IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comment resolutions for 27.16.1 | | | | |
| Date: 2018-06-28 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Alfred Asterjadhi | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92109 | +1-858-658-5302 | aasterja@qti.qualcomm.com |
| Abhishek Patil | Qualcomm Inc. |  |  |  |
| George Cherian | Qualcomm Inc. |  |  |  |
| Matthew Fischer | Broadcomm LTD. |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes resolutions for multiple comments related to TGax D3.0 with the following CIDs (17 CIDs):

* 15120, 15121, 15122, 15166, 15414, 15415, 15416, 15829, 15832, 16039,
* 16074, 16227, 16251, 16444, 16446, 16690, 17090

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

***Editing instructions formatted like this are intended to be copied into the TGax 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.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 15120 | Abhishek Patil | 369.47 | Spec covers details on 2.4GHz and 5GHz operation but doesn't provide any guidance on the BSS operation in 6GHz | As in comment | Revised –  Agree in principle with the comment. Proposed resolution is to provide operation details for the 6 GHz band.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 15120. |
| 15121 | Abhishek Patil | 369.47 | Spec needs to provide rules on how a non-AP STA discovers and associates with a 6GHz BSS. Need details on how 6GHz BSS presence and configuration is advertised in 5/2.4G | As in comment | Revised –  Agree in principle with the comment. Proposed resolution is to provide operation details on how the non-AP STA can discover and associate with a 6 GHz AP, by either using passive scanning or active scanning, in either the 2.4/5 GHz band, or in the 6 GHz band when certain conditions are satisfied.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 15121. |
| 15122 | Abhishek Patil | 369.47 | Define 6GHz access rules in compliance with regulatory requirements | As in comment | Revised –  Agree in principle. Proposed resolution is to provide details for the access rules in the 6 GHz band, specifying that the STAs’ access to this greenfield band is controlled by the AP to which it intends to associate. This way the STAs do not end up transmitting during certain times at which other traffic is being exchanged.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 15122. |
| 15166 | Alfred Asterjadhi | 369.47 | HE BSS Operation needs some changes to enable 6 Ghz setup, operation, and everything that comes with it. Same consideration for the HE Operation element. And the HE Capabilities. | Will submit a proposal. | Revised –  Agree in principle with the comment. Proposed resolution is to provide operation details on how the non-AP STA can discover and associate with a 6 GHz AP, by either using passive scanning or active scanning, in either the 2.4/5 GHz band, or in the 6 GHz band when certain conditions are satisfied. And also provides additional details on the BSS setup, operation, and signaling for 6 GHz operation.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 15166. |
| 15414 | Amelia Andersdotter | 370.24 | "when either B0 or B1 of the Channel Width Set subfield of the HE Capabilities element is 1," should be "when either B0 or B1 of the Channel Width Set subfield of the HE Capabilities element is equal to 1," | As in comment. | Accepted |
| 15415 | Amelia Andersdotter | 370.26 | " the Supported Channel Width Set subfield of the HT Capabilities element is 0" should be " the Supported Channel Width Set subfield of the HT Capabilities element is set to 0" | As in comment. | Accepted |
| 15416 | Amelia Andersdotter | 370.30 | Conditional | Change "When" to "if" | Accepted |
| 15829 | Laurent Cariou | 369.47 | An HE BSS can operate at 6GHz. The description is missing in this subclause. | Specify how a STA determines channelization when operating at 6GHz | Revised –  Agree in principle with the comment. Proposed resolution is to provide operation details on how the non-AP STA can discover and associate with a 6 GHz AP, by either using passive scanning or active scanning, in either the 2.4/5 GHz band, or in the 6 GHz band when certain conditions are satisfied. And also provides additional details on the BSS setup, operation, and signaling for 6 GHz operation.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 15829. |
| 15832 | Laurent Cariou | 371.22 | a multi-band non-AP STA should be able to provide more capabilities about its collocated non-AP STA in another band (6GHz). The multi-band element is the current solution in 802.11 specification to describe a collocated STA, so this would be the natural solution. The multi-band element should however be modified to include an optional subelement field to be able to include capabilities and other information on 6GHz operation. | Modify multi-band element to include optional subelements field and defines normative text associated to its usage in 27.16.1 | Revised –  Agree in principle with the comment that the STA (both non-AP STA and AP) should be able to provide more capabilities of its co-located STA in the other band (6GHz in this case). This applies to other information as well, operation, restrictions, statistics etc).  Using the multi-band IE is an option, however it would require significant changes to the element (to its structure, so that it carries other elements, and other signaling) and potentially not cover all the cases.  In 11ax we have been using the neighbor report element which is naturally extensible for providing the list of elements for the additional band of operation (by simply adding the HE Operation element of the co-located AP). The Neighbor Report also addresses the neighbor signaling case and has already defined the operation on how to include these elements.  The only change needed for the case of co-location is to add a bit specifying that the report is for a co-located AP.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 15832. |
| 16039 | Mark RISON | 370.41 | " MCSs 8(n - 1) to 8(n - 1) + 7" should have explicit multiplication symbols | Insert a multiplication glyph after each "8" in the cited text at the referenced location | Accepted |
