IEEE P802.11
Wireless LANs

|  |
| --- |
| D1.0 Comment Resolution – PHY Miscellaneous |
| Date: Nov. 1 2011 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Minho Cheong | ETRI | Daejeon, Korea | +82-42-860-5635 | minho@etri.re.kr |
|  |  |  |  |  |

Abstract

This document provides resolutions for CIDs 2399, 2404, 2218, 2402, 2426, 2307, 2429, 2233, 2430 and 2431.

R2: resolution change to CID 2399 and CID 2404 reflecting discussion results at Oct. 20th telecom.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2399 | 135.41 | 22.3.7 | 8us for L-STF: replace by T\_L\_STF and a reference to Table 22-4 (or an extra column in Table 22-7 or a further table). Ditto for the other magic numbers in this para. Ditto for the para for TGI,Field at P136L40 | As in comment | AGREE in PRINCIPLE. See doc. 11/1360r2. | PHY |
| <Discussion>Agree in principle. Note that *TVHT-SIG-A* /2 is used for each VHT-SIG-A symbol because *w* function is defined for each symbol as shown in Equation (22-9) and *TVHT-SIG-A* is originally defined as 8 µs (for 2 symbols) in Table 22-5 (Timing-related constants).While the “duration” of every field is defined separately in Table 22-5 (Timing-related constants) depending on its field name, guard interval thing can be one of three candidates, *TGI*, *TGIS* and *TGI2*. So, there is no need to update the text for  **TGac editor: modify the D1.2 text from P175L41, as follows** An example definition of the windowing function, , is given in 18.3.2.5 (Mathematical conventions in the signal descriptions).  is *TL-STF* for L-STF, *TL-LTF* for L-LTF, *TL-SIG* for L-SIG, *TSYML* for VHT-SIG-A, *TVHT-STF* for VHT-STF, *TVHT-LTF* for each VHT-LTF symbol and *TVHT-SIG-B* for VHT-SIG-B.  is *TSYM* for VHT-Data, that is, *TSYML*  when not using the short guard interval (B0 of VHT-SIG-A is 0) and *TSYMS*  for VHT-Data when using the short guard interval (B0 of VHT-SIG-A is 1). Refer to Table 22-5 (Timing-related constants).**TGac editor: modify the D1.2 text from P185L17, as follows**Replace all the *TSYM* parameters in the following equation by *TSYML* (three times) because a symbol interval for VHT-SIG-A is constantly 4us irrespective of short GI value in VHT-SIG-A. (22-24)**TGac editor: modify the D1.2 text from P170L28, as follows**All the table numbers since Table 22-5 need to be updated because currently Table 22-5 are introduced twice in Draft 1.2. |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2404 | 136.17 | 22.3.7 | Relate Q to TXVECTOR | As in comment | AGREE IN PRINCIPLE. See doc. 11/1360r2.  | PHY |
| <Discussion>There is no TXVECTOR parameter defined which can be related to the spatial mapping matrix Q applied to the transmission. There is something similar (CHAN\_MAT) only among the RXVECTOR parameters, but it may not be the same as the spatial mapping matrix which is applied to the actual transmission depending on implementer’s choice. Refer to clause 22.3.10.11, which says “Note that implementations are not restricted to the spatial mapping matrix examples listed in Section 20.3.11.11.2 (Spatial mapping). For MU packets, is the MU-MIMO steering matrix which is implementation specific”.Reflecting discussion results at Oct. 20th teleconference, it seems more appropriate to introduce a new TXVECTOR parameter related to spatial mapping matrix.EXPANSION\_MAT (and EXPANSION\_MAT\_TYPE) is already defined in the TXVECTOR as a spatial mapping matrix for beamformed transmission. It is also described in detail how to set EXPANSION\_MAT in beamformed transmission as follows:<P17879L50 in Draft 10.0 of TGmb>Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION\_MAT parameter of the TXVECTOR. Refer to 20.3.9 (HT preamble) for details<P1791L64 in Draft 10. of TGmb>Otherwise, a spatial mapping matrix associated with each OFDM subcarrier, as indicated by the EXPANSION\_MAT parameter of the TXVECTOR, is used to perform a linear transformation on the vector of complex numbers associated with each subcarrier in each OFDM symbol. This spatial mapping matrix maps the vector of complex numbers in each subcarrier into a vector of complex numbers in each subcarrier. The sequence of complex numbers associated with each transmit chain (where each of the complex numbers is taken from the same position in the vector of complex numbers across the subcarriers associated with an OFDM symbol) constitutes an OFDM symbol associated with the corresponding transmit chain. For details, see 20.3.11.11 (OFDM modulation). Spatial mapping matrices may include cyclic shifts, as described in 20.3.11.11.2 (Spatial mapping).In the current TGac Draft 1.2, EXPANSION\_MAT and EXPANSION\_MAT\_TYPE have no detailed set value for VHT transmission, which needs additional modification according to what the commenter points out. Because implementations are not restricted to the spatial mapping matrix examples listed in Section 20.3.11.11.2 (Spatial mapping) and MU packets, it is the MU-MIMO steering matrix which is implementation specific, I added some note in EXPANSION\_MAT parameter which means it is also possible not to restrict V matrix itself for spatial mapping.  **TGac editor: modify the D1.2 text from P144L38, as follows**EXPANSION\_MAT and EXPANSION\_MAT\_TYPE in the TXVECTOR needs to be modified accordingly.

