IEEE P802.11
Wireless LANs

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| LB266 Comment Resolution Clause 35.3.17 EMLSR Part4 |
| Date: 2022-10-11 |
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Abstract

This submission proposes comment resolution(s) for the following 24 CID(s) received in LB266 on TGbe D2.0 related to 35.3.17 EMLSR Operation:

CIDs:

12839, 13051, 12890, 12724, 13413, 13854, 10055, 11653, 13078, 14068

11779, 12673, 13410, 12676, 12678, 13054, 12411, 13419, 12521, 10866

12429, 13706, 12730, 12731

Revisions:

* Rev 0: Initial version of the document.

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 12839 | Shubhodeep Adhikari | 35.3.17 | 0.00 | 802.11be has defined an NSTR mobile AP MLD. On similar lines, it should now define an EMLSR mobile AP MLD. | Define an EMLSR mobile AP MLD. In its simplest form it will take minimal additions to the specification, since an NSTR mobile AP MLD has already been defined. | Rejected.A non-AP MLD that can operate in EMLSR mode is free to operate as an NSTR mobile AP MLD. |
| 13051 | Huizhao Wang | 9.4.1.74 | 191.04 | Here as well, please reformat this sentence to make it comprehensible of what exactly AP MLD should do when response to received EML Operation Mode Notification | Please rewrite this statement | Revised.The sentence is revised similar to the resolution of CID 12599: “(#12599)An AP MLD with dot11EHTEMLSROptionImplemented equal to true sets the EMLSR Mode subfield to the value obtained from the EMLSR Mode subfieldof the received EML Operating Mode Notification frame.”TGbe editor to make the changes with the CID tag (#13051) in doc.: IEEE 802.11-22/1756r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1756-00-00be-lb266-cr-cl35-emlsr-part4.docx] |
| 12890 | Ilya Levitsky | 35.3.17 | 422.23 | The general description in the subclause lacks a vital point that when an non-AP MLD in EMLSR mode performs a frame exchange on an EMLSR link, the receive chains can be redistributed from other links to the link with the ongoing frame exchange, thus allowing for higher-order MIMO. | Please add the requested general description | Rejected.Since the details of the EMLSR operation (regarding number of spatial streams) are described in the paragraphs in the subclause, adding such details in the introductory paragraph will end up having redundant information in the same subclause. |
| 12724 | Pascal VIGER | 35.3.17 | 461.55 | EMLSR STAs may want to take profit of TWT/rTWT mechanisms, but there is missing specific rules for this operation.Some contributions already discuss about avoiding IC frame obligation inside the TWT/rTWT SP, but this is not specified in the draft. | Please provide rules for EMLSR STAs operating TWT, with avoiding IC frame overhead | Rejected.The initial Control frame during the TWT SP is still needed since there could be overlapping TWT SPs. When there is only one TWT SP across multiple EMLSR links, when the TWT SP is busy due to OBSS or other interference sources, the initial control frame is need to utilize the other available EMLSR links. |
| 13413 | Liwen Chu | 35.3.17 | 461.55 | Clarify that each link of eMLSR mode link set maintains tis power save mode separately. | As in comment. | Rejected.The following NOTE already clarifies that each link maintains its power save mode “NOTE 1—Each of the STAs on the other links of the EMLSR links can transmit a frame with the Power Managementsubfield set to 1 and transition to power save mode immediately after successful transmission of the frame. (see11.2.3.2 (Non-AP STA power management modes)).” |
| 13854 | Sanghyun Kim | 35.3.17 | 461.55 | There are cases that only one EMLSR link is enabled.For example:1. One of the two EMLSR links is removed after a reconfiguration procedure performed by a AP MLD.2. One of the two EMLSR links is disabled by a newly negotiated TID-to-Link mapping.A non-AP MLD does not need to operate in the EMLSR mode if the non-AP MLD has only the single (enabled) EMLSR link, this is because the EMLSR mode cause unnecessary overhead with no benefit for this case. | Please define a restriction on the EMLSR mode operation regarding the number of enabled EMLSR links.If a non-AP MLD has only one EMLSR link enabled, the AP MLD and the non-AP MLD shall consider that the EMLSR mode of the non-AP MLD is deactivated without additional signaling. | Rejected.There is significant power save benefit to use EMLSR mode when only one link is available. Please see 11-22/1414. Disallowing such operation is unnecessary since a non-AP MLD can always disable the EMLSR mode through the explicit signaling. |
