IEEE P802.11
Wireless LANs

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| VHT PHY CID – 3166, 3176, 3189, 3190 |
| Date: 2014-09-17 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Youhan Kim | Qualcomm | 1700 Technology Dr.San Jose, CA 94539 | +1-408-652-1822 | youhank@qca.qualcomm.com |
| Allert Van Zelst | Qualcomm |  |  | allert@qti.qualcomm.com |
| Raja Banerjea | CSR |  |  | Raja.Banerjea@csr.com |
| Brian Hart | Cisco |  |  | brianh@cisco.com |
| Eldad Perahia | Intel |  |  | eldad.perahia@intel.com |
| Mingguang Xu | Marvell |  |  | mxu@marvell.com |
| Edward Au | Marvell |  |  | edwardau@marvell.com |
| Hongyuan Zhang | Marvell |  |  | hongyuan@marvell.com |
| James Yee | Mediatek |  |  | james.yee@mediatek.com |
| James Wang | Mediatek |  |  | james.wang@mediatek.com |
| Sigurd Schelstraete | Quantenna |  |  | sschelstraete@quantenna.com |
| Sean Coffey | Realtek |  |  | coffey@realtek.com |

Abstract

This document contains proposed comment resolutions on the following CIDs pertaining to VHT PHY:

3166, 3176, 3189, 3190.

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| CID | Section | Page | Comment | Proposed Change |
| 3166 | 22 | 2453.27 | Illustration of the transmitter block diagram for 80+80 VHT-SIG-B may not be correct. The same comment applies in a number of places where segment parsing is mentioned for 80+80 VHT-SIG-B. There are a number of contradictions in the text between the way 80+80 VHT-SIG-B is described in 22.3.8.3.6 and the way it is depicted here. | The main question is whether 80+80 VHT-SIG-B really uses segment parsing. This comment needs to be resolved together with other related comments. |
| 3176 | 22 | 2466.20 | N\_CBPSS for 80+80 VHT-SIG-B | Section 22.3.8.3.6 states that the 80 MHz format is used in each of the frequency segments of 80+80 (see p2493, L34). As such, the number of coded bits is ambiguous. |
| 3189 | 22 | 2490.42 | There are inconsistencies in the description of VHT-SIG-B for 80+80. Formulas (22-47), (22-52) and the statement on page 2493, line 34 clearly show that the signal at the input of the spatial mapper is the same on both 80 MHz segments. Yet, page 2490, line 42 states that the input bits to VHT-SIG-B are segment parsed. This is also shown in Figure 22-9. However, Segment parsing as described in 22.3.10.7 would result in the even bits on one segment and the odd bits on the other, contradicting the requirements that the frequency signal is the same in both 80 MHz segments. | Make description of 80+80 VHT-SIG-B consistent. This will require changes in a number of places:1. page 2490, line 42: no segment parsing for 80+80. Instead perform 80 MHz processing and duplicate.2. There is no need to generate 468 bits for 80+80 VHT-SIG-B. Hence Figure 22-22 and accompanying text need to be corrected.3. Correct Figure 22-9.4. Possible other places (will do detailed scrub after comment is resolved in principle). |
| 3190 | 22 | 2491.25 | Notation d^(u) isn't explained until much later (page 2493, line 37). | move sentence from page 2493, line 37 to after equation (22-48). Also clarify "constellation point of VHT-SIG-B for user u". |

**Discussion**

The commenter has accurately pointed out that operation of segment parsing and deparsing need to be clarified for VHT-SIG-B. As was previously discussed in 11-13-0983r1, VHT-SIG-B utilizes segement parsing and deparsing just like the VHT-Data symbols. The equations in section 22.3.8.3.6 is, however, lacking indices in some of the variables needed to clearly indicate that the modulated constellations between the two segments are not identical to each other. This lack of segment index is causing confusion that segment parser/deparser may not be used in VHT-SIG-B. Proposed resolution, thus, is to add the segment index *iSeg* in the equations in section 22.3.8.3.6 to avoid further confusion.

During the discussion, it was also discovered that the segment parser/deparser operation has a potential interoperability issue. The VHT PHY is designed such that the VHT160 and VHT80+80 PPDUs are interoperable with each other if the two 80 MHz frequency segments of the VHT80+80 are placed adjacent to each other. For example, each frequency segment of the VHT80+80 PPDU utilizes the frequency tone allocation of VHT80 PPDUs. And the frequency tone allocation of the VHT160 PPDU is identical to placing two VHT80 tone allocations side by side. This allows STAs to demodulate VHT160 PPDUs using two 80 MHz demodulators designed to receive VHT80+80 PPDUs, and vice versa.

VHT160 and VHT80+80 PPDUs use the segment parser (section 22.3.10.7) to separate out each stream of the stream parser output into two 80 MHz frequency subblocks. This allows subsequent frequency domain processing, such as interleaver, to be performed per 80 MHz (reusing the VHT80 definitions). For VHT160, output of the constellation mapper (in case of BCC encoded PPDUs) or the LDPC tone mapper (in case of LDPC encoded PPDUs) from the two frequency subblocks are combined into a single 160 MHz segment using the segment deparser (section 22.3.10.9.3). As shown in the screen capture of section 22.3.10.9.3 below, bits from the frequency subblock 0 are mapped to the lower half frequency (tone indices 0 ~ *NSD*/2-1 ) while bits from the frequency subblock 1 are mapped to the upper half frequency (tone indices *NSD*/2 ~ *NSD* ). Hence, the lower half of the 160 MHz spectrum always gets assigned the frequency subblock 0 regardless of whether the Primary80 below or above the Secondary80 in frequency.

