IEEE P802.11
Wireless LANs

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| Proposed changes on Tx mask |
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Abstract

This document proposes to change the PSD floor in Tx mask of 11ax/ac/n/a in 5/6GHz such that the PSD floor of 11be is aligned with the legacy WiFi mendaments.

Revisions:

 R0: The initial version of the draft.

 R1: updated text in the discussions.

 R2: Editorial based on the online comments.

Discussions:

The transmit spectrum mask of 802.11 was defined as: The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and X dBm/MHz at any frequency offset, where “X” is the absolute PSD floor (dBm/MHz). With a moderate Tx power, transmitter always need to meet -40dBr (as shown in table below) and “X” only kicks in for very low Tx power.

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| BW(MHz) | Abs PSD Floor (dBm/MHz) | Assuming 23dBm EIRP: -40dBr -> PSD(dBm/MHz) |
| 20 | -53 | -30 |
| 40 | -56 | -33 |
| 80 | -59 | -36 |
| 160 | -59 | -39 |
| 320 | -59 | -42 |

The PSD definition in IEEE brings in potential issues below:

1) for high Tx power, E.g., 23dBm, transmitter need to meet a tigher PSD for a larger BW because the X value never take affect.

2)In addition, if the Tx power is very low due to power control, E.g., 0dBm, the transmitter needs to meet -59dBm/MHz. Both issues could be challenging to the analog implementations.

3)Another potential issue is the coexistence fairness between WiFi and other technologies. Figure 1 shows the comparisons of the PSD floor defined for IEEE/FCC/ETSI/5GNR:

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Figure 1.

**11be changed the -59/-56/-53dBm/MHz PSD floor to -39dBm/MHz regardless of PPDU BW (last page of 11-21-0923r1).** However, if only change the PSD floor of 11be and leave legacy reqruiement as is, 11be device works in legacy mode will still be limited by the tight PSD floor. The issues mentioned in the previous paragraph still exist. This contribution proposes to change the PSD floor for all the legacy WiFi amendaments in the 5 and 6 GHz band (reason of not chang the requrirements in 2.4GHz band is the three issues are not quite challenging/exist in 2.4GHz band).

-------------------------------------------------------------------------End of discussions--------------------------------------------------------------

To TGm editor: make the following changes based on 11me D0.2

***Changes for 11ax:***

Change clause 27.3.19.1 (P.L. 4065.06) as below

### For a 20 MHz mask PPDU of HE format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 19.5 MHz, –20 dBr at 10.5 MHz frequency offset, –28 dBr at 20 MHz frequency offset, and –40 dBr at 30 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets between 9.75 MHz and 10.5 MHz, 10.5 MHz and 20 MHz, and 20 MHz and 30 MHz shall be linearly interpolated in dB domain from the requirements for 9.75 MHz,10.5 MHz, 20 MHz, and 30 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and –53 dBm/MHz at any frequency offset in the 2.4GHz band. The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and –39 dBm/MHz at any frequency offset in the 5 GHz and 6 GHz bands. Figure 27-47 (Exampletransmit spectral mask for a 20 MHz mask PPDU(11ax)) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –53 dBm/MHz in the 2.4GHz or when the –40 dBr spectrum level is above –39 dBm/MHz in the 5 GHz and 6 GHz bands.

Change clause 27.3.19.1 (P.L. 4065.50) as below

### The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and –56 dBm/MHz at any frequency offset greater than 19.5 MHz in the 2.4 GHz band. The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and –39 dBm/MHz at any frequency offset in the 5 GHz and 6 GHz bands. Figure 27-48 (Example transmit spectral mask for a 40 MHz mask PPDU(11ax)) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –56 dBm/MHz in the 2.4 GHz or when the –40 dBr spectrum level is above –39 dBm/MHz in the 5 GHz and 6 GHz bands.

Change clause 27.3.19.1 (P.L. 4066.32) as below

### The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –39 dBm/MHz at any frequency offset. Figure 27-49 (Example transmit spectral mask for an 80MHz mask PPDU(11ax)) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –39 dBm/MHz.

