**IEEE P802.11
Wireless LANs**

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| **802.11****Draft P802.11ax\_D0.1 Comment Resolution** |
| **Date:** 2016-04-25 |
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This document contains proposed resolutions to comments:

861, 1073, 16, 1398, 1212, 1211, 1176, 964, 823, 798, 797, 781, 733, 1400, 1072

203, 735

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| 861 | 42.42 | 10.3.2.11.3 | For HE DL MU PPDU, STAs response UL MU acknowledgement based on received information in (1) Trigger MPDU or (2) UL MU Response field in MAC header.For the case (1), Trigger MPDU is aggregated with Data MPDUs in A-MPDU modulated with high MCS. Therefore, Trigger MPDU is not robustly decoded at receiving STAs. If the Trigger MPDU is corrupted, any correctly received Data MPDUs cannot be acknowledged imposing single point of failure. Therefore, AP should send a BAR when there is no immediate response after sending an MPDU with Ack Policy '01' in DL MU PPDU. | Add the following text in line 42:"If there is no UL MU response from a STA solicited by a Trigger frame, AP should send (MU-)BAR to the STA to solicit immediate acknowledgement of the previous DL MU Data." |

**Discussion:** The comment is about defining transmit side behaviour in the event that the AP does not receive the response from the STA. The AP can choose to send BAR, MU-BAR or continue Data MPDU transmission which can solicit BA again in the current spec. It is not necessary to define the behaviour for this BA session specifically under MU operation.

**Proposed Resolution:** Reject.

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| 1073 | 43.04 | 10.3.2.11.3 | The current spec text only specifies MU-BAR usage for GCR-BA. But, MU acknowledgement may be triggered by MU-BAR as well as the immediate MU acknowledgement in response to HE MU PPDU. | Add the text "An AP may send an MU-BAR variant Trigger frame to request more than one HE STA to send the BlockAck frame, the Ack frame, or the Multi-STA BlockAck frame when it did not receive the immediate acknowledgement in response to (A-)MPDU with Ack Policy 01 carried in the HE MU PPDU or it sent (A-)MPDU with Ack Policy 11 carried in the HE MU PPDU" |

**Proposed Resolution:** Agree. Add the following text at the end of this section.

 “An AP may use MU-BAR variant Trigger frame to solicit the acknowledgment frames from multiple HE STAs, to whom the AP sends the QoS Data frame(s) with Ack Policy equal to Block Ack or from whom the AP does not receive the immediate acknowledgement frames after sending QoS Data frame(s) in a HE MU PPDU with Ack Policy equal to MU Ack.”

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| 16 | 42.37 | 10.3.2.11.3 | "A non-AP STA that is the recipient, within a HE MU PPDU, of an MPDU that solicits an immediate response with Ack Policy '01' in QoS Control field, shall send the immediate response according to the scheduling information defined by the UL trigger information that is carried either in the Trigger frame(s) or in MAC header. If no valid Trigger frame(s) or MAC header containing UL trigger information is received, then the STA shall not respond." | "A non-AP STA that is the recipient, within a HE MU PPDU, of an MPDU that solicits an UL MU immediate response with Ack Policy '01' in QoS Control field, shall send the immediate response according to the scheduling information defined by the UL trigger information that is carried either in the Trigger frame or in MAC header received in the HE MU PPDU. If no valid Trigger frame(s) or MAC header containing UL trigger information is received, then the STA shall not respond." |

**Discussion:** The commenter proposed to change “Trigger frame(s)” to “Trigger frame”, which puts unnecessary restriction on AP’s behaviour. There are a few motivations for AP to send multiple trigger frames in one aggregate, for example, use trigger frame in place of possible padding or send multiple trigger frames to enhance the robustness. However, the trigger frames in the AMPDU shall have the same content.

**Proposed Resolution:** Reject.

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| 1398 | 42.08 | 10.3.2.11.2 | "The acknowledgment procedure performed by a STA that receives MPDUs that were transmitted within a VHT MU PPDU or an HE MU PPDU is the same as the acknowledgment procedure for MPDUs that were not transmitted within a VHT MU PPDU or an HE MU PPDU.NOTE---All MPDUs transmitted within a VHT MU PPDU or an HE MU PPDU are contained within A-MPDUs, and the rules specified in 9.7.3 (A-MPDU contents) prevent an immediate response to more than one of the A-MPDUs." adds nothing of value | Delete the cited text. |

**Discussion:** The text is already there for VHT MU PPDU. Here the purpose is only to extend the context to include HE MU PPDU.

