IEEE P802.11
Wireless LANs

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Abstract

This submission provides resolutions to the following seven (7) CIDs: 24031, 24169, 24365, 24523, 24142, 24457 and 24458.

R2 Discussed in 802.11ax CRC.

R3 CID 24031 and CID 24523 revised based on comments from Mark Rison.

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24031 | 206.52 | 9.4.2.248 | The 6 GHz PPDU MCS selection can be controlled by minimum rate field which is completely new mechanism to configure the transmission rate that can be used. Sub 6 GHz HE rate selection configures the available HE rates by using HT-MCS support field. This configuration is similar to minimum rate control in HT and VHT.The sub 6 GHz minimum rate control is capable to control more precisely which tansmission rates are available. In sub 6 GHz, the AP can configure more precisely:- the range of BSS- the BW of transmissions- i.e. AP can control the transmission modes and coverage of the BSS.It is unclear why 6 GHz minimum rate mechanism uses completely different mechanism from legacy HT, VHT and HE in sub 6 GHz modes. The new mechanism to control the minimum rate at 6 GHz requires implementation of completely new mechanism. It is hard to see value in the new configuration mechanism.The 6 GHz minimum rate configuration causes a situation, in which STAs far away from the AP transmit with large BW and low MCS. These transmissions will have poor spectral efficiency and they will consume a lot of resources. Also the AP has poor control of hte BSS range. Change the Minimum Rate field to lowest HE-MCS configuration that is similar to mechanism that is used for HE in sub 6 GHz bands. | Change the Minimum Rate field to lowest HE-MCS configuration that is similar to mechanism that is used for HE in sub 6 GHz bands. | Revised. Agree in principle with the comment. TGax Editor, please implement the changes related with the CID 24031 in submission 20/297r3 |

Discussion:

Agree in principle of the comment.

Clause 10.6.13(Additional rate selection constraints for VHT PPDUs) sets constrains to VHT PPDUs rate selction rules for PPDUs with less than 4 NSSs. Clause 26.15.4.3(Additional rate selection constraints for HE PPDUs) sets constrains to HE PPDUs rate selction rules for PPDUs with less than 4 NSSs.

Both of these rules allow the receiver to control whether MCS 0,1,2 or 3 are in use for 20 or 40 MHz PPDUs. Similarly, the receiver may control whether the MCS 0 or 1 are in used for BW 80 or 160 MHz PPDUs.

802.11ax STAs should follow the same principle for the rate constraint mechanism in 6 GHz. This allows implementations to implement 6 GHz operation with minimum changes to their exsisting implementations.

The HT-MCS bitfield is not present in signalling transmitted in 6 GHz. For 6 GHz operation, the similar signaling may be done by the Minimum Rate field.

The transmission rates of the non-HT PPDUs should not be restricted. In many cases, the transmitted NON-HT PPDU is short and high data rates do not have big impact of the transmission duration. For instance, RTS, CTS, ACK, PS-Poll, QoS Null frames are likely transmitted in non-HT PPDU, because they are consuming the least transmission time in this format. The use of high transmission rate for these frames has very small impact of the transmission duration of the PPDUs, but it may lead to poor reception of the frames, which may have severe impacts on the frame loss and to the system performance.

Clause 9.4.2.248 HE Operation element defines that the Minimum rate is only for non-AP STA. Clause 26.15.8 Additional rules for PPDUs sent in the 6 GHz band sets the minimum rules for STA, i.e. including both the AP and STA.

The AP needs to send group addressed frames and broadcast management frames. To ensure succesfull reception of these frames, the minimum rate rules should be applied only in non-AP STAs.

 **Proposed Text Changes:**

**9.4.2.248 HE Operation element**

TGax Editor, please change the 6GHz Operation element sizeto 0 or 7 Octets in Figure 9-787h.

TGax Editor, please change the Minimum Rate field size to 3 Octest in figure 9-787k.

TGax Editor, please add the new figure and replace the last paragraph with the new text as shown below.

