IEEE P802.11
Wireless LANs

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| Resolution for Miscellaneous CIDs related to Clause 35.2.1.2 (CC34) |
| Date: Jun 28, 2021 |
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 Abstract

This submission proposes resolutions for following 9 comments received for TGbe CC34 and 2 comments from in [21/0218r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0218-00-00be-review-of-p802-11be-d0-3-for-cc34.docx):

* 9 CIDs: 1086, 1667, 1936, 2147, 2148, 2180, 3120, 3151, 2541
* 2 comments from in [21/0218r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0218-00-00be-review-of-p802-11be-d0-3-for-cc34.docx) on subclause 35.2.1.2

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: simplified the text on puncturing rules for all the applicable PPDU types; revised text for CTS procedure so that it is based on CCA rules in D0.4
* Rev 2: applied puncturing to PPDUs instead of individual frames; updated Table 36-1 on INACTIVE\_SUBCHANNELS based on comments
* Rev 3: addressed various comments received after Rev 2 from Greg, Yongho, Lei and Ron.
* Rev 4: Clarified that MU transmission is allowed to puncture additional subchannels as in HE; aligned the Table 36-1 entries with those from 21/0635r3
* Rev 5: Revised text to address comments from Xiaogang, Laurent and Wook Bong; addressed editorial comment from CID 2541 that is transferred from Edward.
* Rev 6: updated subclause numbers based on D1.0; adopted editorial updates from Xiaofei; Incorporated Yunbo’s and Yongho’s comments on P2P link
* Rev 7: resolved Jarkko’s comment on puncturing pattern selection to avoid corner cases and Laurent’s comment on the removal redundant text.
* Rev 8: added clarifications that non-HT duplicate PPDU may puncture additional subchannels even without including a Trigger frame (e.g. CTS-to-self, changes are in the last paragraph on page 9)