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |  |  |  |
|  |  |
|  |  |  |  |  |
|  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| EXPANSION\_MAT\_TYPE | FORMAT is VHT | Set to COMPRESSED\_SV | Y | N |
| Otherwise | See corresponding entry in Table 20-1 |
| EXPANSION\_MAT | FORMAT is VHT (#145) | Contains a set of compressed beamforming feedback matrices asdefined in 22.3.11.2 (Beamforming Feedback Matrix V). The number of elements depends on the number of space-time streams and the number of users. Note that implementations are not restricted to the spatial mapping matrix examples listed in Section 20.3.11.11.2 (Spatial mapping). For MU packets, it is the MU-MIMO steering matrix which is implementation specific. (#145) | MU | N |
| Otherwise | See corresponding entry in Table 20-1 |
| CHAN\_MAT\_TYPE | FORMAT is VHT | Set to COMPRESSED\_SV | N | Y |
| Otherwise | See corresponding entry in Table 20-1 |
| CHAN\_MAT | FORMAT is VHT (#145) | Contains a set of compressed beamforming feedback matrices asdefined in 22.3.11.2 (Beamforming Feedback Matrix V) basedon the channel measured during the training symbols of thereceived NDP. (#145) | N | Y |
| Otherwise | See corresponding entry in Table 20-1 |

