Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Text modifications for 802.16m evaluation methodology (802.16m-07/080r1) regarding link-to-system mapping with repeated bits/symbols in HARQ**
Date	~~**2007-04-30**~~
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Re:	Call for Comments 802.16m evaluation methodology, 2007-04-09
Abstract	This document proposes text modifications for 802.16m evaluation methodology (802.16m-07/080r1) regarding link-to-system mapping with repeated bits/symbols in HARQ
Purpose	Propose text modification for IEEE 802.16m evaluation methodology (802.16m-07/080r1) regarding link-to-system mapping with repeated bits/symbols in HARQ
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Text modifications for 802.16m evaluation methodology (802.16m-07/080r1) regarding link-to-system mapping with repeated bits/symbols in HARQ

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With various rate matching methods, every H-ARQ transmission could have a set of new systemic/parity bits, and some other repeated coded bits. In order to model this process, the Section 5.4.2 in 802.16m evaluation methodology (802.16m-07/080r1) proposed an approach to model a receiver with bit LLR combining. This contribution proposes a modified text to Section 5.4.2 that is more general, and models this process more accurately.

Proposed Text modification for Section 5.4.2

~~To handle this case, we consider a code-block transmission of N_{NR} symbols that are not repeated, and a set of N_R symbols (or coded bits) that constitute repeated coded bits. We assume that the block of N_R symbols/coded bits have SINR $\{SINR_{R,i}\}$ $i=1,\ldots,N_R$, each with modulation $\{m_{R,i}\}$ $i=1,\ldots,N_R$. Note that if the $SINR_{R,i}$ corresponds to the SINR of the repeated coded bits, then we can take $m_{R,i} = 1$.~~

~~We can then compute an effective SINR using the weight sum of the repeated and non-repeated effective SINR as follows:~~

$$SINR_{eff} = \frac{\left[\sum_{i=1}^{N_{NR}} m_i\right] f_1^{-1}(I_b) + \sum_{i=1}^{N_R} SINR_{R,i}}{\sum_{i=1}^{N_{NR}} m_i + \sum_{i=1}^{N_R} m_{R,i}} \quad (1)$$

~~Here, I_b corresponds to the coded-bit level mutual information using all the non-repeated bits, defined by either Equation **Error! Reference source not found.** or **Error! Reference source not found.**, and $\sum_{i=1}^{N_{NR}} m_i$ is the total number of coded bits of the non-repeated portion, each symbol transmitted with modulation order $\{m_i\}$ $i=1,\ldots,N_{NR}$. The function $f_1(\cdot)$ is the mapping from bit SINR to mutual information per bit that is used by a given link-system mapping method. This effective bit-level SINR can be used to compute the PER by looking up the PER curve corresponding to an effective code rate obtained from only the non-repeated portion of the coded bits.~~

To handle this case, we consider a retransmission including a set of N_{NR} new coded bits, and a set of N_R coded bits that are repeated from pervious transmissions. Further, we assume there are N_{pre} coded bits that are not re-transmitted in this re-transmission. The averaged mutual information per bit from previous transmissions is $RBIR_{old}$. The averaged mutual information per bit in the this re-transmissions is $\overline{I}_b$, which may be derived using a link-system mapping method in Section 5.1.2.1.

We can then compute an updated RBIR after this retransmission as follows

$$RBIR_{new} = \frac{N_{pre} \cdot RBIR_{old} + N_{NR} \cdot \overline{I}_b + N_R \cdot f_1\left(f_1^{-1}\left(RBIR_{old}\right) + f_1^{-1}\left(\overline{I}_b\right)\right)}{N_{pre} + N_{NR} + N_R} \qquad (2)$$

where $f_1\left(\cdot\right)$ is a mapping from bit SINR to RBIR that is used by a link-system mapping method in Section 5.1.2.1.