### IEEE P802.11Wireless LANs

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| 11ax D1.0 MAC Comment Resolution for 27.13 and 9.4.2.218.2 |
| Date: 2017-09-05 |
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Abstract

This submission proposes resolutions for comments of TGax Draft 1.0 with the following CIDs:

**4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145 (27.13)**

**4598, 6090, 7366, 7882, 10074 (9.4.2.218.2)**

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Add discussion and editorial change
* Rev 2: Statement change of how a STA can send unsolicited MFB to abother STA. Add statement the RUand BW of solicited MFB is based on the MRQ.
* Rev 3: Add reception capability descrption to the HE Link Adaptation Support Encoding in table of Subfields of the HE MAC Capabilities Information field. Add description that for solicited MFB, the PPDU carries the MRQ shall include the RU it requests for MFB.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax D1.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D1.0 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

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| **CID** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 4598 | Albert Petrick | 78.27 | 9.4.2.218.2 | Add clarity and call out bit position in Table 9-262z for subfield "HE Link Adaptation" corresponding to those bit positions in Figure 9-589ck. | Add bits "B15-B16:" in Definition column before the word "Indicates" | Rejected.See “Edit Notes” of CID 3274: EDITOR: 2017-02-06 22:17:22Z - Adding bit numbering to the table is a bad idea since this duplicates information already in the figure and increases the risk of errors. Bit numbering, if needed at all, should be for the field itself. |
| 7366 | Kwok Shum Au | 78.27 | 9.4.2.218.2 | The name of the subfield is "HE Link Adaptation" rather than "HE Link Adaptation Capable", according to Figure 9-589ck. | Replace "HE Link Adaptation Capable" with "HE Link Adaptation". | Rejected.In resolved CID 7879, EDITOR has updated both the name to “HE Link Adaptation Supported” in Table 9-262z and Figure 9-5989ck |
| 6090 | Jian Yu | 78.27 | 9.4.2.218.2 | HE Link Adaptation detail is missing, the capable bits come out of nowhere | Add the detail of HE lnk adaptation and modify the capable field according to the detail | Revised.Details of HE link adaptation are provided in 11-17/1377r3TGax editor makes changes as specified in 11-17/1377r3 |
| 7882 | Mark RISON | 78.31 | 9.4.2.218.2 | Solicited HE MFB/MRQ is not described | Delete "Set to 3 (Both) if the STA can provide HE MFB in response to HE MRQ and if the STA provides unsolicited HE MFB." | Rejected.Details of HE link adaptation are provided in 11-17/1377r3. Solicited MFB and MRQ are defined. |
| 10074 | yujin noh | 78.27 | 9.4.2.218.2 | There is no agreed HE link adaptation operation such that it's not clear whether to have unsolicited HE MFB. Depending on the decision, its decription needs to be modified. | As in the comment. | Revised.Details of HE link adaptation are provided in 11-17/1377r3.Unsolicited HE MFB is defined.TGax editor makes changes as specified in 11-17/1377r3. |
| 4786 | Alfred Asterjadhi | 198.61 | 27.13 | This subclause seeems incomplete. Please complete it in terms of expected norm behavior at RX, at TX, etc. | As in comment | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes as specified in 11-17/1377r3. |
| 5916 | James Yee | 199.01 | 27.3 | The text refers to "The HE-MCS subfield of the MFB subfield of HE link adaptation field" but there is no MFB subfield defined in the HE Link Adaptation field. The overall description of the HE Link Adaptation procedure is unclear. | Please clarify. | Revised.Details of HE link adaptation are provided in 11-17/1377r3.Unsolicited and solicited MFBs are defined.TGax editor makes changes as specified in 11-17/1377r3. |
| 6032 | Jarkko Kneckt | 199.01 | 27.13 | The use of HE-MCS subfield in link adaptation is very loosely defined. It is not clear how the AP and the STA use the link adaptation information. | Please provide some more details how the link adaptation is used by the non-AP STA and the AP. Please describe how to recommended MFB should be used by the transmitter and the receiver. Especially it is interesting to know how non-AP STA can use link adaptation for Triggered transmissions. | Revised.Details of HE link adaptation are provided in 11-17/1377r3.Details of how to use HE-MCS are defined.TGax editor makes changes as specified in 11-17/1377r3. |
| 6107 | Jian Yu | 198.61 | 27.13 | Link adaptation using the HE variant HT Control field part lacks details | Add the details | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes as specified in 11-17/1377r3. |
| 7891 | Mark RISON | 198.60 | 27.13 | This just has a statement on how to set the HE MCS subfield. Everything else is missing (setting of caps for solicited, unsolicited, expected behaviour at TX and at RX, etc.) | Add all the missing LA/MFB detail | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes as as specified in 11-17/1377r3. |
| 8529 | Robert Stacey | 199.01 | 27.13 | It is not clear what the receiving side (AP/STA) is expected to do with the HE-MCS / NSS values in this A-control | Need a description for receiver sode behavior in response to this A-control field (similarly to section 27.8, which details what is expected from the receiving side to do with the OMI A-control field values) | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes sas specified in 11-17/1377r3. |
| 9738 | Yongho Seok | 199.03 | 27.13 | "The transmission properties, RU\_ALLOCATION, DCM, NUM\_STS, FEC\_CODING, BEAMFORMED, BEAM\_CHANGE, and STBC, are determined by the RXVECTOR of the PPDU used toestimate recommended MFB."Is the recommended MFB for a solicited link adaptation? Or, is it for an unsolicited link adaptation?Please clarify it. | As per comment. | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes as specified in 11-17/1377r3. |
| 9955 | Young Hoon Kwon | 199.60 | 27.13 | There's no description on how link adaptation using the HE variant HT Control field works. For example, it is not clear when to send the feedback, how to figure out the reference frame for the measurement, etc. Further clarification is needed. | As in the comment. | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes as specified in 11-17/1377r3. |
| 10145 | yujin noh | 198.60 | 27.13 | complete HE link adaptation operation in sub-clause 27.13 if needed | As in the comment. | Revised.Details of HE link adaptation are provided in 11-17/1377r3.TGax editor makes changes as specified in 11-17/1377r3. |

