IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| D2.0 Comment Resolution Subclause 35.3.18 Part 1 | | | | |
| Date: August 2022 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Liwen Chu | NXP |  |  | Liwen.chu@nxp.com |

Abstract

Proposed draft text for enhancements to TID mapping.

The submission proposes text changes to resolve the following CIDs

10368, 10867, 11583, 11599, 11680, 13707, 14003, 12889, 12683, 10362,

12891, 13634, 10165, 10167, 12851, 10046, 10047, 12856, 12857, 12858,

12859, 10166, 11462, 11463, 11464, 12448, 12862, 10042, 12893, 13956,

11588, 11590, 12873, 11589, 13663.

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2022-08-25 | 0 | Initial draft |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Line** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 10368 | 466 |  | Both "eMLMR" and "EMLMR" are present. The term should be unified to "EMLMR". | As in comment. | Revised  The accepted CID 12683 provides the accepted change. |
| 10867 | 466 | 61 | "eMLMR" is inconsistent with "EMLMR". | as in comment | Revised  The accepted CID 12683 provides the accepted change. |
| 11583 | 466 | 61 | please consolidate the usage of terms "eMLMR" and "EMLMR" | as in comment | Revised  The accepted CID 12683 provides the accepted change. |
| 11599 | 466 | 61 | eMLMR -> EMLMR. | As in comment | Revised  The accepted CID 12683 provides the accepted change. |
| 11680 | 466 | 61 | eMLMR is not consistent with the term, "EMLMR" | change "eMLMR STA" to "EMLMR STA"; change "eMLMR STA" to "EMLMR STA" | Revised  The accepted CID 12683 provides the accepted change. |
| 13707 | 466 | 61 | both eMLMR and EMLMR exist. Please unify them. | as in comment. | Revised  The accepted CID 12683 provides the accepted change. |
| 14003 | 466 | 61 | Use a capital letter E for eMLMR. | As in comment | Revised  The accepted CID 12683 provides the accepted change. |
| 12889 | 466 | 61 | Change "eMLMR" to "EMLMR" for all instances | As in comment | Revised  The accepted CID 12683 provides the accepted change. |
| 12683 | 466 | 60 | typo: replace the "e" with "E" in the following sentence: "A STA of the non-AP MLD that is on an eMLMR link is an eMLMR STA" | The sentence should be revised as follows: "A STA of the non-AP MLD that is on an EMLMR link is an EMLMR STA" | Accepted |
|  |  |  |  |  |  |
| 10362 | 466 |  | The EMLMR operation should be clarified what it is at the beginning of this subclause. | Add a description what the EMLMR operation to have its distinct identity and advantages understandable. If it cannot be explained, delete the operation from the draft. | Revised  Discussion: generally agree with the commenter, a general description of EMLMR is added at the beginning of the subclause.  TGbe editor to make changes in THIS DOCUMET with CID label 10362. |
| 12891 | 466 | 57 | The subclause lacks the general description, similar to that found in 35.3.17. | Please add the requested general description | Revised  Discussion: generally agree with the commenter, a general description of EMLMR is added at the beginning of the subclause.  TGbe editor to make changes in THIS DOCUMET with CID label 12891. |
| 13634 | 466 | 55 | There is no clear definition of EMLMR operation in the spec | Please provide a clear definition/explanation of what is meant by EMLMR operation. | Revised  Discussion: generally agree with the commenter, a general description of EMLMR is added at the beginning of the subclause.  TGbe editor to make changes in THIS DOCUMET with CID label 13634. |
|  |  |  |  |  |  |
| 10165 | 466 | 58 | When a non-AP MLD operates in EMLMR mode, it is not specified how a non-AP MLD initiates a frame exchange for untriggered UL transmissions. | Specify clearly the procedure for a non-AP MLD to initiate a frame exchange for untriggered UL transmission. | Revised  Discussion: generally agree with the commenter, a paragraph that describe the TXOP initiated by a STA of non-AP MLD in EMLMR mode is added.  TGbe editor to make changes in THIS DOCUMET with CID label 10165. |
| 10167 | 466 | 58 | When a non-AP MLD operates in EMLMR mode and intends to grant the medium for transmitting UL data, the backoff procedure is not clearly specified. | Specify clearly the use of the backoff procedure when an non-AP MLD operates in EMLMR mode and intends to operate an untriggered UL transmission. | Revised  Discussion: generally agree with the commenter, a paragraph that describe the TXOP initiated by a STA of non-AP MLD in EMLMR mode is added.  TGbe editor to make changes in THIS DOCUMET with CID label 10167. |
