

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	C80216maint-05_106.doc	
Date Submitted	2005-04-25	
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Re:	IEEE P80216_Cor1_D2	
Abstract	Correction to make EVM and Receiver SNR consistent	
Purpose	EVM and Rx SNR are inconsistent with one another. In addition, there are many inconsistencies throughout section 8.3, 8.4, and 12.4 specifying EVM and Rx SNR. This submission attempts to resolve these inconsistencies.	
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Introduction

There are a number of inconsistencies in the 802.16-2004 standard in specifying Tx EVM requirements. For example, table 265 (OFDM-PHY) specifies that the Tx EVM must be -31 dB. Table 336 (OFDMA-PHY) specifies that the EVM must be -31.4. Table 413 (minimum performance requirement for OFDMA in the Systems Profiles chapter) calls for a minimum EVM of -34.4 dB.

Most of these discrepancies were the result of an initial (incorrect) assumption on Rx SNR requirements. Tx EVM was initially specified so that the Tx SNR would cause less than 0.5 dB reduction in overall Rx SNR. However, the original Rx SNR on which this was based was too high. This error was corrected, but many instances of Tx EVM were not corrected, leading to the inconsistencies noted above.

We believe that the required Rx SNR has been properly captured by Tal Kaitz and Naftali Chayat in C80216d-03_44. These changes were only partly propagated through in to the 802.16-2004 standard.

This document attempts to identify and correct all of the inconsistencies in Tx EVM in the 802.16-2004 document, and to correct any remaining Rx SNR errors that were not implemented after the Kaitz and Chayat document.

Discussion

As it currently stands, the EVM (in table 264) and Rx SNR (in table 264) are inconsistent with one another.

Section 8.3.10.1.2 states that the receiver SNR can not degrade by more than 0.5 dB due to the transmitter's SNR. Table 264 states that (for example) 64-QAM-3/4 requires a relative constellation error of -31 dB. Table 266 states that the receiver SNR requirements for 64-QAM-3/4 is 24.4 dB.

These values are mutually inconsistent. If the Rx SNR is 24.4 dB, adding in a -31 dB Tx impairment results in a net SNR of 23.5 dB. This is a 0.9 dB reduction in Rx SNR, significantly worse than the 0.5 dB requirement. In order to have the transmitter impact a 24.4dB Rx SNR by only 0.5 dB, the required transmit EVM would be -33.9 dB.

We believe that the error is in table 266. The document C80216d-03_44, submitted by Tal Kaitz and Naftali Chayat of Alvarion in 2003, shows that the receiver SNR should be as shown below:

Modulation	Coding rate	Required SNR for BER=1e-6 [dB]
QPSK	1/2	6
QPSK	3/4	8.5

QAM16	$\frac{1}{2}$	11.5
QAM16	$\frac{3}{4}$	15
QAM64	$\frac{2}{3}$	18.5
QAM64	$\frac{3}{4}$	21

With these numbers for required receiver SNR, then a -31 dB EVM on the transmitter gives a 0.4 dB reduction in overall SNR.

Suggested Corrections to 802.16-2004:

8.3.10.1.2

New text becomes “To ensure that the receiver SNR does not degrade by more than **0.4 dB** due to the transmitter SNR, the relative constellation RMS error, averaged over subcarriers, OFDM frames, and packets, shall not exceed a burst profile dependent value according to table 264.”

Table 264 remains unchanged.

8.3.11.1

Table 266 should be:

Modulation	Coding rate	Required SNR for BER=1e-6 [dB]
QPSK	$\frac{1}{2}$	6
OPSK	$\frac{3}{4}$	8.5
QAM16	$\frac{1}{2}$	11.5
QAM16	$\frac{3}{4}$	15
QAM64	$\frac{2}{3}$	18.5
QAM64	$\frac{3}{4}$	21

8.4.12.3:

Change the paragraph to read: “To ensure that the receiver SNR does not degrade by more than **0.4 dB** due to the transmitter SNR, the relative constellation RMS error, averaged over subcarriers, OFDMA frames, and packets, shall not exceed a burst profile dependent value according to table 336.”

Table 336 should be identical to table 266 (EVM values are -13, -16, -18.5, -21.5, -25, -28.5, and -31 dB—all values in table 336 are 0.4 dB worse than these values).

8.4.13.1:

Section 8.4.13.1 must be made to look the same as section 8.3.11.1. Remove all references to E_b/N_0 (see document C80216d-03_44 for justification) in table 338, and change Table 338 so that the receiver SNR is 6, 8.5, 11.5, 15, 18.5, and 21. This will make the Receiver SNR requirements in table 338 identical to those in table 266 of 8.3.11.1.

12.4.3.1.5

In table 413, Tx relative constellation errors should be -16, -18.5, -21.5, -25, -28.5, and -31 dB (not -19.4, -21.2, -26.4, -28.2, -32.7, -34.4).

12.4.3.2

In table 414, requirements of Tx relative constellation error are listed. These requirements are covered in table 413, and should be removed in table 414. Note that none of the other profiles includes EVM, so removing the EVM requirement here makes the table consistent with all other profiles.