IEEE P802.11
Wireless LANs

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| PDT-PHY- Receive specification: General and receiver minimum input sensitivity and channel rejection |
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Abstract

This submission proposed the draft text on modulation accuracy for TGbe D0.1.

This document is based on 27.3.20 Receiver specification of P802.11ax D6.1.

Added 320MHz, 4KQAM related discussion and values.

This draft is only for 20/40/80/160/320MHz transmission. Didn’t include 80+80/160+160MHz yet as there is some related discussion.

Yellow highlighted texts are TBD.

R1: correction in table xx-y2

R2: connectors to connector.

xx.3.20.4 Nonadjacent channel rejection and xx.3.20.5 Receiver maximum input level added

R3: feedback during conference call

R4: MCS level indices

R5: add 80+80/160+160 MHz with TBD (highlighted)

R6: feedback during conference call

xx.3.20 Receiver specification

xx.3.20.1 General

For receiver minimum input sensitivity, adjacent channel rejection, nonadjacent channel rejection, receiver maximum input level and CCA sensitivity requirements described in this subclause, the input levels are measured at the antenna connector and are referenced as the average power per receive antenna. The number of spatial streams under test shall be equal to the number of utilized transmitting STA antenna (output) ports and also equal to the number of utilized Device Under Test input ports. Each output port of the transmitting STA shall be connected through a cable to one input port of the Device Under Test.

NOTE—Additional test requirements and/or test methods may be needed to meet regulatory requirements.

The requirements on receiver minimum input sensitivity in xx.3.20.2 (Receiver minimum input sensitity), adjacent channel rejection in xx.3.20.3 (Adjaent channel rejection) and nonadjacent channel rejection in xx.3.20.4 (Nonadjacent channel rejection) apply to PPDUs that meet all the following conditions:

* [STBC is not used]
* 0.8 µs GI is used
* If the PPDU bandwidth is 20 MHz and the EHT-MCS is less than [10], then BCC is used. Otherwise, LDPC is used. DCM MCS TBD.
* The PPDU is an EHT MU PPDU, compressed mode (non-OFDMA), transmitted to a single user, and without puncturing.

xx.3.20.2 Receiver minimum input sensitivity

The packet error rate (PER) shall be less than 10% for a PSDU with the rate-dependent input levels listed in Table xx-y1 (Receiver minimum input level sensitivity). The PSDU length shall be 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations.

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|  | Table xx-y1- Receiver minimum input level sensitivity  |
| **Modulation** | Rate (R) | Minimum sensitivity (20 MHz PPDU)(dBm) | Minimum sensitivity (40 MHz PPDU)(dBm) | Minimum sensitivity (80 MHz PPDU)(dBm) | Minimum sensitivity (160 MHz or 80+80 MHz PPDU)(dBm) | Minimum sensitivity (320 MHz or 160+160 MHz PPDU)(dBm) |
| Without DCM | With DCM |
| N/A | BPSK | 1/2 | –82 | –79 | –76 | –73 | –70 |
| BPSK | N/A | 1/2 | –82 | –79 | –76 | –73 | –70 |
| QPSK | N/A | 1/2 | –79 | –76 | –73 | –70 | –67 |
| QPSK | N/A | 3/4 | –77 | –74 | –71 | –68 | –65 |
| 16-QAM | N/A | 1/2 | –74 | –71 | –68 | –65 | –62 |
| 16-QAM | N/A | 3/4 | –70 | –67 | –64 | –61 | –58 |
| 64-QAM | N/A | 2/3 | –66 | –63 | –60 | –57 | –54 |
| 64-QAM | N/A | 3/4 | –65 | –62 | –59 | –56 | –53 |
| 64-QAM | N/A | 5/6 | –64 | –61 | –58 | –55 | –52 |
| 256-QAM | N/A | 3/4 | –59 | –56 | –53 | –50 | –47 |
| 256-QAM | N/A | 5/6 | –57 | –54 | –51 | –48 | –45 |
| 1024-QAM | N/A | 3/4 | –54 | –51 | –48 | –45 | –42 |
| 1024-QAM | N/A | 5/6 | –52 | –49 | –46 | –43 | –40 |
| 4096-QAM | N/A | 3/4 | -49 | -46 | -43 | -40 | -37 |
| 4096-QAM | N/A | 5/6 | -46 | -43 | -40 | -37 | -34 |

xx.3.20.3 Adjacent channel rejection

Adjacent channel rejection for *W* MHz (where *W* is 20, 40, 80, 160 or 320) shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-y1 (Receiver minimum input level sensitivity) and raising the power of the interfering signal of *W* MHz bandwidth until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. The difference in power between the signals in the interfering channel and the desired channel is the corresponding adjacent channel rejection. The center frequency of the adjacent channel shall be placed *W* MHz away from the center frequency of the desired signal.

Adjacent channel rejection for 80+80 MHz channels shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-y1 (Receiver minimum input level sensitivity). Then, an interfering signal of 80 MHz bandwidth is introduced, where the center frequency of the interfering signal is placed 80 MHz away from the center frequency of the frequency segment lower in the frequency of the desired signal. The power of interfering signal is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the difference between the interfering and desired signal. Next, the interfering signal of 80 MHz bandwidth is moved to the frequency where the center frequency of the interfering signal is 80 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The power of the interfering is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the power difference between the interfering and desired signal. The smaller value between  and  is the corresponding adjacent channel rejection.

Adjacent channel rejection for 160+160 MHz channels shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-y1 (Receiver minimum input level sensitivity). Then, an interfering signal of 160 MHz bandwidth is introduced, where the center frequency of the interfering signal is placed 160 MHz away from the center frequency of the frequency segment lower in the frequency of the desired signal. The power of interfering signal is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the difference between the interfering and desired signal. Next, the interfering signal of 160 MHz bandwidth is moved to the frequency where the center frequency of the interfering signal is 160 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The power of the interfering is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the power difference between the interfering and desired signal. The smaller value between  and  is the corresponding adjacent channel rejection.

