IEEE P802.11
Wireless LANs

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| SB 0 PHY CIDs (Comment Resolution for D5.0) |
| Date: 5 June 2013 |
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Abstract

This document provides resolutions for CIDs: 10057, 10138, 10139, 10003, 10059

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resn Status** | **Resolution** |
| 10057 | 313.12 | 22.3.18.3 | I understand that if you have 2 co-located RF LOs which are not correlated (e.g. NOT 90, 270 deg phase shifted) then won'tyou get some sort of adjacent signal nonlinear distortion product reducing the power output of both signals? In addition, if the phase correlation is ~180 deg then you may have destructive interference occuring making the situation even worse. | Remove the NOTE from this clause | V | Revised.The issue at hand is how to ensure interoperability between 160 MHz contiguous devices and 80+80 MHz non-contiguous devices. An 80+80 MHz transmitter would reasonably use separate RF LOs for each 80 MHz frequency segment. Essentially the note was place there to “warn” someone implementing a receiver, especially someone only implementing 160 MHz contiguous. They would need to make sure they are addressing the possibility of having phase noise in each frequency segment that may not be correlated.We need to be more explicit (i.e. normative) that the transmitter is allowed to do this, forcing receivers to address this.See editing instructions in 11-13-0659r2. |

**Discussion:**

Clause 22.3.18.3 is given below:

**“22.3.18.3 Transmit center frequency and symbol clock frequency tolerance**

The symbol clock frequency and transmit center frequency tolerance shall be ±20 ppm maximum. The transmit

center frequency and the symbol clock frequency for all transmit antennas and frequency segments shall

be derived from the same reference oscillator.

NOTE—If two separate RF LOs are used to generate the lower and upper 80 MHz frequency portions of a transmit signal

with TXVECTOR parameter CH\_BANDWIDTH set to CBW160 or CBW80+80 the signal phase of the two 80 MHz

frequency portions might not be correlated.”

The issue at hand is how to ensure interoperability between 160 MHz contiguous devices and 80+80 MHz non-contiguous devices. An 80+80 MHz transmitter would reasonably use separate RF LOs for each 80 MHz frequency segment. Essentially the note was place there to “warn” someone implementing a receiver, especially someone only implementing 160 MHz contiguous. They would need to make sure they are addressing the possibility of having phase noise in each frequency segment that may not be correlated.

We need to be more explicit (i.e. normative) that the transmitter is allowed to do this, forcing receivers to address this.

**TGac editor: modify TGac D5.0 Clause 22.3.18.3 as follows:**

The symbol clock frequency and transmit center frequency tolerance shall be ±20 ppm maximum. The transmit

center frequency and the symbol clock frequency for all transmit antennas and frequency segments shall

be derived from the same reference oscillator. Transmit signals with TXVECTOR parameter CH\_BANDWIDTH set to CBW160 or CBW80+80 may be generated using two separate RF LOs, one for each of the lower and upper 80 MHz frequency portions.

NOTE—The signal phase of the two 80 MHz

frequency portions might not be correlated.”

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| 10138 | 321.19 | 22.3.20 | "Note that under some circumstances, the MAC uses the value of the PHY-CCA.indication primitive before (and if) issuing the PHYTXSTART.request primitive." This is hard to read. | Change to "Note that under some circumstances, the MAC uses the value of the PHY-CCA.indication primitive which was present before the PHYTXSTART.request primitive was issued." | V | Revised.Given question over the sentence and the fact that it is not necessary to indicate in the PHY subclause what the MAC may or may not be doing, the sentence will be deleted.TGac Editor: delete the sentence in question. |

**Discussion:**

The paragraph in question is as follows:

“The PHY indicates the state of the primary channel and other channels (if any) via the PHY-CCA.indication

primitive (see 22.3.19.5 (CCA sensitivity) and 7.3.5.11 (PHY-CCA.indication)). Note that under some circumstances, the MAC uses the value of the PHY-CCA.indication primitive before (and if) issuing the PHYTXSTART.request primitive. Transmission of the PPDU shall be initiated by the PHY after receiving the

PHY-TXSTART.request(TXVECTOR) primitive. The TXVECTOR elements for the PHY-TXSTART.request

primitive are specified in Table 22-1 (TXVECTOR and RXVECTOR parameters).”

Given question over the sentence and the fact that it is not necessary to indicate in the PHY subclause what the MAC may or may not be doing, the sentence will be deleted.

