IEEE P802.11
Wireless LANs

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| CC34 Comment Resolution for EMLSR – Part 2 |
| Date: 2021-3-10 |
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Abstract

This submission proposes comment resolutions for the following CIDs received in CC34 related to EMLSR mode duration:

* 1459
* 1758
* 2337
* 2338
* 2550
* 2551
* 2936

Revisions:

* Rev 0: Initial version of the document.

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 1459 | Chunyu Hu | 35.3.14 | 145.34 | Since the txop holder is specific to a link, it makes more sense that the non-AP MLD stays on the same link till end of the TXOP. It's also more efficient by reducing some overhead. | "immediately after the end of the frame exchange sequence" ==> "immediately after the end of theTXOP" | Revised.Agree in principle. The ‘frame exchange’ sequence has been replaced with ‘frame exchanges’ to indicate that there could be multiple frame exchanges during the TXOP. Also defined a procedure to determine when a non-AP MLD should return to the listening mode.TGbe editor to make the changes with the CID tag (#1459) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |
| 1758 | Hanseul Hong | 35.3.14 | 145.36 | The description in this subclause only applies for downlink traffic. Add the operaiton of uplink procedure or reference to other subclause. | As in the comment | Revised.The current 11be draft doesn’t prevent a non-AP MLD operating in the EMLSR mode from initiating a transmission to an AP MLD. However, the spec also is lacking a procedure how to determine when to return to the listening mode after initiating an UL transmission. A procedure is added to the subclause.TGbe editor to make the changes with the CID tag (#1758) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |
| 2337 | Minyoung Park | 35.3.14 | 145.04 | When an AP MLD transmits MU-RTS or BSRP as an initial control frame, multiple frame exchanges could follow the initial control frame (e.g. MU-RTS/CTS/Data/BA/Data/BA). However, in 35.3.14, the phase 'a frame exchange sequence' is used, which could be interpreted as a single frame exchange sequence, e.g. BSRP follwed by BSR or Data followed by BA. This needs to be rephrased to represent multiple frame exchanges. | Replace 'a frame exchange sequence' with 'frame exchanges'. Also make the same changes in L5, L21, L25, L27, L31, L35. | Revised.Agree in principle. The proposed changes are made in subclause 35.3.14.TGbe editor to make the changes with the CID tag (#2337) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |
| 2338 | Minyoung Park | 35.3.14 | 145.34 | It is unclear when the non-AP MLD switches back to the listening operation on the enabled links. The end of frame exchange seqeuence is not defined clearly. The spec should define a deterministic way of knowing when the non-AP MLD switches back to the listening operation. | Define a timer at the non-AP MLD that initializes based on a received frame's Duration field so that the non-AP MLD knows when the frame exchanges with the AP MLD end and can safely go back to the listening operation. Also define a timeout interval so that the non-AP MLD can go back to the listening operation when the medium is idle for the timeout interval knowing that there is no more frame exchange between the AP MLD and the non-AP MLD. The details will be provided by the commenter. | Revised.Agree in principle. A procedure to determine when to return to the listening operation is added to the subclause.TGbe editor to make the changes with the CID tag (#2338) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |
| 2550 | Robert Stacey | 35.3.14 | 145.21 | Inappropriate shall: the requirement is not to initiate a frame exchange sequence, the requirement is that a frame exchange sequence begin with an initial Control frame. | Change to "An AP MLD that initiates a frame exchange sequence with an EMLSR non-AP STA, shall begin the frame exhange with an initial Control frame." | Revised.Agree in principle. TGbe editor to make the changes with the CID tag (#2550) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |
| 2551 | Robert Stacey | 35.3.14 | 145.25 | An initial Control frame is not something that you identify just by its content. It is identified by (and behavior is dependent on) both context and content. | I would suggest we create two modes for this EMLSR non-AP STA; a listen state and full-on active channel state. This statement then becomes something like: "An EMLSR non-AP STA that is in \_listen\_ state and that receives a MU-RTS Trigger or BSRP Trigger frame with a STA Info field addressed to it shall enter the \_full on active channel\_ state." Add additional statements for transitioning between these two states so that both sides know which state the EMLSR non-AP ST is in at all times. | Revised.To clarify that the non-AP MLD is listening on the enabled links before receiving an initial Control frame from the AP MLD, the paragraph is modified as follows: “After receiving the initial Control frame of frame exchanges, the non-AP MLD that was listening on the enabled links shall be able to transmit or receive frames on the link in which the initial Control frame was received …”A method to determined when the non-AP MLD returns to listen on the enabled links is added.TGbe editor to make the changes with the CID tag (#2551) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |
| 2936 | Thomas Handte | 35.3.14 | 145.33 | "The non-AP MLD switches back to the listening operation on the enabled links immediately after the end of the frame exchange sequence." The immediately contradicts with p.146 l.10-12, where it is stated that a link switch delay may be present. | Consider to revise to "The non-AP MLD \*initiates\* switching back to the listening operation on the enabled links immediately after the end of the frame exchange sequence" | Revised.Agree in principle. Deleted the sentence and added a procedure to determine when to return to the listening operation.TGbe editor to make the changes with the CID tag (#2936) in doc.: IEEE 802.11-20/287r0[https://mentor.ieee.org/802.11/dcn/21/11-21-0287-00-00be-cc34-cr-emlsr-part2.docx] |

**TGbe Editor to make the following changes in Subclause 35.3.14 :**

**35.3.14 Enhanced multi-link single radio operation**

A non-AP MLD may operate in the EMLSR mode on the enabled links between the non-AP MLD and its associated AP MLD.