 |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2218 | 136.21 | 22.3.7 | Why average across tones? | Impose norm per tone | COUNTER. See doc. 11/1360r0. | PHY |
| <Discussion>This CID is similar to CID2456 which talks about the similar text in clause 22.3.10.11.1.Because not only is the method of averaging unclear, but it’s not even clear whether this is normative or informative, it seems appropriate to simply delete this passage, which means leave the detailed averaging method as implementers’ choice, in consistency to the resolution to CID2455 in 11/1365. **TGac editor: modify the D1.2 text from P176L12, as follows**For VHT modulated fields,  is a matrix with  rows and  columns. |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2402 | 136.27 | 22.3.7 | "X … output of any spatial processing" yet the same equation includes Q. I would exclude spatial processing from X  | As in comment | AGREE in PRINCIPLE. See doc. 11/1360r0. | PHY |
| <Discussion>What the commenter points out seems appropriate becase a spatal mapping matrix Q is also introduced in Equation (22-9). Note that matrix processing of  needs to be considered in the calculation of $X\_{k,u}^{(i\_{seg},m)}$ for VHT-LTF field.  for VHT-SIG-B field as well.  **TGac editor: modify the D1.2 text from P176L19, as follows**$X\_{k,u}^{(i\_{seg},m)}$ is the frequency-domain symbol $\_{}^{\_{}}$(#1169) in subcarrier *k* of user *u* for frequency segment  of space-time stream *m*. Some of the $X\_{k,u}^{(i\_{seg},m)}$ within  may have a value of zero. Examples of such cases include the DC tones, guard tones on each side of the transmit spectrum, as well as the unmodulated tones of L-STF and VHT-STF fields. Note that multiplication of matrix  and  are included in the calculation of $X\_{k,u}^{(i\_{seg},m)}$ for VHT-LTF and VHT-SIG-B fields, respectively. |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2426 | 151.20 | 22.3.8.2.6 | This ordering is as expected, os the example is spurious | Remove example | DISGREE. See doc. 11/1360r0. | PHY |
| <Discussion>There are several other texts in TGac D1.2 which also try to resolve any ambiguity in the bit ordering as follows:For L-SIG definition (clause 22.3.8.1.4, P179L62 of D1.2)“The LSB of the binary expression of the Length value shall be mapped to B5.”For VHT-SIG-A definition (clause 22.3.8.2.3, P184L61 of D1.2)“NOTE – Integer fields are represented in unsigned binary format with the least significant bit in the lowest numbered bit position.”For SERVICE field definition (clause 22.3.10.2, P199L8 of D1.2)“The CRC field is transmitted with c7 first. Hence, c7 is mapped to B8 of the SERVICE field, c6 is mapped to B9,…, and c0 is mapped to B15 of the SERVICE field.”For VHT Compressed Beamforming Report field (clause 8.4.1.47, P049L49 of D1.2)“If the size of the Compressed Beamforming Report field is not an integer multiple of 8 bits, up to 7 zeros are appended to the end of the field to make its size an integral multiple of 8 bits.”For contents of first 7 bits of scrambling sequence when CH\_BANDWIDTH\_IN\_NON\_HT is present (clause 18.3.5.5, P133L01 of D1.0)“CH\_BANDWIDTH\_IN\_NON\_HT is transmitted LSB first. For example, if CBW80 has a value of 2, which is ‘10’ in binary representation, then B5=0 and B6=1.”From several other texts as above, I’ve got to know that this is not the only text which enumerates an example in detail. In my opinion, it may not be a bad idea to prevent the bit ordering for VHT SIG-B field from any confusion and help this paragraph be understandable more clearly just by introducing this specific example. **TGac editor:** No change  |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2307 | 152.01 | 22.3.8.2.6  | The determination of zero length for an NDP packet seems to be possible only by detecting the fixed bit pattern placed in the length field of VHT-SIG-B. This is cumbersome and needs additional processing at the receiver. | Place all zeros in the length field of VHT-SIG-B or provide an NDP indication elsewhere in the preamble say in VHT-SIG-A. | DISGREE. See doc. 11/1360r0. | PHY |
| <Discussion>As already discussed in 11/1290r0 (VHT-SIG-B in NDPs), there is some critical disadvantage when we use the normal SU content of VHT-SIG-B for NDPs with dozens of bits for length field=0, which results in a very high value of PAPR (peak-to-average power ratio) of VHT-SIG-B with a length field of 0. For example, with a four times oversampled IFFT, PAPR value is 12.06 dB for 20MHz, 15.21 dB for 40MHz and 15.72 dB for 80MHz (almost 8 times the lowest one possible with the fixed bit pattern)So, it is desirable to select bit patterns as suggested in TGac D1.0 that have the lowest PAPR values, which can help limit the extra spectrum spillover from possible signal nonlinearity due to excessive PAPR of VHT-SIG-B.In addition, there is no additional burden or ambiguity to determine if a packet is a VHT NDP or not with these fixed bit patterns because a VHT NDP packet shall only be transmitted SIFS after an NDPA frame and a receiver can also check for L\_LENGTH==(3+*NVHT-LTF*+1)\*3-3 indicated in L-SIG field in VHT NDP.Note that as follows: “A VHT NDP frame shall only be transmitted SIFS after an NDPA frame.” (P112L11 of D1.2)“A beamformer shall not transmit a frame other than a VHT NDP SIFS after an NDPA frame.” (P112L19 of D1.2)A STA shall transmit a VHT NDP using the following TXVECTOR parameters: (clause 9.31.6 Transmission of a VHT NDP)* APEP\_LENGTH set to 0
* NUM\_USERS set to 1 (regarded as SU PPDU)
* and so on