| 16074 | Mark RISON | 371.51 | The HE feedback fragmentation rules are in 27.6.3:  The HE compressed beamforming feedback shall be transmitted in a single HE Compressed Beamforming And CQI frame unless the size of the feedback results in an HE Compressed Beamforming And CQI frame that would exceed 11 454 octets, in which case the feedback shall be segmented as defined in 27.6.4 (Rules for generating segmented feedback).  An HE beamformer shall support a maximum MPDU length for HE Compressed beamforming feedback which is the minimum between 11 454 octets and the maximum length of the HE compressed beamforming feedback that the HE beamformer intends to solicit from its HE beamformees.  i.e. you fragment only if it's more than 11k, irrespective of the MPDU length capability of the BFer.  But it also says in 27.16.1:  An HE STA shall not transmit an MPDU in an HE PPDU to a STA that exceeds the maximum MPDU length capability indicated in the VHT Capabilities element received from the recipient STA  which contradicts this, in the case the max MPDU len is <11k and the feedback is >8k | At the end of the sentence containing the cited text in the referenced location insert ", excepf if it is an HE Compressed Beamforming And CQI frame" | Revised –  Agree with the comment. Added the exception as suggested.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 16074. |
| 16227 | Mark RISON | 369.47 | The VHT Operation Information field is not needed as a VHT Operation element will always be present in the same frame (Beacon etc.), per "A STA that sets dot11HEOptionImplemented to true shall set dot11VeryHighThroughputOptionImplemented and dot11HighThroughputOptionImplemented to true when operating in the 5 GHz band." | Delete all the text and figure components related to "VHT Operation Information" (including "VHT Operation Information Present) (14 instances) | Revised –  Disagree in principle with the comment. An HE AP can decide to not accept VHT STAs even if it implements VHT. To do so the HE AP can omit from including the VHT Operation element in the Beacon frames, in which case it needs to signal the Channel Width, Segment 0 and Segment 1 to its HE STAs. Having the VHT Operation Information present in the HE Operation element allows to do so. Proposed resolution clarifies this aspect for when this field is present.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 16227. |
| 16251 | Mark RISON | 371.56 | "An HE STA shall not transmit an A-MPDU in an HE PPDU to a STA that exceeds the maximum A-MPDU length capability indicated in the HE Capabilities, VHT Capabilities, and HT Capabilities element received from the recipient STA. The maximum A-MPDU length capability is obtained as a combination of the Max- imum A-MPDU Length Exponent subfields in the HE Capabilities and VHT Capabilities element if the recipient STA has transmitted the VHT Capabilities; otherwise it is obtained from a combination of the Maximum A-MPDU Length Exponent subfields in the HE Capabilities and the HT Capabilities element." has forgotten about the Maximum A-MPDU Length Exponent Extension field | Add a reference to the Maximum A-MPDU Length Exponent Extension field | Revised –  Agree with the comment. Proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 16251. |
| 16446 | Matthew Fischer | 371.27 | Missing a reference to 6 GHz operation. | Change "5 GHz" to "5 GHz or 6 GHz" | Revised –  Agree in principle with the comment. Proposed resolution is to include a statement that refers the reader to the subclause 27.16.2 where the channelization rules for the 6 GHz operation are defined.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 16446. |
| 16444 | Matthew Fischer | 579.17 | Given that a new protocol might be defined for the 5.940 band, it would be good to have some way to disable EDCA access by Tgax devices in this band to allow most efficient use of this new spectrum. | Add a signaling mechanism that allows future devices to disable EDCA in Tgax devices operating in channels referenced to 5.940 GHz | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested changes. By disabling EDCA the AP can beter manage the traffic in the BSS which is required for dealing with delay sensitive traffic which is very susceptible to uncontrolled transmissions.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 16444. |
| 16690 | Robert Stacey | 369.49 | The statement "A BSS started by an HE STA is an HE BSS" is not accurate and not aligned with definition of HE BSS in 3.2. The definition in 3.2 also has problems: remove "transmited by an HE STA" since it is not relavant (how does another device know whether or not the transmitter is an HE STA?) | Change statement to "An HE BSS is a BSS in which the Beacon frames include an HE Operation element" and remove the definition from 3.2 | Revised –  Agree in principle with the comment. Proposed resolution is to include a statement as suggested. However, keeping the statement that an HE BSS is started by an HE STA. Also keeping the definition, since it was requested by a commenter in the past CR, and amended it as suggested in the comment.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 16690. |
| 17090 | Youhan Kim | 370.46 | "An HE AP or an HE mesh STA shall set the VHT Operation Information Present field in the HE Operation element to 0 if dot11VeryHighThroughputOptionImplemented is false". But VHT Operation element must be used to signal the channel center frequency even if VHT is not implemented. | Clarify that VHT Operation element must always be present (whether inside or outside of HE Operation element) for HE operations. | Revised –  Agree in principle with the comment. Proposed resolution clarifies these two cases. In general, the VHT Operation element is not present in the 2.4 and 6 GHz case. And the VHT Operation Information field is present only in the 5 GHz when the VHT Operation element is not present in the frame carrying the HE Operation element.  TGax editor to make the changes shown in 11-18/1211r0 under all headings that include CID 17090. |

