IEEE P802.11
Wireless LANs

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| Common Requirements |
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|  |  |  |  |  |

Abstract

This document proposes specification text for subclause 29.3.9 (Common requirements). Reference text is D2.0.

*Add the following after 29.3.9.2:*

**29.3.9.3 Transmit center frequency and symbol clock frequency tolerance**

The requirements defined in 20.3.3.2 for the center frequency tolerance and center frequency convergence and in 20.3.3.3 for the symbol clock tolerance apply for all EDMG and non-EDMG modes. The transmit center frequency and the symbol clock frequency for all transmit chains and channels shall be derived from the same reference oscillator. Transmit signals with TXVECTOR parameter CH\_BANDWIDTH set to CBW216+216 or CBW432+432 may be generated using two separate RF LOs, one for each channel, with the constraint that all RF LOs shall be locked to a common source.

**29.3.9.4 Transmit center frequency leakage**

The transmit center frequency leakage is specified per transmit chain.

For transmissions with TXVECTOR parameter CH\_BANDWIDTH set to CBW216, CBW432, CBW648, or CBW864, the transmitter center frequency leakage shall not exceed –23 dB relative to the transmit power per transmit chain regardless of the relationship between the RF LO and center of the transmitted PPDU BW. Equivalently, for the EDMG OFDM mode, the transmitter center frequency leakage shall not exceed $\left(P+2.5-10log\_{10}\left(N\_{SD}+N\_{SP}\right)\right)$ measured over a subcarrier spacing bandwidth regardless of the relationship between the RF LO and center of the transmitted PPDU BW, where *P* is the transmit power per transmit chain in dBm and $N\_{SD}$ and $N\_{SP}$ are defined in Table 90.

For transmissions with TXVECTOR parameter CH\_BANDWIDTH set to CBW216+216 or CBW432+432, the transmitter center frequency leakage shall meet the following requirements for all EDMG and non-EDMG formats:

— When the RF LO falls within one of the two frequency segments, the transmitter center frequency leakage requirement is the same as the one for transmissions with TXVECTOR parameter CH\_BANDWIDTH set to CBW216, CBW432, CBW648, or CBW864.

— When the RF LO falls outside both frequency segments, the RF LO shall follow the spectral mask requirements as defined in 29.3.5.

**29.3.9.5 Transmit rampup and rampdown**

The requirements defined in 20.3.3.5 for transmit power-on ramp and power-down ramp apply for all EDMG and non-EDMG modes.

**29.3.9.6 Antenna setting**

Antenna setting shall remain constant for the transmission of the entire packet, except for the case of transmission of EDMG BRP-TX packets and EDMG BRP-RX/TX packets. During the transmission of EDMG BRP-TX packets and EDMG BRP-RX/TX packets, it shall remain constant for the transmission of all fields up to the TRN field. The transmission of the TRN field is defined in 29.9.2.2.5.

**29.3.9.7 Maximum input requirement**

The requirement defined in 20.3.3.7 for the receiver maximum input level apply for all EDMG and non-EDMG modes.

**29.3.9.8 Receive sensitivity**

For the EDMG control mode and non-EDMG control mode, the PER shall be less than 5% for a PSDU length of 256 octets and with the input level listed in Table 29-X1 defined at the antenna connector(s). If the TXVECTOR parameter NON\_EDMG\_MODULATION is set to NON\_EDMG\_DUP\_SC\_MODE, the minimum sensitivity listed in Table 29-X1 shall be met in the reception of each 2.16 GHz channel.

For the non-EDMG SC mode, EDMG SC mode, and EDMG OFDM mode, the PER shall be less than 1% for a PSDU length of 4096 octets with the MCS and mode dependent input levels listed in Table 29-X2 - 29-X6 defined at the antenna connector(s).

The number of spatial streams under test shall be equal to the number of antenna (output) ports of the transmitting EDMG STA and also equal to the number of input ports of the device under test. Each antenna (output) port of the transmitting EDMG STA shall be connected through a cable to one input port of the device under test. The minimum sensitivity levels specified in Tables 29-X2 – 29-X6 apply only to non-STBC modes.

For transmissions with TXVECTOR parameter CH\_BANDWIDTH set to CBW216+216 or CBW432+432, the minimum sensitivity listed in Table 29-X2 – 29-X6 (values corresponding to CH\_BANDWIDTH equal to CBW216 or CBW432) shall be met in the reception of each channel. For transmissions with TXVECTOR parameter NON\_EDMG\_MODULATION set to NON\_EDMG\_DUP\_SC\_MODE, the minimum sensitivity listed in Table 29-X2 – 29-X6 (values corresponding to CH\_BANDWIDTH equal to CBW216) shall be met in the reception of each channel.