Change clause 27.3.19.1 (P.L. 4067.07) as below

### The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –39 dBm/MHz at any frequency offset. Figure 27-50 (Example transmit spectral mask for a 160 MHz mask PPDU(11ax)) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –39 dBm/MHz.

Change clause 27.3.19.1 (P.L. 4067.55) as below

The transmit spectrum shall not exceed the maximum of the overall interim transmit spectrum mask
and –39 dBm/MHz at any frequency offset. Figure 27-51 (Example transmit spectral mask for an 80+80 MHz mask PPDU(11ax)) shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –39 dBm/MHz.

***Changes for 11ac:***

Change clause 21.3.17.1 (P.L. 3384.15) as below

For a 20 MHz mask PPDU of non-HT, HT or VHT format, the interim transmit spectral mask shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth of 18 MHz, –20 dBr at 11 MHz frequency offset, –28 dBr at 20 MHz frequency offset, and –40 dBr at 30 MHz frequency offset and above. The interim transmit spectral mask for frequency offsets in between 9 and 11 MHz, 11 and 20 MHz, and 20 and 30 MHz shall be linearly interpolated in dB domain from the requirements for 9 MHz, 11 MHz, 20 MHz, and 30 MHz frequency offsets. The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and –39 dBm/MHz at any frequency offset. Figure 21-29 (Example transmit spectral mask for 20 MHz mask PPDU) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –39 dBm/MHz.

Change clause 21.3.17.1 (P.L. 3384.57) as below

The transmit spectrum shall not exceed the maximum of the interim transmit spectral mask and –39 dBm/MHz at any frequency offset greater than 19 MHz. Figure 21-30 (Example transmit spectral mask for 40 MHz mask PPDU) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –39 dBm/MHz.

Change clause 21.3.17.1 (P.L. 3385.31) as below

The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –39 dBm/MHz at any frequency offset. Figure 21-31 (Example transmit spectral mask for 80 MHz mask PPDU) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –39 dBm/MHz.

Change clause 21.3.17.1 (P.L. 3386.01) as below

The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –39 dBm/MHz at any frequency offset. Figure 21-32 (Example transmit spectral mask for 160 MHz mask PPDU) shows an example of the resulting overall spectral mask when the –40 dBr spectrum level is above –39 dBm/MHz.

Change clause 21.3.17.1 (P.L. 3386.41) as below

The transmit spectrum shall not exceed the maximum of the interim transmit spectrum mask and –39 dBm/MHz at any frequency offset. Figure 21-33 (Example transmit spectral mask for 80+80 MHz mask PPDU) shows an example of a transmit spectral mask for a noncontiguous transmission using two 80 MHz channels where the center frequency of the two 80 MHz channels are separated by 160 MHz and the –40 dBr spectrum level is above –39 dBm/MHz.

***Changes for 11n:***

Change clause 19.3.18.1 (P.L. 3213.57) as below

For the 5 GHz band, when transmitting in a 20 MHz channel, the transmitted spectrum shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth not exceeding 18 MHz, –20 dBr at 11 MHz frequency offset, –28 dBr at 20 MHz frequency offset, and the maximum

of –40 dBr and –39 dBm/MHz at 30 MHz frequency offset and above.

Change clause 19.3.18.1 (P.L. 3214.27) as below

For the 5 GHz band, when transmitting in a 40 MHz channel, the transmitted spectrum shall have a 0 dBr bandwidth not exceeding 38 MHz, –20 dBr at 21 MHz frequency offset, –28 dBr at 40 MHz offset, and the maximum of –40 dBr and –39 dBm/MHz at 60 MHz frequency offset and above. The transmitted spectral density of the transmitted signal shall fall within the spectral mask, as shown in Figure 19-20 (Transmit spectral mask for a 40 MHz channel in the 5 GHz band).

***Changes for 11a:***

Change clause 17.3.9.3 (P.L. 3107.50) as below

For operation using 20 MHz channel spacing, the transmitted spectrum shall have a 0 dBr (dB relative to the maximum spectral density of the signal) bandwidth not exceeding 18 MHz, –20 dBr at 11 MHz frequency offset, –28 dBr at 20 MHz frequency offset, and the maximum of –40 dBr and -39 dBm/MHz at 30 MHz frequency offset and above.