**Discussion: *…***

**3.2 Definitions specific to IEEE 802.11**

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16690):***

**high Efficiency (HE) basic service set (BSS):** The BSS indicated in a Beacon frame that contains an HE Operation element is an HE BSS. *(#16690)*

**9.4.2.237.3 HE PHY Capabilities Information field**

**TGax Editor: *Replace “Reserved” with “6 GHz Support” in bit B0 of the HE PHY Capabilities Information field.***

**TGax Editor: *Insert the following row as the first row of Table 9-262aa (Subfields of the HE PHY Capabilities Information field):***

|  |  |  |
| --- | --- | --- |
| 6 GHz Support | Indicates support for 6 GHz operation. | Set to 0 if not supported(#12674).  Set to 1 if supported.*(#15120)* |

* HE Operation element

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 15120, 15121, 15166, 15829, 15832)):***

The operation of HE STAs in an HE BSS is controlled by the HT Operation element, the VHT Operation element and the HE Operation element. The format of the HE Operation element is defined in Figure 9-589cq (HE Operation element format).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | HE Operation Parameters | BSS Color Information | Basic HE-MCS And NSS Set | VHT Operation Information | Max Co-Located BSSID Indicator(#11742) | 6 GHz Operation Information |
| Octets: | 1 | 1 | 1 | 3(#11374) | 1(#11374) | 2 | 0 or 3 | 0 or 1 | 0 or 4 |
| HE Operation element format | | | | | | | | | |

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The format of the HE Operation Parameters field is defined in Figure 9-589cr (HE Operation Parameters field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0       B2 | B3 | B4      B13 | B14 | B15 | B16 | B17 | B18     B23 |
|  | Default PE Duration | TWT Required | TXOP Duration RTS Threshold | VHT Operation Information Present | Co-Located BSS(#11742) | ER SU Disable(#11261) | 6 GHz Present | Reserved |
| Bits: | 3 | 1 | 10 | 1 | 1 | 1 | 1 | 6(#11374) |
| * HE Operation Parameters field format | | | | | | | | |

The Default PE Duration subfield indicates the Packet Extension (PE) field duration in units of 4 μs for an HE TB PPDU that is solicited with a TRS Control subfield(#13136) and its use is(#11062) defined in 27.5.3.3 (STA behavior for UL MU operation). Values 5-7 of the Default PE Duration subfield are reserved.

The TWT Required subfield is set to 1 to indicate that the AP requires its associated non-AP HE STAs that have declared support for TWT (by setting any one of TWT Requester Support or TWT Responder Support or Broadcast TWT Support subfield in HE Capabilities element that it transmits to 1)(#11024) to operate in the role of either TWT requesting STA, as described 27.7.2 (Individual TWT agreements), or TWT scheduled STA, as described in 27.7.3 (Broadcast TWT operation) and set to 0 otherwise.

The TXOP Duration RTS Threshold subfield enables an HE AP to manage RTS/CTS usage by non-AP HE STAs that are associated with it (see 27.2.1 (TXOP duration-based RTS/CTS)). The TXOP Duration RTS Threshold subfield contains the TXOP duration RTS threshold in units of 32 s, which enables the use of RTS/CTS except for the value 1023. The value 1023 indicates that TXOP duration-based RTS is disabled.

The VHT Operation Information Present subfield(#11883) is set to 1 to indicate that the VHT Operation Information field is present in the HE Operation element and set to 0 otherwise. The field is set to 0 if the frame containing this element also contains a VHT Operation element.

The Co-Located BSS subfield(#Ed) is set to 1 to indicate that the AP transmitting this element shares the same operating class, channel and antenna connectors with at least one other BSS and is set to 0 otherwise. A TDLS STA, IBSS STA or mesh STA transmitting this element sets the subfield to 0.

The ER SU Disable subfield indicates whether 242-tone HE ER SU PPDU reception is disabled or enabled by the AP. The ER SU Disable subfield is set to 1 to indicate that 242-tone HE ER SU PPDU reception is disabled and set to 0 to indicate that 242-tone HE ER SU PPDU reception is enabled.(#11261)

The 6 GHz Present field indicates whether 6 GHz operation is enabled at the AP transmitting this element. The 6 GHz Present field is set to 1 if 6 GHz operation is enabled and set to 0 if 6 Ghz operation is disabled or not supported. *(#15120, 15121, 15166, 15829, 15832)*

The BSS Color Information field is defined in Figure 9-589cs (BSS Color Information field).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0         B5 | B6 | B7 |
|  | BSS Color | Partial BSS Color | BSS Color Disabled |
| Bits: | 6 | 1 | 1 |
| * BSS Color Information field | | | |

The BSS Color subfield is an unsigned integer whose value is the BSS Color of the BSS corresponding to the AP, IBSS STA, mesh STA or TDLS STA that transmitted this element and is set as defined in 27.11.4 (BSS\_COLOR).

