IEEE P802.11
Wireless LANs

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| 11be PDT: Spectral flatness |
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Abstract

This contribution proposes the draft text on transmit spectral mask for TGbe D0.1.

R0: main changes comparing with 11ax include:

* Add spectral flatness in test indices for 320MHz.
* Relax edge tone text requirement to -6dB.

R2: remove TBDs for 80+80/160+160. Incorporate the latest passed SP in DCN 1954r4

35.3.17.2 Spectral flatness

Spectral flatness measurements shall be conducted using BPSK modulated EHT PPDUs. The EHT PPDUs shall be demodulated using the following (or equivalent) procedure:

* Start of PPDU shall be detected.
* Transition from L-STF to L-LTF shall be detected and fine timing shall be established.
* Coarse and fine frequency offsets shall be estimated.
* Symbols in a PPDU shall be manipulated to account for both frequency error and sampling offset drift.
* For each EHT-LTF symbol, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers, and compensate the subcarrier values according to the estimated phase.
* For each of the data OFDM symbols: transform the symbol into subcarrier received values.

The spectral flatness test shall be performed over at least 20 EHT PPDUs. The PPDUs under test shall be at least 16 data OFDM symbols long.

Evaluate spectral flatness using the subcarrier received values or the magnitude of the channel estimation of the occupied subcarriers of the transmission EHT PPDUs. Nonoccupied subcarriers of the transmitted EHT PPDUs shall be ignored during averaging and testing. Resource unit power boosting and beamforming should not be used when measuring spectral flatness.

Let *Ei,avg* denote the magnitude of the channel estimation on subcarrier *i* or the average constellation energy of a BPSK modulated subcarrier *i* in an EHT data symbol.

In a contiguous EHT transmission having a bandwidth listed in Table 35-x1 (Maximum transmit spectral flatness deviations), *Ei,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 35-x1 (Maximum transmit spectral flatness deviations for EHT PPDU) from the average of *Ei,avg* over subcarrier indices listed as averaging subcarrier indices. Averaging of *Ei,avg* is done in the linear domain. For PPDU Bandwidth equal to 80MHz, 160MHz, 320MHz, depends on whether the preamble puncturing is applied or not, the maximum deviation is different.

**Table 35-x1 Maximum transmit spectral flatness deviations for EHT PPDU**

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| --- | --- | --- | --- | --- |
| **Bandwidth of EHT transmission (MHz)** | **Averaging subcarrier indices (inclusive)** | **Tested subcarrier indices (inclusive)** | **Maximum deviation (dB)****(Without preamble puncture)** | **Maximum deviation (dB)****(With preamble puncture)** |
| 20 | –84 to –2 and +2 to +84 | –84 to –2 and +2 to +84 | ±4 | N/A |
| –122 to –85 and +85 to +122 | +4/–6 |
| 40 | –168 to –3 and +3 to +168 | –168 to –3 and +3 to +168 | ±4 |
| –244 to –169 and +169 to +244 | +4/–6 |
| 80 | –344 to –3 and +3 to +344 | –344 to –3 and +3 to +344 | ±4 | +4/–6 |
| –500 to –345 and +345 to +500 | +4/–6 | +4/–6 |
| 160 | –696 to –515, –509 to -12, +12 to +509, and +515 to +696 | –696 to –515, –509 to -12, +12 to +509, and +515 to +696 | ±4 | +4/–6 |
| –1012 to –697, and +697 to +1012 | +4/–6 | +4/–6 |
| 320 | -1400 to -1036, -1012 to -515, -509 to -12, +12 to +509, +515 to +1012, and +1036 to +1400 | -1400 to -1036, -1012 to -515, -509 to -12, +12 to +509, +515 to +1012, and +1036 to +1400 | ±4 | +4/–6 |
| -2036 to -1539, -1533 to -1401, +1401 to +1533, and +1539 to +2036 | +4/–6 | +4/–6 |

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In a contiguous non-HT duplicate transmission having a bandwidth listed in Table 35-x2 (Maximum transmit spectral flatness deviations for non-HT duplicated PPDU), *Ei,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 35-x2 (Maximum transmit spectral flatness deviations) from the average of *Ei,avg* over subcarrier indices listed as averaging subcarrier indices. Averaging of *Ei,avg* is done in the linear domain. For PPDU Bandwidth equal to 80MHz, 160MHz, 320MHz, depends on whether the preamble puncturing is applied, the maximum deviation is different.

**Table 35-x2 Maximum transmit spectral flatness deviations for non-HT duplicated PPDU**

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| **Non-HT duplicate** | **Bandwidth of transmission (MHz)** | **Averaging subcarrier indices (inclusive)** | **Tested subcarrier indices (inclusive)** | **Maximum deviation (dB) (Without preamble puncture)** | **Maximum deviation (dB) (With preamble punctured)** |
| 40 | -42 to -33, -31 to -6, +6 to +31, and +33 to +42 | -42 to -33, -31 to -6, +6 to +31, and +33 to +42 | ±4 | N/A |
| -58 to -43 and +43 to +58 | +4/-6 |
| 80 | -84 to -70, -58 to -33, -31 to -6, +6 to +31, +33 to +58, +70 to +84 | -84 to -70, -58 to -33, -31 to -6, +6 to +31, +33 to +58, +70 to +84 | ±4 | +4/-6 |
| -122 to -97, -95 to -85 and +85 to 95, +97 to +122 | +4/-6 | +4/-6 |
| 160 | -172 to -161, -159 to -134, -122 to -97, -95 to -70, -58 to -44, +44 to +58, +70 to +95, +97 to +122, +134 to +159, +161 to +172 | -172 to -161, -159 to -134, -122 to -97, -95 to -70, -58 to -44, +44 to +58, +70 to +95, +97 to +122, +134 to +159, +161 to +172 | ±4 | +4/-6 |
| -250 to -225, -223 to -198, -186 to -173, -43 to -33, -31 to -6, +6 to +31, +33 to +43, +173 to +186, +198 to +223, +225 to +250 | +4/-6 | +4/-6 |
| 320 | -348 to -326, -314 to -300, -212 to -198, -186 to -161, -159 to -134, -122 to -97, -95 to -84, +84 to +95, +97 to +122, +134 to +159, +161 to +186, +198 to +212, +300 to +314, +326 to +348 | -348 to -326, -314 to -300, -212 to -198, -186 to -161, -159 to -134, -122 to -97, -95 to -84, +84 to +95, +97 to +122, +134 to +159, +161 to +186, +198 to +212, +300 to +314, +326 to +348 | ±4 | +4/-6 |
| -506 to -481, -479 to -454, -442 to -417, -415 to -390, -378 to -353, -351 to -349, -299 to -289, -287 to -262, -250 to -225, -223 to -213, -83 to -70, -58 to -33, -31 to -6, +6 to +31, +33 to+58, +70 to +83, +213 to +223, +225 to +250, +262 to +287, +289 to +299, +349 to +351, +353 to +378, +390 to +415, +417 to +442, +454 to +479, +481 to +506 | +4/-6 | +4/-6 |

For the spectral flatness test, the transmitting STA shall be configured to use a spatial mapping matrix *Qk* (see 35.3.xx (OFDM modulation)) 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. The requirements shall apply to 20 MHz, 40 MHz, 80 MHz, 160 MHz and 320MHz transmissions.