| 10055 | Morteza Mehrnoush | 35.3.17 | 461.58 | Due to lower cost and power consumption of the EMLSR devices, a good percentage of the non-AP MLD devices may operate in EMLSR mode; so it's reasonbale to enable the mobile-AP EMLSR operation for such devices. Please add support for this mode. | as in comment | Rejected.Per the comment resolution guide document (11-11/1625r1), this is an invalid comment.The comment identifies a new feature called mobile-AP EMLSR operation, but doesn’t provide specific changes – it is essentially giving the CRC permission to do more work. |
| 11653 | Morteza Mehrnoush | 35.3.17 | 461.58 | Due to lower cost and power consumption of the EMLSR devices, a good percentage of the non-AP MLD devices may operate in EMLSR mode; so it's reasonable to enable the mobile-AP EMLSR operation for such devices. Please add support for this mode. | as in comment | Rejected.Per the comment resolution guide document (11-11/1625r1), this is an invalid comment.The comment identifies a new feature called mobile-AP EMLSR operation, but doesn’t provide specific changes – it is essentially giving the CRC permission to do more work. |
| 13078 | Chittabrata Ghosh | 35.3.17 | 461.58 | Due to lower cost and power consumption of the EMLSR devices, a good percentage of the non-AP MLD devices may operate in EMLSR mode; so it's reasonbale to enable the mobile-AP EMLSR operation for such devices. Please add support for this mode. | as in comment | Rejected.Per the comment resolution guide document (11-11/1625r1), this is an invalid comment.The comment identifies a new feature called mobile-AP EMLSR operation, but doesn’t provide specific changes – it is essentially giving the CRC permission to do more work. |
| 14068 | Pooya Monajemi | 35.3.17 | 461.58 | When a link that is included in the EMLSR link set becomes disabled, or the corresponding AP is removed from the AP MLD, the link should be automatically removed from the EMLSR set, and EMLSR should be automatically disabled if only one link remains in the set. There should be no explicit signaling required for the above. | Add language to remove links from EMLSR link set after AP removal, or link disablement | Revised.In TGbe D2.2, the following sentence was added “(#13280)(#14018)If an AP affiliated with an AP MLD is removed and if the link associated with theremoved AP is one of the EMLSR links or the EMLMR links for one or more non-AP MLDs, the AP MLDshall remove the corresponding link from the EMLSR links and/or EMLMR links of those non-AP MLDs.”When there is only one link available, the EMLSR mode still has benefit for power save so no need to disable the EMLSR mode.TGbe editor to make the changes with the CID tag (#13280)(#14018) in doc.: IEEE 802.11-22/ 22/1487r4.  |
| 11779 | Osama Aboulmagd | 53.3.17 | 461.59 | EMLSR link needs to be defined. | Add definition in clause 3.2 | Rejected.The EMLSR link is defined as follows in D2.2 P500L3 “A non-AP MLD may operate in the EMLSR mode on a specified set of the enabled links between the nonAP MLD and its associated AP MLD. The specified set of the enabled links (#13809)on which the EMLSRmode is applied is called EMLSR links.” |
| 12673 | Arik Klein | 35.3.17 | 462.18 | typo: replace "of" with "in" in the following sentence: "An MLD with dot11EHTEMLSROptionImplemented equal to true shall set the EML Capabilities Present subfield to 1 and shall set the EMLSR Support subfield \*of\* the Common Info field of the Basic Multi-Link element (9.4.2.312.2 (Basic Multi-Link element)) to 1 in all Management frames.." | The sentence should be revised as follows: "An MLD with dot11EHTEMLSROptionImplemented equal to true shall set the EML Capabilities Present subfield to 1 and shall set the EMLSR Support subfield \*in\* the Common Info field of the Basic Multi-Link element (9.4.2.312.2 (Basic Multi-Link element)) to 1 in all Management frames.." | Revised.TGbe editor to make the changes with the CID tag (#12673) in doc.: IEEE 802.11-22/1756r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1756-00-00be-lb266-cr-cl35-emlsr-part4.docx] |
