### IEEE P802.11Wireless LANs

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| 11ax D4.0 MAC Comment Resolution for MU-RTS/CTS |
| Date: 2019-03-10 |
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Abstract

This submission proposes resolutions for comments of TGax Draft D4.0 with the following CIDs:

20007, 20159, 20160, 20721, 20888, 20994, 20995, 21125, 20310, 20311, 21413, 21460, 20540, 20548, 21181, 21488

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised based on the discussion during the presentation.

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 D4.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D4.0 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** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 20007 | 113.59 | 9.3.1.22.5 | Which 80MHz segment is it referring to? [several instances in this sub-clause] | Change to "primary 80 MHz segment" | Revised – Agree in principle with the commenter. There is no definition of primary 80 Mhz segment. However, we note that primary 80 MHz channel already covers the case for 160 MHz as shown below. *primary 80 MHz channel: In a 160 MHz or 80+80 MHz very high throughput (VHT) basic service set (BSS), the 80 MHz channel that is used to transmit 80 MHz physical layer (PHY) protocol data units (PPDUs).* As a result, we just remove 80 MHz segment and say primary 80 MHz.TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20007 |
| 20159 | 114.17 | 9.3.1.22.5 | How to indicate "primary 80 MHz channel is the higher frequency 80 MHz channel in the 80+80/160 MHz" | As in comment | Revised – Agree in principle with the commenter. We just revise the texts to say primary 80 MHz channel.TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20159 |
| 20160 | 114.34 | 9.3.1.22.5 | In Figure 9-64j, B7-B1=68 should span entire 160 or 80+80 | as in comment | Rejected – 68 already span entire 160 or 80+80 |
| 20721 | 113.51 | 9.3.1.22.5 | Re CID 16024: OK, in that case there's no point the AP indicating the position of the primary within the operating channel, since the non-AP STA ignores this anyway (see 26.2.6.3) | Change from "B0 of the RU Allocation subfield is set to 0 to indicate primary 20 MHz channel, primary 40 MHz channeland primary 80 MHz channel. For 160 MHz and 80+80 MHz indication, B0 of the RU Allocation subfield isset to 1. A non-AP STA ignores B0 for 160 MHz and 80+80 MHz indication." to "Figure 9-64j---UL BW subfield and B7-B1 of RU Allocation subfield in MU-RTS Trigger frame" inclusive in 9.3.1.22.5 to "B0 of the RU Allocation subfield is reserved.B7--B1 of the RU Allocation subfield is set as follows:--- 61 for the primary 20 MHz channel--- 65 for the primary 40 MHz channel--- 67 for the primary 80 MHz channel--- 68 for the primary and secondary 80 MHz channel." | Rejected – The signalling aligns with the Trigger frame RU allocation setting, and the group has detailed discussion before to agree on aligning the settings. |
| 20888 | 113.52 | 9.3.1.22.5 | "For 160 MHz and 80+80 MHz indication, B0 of the RU Allocation subfield isset to 1. A non-AP STA ignores B0 for 160 MHz and 80+80 MHz indication." -- in that case B0 has no value | Change the cited text at the referenced location to "For 160 MHz and 80+80 MHz indication, B0 of the RU Allocation subfield is reserved." | Rejected – The signalling aligns with the Trigger frame RU allocation setting, and the group has detailed discussion before to agree on aligning the settings. |
| 20994 | 113.58 | 9.3.1.22.5 | I don't understand "the primary 40 MHz or 80 MHz channel or 80 MHz segment of 80+80/160 MHz (if present)". The concept "primary 80 MHz segment" is not defined | Change to "the primary 40 MHz channel or the primary 80 MHz channel or the lower-frequency 80 MHz segment of the 160 MHz channel (as applicable)" | Revised – Agree in principle with the commenter. we just remove 80 MHz segment and say primary 80 MHz.TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20994 |
| 20995 | 113.58 | 9.3.1.22.5 | I don't understand "he lowest frequency 20 MHz channel in the primary 40 MHz or 80 MHz channel or 80 MHz segment of 80+80/160 MHz (if present)". The lowest-frequency 20 MHz channel of the primary 40 MHz channel is not necessarily the lowest-frequency channel of the primary 80 MHz channel, so the "or" doesn't work. But in any case the non-AP STA treats 61-64 the same | Change all 4 bullets at the referenced location to "any value in the range 61 to 64", and delete Figure 9-64j and the para above it | Revised – Agree in principle with the commenter. we just remove 80 MHz segment and say primary 80 MHz.TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20995 |
| 21125 | 231.24 | 10.3.1 | The use of RTS/CTS mechanism is explained, but there is no rule for MU RTS/CTS, which is also a protection mechanism. | please add a rule for this use. | Rejected – The referred sentence is about dot11RTSThreshold, which is not used by MU-RTS. AP can decide whether it wants to use MU-RTS or not based on implementation specific consideration.  |
