IEEE P802.11  
Wireless LANs

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| Submission  CR 10.3.2.9 CTS procedure NSTR limited | | | | |
| Date: 2021-04-13 | | | | |
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Abstract

This submission proposes resolutions to TGbe CC34 CIDs as listed:

1100 1489 1491 1492 1738 1739 1768 1837 1838 1839 1840 1909 1910 1911 1912 1913 1914 1915 2060 2273 2822 2889 2890 2891 3020 3313

Related to the subject CTS procedure NSTR limited with implications to Triggered HE TB PPDU when similarly NSTR limited

Revisions:

* R0: Initial version of the document.
* R1:
  + Slight change to STA reference of the MLD in the third bullet of 10.3.2.9
* R2:
  + Change doc reference
  + Remove changes of “link” to “WM interface”

***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.***

**CIDs**

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| **CID** | **Commenter** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution (Proposed)** |
| 1100 | Alfred Asterjadhi | 10.3.2.9 | 81.27 | Propose adding a subclause in 36, which contains the BW negotiation for EHT, call out baseline there and add appropriate exceptions (such as these ones). | As in comment. | Reject – the subclause specifically addresses the case of RTS followed by CTS, for which a precedent was set by the elders of 11ax, in creating the subclause 10.3.2.9 and referencing that subclause for this case in the subclause that addresses the other cases, i.e. **10.7.6.6 Channel Width selection for Control frames.** I.e. The request of the commenter is equally applicable to the baseline text of 10.3.2.9. |
| 1489 | Dibakar Das | 10.3.2.9 | 81.32 | "NSTR limits" is not defined. | Change to "whether its NSTR limited" | Revise – TGbe editor to make changes labeled CID 1489 within 11-21/0671r2 which effect a solution that is logically equivalent to the commenter’s proposed resolution but uses slightly different wording. |
| 1491 | Dibakar Das | 10.3.2.9 | 81.44 | A NSTR STA may not respond with a CTS if its intending to transmit a frame on the other link but is not a TXOP owner. | Add another condition where a STA that is intending to transmit a high priority packet on another link of a NSTR link pair is considered NSTR limited. | Revise – TGbe editor to make changes labeled CID 1491 within 11-21/0671r2 which effect a solution that is logically equivalent to the commenter’s proposed resolution but uses slightly different wording. |
| 1492 | Dibakar Das | 10.3.2.9 | 81.44 | A NSTR limited STA may not respond to an MU-RTS | Clarify the behavior in clause 26.2.6 MU-RTS Trigger/CTS frame exchange procedure | Revise – TGbe editor to make changes labeled CID 1492 within 11-21/0671r2 which add the same NSTR limited condition as in the clause 35 section for the MU-RTS response case. |
| 1738 | Hanseul Hong | 10.3.2.9 | 82.44 | Similar to CTS frame transmission response to the RTS frame, the conflicting statement is also applied for MU-RTS: -If a non-AP STA receives an MU-RTS Trigger frame, the non-AP STA shall commence the transmission of a CTS frame response at the SIFS time boundary after...(as described in 26.5.2.3.1 of 11ax) -A STA that is affiliated with a NSTR non-AP MLD should not transmit a frame while another STA in the same NSTR MLD is receiving a frame (as described in 35.3.13.3 of D0.3) The peer STA may not respond with a CTS frame even though the NAV is idle, when it is in NSTR contraints | Modify the correponding clauses so that CTS frame may not be transmitted in case of NSTR limited | Revise – TGbe editor to make changes labeled CID 1738 within 11-21/0671r2 which add the same NSTR limited condition as in the clause 35 section for the MU-RTS response case. |
| 1739 | Hanseul Hong | 10.3.2.9 | 82.44 | In the current spec, a STR shall transmit TB PPDU as a response to the Trigger frame in certain condition (as described in 26.5.2.3.1). However, a NSTR MLD may not be able to transmit TB PPDU even though it is in idle state for NSTR limited case. Therefore, the NSTR STA may not transmit the TB PPDU as a response to the Trigger frame when it is receiving a frame in another link | Modify the correponding clauses so that TB PPDU may not be transmitted in case of NSTR limited | Revise – TGbe editor to make changes labeled CID 1739 within 11-21/0671r2 which add the same NSTR limited condition as in the clause 35 section for the Trigger and TRS HE TB PPDU response case. |