The Partial BSS Color subfield is set to 1 to indicate that an AID assignment rule based on the BSS color as defined in 27.16.3 (AID assignment) is applied for the BSS. Otherwise, the Partial BSS Color subfield is set to 0.

An HE STA that transmits an HE Operation element sets the BSS Color Disabled subfield to 1 if the HE STA decides to temporarily disable the use of color for the BSS to which it belongs, for example, after detecting a BSS Color overlap in the neighborhood as described in 27.11.4 (BSS\_COLOR); otherwise the HE STA sets the BSS Color Disabled subfield to 0.(#11374)(#12426)

NOTE—While the BSS Color Disabled subfield is set to 1, an HE STA continues to advertise a nonzero value in the BSS Color subfield.(#11547, #13010, #11867)

The Basic HE-MCS And NSS Set field indicates the HE-MCSs for each number of spatial streams in HE PPDUs that are supported by all HE STAs in the BSS (including IBSS and MBSS) in transmit and receive. The Basic HE-MCS And NSS Set field is defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field).

The structure of the VHT Operation Information field is defined in Figure 9-564 (VHT Operation Information field) and its subfields are as defined in Table 9-252 (VHT Operation Information subfields). The VHT Operation Information field is present if the VHT Operation Info Present field is 1; otherwise not present.

(#11742)The Max Co-Located BSSID Indicator field contains a value assigned to *n*, where 2*n* is the maximum number of BSSIDs in the co-located BSSID set as defined in 27.16.6 (Co-located BSSID set). This field is present if the Co-Located BSS subfield in HE Operation Parameters field is set to 1 and is not present otherwise.

NOTE—The Max Co-Located BSSID Indicator field doesn't provide the exact number or the identity of each co-located BSSIDs.

The 6 GHz Operation Information field is present when the 6 GHz Present field is 1 and provides channel and bandwidth information related to 6 GHz operation (see X.Y (6 GHz channelization). The structure of the 6 GHz Operation Information field is defined in Figure 9-XXX (6 GHz Operation Information field).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Primary Channel | Channel Control | Channel Center Frequency Segment 0 | Channel Center Frequency Segment 1 |
| Octets: | 1 | 1 | 1 | 1 |
| Figure 9-XXX 6 GHz Operation Information field | | | | | |

The Primary Channel field indicates the channel number of the primary channel in the 6 GHz band.The Channel Control field contains the Channel Width field and the Pre-Association Access field.

The Channel Width field is 4 bits in length and indicates the BSS bandwidth and is set to 0 for 20 MHz, 1 for 40 MHz, 2 for 80 MHz, and 3 for 80+80 or 160 MHz; other values of this field are reserved.

The Pre-Association Access field is 4 bits in length and indicates access rules for pre-association exchanges and is set to 0 if EDCA-based pre-association exchanges are not allowed in the 6 GHz band, set to 1 if EDCA-based preassociation exchanges are allowed in the 6 GHz band; other values of this field are reserved.

The Channel Center Frequency Segment 0 field indicates the channel center frequency for 20, 40, 80, 80+80, 160 MHz HE BSS widths.

The Channel Center Frequency Segment 1 field indicates the channel center frequency for the secondary 80 MHz channel of an 80+80 or 160 MHz HE BSS and is set to 0 for a 20, 40, or 80 MHz BSS.*(#15120, 15121, 15166, 15829, 15832)*

* HE BSS operation
* Basic HE BSS functionality

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16690):***

An HE BSS is a BSS started by an HE STA. Beacon frames generated within an HE BSS contain an HE Operation element. *(#16690)* (#13670)

An HE STA has dot11HEOptionImplemented equal to true.

A STA that is starting an HE BSS shall be able to receive and transmit at each of the <HE-MCS, NSS> tuple values indicated by the Basic HE-MCS And NSS Set field of the HE Operation parameter of the MLME-START.request primitive and shall be able to receive at each of the <HE-MCS, NSS> tuple values indicated by the Supported HE-MCS and NSS Set field of the HE Capabilities parameter of the MLME-START.request primitive. The basic HE-MCS and NSS set is the set of <HE-MCS, NSS> tuples that are supported by all HE STAs that are members of an HE BSS. It is established by the STA that starts the HE BSS, indicated by the Basic HE-MCS And NSS Set field of the HE Operation parameter in the MLME-START.request primitive. Other HE STAs determine the basic HE-MCS and NSS set from the Basic HE-MCS And NSS Set field of the HE Operation element in the BSSDescription derived through the scan mechanism (see 11.1.4.1 (General)).