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In case of VHT80+80, Table 22-22 assigns dot11CurrentChannelCenterFrequencyIndex0 and dot11CurrentChannelCenterFrequencyIndex1 to Primary80 and Secondar80, respectively.

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Then, Equations (22-1) and (22-2) maps *fc,idx0* and *fc,idx1* to Primary80 and Secondary80, respectively.

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Table 22-7 then connects $f\_{\left(0\right)}$ and $f\_{\left(1\right)}$ to Primary80 and Secondary80, respectively.

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Finally, Equation (22-90) maps frequency subblocks 0 and 1 to Primary80 and Secondary80, respectively.

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Now, consider the scenario where the Primary80 occupies the frequency spectrum with higher frequency than the Secondary80. Then, a VHT160 PPDU would assign the constellation mapper or LDPC tone mapper outputs to the 80 MHz spectrum ***lower*** in frequency first (i.e. frequency subblock0 goes to lower frequency), while a VHT80+80 PPDU would assign to the 80 MHz spectrum ***higher*** in frequency first (i.e. frequency subblock0 goes to higher frequency). This creates unintended difference between VHT160 and VHT80+80 operation, which could cause interoperability issues between VHT160 and VHT80+80 capable devices.

The reason for this unintended difference is due to an oversight in Table 22-7. Note that Table 22-7 was created to correctly place center frequency of PPDUs utilizing bandwidth less than the channel bandwidth – e.g. to indicate the center frequency for a VHT20 PPDU being sent in an 80 MHz channel. In case of VHT80+80 PPDU, $f\_{\left(0\right)}$ and $f\_{\left(1\right)}$ should refer to the center frequency for the frequency segment lower in frequency and the frequency segment higher in frequency, respectively. But Table 22-7 is incorrectly mapping, $f\_{\left(0\right)}$ and $f\_{\left(1\right)}$ to Primary80 and Secondar80, respectively, causing the aforementioned issue. By correcting the VHT80+80 entry in Table 22-7, the discrepancy between VHT160 and VHT80+80 PPDUs can be removed, thus eliminating interoperability issues.

**Proposed Resolutions**

CID 3166: **REVISED**. See “Proposed Text Updates” in 11-14-1283r0 which updates section 22.3.8.3.6 to clarify that VHT-SIG-B utilizes the segment parsing. Hence, there is no need to update Figure 22-9.

CID 3176: **REVISED**. See “Proposed Text Updates” in 11-14-1283r0 which updates section 22.3.8.3.6 to clarify that VHT-SIG-B utilizes the segment parsing. Hence, definition for N\_CBPSS does not need to be updated.

CID 3189: **REVISED**. See “Proposed Text Updates” in 11-14-1283r0 which updates section 22.3.8.3.6 to clarify that VHT-SIG-B utilizes the segment parsing by adding segment index to various variables in the equations.

CID 3190: **REVISED**. See “Proposed Text Updates” in 11-14-1283r0 which moves the definition of “d” to right before Equation (22-48).

**Proposed Text Updates**

***Editor: Please update Table 22-7 on P2471L34 as below.***

Table 22-7. Center frequency of the portion of the PPDU transmitted in frequency segment *iSeg*

|  |  |  |
| --- | --- | --- |
| dot11CurrentChannelWidth | CH\_BANDWIDTH |  |
|  |  |
| … | … | … | … |
| 80+80 MHz | CBW20 |  | - |
| CBW40 |  | - |
| CBW80 |  | - |
| CBW80+80 | *-*min( *fc*,idx0, *fc*,idx1 ) | *-*max( *fc*,idx0, *fc*,idx1 ) |

***Editor: Please update D3.0 P2490L40 and following as below.***

For each user *u*, the VHT-SIG-B field shall be BCC encoded at rate R = 1/2 as defined in 18.3.5.6 (Convolutional encoder), be segment parsed as defined in 22.3.10.7 (Segment parser), be interleaved as defined in 22.3.10.8 (BCC interleaver), be mapped to a BPSK constellation as defined in 18.3.5.8 (Subcarrier modulation mapping), be segment deparsed as defined in 22.3.10.9.3 (Segment Deparser) and have pilots inserted following the steps described in 22.3.10.10 (Pilot subcarriers).

***Editor: Please update D3.0 P2490L62 as below.***

In Equation (22-47), replace “” with “”.

***Editor: Please add the following sentence on D3.0 P2491L18.***

Let  be the stream of complex numbers generated for VHT-SIG-B for user *u* at subcarrier *k* (logical index, starting with 0) on frequency segment *iSeg* (prior to multiplication by PVHTLTF). For a 20 MHz VHT transmission,

***Editor: Please update D3.0 P2491L21 as below.***

In Equation (22-48), replace “” with “”, and “” with “”.

***Editor: Please update D3.0 P2491L42 as below.***

In Equation (22-50), replace “” with “”, and “” with “”.

***Editor: Please update D3.0 P2492L4 as below.***

In Equation (22-52), replace “” with “”, and “” with “”.

***Editor: Please update D3.0 P2492L30 as below.***

In Equation (22-54), replace “” with “”, and “” with “”.

***Editor: Please delete the following sentence from D3.0 P2493L37.***



***Editor: Please add the following sentence on D3.0 P2510L12 (right after Equation (22-90)).***

NOTE – As per Table 22-7,  (center frequency for frequency segment *iSeg*=0) is always less than  in case of 80+80 MHz VHT PPDU transmissions. Hence,  (frequency subblock 0) is always transmitted in the frequency segment lower in frequency, while  (frequency subblock 1) is always transmitted in the frequency segment higher in frequency.

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