**Discussion:**

* **HLA Options, pros and cons analysis**
	1. **Unsolicited MFB only with 16 bits**
		+ **Pros:** Possible aggregation with other A-control subfield. Save one bit of HE capabilities element. Complexity reduces.
		+ **Cons:** Lack of precise PPDU information under estimation, such as RU/BW and PPDU format, which makes HLA less useful
	2. **Unsolicited MFB only with 26 bits**
		+ **Pros:** Better PPDU information used for LA estimation. Save one bit of HE capabilities element. Complexity reduces.
		+ **Cons:** No possible aggregation with other A-control subfield
	3. **MRQ, Solicited MFB, and unsolicited MFB with 26 bits**
		+ **Pros:** With MRQ and MU UL, HLA added in TF able to collect multiple LA data by receiving one UL MU PPDU (legacy LA can’t). Complete design inherent from legacy LA.
		+ **Cons:** No possible aggregation with other A-control subfield. Complexity increases a little.

***TGax editor: Modify Table 9-262z (9.4.2.237.2 HE MAC Capabilities Information field) as the following:***

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| * Subfields of the HE MAC Capabilities Information field
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| Subfield | Definition | Encoding |
| … | … | … |
| HE Link Adaptation Support(#7879) | Indicates support for link adaptation using the HLA Control field(#4727).(#6364) | If +HTC-HE Support is 1:Set to 0 (No Feedback) if the STA does not provide HE MFB.Set to 2 (Unsolicited) if the STA can receive and provide (#4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145, 6090, 7882, 10074) only unsolicited HE MFB.Set to 3 (Both) if the STA is capable of receiving HE MRQ and is capable of(#4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145, 6090, 7882, 10074) providing (#7763) HE MFB in response to HE MRQ and if the STA can receive and provide (#4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145, 6090, 7882, 10074) unsolicited HE MFB.The value 1 is reserved.Reserved if +HTC-HE Support is 0. |
| … | … | … |

