IEEE P802.11  
Wireless LANs

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| Proposed CR for CID 2112, 2633 | | | | |
| Date: 2019-04-12 | | | | |
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Abstract

This submission proposes the spec text for a resolving to CID 2112, 2633 in 11-19-0312-01-00ba-comments-on-tgba-d2-0.xlsx

R0 – Initial Draft based on D2.0

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| **CID** | **P,L** | **Clause** | **Comment** | **Proposed Change** | **Resolutions** |
| 2633 | 106,21 | 31.2.12 | The EVM of the transmit signal should be defined. | The commenter will provide a draft of subclause. | Revised.  Agree in principle with the commenter. Defined EVM for transmit signal.  Instructions to editor: Please incorporate changes as shown in 11-19/0641r0. |
| 2112 | 106,65 | 31.2.12 | Transmitter constellation error is not defined anywhere. If this is left unspecified this can lead to interoperability issues, since a receiver may not have an adequate AGC and/or ADC resolution to distinguish ON levels from the OFF levels. | Add a new subcluase (for example 31.2.12.4) in which requirement for dB difference between ON and OFF period signal power is specified. Suggest 15 dB difference integrated over entire 2us or 4 us ON/OFF duration. Note that the max difference is limited by the TX LO specification in implementations where the transmitter stays on on during OFF periods. | Revised.  Agree in principle. Constellation error for the transmitted OFDM signal is typically controlled by the EVM requirement. For OOK signal, the EVM requirement can also be specified. The resolution for CID 2633 should be able to resolve this comment. The EVM for OOK modulation captures the variation between ON and OFF, which is the key factor to distinguish between ON and OFF levels.  Instructions to editor: Please incorporate changes as shown in 11-19/0641r0. |

TGba Editor: Please insert the following text in page 106, after line 65 of D2.0:

**31.2.12.4 Transmit EVM**

The transmit EVM accuracy test shall be performed by instrumentation that is capable of converting the transmitted signal into a stream of complex samples at a sampling rate . The test shall be performed for each 20 MHz channel in 2.4 GHz and 5 GHz bands used for WUR transmissions at both LDR and HDR, respectively. During the test, a bandpass filter of which the 3dB-bandwidth is equal to 50.5MHz shall be used to obtain the signal on the channel under the test. The measurement shall start from the beginning of the sync field for each WUR PPDU with timing accuracy .

The instrumentation used shall have sufficient accuracy in terms of I/Q amplitude and phase balance, DC offsets, phase noise, and analog-to-digital quantization noise, so as not to mask or degrade the true EVM measurement. A possible embodiment of such a setup is converting the signals to a low IF frequency with a microwave synthesizer, sampling the signal with a digital oscilloscope and decomposing it digitally into quadrature components. The instrumentation shall perform carrier lock, symbol timing recovery and amplitude adjustment while making the measurements.

The EVM in dB is then calculated according to the formula below:

where

is the number of tested frame in a measurement duration;

is the number of On symbols in k-th test frame;

is the number of Off symbols in k-th test frame;

and are the measurement metrics in j-th On symbol and k-th test frame and j-th Off symbol and k-th test frame, respectively, calculated as

where

is the *i*-th observed sample of signal envelope on the *j*-th On symbol and the *k*-th test frame;

is the *i*-th observed sample of signal envelope on the *j*-th Off symbol and the *k*-th test frame;

is the number of complex samples within each symbol duration, which is 2s for Sync and HDR data fields, 4s for LDR data field;

is the normalization coefficient calculated as

Note:

Assuming the testing instrument can obtain the real (I) and imaginary (Q) components of the WUR signal, the envelope functions in On symbol and in Off symbol may respectively be expressed as

and

where

, are the i-th observed real and imaginary values in the j-th On symbol and the k-th test frame, respectively;

, are the i-th observed real and imaginary values in the j-th Off symbol and the k-th test frame, respectively;

The test shall be performed over at least [20] frames (). The frame under test, which includes both Sync and HDR/LDR data fields, shall be at least [256] s long.

The EVM shall not exceed a data-rate dependent value provided in Table 31-x (EVM requirement for WUR Signals).

**Table 31-x EVM requirement for WUR Signals**

|  |  |
| --- | --- |
| Data Rate | EVM Value (dB) |
| LDR | [-15] |
| HDR | [-20] |

(#2633)(#2112)