| 13410 | Liwen Chu | 35.3.17 | 462.34 | Update the text as a non-AP MLD transmits eML operation mode notification frame through one of its affiliated STA. | Fix the issues mentioned in the comment | Rejected.The following sentence seems to be correct “When a non-AP MLD with dot11EHTEMLSROptionImplemented equal to true intends to (#12675)enablethe EMLSR mode on the EMLSR links, a (#12242)non-AP STA affiliated with the non-AP MLD shall transmit an EML Operating Mode Notification frame with the EMLSR Mode subfield of the EML Control field of the frame set to 1 to an AP affiliated with an AP MLD with dot11EHTEMLSROptionImplementedequal to true.” |
| 12676 | Arik Klein | 35.3.17 | 462.38 | Need to add the word "and" to the following sentence for better readability and understanding: "An AP affiliated with the AP MLD that received the EML Operating Mode Notification frame from the STA ....starting at the end of the PPDU transmitted by the AP affiliated with the AP MLD as an acknowledgement.." | The sentence should be revised as follows: "An AP affiliated with the AP MLD that received the EML Operating Mode Notification frame from the STA ....starting at the end of the PPDU \*and\* transmitted by the AP affiliated with the AP MLD as an acknowledgement.." | Revised.Updated as follows: “....starting at the end of the PPDU \*that is\* transmitted by the AP affiliated with the AP MLD as an acknowledgement…”TGbe editor to make the changes with the CID tag (#12676) in doc.: IEEE 802.11-22/1756r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1756-00-00be-lb266-cr-cl35-emlsr-part4.docx] |
| 12678 | Arik Klein | 35.3.17 | 462.60 | Need to add the word "and" to the following sentence for better readability and understanding: "An AP affiliated with the AP MLD that received the EML Operating Mode Notification frame from the STA ....starting at the end of the PPDU transmitted by the AP affiliated with the AP MLD as an acknowledgement.." | The sentence should be revised as follows: "An AP affiliated with the AP MLD that received .... starting at the end of the PPDU \*and\* transmitted by the AP affiliated with the AP MLD as an acknowledgement..." | Revised.Updated as follows: “....starting at the end of the PPDU \*that is\* transmitted by the AP affiliated with the AP MLD as an acknowledgement…”TGbe editor to make the changes with the CID tag (#12678) in doc.: IEEE 802.11-22/1756r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1756-00-00be-lb266-cr-cl35-emlsr-part4.docx] |
| 13054 | Chittabrata Ghosh | 35.3.17 | 463.46 | In ML concept, how do we consider a scenario where a (NSTR or eMLSR) STA on one link approaches a scheduled r-TWT SP start time, while it gains channel access on another linkExample: STA 1 on link 1 has an r-TWT SP start time in 0.5ms, while STA 2 gains channel access on link 2 and starts transmitting dataDoes the STA prioritize Tx on link 2 and disregards waking up at beginning of r-TWT SP in link 1? Similar requirements might be needed for an EHT AP while scheduling an RU/MRU in an TF to an eMLSR or NSTR STA, which is also a member of an forthcoming r-TWT SP | Please add specific behavior for eMLSR/NSTR STA and AP scheduling to consider the scenario | Revised.The procedure related to rTWT has been added in TGbe D2.2 subclause 35.8.4.1 (TXOP and backoff procedures rules for R-TWT SPs) as a resolution to CID 13464 and 10435.TGbe editor to make the changes with the CID tag (#13646)(#10435) in doc.: IEEE 802.11-22/1470r6  |
| 12411 | Juseong Moon | 35.3.17 | 463.58 | Since EMLSR operation and power saving operation are separate operations, joint operation of EMLSR and power saving needs to be defined. When a STA of an EMLSR STA MLD in power saving received a TIM and transmitted PS-POLL frame, the STA may return to EMLSR listening mode if BU is not received within aSIFSTime + aSlotTime + aRxPHYStartDelay. Since AP will transmit BU using the link where PS-Poll is received, returning to unnecessary operation. The STA of EMLSR STA MLD may keep EMLSR operation status until the reception of BU. | As in comment | Rejected.Since the buffered BU delivery time after the reception of the PS-Poll can vary and can be delivered after a long delay, waiting for the buffered BU in the listening operation could save more power than not returning to the listening operation (See doc. 11-22/1414). Also the other EMLSR links can be transitioned to awake state and multiple EMLSR links can be utilized. |
| 13419 | Liwen Chu | 35.3.17 | 463.59 | change "shall be switched back to" to "shall switch back" | As in comment. | Rejected.The change “be switched back” was made to clarify that the non-AP MLD is in the listening operation rather than starting to switch back to the listening operation. The same resolution was provided for CID# 13815.Note to the commenter: This was the change based on CC36 (CID# 5222). |