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| 10139 | 324.41 | 22.3.21 | Definition for the invalid L-SIG length should be updated because a) Equation (22-24) no longer has a ceiling function and b) invalid L-SIG length applies only to VHT PPDUs. | Change "An invalid L-SIG Length field value is defined as a value that does not satisfy Equation (22-24)." to "The L-SIG Length field value of a VHT PPDU is invalid if it is not divisible by 3." | A | Accepted |

**Discussion:**

Equation 22-24 is given below:



The ceiling function is in TXTIME, which forces Length for VHT PPDU to always be divisible by 3. Therefore, agree with commenter.

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| 10003 |  |  | Given shared bands, what appears to be missing is the mechanisms to avoid interference. | Add provisions to avoid interferenc ein shared bands. | J | Rejected. 802.11ac employs CSMA/CA mechanism as did 802.11a and 802.11n, which preceded it in the 5 GHz bands. This will provide it similar capability in avoiding interference. However, due to the increased channel bandwidths, there are additional mechanisms as follows.CCA has been enhanced relative to 802.11n such that the detection level of a valid 802.11 signal on the secondary channel is more stringent. In addition, a STA must be able to detect the signal in the middle of the packet.In addition, 802.11ac includes improved dynamic channel width control to mitigate interference. BW signaling is added to RTS and CTS frames to help the station determine which channels are clear. Then the AP only sends data on clear channels.Lastly, if a station detects frequent interference on a channel, it can send an Operating Mode Notification frame to the AP. This frame tells the AP that the station is changing to narrower bandwidth to avoid interference. The AP will then only send frames occupying the reduced BW. |

**Discussion:**

802.11ac employs CSMA/CA mechanism as did 802.11a and 802.11n, which preceded it in the 5 GHz bands. This will provide it similar capability in avoiding interference. However, due to the increased channel bandwidths, there are additional mechanisms as follows.

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In addition, 802.11ac includes improved dynamic channel width control to mitigate interference. BW signaling is added to RTS and CTS frames to help the station determine which channels are clear. Then the AP only sends data on clear channels.

Lastly, if a station detects frequent interference on a channel, it can send an Operating Mode Notification frame to the AP. This frame tells the AP that the station is changing to narrower bandwidth to avoid interference. The AP will then only send frames occupying the reduced BW.

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resn Status** | **Resolution** |
| 10059 | 311.57 | 22.3.18.2 | We should be careful for evaluating the spectral flatness.Spectral flatness measurements are processed according to 22.3.18.4.4. But, a spectral flatness could not be measured correctly by the standardized way owing to 'multiply the vector by a zero-forcing equalization matrix generated from the estimated channel' in 22.3.18.4.4. g).For example, if the multiplication would be carried out before evaluating the spectral flatness, it would be modified to more ideal characteristic. Therefore, any processing to correct the frequency characteristic should be deleted from the procedure of the spectral flatness evaluation. | I propose changing LINE# 57-59 as follows:--------------Spectral flatness measurements shall be conducted using BPSK modulated PPDUs. Demodulation procedure of the PPDUs accords to the following steps, or equivalent procedure.a) Start of PPDU shall be detected.b) Transition from L-STF to L-LTF shall be detected and fine timing shall be established.c) Coarse and fine frequency offsets shall be estimated.d) Symbols in a PPDU shall be derotated according to estimated frequency offset.e) For each VHT-LTF symbol, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers, and derotate the subcarrier values according to the estimated phase.f) 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 PPDUs. The PPDUs under test shall be at least 16 data OFDM symbols long.Evaluate spectral flatness using the subcarrier received values. | V | Revised.Agree with the commenter’s sentiment. It does seem odd that we equalize before measuring spectral flatness. Also give the option of using either the data symbols or channel estimate.See editing instructions in 11-13-0659r4. |

**Discussion:**

Agree with the commenter’s sentiment. It does seem odd that we equalize before measuring spectral flatness. Also give the option of using either the data symbols or channel estimate.

**TGac editor: modify TGac D5.0 Clause 22.3.18.2 as follows:**

**22.3.18.2 Spectral flatness**

Spectral flatness measurements shall be conducted using BPSK modulated PPDUs. Demodulate the PPDUs according to the following steps, or equivalent procedure:

a) Start of PPDU shall be detected.
b) Transition from L-STF to L-LTF shall be detected and fine timing shall be established.
c) Coarse and fine frequency offsets shall be estimated.
d) Symbols in a PPDU shall be derotated according to estimated frequency offset.
e) For each VHT-LTF symbol, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers, and derotate the subcarrier values according to the estimated phase.
f) 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 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.

Let denote the magnitude of the channel estimation on subcarrier *i* or the average constellation energy of a BPSK modulated subcarrier *i* in a VHT data symbol.