diversity

In HARQ re-transmissions, the bits or symbols are transmitted in a different order to exploit the frequency diversity of the channel. The mechanism is FFS.

11.x.1.2.5 MIMO HARQ

For HARQ subpacket retransmission, the mapping of bits or modulated symbols to spatial streams may be applied to exploit spatial diversity with given mapping pattern, depending on the type of IR. In this case, the predefined set of mapping patterns should be known to both transmitter and receiver. The specific mechanism is FFS and it should be determined with the consideration of MIMO architecture and data processing for IEEE 802.16m.

11.x.1.2.6 HARQ feedback

A basic ACK/NAK channel to transmit 1-bit feedback is supported.

An enhanced ACK/NAK control channel with some additional information is FFS.