IEEE P802.11
Wireless LANs

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| Comment resolutions for HE BSS operation |
| Date: 2019-03-01 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D4.0 with the following CIDs (6 CIDs):

* 20126, 20347, 20348, 20905, 21268,
* 21493

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: CIDs 20240, 21269, 21270, 21272, 21275, 21277, 21279 are deferred and will be addressed subsequently.

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.***

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 20126 | Alfred Asterjadhi | 429.05 | This last sentence is applicable only for the 6 GHz band. Add " the 6 GHz band". | As in comment. | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested change.TGax editor to make the changes shown in 11-19/0302r1 under all headings that include CID 20126. |
|  |  |  |  |  |  |
| 20347 | kaiying Lv | 427.12 | 80 MHz is mandatory in 6GHz band. Add the case for 6GHz. | Change to "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 or 6GHz; otherwise it may indicate any channel width support." | Rejected –This requirement is already stated in subclause 26.17.2.1 (General). “An HE AP operating in the 6 GHz band shall indicate support for at least 80 MHz channel width.”Adding it here would be a duplication. |
| 20348 | kaiying Lv | 427.46 | VHT Operation is not supported in the 6GHz. | Change to: "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 band or 6GHz band." | Revised –Agree in principle with the comment. However, we already specify this requirement in clause 26.17.2.1. Proposed resolution is to make it explicitly clear that it is the HE Operation element that contains the VHT Operation Information field.TGax editor to make the changes shown in 11-19/0302r1 under all headings that include CID 20348. |
| 20905 | Mark RISON | 428.46 | "An HE STA shall not transmit an MPDU in an HE PPDU to a STA that exceeds the maximum MPDUlength capability indicated in the VHT Capabilities element received from the recipient STA or, if a VHTCapabilities element is not received, that exceeds the Maximum A-MSDU Length in the HT Capabilitieselement received from the recipient STA unless the MPDU is an HE Compressed Beamforming/CQI frame(see 26.7.3 (Rules for HE sounding protocol sequences))." -- (a) should be about STAs generally, for forward-compatibility (see baseline) (b) not clear how A-MSDU length relates to MPDU length (c) precedence of "unless" unclear | Change the cited text at the referenced location to "An STA shall not transmit in an HE PPDU an MPDU other than an HE Compressed Beamforming/CQI frame(see 26.7.3 (Rules for HE sounding protocol sequences)) that exceeds the maximum MPDUlength capability indicated in the VHT Capabilities element received from the recipient STA or, if a VHTCapabilities element was not received from that STA, that exceeds the maximum A-MSDU length capability indicated in the HT Capabilitieselement received from that STA.NOTE---The maximum A-MSDU length is not added to to account for the MAC header length." | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested changes except for point b) that allegedly identifies as not clear how A-MSDU length relates to MPDU length. Please note that the MPDU is the container of the A-MSDU. As such the relationship between the two is straightforward. MPDU length minus MAC header and minus FCS is the A-MSDU length.TGax editor to make the changes shown in 11-19/0302r1 under all headings that include CID 20905. |
| 21268 | Robert Stacey | 426.39 | HE BSS definition is inconsistent with definition at 38.22. It is also inaccurate since it implies that an IBSS is an HE BSS if the first STA to start beaconing is an HE STA. The 3.2 definition is more accurate. | Remove "An HE BSS is a BSS started by an HE STA" | Accepted |
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| 21493 | Xiaofei Wang | 429.03 | Is a HE STA always mandated to follow the ruled defined in 26.17.2 for scanning or should the STA only follow the rules for scanning if it wants to operate in the 6GHz band? Please clarify | please clarify | Revised –Agree in principle with the comment. Proposed resolution clarifies this aspect by specifying that they are applicable if the STA wants to operate in the 6 GHz band.TGax editor to make the changes shown in 11-19/0302r1 under all headings that include CID 21493. |

**Discussion: *None***

* HE BSS operation
* Basic HE BSS operation(#Ed)

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21268):***

The Beacon frames generated within an HE BSS contain an HE Operation element.*(#21268)* (#16690)

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 sets dot11HEOptionImplemented to true shall set dot11VeryHighThroughputOptionImplemented and dot11HighThroughputOptionImplemented to false if operating in the 6 GHz band.(#16446, #15824)

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 9-321b (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.