**Proposed Resolution:** Reject.

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| 1212 | 43.06 | 10.3.2.11.4 | Compared with HE/VHT PPDU of M-BA, OFDMA M-BA has longer HE SIG B. So OFDMA M-BA should be optional. | As in comment. |

**Discussion:** Agree. Besides the reason that the commenter suggested, OFDMA M-BA design is an optional feature. Meanwhile, in the BA design, it should also be optional to use ACK to indicate all the MPDUs in an AMPDU is received correctly.

**Proposed Resolution:** already fixed in D0.5.

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| 1211 | 43.06 | 10.3.2.11.4 | HE MU needs BA Req for muitlple TID. Change the subclause accordingly | As in comment. |

**Discussion:** HE STA can use existing Multi-TID BAR for the multiple TID AMPDU.

**Proposed Resolution:** Add the following at the end of this section: “An STA may use BlockAckReq frame to solicit the acknowledgment frame(s), to whom the STA sent the QoS Data frame(s) with Ack Policy subfield equal to BlockAck or from whom the STA did not receive the immediate acknowledgement frames after sending QoS Data frame(s) in a HE triggered-based PPDU with Ack Policy subfield equal to Normal Ack or Impilcit BAR.”

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| 1176 | 42.48 | 10.3.2.11.3 | In Figure 10-ax4, there is "unicast trigger". Such a description is missing in the subclause 10.3.2.11.3. | Define unicast trigger in subclause 10.3.2.11.3. |

**Discussion:** Yes, there is no precedent usage of such term “unicast trigger”. Propose to use “an individually addressed Trigger frame” to replace “unicast trigger”.

**Proposed Resolution:** already fixed in D0.5.

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| 964 | 42.00 | 10.3.2.11.3 | The figure 10-ax4, "Backoff or PIFS " is confusing. Does "Backoff or PIFS " mean that an AP uses bacoff or PIFS to contend the primary channel or an AP uses backoff to contend the primary channel and PIFS to determine the status of the sencondary channels? | Please clarify it. |

**Discussion:** There are multiple cases that a PIFS could be used. Please refer to 10.3.2.3.4 and also TWT operation. However, the TXOP is not accurately drew in the figure.

**Proposed Resolution:** Remove “PIFS” in all the figures (10.ax4-10.ax8) to eliminate confusion.

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| 823 | 43.01 | 10.3.2.11.3 | If spec does not allow UL MU MIMO Block ACK and Ack policy, STAs with UL MU MIMO capability and without UL MU OFDMA capablity cannot be the target of Ack Policy '01' in QoS Control field in MPDUs. | Change the followingAn AP shall not set Ack Policy to "01" in QoS Control field in MPDUs of HE MU PPDU if (both) UL MU OFDMA Capable subfield (and UL MU MIMO Capable subfield) of the HE Capabilities element of the receiver of the MPDUs are set to 0.orSpecify MU MIMO Ack procedure |

**Discussion:** In general, agree with the commenter’s intention to differentiate UL MUMIMO and UL MU OFDMA capability. To remove confusion, the paragraph is to be deleted. Also see CID 2607

**Proposed Resolution:** Already fixed in D0.5

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| 798 | 44.46 | 10.3.2.11.4 | in Figure 10-ax5, TXOP starts from the middle of the Backoff or PIFS. On the other hand, all TXOP start from the beginning of the Trigger frame transmission as shown in Figure 10-ax6~ax8. Does the example shown in Figure 10-ax5 mean special case which the TXOP starts from the middle of backoff or PIFS | Make the figures consistent or describe the difference in Figure 10-ax5 |

**Discussion:** Agree.

Proposed changes: already fixed in D0.5.

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| 797 | 43.8 | 10.3.2.11.4 | For more clarification, add the details of an immediate acknowledgement as follows:an immediate acknowledgement (i.e., when the ACK Policy of the eliciting QoS data frame is set to 00(Normal ACK or Implicit BAR)) | Change the related text as follows:When receiving multiple frames from more than one STA that are part of an UL MU transmission (Clause 9.42.2) and that require an immediate acknowledgement(i.e., when the ACK Policy of the eliciting QoS data frame is set to 00(Normal ACK or Implicit BAR)) |

**Discussion:** Agree.

**Proposed changes:** Changes are in red for this paragraph as follows:

“When receiving multiple frames from more than one STA that are part of an UL MU transmission (Clause 9.42.2) and that require an immediate acknowledgement (i.e., the ACK Policy subfield of the eliciting QoS Data frame is equal to Normal Ack or Implicit BAR), an AP may send multiple BlockAck frames (or ACK frames) in an OFDMA HE MU PPDU or a Multi-STA BlockAck (M-BA) frame. Additional conditions to transmit multiple BlockAck frames (or ACK frames) in an OFDMA HE MU PPDU or Multi-STA BlockAck are TBD. After a successful reception of an UL frame requiring acknowledgment, transmission of the DL acknowledgement shall commence after a SIFS, without regard to the busy/idle state of the medium.”