| 12851 | 466 | 55 | In EMLMR mode, for untriggered UL transmission, considering EDCA backoff procedure independently for each EMLMR link is not adapted as it doesn't take into account that only one EMLMR link is usabled at a time. | For untriggered uplink transmission in EMLMR mode, specify an EDCA backoff procedure taking into account the dependencies between EMLMR links | Revised  Discussion: generally agree with the commenter, a paragraph that describe the TXOP initiated by a STA of non-AP MLD in EMLMR mode is added.  TGbe editor to make changes in THIS DOCUMET with CID label 12851. |
|  |  |  |  |  |  |
| 10046 | 466 | 58 | What would be the EMLMR behavior if all EMLMR STAs except one EMLMR STA affiliated with non-AP MLD goes to power save mode (doze state)? Please explain this PM behavior in the spec. | as in comment | Revised  Discussion: Each EMLMR STA inpendently maintains its own power management mode. When all EMLMR STAs except one EMLMR STA are in power save mode or all EMLMR STAs are in power save mode with one of them is in awake state, the AP MLD can do frame exchanges with the EMLMR STA in active mode or awake state by using EMLMR MCS, Nss after the initial frame exchange. Within the initial frame exchange, the AP MLD can ignore the radio switch delay.  TGbe editor to make changes in THIS DOCUMET with CID label 10046. |
|  |  |  |  |  |  |
| 10047 | 466 | 58 | What is the TID to link mapping that should be used over the EMLMR links? Please add text to clarify. | as in comment | Revised  Discussion: in UL traiggered based frame exchanges with an EMLMR STA, an AP solicits the frames from the STA in a EMLMR link where the TIDs of the frames are mapped to the link per the TID-ot-link mapping. When all the TIDs of a non-AP MLD is mapped to a single EMLMR link, the EMLMR rules are followed with the exception that the EMLMR Padding Delay is not needed.  TGbe editor to make changes in THIS DOCUMET with CID label 10047 |
| 12856 | 466 | 55 | Lack of rules for an efficient operation of EMLMR mode regarding uplink TID-To-Link Mapping. Especially, in some situations, EMLMR links may be not in line with the uplink TID-To-Link mapping in use. | Speficy rules for EMLMR links regarding uplink TID-To-Link mapping. | Revised  Discussion: in UL traiggered based frame exchanges with an EMLMR STA, an AP solicits the frames from the STA in a EMLMR link where the TIDs of the frames are mapped to the link per the TID-ot-link mapping. When all the TIDs of a non-AP MLD is mapped to a single EMLMR link, the EMLMR rules are followed with the exception that the EMLMR Padding Delay is not needed.  TGbe editor to make changes in THIS DOCUMET with CID label 12856 |
| 12857 | 466 | 55 | Lack of rules for an efficient operation of EMLMR mode regarding uplink TID-To-Link Mapping. Especially, in some situations, the transmitted BSRP TF (Initial frame) may be not in line with the uplink TID-To-Link mapping in use. | Specify rules for transmission of BSRP TF regarding uplink TID-To-Link mapping. | Revised  Discussion: in UL traiggered based frame exchanges with an EMLMR STA, an AP solicits the frames from the STA in a EMLMR link where the TIDs of the frames are mapped to the link per the TID-ot-link mapping. The BSRP TF is used to solicit the buffer information whose TIDs are mapped to the link where the BSRP is transmitted. When all the TIDs of a non-AP MLD is mapped to a single EMLMR link, the EMLMR rules are followed with the exception that the EMLMR Padding Delay is not needed.  TGbe editor to make changes in THIS DOCUMET with CID label 12857 |
| 12858 | 466 | 55 | Lack of rules for an efficient operation of EMLMR mode regarding uplink TID-To-Link Mapping. Especially, in some situations, the buffered data reported in BSR sent in reponse to BSRP TF may be not in line with the uplink TID-To-Link mapping in use. | Specify rules for buffered data reporting in BSR regarding uplink TID-To-Link mapping. | Revised  Discussion: in UL traiggered based frame exchanges with an EMLMR STA, an AP solicits the frames from the STA in a EMLMR link where the TIDs of the frames are mapped to the link per the TID-ot-link mapping. The BSRP TF is used to solicit the buffer information whose TIDs are mapped to the link where the BSRP is transmitted. When all the TIDs of a non-AP MLD is mapped to a single EMLMR link, the EMLMR rules are followed with the exception that the EMLMR Padding Delay is not needed.  TGbe editor to make changes in THIS DOCUMET with CID label 12858 |