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 if(#Ed) either B0 or B1 of the Supported Channel Width Set subfield of the HE Capabilities element is set to 1(#15414) unless(#Ed) 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(#15415).

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 indicate the same channel width as indicated(#Ed) in the HE Capabilities element unless(#15416) 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.

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 8× (*n*– 1) to 8× (*n*– 1) + 7(#16039) in the Rx MCS Bitmask subfield, where *n* is the number of spatial streams, except for those MCSs marked as unsupported as described in 26.15.4.3 (Additional rate selection constraints for HE PPDUs).

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 band. An HE AP or 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.

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 9.4.2.242 (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.

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 if operating in the 5 GHz band (see 21.3.14 (Channelization)). An HE STA determines the channelization as defined in 26.17.2 (HE BSS operation in the 6 GHz band) if operating in the 6 GHz band.(#16446, #15824)

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 follows the rules defined in 26.5.3.3 (Non-AP 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 27-20 (HE-SIG-A field of an HE MU PPDU) and 10.22.2.5 (EDCA channel access in VHT, HE, or TVHT BSS)).

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

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20905):***

An STA shall not transmit in an HE PPDU an MPDU other than an HE Compressed Beamforming/CQI frame (see 26.7.3(Rules for HE sounding protocol sequences)) that exceeds the maximum MPDU length capability indicated in the VHT Capabilities element received from the recipient STA or, if a VHT Capabilities element is not received from that STA,(#16367) that exceeds the maximum A-MSDU length capability indicated in the HT Capabilities element received from that STA(#16074).*(#20905)*

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 elements received from the recipient STA. If a VHT Capabilities element is received from the recipient STA, then the maximum A-MPDU length capability is derived from the Maximum A-MPDU Length Exponent Extension subfield in the HE Capabilities and the Maximum A-MPDU Length Exponent subfield in the VHT Capabilities element. Otherwise the maximum A-MPDU length capability is derived from the Maximum A-MPDU Length Exponent subfields 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.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20126, 21493):***

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 26. An HE STA shall additionally follow the rules defined in 26.17.2 (HE BSS operation in the 6 GHz band) for scanning and operating in the 6 GHz band.*(#20126, 21493)*

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 26.

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 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.

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.

**26.17.2 HE BSS operation in the 6 GHz band**

**26.17.2.1 General**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20348):***

A 6 GHz HE STA shall not transmit an HT Capabilities element, VHT Capabilities element, HT Operation element, VHT Operation element or an HE Operation element that contains a VHT Operation Information field.*(#20348)*

**26.15.3 MCS, NSS, BW and DCM selection**

An HE STA shall follow the rules defined in 10.7 (Multirate support) and 26.15.4 (Rate selection constraints for HE STAs) for selecting the rate, MCS, NSS, and the rules defined in 10.3.2.6 (VHT RTS procedure), 10.3.2.7 (CTS and DMG CTS procedure), 10.7.6.6 (Channel Width selection for Control frames) and 10.7.11 (Channel Width in non-HT and non-HT duplicate PPDUs) for selecting the channel width (BW) of transmitted PPDUs with the following exceptions:

* MCS, NSS, and BW selection for an HE TB PPDU are defined in 26.5.3.3 (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 26.2.6 (MU-RTS Trigger/CTS frame exchange procedure)
* A STA that transmits a Control frame carried in a non-HT PPDU that is a response to a frame received in an HE ER SU PPDU shall set the rate of the non-HT PPDU to 6 Mb/s.
* A STA that transmits a Control frame that is an S-MPDU carried in an HE ER SU PPDU and that is a response to a frame received in an HE ER SU PPDU shall use the <HE-MCS, NSS> tuple <MCS 0, 1>.
* NSS and BW selection is further constrained as defined in 26.9 (Operating mode indication), 11.42 (Notification of operating mode changes) and 26.15.2 (PPDU format selection).