***TGbe editor: Please note Baseline is REVmd D5.0, 11ax D8.0, and 11be D1.0***

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.***

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| --- | --- | --- | --- | --- | --- | --- |
| CID | Commenter | Page | Clause | Comment | Proposed Change | Resolution |
| 3151 | Yongho Seok | 125.40 | 35.2.1.2.2 | "When an EHT STA transmits an RTS, MU-RTS Trigger, or CTS frame in a non-HT duplicate PPDU,..."The CF-End frame and PS-Poll frame can be sent in a non-HT duplicated PPDU with a preamble puncturing.Please add the CF-End frame and PS-Poll frames. | As in comment. | **Revised**Agree with the commenter in principle. Generalized the spec text so that the puncturing rules are applicable to any Control frame. **Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 3151, 3120, 2180, 1086.** |
| 3120 | Yanjun Sun | 125.40 | 35.2.1.2.2 | It's not defined how to handle control frames other than RTS, CTS, MU-RTS based on INACTIVE\_SUBCHANNELS | Apply the same rule to other controls frames: Ack, PS-Poll, CF-End, BAR, BASuggested change: replace "RTS, MU-RTS Trigger, or CTS" with "RTS, MU-RTS Trigger, CTS, Ack, PS-Poll, CF-End, BAR, or BA" | **Revised**Agree with the commenter in principle. Generalized the spec text so that the puncturing rules are applicable to any Control frame. **Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 3151, 3120, 2180, 1086.** |
| 2180 | Li-Hsiang Sun | 125.40 | 35.2.1.2.2 | INACTIVE\_SUBCHANNELS TXVECTOR should alos be aplicablle to NDPA, other trigger frames, BA, Ack, CF-End in non-HT duplicate format | adding the additional control frames into this subclause | **Revised**Agree with the commenter in principle. Generalized the spec text so that the puncturing rules are applicable to any Control frame. **Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 3151, 3120, 2180, 1086.** |
| 1086 | Alfred Asterjadhi | 125.28 | 35.2.1.2 | 1) Need to specify how preamble puncturing is signaled (i.e., where these INACTIVE\_SUBCHANNELS are obtained from). 2) Also the subclause seems to specify the behavior for (MU) RTS/CTS frames. What happens to the other control frames and PPDU formats? Please call out explicitly the punctured rules for all the PPDUs that can be exchanged in this type of TXOP and what subchannel the STA can or cannot transmit. 3) Is the STA that receives this signaling required to puncture all specified subchannels? 4) In 11ax this parameter was provided in NDPA but EHT NDPA does not have this anymore. Please ensure that there is no conflicts between the two. | As in comment. | **Revised**Agree with the commenter in principle. 1) Added text to specify how preamble puncturing is indicated in management frames (e.g. beacons)2) Generalized the spec text so that the puncturing rules are applicable to any Control frame. In additional, text has been added to clarify that the rules are applicable to EHT PPDU as well3) Added subclause 35.9.x (Preamble Puncturing Operation) to require a STA that has received the signaling to puncture all the specified subchannels.**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 3151, 3120, 2180, 1086, 1667, 2148, 2147.** |
| 1667 | GEORGE CHERIAN | 125.40 | 35.2.1.2.2 | The indication of which subchannels are punctured in an RTS, MU-RTS Trigger, or CTS frame that is carried in a non-HT duplicate PPDU is conveyed from the MAC to the PHY through the TXVECTOR parameter INACTIVE\_SUBCHANNELS.":How the non-AP STA MAC knows whether a channel is punctured or not is not specified. Please specify, | As in the comment | **Revised**Agree with the commenter in principle. Added text to specify how preamble puncturing is indicated in management frames (e.g. beacons)**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 1086, 1667, 2148, 2147.** |
| 2148 | Laurent Cariou | 0.00 | 35.2.1.2 | Define procedure for static puncturing, which is the puncturing flavor that should be defined for R1 (dynamic puncturing beihng for R2) | as in comment | **Revised**Agree with the commenter in principle. Added text to specify how preamble puncturing is indicated in management frames (e.g. beacons)**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 1086, 1667, 2148, 2147.** |
| 2147 | Laurent Cariou | 0.00 | 35.2.1.2.2 | Inactive\_Subchannels in the TxVector should be also used for any PPDU types when we do static puncturing, which is the puncturing mode that is defined for R1 (dynamic puncturing being R2). The Inactive\_Subchannels are derived from the Transmit Power element transmitted by the AP. | as in comment | **Revised**Agree with the commenter in principle. 1) Generalized the spec text so that the puncturing rules are applicable to EHT PPDU as well2) Added text to specify how preamble puncturing is indicated in management frames (e.g. beacons). Instead of the Transmit Power element, the proposed text is based on a bitmap in EHT Operation element, which offers lower overhead in most common cases.**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 1086, 1667, 2148, 2147**. |
| 1936 | Jeongki Kim | 125.47 | 35.2.1.2.2 | When any 20 MHz subchannel is punctured, how or where does the STA send CTS frame?Define the rule how the STA send a CTS frame in case that there are puctured channels or busy channels. | Define the rule how the STA send a CTS frame in case that there are puctured channels or busy channels. | **Revised**Agree with the commenter in principle.Added rules on CTS response in subclause 10.3.2.9.**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as** 1936**.** |
| [21/0218r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0218-00-00be-review-of-p802-11be-d0-3-for-cc34.docx)a | Mark Rison | 125.40 | 35.2.1.2 | Why do we need this? We don’t say it for HE. “When an EHT STA transmits an RTS, MU-RTS Trigger, or CTS frame in a non-HT duplicate PPDU, the STA shall not transmit on any 20 MHz subchannel that is punctured.” | PC: delete this para | **Revised**The paragraph corresponds to the motion that defined punctured transmission of RTS, MU-RTS Trigger and CTS frame in a non-HT duplicate PPDU, which is a new EHT feature. Text revised to include EHT PPDU as well.**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 21/0218r0a.** |
| [21/0218r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0218-00-00be-review-of-p802-11be-d0-3-for-cc34.docx)b | Mark Rison | 125.47 | 35.2.1.2 | Is this trying to say that it cannot be present for any other kind of PPDU?“The parameter INACTIVE\_SUBCHANNELS may be present in the TXVECTOR of a non-HT duplicate PPDU that carries an RTS, MU-RTS Trigger, or CTS frame”  | PC: change to “shall not be present in the TXVECTOR of a PPDU that is not a non-HT duplicate PPDU that carries […]” | **Revised**Agree with the commenter in principle that it’s unclear if this rule is applicable to other PPDU types.Revised text to clarify that INACTIVE\_SUBCHANNELS is applicable to EHT PPDU as well.**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 21/0218r0b.** |
| 2541 | Robert Stacey | 125.40 | 35.2.1.2.2 | Inappropriate "when"; "when" implies certainty that this will happen. Use "if" if the event is not certain to happen.Also, the combination of "when transmits" and "shall not transmit" is cumbersome. Better to just not transmit.Finally, when describing a transmission, use the following general rule: if the PPDU is defined then it is the PPDU that is trasnmitted and the frames are included in the PPDU. If the PPDU is undefined then it is the the frames that are transmitted. | Change to "An EHT STA shall not transmit a non-HT duplicate PPDU that carries an RTS, MU-RTS Trigger, or CTS frame on a punctured 20 MHz subchannel." Or, possibly, "An EHT STA shall not transmit a non-HT duplicate PPDU that carries an RTS, MU-RTS Trigger, or CTS frame if the non-HT duplicate PPDU occupies a punctured 20 MHz subchannel." | **Revised**Agree with the commenter in principle. Revised text to use “if” and “PPDU” and to avoid redundancy as suggested**Tgbe editor please implement changes as shown in doc 11-21/0455r8 tagged as 2541.** |