| 1768 | Ilya Levitsky | 10.3.2.9 | 81.32 | "A STA that receives an RTS frame addressed to it considers the NAV and NSTR limits in determining whether to respond with CTS, unless the NAV was set by a frame originating from the STA sending the RTS frame " - The STA still needs to consider NSTR limits even if the NAV was set by a frame originating from the STA sending the RTS frame | Change the text so that the STA does not ingore NSTR limits when responding with a CTS. | Revise – TGbe editor to make changes labeled CID 1768 within 11-21/0671r2 which modify the wording to avoid confusion about the applicability of the NAV origination with respect to the NSTR limited condition in responding to the RTS. |
| 1837 | Jarkko Kneckt | 10.3.2.9 | 81.32 | A non-AP STA or an AP that is not NSTR should not consider NSTR limits. NSTR limits complicate STR STA implementation unnecesarily. Also, please clarify whether NSTR limits are the same as NSTR Limited? | Please delete the text:" and NSTR limits" form line 32. NSTR limits may be used after it is introduced later. Please add a separate condition to specify that the condition is only for NSTR STAs, no need to include it with the main description of the RTS operations. | Revise – TGbe editor to make changes labeled CID 1837 within 11-21/0671r2 which modify the wording to change the term “NSTR limits” but do not remove it and which do not create separate conditions for the NSTR limited case because if that were to be done, then a significant amount of very precise text would have to be duplicated and the duplicate text creates a synchronization problem which is a risky syntax. |
| 1838 | Jarkko Kneckt | 10.3.2.9 | 81.50 | The sentence:" a STA of the MLD is a TXOP holder or TXOP responder on one of the other links that is a member of at least one of the NSTR link pairs of which the link on which the RTS was received is a member" is very complicated and hard to understand. | Please clarify the sentence and add a figure to show the situation. | Reject – the flow of the sentence is very linear. |
| 1839 | Jarkko Kneckt | 10.3.2.9 | 82.07 | It would be good to describe NSTR limited STA CTS response rules separately to make the text more readable and understandable. No need to group the operation in legacy rules | Please move NSTR Limited STA operation to a separate clause. | Reject – there is a very good reason to include the NSTR limited case in the exsiting text: The alternative of creating a parallel clause causes a duplication of a significant amount of very precise text and that duplicity creates a synchronization weak point and that is a very risky approach. |
| 1840 | Jarkko Kneckt | 10.3.2.9 | 82.07 | It is not clear why NSTR Limited STA \_\_may\_\_ tarnsmit CTS as a response to RTS. It would be better that NSTR STA responds by saying "Should/shall respond" unless it has some conditions that prevent the transmission. | Please change the may respond to should/shall respond. | Reject – shall is incorrect, as the responding STA knows that if it responds, it might cause self-interference and only the STA knows the extent of that interference and the potential failures that result from it, so the responding STA needs to be allowed to make a choice which is situationally dependent. May and should are both choices in that case, but again, should supposes that the authors of the amendment know of the conditions at the STA at a time in the future, and lacking prescience, that is unlikely. This leaves “may” as the best choice of directive. |
| 1909 | Jeongki Kim | 10.3.2.9 | 81.54 | "If at least one of the above conditions is not true, then the STA is not NSTR limited." text seems to be redundant with the previous paragraph. Remove the text or change it to "Otherwise, then the STA is not NSTR limited" | Remove the text or change it to "Otherwise, then the STA is not NSTR limited" | Reject – the sentence exists in order to define the combination of “not” plus “NSTR limited”. If the group agrees that the meaning of adding “not” in front of the term is obvious, then we can remove the cited sentence. |
| 1910 | Jeongki Kim | 10.3.2.9 | 81.62 | The condition "the STA is not NSTR limited" is related to EHT STA while the inserted text is the text for VHT STA. Instead of adding the EHT STA specific condition in the VHT STA related text, why not making new text for it. VHT STA does not know NSTR limited. | Making the new paragraph for the condition for all the related text | Reject – all EHT STA are required to be VHT STA and therefore, the need to create nearly identical text and risk a synchronization error is not justified. |
