IEEE P802.11
Wireless LANs

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| D2.0 Comment Resolution Subclause 35.3.18 Part 1 |
| Date: August 2022 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
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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.

12167, 13596

SP1: Do you support the resolution in 11-22/1503r7 for the following CIDs?

10046, 10047, 12856, 12857, 12858,

12859, 10166, 11463, ~~11464,~~ 12862, 12873, 11589

SP2: Do you support the resolution in 11-22/1503r7 for the following CIDs?

12862,

SP3: Do you support option 1 as the resolution in 11-22/1503r7 for the following CIDs?

10165, 10167, 12851, 10042, 12893, 13956, 11588, 11590, 12167, 13596

# 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. | RevisedThe accepted CID 12683 provides the accepted change. |
| 10867 | 466 | 61 | "eMLMR" is inconsistent with "EMLMR". | as in comment | RevisedThe accepted CID 12683 provides the accepted change. |
| 11583 | 466 | 61 | please consolidate the usage of terms "eMLMR" and "EMLMR" | as in comment | RevisedThe accepted CID 12683 provides the accepted change. |
| 11599 | 466 | 61 | eMLMR -> EMLMR. | As in comment | RevisedThe 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" | RevisedThe accepted CID 12683 provides the accepted change. |
| 13707 | 466 | 61 | both eMLMR and EMLMR exist. Please unify them. | as in comment. | RevisedThe accepted CID 12683 provides the accepted change. |
| 14003 | 466 | 61 | Use a capital letter E for eMLMR. | As in comment | RevisedThe accepted CID 12683 provides the accepted change. |
| 12889 | 466 | 61 | Change "eMLMR" to "EMLMR" for all instances | As in comment | RevisedThe 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. | RevisedDiscussion: 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 | RevisedDiscussion: 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. | RevisedDiscussion: 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. |
|  |  |  |  |  |  |
| 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 | RevisedDiscussion: Each EMLMR STA inpendently maintains its own power management mode. The behavior of EMLMR non-AP MLD with one STA in active mode and the behavior of EMLMR non-AP MLD with multiple STAs in active mode are same.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 | RejectedDiscussion: EMLMR feature has no special TID to link mapping requirement.  |
| 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. | RejectedDiscussion: The normal TID to link mapping can be used in EMLMR, i.e. EMLMR feature has no special TID to link mapping requirement. |
| 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. | RejectedDiscussion: The normal TID to link mapping can be used in EMLMR, i.e. EMLMR feature has no special TID to link mapping requirement. |
| 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. | RejectedDiscussion: The normal TID to link mapping can be used in EMLMR, i.e. EMLMR feature has no special TID to link mapping requirement. |
| 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. | RejectedDiscussion: 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.  |
|  |  |  |  |  |  |
| 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 | RejectedDiscussion: 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'. | RejectedDiscussion: 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.' | RevisedGenerally agree with the commenterTGbe 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. | RejectedDiscussion: 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. | RejectedDiscussion: 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**.** |
|  |  |  |  |  |  |
| 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 | RejectedDiscussion: Per link Nss is used when a STA of a non-AP MLD initializes the frame exchanges with the AP of the associated AP MLD in an EMLMR link. The Nss defined by the EMLMR Supported MCS And NSS Set subfield is used when an AP initializes the frame exchanges with the STA of the non-AP MLD in an EMLMR link.  |
| 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. | RejectedDiscussion: ~~the usage of Nss in EMLMR mode by the commenter is complicated: the link the receives the initial frame needs to notify another link the AP’s requirement of the Nss. Some frames can’t be used as the initial frames, e.g. MU-RTS, BSRP Trigger frame.~~ In a TXOP solicited by the AP affiliated with the AP MLD, the Nss used by the AP can be different in different frame exchanges. |
|  |  |  |  |  |  |
| 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. | RejectedDiscussion: 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 dot11EHTEMLMROptionActivated equal to true shall have dot11EHTEMLSROptionActivated equal to false.(#11464)

***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.

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| **CID** | **Page** | **Line** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 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. | RevisedDiscussion: 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. | RevisedDiscussion: 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 | RevisedDiscussion: 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. |
|  |  |  |  |  |  |
| 12167 | 467 | 57 | An MLD that operates in the EMLMR mode may receive an initial frame on one link (link1) while waiting an response of an inital frame sent on another link (link). In this case, it is not clear when the MLD should start frame exchange sequence, either after receving response of inital frame on link1 or link2. | Please clarify when a MLD should start frame exchange sequence if the MLD receives an initial frame on one link while waiting an response of an inital frame sent on another link. | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.TGbe editor to make changes in THIS DOCUMET with CID label 12167 |
| 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 | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.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. | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.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. | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.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. | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.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. | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.TGbe editor to make changes in THIS DOCUMET with CID label 11590 |
| 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. | RevisedDiscussion: in EMLMR mode, when an AP of the AP MLD as the TXOP holder or responder has a TXOP with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA is not finished, another AP of the AP MLD can’t initiate a TXOP with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD can’t do the frame exchange with its associated AP.TGbe editor to make changes in THIS DOCUMET with CID label 13596 |

***TGbe editor: Add the following paragraph at the end of 35.3.18: (#10165, 10167, 12851)***If an EMLMR STA of a non-AP MLD obtains the TXOP and transmits frames, the PPDUs that carries the frames are subject to the MCS, Nss in EMLMR Supported MCS and Nss Set announced by the non-AP MLD. The non-AP MLD shall switch to its per-link spatial stream capabilities defined by EHT Capabilities element or the latest OM (if exists) on the EMLMR links after the time duration indicated in the EMLMR Delay subfield after the end of the TXOP.

***TGbe editor: Add the following paragraph at the end of 35.3.18: (#12167, 10042, 12893, 13596, 11588, 11590, 13596)***

When an AP affiliated with the AP MLD as the TXOP holder ~~or the TXOP responder~~ does the frame exchanges with an EMLMR STA of a non-AP MLD and the frame exchanges with the EMLMR STA are not finished, another AP affiliated with the AP MLD shall not initiate the frame exchanges with another EMLMR STA of the non-AP MLD, and another EMLMR STA of the non-AP MLD shall not do the frame exchange with its associated AP.