**35.2.1.2 Preamble puncturing**

**35.2.1.2.2 INACTIVE\_SUBCHANNELS**

***Discussion: Proposed changes below address CID 3151, 3120, 2180, 1086, 2147, 21/0218r0b, 2541.***

* ***CID 3151, 3120, 2180, 1086 suggested to apply the rules of punctured transmissions (already defined for (MU) RTS and CTS) to other control frames such as Ack, PS-Poll, CF-End, BAR, BA, NDPA.***
* ***CID 1086, 2147, 21/0218r0b suggested to call out explicitly the puncturing rules for all the applicable PPDU types***
* ***CID 2541 suggested to use PPDU types if defined; use “if” instead of “when” for uncertain event***

***TGbe editor: Please update the first two paragraphs as follows***

[CID 3151, 3120, 2180, 1086, 2541] An EHT STA shall not transmit on any 20 MHz subchannel that is punctured as indicated in the TXVECTOR parameter INACTIVE\_SUBCHANNELS (see Table 36-1 (TXVECTOR and RXVECTOR parameters)). [CID 1086, 2147, 21/0218r0b]

[CID 3151, 3120, 2180, 1086] The indication of which subchannels are punctured in a non-HT duplicate PPDU or EHT PPDU is conveyed from the MAC to the PHY through the TXVECTOR parameter INACTIVE\_SUBCHANNELS (see Table 36-1 (TXVECTOR and RXVECTOR parameters)). The parameter INACTIVE\_SUBCHANNELS may be present in the TXVECTOR of a non-HT duplicate PPDU or EHT PPDU . [CID 3151, 3120, 2180, 1086, 2147, 21/0218r0b]

***Discussion: Proposed changes below address CID 1086, 1667, 2148, 2147. These CIDs suggested to define how preamble puncturing is signaled.***

