IEEE P802.11  
Wireless LANs

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| CC36 comment resolution: Subclause 35.15 | | | | |
| Date: 2022-03-27 | | | | |
| Author(s): | | | | |
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Abstract

This submission proposes resolutions for multiple comments related to TGbe D1.0 with the following CIDs:

4517, 2065, 4285

Revisions:

* Rev 0: Initial version of the document.

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 TGbe Draft. This introduction is not part of the adopted material.

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 4517 | 148 | 29 | What does the "Basic EHT-MCS and NSS set field" refer to? | as in the comment. | Revised  Basic-MCS and Nss Set is used in EHT Operation element to indicate the EHT-MCS, Nss that all EHT STAs join the BSS need to support.  The announcement that all STAs in the BSS are EHT STAs is also added.  TGbe editor to make changes in this document under CID #4517 |

**9.4.2.3 Supported Rates and BSS Membership Selectors element**

***TGbe Editor: Please change Table 9-129 as shown below: (#4517)***

**Table 9-129—BSS membership selector value encoding**

|  |  |  |
| --- | --- | --- |
| ANA | EHT PHY | Support for the mandatory features of Clause 36 ( Extremely high throughput (EHT) PHY specification) is required in order to join the BSS that was the source of the Supported Rates and BSS Membership Selectors element or Extended Supported Rates and BSS Membership Selectors element containing this value. |

**9.4.2.311 EHT Operation element**

***TGbe Editor: Please change Figre 9-1002a as shown below: (#4517)***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element ID | Length | Element ID Extension | EHT Operation Parameters | Basic EHT-MCS And Nss Set | EHT Operation Information |

Octets: 1 1 1 1 4 0 or 3 or 5

**Figure 9-1002a—EHT Operation element format(#4261)(#6603)(#1086)(#1667)(#2148)(#2147)**

***TGbe Editor: Please add the following paragraph at the end of 9.4.2.311: (#4517)***

The Basic EHT-MCS And NSS Set field indicates the EHT-MCSs for each number of spatial streams in EHT PPDUs that are supported by all EHT STAs in the BSS (including IBSS and MBSS) in transmit and receive. The Basic EHT-MCS And NSS Set field is defined in **Figure 9-1002aa (EHT-MCS Map (20 MHz-Only Non-AP STA) subfield and Basic EHT-MCS and NSS Set field format)**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 2065 | 243 | 5 | PPDU format, BW, MCS, Nss selection of EHT STA should be defined | As in comment | Revised  Discussion: In 802.11baseline, for each generation of PHY, the rules of related PPDU format, MCS, Nss selection are defined. For EHT amendment, the rules for EHT PPDU format, BW, MCS, Nss should be defined.  TGbe editor to make change in this document under CID 2065 |
| 4285 |  |  | Subclause for PPDU format, BW, MCS, NSS selection is missing for EHT. Please add it (use 11ax as a reference). | As in comment. | Revised  Discussion: In 802.11baseline, for each generation of PHY, the rules of related PPDU format, MCS, Nss selection are defined. For EHT amendment, the rules for EHT PPDU format, BW, MCS, Nss should be defined.  TGbe editor to make change in this document under CID 4285 |

**35.15 PPDU format, BW, MCS, NSS, and DCM selection rules(#1752)**

***TGbe editor: Please update subclause 35.15.2 as shown below: (#2065, 4285)***

35.15.2 PPDU format selection

An EHT STA that transmits non-HT, HT, VHT, or HE PPDUs shall follow the rules in 26.15.2 (PPDU format selection).

An EHT AP may transmit an EHT MU PPDU as defined in  **35.4.1 (EHT DL MU operation**). A non-AP EHT STA transmits EHT TB PPDUs as defined in  **35.4.2 (EHT UL MU operation**). An EHT STA may transmit an EHT MU PPDU to a peer EHT STA subject to the restrictions defined below.

An EHT STA in 6GHz band shall not transmit a EHT PPDU in EHT Dup mode to a peer EHT STA if the EHT Capabilities element received from that peer EHT STA has the Support Of EHT DUP (EHT-MCS 14) In 6 GHz subfield equal to 0.

An EHT STA shall not transmit a EHT PPDU with EHT-MCS 15 and MRUs listed in Table 9-401l (Subfield of the EHT PHY Capabilities Information field) to a peer EHT STA if the EHT Capabilities element received from that peer EHT STA has the Support Of MCS 15 subfield equal to 0.

