IEEE P802.11
Wireless LANs

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| Proposed Resolution for CID 24101, 24105, 24106, 24107 |
| Date: 2020-07-24 |
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Abstract

Comment resolution with proposed changes to TGax D6.0 for CID 24101, 24105, 24106, 24107

# Revision Notes

|  |  |
| --- | --- |
| R0 | Initial revision – CID 24101 |
| R1 | Modification based on SPs ran on April 23rd, 2020 and captured in the agenda (20/0538r13), corresponding to Mark Rison’s Option A1. |
| R2 | Deleted “No more than two adjacent 20 MHz subchannels are punctured across 160 MHz” for 80+80 MHz HE MU PPDU following offline comment. |
| R3 | Include CRs for CID 24105, 24106 and 24107. Proposed texts related to 80 MHz punctured frames are imported from doc 11-20/0497r7. Include Mark Rison’s comments, including adding MIB part. |
| R4 | Modifications (cyan) following a SP run on July 23rd, 2020 (doc 11-20/0538r52) to allow no puncturing on the primary 80 for the value of 7 for the Bandwidth field in HE-SIG-A. |

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 24101 |  |  | The preamble puncture feature in its current definition can cause harmful interferences to legacy (victim) devices when continuous puncturing is larger than 40MHz, as demonstrated in IEEE 802.11-19/2087r0. | It is proposed, for 160 or 80+80 MHz MU PPDUs, to support preamble puncture with no continuous puncturing larger than 40MHz. No change is required for 80 MHz MU PPDU. | Revised-The proposed change aligns with the SPs ran on April 23rd, 2020 and captured in the agenda (20/0538r13), corresponding to Mark Rison’s Option A1Instructions to the editor, please make the changes shown in doc 11-20/0618r4under all headings that include CID 24101. |
| 24105 | 561.25 | 27.3.11.7.2 | "where in the primary 80 MHz ... at leastone 20 MHz subchannel that is not in the primary 40MHz is punctured". Does this mean that in 160 MHz preamble puncturing using bandwidth field value 7, at least one 20 MHz within the Secondary 40 MHz need to be punctured? Probably that is not what was intended. The phrase "where in the primary 80 MHz" is unnecessary and may cause confusion. | Delete "the primary 80 MHz of". | Revised-Clarify the puncturing patterns.The proposed change aligns with the SPs ran on April 23rd, 2020 and captured in the agenda (20/0538r13), corresponding to Mark Rison’s Option A1Instructions to the editor, please make the changes shown in doc 11-20/0618r4under all headings that include CID 24105. |
| 24106 | 192.57 | 9.4.2.247.3 | As written, B2 means that in 160 MHz, only one 20 MHz can be punctured, and that 20 MHz is the Secondary20. Is this the correct intention of this capability bit? | Please clarify. | Revised-Clarify the puncturing patterns.The proposed change aligns with the SPs ran on April 23rd, 2020 and captured in the agenda (20/0538r13), corresponding to Mark Rison’s Option A1Instructions to the editor, please make the changes shown in doc 11-20/0618r4under all headings that include CID 24106. |
| 24107 | 192.62 | 9.4.2.247.3 | Does this capability bit match the operation for value 7 of the Bandwidth field in HE-SIG-A of an HE MU PPDU? | Please clarify. | Revised.Clarify the puncturing patterns.The proposed change aligns with the SPs ran on April 23rd, 2020 and captured in the agenda (20/0538r13), corresponding to Mark Rison’s Option A1Instructions to the editor, please make the changes shown in doc 11-20/0618r4under all headings that include CID 24107. |

***Discussion:***

In 802.11ax D6.0:

* One 20 MHz subchannel can be punctured in 80 MHz MU PPDUs
* Multiple contiguous 20 MHz subchannels can be punctured in 160 MHz or 80+80 MHz MU PPDUs

Contiguous 20 MHz punctured subchannels can cause harmful interferences to legacy (victim) devices. The simulation results presented in 802.11-19/2087r0 show that the victim SINR degradation can be higher than 11 dB when 3 channels are punctured and the victim is at the edge of the punctured subchannels.