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|  | 20 or 40 MHz, NSS1, HE-MCS 0 | 20 or 40 MHz, NSS1, HE-MCS 1  | 20 or 40 MHz, NSS1, HE-MCS 2 | 20 or 40 MHz, NSS1, HE-MCS 3 | 20 or 40 MHz, NSS2, HE-MCS 0  | 20 or 40 MHz, NSS2, HE-MCS 1 | 20 or 40 MHz, NSS2, HE-MCS 2 | 20 or 40 MHz, NSS2, HE-MCS 3 |
| Bits: | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

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| 20 or 40 MHz, NSS3, HE-MCS 0  | 20 or 40 MHz, NSS3, HE-MCS 1  | 20 or 40 MHz, NSS3, HE-MCS 2  | 20 or 40 MHz, NSS3, HE-MCS 3  | 80 + MHz, NSS1, HE-MCS 0  | 80 + MHz, NSS1, HE-MCS 1  | 80 + MHz, NSS2, HE-MCS 0  | 80 + MHz, NSS2, HE-MCS 1  |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

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| 80 + MHz, NSS3, HE-MCS 0 | 80 + MHz, NSS3, HE-MCS 0 | Reserved |
| 1 | 1 | 6 |

**Figure 9-XX Minimum Rate field format [24031]**

~~The Minimum Rate field indicates the minimum rate, in units of 1 Mb/s, that the non-AP STA is allowed to use for sending PPDUs (see 26.15.4.3 (Additional rate selection constraints for HE PPDUs)), where the rate is obtained with an NSS that is less than or equal to 3 and an MCS that is less than or equal to 3.~~

A subfield in the Minimum Rate field is set to 1 to indicate that a transmitting non-AP STA supports the respective NSS, BW and HE-MCS combination for sending PPDUs (see 26.15.4.3 (Additional rate selection constraints for HE PPDUs)); otherwise the subfield is set to 0. **[24031]**

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

TGax Editor, please make the changes as shown below.

An HE non-AP STA that transmits a PPDU that is not sent in response to a Trigger frame in the 6 GHz band and that contains a frame that is not a control response frame with the Address 1 field set to the MAC address of an HE AP with which it is not associated and from which it has received a FILS Discovery frame or an HE Operation element shall ensure that the PPDU meets the following conditions:

—  The bandwidth of the PPDU is less than or equal to the operating bandwidth of the HE BSS as indicated in the BSS Operating Channel Width subfield of the FILS Discovery frame or in the Channel Width subfield of the HE Operation element received from ~~sent by~~ the AP

—  The PPDU is transmitted with a number of spatial streams that is less than or equal to the maximum number of spatial streams of the HE BSS as indicated in the Maximum Number of Spatial Stream subfield of the FILS Discovery frame or in the Basic HE-MCS and NSS Set field of the HE Operation element received from ~~sent by~~ the AP

—  If the PPDU is an HE PPDU, then the PPDU is transmitted with an <HE-MCS, NSS> tuple that is indicated as supported in the Minimum Rate field of the HE Operation element received from the AP and provides a data rate that is greater than or equal to the minimum rate indicated in the FILS Minimum Rate field (if present) of the FILS Discovery frame ~~or in the Minimum Rate field of the HE Operation ele- ment~~ received from ~~sent by~~ the AP. **[24031]**

—  If the PPDU is a non-HT PPDU, then the PPDU is transmitted with a data rate that is greater than or equal to the minimum of <R, 54 Mb/s>, where R is the minimum rate indicated in the FILS Minimum Rate field (if present) of the FILS Discovery frame ~~or in the Minimum Rate field of the HE Operation element~~ received from ~~sent by~~ the AP **[24031]**

An HE non-AP STA that transmits a PPDU that is not sent in response to a Trigger frame in the 6 GHz band and that contains a frame that is not a control response frame with Address 1 field set to the MAC address of the AP with which it is associated shall ensure that the PPDU meets the following conditions:

~~— If the PPDU is a non-HT (duplicate) PPDU then the PPDU is transmitted with a data rate that is greater than or equal to the minimum of <R, 54 Mb/s>, where R is the minimum rate indicated in the Minimum Rate field of the HE Operation element sent by the AP.~~ **[24031]**

— If the PPDU is an HE PPDU, then the PPDU is transmitted with an <HE-MCS, NSS> tuple that is indicated as supported in the Minimum Rate field of the HE Operation element received from ~~sent by~~ the AP ~~providing a data rate that is not less than the data rate indicated in the Minimum Rate field of the HE Operation element sent by the AP~~. **[24031]**

An HE non-AP STA that transmits a PPDU that is not an HE TB PPDU in the 6 GHz band and that contains a frame that is not a control response frame with Address 1 field set to the MAC address of an AP with which it is not associated shall determine a local maximum transmit power for that transmission following the rules in 11.7.5 (Specification of regulatory and local maximum transmit power levels), if the local maximum trans- mit power is received in Transmit Power Envelope elements and combinations of Country elements and Power Constraint elements in the most recent Beacon or Probe Response frame, on the channel from that AP.

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24169 | 162.27 | 9.4.2.29 | Per definition of TID in Table 9-12, TID is either UP or TSID. However, the added sentence says that TSID subfield contains the TID associated with the TSPEC. This feels like a circular definition and in any case, true for all cases, include pre-HE MACs | Delete the sentence or provide a justificaiton on why this is different | Revised. Agree in principle with the comment. Delete the sentence, “For HE STAs, the TSID subfield contains the TID associated with this TSPEC.” In 9.4.2.29.  |

**9.4.2.29 TSPEC element**

The subfields of the TS Info field are defined as follows:

* The Traffic Type subfield is set to 1 for a periodic traffic pattern (e.g., isochronous TS of MSDUs or A-MSDUs, with constant or variable sizes, that are originated at fixed rate) or set to 0 for an aperiodic, or unspecified, traffic pattern (e.g., asynchronous TS of low-duty cycles).
* The TSID subfield contains a value that is a TSID. Note that the MSB (bit 4 in TS Info field) of the TSID subfield is always set to 1 when the TSPEC element is included within an ADDTS Response frame. ~~For HE STAs, the TSID subfield contains the TID associated with this TSPEC.~~ [24169]
* The Direction subfield specifies the direction of data carried by the TS as defined in Table 9-158 (Direction subfield encoding).

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24365 | 372.65 | 26.5.8 | "A non-AP HE STA transmits an ADDTS Request with Schedule and APSD subfields in the TSPEC elementset to 0 to signal its traffic characteristics and QoS requirements." -- also for other stuff, e.g. admission control. What is the point of this sentence? It's true also for non-AP non-HE STAs | Delete the cited sentence. | Accepted.  |

**26.5.8 Use of TSPEC by HE STAs**

In addition to the TS Setup operations as described in 11.4.4 (TS setup), a non-AP HE STA may use a TSPEC contained in a Basic ADDTS Request frame to provide its traffic characteristics and QoS require ments to an HE AP that supports the reception of Basic ADDTS Request frame in order to facilitate efficient scheduling for HE AP’s UL and DL MU operations. A TSPEC provided by a non-AP HE STA is used by a receiving HE AP to facilitate the creation of a schedule for contention based channel access (EDCA) or MU operation. How the HE AP uses the information provided by the non-AP HE STA is beyond the scope of the specification.