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| 781 | 44.50 | 10.3.2.11.4 | The texts related to the Ack Policy of UL MU OoS data frame was included in SFD at the last March meeting. The related texts for the Ack Policy needs to be included in 11ax Draft also. | Add the text for the Ack Policy of UL MU QoS data at the end of subclause 10.3.2.11.4 as follows:"A non-AP STA shall set the Ack Policy of the QoS data frame(s) sent in an HE trigger-based PPDU to 00 (Normal Ack or Implicit BAR) when the QoS data frame requires to be acknowledged (i.e., the Ack Policy cannot be set to 11 (Block Ack))." |

**Discussion:** Agree.

**Proposed changes:** Add the text for the Ack Policy of UL MU QoS data at the end of subclause 10.3.2.11.4 as follows:

“The ACK Policy of the QoS data frame sent in an HE trigger-based PPDU shall not be set to Block Ack.”

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| 733 | 44.23 | 10.3.2.11.4 | The figure 10-ax8 seems to describe better the use of non-HT duplicate PPDU than figure 10-ax7. Clearly 10-ax8 has non HT duplicate BAs. | Delete figure 10-ax7 and use 10-ax8 to describe the operation of non-HT duplicate BA use. Drax a new figure to 10-ax8 to better show the operation more clearly. |

**Discussion:**10-ax7 and 10-ax8 are different as indicated in the titles of the figures.

**Proposed changes:** Reject.

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| 1400 | 42.24 | 10.3.2.11.2 | "Recovery within the TXOP that contains a VHT MU PPDU or an HE MU PPDU can be performed according to the rules of 10.22.2.7 (Multiple frame transmission in an EDCA TXOP). BlockAckRequest frames related to A-MPDUs within a VHT MU PPDU or an HE MU PPDU can be transmitted in a TXOP separate from the one that contained the VHT MU PPDU or the HE MU PPDU.NOTE∩Ç¡A BlockAck frame or an Ack frame is sent in immediate response to the BlockAckReq frame for HT-immediate or HT-delayed Block Ack, respectively. An Ack frame might be sent in immediate response to a VHT single MPDU in the VHT MU PPDU or the HE MU PPDU." either duplicates existing text or is a new requirement on VHT STAs | Delete the cited text. |

**Discussion:** The text is an extension of current text from VHT to HE.

**Proposed changes:** Reject.

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| 1072 | 42.41 | 10.3.2.11.3 | HE variant HT Control field with Control ID 0 (UL MU response scheduling) contains the trigger information for the immediate response of (A-)MPDU in the HE MU PPDU. | Replace "MAC header" with "the HE variant HT Control field with Control ID 0 (i.e. UL MU response scheduling)" |

**Discussion:** Agree, but a slight editorial change on the commenter’s suggestion.

**Proposed changes:** Replace "MAC header containing UL trigger information" with "UL MU Response Scheduling A-Control field".

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| 203 | 63.24 | 10.7.6.5.2 | MCS selection rules for sending M-BA by a STA is not defined | As in comment. |

**Discussion:** The rate selection rules for BlockAck frame (either in SU or in MU) should apply to the M-BA sent by a non-AP STA. However, the rate selection rules are missing for HE-MCS for all cases in Section 10.7.6.4 and 10.7.6.5.

**Proposed changes:** Reject.

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| 735 | 45.12 | 10.7.6.5.2 | The paragraph starting "If a Multi-STA..." is hard to understand and seems to contradict the sentence in lines 23 and 24. The first sentence says that the STAmay ignore the <HE-MCS, NSS> tuple and the next sentence says that it shall transmit according to these parameters. | Please clarify the text and possible delete the lines 10 - 13. |

**Discussion:** Line 11-13 is about AP does NOT need to abide by the rate selection rules in SU transmission, in which the STA’s rate is used to select rate/MCS of the AP’s response. Line 15-16 and so on explicit says that the rule AP shall adopt.

**Proposed changes:** Revised the paragraph as the following:

The rate, HT-MCS, <VHT-MCS, NSS> tuple or <HE-MCS, NSS> tuple selected by an HE AP for a BlockAck frame or Ack frame that is an immediate response to frames received in an HE trigger-based PPDU shall be selected from those supported by the STA addressed in the frame.