* ***CID 2147 suggested to define static puncturing and to derive INACTIVE\_SUBCHANNELS based on the Transmit Power element (TPE) to indicate.***
* ***Contribution*** [***21/162r0***](https://mentor.ieee.org/802.11/dcn/21/11-21-0162-00-00be-signaling-on-static-puncture-info.pptx) ***discusses the related topic and proposes to use a bitmap in the EHT Operation element instead of the TPE in order to reduce Beacon overhead***
* ***TPE had some “bug”*** [***fixed***](https://mentor.ieee.org/802.11/dcn/20/11-20-1710-00-00ax-sa2-cid-25039-25040.docx) ***only recently, which may add uncertainty in inter-op if we build EHT preamble puncturing on top of it.***

***In order to reduce Beacon overhead and to avoid uncertainty caused by the recent bug fixes for TPE, we added text for the bitmap-based approach.***

***TGbe editor: Please change the subclause below as follows:***

45 **9.4.2.295a EHT Operation element**

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47 The operation of EHT STAs in an EHT BSS is controlled by the following:

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1. — The HT Operation element, HE Operation element, and EHT Operation element if operating in the
2. 2.4 GHz band

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1. — The HT Operation element, VHT Operation element (if present), HE Operation element, and EHT
2. Operation element if operating in the 5 GHz band
3. — The HE Operation element and EHT Operation element if operating in the 6 GHz band

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57 The format of the EHT Operation element is shown in Figure 9-788ee (EHT Operation element format).

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| --- | --- | --- | --- | --- |
| Element ID | Length | Element ID Extension | EHT Operation Information | **Disabled Subchannel Bitmap** |

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63 Octets: 1 1 1 TBD **0 or 2**

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65 **Figure 9-788ee—EHT Operation element format** [CID 1086, 1667, 2148, 2147]

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

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1. The EHT STA obtains the channel configuration information from the EHT Operation element if operating
2. in the 6 GHz band. The subfields of EHT Operation Information field are defined in Table 9-322al (EHT Operation Information subfields).

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9 **Table 9-322al—EHT Operation Information subfields** [CID 1086, 1667, 2148, 2147]

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| **Subfield** | **Definition** | **Encoding** |
| Channel Width | This field defines the EHT BSS band- width. | Set to 0 for 20 MHz EHT BSS band- width.Set to 1 for 40 MHz EHT BSS band- width.Set to 2 for 80 MHz EHT BSS band- width.Set to 3 for 160 MHz EHT BSS band- width.Set to 4 for 320 MHz EHT BSS band- width.Other values are reserved. |
| CCFS | TBD | TBD |
| **Disabled Subchannel Bitmap Present** | **Indicates whether the Disabled Subchannel Bitmap field is present or not.** | **Set to 1 if the Disabled Subchannel Bitmap field is present; set to 0 otherwise.** |

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The Disabled Subchannel Bitmap field is present if the Disabled Subchannel Bitmap Present subfield is 1 and provides a list of subchannels that are punctured within the BSS bandwidth; otherwise it is not present. [CID 1086, 1667, 2148, 2147]

The Disabled Subchannel Bitmap field is a 16-bit bitmap where the lowest numbered bit corresponds to the 20 MHz subchannel that lies within the BSS bandwidth and that has the lowest frequency of the set of all 20 MHz subchannels within the BSS bandwidth. Each successive bit in the bitmap corresponds to the next higher frequency 20 MHz subchannel. A bit in the bitmap is set to 1 to indicate the corresponding 20 MHz subchannel is punctured and set to 0 to indicate the corresponding 20 MHz subchannel is not punctured. [CID 1086, 1667, 2148, 2147]

***Discussion: Proposed changes below address CID*** ***1086, 1667, 2148, 2147:***

* ***To address CID 1086, 1667, 2148, 2147, the corresponding procedures are defined on how an AP signals a puncturing pattern in BSS Operation parameters***