| 1911 | Jeongki Kim | 10.3.2.9 | 82.17 | The condition "the STA is not NSTR limited" is related to EHT STA while the inserted text is the text for VHT STA. Instead of adding the EHT STA specific condition in the VHT STA related text, why not making new text for it. VHT STA does not know NSTR limited. | Making the new paragraph for the condition for all the related text | Reject – all EHT STA are required to be VHT STA and therefore, the need to create nearly identical text and risk a synchronization error is not justified. |
| 1912 | Jeongki Kim | 10.3.2.9 | 82.37 | The condition "the STA is not NSTR limited" is related to EHT STA while the inserted text is the text for non-VHT and non-S1G STA. Instead of adding the EHT STA specific condition in the non-VHT and non-S1G STA related text, why not making new text for it. Non-VHT and non-S1G STA does not know NSTR limited. | Making the new paragraph for the condition for all the related text | Reject – all EHT STA are required to be VHT STA and therefore, the need to create nearly identical text and risk a synchronization error is not justified. |
| 1913 | Jeongki Kim | 10.3.2.9 | 82.08 | "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." In this text, the STA may respond with the CTS frame .. while the STA shall respond with the CTS frame in the previous text. Align two texts (i.e., change may to shall in the indicated text) and add the condition if necessary. | To align two sentences , change "may" to "shall" in the indicate text and add the condition to make it shall if necessary. | Reject – the purpose of the new sentence is to allow the responding STA to choose whether it responds with CTS and therefore “may” is the correct verb, as this does not force the response, but does allow the response if the STA makes that choice. The choice on the part of the STA depends on the STA’s assessment of the extent of self-interference induced failure that might result from the CTS transmission and the subsequent sequence of frames in the TXOP. |
| 1914 | Jeongki Kim | 10.3.2.9 | 82.25 | "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." In this text, the STA may respond with the CTS frame .. while the STA shall respond with the CTS frame in the previous text. Align two texts (i.e., change may to shall in the indicated text) and add the condition if necessary. | To align two sentences , change "may" to "shall" in the indicate text and add the condition to make it shall if necessary. | Reject – the purpose of the new sentence is to allow the responding STA to choose whether it responds with CTS and therefore “may” is the correct verb, as this does not force the response, but does allow the response if the STA makes that choice. The choice on the part of the STA depends on the STA’s assessment of the extent of self-interference induced failure that might result from the CTS transmission and the subsequent sequence of frames in the TXOP. |
| 1915 | Jeongki Kim | 10.3.2.9 | 82.40 | "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." In this text, the STA may respond with the CTS frame .. while the STA shall respond with the CTS frame in the previous text. Align two texts (i.e., change may to shall in the indicated text) and add the condition if necessary. | To align two sentences , change "may" to "shall" in the indicate text and add the condition to make it shall if necessary. | Reject – the purpose of the new sentence is to allow the responding STA to choose whether it responds with CTS and therefore “may” is the correct verb, as this does not force the response, but does allow the response if the STA makes that choice. The choice on the part of the STA depends on the STA’s assessment of the extent of self-interference induced failure that might result from the CTS transmission and the subsequent sequence of frames in the TXOP. |
| 2060 | Jonas Sedin | 10.3.2.9 | 0.00 | "NSTR limited" as is described is a momentary state that can change with time, while the name itself is closely related to NSTR link peers which is a static relationship that does not change over time. | Consider changing the name of the state "a STA is NSTR limited" to "a STA is in a NSTR limited state" to make it more clear that this is time-changing state | Reject – there seems to be enough distinction between NSTR link pairs and a STA that is NSTR limited so that confusion related to NSTR is not problematic, and the exact definition of NSTR limited is provided right here in the subclause so that its meaning should be fresh in the reader’s mind. Note that the NSTR limited condition is reevaluated for each instance of RTS reception. |