Simulation result for 3 contiguous punctured channels:

Simulations were run for various conditions to compare SINR of an 11ac victim on channel 6,7 or 8 (figure below) when:

* 1. - Aggressor is an 11ax 160 MHz frame with channels 6, 7, 8 punctured - Blue SEM
	2. - Aggressor is an 11ac 20 MHz frame on Channel 5 - Green SEM (reference)



Figure 1 Example of 160 MHz MU PPDU with preamble puncture (802.11-19/2087r0)

The impact on the 802.11ac victim varies from minor to severe depending on the scenarios:

1. - SINR degradation can be higher than **11dB** when the victim is on channel 8

The proposed changes in revision 1 align with the SPs ran on April 23rd, 2020 and captured in the agenda 20/0538r13:

**SP1) For 160M/80+80M, should having all the 20M subchannels in the secondary 80M channel punctured be allowed?**

**Y/N/A = 0/23/6**

**SP4) Do you agree that for 160M/80+80M, allow only a maximum of two adjacent 20 MHz subchannels to be punctured?**

•       **When puncturing 40 MHz in secondary 80, only puncturing either the lower 40 MHz or the upper 40 MHz**

**Y/N/A = 19/5/8**

The proposed changes in revision 4 align with the SP ran on July 23rd, 2020 and captured in the agenda 20/0538r52:

**Do you agree with the proposed resolutions to CIDs 24101, 24105, 24106, 24107 in doc 11-20/0618r3 with the modifications to allow no puncturing on the primary 80 for the value of 7 for the Bandwidth field in HE-SIG-A?**

**Y/N/A: 21/8/9**

***Proposed changes for CID 24101 and 24105:***

**Instructions to the editor**

**Please make the changes to L20, P561 as shown below:**

**Table 27-20—HE-SIG-A field of an HE MU PPDU**, Bandwidth field

Set to 4 for preamble puncturing in 80 MHz, where in the preamble the only punctured subchannel is the secondary 20 MHz channel.

Set to 5 for preamble puncturing in 80 MHz, where in the preamble the only punctured subchannel is one of the two 20 MHz subchannels in the secondary 40 MHz channel.

Set to 6 for preamble puncturing in 160 MHz or 80+80 MHz, where in the preamble the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel. 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 160 MHz.

Set to 7 for preamble puncturing in 160 MHz or 80+80 MHz, 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; 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 160 MHz.

***Proposed changes for CID 24101, 24106 and 24107:***

**Instructions to the editor**

**Please make the changes to L57, P192 as shown below:**

**Table 9-321b—Subfields of the HE PHY Capabilities Information field**

B0 indicates support for the reception of an 80 MHz preamble where the only punctured subchannel is the secondary 20 MHz channel.

B1 indicates support for the reception of an 80 MHz preamble where the only punctured subchannel is one of the two 20 MHz subchannels in the secondary 40 MHz channel.

B2 indicates support for the reception of a 160 MHz or 80+80 MHz preamble where the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.

B3 indicates support for the reception of a 160 MHz or 80+80 MHz preamble where 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; at least one 20 MHz subchannel is punctured. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.

***Proposed changes for CID 24101:***

**Instructions to the editor**

**Please make the changes to L38, P274 as shown below:**

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

i) Transmit an 80 MHz HE MU PPDU where in the preamble the only punctured subchannel is the secondary 20 MHz channel, 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.

j) Transmit an 80 MHz HE MU PPDU where in the preamble the only punctured subchannel is one of the two 20 MHz subchannels in the secondary 40 MHz channel, 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.

k)Transmit a 160 MHz or 80+80 MHz HE MU PPDU where in the preamble the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel, 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. 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.

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 subchannels 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.

NOTE 3—In the case of rule j), there is only one idle 20 MHz subchannel in the secondary 40 MHz channel and the other 20 MHz subchannel in the secondary 40 MHz channel is preamble punctured.

**Instructions to the editor**

**Please make the changes to L38, P484 as shown below:**

**Table 27-1—TXVECTOR and RXVECTOR parameters (continued)**

HE-CBW-PUNC80-PRI for preamble puncturing in 80 MHz, where in the preamble the only punctured subchannel is the secondary 20 MHz channel.

HE-CBW-PUNC80-SEC for preamble puncturing in 80 MHz, where in the preamble the only punctured subchannel is one of the two 20 MHz subchannels in the secondary 40 MHz channel.

HE-CBW-PUNC160-PRI20 for preamble puncturing in 160 MHz, where in the preamble the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.

HE-CBW-PUNC80+80-PRI20 for preamble puncturing in 80+80 MHz, where in the preamble the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.

HE-CBW-PUNC160-SEC40 for preamble puncturing in 160 MHz, 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; at least one 20 MHz subchannel is punctured. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.

HE-CBW-PUNC80+80-SEC40 for preamble puncturing in 80+80 MHz, 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; at least one 20 MHz subchannel is punctured. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.