The interfering signal in the adjacent channel shall be a signal compliant with the EHT PHY, unsynchronized with the signal in the channel under test, and shall have a minimum duty cycle of 50%. The corresponding rejection shall be no less than specified in Table xx-y2 (Minimum required adjacent and nonadjacent channel rejection levels).

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| Table xx-y2- Minimum required adjacent and nonadjacent channel rejection levels  |
| Modulation | Rate (R) | Adjacent channel rejection (dB) | Nonadjacent channel rejection (dB) |
| Without DCM | With DCM | 20/40/80/160/320 MHz Channel | 80+80/160+160 MHz Channel | 20/40/80/160/320 MHz Channel | 80+80/160+160 MHz Channel |
| N/A | BPSK | 1/2 | 16 | 13 | 32 | 29 |
| BPSK | N/A | 1/2 | 16 | 13 | 32 | 29 |
| QPSK | N/A | 1/2 | 13 | 10 | 29 | 26 |
| QPSK | N/A | 3/4 | 11 | 8 | 27 | 24 |
| 16-QAM | N/A | 1/2 | 8 | 5 | 24 | 21 |
| 16-QAM | N/A | 3/4 | 4 | 1 | 20 | 17 |
| 64-QAM | N/A | 2/3 | 0 | -3 | 16 | 13 |
| 64-QAM | N/A | 3/4 | –1 | -4 | 15 | 12 |
| 64-QAM | N/A | 5/6 | –2 | -5 | 14 | 11 |
| 256-QAM | N/A | 3/4 | –7 | -10 | 9 | 6 |
| 256-QAM | N/A | 5/6 | –9 | -12 | 7 | 4 |
| 1024-QAM | N/A | 3/4 | –12 | -15 | 4 | 1 |
| 1024-QAM | N/A | 5/6 | –14 | -17 | 2 | -1 |
| 4096-QAM | N/A | 3/4 | –17 | -20 | -1 | -3 |
| 4096-QAM | N/A | 5/6 | –20 | -23 | -4 | -7 |

The measurement of adjacent channel rejection for 160 MHz and 320 MHz operation in regulatory domain is required only if such a frequency band plan is permitted in the regulatory domain.

xx.3.20.4 Nonadjacent channel rejection

Nonadjacent channel rejection for *W* MHz channels (where *W* is 20, 40, 80, 160 or 320) shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-y1 (Receiver minimum input level sensitivity), and raising the power of the interfering signal of *W* MHz bandwidth until a 10% PER occurs for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. The difference in power between the signals in the interfering channel and the desired channel is the corresponding nonadjacent channel rejection. The nonadjacent channel rejection shall be met with any nonadjacent channels located at least 2×*W* MHz away from the center frequency of the desired signal.

Nonadjacent channel rejection for 80+80 MHz channels shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-y1 (Receiver minimum input level sensitivity). Then, an interfering signal of 80 MHz bandwidth is introduced, where the center frequency of the interfering signal is placed at least 160 MHz away from the center frequency of the frequency segment lower in the frequency of the desired signal. The center frequency of the interfering signal shall also be at least 160 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The power of interfering signal is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the difference between the interfering and desired signal. Next, the interfering signal of 80 MHz bandwidth is moved to the frequency where the center frequency of the interfering signal is at least 160 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The center frequency of the interfering signal shall also be at least 160 MHz away from the center frequency of the frequency segment lower in frequency of the desired signal. The power of the interfering is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the power difference between the interfering and desired signal. The smaller value between  and  is the corresponding nonadjacent channel rejection.

Nonadjacent channel rejection for 160+160 MHz channels shall be measured by setting the desired signal’s strength 3 dB above the rate-dependent sensitivity specified in Table xx-y1 (Receiver minimum input level sensitivity). Then, an interfering signal of 160 MHz bandwidth is introduced, where the center frequency of the interfering signal is placed at least 320 MHz away from the center frequency of the frequency segment lower in the frequency of the desired signal. The center frequency of the interfering signal shall also be at least 320 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The power of interfering signal is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the difference between the interfering and desired signal. Next, the interfering signal of 160 MHz bandwidth is moved to the frequency where the center frequency of the interfering signal is at least 320 MHz away from the center frequency of the frequency segment higher in frequency of the desired signal. The center frequency of the interfering signal shall also be at least 320 MHz away from the center frequency of the frequency segment lower in frequency of the desired signal. The power of the interfering is raised until 10% PER is caused for a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations. Let  be the power difference between the interfering and desired signal. The smaller value between  and  is the corresponding nonadjacent channel rejection.

The interfering signal in the nonadjacent channel shall be a signal compliant with the EHT PHY, unsynchronized with the signal in the channel under test, and shall have a minimum duty cycle of 50%. The corresponding rejection shall be no less than specified in Table xx-y2 (Minimum required adjacent and nonadjacent channel rejection levels).

The measurement of nonadjacent channel rejection for 160 and 320 MHz operation in regulatory domain is required only if such a frequency band plan is permitted in the regulatory domain.

xx.3.20.5 Receiver maximum input level

The receiver shall provide a maximum PER of 10% at a PSDU length of 2048 octets for BPSK modulation with DCM or 4096 octets for all other modulations, for a maximum input level of –30 dBm in the 5 GHz and 6 GHz bands and –20 dBm in the 2.4 GHz band, measured at each antenna for any baseband EHT modulation.

**References:**

1. [P820.11REVaxD6.1](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D4.0.pdf)