| 20310 | 300.44 | 26.2.6.1 | In the figure 26-1,Non-AP STA1 and Non-AP STAs also need to update the NAV, so it is nit accurate to say "other" updates the NAV in the figure. | Please clarify it. | Revised – Agree in principle with the commenter. TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20310 |
| 20311 | 301.20 | 26.2.6.1 | In the figure 26-2,Non-AP STA1 and Non-AP STAs also need to update the NAV, so it is nit accurate to say "other" updates the NAV in the figure. | Please clarify it. | Revised – Agree in principle with the commenter. TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20311 |
| 21413 | 300.21 | 26.2.6 | The benefit of the MURTS/CTS mechanism applies in the BSS controlled by an AP, but also between BSSs using the same channel. It is then beneficial for all the 11ax AP to have a similar usage of the MURTS/CTS mechanism. In the current spec, there is no indication of the conditions to initiate a MU\_RTS/CTS by the AP. The mechanism described for the RTS/CTS to condition the usage of the RTS/CTS protection should then also be indicated for the MU\_RTS/CTS mechanism. | Indicate the conditions, related to the TXOPDuration and/or to the RTSThreshold, for the emission of a MURTS as for the RTS/CTS. | Rejected –The TXOPDurationThreshold and RTSThreshold does not guarantee that different BSSs have similar behaviors. There is no guarantee that different BSSs will choose similar threshold.  |
| 21460 | 300.00 | 26.2.6.1 | MU-CTS won't work in practice. STAs within earshot of two or more MU-CTS transmissions may not be able to decode any of the CTS frames due to a variety of PHY layer issues, thus defeating the whole purpose of reserving the medium. | Remove MU-CTS | Rejected –Decoding of simultaneous CTS is similar to the decoding of simultaneously HE-SIG-A field in HE TB response. Various simulations have shown that it will work (see 15/867 and 15/806), and the corresponding design is in place to make sure that different STAs can respond the same CTS frame. |
| 20540 | 302.29 | 26.2.6.3 | "The ED-based CCA during the SIFS after receiving an MU-RTS Trigger frame and virtual CS functions are used to determine the state of the medium to respond to an MU-RTS Trigger frame. See 26.5.3.5 (UL MU CS mechanism) for details." -- impenetrable grammar | Change the cited text at the referenced location to "A combination of virtual CS and ED-based CCA during the SIFS after the PPDU containing the MU-RTS Trigger frame is used to determine whether the medium is idle (see 26.5.3.5 (UL MU CS mechanism))." | Revised – Agree in principle with the commenter. TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20540 |
| 20548 | 302.55 | 26.2.6.3 | "NOTE---The Frame Control field of the CTS frames sent in response to an MU-RTS Trigger frame are set to the samevalue (see Figure 9-19 and 9.2.4.1.8 (More Data subfield))." is not clear. 1) to the same value as what. 2) it's not immediately obvious why the More Data subfield would be the same at each STA | Delete the cited NOTE and change the para above to "The Power Management and More Data subfields in a CTS frame sent in response to an MU-RTS Trigger frame shall be setto 0." | Revised –Agree in principle with the commenter. We update the referce and clarify that for More data field, it is reserved. *9.2.4.1.8**The More Data subfield is valid in individually addressed Data or Management frames transmitted by an AP to a STA in PS mode.*TGax editor to make the changes shown in 11-19/0492r1 under all headings that include CID 20548 |
| 21181 | 302.35 | 26.2.6.3 | It is overly restrictive that the CTS in response to an MU-RTS can only be sent at 6 Mbps, requiring 6 Data symbols. In High Density deployments it is common practice to disable non-HT rates of 6/9/12/18 Mbps. Sending at 36 Mbps for example would saving 5 Data symbols (20us). Since there are sufficient bits in the UL MCS to select between the 8 non HT rates, we should drop such a restriction. | Drop the restriction here, and elsewhere, then add a table mapping from UL MCS to Rate. In light of current WFA certification, it is acceptable to make this optional for Clients, and to restrict the AP to only selecting rates > 6Mbps when all AID selected support the option so all generate the same PPDU. | Rejected –During the early stage of MU-RTS discussion, the group agrees to use the most robust rate to make sure that the simultaneous CTS mechanism will work on the existing PHY design.  |
| 21488 | 302.24 | 26.2.6.3 | Note 1 contains normative behavior and it should not be in a note. The text should clearly state that a STA should transmit CTS in a certain way; this should be clearly specified, and not in a note. | Move the content of Note 1 to regular text, possibly to the end of the paragraph that starts at line 34 on page 302. | Rejected – The behaviour is already described in the subclase on when non-AP STA respond to MU-RTS and which 20 MHz channel to respond CTS.  |