An EHT STA shall send Control frames following the rules defined in 10.6.6 (Rate selection for Control frames) and 26.15.2 (PPDU format selection) with the following additional exception:

* A Control frame sent by an EHT AP as a response to an EHT TB PPDU may be carried in any PPDU format that is supported by the intended receivers.
* A Trigger frame that is not an MU-RTS Trigger frame may be carried in any PPDU format that is supported by the intended receivers subject to the restrictions in **35.5.2 (EHT UL MU operation**).
* A Control frame is carried in an EHT TB PPDU if it is sent as a response to a PPDU that contains a Trigger frame that is not an MU-RTS Trigger frame  **35.5.2 (EHT UL MU operation**).
* A Control frame sent by an EHT STA as a response to an EHT PPDU with EHT-MCS 15 or 14 that does not contain a Trigger frame should be carried in an EHT PPDU with EHT-MCS 15 or 14 respectively unless
* the most recently transmitted EHT PPDU by the STA that is correctly received by the transmitter of the EHT PPDU with EHT-MCS 15 or 14 to the EHT STA was not an EHT PPDU with EHT-MCS 15 or 14 in which case the Control frame should be carried in non-HT (duplicate) PPDU.
* A Control frame sent by an EHT STA as a response to an EHT PPDU with MCS other than EHT-MCS 14 and 15 or to a non-HT (duplicate) PPDU that does not contain a triggering frame should be carried in a non-HT (duplicate) PPDU unless
* the most recent PPDU sent by the EHT STA to the recipient of the Control frame and received correctly by the peer STA was an EHT PPDU with EHT-MCS 14 or 15 in which case the Control frame should be carried in EHT PPDU with EHT-MCS 14 or 15 respectively.A Control frame that is not solicited by another frame and is not a Trigger frame may be carried in EHT PPDU with MCS 14 or 15.
* A Control frame sent by an EHT AP as a response solicited by SRC Control field is carried in the PPDU that satisfies the requirements defined in 35.3.15.5.2 (End time alignment of response PPDUs using SRC Control field)
* An EHT STA may transmit a BlockAck frame in an HE SU PPDU or (#2756)(#2838)in an EHT MU PPDU directed to a single (#1752)EHT STA if the PPDU duration of the HE SU PPDU or EHT MU PPDU (respectively) is less than the PPDU duration of a non-HT PPDU containing the Control frame sent at the primary rate (see 10.6.6.5.2 (Selection of a rate or MCS)).

***TGbe editor: Please add the following subclauses at the end of subclause 35.15 as shown below: (#2065, 4285)***

**35.15.3 MCS, NSS, BW selection**

An EHT STA shall follow the rules defined in 10.6 (Multirate support) and 26.15.4 (Rate selection constraints for HE STAs) for selecting the rate, MCS, NSS, and the rules defined in 10.3.2.8 (VHT and S1G RTS procedure), 10.3.2.9 (CTS and DMG CTS procedure), 10.6.6.6 (Channel Width selection for Control frames) and 10.6.12 (Channel Width in non-HT and non-HT duplicate PPDUs) for selecting the channel width (BW) of transmitted PPDUs with the following exceptions:

* EHT-MCS, NSS, and BW selection for an EHT TB PPDU are defined in **35.4.2.3 (Non-AP STA behavior for UL MU operation)**.
* Rate and BW selection for a CTS sent in response to an MU-RTS Trigger frame are defined in **35.2.2.2 (CTS frame response to an MU-RTS Trigger frame)**.

An EHT STA that transmits an EHT PPDU to a receiving STA shall use an <EHT-MCS, NSS> tuple that is supported by the receiving STA as indicated by the Supported EHT-MCS And NSS Set field in the EHT Capabilities element that the receiving STA transmits. If the Supported EHT-MCS and NSS set of the receiving STA or STAs is not known, the transmitting STA shall transmit using a <EHT-MCS, NSS> tuple in the basic EHT-MCS and NSS set if the basic EHT-MCS and NSS set is not empty, otherwise the transmitting STA shall transmit using a <EHT-MCS, NSS> tuple in the mandatory EHT-MCS and NSS Set. An EHT STA is subject to all of the rules for HT STAs and VHT STAs that apply to its operating band (see 10.27 (Protection mechanisms)) and HE STAs that apply to operating band (see 26.2.4 (Updating two NAVs)).