| 12859 | 466 | 55 | Current EMLMR operation mandates that the EMLMR link to be used for frame exchange is the link in which the initial frame was received. For uplink traffic transmission, depending on uplink TID-To-Link mapping, it may be inefficient. | Specify an EMLMR operation allowing to select the EMLMR link to be used for frame exchange among the set of EMLMR links. | Revised  Discussion: in UL traiggered based frame exchanges with an EMLMR STA, an AP solicits the frames from the STA in a EMLMR link where the TIDs of the frames are mapped to the link per the TID-ot-link mapping. When all the TIDs of a non-AP MLD is mapped to a single EMLMR link, the EMLMR rules are followed with the exception that the EMLMR Padding Delay is not needed.  TGbe editor to make changes in THIS DOCUMET with CID label 12859 |
|  |  |  |  |  |  |
| 10166 | 466 | 58 | Contrary to the EMLSR mode, it is not indicated that a non-AP STA affiliated with a non-AP MLD operating in the EMLMR mode does not need to transmit an initial frame to initiate frame exchanges with the AP MLD | Indicate that a non-AP STA affiliated with a non-AP MLD operating in the EMLMR mode does not need to transmit an initial frame to initiate frame exchanges with the AP MLD | Rejected  Discussion: the initial frame exchange whose Nss is decided by the link capability instead of EMLMR Nss capability for RF chain switch is needed. |
|  |  |  |  |  |  |
| 11462 | 466 | 60 | Replace 'A STA of the non-AP MLD' with 'A STA affiliated with the non-AP MLD'. | As in comment | Accepted |
|  |  |  |  |  |  |
| 11463 | 466 | 61 | There is no need to define an 'eMLMR' STA. Similar descriptions in the EMLSR subclause use 'STA operating on the EMLSR links'. Better to keep the text consistent in the two subclauses. Also, it should be 'EMLMR' and not 'eMLMR'. | Remove the definition of an eMLMR STA. Replace the corresponding text throughout the subclause with 'STA operating on EMLMR link'. | Rejected  Discussion: by defining EMLMR STA the specification text can be simplified**.** |
| 11464 | 466 | 1 | Support for EMLSR and EMLMR is mutually exclusive at the non-AP MLD. Add normative text to specify this. | Add the following - 'A non-AP MLD with dot11EHTMLMROptionImplemented equal to true shall have dot11EHTEMLSROptionImplemented equal to false.' | Revised  Generally agree with the commenter  TGbe editor to make changes in THIS DOCUMET with CID label 11464 |
|  |  |  |  |  |  |
| 12448 | 466 | 55 | Definition of sounding sequence in enhanced multi-link multi-radio operation is missing. | Define sounding sequence in EMLMR operation. | Rejected  Discussion: There is no new rule for the sounding under EMLMR operation. Once the RF chains of the other links are switched to the link where the initicial frame exchange happens for EMLMR operation, the normal sounding procedure can be used. |
| 12862 | 466 | 55 | The current text considers only one set of EMLMR links, it is restrictive. | Add text for the support of non-AP MLD implementations with several sets of radios supporting the EMLMR mode independently. | Rejected  Discussion: with more than one set of EMLMR links, ,the implementation of AP MLD and non-AP MLD become complicated. It is not realistic to have multiple sets of EMLMR links since the typical AP MLDs and non-AP MLDswill have no morethan three links**.** |
|  |  |  |  |  |  |
| 10042 | 466 | 57 | After non-AP MLD receive initial frame in one EMLMR STA from AP MLD for frame exchange initiation, both both TX/RX chain switches to that link (L1) for reception of the PPDU over that link. It's not clear if the EMLMR can do frame exchange over the other EMLMR link (L2) when there is frame exchange over one of the links (L1). Please add text for clarification. | as in comment | Revised  Discussion: in EMLMR mode, when there is one TXOP with an EMLMR STA of a non-AP MLD, another EMLMR STA of the non-AP MLD can’t do frame exchanges as the TXOP holder or TXOP responder.  TGbe editor to make changes in THIS DOCUMET with CID label 10042 |