~~A non-AP HE STA transmits an ADDTS Request with Schedule and APSD subfields in the TSPEC element set to 0 to signal its traffic characteristics and QoS requirements. An HE AP transmits an ADDTS Response frame as a response to ADDTS Request frame as described in 11.4.4 (TS setup).~~ [24365]

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24523 | 414.35 | 26.9.2 | "An OMI initiator that is an HE AP should be capable of receiving within an operating channel width andwith NSS that are up to the values of the most recently transmitted Channel Width subfield and Rx NSS sub-field that the OMI initiator has successfully indicated in the OM Control subfield or in the Operating Modefield sent to any associated STA." -- it shall be capable of doing so (lying is a mortal sin, isn't it?), except of course when it is transitioning and hasn't told every STA | Change "An OMI initiator that is an HE AP should be capable of receiving within an operating channel width andwith NSS that are up to the values of the most recently transmitted Channel Width subfield and Rx NSS sub-field that the OMI initiator has successfully indicated in the OM Control subfield or in the Operating Modefield sent to any associated STA." to "While an OMI initiator that is an HE AP is communicating a new operating mode to its associated STAs, it should be capable of receiving within an operating channel width andwith NSS that are up to the values of the most recently transmitted Channel Width subfield and Rx NSS subfield that it has successfully indicated in the OM Control subfield or in the Operating Mode field sent to any associated STA. After an OMI initiator that is an HE AP has successfully communicated a new operating mode to all its associated STAs, it shall be capable of receiving within an operating channel width andwith NSS that are up to the values of the most recently transmitted Channel Width subfield and Rx NSS subfield that it has indicated in the OM Control subfield or in the Operating Mode field sent to its associated STAs. | Rejected. Similar to CID 22417 and CID 20788. The TGax group has discussed on this resolution and does not agree to proposed resolution. The OM parameters change may be initiated based on AP internal logic. It is unclear when the parameters change will start. Thus, the OM parameters that AP uses are not reliable for the STAs and it is better to keep should statement, so that STA implementations do not assume that parameters will remain the same.  |

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24142 | 50.23 | 4.3.15a | "under certain circumstances" is quite vague ... please try to develop a bit more, e.g. at least relates it to dense deployment scenario | As in comment | Revised. TGax Editor, please implement the changes shown for CID 24142 in submission 20/297r3 |

**4.3.15a High efficiency (HE) STA**

TGax Editor, please make the changes as shown below.

These features can reduce protocol overhead and increase aggregate network throughput (e.g., DL and UL OFDMA, DL/UL MU-MIMO), enhance peak link throughput (e.g., HE-MCS 10, 11), enhance dense net- work efficiency (e.g., spatial reuse), and/or enhance power conservation (e.g., TWT). These features can, ~~under certain circumstances,~~ improve the average throughput per STA in a BSS by a factor of four, compared to VHT. [24124]

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24457 | 49.11 | 4.3.15a | As the resolution to CID 22217 indicates, and as supported by the many instances of the text only covering behaviour in those bands, HE STAs only operate in the 2.4, 5 and 6 GHz bands | Change "The IEEE 802.11 HE STA operates in frequency bands between 1 GHz and 7.125 GHz." to "An IEEE 802.11 HE STA can operate in the 2.4, 5 or 6 GHz band." | Rejected. The cited text is in the introduction clause and does not need to provide full technical details. The abstract of the 802.11ax spec uses the same wording for the supported bandwidth. It is better to keep the same language as in abstract. |

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| CID | Page.Line | Clause | Comment | Proposed change | Resolution  |
| 24458 | 49.14 | 4.3.15a | This is far too technical for Clause 4 and should be in Clause 26 | Move "An HE STA that is a mesh STA does not transmit and does not receive HE TB PPDUs." to 26.5.2.1 and change "does" to "shall" (2x) | Revised. Agree in principle with the comment TGax Editori please implement the changes related to CID24458 in submission 20/297r3.  |

**4.3.15a High efficiency (HE) STA**

TGax Editor, please make the changes as shown below.

The IEEE 802.11 HE STA operates in frequency bands between 1 GHz and 7.125 GHz.

~~An HE STA that is a mesh STA does not transmit and does not receive HE TB PPDUs.~~ [24458]

**26.5.2.1 General**

TGax Editor, please add the following sentence after the second paragraph

An HE STA that is a mesh STA shall not transmit and shall not receive HE TB PPDUs. [24458]