An EHT STA may transmit an EHT PPDU with 1024-QAM or 4096-QAM on a 26-, 52-, and 106-tone RU to a recipient STA if it has received from the recipient STA an EHT Capabilities element with the Rx 1024-QAM And 4096-QAM < 242-tone RU Support subfield in the EHT PHY Capabilities Information field equal to 1; otherwise the EHT STA shall not transmit an EHT PPDU with 1024-QAM or 4096-QAM on a 26-, 52-, and 106-tone RU.

An EHT AP shall not set the UL HE-MCS subfield of a User Info field in a Trigger frame to 10, 11, 12, or 13 for a 26-, 52-, or 106-tone RU allocation unless the User Info field is addressed to a non-AP EHT STA from which the EHT AP has received an EHT Capabilities element with the Tx 1024-QAM And 4096-QAM < 242-tone RU Support subfield in the EHT PHY Capabilities Information field equal to 1.

An EHT STA that sends a Control frame in response to a frame carried in an EHT MU PPDU that carries a frame with the Normal Ack or Implicit BAR ack policy shall set the TXVECTOR parameter CH\_BANDWIDTH to indicate a channel width that is the same as the channel width indicated by the RXVECTOR parameter CH\_BANDWIDTH of the frame eliciting the response with the following exception

* An EHT AP may solicit one Control response frame carried in EHT TB PPDU from a STA only whose BW is narrower than the BW of the solicited PPDU if the Control response frame is in the last frame exchange of the TXOP.

If a control response frame is transmitted in an EHT MU PPDU, the channel width (CH\_BANDWIDTH parameter of the TXVECTOR) shall be selected first according to 10.6.6.6 (Channel Width selection for Control frames), and then the <EHT-MCS, NSS> tuple shall be selected from a set of <EHT-MCS, NSS> tuples called the *CandidateMCSSet*. The *CandidateMCSSet* is defined in 10.6.6.5.3 (Control response frame MCS computation) except that the set additionally contains the <EHT-MCS, NSS> tuples for an EHT STA.

**35.15.4** **Rate selection constraints for EHT STAs**

**35.15.4.1 Receive EHT-MCS and NSS Set**

The receive EHT-MCS and NSS set is the set of <EHT-MCS, NSS> tuples for PPDU bandwidths less than or equal to 20MHz only, 80 MHz, 160 MHz PPDUs or 320 MHz PPDUs that a STA is capable of receiving. The receive EHT-MCS and NSS set for a first STA is determined by a second EHT STA for each <EHT-MCS, NSS> tuple NSS = 1, …, 8 and PPDU bandwidth (less than or equal to 20MHz only, 80 MHz, and 160 MHz or 320 MHz) from the Supported EHT-MCS And NSS Set field in(#Ed) the EHT Capabilities element received from the first STA as follows:

* If support for the EHT-MCS for NSS spatial streams at that PPDU bandwidth is mandatory (see 36.1.1 (Introduction to the EHT PHY)), then the <EHT-MCS, NSS> tuple at that bandwidth is supported by the first STA on receive.
* Otherwise, if the Rx Max Nss That Supports EHT-MCS n1–n2 (n1 and n2 indicate the MCS set being applied) in ~~each~~ **EHT-MCS Map b subfield for** *b* Î {20MHz only for 20MHz only STA, <=80 MHz for >=80MHz STA, 160 MHz for >=160MHz STA, 320 MHz} indicates support and neither the Operating Mode field nor the OM Control subfield + optional EHT OM Control subfield is received from the first EHT STA, then the <EHT-MCS, NSS> tuple at PPDU bandwidth *b* for a given operating channel width is supported by the first STA on receive as defined in 9.4.2.248.4 (Supported HE-MCS And NSS Set field).
* Otherwise,
* If the Operating Mode field is received from the first EHT STA, the <EHT-MCS, NSS> tuple at that PPDU bandwidth for a given operating channel width is supported by the first STA on receive as defined in as defined in **9.4.2.313.4 (Supported EHT-MCS And NSS Set field)**.
* If the OM Control subfield is received from the first EHT STA, the <EHT-MCS, NSS> tuple at that PPDU bandwidth for a given operating channel width is supported by the first STA on receive as defined in as defined in **9.4.2.313.4 (Supported EHT-MCS And NSS Set field)**.
* If the OM Control subfield and EHT OM Control subfield are received from the first EHT STA, the <EHT-MCS, NSS> tuple at that PPDU bandwidth for a given operating channel width is supported by the first STA on receive as defined in **9.4.2.313.4 (Supported EHT-MCS And NSS Set field)**
* Otherwise, the <EHT-MCS, NSS> tuple at that PPDU bandwidth is not supported by the first STA on receive.