NOTE—For RF power measurements performed over the air, the input level shall be corrected to compensate for the antenna gain in the implementation. The gain of the antenna is the maximum estimated gain by the manufacturer. In the case of the phased-array antenna, the gain of the phased-array antenna is the maximum sum of estimated element gain minus 3 dB implementation loss.

Tables 29-X1 – 29-X6 assume 5 dB implementation loss and 10 dB noise factor (Noise Figure).

**Table 29-X1 – Receiver sensitivity for the EDMG and non-EDMG control mode**

|  |  |
| --- | --- |
| **MCS** | **Receive sensitivity (dBm)** |
| 0 | -78 |

**Table 29-X2 – Receiver sensitivity for the EDMG and non-EDMG SC mode**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MCS** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW216 or CBW216+216)** **(dBm)**  | **Minimum sensitivity****(CH\_BANDWIDTH is CBW432 or CBW432+432)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW648)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW864)** **(dBm)** |
| 1 | -68 |  -65 |  -63 |  -62 |
| 2 | -66 |  -63 |  -61 |  -60 |
| 3 | -65 |  -62 |  -60 |  -59 |
| 4 | -64 |  -61 |  -59 |  -58 |
| 5 | -62 |  -59 |  -57 |  -56 |
| 6 | -61 |  -58 |  -56 |  -55 |
| 7 | -63 |  -60 |  -58 |  -57 |
| 8 | -62 |  -59 |  -57 |  -56 |
| 9 | -61 |  -58 |  -56 |  -55 |
| 10 | -59 |  -56 |  -54 |  -53 |
| 11 | -57 |  -54 |  -52 |  -51 |
| 12 | -55 |  -52 |  -50 |  -49 |
| 13 | -54 |  -51 |  -49 |  -48 |
| 14 | -53 |  -50 |  -48 |  -47 |
| 15 | -51 |  -48 |  -46 |  -45 |
| 16 | -50 |  -47 |  -45 |  -44 |
| 17 | -49 |  -46 |  -44 |  -43 |
| 18 | -48 |  -45 |  -43 |  -42 |
| 19 | -46 |  -43 |  -41 |  -40 |
| 20 | -45 |  -42 |  -40 |  -39 |
| 21 | -44 |  -41 |  -39 |  -38 |

**Table 29-X3 – Receiver sensitivity for the EDMG SC mode if the π/2-8-PSK Applied field is 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MCS** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW216 or CBW216+216)** **(dBm)**  | **Minimum sensitivity****(CH\_BANDWIDTH is CBW432 or CBW432+432)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW648)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW864)** **(dBm)** |
| 12 | -56 | -53 | -51 | -50 |
| 13 | -54 | -51 | -49 | -48 |

**Table 29-X4 – Receiver sensitivity for the EDMG SC mode if the π/2-64-NUC Applied field is 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MCS** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW216 or CBW216+216)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW432 or CBW432+432)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW648)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW864)** **(dBm)** |
| 17 | -49 |  -46 |  -44 |  -43 |
| 18 | -48 |  -45 |  -43 |  -42 |
| 19 | -46 |  -43 |  -41 |  -40 |
| 20 | -45 |  -42 |  -40 |  -39 |
| 21 | -44 |  -41 |  -39 |  -38 |

**Table 29-X5 - Receiver sensitivity for the EDMG SC mode if the DCM π/2-BPSK Applied field is 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MCS** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW216 or CBW216+216)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW432 or CBW432+432)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW648)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW864)** **(dBm)** |
| 2 | -66 |  -63 |  -61 |  -60 |
| 3 | -65 |  -62 |  -60 |  -59 |
| 4 | -64 |  -61 |  -59 |  -58 |
| 5 | -62 |  -59 |  -57 |  -56 |
| 6 | -61 |  -58 |  -56 |  -55 |