***Editor’s Note: Per the authors of 20/1291r12, the name of the EMLSR mode is TBD.***

An MLD with dot11EHTEMLSROptionImplemented equal to true shall set the EMLSR mode subfield of the Common Info field of the Basic variant Multi-Link element to 1; otherwise, the MLD shall set the EMLSR mode subfield to 0.

When a non-AP MLD is operating in the EMLSR mode with an AP MLD supporting the EMLSR mode the following applies:

— The non-AP MLD shall be able to listen on the enabled links, by having its affiliated STA(s) corresponding to those links in the awake state. The listening operation includes CCA and receiving the initial Control frame of frame exchanges that is initiated by an AP MLD. (#2337)

— The initial Control frame of frame exchanges shall be sent in the OFDM PPDU or non-HT duplicate PPDU format using a rate of 6 Mbps, 12 Mbps, or 24 Mbps. (#2337)

— The initial Control frame shall be an MU-RTS Trigger frame or a BSRP Trigger frame.

NOTE 1—Mandatory or optional support for the non-AP MLD of reception of MU-RTS and BSRP Trigger frames is TBD.

NOTE 2—Optional support for the non-AP MLD of reception of Basic Trigger frame is TBD.

— The non-AP MLD shall indicate the delay time needed by the non-AP MLD in the EMLSR Delay field in the Common Info field of the Basic variant Multi-Link element. The value in the EMLSR Delay field indicates the MAC padding duration of the Padding field of the initial Control field. The EMLSR Delay field is 3 bits and set to 0 for 0 µs, set to 1 for 32 µs, set to 2 for 64 µs, set to 3 for 128 µs, set to 4 for 256 µs, and the values 5 to 7 are reserved.

— The AP MLD that initiates frame exchanges with the non-AP MLD on one of the enabled links shall begin the frame exchanges by transmitting the initial Control frame to the non-AP MLD with the limitations specified above. (#2337, 2550)

— After receiving the initial Control frame of frame exchanges, the non-AP MLD that was listening on the enabled links (#2551) shall be able to transmit or receive frames on the link in which the initial Control frame was received and shall not transmit or receive on the other link(s) until the end of the frame exchanges, and subject to its spatial stream capabilities, operation mode, and link switch delay, the non-AP MLD shall be capable of receiving a PPDU that is sent using more than one spatial stream a SIFS after the end of its response frame transmission solicited by the initial Control frame.(#2337) During the frame exchanges, the AP MLD shall not transmit frames to the non-AP MLD on the other link(s). . (#1459, 2338, 2936)

— The EMLSR timer in a STA of the non-AP MLD is initialized with the duration from the Duration/ID field in the frame most recently received from the AP of the AP MLD that initiated the frame exchange. The EMLSR timer begins counting down from the end of the reception of the PPDU containing that frame. (#1459, 2338, 2936, 2551)

— The non-AP MLD shall switch back to the listening operation on the enabled links after the time indicated in the EMLSR Delay2 field if one of the following conditions is met and this is defined as the end of the frame exchanges: (#1459, 2338, 2936, 2551)

* The EMLSR timer in the STA of the non-AP MLD has expired.
* The medium is idle for a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay after the end of the transmission of the PPDU by the STA of the non-AP MLD as a response to the most recently received frame from the AP of the AP MLD.
* The medium is idle for a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay after the end of the reception of the PPDU containing a frame from the AP of the AP MLD that does not require immediate acknowledgement.

— When the AP of the AP MLD performs a backoff before the TXNAV timer expires, the AP of the AP MLD shall begin the frame exchange by transmitting the initial Control frame to the non-AP MLD. (#1459, 2338, 2936, 2551)

— When a STA of the non-AP MLD initiates frame exchanges the following applies: (#1758, 2338, 2936, 2551)

* The EMLSR timer in the AP of the AP MLD is initialized with the duration from the Duration/ID field in the frame most recently received from the STA of the non-AP MLD that initiated the frame. The EMLSR timer in the AP of the AP MLD begins counting down from the end of the reception of the PPDU containing that frame.
* The non-AP MLD switches back to the listening operation after the time indicated in the EMLSR Delay2 field if any of the following conditions is met:
	+ The medium is idle for a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay after the end of the transmission of the PPDU by the STA of the non-AP MLD and cannot complete a retransmission within the TXOP.
	+ The final frame exchange between the STA of the non-AP MLD and the AP of the AP MLD within the TXOP has completed.
* The AP MLD may initiate a frame exchange with the non-AP MLD on one of the enabled links after the time indicated in the EMLSR Delay2 field if any of the following conditions is met:
	+ The EMLSR timer in the AP of the AP MLD has expired.
	+ The medium is idle for a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay after the end of the transmission of the PPDU by the AP of the AP MLD as a response to the most recently received frame from the STA of the non-AP MLD.
	+ The medium is idle for a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay after the end of the reception of the PPDU containing a frame from the STA of the non-AP MLD that does not require immediate acknowledgement.