***TGax editor: Modify 9.2.4.6.4.1 as the following:***

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| --- |
| * Control ID subfield values
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| Control ID value | Meaning | Length of the Control Information subfield (bits) | Content of the Control Information subfield |
| 0 | UL MU response scheduling (UMRS)(#4727) | 26 | See 9.2.4.6.4.2 (UMRS Control(#4727)(#3104)) |
| 1 | Operating mode (OM)(#4727) | 12 | See 9.2.4.6.4.3 (OM Control(#4727)(#3104)) |
| 2 | HE link adaptation (HLA)(#4727) | ~~16~~ 26((#4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145, 6090, 7882, 10074)) | See 9.2.4.6.4.4 (HLA Control(#4727)(#3104)) |
| 3 | Buffer status report (BSR) | 26 | See 9.2.4.6.4.5 (BSR Control(#4727)(#3104)) |
| 4 | UL power headroom (UPH)(#4727) | 8 | See 9.2.4.6.4.6 (UPH Control(#4727)(#3104)) |
| 5 | Bandwidth query report (BQR) | 10 | See 9.2.4.6.4.7 (BQR Control(#4727)) |
| 6 | Command Control Indication(#8087) | 8 | See 9.2.4.6.4.8 (CAS Control(#8087, #3156)(#3104)))(#5025, #7471) |
| 7-15 | Reserved |  |  |

***TGax editor: Modify 9.2.4.6.4.4 as the following:***

9.2.4.6.4.4 HE link adaptation (HLA) Control(#4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145, 6090, 7882, 10074)

If the Control ID subfield is 2, the Control Information subfield contains information related to the HE link adaptation procedure (see 27.13 (Link adaptation using the HLA Control field. The format of the subfield is shown in Figure 9-15e (Control Information subfield format when Control ID subfield is 2).

|  |  |  |  |
| --- | --- | --- | --- |
| ~~B0 B2~~ | ~~B3 B6~~ | ~~B7~~ | ~~B8 B15~~ |
| ~~NSS~~ | ~~HE-MCS~~ | ~~DCM~~ | ~~Reserved~~ |
| ~~3~~ | ~~4~~ | ~~1(#9619)~~ | ~~8~~ |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 B6 | B2 B4 | B5 B8 | B9 | B10 B17 | B18 B19 | B20 B22 | B23 | B24 B25 B15 |
|  | Unsolicited MFB | MRQ | NSS | HE-MCS | DCM | RU | BW | MSI/PPDU-Type | Tx BF | Reserved |
| Bits: | 1 | 1 | 3 | 4 | 1 | 8 | 2 | 3 | 1 | 2 |
| * Control Information subfield format when Control ID subfield is 2
 |

~~The NSS subfield indicates the recommended number of spatial streams,~~ *~~N~~~~SS~~*~~, and is set to~~ *~~N~~~~SS~~*~~– 1.~~

~~The HE-MCS subfield indicates the recommended HE-MCS, and is set to the HE-MCS Index value (defined in 28.5 (Parameters for HE-MCSs)).~~

~~The DCM subfield indicates the recommended usage of DCM, and is set to 1 if DCM is recommended and is set to 0 otherwise.~~

