IEEE P802.11
Wireless LANs

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| D2.0 Sounding Comment Resolutions – Part 2 |
| Date: 2012-05-02 |
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Abstract

This document provides resolutions to the following comments:

MU comments: 4197, 5379, 5368, 5369, 4432, 4922, 4923, 4752, 4433, 4434, 5266, 4435, 4437, 5267, 4439, 4440, 4792, 5332, 5089, 4441, 5307

MAC comment: 4814

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| 4197 | 126.54 | 9.31.1 | Is this clear enough: "A STA shall not transmit a VHT NDP in a NDP sequence that contains an NDP announcement." given that VHT also has an NDPA? My suggestion is to change above to "A STA shall not transmit a VHT NDP in a HT NDP sequence that contains an HT NDP announcement." Change all other relevant occurences of NDP announcement in the spec to HT NDP announcement. | As in comment |  ReviseMake changes under heading CID 4197 in 11-12/0523r3These changes differentiate VHT NDP from HT NDP. |

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| 5379 | 126.54 | 9.31.1 | Does the "NDP announcement" refer only to HT NDP announcement, or does it also include VHT NDPA? | Change P126L54 to "A STA shall not transmit a VHT NDP in a HT NDP sequence that contains an HT NDP announcement." Change all other relevant occurences of NDP announcement in the spec to "HT NDP announcement". | ReviseRefer to CID 4197 resolution |

r3 change: remove option 1 and option 2, and use option 2 as resolution

**Proposed resolution:**

*In subclause 9.31.5 and 9.31.6, replace all “NDP” with “VHT NDP”*

Note that most places have been replaced based on CID4921 resolution, but the following places are missed (referring to P802.11ac\_D2.1 Redline):

P136 L36

P137 L25

P138 L14

P138 L31

P138 L42

P139 L60

*In subclause 9.31.1, 9.31.2, 9.31.3, and 9.31.4, replace all “NDP” with “HT NDP”, except for the places where NDP already has the “HT” or “VHT” prefix.*

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| 4432 | 129.16 | 9.31.5 | Really we have HT BFer/BFee and VHT BFer/BFee, so an overliberal use of an unadorned BFer/BFee leasd to some overly restrictive requirements. Define 6 terms for VHT BFer, VHT BFee, VHT SU-only BFer (yes, a hyphen helps a lot here!), VHT SU-only BFee, VHT MU BFer, VHT MU BFee based on 4 MIB variables. Then starting at P129L16 and for the rest of the section, use these terms - if you see BFer or BFee, replace as appropriate by these terms, so there is no HT/VHT confusion | As in comment |  ReviseMake changes under heading CID 4432 and CID 4922 in 11-12/0523r3. These changes differentiate VHT BFmer/NFmee from HT BFmer/BFmee. |
| 4922 | 129.25 | 9.31.5 | There really must be a qualifier here - the language sounds way too broad: A STA that does not have the value true for dot11VHTSUBeamformerActivated shall not act in the role of a beamformer. A STA that does not have the value true for dot11VHTSUBeamformeeActivated shall not act in the role of a beamformee. | Narrow the scope of these statements so that they do not block any beamforming from occurring. At a minimum, place a sentence at the beginning of the subclause that makes the scope clear - the words in the title of the subclause are not sufficient. |  ReviseMake changes under heading CID 4432 and CID 4922 in 11-12/0523r3. These changes add qualifier for BFmer and BFmee. |

r3 change:

1. remove option 1 and option 2, and use option 2 as the resolution
2. remove clause 20 from change list
3. some editorial changes

**Proposed resolution**

*Add following definitions in subclause 3.1*

**Multi-user (MU) beamformee:** A station (STA) that receives a physical layer convergence procedure (PLCP) protocol data unit (PPDU) that was transmitted using a multi-user beamforming steering matrix.

**Multi-user (MU) beamformer:** A station (STA) that transmits a physical layer convergence procedure (PLCP) protocol data unit (PPDU) using a multi-user beamforming steering matrix.

*Add following definitions in subclause 3.2*

**VHT beamformee:** A VHT STA that receives a VHT physical layer convergence procedure (PLCP) protocol data unit (PPDU) that was transmitted using a beamforming steering matrix.

**VHT beamformer:** A VHT STA that transmits a VHT physical layer convergence procedure (PLCP) protocol data unit (PPDU) using a beamforming steering matrix.

