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Re:	Call for contributions for 802.16m Evaluation Methodology
Abstract	Clarify the original text in EVM document to clearly understand RBIR ML Receiver Abstraction.
Purpose	For discussion and approval by TGm
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Clarification of RBIR ML Receiver Abstraction for SISO/MIMO

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Introduction

In the current EVM document [1], the method of RBIR ML receiver abstraction for SISO/MIMO is proposed. But, it is a bit unclear to understand how RBIR ML receiver abstraction is performed.

In order to clearly understand on RBIR ML receiver abstraction, we clarify the RBIR in EVM document as below.

Proposed Text for Section on RBIR ML Receiver Abstraction for SISO/MIMO

----------Start of the text----------

[*Add the following text after the line#1 of the page 65 in C802.16m-07/037r1*]

$$RBIR = \frac{1}{\log_2 N}\frac{1}{N}\sum_{i=1}^{N}\int_{LLR_i}\frac{1}{\sqrt{2\pi\cdot VAR}}e^{-\frac{(LLR_i-AVE_i)^2}{2VAR_i}}\log_2\frac{N}{1+\exp(-LLR_i)}dLLR_i$$

$$= \frac{1}{\log_2 N}\int_{LLR}\frac{1}{\sqrt{2\pi\cdot VAR}}e^{-\frac{(LLR-a\times AVE)^2}{2VAR}}\log_2\frac{N}{1+\exp(-LLR)}dLLR$$

$$RBIR = \frac{1}{\log_2 N}\frac{1}{N}\sum_{i=1}^{N}\int_{LLR_i}\frac{1}{\sqrt{2\pi\cdot VAR_i}}e^{-\frac{(LLR_i-AVE_i)^2}{2VAR_i}}\log_2\frac{N}{1+\exp(-LLR_i)}dLLR_i$$

$$= \frac{1}{\log_2 N}\int_{LLR}\frac{1}{\sqrt{2\pi\cdot VAR}}e^{-\frac{(LLR-AVE)^2}{2VAR}}\log_2\frac{N}{1+\exp(-LLR)}dLLR$$

The simplified numerical integration for the above RBIR can be written as [73]

$$RBIR \approx 1 - \frac{1}{\log_2 N \log_e 2}\left[\begin{array}{l}\frac{2}{3}f_1(a\cdot AVE)+\frac{f_1(a\cdot AVE+\sqrt{3VAR})}{6}\\ +\frac{f_1(a\cdot AVE-\sqrt{3VAR})}{6}\end{array}\right] \quad (1)$$

$$RBIR \approx 1 - \frac{1}{\log_2 N \log_e 2}\left[\frac{2}{3} f_1(AVE) + \frac{f_1(AVE + \sqrt{3VAR})}{6} + \frac{f_1(AVE - \sqrt{3VAR})}{6}\right] \quad (2)$$

where the function $f_1(\cdot)$ has the following definition

$$f_1(x) = \log_e(1 + e^{-x}).$$

~~The parameter 'a' is used to close the gap between measured PER and RBIR MLD PHY.~~

For QPSK, 16QAM and 64QAM, the LLR mean value will be optimized as $AVE = a \cdot AVE_{computed}$ for the RBIR calculation. The parameter 'a' is used to close the gap between measured PER and RBIR MLD PHY.

~~The LLR variance will be optimized for 64QAM as, $VAR = 2 \cdot VAR_{computed}$.~~

For QPSK and 16QAM, the LLR variance will be optimized as $VAR = VAR_{computed}$. But, the LLR variance will be optimized for 64QAM as, $VAR = 2 \cdot VAR_{computed}$.

$AVE_{computed}$ and $VAR_{computed}$ are obtained from one of AVE_i and VAR_i (i=1,...,N), respectively.

----------End of the text----------

Reference

[1] IEEE 802.16m Evaluation Methodology 037r1