IEEE P802.11  
Wireless LANs

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| Initial SA Ballot Comment Resolution – EMLSR and Misc. | | | | |
| Date: 2024-2-26 | | | | |
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Abstract

This submission proposes comment resolution(s) for the following 12 CID(s) received in the initial SA ballot on TGbe D5.0 related to the EMLSR Operation in subclause 35.3.17, and other subclauses:

CIDs:

22364 22356 22255 22261 22271 22258 22260 22256 22158 22254

22163 22162

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: revised resolution based on comment during the March F2F meeting.

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| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 22364 | Alfred Asterjadhi | 35.3.16.8.1 | 571.51 | [Al Petrick] For EMLSR includes a link switch delay contributed from the delay switching from listen to frame exchanges and visa versa. Link switch delay in "time" is not defined in the text as a value of x micoseconds. A time value (typical or max) for link switch delay should be defined for EMLSR and EMLMR operation. If the time values are defined in another subclause then add a reference in Note 2. | Add time value in use or msec in the normative text or in Note 2 on line 59 pg. 571 | Revised.  Added references to the tables that define values of the link switch delays: Table 9-404e—Encoding of the EMLSR Padding Delay subfield, Table 9-404f—Encoding of the EMLSR Transition Delay subfield, Table 9-404g—Encoding of the EMLMR Padding Delay subfield, and Table 9-404h—Encoding of the EMLMR Transition Delay subfield.  TGbe editor to make the changes with the CID tag (#22364) in doc.: IEEE 802.11-24/0343r1  [https://mentor.ieee.org/802.11/dcn/24/11-24-0343-01-00be-sa1-cr-emlsr-misc.docx] |
| 22356 | Alfred Asterjadhi | 35.3.17 | 572.22 | [Al Petrick] Provide high level block diagram illustrating the EMLSR operation with multiple radios and multiple links identifying PHY / MAC functionality for transmitter and receiver illustrating w/antennas. This can be similar to other block diagrams in legacy amendments within the 802.11 baseline. This will enable the reader to better understand the text content. The diagram could be part of the examples in the AF annex. | as commented | Rejected.  Since different vendors have different implementation architectures, it is difficult to provide a block diagram in the amendment that represents different implementation architectures. |
| 22255 | Pascal VIGER | 35.3.17 | 574.50 | Rules b) and d) seems opposed: Rule b) provides buffering group addressed frame, whereas rule d) provides not performing frame exchanges initiated by the initial Control frame on one of the EMLSR links that would overlap with group addressed frame transmissions . | please align the rules (if required), otherwise add a Note to explain the distinction of these rules. | Rejected.  There are no conflicting rules between b) and d).  The item b) defines that on the EMLSR links the group addressed BUs are buffered and delivered following the rules defined in 35.3.15(MLO group addressed frames) and the item d) defines the rules for a non-AP MLD that when it receives the initial control frame on one of the EMLSR links, it responds following the rules in 35.5.2.3 (non-AP STA behavior for UL MU operation) except when the group address frame transmissions on the other EMLSR link overlap with the frame exchanges that is initiated by the initial control frame. |
| 22261 | Pascal VIGER | 35.3.17 | 576.64 | From last round discussions, it is admitted that initial Control frame can initiate frame exchanges for both EMLSR and EMLMR, so it seems reasonable to align some common requirements for both : especially, padding delay shall be adapted to both EMLSR and EMLMR | Either add a Note 8 for considering both EMLSR and EMLMR padding , or update Note 7. | Rejected.  35.3.18 (Enhanced multi-link multi-radio operation) in TGbe D5.0 P580L26 already considers the padding delay as follows:  “When an AP affiliated with an AP MLD transmits a PPDU that initiates a frame exchange with a non-AP MLD operating in EMLMR mode, the AP shall ensure that the padding duration of the PPDU is longer than or equal to the minimum padding duration value indicated by the EMLMR Padding Delay field of the Basic Multi-Link element in the (Re)Association Request frame received from the non-AP MLD.  NOTE 2—The initial frame exchange can be any frame exchange as long as the soliciting frame satisfies the padding requirement, e.g., through Trigger frame padding if the soliciting frame is a Trigger frame, or through MPDU delimiter padding if the soliciting frame is carried in an A-MPDU.” |