| 12893 | 466 | 55 | It is not clear if an AP is allowed to perform a new frame exchange with a non-AP in EMLMR mode during an ongoing frame exchange in a different link. If it is allowed, what are the per-link spatial stream capabilities and operating mode on links with new frame exchange? The single EMLMR Supported MCS And NSS Set subfield of the EML Control field of the EML Operating Mode Notification frame does not provide this information. | Please clarify what are per-link spatial stream capabilities and operating mode on EMLMR links other than the EMLMR link with the ongoing frame exchange. | Revised  Discussion: in EMLMR mode, when there is one TXOP with an EMLMR STA of a non-AP MLD, another EMLMR STA of the non-AP MLD can’t do frame exchanges as the TXOP holder or TXOP responder.  TGbe editor to make changes in THIS DOCUMET with CID label 12893 |
| 13596 | 466 | 55 | Similar to the EMLSR, during the EMLMR mode, only one among STAs operating in the EMLMR links can receive and transmit a PPDU. Please specify the missing rules. | As in the comment. | Revised  Discussion: generally agree with the commenter.  TGbe editor to make changes in THIS DOCUMET with CID label 13596 |
| 11588 | 468 | 5 | When a STA of an EMLMR nonAP MLD is involved in a frame exchange sequence with an AP of the AP MLD, what is the state of the other STAs of the nonAP MLD? | Provide a mehcanism where during switch to EMLMR mode, a nonAP MLD can indicate the capability of its other EMLMR links when one EMLMR link is involved in a frame exchange sequence. Note: Retaining some NSS on other links can improve channel access, prevent loss of medium synchornization etc. | Revised  Discussion: Similar to the EMLSR, during the EMLMR mode, only one among STAs operating in the EMLMR links can receive and transmit a PPDU.  TGbe editor to make changes in THIS DOCUMET with CID label 11588 | |
| 11590 | 468 | 5 | When a STA of an EMLMR nonAP MLD is involved in a frame exchange sequence with an AP of the AP MLD, can the other EMLMR STAs of a nonAP MLD contend for channel access and transmit in uplink? | Propose mechanism and rules for the frame exchanges on other EMLMR links, e.g., end time alignment of the PPDUs with frame exchange on the first link. | Revised  Discussion: Similar to the EMLSR, during the EMLMR mode, only one among STAs operating in the EMLMR links can receive and transmit a PPDU.  TGbe editor to make changes in THIS DOCUMET with CID label 11590 | |
| 12873 | 468 | 5 | Is there any capability limitation regarding Supported Nss and MCS when multiple links are transmitted or received simultaneously? | Please calrify if there is a need to have the cabability of supported MCS and NSS set across multiple links in EMLMR | Revised  Discussion: Similar to the EMLSR, during the EMLMR mode, only one among STAs operating in the EMLMR links can receive and transmit a PPDU.  TGbe editor to make changes in THIS DOCUMET with CID label 12873 | |
| 11589 | 468 | 10 | How does a EMLMR nonAP MLD know how many NSS an AP of AP MLD plans to use for a frame exchange sequence, and accordingly if it needs to switch radios from other EMLMR links? Note that due to link condition, multi-user transmission etc, the AP may not always use the highest possible NSS. | A mechanism is required for an AP MLD to indicate the NSS it plans to use for the current frame exchange sequence with an EMLMR nonAP MLD. This can help the nonAP MLD determine how many additional radios it needs to switch to current link. | Revised  Discussion: Similar to the EMLSR, during the EMLMR mode, only one among STAs operating in the EMLMR links can receive and transmit a PPDU.  TGbe editor to make changes in THIS DOCUMET with CID label 11589 | |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| 13663 | 466 | 61 | The AP MLD may not have same capability to operate with the maximum TX/RX streams on all the links included in the EMLMR links as indicated by the non-AP MLD. In such cases, it would be necessary for the AP MLD to suggest or negotiate an alternative link set for EMLMR Links. Currently, no mechanism is defined in the spec that would enable a negotiation of EMLMR links between an AP MLD and a non-AP MLD before operating in the EMLMR mode. | Please provide mechanisms and frameworks for EMLMR Links negotiation between an AP MLD and a non-AP MLD supporting EMLMR mode of operation. | Rejected  Discussion: a non-AP MLD knows the capabilitites of all the links at its associated AP MLD. The non-AP MLD can select the links among its associated links for EMLMR operation.. |

