IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)
Title	Proposed Specification for a Transmit Modulation Accuracy Test for MR-OFDM
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Abstract	Proposed Specification for a Transmit Modulation Accuracy Test for MR-OFDM
Purpose	Technical proposal
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Change 16.2.4.8 as indicated:

The relative constellation RMS error averaged over subcarriers, symbols, and packets shall not exceed the values shown in Table 147. ~~Information on the EVM calculation process is given in 8.2.3.~~

Add the following text to 16.2.4.8:

The transmit modulation accuracy test shall be performed by instrumentation capable of converting the transmitted signal into a stream of complex samples at $\frac{4}{3}$ Msample/s or more.
The sampled signal shall be processed in a manner similar to an actual receiver, according to the following steps, or an equivalent procedure:

1. Start of frame shall be detected.
2. Transition from STF to LTF shall be detected, and fine timing (with one sample resolution) shall be established.
3. Coarse and fine frequency offsets shall be estimated.
4. The packet shall be derotated according to estimated frequency offset.
5. The complex channel response coefficients shall be estimated for each of the subcarriers.
6. For each of the payload OFDM symbols: transform the symbol into subcarrier received values and divide each subcarrier value with the complex estimated channel response coefficient.
7. For each of the N_d data-carrying subcarrier, find the closest constellation point and compute the squared Eucleadian distance from it.
8. Compute the RMS average of all errors in a frame. It is given by

$$RMS_{error} = 20\log_{10}\left\{\frac{1}{N_f}\sum_{i=1}^{N_f}\sqrt{\frac{\sum_{j=1}^{N_{SYM}}\sum_{k\in U_D}\Delta(i,j,k)^2}{N_d\cdot N_{SYM}\cdot P_0}}\right\}$$

with

$$\Delta(i,j,k)^2 = (I(i,j,k) - I_0(i,j,k))^2 + (Q(i,j,k) - Q_0(i,j,k))^2$$

where

N_{SYM} is the number of OFDM symbols of the frame;

N_f is the number of frames for the measurement;

$U_D = \{-N_d/2, \ldots, -1, 1, \ldots, N_d/2\}$ is the index set of data tones;

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

$(I(i,j,k), Q(i,j,k))$ denotes the observed point of the i-th frame, j-th OFDM symbol of the frame, k-th tone of the OFDM symbol in the complex plane;

P_0 is the average power of the constellation.

The test shall be performed over at least $N_f = 20$ frames, and the RMS average shall be taken. The payload of the frames under test shall contain $N_{SYM} = 16$ OFDM symbols. Random data shall be used for the payload.