**Discussion:**

**Propose:** Revised for CID 20007, 20159, 20994, 20995, 20310, 20311, 20540, 20548 per discussion and editing instructions in 11-19/0492r1.

***TGax editor: Change 9.3.1.22.5 MU-RTS variant as follows:***

* MU-RTS variant

The Trigger Dependent Common Info subfield and Trigger Dependent User Info subfield are not present in the MU-RTS Trigger frame.

(#15013)The CS Required subfield in the Common Info field is set as described in 26.5.3.5 (UL MU CS mechanism).

The UL BW subfield in the Common Info field indicates the bandwidth of the PPDU carrying the MU-RTS Trigger frame and is defined in Table 9-31c (UL BW subfield encoding).(#16021)

The UL Length, GI And LTF Type, MU-MIMO LTF Mode, Number Of HE-LTF Symbols And Midamble Periodicity, UL STBC, LDPC Extra Symbol Segment, AP TX Power, UL Packet Extension, UL Spatial Reuse, Doppler and UL HE-SIG-A2 Reserved subfields in the Common Info field are reserved.(#15014)(#7073)

The UL MCS, UL FEC Coding Type, UL DCM, SS Allocation/RA-RU Information and UL Target RSSI fields in the User Info field are reserved.(#17073)

The RU Allocation subfield in the User Info field addressed to the STA indicates whether the CTS frame is transmitted on the primary 20 MHz channel, primary 40 MHz channel, primary 80 MHz channel, 160 MHz channel, or 80+80 MHz channel.

B0 of the RU Allocation subfield is set to 0 to indicate primary 20 MHz channel, primary 40 MHz channel and primary 80 MHz channel. For 160 MHz and 80+80 MHz indication, B0 of the RU Allocation subfield is set to 1.(#16022) A non-AP STA ignores B0 for 160 MHz and 80+80 MHz indication.(#16023)

(#16318)B7–B1 of the RU Allocation subfield is set to indicate the primary 20 MHz channel as follows:

* 61 if the primary 20 MHz channel is the only 20 MHz channel or the lowest frequency 20 MHz channel in the primary 40 MHz or primary 80 MHz channel
* 62 if the primary 20 MHz channel is the second lowest frequency 20 MHz channel in the primary 40 MHz or primary 80 MHz
* 63 if the primary 20 MHz channel is the third lowest frequency 20 MHz channel in the primary 80 MHz
* 64 if the primary 20 MHz channel is the fourth lowest frequency 20 MHz channel in the primary 80 MHz (#20007, #20994, #20995)

B7–B1 of the RU Allocation subfield is set to indicate the primary 40 MHz channel as follows:

* 65 if the primary 40 MHz channel is the only 40 MHz channel or the lowest frequency 40 MHz channel in the primary 80 MHz channel

66 if the primary 40 MHz channel is the second lowest frequency 40 MHz channel in the primary 80 MHz channel (#20007)

B7–B1 of the RU Allocation subfield is set to 67 to indicate the primary 80 MHz channel. (#20007, #20159)

B7–B1 of the RU Allocation subfield is set to 68 to indicate the primary and secondary 80 MHz channel.

The settings for B7–B1 of the RU Allocation subfield are illustrated in Figure 9-64j (UL BW subfield and B7-B1 of RU Allocation subfield in MU-RTS Trigger frame).