An HE STA shall not attempt to join (MLME-JOIN.request primitive) a BSS unless it supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples in the basic HE-MCS and NSS set.

NOTE—An HE STA does not attempt to (re)associate with an HE AP unless the STA supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples in the Basic HE-MCS And NSS Set field in the HE Operation element transmitted by the AP because the MLME-JOIN.request primitive is a necessary precursor to (re)association.

A STA that sets dot11HEOptionImplemented to true shall set dot11HighThroughputOptionImplemented to true when operating in the 2.4 GHz band. A STA that sets dot11HEOptionImplemented to true shall set dot11VeryHighThroughputOptionImplemented and dot11HighThroughputOptionImplemented to true when operating in the 5 GHz band. A non-AP STA that sets dot11HEOptionImplemented to true shall set dot11MultiBSSIDImplemented to true.

A STA that is an HE AP or an HE mesh STA declares its channel width capability in the HE Capabilities element as described in Table 9-262aa (Subfields of the HE PHY Capabilities Information field). If the STA is an HE AP then it shall indicate support for at least 80 MHz channel width if it operates in 5 GHz; otherwise it may indicate any channel width support.

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 15416, 15415, 15414):***

A STA transmitting an HT Capabilities element and HE Capabilities element shall set the Supported Channel Width Set subfield of the HT Capabilities element to 1 when either B0 or B1 of the Channel Width Set subfield of the HE Capabilities element is equal to 1, except when the STA is a 20 MHz-only non-AP HE STA in which case the Supported Channel Width Set subfield of the HT Capabilities element is set to 0. A STA transmitting a VHT Capabilities element and HE Capabilities element shall set the Supported Channel Width Set subfield of the VHT Capabilities element to a value that indicates the same channel width capability as the channel width capability indicated in the HE Capabilities element, except if the STA is a 20 MHz-only non-AP HE STA in which case the Supported Channel Width Set subfield of the VHT Capabilities element is reserved.*(#15416, 15415, 15414)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16039):***

At a minimum, an HE STA sets the Rx MCS Bitmask subfield of the Supported MCS Set field of its HT Capabilities element according to the setting of each Rx HE-MCS Map For *b* subfield, *b*  { 80 MHz, 160 MHz, 80+80 MHz}, of the Supported HE-MCS And NSS Set field of its HE Capabilities element as follows: for each Max HE-MCS For *n* SS subfield, 1  *n*  4, of each Rx HE-MCS Map For *b* subfield, *b*  { 80 MHz, 160 MHz, 80+80 MHz}, with a value other than 3 (no support for that number of spatial streams), the STA shall indicate support for MCSs 8x(*n*– 1) to 8x(*n*– 1) + 7 in the Rx MCS Bitmask subfield, where *n* is the number of spatial streams, except for those MCSs marked as unsupported as described in 27.15.4.3 (Additional rate selection constraints for HE PPDUs). *(#16039)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 17090, 16227):***

An HE AP or an HE mesh STA shall set the VHT Operation Information Present field in the HE Operation element to 0 if a VHT Operation element is present in the frame that carries the HE Operation element or if the frame that carries the HE Operation element is sent in the 2.4 GHz or 6 GHz band. An HE AP or an HE mesh STA shall set the VHT Operation Information Present field in the HE Operation element to 1 if a VHT Operation element is not present in the frame that carries the HE Operation element and the frame is sent in the 5 GHz band.*(#17090, 16227)*

A STA that is an HE AP or an HE mesh STA that transmits an HE Operation element that has the VHT Operation Information Present field set to 1 shall do one of the following to set the BSS operating channel:

* Set the STA Channel Width subfield and Channel Center Frequency Segment 2 subfield in the HT Operation Information field in the HT Operation element, the Channel Width subfield in the VHT Operation Information field in the HE Operation element, the Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields in the VHT Operation Information field in the HE Operation element to indicate the BSS bandwidth as defined in Table 11-24 (VHT BSS bandwidth) and Table 11-26 (Extended NSS channel width) respectively based on the Extended NSS BW Support and Supported Channel Width Set fields.
* Set the STA Channel Width subfield and Channel Center Frequency Segment 2 subfield in the HT Operation Information field in the HT Operation element, the Channel Width subfield in the VHT Operation Information field in the HE Operation element, the Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields in the VHT Operation Information field in the HE Operation element to indicate the BSS bandwidth as defined in Table 11-24 (VHT BSS bandwidth) and Table 11-26 (Extended NSS channel width) respectively based on the Rx HE-MCS Map  80 MHz, Rx HE-MCS Map 160 MHz, and Rx HE-MCS Map 80+80 MHz fields.

NOTE 1—The Channel Center Frequency Segment 2 is 0 if Table 11-24 (VHT BSS bandwidth) is applied.