***TGbe editor: Please add a new subclause 35.9.x as follows***

**35.10 EHT BSS operation** [CID 1086, 1667, 2148, 2147]

**35.10.x Preamble Puncturing Operation**

[CID 1086, 1667, 2148, 2147] An EHT AP may add the Disabled Subchannel Bitmap field in the EHT Operation element it includes in transmitted Management frames. The AP shall set the Disabled Subchannel Bitmap Present subfield to 1 and include the Disabled Subchannel Bitmap field in the EHT Operation element if the AP punctures any subchannel for the BSS. Otherwise, the AP shall set the Disabled Subchannel Bitmap Present subfield to 0 and not include the Disabled Subchannel Bitmap field in the EHT Operation element. The puncturing pattern indicated in the Disabled Subchannel Bitmap field of the EHT Operation element shall be one of the non-OFDMA puncturing patterns defined in Table 36-30 (5-bit punctured channel indication for the non-OFDMA case in an EHT MU PPDU) for the PPDU bandwidth that is equal to the operating channel width of the BSS. The AP may set each bit in the Disabled Subchannel Bitmap field to a value subject to the following constraints:

- The resulting puncturing pattern is one of the puncturing patterns selected above.

- A bit in the bitmap that corresponds to a 20 MHz subchannel outside the BSS bandwidth shall be set to 1.

- The bit in the bitmap that corresponds to the primary 20 MHz subchannel shall be set to 0.

In an EHT BSS set up by an EHT AP that has included the Disabled Subchannel Bitmap field in the EHT Operation element, an EHT STA shall set the TXVECTOR parameter INACTIVE\_SUBCHANNELS of an HE, EHT, or non-HT Duplicate PPDU based on the value indicated in the most recently exchanged Disabled Subchannel Bitmap field in the EHT Operation element for that BSS. If a 20 MHz subchannel is indicated as a punctured subchannel in the Disabled Subchannel Bitmap field in the EHT Operation element, the corresponding bit in the TXVECTOR parameter INACTIVE\_SUBCHANNELS shall be set to 1 and the punctured 20 MHz subchannel shall not be used by any PPDU that is transmitted within the operating channel of the EHT AP to a member of the EHT BSS.

In an EHT MU PPDU or a non-HT duplicate PPDU, an EHT AP may puncture other subchannels in addition to those indicated in the Disabled Subchannel Bitmap field in the EHT Operation element. In this case, the EHT AP shall assign an RU or MRU within the nonpunctured subchannel set to a responding EHT STA using a triggering frame if the EHT AP intends to solicit a response.

Note- Since the parameter INACTIVE\_SUBCHANNELS is not present in the RXVECTOR as defined in Table 36-1 (TXVECTOR and RXVECTOR Parameters), a responding EHT STA cannot learn the additionally punctured subchannels. The EHT MU PPDU or a non-HT duplicate PPDU does not include a Trigger frame if the EHT AP does not intend to solicit a response (e.g., a CTS-to-self frame carried in a non-HT duplicate PPDU).

Regardless if the EHT AP has included the Disabled Subchannel Bitmap field in the EHT Operation element, an EHT STA may use EHT MU PPDU preamble puncturing modes as defined in 36.3.12.11 (Preamble punctured EHT PPDU) or EHT TB PPDU in which not all the 20 MHz subchannels are assigned.

***Discussion: Proposed changes below address CID 1936:***

* ***To address CID 1936, rules have been defined on how to handle CTS responses if there are punctured or busy subchannels***

***TGbe editor: Please add the following paragraphs to subclause 10.3.2.9 as follows***

**10.3.2.9 CTS and DMG CTS procedure** [CID 1936]

An EHT STA that is addressed by an RTS frame in a non-HT or non-HT duplicate PPDU that has a bandwidth signaling TA and that has the RXVECTOR parameter DYN\_BANDWIDTH\_IN\_NON\_HT equal to Static behaves as follows:

—If the NAV indicates idle, the STA is not NSTR limited, and CCA has been idle for all nonpunctured nonprimary 20 MHz subchannels based on rules defined in 36.3.20.6.4 (Per 20 MHz CCA sensitivity) in the channel width indicated by the RTS frame’s RXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT for a PIFS prior to the start of the RTS frame, then the STA shall respond with a CTS frame carried in a non-HT or non-HT duplicate PPDU after a SIFS. The CTS frame’s TXVECTOR parameters CH\_BANDWIDTH and CH\_BANDWIDTH\_IN\_NON\_HT shall be set to the same value as the RTS frame’s RXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT.