| 22271 | stephane baron | 35.3.6.1 | 577.01 | I don't see the link between this note 8, and the EMLSR mode. Please add "that is operating in the EMLSR mode" after "A non-AP STA affiliated with the non-AP MLD", or remove note 8. | as in comment | Revised.  Added ‘that is operating in the EMLSR mode’ as suggested by the commenter.  TGbe editor to make the changes with the CID tag (#22271) in doc.: IEEE 802.11-24/0343r1  [https://mentor.ieee.org/802.11/dcn/24/11-24-0343-01-00be-sa1-cr-emlsr-misc.docx] |
| 22258 | Pascal VIGER | 35.3.17 | 577.04 | Note 9 says a "non-AP STA…operating on EMLSR mode can receive Beacon frames". This is unclear. It is better to provide rules for the STA, as is done for R-TWT SPs for non-AP STA operating " on one link of an NSTR link pair, or one of the EMLSR or EMLMR links" (35.8.4.1). | Clarify that second non-AP STA as a TXOP holder on the second link should ensure its TXOP ends no later than T amount of time before the TBTT on the link the non-AP STA expects to receive beacon or group-addressed frame.(as done in page 623 line 8 in 35.8.4.1). | Rejected.  Since a non-AP STA is the TXOP holder and it can end the TXOP before the TBTT on the link on which the non-AP STA expects to receive a beacon or group addressed frames, additional rules for this case are not needed. |
| 22260 | Pascal VIGER | 35.3.17 | 577.04 | It is still unclear what is the purpose of Note 9, with "non-AP STA…operating on EMLSR mode can receive Beacon frames". What is expected from the STA ? Be prepared to listen and receive on both links ?... | Please clarify the intend and operating expectations for the EML STA. | Rejected.  The note is clarifying that a non-AP STA affiliated with a non-AP MLD in the EMLSR mode can receive a beacon frame scheduled at a TBTT. |
| 22256 | Pascal VIGER | 35.3.17 | 578.45 | End of the sentence seems not clear nor correct : "if any of the following conditions is met and \*\*this is defined as\*\* the end of the frame exchanges". | as per comment | Revised.  To clarify, made an editorial change by moving ‘,’ before ‘if any of the following…’ to before ‘and this is defined…’.  TGbe editor to make the changes with the CID tag (#22256) in doc.: IEEE 802.11-24/0343r1  [https://mentor.ieee.org/802.11/dcn/24/11-24-0343-01-00be-sa1-cr-emlsr-misc.docx] |
| 22158 | Yongho Kim | 35.3.17 | 578.55 | When a non-AP STA affiliated with an EMLSR non-AP MLD performs a TXS operation as defined in 35.2.1.2 and transmits a CTS response to a MU-RTS frame, since it shall switch back after the end of the frame exchanges as defined in 35.3.17 due to not receiving PHY-RXSTART.indication in shared TXOP, it can not perform TXS operation. Therefore, EMLSR non-AP STA MLD's transmission to the AP or to a peer STA is not possible. The 802.11be draft shall define an EMLMR non-AP MLD's TXS operation. | Add the following text: m) When a non-AP STA affiliated with the non-AP MLD is addressed in an MU-RTS TXS Trigger frame, the following applies: \* The non-AP MLD shall be switched back to the listening operation on the EMLSR links not later than the EMLSR transition delay time most recently indicated by the non-AP MLD, as measured immediately after the end of the allocated time specified in 35.2.1.2 (Triggered TXOP sharing procedure). | Revised.  Added a new item that disallows the switch back to the listening operation during the time allocated by an MU-RTS TXS Trigger frame.  TGbe editor to make the changes with the CID tag (#22158) in doc.: IEEE 802.11-24/0343r1  [https://mentor.ieee.org/802.11/dcn/24/11-24-0343-01-00be-sa1-cr-emlsr-misc.docx] |
| 22254 | Pascal VIGER | AF.15 | 1040.01 | Figure AF-53 illustrates EHT TB PPDUi with acknowledgement. What is 'with acknowledgement' ? Acknowledgement of what, the DL MU PPDU received with TRS ? | as per comment | Rejected.  This is an invalid comment asking questions without a suggested change.  ‘acknowledgement’ in the diagram is an acknowledgement to the EHT MU PPDU. A similar illustration can be found in Figure 26-1 in TGme D4.0. |

