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Abstract	Corrections for EVM definitions in OFDMA PHY
Purpose	Adopt changes
Notice	
Release	
Patent Policy and Procedures	

Corrections for EVM definitions in OFDMA PHY

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1. Motivation

RMS constellation error definition seems to be borrowed from OFDM and not relevant for OFDMA this contribution proposes corrections for the definition.

2. Details

3. Changes summary

[add section 8.4.12.3 to the document]
[Note: the following text includes editing instructions to modify 8.4.12.3 in 802.16-2004 which are to be included in 802.16Cor1/D4]

8.4.12.3 Transmitter constellation error and test method
[modify the text starting at p.626 from "The sampled signal…" as follows, and add sub-sections as indicated below]

8.4.12.3.1 RMS constellation error measurement for BS (downlink):

The test may be performed in PUSC. The FCH configuration (used PUSC groups) shall be determined according to the desired BS configuration. The sampled signal shall be processed in a manner similar to an actual receiver, according to the following steps:~~, or an equivalent procedure [B29]~~.

a) The BS under test shall transmit all subchannels defined in the symbol structure (see 8.4.6).
b) Locate the Preamble.
c) Perform timing and frequency estimation.
d) The packet shall be de-rotated according to estimated timing and frequency offset.
e) The complex channel response coefficients shall be estimated for each of the subcarriers.
f) Divide each subcarrier value with a complex estimated channel response coefficient.
g) For each data-carrying subcarrier, find the closest constellation point and compute the Euclidean distance from it.
h) Compute the RMS average of all errors in a packet. It is given by equation 149 ~~:~~

8.4.12.3.2 RMS constellation error measurement for SS

The sampled signal shall be processed in a manner similar to an actual receiver, according to the following steps:

a) The SS under test shall transmit on part of the UL subchannels. Recommended value is 1/4 of the UL subchannels.
b) The tester will locate a complete UL subframe.
c) Estimate the averaged timing and frequency offset.
d) The packet shall be de-rotated according to estimated timing and frequency offset.
e) Estimate the average channel according to the pilots.
f) Divide each subcarrier value with a complex estimated channel response coefficient.
g) For each data-carrying subcarrier, find the closest constellation point and compute the Euclidean distance from it.
h) Compute the RMS average of all errors in a packet. It is given by equation (149).
i) Normal RMS constellation error measurement shall be performed in scenarios where the number of modulated subcarriers is constant across symbols.
j) In case the number of subcarriers varies between symbols, it is recommended to measure RMS constellation error separately for symbols with different power levels.

8.4.12.3.3 calculation of RMS constellation error

$$Error_{RMS}{}^{2} = \frac{1}{N_f}\sum_{i=1}^{N_f}\frac{\sum_{j=1}^{L_p}\sum_{k \in S}\left[\left(I(i,j,k)-I_0(i,j,k)\right)^2+\left(Q(i,j,k)-Q_0(i,j,k)\right)^2\right]}{\sum_{j=1}^{L_p}\sum_{k \in S}\left[I_0(i,j,k)^2+Q_0(i,j,k)^2\right]} \quad (149)$$

Where:

L_P is the length of the packet;

N_f is the number of frames for the measurement;

($I_0(i,j,k)$, $Q_0(i,j,k)$) denotes the ideal symbol point of the *I* th frame, *j* th OFDMA symbol of the frame, *k* th subcarrier of the OFDMA symbol in the complex plane;

($I(i,j,k)$, $Q(i,j,k)$) denotes the observed point of the *i*-th frame, *j*-th OFDMA symbol of the frame,

k-th subcarrier, of the OFDMA symbol in the complex plane;

S is the group of the modulated data subcarriers where the measurement is performed.