**TGac editor:** No change.   |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2429 | 152.58 | 22.3.8.2.6 | "BCC encoded, interleaved, mapped, ..." 1) Need references for each of these steps. 2) need to add segment parsing/deparsing with references 3) Actually, interleaving is more complicated, because at this point each user's VHT-SIG-B is a 1 STS signal (a fact that should be explicitly mentioned) and potentially 40/80/160/80+80 wide, so its interleaving may look nothing like any other field in the PPDU. Thus proper description is required "same as 22.3.10.8 but with 1STS, and NCBPSS=x, NSS=1, NBPSCS=x, etc" | As in comment | COUNTER. See doc. 11/1360r0. | PHY |
| <Discussion>Regarding segment parsing/deparsing or stream parsing which the commenter points out, in my thinking it may be needless to apply to the VHT-SIG-B field because all the bits assigned to each segment or each stream (before multiplication by 1st column of P matrix) are only repeated over segments or streams. This is already described well from P192L53 of Draft 1.2. This is also depicted in Figure 22-4 (SU case) and Figure 22-5 (MU case), in which there is only one (common) stream processing per each user before multiplication by 1st column of P matrix and the bits for VHT-SIG-B field are just repeated over the bandwidth indicated by CH\_BANDWIDTH if its bandwidth is larger than 20MHz.In addition, BCC interleaving for the VHT-SIG-B field is not a different one from the text described in 22.3.10.8 (BCC interleaver). All the cases of 20, 40, 80, 80+80 and 160MHz are already defined in 22.3.10.8 (BCC interleaver). The only thing we need to mention here (while it is also one of examples defined in the same clause) is that the BCC interleaving for the VHT-SIG-B field assumes 1 space-time stream per each user, which means Nrot (frequency rotation) over spatial streams need not be applied to the 3rd stage of BCC interleaving (frequency rotation) for the VHT-SIG-B field. **TGac editor: modify the D1.2 text from P193L39, as follows**For each user *u*, the VHT-SIG-B field(#314) shall be BCC encoded at rate R = 1/2 as described in 18.3.5.6 (Convolutional encoder), interleaved with *Nss*=1 as described in 22.3.10.8 (BCC interleaver), mapped to a BPSK constellation as defined in 18.3.5.8 (Subcarrier modulation mapping), and have pilots inserted following the steps described in 22.3.10.10 (Pilot subcarriers). The VHT-SIG-B field(#314) constellation points are mapped to  space-time streams by the user-specific elements of the first column of the  matrix which is defined in clause 22.3.8.2.5 (VHT-LTF definition) |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2233 | 152.62 | 22.3.8.2.6 | Clarify "remaining transmission flow" | E.g. "The space-time streams are input into the CSD block and follow the same transmission flow as the Data Field from there on" | AGREE IN PRINCIPLE. See doc. 11/1360r0. | PHY |
| <Discussion>Also added the term “per each frequency segment” to match to another text recently inserted in clause 22.3.4.8 (Construction of VHT-SIG-B) as a resolution to CID2374 during D1.0 comments resolution* i) CSD: Apply CSD for each space-time stream and frequency segment as described in 22.3.8.1.1 (Cyclic shift definition)