**VHT Multi-user (MU) beamformee:** A VHT STA that is a MU beamformee.

**VHT Multi-user (MU) beamformer:** A VHT STA that is a MU beamformer.

**VHT Single-user-only (SU-only) beamformee:** A VHT beamformee that is not a VHT MU beamformee

**VHT Single-user-only (SU-only) beamformer:** A VHT beamformer that is not a VHT MU beamformer

*In subclause 9.31.5 and 9.31.6,*

1. *replace all “SU only” to “SU-only”*
2. *replace all “xxx beamforme\*” to “VHT xxx beamforme\*” if xxx = “MU”, or “SU-only”; other wise, replace “xxx beamforme\*” to “xxx VHT beamforme\*” in subclause 9.31.5*

*Add following definitions in subclause 3.2*

**HT beamformee:** A HT STA that receives a HT physical layer convergence procedure (PLCP) protocol data unit (PPDU) that was transmitted using a beamforming steering matrix.

**HT beamformer:** A HT STA that transmits a HT physical layer convergence procedure (PLCP) protocol data unit (PPDU) using a beamforming steering matrix.

*Replace "beamformer" to "HT beamformer" and replace "beamformee" to "HT beamformee" in following subclauses:*

*8.4.1.27*

*8.4.1.28*

*8.4.1.29*

*8.4.2.58.6*

*9.27*

*9.28.2*

*9.29*

*9.30.2*

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| 4433 | 130.28 | 9.31.5 | This language is loose, since it doesn't address HT/VHT-variant. Split into two sentences: "only allowed to send VHT variant HT ctrl field if all support VHT variant"; "only allowed to send HT variant HT ctrl field if all support HT variant" | As in comment | ReviseMake changes under heading CID 4433 in 11-12/0523r3. These changes differentiate HT and VHT variants HTC control fields. |

**Proposed resolution:**

*Revise P136 L21 in P802.11ac\_D2.1 Redline as follows:*

A VHT NDP Announcement(#4921) frame with more than one STA Info field shall not carry an HT variant HT Control field, unless all the STAs listed in the AID field of the STA Info fields have set ~~+HTC-VHT Capable to 1 in~~

~~the VHT Capabilities Info field or set~~ +HTC-HT Support to 1 in the HT Extended Capabilities field.

A VHT NDP Announcement frame with more than one STA Info field shall not carry an VHT variant HT Control field, unless all the STAs listed in the AID field of the STA Info fields have set +HTC-VHT Capable to 1 in the VHT Capabilities Info field.

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| 4434 | 131.02 | 9.31.5 | "BFer's AID" is overly simplified if a destination is an AP, which does not have an AID; rather the AID field contains 0 | Fix. Also P131L14 |  ReviseMake changes under heading CID 4434 in 11-12/0523r3. These changes differentiate BFmee as an AP or non-AP STA. |

**Proposed resolution:**

*Revise P132 L44 and L56 in P802.11ac\_D2.1 Redline as follows:*

A non-AP beamformee that receives a VHT NDP Announcement(#4921) frame from a beamformer with which it is associated or (#4908)has an established DLS or TDLS session and that contains the beamformee's AID in the AID subfield of the first (or only) STA Info field and also receives a VHT NDP a SIFS after(#5423) the VHT NDP Announcement(#4921), shall transmit its VHT Compressed Beamforming frame a SIFS after the VHT NDP. A beamformee that is an AP, mesh STA, or STA that is a member of an IBSS, when receiving a VHT NDP Announcement frame with the RA matching its MAC address and the AID subfield of the only STA Info field set to 0, and also receiving a VHT NDP a SIFS after the VHT NDP Announcement, shall transmit its VHT Compressed Beamforming frame a SIFS after the VHT NDP. The TXVECTOR parameter CH\_BANDWIDTH of the VHT Compressed Beamforming frame shall be set to indicate a bandwidth not wider than that indicated in the RXVECTOR parameter CH\_BANDWIDTH of the received NDP frame. A STA shall ignore received VHT NDP Announcement(#4921), VHT NDP, and Beamforming Report Poll frames unless it has the value true for dot11VHTSUBeamformeeActivated.