NOTE 2—These two methods give the same result.(18/795r2)

The setting of the Channel Center Frequency Segment 0, Channel Center Frequency Segment 1 and Channel Center Frequency Segment 2 subfields is shown in Table 11-25 (Setting of Channel Center Frequency Segment 0, Channel Center Frequency Segment 1 and Channel Center Frequency Segment 2 subfields), except that the Max NSS support is provided by the HE STA in frames that contain an HE Capabilities element (see 9.4.2.237 (HE Capabilities element)) and an Operating Mode field (see 9.2.4.6.4.3 (Operating Mode) and 9.4.1.53 (Operating Mode field)), wherein in the table the Max NSS support refers to the HE Max NSS support instead of the VHT Max NSS support for an HE STA.

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16446):***

An HE STA shall determine the channelization using the information in the Primary Channel field of the HT Operation element when operating in 2.4 GHz and the combination of the information in the Primary Channel field in the HT Operation element and the Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields in the VHT Operation Information field in the VHT Operation element when operating in 5 GHz (see 21.3.14 (Channelization. An HE STA determines the channelization as defined in 27.16.2 when operating in 6 GHz.*(#16446)*

An HE AP or an HE mesh STA shall set the Secondary Channel Offset subfield in the HT Operation Information field in the HT Operation element to indicate the secondary 20 MHz channel as defined in Table 9-168 (HT Operation element fields and subfields), if the BSS bandwidth is more than 20 MHz.

An HE STA that is a member of an HE BSS shall follow the same rules that are defined in 11.40.1 (Basic VHT BSS functionality) when transmitting a 20 MHz, 40 MHz, 80 MHz, 160 MHz or 80+80 MHz HE PPDUs with the following exceptions:

* An HE TB PPDU sent in response to a Trigger frame or a frame with a TRS Control subfield(#13136)(#14137) follows the rules defined in 27.5.3.3 (STA behavior for UL MU operation).
* An 80 MHz, 160 MHz or 80+80 MHz DL HE MU PPDU with preamble puncturing may be transmitted if the primary 20 MHz or the primary 40 MHz are occupied by the transmission and certain 20 MHz subchannels of the secondary channel are idle (see Table 28-19 (HE-SIG-A field of an HE MU PPDU) and 10.22.2.5 (EDCA channel access in VHT, HE, or TVHT BSS)).(#12581)

An HE STA shall not transmit to a second HE STA using a bandwidth that is not indicated as supported in the Channel Width Set subfield in the HE Capabilities element received from that HE STA.

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16074):***

An HE STA shall not transmit an MPDU in an HE PPDU to a STA that exceeds the maximum MPDU length capability indicated in the VHT Capabilities element received from the recipient STA or that exceeds the Maximum A-MSDU Length in the HT Capabilities element received from the recipient STA unless the MPDU is an HE Compressed Beamforming And CQI frame. *(#16074)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16251):***

An HE STA shall not transmit an A-MPDU in an HE PPDU to a STA that exceeds the maximum A-MPDU length capability indicated in the HE Capabilities, VHT Capabilities, and HT Capabilities element received from the recipient STA. The maximum A-MPDU length capability is obtained as a combination of the Maximum A-MPDU Length Exponent Extension subfield in the HE Capabilities element and the Maximum A-MPDU Length Exponent subfield in the VHT Capabilities element if the recipient STA has transmitted the VHT Capabilities element; otherwise it is obtained from a combination of the Maximum A-MPDU Length Exponent Extension subfield in the HE Capabilities element and the Maximum A-MPDU Length Exponent subfield in the HT Capabilities element. *(#16251)*

An HE AP shall set the RIFS Mode field in the HT Operation element to 0.

An HE STA shall follow the rules defined in 11.40 (VHT BSS operation) for channel selection, determining scanning requirements, channel switching, NAV assertion and antenna indication when operating in 5 GHz unless explicitly stated otherwise in Clause 27.

An HE STA shall follow the rules defined in 11.16 (20/40 MHz BSS operation) for channel selection, determining scanning requirements, channel switching, NAV assertion when operating in 2.4 GHz unless explicitly stated otherwise in Clause 27.

An HE AP corresponding to the ER BSS shall not respond to the Probe Request or (Re)Association Request frames sent from a non-HT STA, or an HE STA that does not support Partial Band Extended Range capability if the HE AP transmits ER Beacon in HE ER SU PPDU(#12599) with 106-tone RU. An HE AP that is not operating an ER BSS may set the ER SU Disable subfield in the HE Operation element it transmits to 1.(#11261)