* MU acknowledgement procedure

Insert a new subclause heading before the first paragraph as follows:

* Acknowledgement procedure for DL MU PPDU in SU format

Change the subclause as follows:

The acknowledgment procedure performed by a STA that receives MPDUs that were transmitted within a VHT MU PPDU or an HE MU PPDU for DL transmission(#129)(#406) is the same as the acknowledgment procedure for MPDUs that were not transmitted within a VHT MU PPDU or an HE MU PPDU for DL transmission(#129)(#406).

NOTEAll MPDUs transmitted within a VHT MU PPDU or an HE MU PPDU for DL transmission(#129)(#406) are contained within A-MPDUs, and the rules specified in 9.7.3 (A-MPDU contents) prevent an immediate response carried in SU format to more than one of the A-MPDUs.

Responses to A-MPDUs within a VHT MU PPDU or an HE MU PPDU for DL transmission(#129)(#406) that are not immediate responses to the VHT MU PPDU or the HE MU PPDU for DL transmission(#129)(#406) are transmitted in response to explicit BlockAckReq frames by the AP. Examples of VHT MU PPDU frame exchange sequences are shown in Figure 10-11 (An example of a TXOP containing a VHT MU PPDU transmission with an immediate acknowledgment to the VHT MU PPDU) and Figure 10-12 (An example of a TXOP containing a VHT MU PPDU transmission with no immediate acknowledgment to the VHT MU PPDU).

Recovery within the TXOP that contains a VHT MU PPDU or an HE MU PPDUfor DL transmission(#129)(#406) can be performed according to the rules of 10.22.2.7 (Multiple frame transmission in an EDCA TXOP). BlockAckRequest frames related to A-MPDUs within a VHT MU PPDU or an HE MU PPDU for DL transmission(#129)(#406) can be transmitted in a TXOP separate from the one that contained the VHT MU PPDU or the HE MU PPDU for DL transmission(#129)(#406).

NOTE 1—A BlockAck frame or an Ack frame is sent in immediate response to the BlockAckReq frame for HT-immediate or HT-delayed Block Ack, respectively. An Ack frame might be sent in immediate response carried in SU format(#405) to a Single MPDU(11ah) in the VHT MU PPDU or the HE MU PPDU for DL transmission(#129)(#406). A Multi-STA Block Ack frame is sent in immediate response to the BlockAckReq frame with multi-TID BAR variant or MU-BAR frame with multi-TID BAR variant(#131).

NOTE 2—A BlockAckRequest frame would typically not be sent to a STA in the case where the A-MPDU to the STA contained no MPDUs requiring acknowledgment. It could be sent if MPDUs in a previous A-MPDU remain unacknowledged.

Insert a new subclauses 10.3.2.11.2 and 10.3.2.11.3 as follows:

* Acknowledgement procedure for DL(#1410) MU PPDU in MU format

A non-AP STA that is the recipient, within an(#2829) HE MU PPDU, of a QoS Data frame or QoS Null frame(#2606) that solicits an immediate response with Ack Policy equal to MU Ack in QoS Control field, or of an MMPDU that solicits an immediate response(#130), shall send the immediate response according to the scheduling information defined by the UL trigger information that is carried either in the Trigger frame(s) or in ~~the(#1402) MAC header~~ UL MU Response Scheduling A-Control field. If no valid Trigger frame(s) (see 9.3.1.23 (Trigger frame format))(#130)(#407) or ~~MAC header header~~ UL MU Response Scheduling A-Control field (see 9.2.4.6.4.2 (UL MU response scheduling))(#130)(#407) containing UL trigger information is received, then the STA shall not respond. An example of UL OFDMA acknowledgement to an HE MU PPDU is shown in Figure 10-12a (An example of an HE MU PPDU transmission with an immediate UL OFDMA acknowledgement(#1730)).