A non-AP beamformee that receives a VHT NDP Announcement(#4921) from a beamformer with which it is associated or with which it has an established DLS or TDLS session and that contains the beamformee’s AID in the AID subfield of a STA Info field that is not the first STA Info field shall transmit its VHT Compressed Beamforming frame after receiving a Beamforming Report Poll with RA matching its MAC address and TA with the Individual/Group bit forced to 0 matching the MAC address of the beamformer …

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| 4435 | 131.28 | 9.31.5 | This note describes the existence of additional rules. My experience is that often such notes claiming the existence of additional rules are too optimistic - that often such additional rules do not exist. Ease my mind by adding reference to these rules | As in comment |  ReviseMake changes under heading CID 4435 in 11-12/0523r3. Remove note and make it a normal text. |

**Discussion**

The comment text is quoted below:

*NOTE—The RA field of the VHT Compressed Beamforming frame is set to the MAC address obtained from the TA field of the NDPA frame or the Beamforming Report Poll frame to which this VHT Compressed Beamforming frame is a response with the Individual/Group bit in the RA field set to 0.*

The related text in 9.7.6.6 Channel Width selection for control frames is quoted below:

*A VHT STA that transmits a control frame that is not an RTS frame in a non-HT duplicate format (channel*

*width 40 MHz or wider), addressed to a VHT STA and eliciting a control response frame or a VHT Compressed*

*Beamforming frame shall set the TA field to a signaling TA and shall set the TXVECTOR parameters*

*CH\_BANDWIDTH\_IN\_NON\_HT and CH\_BANDWIDTH to the same value. A VHT STA that transmits a*

*control frame that is not an RTS frame in a non-HT format (channel width 20 MHz), addressed to a VHT STA*

*and eliciting a control response frame or a VHT Compressed Beamforming frame may set the TA field to a*

*signaling TA, in which case it shall set the TXVECTOR parameters CH\_BANDWIDTH\_IN\_NON\_HT and*

*CH\_BANDWIDTH to the same value. Channel width selection rules for RTS frames are described in 9.3.2.5a*

*(VHT RTS procedure).*

*A VHT STA that sends a control frame that is not a CTS in response to a non-HT or non-HT duplicate format*

*frame with a signaling TA, shall set the channel width indicated by the TXVECTOR parameter*

*CH\_BANDWIDTH to the same value as the channel width indicated by the RXVECTOR parameter*

*CH\_BANDWIDTH\_IN\_NON\_HT for the frame eliciting the response. The Individual/Group field of the RA*

*field of a control frame that is sent in response to a control frame with a signaling TA shall be set to 0. For*

*the channel width selection rules for CTS sent in response to an RTS with the Individual/Group bit in the TA*

*field equal to 1 see 9.3.2.6 (CTS procedure).*

Subclause 9.7.6.6 descrbes the case that if a control frame is sent in response to a control initiating frame with signaling TA, the Individual.Group field of the RA shall be set to 0. However, it does not mention the case of the VHT Compressed Beamforming frame.

**Proposed resolution: remove note and make it a normal text as follows.**

*Revise P133 L44 and L7 in P802.11ac\_D2.1 Redline as follows:*

~~NOTE—~~The RA field of the VHT Compressed Beamforming frame ~~is~~ shall be set to the MAC address obtained from the TA field of the VHT NDP Announcement(#4921) frame or the Beamforming Report Poll frame to which this VHT Compressed Beamforming frame is a response with the Individual/Group bit in the RA field set to 0.

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| 4437 | 131.33 | 9.31.5 | This sentence as a hole: "don't include A+B if A or A+B make it too long." But, if the frame only includes A and A makes it too long, how do I remove B? Suggest two sentences, for the A case and the A+B case | As in comment |  ReviseMake changes under heading CID 4437 in 11-12/0523r3. Clarify the text by breaking it to two sentences |

**Proposed resolution:**

*Revise P133 L11 and L7 in P802.11ac\_D2.1 Redline as follows:*

A beamformee that transmits a VHT Compressed Beamforming frame shall not include the VHT Compressed Beamforming Report field and the MU Exclusive Beamforming Report field if

1. the transmission duration of the VHT Compressed Beamforming frame with the VHT Compressed Beamforming Report field would exceed the maximum PPDU duration; or
2. the transmission duration of the VHT Compressed Beamforming frame with both the VHT Compressed Beamforming Report field and the MU Exclusive Beamforming Report field would exceed the maximum PPDU duration.