A STA shall have the same value of maximum VHT NSS defined by its Rx HE-MCS Map For  80 MHz field in the HE Capabilities element as the maximum NSS value indicated by its Rx VHT-MCS Map field in the VHT Capabilities element. If a STA supports 160 MHz, the Maximum NSS defined by its Rx VHT-MCS Map field and Extended NSS BW Support field in the VHT Capabilities element at 160 MHz shall not be more than the maximum NSS defined by its Rx HE-MCS Map For 160 MHz field in the HE Capabilities element at 160 MHz. If a STA supports 80+80 MHz, the maximum NSS defined by its Rx VHT-MCS Map field and Extended NSS BW Support field in the VHT Capabilities element at 80+80 MHz shall not be more than the maximum NSS defined by its Rx HE-MCS Map For 80+80 MHz field in the HE Capabilities element at 80+80 MHz. For every NSS in VHT Capabilities elements and HE Capabilities elements transmitted by a STA, if the maximum HE-MCS is 9 or more, the maximal VHT-MCS shall be 9. Otherwise the maximal VHT-MCS shall be the same as the HE-MCS. An HE STA shall not transmit a VHT Capabilities element with the Supported Channel Width Set field equal to 1 and the Extended NSS BW Support field equal to 3 or with the Supported Channel Width Set field equal to 2 and the Extended NSS BW Support field equal to 3.

If an HE STA supports 160 MHz, the maximum NSS defined by its Rx HE-MCS Map field for an HE-MCS in the HE Capabilities element at 160 MHz shall not be more than the maximum NSS defined by its Rx HE-MCS Map field for the HE-MCS in the HE Capabilities element at 80 MHz.

If an HE STA supports 80+80 MHz, the maximum NSS defined by its Rx HE-MCS Map field for an HE-MCS in the HE Capabilities element at 80+80 MHz shall not be more than the maximum NSS defined by its Rx HE-MCS Map field for the HE-MCS in the HE Capabilities element at 80 MHz.

**TGax Editor: *Insert a new subclause as follows (#CID 15120, 15121, 15166, 15829, 15832, 15122):***

27.16.1a HE BSS functionality in 6 GHz band

A BSS started by an HE STA in the 6 GHz band is a 6G HE BSS.

A STA that is starting a 6G HE BSS shall be able to receive and transmit at each of the <HE-MCS, NSS> tuple values defined in 27.16.1.

(#13670)A HE STA that has a value of true for dot11HE6GOptionImplemented is capable of operation in the 6 GHz band. An HE STA that has a value of true for dot11HE6GOptionImplemented shall set the 6 GHz Support subfield to 1 in the HE Capabilities elements it transmits; otherwise the subfield shall be set to 0.

An HE STA shall not attempt to join (MLME-JOIN.request primitive) a 6G HE BSS unless it supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples indicated by the AP in the basic HE-MCS and NSS set.

**DISCUSSION: AP has the same BW requirement for both 5 GHz and 6 GHz.**

An HE AP shall indicate support for at least 80 MHz channel width if it is operating in the 6 GHz band.

**DISCUSSION: Only HE operation (and beyond) is allowed in the 6 GHz band. As such HT Operation and VHT Operation elements are not allowed to be included in MGMT frames sent in the 6 GHz band.**

A STA shall not transmit HT Operation, and VHT Operation elements while operating in the 6 GHz band.

An HE AP or an HE mesh STA that operates in the 6 GHz band shall set the 6 GHz Present field to 1 in the HE Operation elements it transmits. The HE AP or HE mesh STA shall set the Channel Width subfield, the Channel Center Frequency Segment 0, and the Channel Center Frequency Segment 1 subfields of the 6 GHz Operation Information field as defined in Table XX-YY (6 GHz HE BSS bandwidth), based on the Rx HE-MCS Map  80 MHz, Rx HE-MCS Map 160 MHz, and Rx HE-MCS Map 80+80 MHz fields.

|  |  |  |
| --- | --- | --- |
| Table XX-YY--6 GHz HE (#6508)BSS bandwidth(11ac) | | |
| 6 GHz Operation Information Channel Width field | 6 GHz Operation Information Center Frequency Segment 1 subfield (Ed)(M188) | (#6508)BSS bandwidth |
| 0 | 0 | 20 MHz |
| 1 | 0 | 40 MHz |
| 2 | 0 | 80 MHz |
| (M188)  3 | CCFS1 > 0 and | CCFS1 - CCFS0 | = 8 | 160 MHz |
| (M188)  3 | CCFS1 > 0 and | CCFS1 - CCFS0 | > 16 | 80+80 MHz |
| NOTE 1—CCFS0 represents the value of the Channel Center Frequency Segment 0 subfield.  NOTE 2—CCFS1 represents the value of the Channel Center Frequency Segment 1 subfield. | | |

An HE STA shall determine the BSS channelization using the information in the Primary Channel field in the 6 GHz Operation Information field in the HE Operation element when operating in 6 GHz (see 28.3.22.2 (Channel allocation in the 6 GHz band)).

**DISCUSSION: Active scanning in the 6 Ghz band is always done using individually addressed Probe Request frames and is controlled by the AP so that the impact of uncontrolled access to the BSS operation is limited. The STA can perform active scanning (and in general send pre-association frames) in 1) 2.4 or 5 GHz band, 2) in response to Trigger frame for random access, 3) in certain intervals of time explicitly indicated by AP (currently TBD). By controlling the access of the STAs the AP can better manage delay sensitive traffic, since 6 GHz band is greenfield.**

An HE STA shall not perform active scanning in the 6 GHz band unless explicitly allowed by the AP to which the STA intends to associate. The AP indicates its pre-association access rules in the Pre-Association Access field of its HE Operation element.