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| * UL BW subfield and B7-B1 of RU Allocation subfield in MU-RTS Trigger frame
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***TGax editor: remove “other” in Figure 26-1.(#20310)***

***TGax editor: remove “other” in Figure 26-2.(#20311)***

***TGax editor: Change 26.2.6.3 CTS frame response to an MU-RTS Trigger frame as follows:***

* CTS frame response to an MU-RTS Trigger frame(#15729)

If a non-AP STA(#16592) receives an MU-RTS Trigger frame, the non-AP STA(#16592) shall commence the transmission of a CTS frame response at the SIFS time boundary after the end of a received PPDU when all the following conditions are met:

* The MU-RTS Trigger frame has one of the User Info fields addressed to the non-AP STA(#16592). The User Info field is addressed to a non-AP STA(#16592) if the AID12 subfield is equal to the 12 LSBs of the AID of the STA and the MU-RTS Trigger frame is sent by the AP with which the non-AP STA(#16592) is associated or by the AP corresponding to the transmitted BSSID if the non-AP STA(#16592) is associated with a nontransmitted BSSID and has indicated support for receiving Control frames with TA field(#15959) set to the transmitted BSSID by setting the Rx Control Frame To MultiBSS subfield to 1 in the HE Capabilities element that the non-AP STA(#16592) transmits.
* The UL MU CS condition indicates that the medium is idle (see 26.5.3.5 (UL MU CS mechanism)).(19/0162r1)

Otherwise, the non-AP STA(#16592) shall not send a CTS frame response.

NOTE 1—The RU Allocation subfield in the User Info field addressed to the non-AP STA indicates whether the CTS frame response is to be sent on the primary 20 MHz channel, primary 40 MHz channel, primary 80 MHz channel, 160 MHz channel, or 80+80 MHz channel as described in 9.3.1.22.5 (MU-RTS variant).(19/0162r1)

NOTE 2—A combination of virtual CS and ED-based CCA during the SIFS after the PPDU containing the MU-RTS Trigger frame are used to determine the state of the medium to respond to an MU-RTS Trigger frame (see 26.5.3.5 (UL MU CS mechanism)).

(#20540)

The CTS frame sent in response to an MU-RTS Trigger frame shall be carried in a non-HT or non-HT duplicate PPDU (see Clause 17) with a 6 Mb/s rate and with the TXVECTOR parameter SCRAMBLER\_INITIAL\_VALUE to the same value as the RXVECTOR parameter SCRAMBLER\_INITIAL\_VALUE of the PPDU carrying the MU-RTS Trigger frame. The PPDU carrying the CTS frame shall be transmitted on the 20 MHz channels indicated in the RU Allocation subfield of the User Info field of the MU-RTS Trigger frame.

(#15984)

NOTE—A bandwidth signaling TA is not used in an MU-RTS Trigger frame or a CTS frame response to an MU-RTS Trigger frame (see 9.3.1.22 (Trigger frame format) and 9.3.1.3 (CTS frame format)). As a result, the TXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT is not present when transmitting an MU-RTS Trigger frame or CTS frame response to an MU-RTS Trigger frame. In Figure 17-7 (Data scrambler) the first 7 bits of scrambling sequence of an MU-RTS Trigger frame or CTS frame response to an MU-RTS Trigger frame are not defined by Table 17-7 (Contents of the first 7 bits of the scrambling sequence).(#17087)

The Power Management subfield in a CTS frame sent in response to an MU-RTS Trigger frame shall be set to 0.

NOTE—The Frame Control field of the CTS frames sent in response to an MU-RTS Trigger frame are set to the same value as described in Figure 9-26 (Frame Control field subfield values within Control frames (11ah)carried in a non-S1G PPDU)and 9.2.4.1.8 (More Data subfield).(#20548)

Figure 26-3 (An example of an MU-RTS Trigger frame soliciting CTS frame responses on the primary 40 MHz channel) shows an example of the exchange of an MU-RTS Trigger frame(#15729) and simultaneous CTS frame responses on the primary 40 MHz channel. In this example, MU-RTS Trigger frame is transmitted in a 40 MHz non-HT duplicate PPDU on the primary 40 MHz channel. Further, the MU-RTS Trigger frame requests non-AP STA1(#16592) to transmit a CTS frame response in a non-HT PPDU on the primary 20 MHz channel and non-AP STA2(#16592) to transmit a CTS frame response in a 40 MHz non-HT duplicate PPDU on the primary 40 MHz channel.

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| * An example of an MU-RTS Trigger frame soliciting CTS frame responses on the primary 40 MHz channel(#16592)
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A non-AP STA(#16592) that transmits a CTS frame in response to an MU-RTS Trigger frame shall follow the synchronization requirement defined in 17.3.9.10 (Pre-correction accuracy requirements).