~~the transmission duration of the VHT Compressed Beamforming frame with the VHT Compressed Beamforming Report field or both the VHT Compressed Beamforming Report field and the MU Exclusive Beamforming Report field would exceed the maximum PPDU duration.~~

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| 4439 | 131.54 | 9.31.5 | "currently supported receiving spatial streams" is imprecise | Refer to field(s) in frame(s) |  ReviseMake changes under heading CID 4439 in 11-12/0523r3. Clarify the “currently supported receiving special streams” |
| 4440 | 131.57 | 9.31.5 | NUM\_STS field in NDP | NUM\_STS parameter in the RXVECTOR of the corresponding VHT NDP |  AcceptChange as suggested |
| 5267 | 131.54 | 9.31.5 | "or the number of currently supported receiving spatial streams, whichever smaller"for this case there is already a rule for which Nc canot be greater than the suported spatial streams indicated by the STA, so above specification may not be necessary | clarify | ReviseMake changes under heading CID 4439 in 11-12/0523r3. There is no harm to clarify it again from BFmee side. |

**Proposed resolution:**

*Revise P133 L24 in P802.11ac\_D2.1 Redline as follows:*

A beamformee shall transmit(#4543) a VHT Compressed Beamforming frame with the VHT MIMO Control Feedback Type field set to the same value as the Feedback Type field in the corresponding STA Info field in the VHT NDP Announcement(#4921) frame. If the Feedback Type field indicates MU, the STA shall send a feedback with the Nc Index field value in the VHT MIMO Control field equal to the minimum of the following:

— the Nc Index field value in the corresponding STA Info field in the VHT NDP Announcement(#4921) frame, or

— the maximum number of supported spatial streams according to its Rx MCS Map in the VHT Supported MCS Set field, or

— the maximum number of supported spatial streams according to its Rx Nss subfield value in the VHT Operation Mode field of the most recently transmitted Operating Mode Notification frame.

~~or the number of currently supported receiving spatial streams, whichever smaller.~~ If the Feedback Type indicates SU, the Nc Index field value in the VHT MIMO Control field is determined by the beamformee. The Nr Index field in the VHT MIMO Control field shall be set to the same value as the NUM\_STS ~~field~~parameter in the RXVECTOR of the corresponding VHT NDP.

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| 4441 | 133.01 | 9.31.5 | To confirm, if the BFee is missing some requested segments, it never sends anything. | Make this explicit |  ReviseMake changes under heading CID 4441 in 11-12/0523r3. Clarify that the indicated segments may not exist.  |

r3 change: add “exist at the beamformee”

**Proposed resolution:**

*Revise P134 L36 in P802.11ac\_D2.1 Redline as follows:*

A beamformee that transmits a VHT Compressed Beamforming frame including the VHT Compressed Beamforming Report field in response to a Beamforming Report Poll frame shall either transmit(#4543) only the segments indicated in the Segment Retransmission Bitmap field in the Beamforming Report Poll frame (#5254), excluding the indicated segments that do not exist at the beamformee, or transmit(#4543) all the segments that exist at the beamformee disregarding the Segment Retransmission Bitmap field in the Beamforming Report Poll fame.

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| 4752 | 130.00 | 9.31.5 | These figures do not show repolling/retransmission | Add to figure, preferably, or state this omission in the text, at least | ReviseIt is not necessary to show all possible operations, esp. optional operations, in the Figure.It is useful though to indicate that Figure 9-41a and Figure 9-41b show examples of the sounding protocols.Make changes under heading CID 4752 in 11-12/0523r3.  |

**Proposed resolution:**

*Change the caption of Figure 9-41a to “***Example of ~~S~~sounding protocol with a single beamformee(#4921)***”*

*Also change the reference text of Figure 9-41a to* “An example of the~~The~~ VHT sounding protocol with a single beamformee is shown in Figure 9-41a.”

*Change the caption of Figure 9-41b to “***Example of ~~S~~sounding protocol with more than one beamformee(#4921)***”*

*Also change the reference text of Figure 9-41b to* “An example of the~~The~~ VHT sounding protocol with more than one beamformee is shown in Figure 9-41b.”