An HE STA shall not transmit broadcast Probe Request frames in the 6 GHz band.An HE STA shall not transmit HT PPDUs in the 6 GHz band.An HE STA shall not transmit VHT PPDUs in the 6 GHz band.NOTE: An HE STA that intends to associate with an HE AP operating in the 6 GHz band that does not allow active scanning using EDCA in the 6 GHz band can perform active scanning in the 2.4 GHz and/or 5 GHz band.

An HE STA that supports 6 GHz operation shall set the 6 GHz Support field to 1 in the HE Capabilities element contained in Management frames that it transmits during active scanning.

**DISCUSSION: An HE AP uses Neighbor Report element to advertise 6 GHz operation details of its co-located AP and the 6 GHz operation details of other neighboring APs.**

An HE AP which transmits a value of 1 in the 6 GHz Enabled field in the HE Operation element and that receives a Management frame in the 2.4 and/or 5 GHz band that contains an HE Capabilities element with the 6 GHz Support field equal to 1, shall include in the Management frame that it transmits in response, at least one Neighbor Report element that contains information regarding 6 GHz operation. The AP shall set the Co-Located field to 1 in the Neighbor Report element if the 6 GHz AP is a co-located AP, and otherwise shall set it to 0. Elements specific to the 6 GHz AP may be carried in the Optional Subelements field of the Neighbor Report element.

An HE STA may perform passive scanning in the 6 GHz band. The HE STA should scan channels that are indicated in the 6 GHz Primary Channel fields of HE Operation elements received in the 2.4 and/or 5 GHz bands.

**DISCUSSION: An HE STA shall support baseline transmit power control when operating in the 6 GHz band.**

An HE STA that intends to operate in the 6 GHz band shall set dot11SpectrumManagementRequired to true and shall operate according to the rules defined in 11.8 (TPC procedures).*(#15120, 15121, 15166, 15829, 15832, 15122)*

**9.4.2.240 MU EDCA Parameter Set element**

The format of the ACI/AIFSN field is defined in Figure 9-262 (ACI/AIFSN field) and the encoding of its subfields is defined in 9.4.2.29 (EDCA Parameter Set element), except that the value 0 in the AIFSN field indicates that EDCA is disabled for the duration specified by the MUEDCATimer for the corresponding AC.

**9.4.2.29 EDCA Parameter Set element**

**DISCUSSION: Use of AIFSN value of 0 in the EDCA Parameter Set to indicate that EDCA is disabled for that AC.**

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 16444):***

The value of the AC index (ACI) references the AC to which all parameters in this record correspond. The mapping between ACI and AC is defined in Table 9-136. The ACM (admission control mandatory) subfield indicates that admission control is required for the AC. If the ACM subfield is equal to 0, then there is no admission control for the corresponding AC. If the ACM subfield is set to 1, admission control has to be used prior to transmission using the access parameters specified for this AC. The AIFSN subfield indicates the number of slots after a SIFS a STA defers before either invoking a backoff or starting a transmission, except that the value 0 in the AIFSN field indicates that EDCA is disabled for the corresponding AC in the 6 GHz band.*(#16444)*

* **Neighbor Report element**

***TGax Editor: Please make the following changes to this section (11ax D2.0 P120L45):***

Change Figure 9-296 (BSSID Information field) as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | | B2 | B3 | B4 B9 | B10 | B11 | B12 | B13 | B14 | B15 | B16 | B1~~4~~7 B31 |
|  | AP Reachability | | Security | Key Scope | Capabilities | Mobility  Domain | High Throughput | Very High Throughput | FTM | High Efficiency | ER BSS | Co-Located | Reserved |
| Bits: | 2 | | 1 | 1 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 15 |
|  | | **Figure 9-296 – BSSID Information field** | | | | | | | | | | | |

***Insert the following after the paragraph beginning “The FTM field...”:***

The High Efficiency subfield is set to 1 to indicate that the AP represented by this BSSID is an HE AP and that the HE Capabilities element, if included as a subelement in the report, is identical in content to the HE Capabilities element included in the AP's Beacon frame. Otherwise the High Efficiency subfield is set to 0.

When the High Efficiency subfield is 1 the ER BSS subfield is set to 1 to indicate that the BSS corresponding to the HE AP representing this BSSID is an extended range BSS (see 27.16.5 (ER Beacon Generation in an ER BSS)). Otherwise the ER BSS subfield is set to 0.

The Co-Located subfield is set to 1 to indicate the AP represented by this BSSID is co-located with the reporting AP. Otherwise the Co-Located subfield is set to 0. *(#15120, 15121, 15166, 15829, 15832)*

Delete the paragraph “Bits 14-31 are reserved.”