**Instructions to the editor**

**Please make the changes to L8, P498 as shown below:**

**Table 27-3— Interpretation of FORMAT, NON\_HT Modulation and CH\_BANDWIDTH parameters *(continued)***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **FORMAT** | **NON\_HT\_ MODULATION** | **CH\_BANDWIDTH** | **CH\_OFFSET** | **PPDU format** |
|  |  | HE-CBW-PUNC80- PRI |  | The STA transmits an 80 MHz HE PPDU where the only punctured subchannel is the secondary 20 MHz channel. |
|  |  | HE-CBW-PUNC80- SEC |  | The STA transmits an 80 MHz HE PPDU where the only punctured subchannel is one of the two 20 MHz subchannels in the secondary 40 MHz channel. |
|  |  | HE-CBWPUNC160- PRI20 |  | The STA transmits a 160 MHz HE PPDU where the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.  |
|  |  | HE-CBWPUNC80+ 80-PRI20 |  | The STA transmits an 80+80 MHz HE PPDU where the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations.  |
|  |  | HE-CBWPUNC160-SEC40 |  | The STA transmits a 160 MHz HE PPDU where 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; at least one 20 MHz subchannel is punctured. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations. |
|  |  | HE-CBWPUNC80+80-SEC40 |  | The STA transmits an 80+80 MHz HE PPDU where 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; at least one 20 MHz subchannel is punctured. Refer to Table 27-20 for allowed 20 MHz punctured subchannel combinations. |

**Instructions to the editor**

**Please make the changes to L47, P754 as shown below:**

**C.3 MIB Detail**

dot11HEPuncturedPreambleRxImplemented OBJECT-TYPE

SYNTAX OCTET STRING(SIZE(1))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable. Its value is determined by device capabilities.

This attribute is a bitmap that indicates the preamble puncturing support, where bit 0 is set to 1 to indicate support for the reception of an 80 MHz preamble where the only punctured subchannel is the secondary 20 MHz channel, bit 1 is set to 1 to indicate support for the reception of an 80 MHz preamble where the only punctured subchannel is one of the two 20 MHz subchannels in the secondary 40 MHz channel, bit 2 is set to 1 to indicate support for the reception of a 160 MHz or 80+80 MHz preamble where the only punctured subchannels are the secondary 20 MHz channel and zero to two of the 20 MHz subchannels in the secondary 80 MHz channel, and bit 3 is set to 1 to indicate support for the reception of a 160 MHz or 80+80 MHz preamble where 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; at least one 20 MHz subchannel is punctured. For bits 2 and 3, 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 a 160 MHz preamble."

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**Instructions to the editor**

**Please make the changes to L14, P499 as shown below:**

**Table 27-4—Interpretation of CH\_BANDWIDTH and INACTIVE\_SUBCHANNELS parameters**

**when FORMAT is equal to NON\_HT and NON\_HT\_MODULATION is equal to NON\_HT\_DUP\_**

**OFDM**

|  |  |
| --- | --- |
| **CH\_BANDWIDTH** | **INACTIVE\_SUBCHANNELS** |
| CBW80 | All bits set to 1 except for thefour bits corresponding to theprimary 80 MHz channel, which are set to 0 |
| CBW80 | The bit corresponding to the primary 20 MHz channel set to 0 and two other bits set to 0 that correspond to any other subchannels in the primary 80 MHz, all other bits set to 1 |
| CBW160 | All bits set to 0 |
| CBW160 | Either the bit corresponding to the secondary 20 MHz channel or zero, one or both bits corresponding to the secondary 40 MHz channel set to 1. Zero to two bits corresponding to 20 MHz subchannels in the secondary 80 MHz channel set to 1. All other bits set to 0. Not all bits set to 0. If two bits corresponding to 20 MHz subchannels in the secondary 80 MHz channel are set to 1 these correspond to the lower two or higher two 20 MHz subchannels. No more than two bits corresponding to adjacent 20 MHz subchannels set to 1. |
| CBW80+80 | All bits set to 0 |
| CBW80+80 | Either the bit corresponding to the secondary 20 MHz channel or zero, one or both bits corresponding to the secondary 40 MHz channel set to 1. Zero to two bits corresponding to 20 MHz subchannels in the secondary 80 MHz channel set to 1. All other bits set to 0. Not all bits set to 0. If two bits corresponding to 20 MHz subchannels in the secondary 80 MHz channel are set to 1 these correspond to the lower two or higher two 20 MHz subchannels.  |