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Purpose	Adopt changes
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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

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

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.