The <EHT-MCS, NSS> tuples excluded by **35.15.4.3 (Additional rate selection constraints for EHT PPDUs)** can also be eliminated from the receive EHT-MCS and NSS set.

An EHT STA shall not, unless explicitly stated otherwise, transmit an EHT PPDU unless the <EHT-MCS, NSS> tuple and bandwidth used are in the receive EHT-MCS and NSS set of the receiving STA(s).

**35.15.4.2 Transmit EHT-MCS and NSS Set**

The transmit EHT-MCS and NSS set is the set of <EHT-MCS, NSS> tuples for PPDU bandwidth less than or equal to 20MHz only, 80 MHz, 160 MHz PPDUs or 320 MHz PPDUs that a STA is capable of transmitting. The transmit EHT-MCS and NSS set of a first STA is determined by a second STA for each <EHT-MCS, NSS> tuple NSS = 1, …, 8 and PPDU bandwidth (less than or equal to 20MHz only for 20MHz only STA, 80 MHz for >=80MHz STA, 160 MHz or 320MHz MHz) from the Supported EHT-MCS And NSS Set field received from the first STA as follows:

* If support for the <EHT-MCS, NSS> tuple at that bandwidth is mandatory (see 36.1.1 (Introduction to the EHT PHY)), then the <EHT-MCS, NSS> tuple at that PPDU bandwidth is supported by the first STA on transmit.
* Otherwise, if the Tx Max Nss That Supports EHT-MCS n1–n2 (n1 and n2 indicate the MCS set being applied) in the **EHT-MCS Map b subfield where** *b* is the PPDU BW indicates support, then the <EHT-MCS, NSS> tuple at PPDU bandwidth *b* for a given operating channel width is supported by the first STA on receive as defined in 9.4.2.248.4 (Supported HE-MCS And NSS Set field)
* Otherwise,
* If the OM Control subfield is received from the first EHT STA, the <EHT-MCS, NSS> tuple at that PPDU bandwidth for a given operating channel width is supported by the first STA on transmit as defined in as defined in **9.4.2.313.4 (Supported EHT-MCS And NSS Set field)**.
* If the OM Control subfield and EHT OM Control subfield are received from the first EHT STA, the <EHT-MCS, NSS> tuple at that PPDU bandwidth for a given operating channel width is supported by the first STA on transmit as defined in **9.4.2.313.4 (Supported EHT-MCS And NSS Set field)**
* Otherwise, the <EHT-MCS, NSS> tuple at that PPDU bandwidth is not supported by the first STA on transmit.

**35.15.4.3 Additional rate selection constraints for EHT PPDUs**

If a combination of HE MCS, Nss under a BW is not allowed in the BSS per HE-MCSs that are marked as unsupported as defined in 26.15.4.3 (Additional rate selection constraints for HE PPDUs), the combination of EHT-MCS, Nss where EHT-MCS is equal to HE MCS shall be disallowed under the BW. If a combination of EHT-MCS 0, Nss 1 at a BW is not allowed in a BSS, the EHT-MCS 15 at the BW shall be disallowed.

**35.15.5 Additional rules for group addressed frames**

An AP that transmits (#24433)group addressed frames except the Beacon frames in an EHT MU PPDU whose TXVECTOR has EHT\_PPDU\_TYPE equal to 1 shall transmit the EHT MU PPDU with an <EHT-MCS, NSS> tuple where the EHT-MCS is a mandatory EHT-MCS and NSS = 1.

A group addressed frame transmitted in an EHT MU PPDU whose TXVECTOR has EHT\_PPDU\_TYPE equal to 1 shall be sent as an S-MPDU (see Table 9-532 (A-MPDU contents in the S-MPDU context)), except for group addressed Data frames, which are not required to be sent as an S-MPDU, but are required to follow 10.12.4 (A-MPDU aggregation of group addressed Data frames).