If all of the conditions in the previous paragraph are met, except for the condition “the STA is not NSTR limited”, then the STA may respond with the CTS frame as described in that paragraph. — Otherwise, the STA shall not respond with a CTS frame.

An EHT STA that is addressed by an RTS frame in a non-HT or non-HT duplicate PPDU that has a bandwidth signaling TA and that has the RXVECTOR parameter DYN\_BANDWIDTH\_IN\_NON\_HT equal to Dynamic behaves as follows:

—If the NAV indicates idle, and the STA is not NSTR limited, then the STA shall respond with a CTS frame in a non-HT or non-HT duplicate PPDU after a SIFS. The CTS frame’s TXVECTOR parameters CH\_BANDWIDTH and CH\_BANDWIDTH\_IN\_NON\_HT shall be set to any channel width for which CCA on all nonpunctured secondary channels has been idle for a PIFS prior to the start of the RTS frame based on rules defined in 36.3.20.6.4 (Per 20 MHz CCA sensitivity) and that is less than or equal to the channel width indicated in the RTS frame’s RXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT.

* If all of the conditions in the previous paragraph are met, except for the condition “the STA is not NSTR limited”, then the STA may respond with the CTS frame as described in that paragraph.

—Otherwise, the STA shall not respond with a CTS frame.

***Discussion: In 11be, we also need to define punctured transmission for frames in non-HT duplicate PPDU such as RTS or for EHT PPDU. For example, an EHT AP may indicate a secondary 40MHz is punctured for the whole BSS and RTS needs to avoid the punctured 40MHz. So the cited bullet defines the rule for RTS to begin a TXOP.***

***TGbe editor: Please update subclause 10.3.2.5 as follows***

**10.23.2.5 EDCA channel access in a VHT, HE, EHT or TVHT BSS**

If a STA is permitted to begin a TXOP (as defined in 10.23.2.4 (Obtaining an EDCA TXOP)) and the STA has at least one MSDU pending for transmission for the AC of the permitted TXOP, the STA shall perform exactly one of the following actions:

a) Transmit a 160 MHz or 80+80 MHz mask PPDU if the secondary channel, the secondary 40 MHz channel, and the secondary 80 MHz channel were idle during an interval of PIFS immediately preceding the start of the TXOP.

…

l) Transmit a 160 MHz or 80+80 MHz HE MU PPDU where in the preamble the only punctured subchannels are zero, one or both of the 20 MHz subchannels in the secondary 40 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel, if all of the 20 MHz sub channels that are not punctured were idle during an interval of PIFS immediately preceding the start of the TXOP. At least one 20 MHz subchannel is punctured. If two of the 20 MHz subchannels in the secondary 80 MHz channel are punctured, these are either the lower two or the higher two. No more than two adjacent 20 MHz subchannels are punctured across the preamble, for a 160 MHz preamble.

***TGbe editor: Please add two new bullets as follows***

m) Transmit an EHT MU PPDU if all of the 20 MHz subchannels that are not punctured were idle during an interval of PIFS immediately preceding the start of the TXOP.

n) Transmit a punctured non-HT duplicate PPDU if all of the 20 MHz subchannels that are not punctured were idle during an interval of PIFS immediately preceding the start of the TXOP.

**Do you support the resolutions for the following CIDs in doc 11-21/0455r8:**

1086, 1667, 1936, 2147, 2148, 2180, 3120, 3151, 2541 and Mark’s comments on subclause 35.2.1.2