**35.3.16.8 Medium access recovery procedure**

**35.3.16.8.1 General**

**…**

NOTE 2—The link switch delays include the delay switching from the listening operation to the frame exchanges and the delay switching from the frame exchanges to the listening operation (see 35.3.17 (Enhanced multi-link single radio (EMLSR) operation) 35.3.18 (Enhanced multi-link multi-radio (EMLMR) operation)(#22364), Table 9-404e (Encoding of the EMLSR Padding Delay subfield), Table 9-404f (Encoding of the EMLSR Transition Delay subfield), Table 9-404g (Encoding of the EMLMR Padding Delay subfield), and Table 9-404h (Encoding of the EMLMR Transition Delay subfield)).

**35.3.17 Enhanced multi-link single radio (EMLSR) operation**

**…**

i) The non-AP MLD shall be switched back to the listening operation on the EMLSR links after the

EMLSR transition delay time most recently indicated by the non-AP MLD if any of the following

conditions is met, and this is defined as the end of the frame exchanges:( #22256)

…

**TGbe Editor to insert the following new item right after item i) in Subclause 35.3.17 (Enhanced multi-link single radio operation) in TGbe D5.0 Page578 L38 and update the numbering of the items: (#**22158)

\*) When an MU-RTS TXS Trigger frame that is addressed to a non-AP STA affiliated with the non-AP MLD is received by the non-AP STA, the rules defined in item i) shall not apply to the non-AP MLD during the allocated time indicated in the MU-RTS TXS Trigger frame and the non-AP MLD shall not switch back to the listening operation during the allocated time.(# 22158)

…

NOTE 8—A non-AP STA affiliated with the non-AP MLD (#22271)that is operating in the EMLSR mode follows the rules defined in 11.2.3.7 (Receive operation for STAs in PS mode) and 11.2.3.8 (Receive operation using APSD).

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| 22163 | Gaurav Patwardhan | 9.4.2.315 | 291.35 | If an AP MLD wants to signal link bitmap for large number of devices (eg: Airports, malls,etc.), then the element would carry a link bitmap for each of them. Thus the size of the overall element can be very large. This results in bloating of Beacon frame. It will cause issues such as high management frame overhead in dense enterprise deployments. Additionally, it will cause inter-operability issues with legacy devices which cannot parse very large sized Beacon frames. | Reduce Beacon frame bloating by moving multi-link traffic indication element out of the Beacon to an independent frame. | Rejected.  An AP MLD can always set the TID-To-Link Mapping Negotiation Support subfield of the MLD Capabilities And Operations field of the Basic Multi-Link element to a value to 0 (TTLM not supported) or 1 (all TIDs mapped to the same link set) to not include the MLTI element in a beacon if the size of the Beacon becomes an issue.  In the previous rounds of 802.11 WG LBs, there had been many attempts to move the MLTI element out of a beacon frame but the group couldn’t reach consensus as there were many other related issues that have to be addressed together with separating the MLTI element as an independent frame. |
| 22162 | Gaurav Patwardhan | 9.4.2.315 | 293.22 | If at least one enabled link has all TIDs mapped to it, the a non-AP MLD can request buffered units at the AP on that link. There is no need for any AP affiliated with an AP MLD to transmit the Multi-Link Traffic Indication element in Beacons as it is significant overhead. | Change "all enabled links" with "at least one enabled link" | Rejected.  The method described in the comment forces a non-AP MLD to retrieve data only on a link on which all TIDs are mapped, which could limit the performance of the non-AP MLD.  An AP MLD can also set the TID-To-Link Mapping Negotiation Support subfield of the MLD Capabilities And Operations field of the Basic Multi-Link element to a value to 0 (TTLM not supported) or 1 (all TIDs mapped to the same link set) to not include the MLTI element in a beacon. |