If the EHT MU PPDU whose TXVECTOR has EHT\_PPDU\_TYPE equal to 1 contains a group addressed frame intended for at least one STA that is not associated to the AP, then the EHT AP shall set the TXVECTOR parameters for the EHT PPDU as follows:

* CH\_BANDWIDTH to CBW20
* EHT\_LTF\_TYPE to 2xEHT-LTF and GI\_TYPE to 0u8s\_GI or 1u6s\_GI, or EHT\_LTF\_TYPE to 4xEHT-LTF and GI\_TYPE to 3u2s\_GI
* FEC\_CODING to BCC\_CODING
* BEAMFORMED to 0
* NOMINAL\_PACKET\_PADDING to 16 µs
* NO\_SIG\_EXTN to false in the 2.4 GHz band and true otherwise

Otherwise, if the EHT MU PPDU whose TXVECTOR has EHT\_PPDU\_TYPE equal to 1 contains group addressed frames intended only for associated STAs then the AP shall set the TXVECTOR parameters listed above to values that are indicated as supported by all the intended STAs, except that the CH\_BANDWIDTH shall be set to CBW20 if at least one of the intended STAs is currently not in the awake state.

**35.15.6 Additional rules for group addressed frames in an EHT MU PPDU with Multiple RUs**

An EHT AP may include group addressed frames in an EHT MU PPDU with multiple RUs subject to the rules defined in this subclause.

An EHT AP that includes a group addressed frame in an EHT MU PPDU with multiple RUs shall ensure that the frame is included in a broadcast RU in the HE MU PPDU. The EHT AP shall additionally ensure that the following conditions are satisfied for the broadcast RU:

* The RU allocation shall comply with the rules in 36.3.2 (Subcarrier and resource allocation)
* The <EHT-MCS, NSS> tuple shall have a mandatory EHT-MCS and NSS = 1
* The broadcast RU shall be located within:
* The primary 20 MHz channel if the group addressed frame is a FILS Discovery or a Probe Response frame, except when the primary 20 MHz channel does not coincide with a PSC and the AP is a 6 GHz-only AP, in which case the broadcast RU may be in a PSC that is within the BSS operating channel width (see 26.17.2.3 (Scanning in the 6 GHz band)). The broadcast RU size shall not exceed 106 subcarriers if the MU PPDU has a bandwidth that is greater than 20 MHz.
* The primary 20 MHz channel if the group addressed frame is addressed to at least one associated non-AP STA that has not declared to be in the awake state. The broadcast RU size shall not exceed 106 subcarriers if the MU PPDU has a bandwidth that is greater than 20 MHz.
* A bandwidth that is indicated as supported in reception by one or more associated non-AP STAs, if the group addressed frame is addressed only to those non-AP STAs and the STAs have declared to be in the awake state. The broadcast RU size shall not exceed the minimum common bandwidth that is supported in reception by all STAs in the HE Capabilities element they transmit or in the most recently sent OM Control, EHT OM Control or OMN frames.
* The SST subchannel if the group addressed frame is addressed to one or more EHT SST STAs, the primary 20 MHz channel does not coincide with the subchannel assigned to the EHT SST STAs and the frame is not addressed to any STAs other than the EHT SST STAs in that subchannel (see 26.8.7.2 (SST operation)). The broadcast RU size shall not exceed 106 subcarriers if the SST subchannel is 20 MHz.
* The TXVECTOR parameters listed below shall be set as follows:
* EHT\_LTF\_TYPE to 2xEHT-LTF and GI\_TYPE to 0u8s\_GI or 1u6s\_GI, or EHT\_LTF\_TYPE to 4xEHT-LTF and GI\_TYPE to 3u2s\_GI
* FEC\_CODING to BCC\_CODING
* BEAMFORMED to 0
* NOMINAL\_PACKET\_PADDING to 16 µs
* NO\_SIG\_EXTN to false in the 2.4 GHz band and true otherwise
* STA\_ID as defined in 26.11.1 (STA\_ID)

Group addressed frames transmitted in an EHT MU PPDU shall be sent as an S-MPDU (see Table 9-535 (A-MPDU contents in the S-MPDU context)) except that group addressed Data frames are not required to be sent as an S-MPDU, but are required to follow the rules in 10.12.4 (A-MPDU aggregation of group addressed Data frames).(#24432)

**35.15.7 Additional rules for PPDUs sent in the 6 GHz band**

An EHT STA follows the rules in 26.15.8 (Additional rules for PPDUs sent in the 6 GHz band) and the additional rules in this subclause for PPDU transmission in 6GHz band.

An EHT STA may transmit an individual-addressed QoS Data frame or individual-addressed frame in non-HT duplicate PPDU if the Beacon frame is transmitted in non-HT duplicated PPDU.