| 12521 | Yusuke Tanaka | 35.3.17 | 464.39 | Comma is needed after "TXOP" | As commented. | Revised.Added a comma after TXOP.TGbe editor to make the changes with the CID tag (#12521) in doc.: IEEE 802.11-22/1756r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1756-00-00be-lb266-cr-cl35-emlsr-part4.docx] |
| 10866 | Yousi Lin | 35.3.17 | 464.46 | When the non-AP MLD that is in EMLSR mode intends to do uplink transmission, it still faces the NAV setting problem, since it cannot understand most of the PPDUs during listening operation due to limited capabilities. Even though the MSD timer for blindness recovery expires, it still cannot contend for channel access normally with a valid NAV. If it just initiates TXOP blindly and frequently it may cause interference for other STAs. | A mechanism is needed to help the non-AP MLD in EMLSR mode to do uplink transmission without interfering other STAs much. | Rejected.The duration field of a frame in the non-HT PPDU format provides NAV information and LENGTH field in L-SIG also provides information. For a long TXOP, virtual NAV is commonly used and control frames are transmitted in non-HT PPDU format for protection from legacy STAs. When the medium sync delay timer expires, a STA is allowed to access the medium. |
| 12429 | Yongho Kim | 35.3.17 | 464.50 | In r-TWT SP, when AP wants to transmit data frames in separate TXOPs (different AC data frames) to an EMLSR STA, every transmission shall start with initial control frame. After the first reception of ICF, the STAs of the EMLSR STA MLD can stay on the link without returning to listening operation until the end of the r-TWT SP. In this case, from the second data frame trasmission, ICF doesn't need to be transmitted. | As in comment | Rejected.Instead of multiple TXOPs, TXOP sharing can be used to avoid multiple channel access overhead. |
| 13706 | Yunbo Li | 35.3.17 | 464.63 | when a STA affiliated with a non-AP MLD in EMLSR mode receiving Beacon, the STA is in frame exchange mode or listenling mode? | Please clarify it. If it is in frame exchange mode, whether a initial control exchange is needed before switching to frame exchange mode. | Rejected.This is an invalid comment. The comment is asking a question. A non-AP MLD receives a Beacon at a TBTT. Please see: “NOTE 8—A (#12242)non-AP STA affiliated with a non-AP MLD that is operating in the EMLSR mode can receiveBeacon frames at scheduled beacon transmission times (i.e., TBTT)” |
| 12730 | Pascal VIGER | 35.3.17 | 467.55 | When a non-AP EMLSR STA detects an inactivity period (e.g. TWT it is not member of) through a beacon frame on one of its EMLSR link, then the STA should be able to switch onto a second EMLSR link during the forbidden period of the first link. | as per comment | Rejected.There are a few issues with the suggested behavior in the comment:-The STA on the second EMLSR link may be in PS mode/doze state and doesn’t want to receive frames on the second EMLSR link.- This adds complication to an AP MLD since it has to track non-AP MLDs in EMLSR mode which are not included in TWT and use a different EMLSR control flow (e.g. not transmitting initial control frame) for that TWT periods.- Blindly switching to the second EMLSR link may cause unnecessary power consumption (waiting for any PPDUs with Nss) since there is no guarantee that an AP MLD will transmit data on the second EMLSR link to the non-AP MLD.  |
| 12731 | Pascal VIGER | 35.3.17 | 467.55 | When a non-AP MLD received on one of its EMLSR link an initial Control frame (BSRP-like) where RA-RUs are provided, it is not clear if such a TF is to be considered as Initiating Frame. | Please confirm the behavior. | Rejected.The BSRP follows the same procedure in 26.5.5 (Buffer status report operation) and 35.5.2.3 (Non-AP STA behavior for UL MU operation): “…A (#12242)non-AP STA affiliated with a non-AP MLD that is in the listening operation and thatreceives an MU-RTS Trigger Frame or BSRP Trigger frame addressed to it shall respond asdefined in (#13812)35.5.2.3 (Non-AP STA behavior for UL MU operation) except when theframe exchanges initiated by the initial Control frame on one of the EMLSR links overlaps with group addressed frame transmissions on the other EMLSR link where the non-AP STA intendsto receive the group addressed frames. The number of spatial streams for the response to theBSRP Trigger frame shall be limited to one.”. |