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| 4792 | 132.08 | 9.31.5 | The Sounding Sequence field has 8 bits and hence won't fit in the Sounding Sequence Number subfield | Change "set to the same value as the Sounding Sequence field" to "set to the same value as the Sequence Number subfield in the Sounding Sequence field" |  AcceptChange as suggested |

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| 4814 | 90.00 | 9.2.4.2 | Are NDPA/BRPs subject to admission control? | Change "using any AC" to "using any access category, without being restricted by admission control procedures" | AcceptChange as suggested  |

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| 4923 | 129.32 | 9.31.5 | Wording tense could be better. | Change "A beamformer shall initiate a sounding feedback sequence by sending an NDPA frame followed by a VHT NDP frame after a SIFS." to "A beamformer that initiates a sounding feedback sequence shall begin the sequence by sending an NDPA frame and then, after a SIFS interval, send a VHT NDP." | AcceptChange as suggested*Note to editor: change all “NDP frame” to “NDP”* |

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| 5089 | 132.42 | 9.31.5 | Clarify segmentation requirements for VHT compressed beamforming | Replace last sentence of this paragraph with "All MDPUs containing the segments shall be sent in a single A-MPDU" | Reject The original text “All segments shall be sent in a single A-MPDU” does not cause any ambigurity. |

SP1: We believe the original text “All segments shall be sent in a single A-MPDU” does not cause any ambugurity.

18 Yes, 4 No

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| 5266 | 131.15 | 9.31.5 | shall transmit its VHT Compressed Beamforming frame after receivinga Beamforming Report Poll with RA matching its MAC address and TA with the Individual/Group bitforced to 0 matching the MAC address of the beamformer."after receivinga Beamforming Report " is not well defined | indicate that response comes SIFS after the BR Poll |  Revise Change “shall transmit its VHT Compressed Beamforming frame after receivinga Beamforming Report Poll” to “shall transmit its VHT Compressed Beamforming frame a SIFS after receivinga Beamforming Report Poll” |

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| 5307 | 126.00 | 9.31 | NDP sounding in 11ac allows AP to obtain channel information and SNR from STAs via feedback. The channel information and SNR are used for pre-coding and link adaptation in Downlink MU-MIMO transmission. However, such channel information and SNR do not include inter-STA interference during the pre-coded downlink MU-MIMO transmission because sounding NDP is not MIMO pre-coded. Channel estimation errors, channel aging and channel variations can introduce inter-STA interference. Dealing inter-STA interference should not be put on STAs only. AP should have capability to alleviate performance degradation caused by inter-STA interference too. Inter-STA interference can cause performance degradation and even frequent channel re-sounding. Re-sounding overhead is significant because of channel feedback. | Will bring a proposal to resolve this issue. |  Withdraw |

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| 5332 | 132.42 | 9.31.5 | "All segments shall be sent in a single A-MPDU".The time duration of A-MPDU with channel information segments may be longer than 1 ms, that is, even for a smart BFmer it is also possible that the BF report exceeds the TXOP limit. | Find a good way to avoid this problem. | RejectRefer to P112 L21 in D2.0 for the specific case of allowing compressed beamforming report to exceed the TXOP limitThe reason for this is that the beamformee is unaware of the remaining TXOP time and cannot honor the TXOP limit, and the Beamformer is unware of the duration of the compressed beamforming report. |

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| 5368 | 128.61 | 9.31.5 | Add MIB variable for dot11VHTSUBeamformerActivated to Annex C. | As per comment. |  ReviseReplace all “dot11VHTSUBeamformerActivated” to “dot11VHTSUBeamformerOptionImplemented”and replace all“dot11VHTSUBeamformeeActivated” to “dot11VHTSUBeamformeeOptionImplemented” |
| 5369 | 129.01 | 9.31.5 | Add MIB variable for dot11VHTMUBeamformerActivated to Annex C. | As per comment. |  ReviseReplace all “dot11VHTMUBeamformerActivated” to “dot11VHTMUBeamformerOptionImplemented”and replace all“dot11VHTMUBeamformeeActivated” to “dot11VHTMUBeamformeeOptionImplemented” |

**Discussion**

“dot11VHT\*UBeamforme\*Activated” is not a good term to be used here.

Instead, the following MIB terms should be used:

dot11VHTSUBeamformeeOptionImplemented,

dot11VHTSUBeamformerOptionImplemented,

dot11VHTMUBeamformeeOptionImplemented,

dot11VHTMUBeamformerOptionImplemented.

Note that the above MIBs are already defined in D2.1.