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| Table xxx HLA Control subfields  |
| Subfield | Meaning | Definition |
| Uosolicited MFB | Unsolicited MFB indicator | Set to 1 if the HLA Control is an unsolicited MFB.Set to 0 if the HLA Control is an MRQ or a solicited MFB. |
| MRQ | HLA feedback request indicator | Set to 1 and set Unsolicited MFB subfield to 0 to request an HLA feedback. Set to 0 and set Unsolicited MFB subfield to 0 to respond an HLA request.If the Unsolicited MFB subfield is 1, the MRQ subfiled is reserved. |
| NSS | Recommended number of spatial stream | If the Unsolicited MFB subfield is 1 or if the Unsolicited MFB subfield is 0 and the MRQ subfield is 0, NSS subfield indicates the recommended number of spatial streams, *NSS*, and is set to *NSS* – 1.Otherwise, this subfield is reserved. |
| HE-MCS | Recommended HE-MCS | If the Unsolicited MFB subfield is 1 or if the Unsolicited MFB subfield is 0 and the MRQ subfield is 0, the HE-MCS subfield indicates the recommended HE-MCS, and is set to the HE-MCS Index value (defined in 28.5 (Parameters for HE-MCSs)).The HE-MCS subfield of the MFB subfield of HLA Control field should be set to the highest datarate,for given transmission properties, that results in frame error rate of 10% or lower for an MPDU length of 3895 octets.Otherwise, this subfield is reserved. |
| DCM | Recommended usage of DCM | If the Unsolicited MFB subfield is 1 or if the Unsolicited MFB subfield is 0 and the MRQ subfield is 0, the DCM subfield indicates the recommended usage of DCM. This subfield is set to 1 if DCM is recommended and is set to 0 otherwise.Otherwise, this subfield is reserved. |
| RU | RU index of therecommended HE-MCS/ RU index specified by MFB requester to get feedback | If the Unsolicited MFB subfield is 1, the RU subfield indicates the RU index for which the recommended HE-MCS is intended, as defined in 27.13:If the Unsolicited MFB subfield is 0 and the MRQ subfiled is 1, the RU subfield indicates the RU index requested by the MFB requester to get feedback.RU index is interpreted with the BW subfield to specify the RU.RU index encoding is as defined 9.3.1.23.Otherwise, this subfield is reserved. |
| BW | Bandwidth of the recommended HE-MCS/ Bandwidth specified by MFB requester to get feedback | If the Unsolicited MFB subfield is 1, the BW subfield indicates the bandwidth for which the recommended HE-MCS is intended, asdefined in 27.13.If the Unsolicited MFB subfield is 0 and the MRQ subfiled is 1, the BW subfield indicates the bandwidth requested by the MFB requester to get feedback.For an HE STA:Set to 0 for 20 MHzSet to 1 for 40 MHzSet to 2 for 80 MHzSet to 3 for 160 MHz or 80+80 MHz.Otherwise, this subfield is reserved. |
| MSI/PPDU-Type | Packet format of the measuredPPDU/ MRQ sequence identifier | If the Unsolicited MFB subfield is 0 and the MRQ subfield is 1, the MSI/PPDU-Type subfield contains a sequence number in the range 0 to 6 that identifies the specific MCS feedback request.If the Unsolicited MFB subfield is 0 and the MRQ subfield is 0, the MSI/PPDU-Type subfield contains a sequence number in the range 0 to 6 that reponds to the specific solicited MCS feedback request.If the Unsolicited MFB subfield is 1, the PPDU-Type subfield contains the Packet Format and Coding Type subfields as shown in Figure XXX.The Packet Format subfield indicates the packet format of the PPDU from which the unsolicited MFB was estimated:Set to 0 for HE\_SUSet to 1 for HE\_MUSet to 2 for HE\_EXT\_SUSet to 3 for HE\_TRIGThe Coding Type subfield contains the Coding information (0 for BCC and 1 for LDPC) of thePPDU from which the unsolicited MFB was estimated. |
| Tx BF | Transmission type of the measured PPDU | If the Unsolicited MFB subfield is 1, Tx BF subfield indicateds if the PPDU from which the unsolicited MFB was estimated is beamformed or not.Set to 0 for non-beamformed PPDUSet to 1 for beamformed PPDUOtherwise, this subfield is reserved. |

|  |  |
| --- | --- |
| B0 B1 | B2 |
| Packet Format | Coding Type |
| 2 | 1 |
| Figure XXX MSI/PPDU-Type subfield when the Unsolicited MFB subfield is 1 |

***TGax editor: Modify 27.13 as the following:***

**27.13 Link adaptation using the HLA Control field** (#4786, 5916, 6032, 6107, 7891, 8529, 9738, 9955, 10145, 6090, 7882, 10074)

This subclause applies to frame exchange sequences that include PPDUs containing an HLA control field.

~~The HE-MCS subfield of the MFB subfield of HLA Control field should be set to the highest datarate,~~

~~for given transmission properties, that results in frame error rate of 10% or lower for a MPDU length of~~

~~3895 octets. The transmission properties, RU\_ALLOCATION, DCM, NUM\_STS, FEC\_CODING, BEAMFORMED, BEAM\_CHANGE, and STBC, are determined by the RXVECTOR of the PPDU used to estimate recommended MFB.~~

A STA that supports HE link adaptation using the HLA Control field shall set the HE Link Adaptation Support subfield in the HE Capabilities Information field in the HE Capabilities element to Unsolicited or Both, depending on its own link adaptation feedback capability. A STA shall not send an MRQ to a STA that has not set the HE Link Adaptation Support subfield to Both in the HE Capabilities Information field of the HE Capabilities element. A STA shall not send an unsolicited MFB in any frame that contains an HLA Control field to a STA that has not set the HE Link Adaptation Support subfield to either Unsolicited or Both in the HE Capabilities Information field of the HE Capabilities element.