| 2273 | Michael Montemurro | 10.3.2.9 | 82.07 | This is a really poor way to specify a requirement. | Copy the entire paragraph above and describe the requirement completely at 82.7, 82.24, and 82.40. | Reject – the proposed alternative is an even poorer way to specify the requirement, as all except for one tiny part of the rather expansive condition is changed. Duplication of such large amounts of technical language creates opportunity for genetic drift which eventually can give rise to incompatibility between the different sections of the document. |
| 2822 | Srinivas Kandala | 10.3.2.9 | 82.08 | A "may" condition has been used for responding with CTS. However it is not clear under what conditions one would choose to send (or not send) the CTS. Same occurrence on lines 24 and 40. If the conditions are not specified and if the transmitting side conceives that it is to its advantage to respond to RTS, the "may" never be used | Please identify the conditions | Reject – the conditions for deciding to transmit a CTS or not are implementation specific. Elsewhere in the amendment, the meaning of NSTR is provided, wherein it is explained that a transmission during a reception within the MLD will cause self-induced interference that causes local receive failures. The extent of those failures are only estimable by the potential transmitter upon each instance of RTS reception and each implementer might choose both a different estimation, depending upon conditions and a different threshold of CTS transmission decision, such that no one estimation method or threshold can be specified to suit all situations. |
| 2889 | Stephen McCann | 10.3.2.9 | 81.62 | The cited bulleted paragraph can be re-arranged to remove the new exception bullet. | Change the paragraph to "If the NAV indicates idle and CCA has been idle for all secondary channels (secondary 20 MHz channel, secondary 40 MHz channel, and secondary 80 MHz channel) 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 may respond with a CTS frame carried in a non-HT or non-HT duplicate PPDU after a SIFS. If the STA is additionally not NSTR limited then the STA shall respond with a CTS frame. 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." | Reject – the proposed change does not yield text that is clearer. |
| 2890 | Stephen McCann | 10.3.2.9 | 82.17 | The first sentence of the cited bulleted paragraph can be re-arranged to remove the new exception bullet. | Change "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" to "If the NAV indicates idle the STA may respond with a CTS frame in a non-HT or non-HT duplicate PPDU after a SIFS. If the STA is additionally not NSTR limited then the STA shall respond with a CTS frame." | Reject – the proposed change does not yield text that is clearer. |
| 2891 | Stephen McCann | 10.3.2.9 | 82.37 | The cited bulleted paragraph can be re-arranged to remove the new exception bullet. | Change the paragraph to "If the NAV indicates idle the STA may respond with a CTS frame after a SIFS. If the STA is additionally not NSTR limited then the STA shall respond with a CTS frame." | Reject – the proposed change does not yield text that is clearer. |
| 3020 | Xiaofei Wang | 10.3.2.9 | 81.46 | The first bullet is not necessary for NSTR limitation and can be deleted since all the information has been covered the two other bullet points. | remove the first bullet point | Reject – the second bullet contains reference to an MLD’s NSTR link pair – there is no such concept of an NSTR link pair for a STA that is not part of an MLD. A complete, accurate rewording would be necessary before removing the bullet and seems unnecessary as the existing wording is clear. |
| 3313 | Yunbo Li | 10.3.2.9 | 81.62 | Multi-link is a EHT feature, why a VHT STA will consider the NSTR limitaion? Similar comments for following two paragraphs. | Only STA of an MLD in EHT needs to consider NSTR limitation | Reject – all EHT STA are required to be VHT STA and therefore, the need to create nearly identical text and risk a synchronization error is not justified. Although one could consider adding additional STA types, e.g. HE STA and EHT STA, etc… but even that is complicated – the existing text is the simplest solution, and one should note that the same thing was done for HE STA. |