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| * An example of an HE MU PPDU transmission with an immediate UL OFDMA acknowledgement(#1730)
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(#2607)

* Acknowledgement(#1410) procedure for an UL MU transmission

When receiving frames(#409) from more than one STA that are part of an UL MU transmission (see(#1406) 9.42.2) and that require an immediate acknowledgement (i.e., the ACK Policy subfield of the eliciting QoS Data frame is equal to Normal Ack or Implicit BAR), an AP may send either multiple BlockAck frames (or Ack(#1408) frames) in an HE MU PPDU, or a Multi-STA BlockAck frame(#1407)(#1424) (see 25.4 (Block acknowledgement)). Multi-STA BlockAck frame transmissions are allowed in a non-HT Duplicate PPDU, HT PPDU, VHT PPDU, HE SU PPDU, HE extended range SU PPDU and OFDMA HE MU PPDU.(#1427) After a successful reception of an UL frame requiring acknowledgment, transmission of the DL acknowledgement shall commence after a SIFS, without regard to the busy/idle state of the medium.(#2608) The ACK Policy of the QoS data frame sent in an HE trigger-based PPDU shall not be set to Block Ack. Specifically, when an AP transmits an immediate acknowledgement in HE MU PPDU in response to (A-)MPDU sent in HE trigger-based PPDU, the AP should send it within the 20 MHz channel(s) where the pre-HE modulated fields of the HE trigger-based PPDU sent by the STA are located. The immediate acknowledgement is either a BlockAck frame, Ack frame or Multi-STA Block Ack frame.(MU Motion #58).

An example of a DL OFDMA BA is(#410) shown in Figure 10-12b (An example of an UL MU transmission with an immediate DL MU transmission containing individually addressed(#1512) BlockAck frames acknowledging the frames received from the respective STAs(#1732)).

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| * An example of an UL MU transmission with an immediate DL MU transmission containing individually addressed(#1512) BlockAck frames acknowledging the frames received from the respective STAs(#1732)
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(#1427)

Remove PIFS in the figure.

An example of a Multi-STA BlockAck frame acknowledgement in a non-HT, HT, VHT or HE SU PPDU is given in Figure 10-12c (An example of UL MU transmissions with an immediate Multi-STA BlockAck frame(#1407) acknowledging the MPDUs(#1732)).

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| * An example of UL MU transmissions with an immediate Multi-STA BlockAck frame(#1407) acknowledging the MPDUs(#1732)
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(#1427)

Remove PIFS in the figure.

An example of a Multi-STA BlockAck frame acknowledgement in a non-HT Duplicate PPDU is given in Figure 10-12d (An example of UL MU transmissions with an immediate DL non-HT duplicate PPDU containing the Multi-STA BlockAck frame(#1732)).

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| * An example of UL MU transmissions with an immediate DL non-HT duplicate PPDU containing the Multi-STA BlockAck frame(#1732)
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(#1427)

Remove PIFS in the figure.

An example of a Multi-STA BlockAck frame acknowledgement in an OFDMA HE MU PPDU is given in Figure 10-12e (An example of UL MU transmissions with an immediate OFDMA HE MU PPDU containing Multi-STA BlockAck frames(#1732)).

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| * An example of UL MU transmissions with an immediate OFDMA HE MU PPDU containing Multi-STA BlockAck frames(#1732)
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(#1427)

Remove PIFS in the figure.

An AP may use MU-BAR variant Trigger frame to solicit the acknowledgment frames from multiple HE STAs, to whom the AP sends the QoS Data frame(s) with Ack Policy equal to Block Ack or from whom the AP does not receive the immediate acknowledgement frames after sending QoS Data frame(s) in a HE MU PPDU with Ack Policy equal to MU Ack.

An STA may use BlockAckReq frame to solicit the acknowledgment frame(s), to whom the STA sent the QoS Data frame(s) with Ack Policy subfield equal to BlockAck or from whom the STA did not receive the immediate acknowledgement frames after sending QoS Data frame(s) in a HE triggered-based PPDU with Ack Policy subfield equal to Normal Ack or Impilcit BAR.

* Multirate support
* Rate selection for Control frames
* Rate selection for control response frames
* Selection of a rate or MCS

Insert the following at the end of the subclause:

~~(#863)If a Multi-STA BlockAck frame or DL OFDMA acknowledgement frame is sent as an immediate response to an HE trigger-based PPDU(#1767), the AP may ignore the <HE-MCS, NSS> tuples that are used for MPDUs in HE trigger-based PPDU(#1767) from non-AP STAs that elicits the DL acknowledgement.~~

The rate, HT-MCS, <VHT-MCS, NSS> tuple or <HE-MCS, NSS> tuple selected by an HE AP for a BlockAck frame or Ack frame that is an immediate response to frames received in an HE trigger-based PPDU shall be selected from those supported by the STA addressed in the frame.

An AP that transmits a Multi-STA BlockAck frame in a non-HT PPDU, HT PPDU, VHT PPDU or HE PPDU shall use a rate, HT-MCS, <VHT-MCS, NSS> tuple or <HE-MCS, NSS> tuple, respectively, that is supported by all the recipients(#623).