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Title	**Clarification of channel coding scheme**
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Re:	IEEE P802.16-2004/Cor1-D1
Abstract	There are some ambiguities in the current specifications on channel coding. We provide clean-up text.
Purpose	Adoption of suggested changes into IEEE P802.16-2004/Cor1-D1
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Introduction

This contribution clarifies the number of slots for the repetition scheme and CRC location for H-ARQ CTC scheme.

Motivations and remedies

1. There are some ambiguous descriptions in FEC section.
   A. When the repetition scheme is applied, there can be such case that the allocated slots in DL subframe may not be equal to the multiples of repetition factors due to the 2D allocation scheme in DL.
      i. It results in generating rational number for the number of slots in the concatenation scheme.
   B. In H-ARQ CTC scheme, the term “subchannel” shall be replaced with “slot”.
   C. We propose the suggested text for the clarification. (Suggested text change-1)
2. In the previous #35, it is clarified that the randomizer shall be initialized for each FEC block. However, the randomization for H-ARQ CRC scheme is defined to be initialized for a burst. There is inconsistency between two randomization schemes that play the same role.
   A. Because the randomization scheme is defined for each FEC block, the input to the randomization shall be the whole information bits of FEC block that include CRC if available.
   B. The current CRC block is placed after the randomization block for H-ARQ CTC scheme, it contradicts to the definition of the randomization.
   C. We propose the suggested text for the correction of the unit of the randomization (per FEC block) and the CRC location. (Suggested text change-2)

Suggested text changes-1: FEC corrections

[Modify the text as follows at pp 108 line 44 in 8.4.9.2]

— *n*: ⌊number of allocated slots/repetition factor⌋

[Modify the text as follows at pp 110 line 6 in 8.4.9.2.3.1]

— *n*: ⌊number of allocated slots/repetition factor⌋

[Substitute "subchannel(s)" with slot(s) in 8.4.9.2.3]

[Modify the text as follow at pp 111, line 34 in 8.4.9.2.3.4.4]

k be the subpacket index when HARQ is enabled. k=0 for the first transmission and increases by one for the next subpacket. *k* = 0 when H-ARQ is not used. When there are more than one FEC block in a burst, the subpacket index for each FEC block is same.

[Modify the text as follow at pp 111, line 34 in 8.4.9.2.3.4.4]

NSCHk ~~be the number of subchannel(s) allocated for the k-th subpacket.~~

Be the number of slots for the k-th subpacket ~~after coding and modulation~~. This value is defined as follows:

= the number of the concatenated slots for the subpacket defined in table 324 for non H-ARQ CTC defined in 8.4.9.2.3.1

= Nsch that is indicated in the allocation IE for H-ARQ CTC defined in 8.4.9.2.3.5

8.4.9.2.3.5.6 Modulation order of DL traffic burst

[Modify the text as follow at pp 111, line 51 in 8.4.9.2.3.5.6]

For DL, the modulation order (2 for QPSK, 4 for 16-QAM, and 6 for 64-QAM) shall be set for all the allowed transmission formats as shown in Table 329. The transmission format is given by the *NEP* (Encoding Packet Size) and the *NSCH* (number of allotted ~~subchannels~~ slots). *NEP* per an encoding packet is {144, 192, 288, 384, 480, 960, 1920, 2880, 3840, 4800}. The *NSCH* per an encoding packet is {1, ..., 480}. In the table, the numbers in the first row are *NEP*'s and the numbers in the remaining rows are *NSCH*'s and related parameters.

[Modify the text as follow at pp 112, line 26 in 8.4.9.2.3.5.6]

The information of *NEP* and *NSCH* shall be signaled in UL MAP. Instead of the actual values of *NEP* and *Nsch*, the encoded value of *NEP* (*NEP* code) and *Nsch* (*Nsch* code) shall be used for the signaling. They are encoded by 4 bits, respectively. The encoding of *NEP* (*NEP* code) is shown in Table 330. The encoding of *NSCH* (Nsch code) is performed per *NEP* value. For each *NEP*, there are less than 16 kinds of *NSCH* values and they are encoded from '0'(the smallest number of ~~subchannels~~ slots) to '15' in increasing order. When the kinds of *NSCH* for a *NEP* is smaller than 16 and it is z, the smallest z codes are used. When the fragmentation is applied and the number of the subpackets for an allocation is n, n**NEP* and *Nsch* (the number of ~~subchannels~~ slots allocated for a subpacket) should be signaled.

8.4.9.2.3.5.7 Modulation order of UL traffic burst

[Modify the text as follow at pp 112, line 29 in 8.4.9.2.3.5.7]

For UL, the modulation order (2 for QPSK and 4 for 16-QAM) shall be set for all the allowed transmission formats as shown in Table 331. The transmission format is given by the *NEP* (Encoding Packet Size) and the *NSCH* (number of allotted ~~subchannels~~ slots). *NEP* per an encoding packet is {48, 96, 144, 192, 288, 384, 480, 960, 1920, 2880, 3840, 4800}. The *NSCH* per an encoding packet is {1...288}. In the table, the numbers in the first row are *NEP*'s and the numbers in the remaining rows are *NSCH*'s and related parameters.