**Discussion**

xxxx

**Proposed changes**

***TGbe editor: Within TGbe Draft D0.4, change the text and editing instructions in subclause 10.3.2.9 CTS and DMG CTS procedure, as shown:***

10.3.2.9 CTS and DMG CTS procedure

***Change the first paragraph as follows:***

A STA that receives an RTS frame addressed to it considers whether the STA is NSTR limited in determining whether to respond with a CTS and considers the NAV in determining whether to respond with a CTS, unless the NAV was set by a frame originating from the STA sending the RTS frame (see 10.24.2.2 (EDCA backoff procedure)). In this subclause for a non-S1G STA, “NAV indicates idle” means that the NAV count is 0 or that the NAV count is nonzero but the nonbandwidth signaling TA obtained from the TA field of the RTS frame matches the saved TXOP holder address. In an S1G STA, “NAV indicates idle” means that both NAV and RID counters are 0 or that either NAV or RID counter is nonzero but the TA field of the RTS frame matches the saved TXOP holder address. **(#1489, #1768, #1837)**

***Insert the following two paragraphs as the second and third paragraph of the subclause:***

A STA is NSTR limited if all of the following conditions are true:

—the STA is affiliated with an MLD that has at least one NSTR link pair

—the STA has received the RTS on a link that is a member of one or more of the MLD’s NSTR link pairs

—a STA affiliated with the MLD is a TXOP holder or TXOP responder or is attempting to become a TXOP holder on one of the other links that is a member of at least one of the NSTR link pairs of which the link on which the RTS was received is a member **(#1491, #1492, #1738)**

If at least one of the above conditions is not true, then the STA is not NSTR limited. **(#1492, #1738)**

***Change the now-shifted fourth and fifth paragraphs as follows:***

A VHT 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 secondary channels (secondary 20 MHz channel, secondary 40 MHz channel, and secondary 80 MHz channel) 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.

A VHT 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 secondary channels has been idle for a PIFS prior to the start of the RTS frame 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.

***Change the now-shifted ninth paragraph as follows:***

A non-VHT and non-S1G STA that is addressed by an RTS frame or a VHT STA that is addressed by an RTS frame carried in a non-HT or non-HT duplicate PPDU that has a nonbandwidth signaling TA or a VHT STA that is addressed by an RTS frame in a format other than non-HT or non-HT duplicate behaves as follows:

—If the NAV indicates idle, and the STA is not NSTR limited, the STA shall respond with a CTS frame after a SIFS.

•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.

***TGbe editor: Within TGbe Draft D0.4, add a new subclause and editing instructions to modify the text in subclause 26.2.6.3 CTS frame response to an MU-RTS Trigger frame, as shown:***

**26.2.6.3 CTS frame response to an MU-RTS Trigger frame**

***Change the first and second paragraphs as follows:***

If a non-AP STA receives an MU-RTS Trigger frame, and the following two conditions are met:

— The MU-RTS Trigger frame has one of the User Info fields addressed to the non-AP STA, where the User Info field is addressed to a non-AP STA 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 is associated or by the AP corresponding to the transmitted BSSID if the non-AP STA is associated with an AP corresponding to a nontransmitted BSSID and has indicated support for receiving Control frames with TA field 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 transmits.

— The UL MU CS condition indicates that the medium is idle (see 26.5.2.5 (UL MU CS mechanism)).

And the non-AP STA is not NSTR limited, then the STA shall commence the transmission of a CTS frame response at the SIFS time boundary after the end of a received PPDU.

If the first two conditions are met, but the non-AP STA is NSTR limited, then then the STA may commence the transmission of a CTS frame response at the SIFS time boundary after the end of a received PPDU

Otherwise, the non-AP STA shall not send a CTS frame response following the receipt of an MU-RTS Trigger frame. **(#1492)**

***TGbe editor: Within TGbe Draft D0.4, add a new subclause and editing instruction to modify the text in subclause 26.5.2.3.2 Conditions for not responding with an HE TB PPDU, as shown:***

**26.5.2.3.2 Conditions for not responding with an HE TB PPDU**

***Change the text as shown:*** **(#1739)**

A non-AP STA may choose to not respond to a Trigger frame that contains one or more subfields in theCommon Info field or in the User Info field addressed to or selected by the non-AP STA with values that arenot recognized, not supported or cannot be satisfied by the non-AP STA.

NOTE—The User Info field in this context corresponds to the one directed to the non-AP STA (i.e., value in the AID12 subfield matches the STA’s AID) or the one allocating an RA-RU (single or within a contiguous set) that is selected by the non-AP STA.

A non-AP STA may choose to not respond to a Trigger frame if the STA is NSTR limited.

A non-AP STA may choose to not respond a TRS Control subfield in a frame addressed to the non-AP STA if the TRS Control subfield contains one or more subfields with values that are not recognized, not supported or cannot be satisfied by the non-AP STA.

A non-AP STA may choose to not respond to a TRS Control subfield in a frame addressed to the non-AP STA if the STA is NSTR limited. **(#1739)**