Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Corrections for the definition of repetition code
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Source(s)	Intel: Yuval Lomnitz, yuvall@envara.com Yigal Eliaspur, yigal.eliaspur@intel.com Voice: +972-547-884877 Dov Andelman, dov.andelman@intel.com
Re:	IEEE P802.16e/D3-2004
Abstract	Proposing corrections for the definition of the repetition code in 802.16REVd
Purpose	Correct errors in definition of repetition code.
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Corrections for the definition of repetition code

Yuval Lomnitz

1. Motivation

There as several problems in the definition of the repetition code (8.4.9):

(1) Repetition code is defined only for repetition of 2, however, used for repetition of 4 and 6 - needs definition.
(2) Definition of repetition code is in frequency domain only, so repetition of 6 is inefficient (e.g. for MAP this repetition would leave empty slots).
(3) Repetition code as defined in the standard, cannot be applied in the UL, because of the uni-dimensional allocation. The beginning and end of the UL allocation may have edges which are 1 subchannel wide, so the number of subchannels doesn't divide by the repetition level.

2. Details

We propose to re-define the repetition code. Repetition will be on slots rather than subchannels, so that it will allow repetition in allocations of small number of subchannels. Also, the repeated symbols will be rotated so that the repetition of the same modulated symbol will not be located in an adjacent tone.

Repetition code should supply frequency diversity and therefore use the maximal number of subchannels, while in the same time, allow narrow allocations where this is desired. To allow this the slot numbering should be changed from time-first to frequency-first (see comments #403, #485)

3. Changes summary

[Add the following text between BEGIN and END to modify 8.4.9]

BEGIN

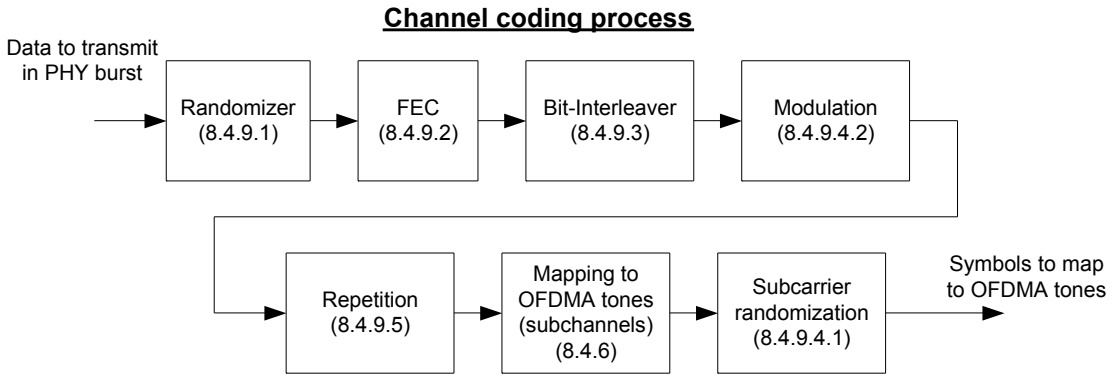
8.4.9 Channel coding

[make the following text changes]

Channel coding procedures include randomization (see 8.4.9.1), FEC encoding (see 8.4.9.2), bit interleaving (see 8.4.9.3), ~~and~~ modulation (see 8.4.9.4), and repetition (see 8.4.9.5).

[Erase the remainder of the paragraph, from “When repetition code is used, “ to “shown in Figure 252.”]

[Change Figure 252 to include the following single diagram]



END

[Add the following section to the baseline document]

8.4.9.5 Repetition

Repetition of r = 2, 4, or 6 shall be applied to the modulated symbols before mapping to subchannels. The number of allocated slots (Ns) shall be a whole multiple of the repetition factor r. The FEC, interleaving and modulation shall be applied to Ns/r slots. Then, each slot will be repeated r times to form r contiguous slots. The repetition scheme includes a rotation of the modulated symbols in order to ensure that repeated modulated symbols are not be mapped to adjacent tones.

Let Rin[s, k] be the repetition block input for slot s (s = 0 .. Ns/r-1) and tone k (k = 0 .. 47), and Rout[s,k] the repetition block output for slot s (s = 0..Ns-1) and tone k (k = 0..47), then the repetition is defined by equation XX:

$$Rout[s, k] = Rin[\text{floor}(s/r), (k + 7 \cdot (s \bmod r)) \bmod 48] \qquad \text{(XX)}$$