 **TGac editor: modify the D1.2 text from P193L44, as follows**The space-time streams per each frequency segment are input into the CSD block which is defined in Table 22-9 (Cyclic shift values of VHT portion of packet) and follow the same transmission flow as the Data field from there on. |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2430 | 153.06 | 22.3.8.2.6 | wTSYM | wTVHTSIGB | AGREE IN PRINCIPLE. See doc. 11/1360r0. | PHY |
| <Discussion>What the commenter points out is correct. As we check for similar equations such as Eq. (22-16) for L-STF, Eq. (22-19) for L-LTF, Eq. (22-21) for L-SIG, Eq. (22-29) for VHT-STF and Eq. (22-38) for VHT-LTF, we can easily get to know that it is conventional to use the field-specific windowing function in the mathematical expression of the corresponding signal field during VHT preamble. There is only one exception for the VHT-SIG-A field, because *TVHT-SIG-A* is defined as 8us in Table 22-5 (Timing-related constants), which is not appropriate for symbol-by-symbol representation in Eq. (22-24) for VHT-SIG-A.Note that *wTSYM*(t) is mainly used for Data field.  **TGac editor: modify the D1.2 text from P193L53, as follows***wTSYM*(t) in the following equation needs to be changed into *wT VHT-SIG-B*(t) which is already defined in P175L41 of Draft 1.2. |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** | **Owing Ad-hoc** |
| 2431 | 153.48 | 22.3.8.2.6 | For (22-36)-(22-43), replace BW by 20/40/80/160 as appropriate. Also in (22-36), Dk(u) should have BW as a subscript. | As in comment | AGREE. See doc. 11/1360r0. | PHY |
| <Discussion>It seems reasonable to replace BW by 20/40/80/160 as appropriate by commenter’s suggestion because there are also other similar examples starting at P176L43 D1.2 (band rotation pattern) as follows:

|  |
| --- |
| The function  is used to represent a rotation of the tones. For a 20 MHz PPDU transmission,*

For a 40 MHz PPDU transmission(Ed),*

For an 80 MHz PPDU transmission(Ed),*

For a non-contiguous 80+80 MHz PPDU transmission(Ed), each 80 MHz frequency segment shall use the phase rotation for 80 MHz PPDU transmissions as defined in Equation (22-12).For a contiguous 160 MHz PPDU transmission(Ed),*

 |

In the above text, BW values are replaced by 20/40/80/160 as appropriate. In addition, there is also additional text we need to change accordingly staring at P214L07 (mathematical expression of OFDM transmission in VHT format) of D1.2. **TGac editor: modify the D1.2 text from P194L24 (clause 22.3.8.2.6 VHT-SIG-B definition), as follows**All the parameters ‘BW’ in Eq. (22-44) need to be changed into 20.All the parameters ‘BW’ in Eq. (22-45) need to be changed into 20.All the parameters ‘BW’ in Eq. (22-46) need to be changed into 40.All the parameters ‘BW’ in Eq. (22-47) need to be changed into 40.All the parameters ‘BW’ in Eq. (22-48) need to be changed into 80.All the parameters ‘BW’ in Eq. (22-49) need to be changed into 80.All the parameters ‘BW’ in Eq. (22-50) need to be changed into 160.All the parameters ‘BW’ in Eq. (22-51) need to be changed into 160.**TGac editor: modify the D1.2 text from P214L07 (clause 22.3.11.1 Transmission in VHT format), as follows**All the parameters ‘BW’ in Eq. (22-92) and its subsequent ‘where’ sentence need to be changed into 20.All the parameters ‘BW’ in Eq. (22-93) and its subsequent ‘where’ sentence need to be changed into 40.All the parameters ‘BW’ in Eq. (22-94) and its subsequent ‘where’ sentence need to be changed into 80.All the parameters ‘BW’ in Eq. (22-95) and its subsequent ‘where’ sentence need to be changed into 160. |