**35.3.18 Enhanced multi-link multi-radio operation**

***TGbe editor: Change the first paragraph in 35.3.18 as follows:***

The enhanced multi-link multi-radio (EMLMR) operation defined in this subclause allows a non-AP MLD with multiple radios in multiple links to listen on the EMLMR links when the corresponding STAs affiliated with the non-AP MLD are in awake state as defined below for an initial frame sent by an AP affiliated with an AP MLD in a PPDU whose Nss satisfy the receiving STA’s receiving capabilities, followed by frame exchanges that satisfy the MCS, Nss capabilities in EMLMR mode on the link on which the initial frame was received. (#10362, 12891, 13634)

A non-AP MLD may operate in the EMLMR mode on a specified set of the enabled links as defined in 9.4.1.74 (EML Control field) between the non-AP MLD and its associated AP MLD. The specified set of the enabled links in which the EMLMR mode is applied is called EMLMR links. A STA of the non-AP MLD that is on an eMLMR link is an eMLMR STA. The EMLMR links shall be indicated in the EMLMR Link Bitmap subfield of the EML Control field of the EML Operating Mode Notification frame (see 9.6.35.8 (EML Operating Mode Notification frame details)) by setting the bit positions of the EMLMR Link Bitmap subfield to 1. A non-AP MLD with dot11EHTMLMROptionImplemented equal to true shall have dot11EHTEMLSROptionImplemented equal to false.(#11464)

***TGbe editor: Add the following paragraph at the end of 35.3.18: (#10165, 10167, 12851)***

After one of its backoff counter becomes 0, an EMLMR STA of a non-AP MLD may initiate the frame exchanges with the AP affiliated with the associated AP MLD by using the MCS, Nss in EMLMR Supported MCS and Nss Set announced by the non-AP MLD. The non-AP MLD shall switch back to the listening operation on the EMLMR links after the time duration indicated in the EMLMR Transition Delay subfield after the end of the TXOP.

***TGbe editor: Add the following paragraph at the end of 35.3.18: (#10046)***

Each EMLMR STA inpendently maintains its own power management mode and awake/doze state in power save mode. When all EMLMR STAs except one EMLMR STA are in power save mode or all EMLMR STAs are in power save mode with one of them is in awake state, the AP MLD can do frame exchanges with the EMLMR STA in active mode or awake state by using the MCS, Nss in EMLMR Supported MCS and Nss Set announced by the non-AP MLD after the initial frame exchange. Within the initial frame exchange, the AP MLD may ignore the EMLMR Padding Delay received from the non-AP MLD.

***TGbe editor: Add the following paragraph at the end of 35.3.18: (#10047, 12856, 12857, 12858, 12859)***

An EMLMR STA of a non-AP MLD as the TXOP holer or TXOP responder selects the frames whose TIDs are mapped to the link as defined in 35.3.7 (Link management). When all the TIDs are mapped to the link of the EMLMR STA, the AP of the associated AP MLD that initiates the frame exchange with the EMLMR STA in a TXOP may ignore the EMLMR Padding Delay received from the non-AP MLD.

***TGbe editor: Add the following paragraph at the end of 35.3.18: (#10042, 12893, 13596, 11588, 11590, 12873, 11589)***

When an EMLMR STA affiliated with a non-AP MLD is doing frame exchanges as either TXOP holder or TXOP responder with the AP of the associated AP MLD, another EMLMR STA affiliated with the non-AP MLD shall not do the frame exchanges with another AP of the associated AP MLD.