[Modify the text as follow at pp 112, line 34 in 8.4.9.2.3.5.7]

The information of *NEP* and *NSCH* shall be signaled in UL MAP. Instead of the actual values of *NEP* and *Nsch*, the encoded value of *NEP* (*NEP* code) and *Nsch* (*Nsch* code) shall be used for the signaling. They are encoded by 4 bits, respectively. The encoding of *NEP* (*NEP* code) is shown in Table 330. The encoding of *NSCH* (Nsch code) is performed per *NEP* value. For each *NEP*, there are less than 16 kinds of *NSCH* values and they are encoded from '0'(the smallest number of ~~subchannels~~ slots) to '15' in increasing order. When the kinds of *NSCH* for a *NEP* is smaller than 16 and it is z, the smallest z codes are used. When the fragmentation is applied and the number of the subpackets for an allocation is n, n**NEP* and *Nsch* (the number of ~~subchannels~~ slots allocated for a subpacket) should be signaled.

Suggested text changes-2: CRC location & Randomization corrections

[Delete text as follows at line 38 pp 111 in 8.4.9.2.3.5, this part is restored in the randomization section below]

~~The scrambler is initialized with the vector created as shown in Figure 261. The lowest 5 bits are IDcell or UL_IDcell and the other bits are set "0." [MSB] 0 1 1 0 1 1 1 0 0 0 1 0 1 0 1 [LSB].~~

~~Delete Figure 261.~~

[Modify the text as follows at line 38 pp 111 in 8.4.9.2.3.5]

8.4.9.2.3.5.1 Padding

MAC PDU (or concatenated MAC PDUs) is a basic unit processed in this channel coding and modulation blocks. When the size of MAC PDU (or concatenated MAC PDUs) is not the element in the allowed set for H-ARQ, '1's are padded at the end of MAC PDU (or concatenated MAC PDUs). The amount of the padding is the same as the difference between the size of the PDU (or concatenated MAC PDUs) and the smallest element in the allowed set that is not less than the size of the PDU (or concatenated MAC PDUs). The padded packet is input into the ~~Randomization~~ CRC encoding block. The allowed set is {32, 80, 128, 176, 272, 368, 464, 944, 1904, 2864, 3824, 4784, 9584, 14384, 19184, 23984} bits.

[Place the following section at the end of **8.4.9.2.3.5.3 Fragmentation]**

8.4.9.2.3.5.~~2~~4 Randomization

The randomization is performed on each ~~allocation (burst)~~ encoder packet, which means that for each ~~allocation of a data~~ encoder packet ~~block~~ the randomizer shall be ~~used~~ initialized independently. The PRBS generator shall be as shown in Figure 260. Each data byte to be transmitted shall enter sequentially into the randomizer, MSB first. Preambles are not randomized. The seed value shall be used to calculate the randomization bits, which are combined in an XOR operation with the serialized bit stream of each FEC block. ~~The randomizer sequence is applied to the output from the padding block. The bit issued from the randomizer shall be applied to the CRC encoder encoder block~~.

~~The bit issued from the randomizer shall be applied to the encoder.~~

The scrambler is initialized with the vector ~~created as shown in Figure 261. The lowest 5 bits are IDcell or UL_IDcell and the other bits are set "0."~~ [MSB] 0 1 1 0 1 1 1 0 0 0 1 0 1 0 1 [LSB].

The bit issued from the randomizer shall be applied to the encoder.

Delete Figure 261.

8.4.9.2.3.5.~~3~~2 CRC encoding

When H-ARQ is applied to a packet, error detection is provided on the padded packet through a Cyclic Redundancy Check (CRC). The size of the CRC is 16 bits. CRC16-CCITT, as defined in ITU-T Recommendation X.25, shall be included at the end of the padded ~~and randomized~~ packet. The CRC covers both the padded bits and the information part of the padded ~~and randomized~~ packet. After the CRC operation, ~~T~~the packet size shall belong to set {48, 96, 144, 192, 288, 384, 480, 960, 1920, 2880, 3840, 4800, 9600, 14400, 19200, 24000}.

8.4.9.2.3.5. .~~4~~3 Fragmentation

When the size after the padding and CRC encoding is n*4800 bits they are separately encoded by the block of 4800 bits and concatenated as the same order of the separation before modulation. No operation is performed for the packet whose size after the padding and CRC encoding is not more than 4800 bits. The bits output from the fragmentation block are denoted by, and this sequence is defined as encoder packet. N_{EP} is the number of the bits in an encoder packet and defined as encoder packet size. The values of N_{EP} are 48, 96, 144, 192, 288, 384, 480, 960, 1920, 2880, 3840, 4800.