The MFB requester may set the MRQ subfield to 1 and Unsolicited MFB subfield to 0 in the HLA Control field of a frame to request a STA to provide link adaptation feedback. In each request, the MFB requester shall set the MSI field to a value ranging from 0 to 6. For the MFB requester, how to choose the MSI value is implementation dependent.

The appearance of more than one instance of an HLA Control field with the MRQ field equal to 1 within a single PPDU shall be interpreted by the receiver as a single request for link adaptation feedback.

The MFB requester shall specify the RU index and BW requesting the link adaptation feedback.

On receipt of an HLA Control field with the MRQ subfield equal to 1, an MFB responder computes the HE-MCS, NSS, and DCM of the RU and BW specified in the MRQ and these estimates are based on the same RU of the PPDU carrying the MRQ. The PPDU carrying MRQ shall include the RU requested for MFB. The MFB responder labels the result of this computation with the MSI value from the HLA Control field in the received frame carrying the MRQ. The MFB responder may include the received MSI value in the MSI field of the corresponding response frame. In the case of a delayed response, this allows the MFB requester to associate the MFB with the soliciting MRQ.

An MFB responder that sends a solicited MFB shall set the Unsolicited MFB subfield to 0 and MRQ subfiled to 0 in the HLA Control field.

The STA receiving MFB may use the received MFB to compute the appropriate HE-MCS, DCM and NSS.

The MFB responder may send a solicited response frame with any of the following combinations of HE-MCS, NSS, and MSI:

* HE-MCS = 15, NSS = 7, MSI = 7: no information is provided for the immediately preceding MRQ request. This combination is used when the responder is required to use HE variant HT Control field for other protocols and when no MFB is available. It has no effect on the status of any other pending MRQ.
* HE-MCS = 15, NSS = 7, MSI = 0~6: the responder is not

now providing, and will never provide, feedback for the request that had the MSI value that matches the MSI value.

* HE-MCS = valid value, NSS = valid value, MSI = 0~6: the responder is providing feedback for the request that had the MSI value that matches the MSI value.

A STA sending unsolicited MFB using the HLA Control field shall set the Unsolicited MFB subfield to 1.

Unsolicited HE-MCS, NSS, DCM, BW, and RU estimates reported of an HLA

Control field sent by a STA are computed based on the most recent PPDU received by the STA whose PPDU format, TxBF, and Coding Type, are indicated in the subfileds of the same HLA Control field.

In an unsolicited MFB response the PPDU formats, and Coding Type, subfields are set according to the RXVECTOR parameters of the received PPDU from which the HE-MCS, RU, BW, and NSS are estimated, as follows:

— The PPDU format subfield is set and encoded as follows:

 — 0 if the parameter FORMAT is equal to HE\_SU

 — 1 if the parameter FORMAT is equal to HE\_MU

 — 2 if the parameter FORMAT is equal to HE\_EXT\_SU

 — 3 if the parameter FORMAT is equal to HE\_TRIG

— The Coding Type subfield is set to 0 if the parameter FEC\_CODING is equal to BCC\_CODING and set to 1 if equal to LDPC\_CODING.

— The Tx BF subfield is set to 1 if the parameter BEAMFORMED is equal to 1 and set to 0 if equal to 0.

— The BW subfield shall indicate a bandwidth less than or equal to the bandwidth indicated by the parameter CH\_BANDWIDTH.

— The RU subfield shall cooperate with the BW subfiled to indicate the RU at which the recommended HE-MCS locates. The recommeded RU shall be within an RU in which the measured HE PPDU is located.

When the MFB requester sets the MRQ subfield to 1 and sets the MSI subfield to a value that matches the MSI subfield value of a previous request for which the responder has not yet provided feedback, the responder shall discard or abandon the computation for the MRQ that corresponds to the previous use of that MSI subfield value and start a new computation based on the new request.

A STA may respond immediately to a current request for MFB with a frame containing an MSI field value and NSS, HE-MCS, and DCM subfields that correspond to a request that precedes the current request.