**Table 29-X6 – Receiver sensitivity for the EDMG OFDM mode**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MCS** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW216 or CBW216+216)** **(dBm)**  | **Minimum sensitivity****(CH\_BANDWIDTH is CBW432 or CBW432+432)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW648)** **(dBm)** | **Minimum sensitivity****(CH\_BANDWIDTH is CBW864)** **(dBm)** |
| 1 | -66 |  -63 |  -61 |  -60 |
| 2 | -64 |  -61 |  -59 |  -58 |
| 3 | -63 |  -60 |  -58 |  -57 |
| 4 | -61 |  -58 |  -56 |  -55 |
| 5 | -60 |  -57 |  -55 |  -54 |
| 6 | -63 |  -60 |  -58 |  -57 |
| 7 | -62 |  -59 |  -57 |  -56 |
| 8 | -61 |  -57 |  -55 |  -54 |
| 9 | -59 |  -55 |  -53 |  -52 |
| 10 | -58 |  -54 |  -52 |  -51 |
| 11 | -58 |  -54 |  -52 |  -51 |
| 12 | -57 |  -52 |  -50 |  -49 |
| 13 | -56 |  -50 |  -48 |  -47 |
| 14 | -55 |  -48 |  -46 |  -45 |
| 15 | -54 |  -47 |  -45 |  -44 |
| 16 | -52 |  -49 |  -47 |  -46 |
| 17 | -51 |  -47 |  -45 |  -44 |
| 18 | -50 |  -45 |  -43 |  -42 |
| 19 | -48 |  -43 |  -41 |  -40 |
| 20 | -46 |  -41 |  -39 |  -38 |

The receiver sensitivity for the EDMG OFDM mode if the DCM BPSK Applied field is 1 and the number of spatial streams is 2 is the same one defined in Table 29-X6 for the coding scheme used (MCSs 1-5). Similarly, the receiver sensitivity for the EDMG OFDM mode if the Phase Hopping field in the EDMG-Header-A is equal to 1 and the number of spatial streams is 2 is the same one defined in Table 29-X6 for the coding scheme used (MCSs 1-20).

**29.3.9.9 Spectral flatness test for the EDMG OFDM mode**

Spectral flatness measurements shall be conducted using DCM BPSK modulated EDMG OFDM PPDUs only while transmitting OFDM symbols. See 29.6.11.1.1 for the demodulation procedure and the number of PPDUs and OFDM symbols to be used for testing. Spectral flatness shall be evaluated using the subcarrier received values or the magnitude of channel estimates obtained with the EDMG-CEF field.

Let $E\_{i,avg}$ denote the magnitude of the channel estimation on subcarrier *i* or the average constellation energy of a DCM BPSK modulated subcarrier *i*. In an EDMG OFDM PPDU having TXVECTOR parameter CH\_BANDWIDTH listed in Table 29-X7, $E\_{i,avg}$ of each of the subcarriers with indices listed as tested subcarrier indices shall not deviate by more than the specified maximum deviation in Table 29-X7 from the average of $E\_{i,avg}$ over subcarrier indices listed as averaging subcarrier indices. Averaging of $E\_{i,avg}$ is done in the linear domain.

**Table 29-X7 - Maximum transmit spectral flatness deviations**

|  |  |  |  |
| --- | --- | --- | --- |
| **TXVECTOR parameter CH\_BANDWIDTH** | **Average subcarrier indices (inclusive)** | **Tested subcarrier indices (inclusive)** | **Maximum deviation (dB)** |
| CBW216  | -146 to -2 and 2 to 146 | -146 to -2 and 2 to 146 | ±2 |
| -177 to -147 and 147 to 177 | +2/-4 |
| CBW432 | -355 to -2 and 2 to 355 | -325 to -2 and 2 to 325 | ±2 |
| -386 to -326 and 326 to 386 | +2/-4 |
| CBW648 | -565 to -2 and 2 to 565 | -505 to -2 and 2 to 505 | ±2 |
| -596 to -506 and 506 to 596 | +2/-4 |
| CBW864 | -774 to -2 and 2 to 774 | -684 to -2 and 2 to 684 | ±2 |
| -805 to -685 and 685 to 805 | +2/-4 |

For transmit signals with TXVECTOR parameter CH\_BANDWIDTH set to CBW216+216, each frequency segment shall meet the spectral flatness requirement for a transmission with TXVECTOR parameter CH\_BANDWIDTH set to CBW216. For transmit signals with TXVECTOR parameter CH\_BANDWIDTH set to CBW432+432, each frequency segment shall meet the spectral flatness requirement for a transmission with TXVECTOR parameter CH\_BANDWIDTH set to CBW432.

For the spectral flatness test, the transmitting STA shall be configured to use a spatial mapping matrix $Q\_{k}$ (see 29.6.10) with flat frequency response. Each output port under test of the transmitting STA shall be connected through a cable to one input port of the testing instrumentation.

*Modify lines 9 and 10 of page 376 as follows:*

NOTE 3—For rules regarding TX center frequency leakage levels, see ~~20.3.3.4~~ 29.3.9.4. The spectral mask requirements in this subclause do not apply to the RF LO leakage and its harmonics.