**9.4.1.74 EML Control field**

***TGbe editor: Please modify the following paragraph in TGbe D2.2,*** P202L24:

A non-AP MLD that supports enhanced multi-link multi-radio operation (see 35.3.18 (Enhanced multi-link
multi-radio operation)) sets the EMLMR Mode subfield to 1 to indicate that the non-AP MLD operates in
EMLMR mode and to 0 to indicate that the non-AP MLD does not operate in EMLMR mode. A non-AP
MLD that does not support enhanced multi-link multi-radio operation (see 35.3.18 (Enhanced multi-link
multi-radio operation)) sets the EMLMR Mode subfield to 0. The EMLMR Mode subfield is set to 0 if the
EMLSR Mode subfield is set to 1. (#13051)An AP MLD with dot11EHTEMLMROptionImplemented equal to true
sets the EMLMR Mode subfield to the value obtained from the EMLMR Mode subfield of the received EML Operating Mode Notification frame.

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

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***TGbe editor: Please modify the following paragraph in TGbe D2.2,*** P500L19:

An MLD with dot11EHTEMLSROptionImplemented equal to true shall set the EML Capabilities Present
subfield to 1 and shall set the EMLSR Support subfield (#12673)in the Common Info field of the Basic Multi-Link
element (9.4.2.312.2 (Basic Multi-Link element)) to 1 in all Management frames that include the Basic
Multi-Link element except Authentication frames. An MLD with dot11EHTEMLSROptionImplemented
equal to false and dot11EHTEMLMROptionImplemented equal to true (see 35.3.18 (Enhanced multi-link
multi-radio operation)) shall set the EML Capabilities Present subfield to 1 and shall set the EMLSR
Support subfield of the EML Capabilities subfield to 0. An MLD with
dot11EHTEMLSROptionImplemented equal to false and dot11EHTEMLMROptionImplemented equal to
false shall set the EML Capabilities Present subfield to 0.

***TGbe editor: Please modify the following paragraphs in TGbe D2.2,*** P500L36:

When a non-AP MLD with dot11EHTEMLSROptionImplemented equal to true intends to (#12675)enable
the EMLSR mode on the EMLSR links, a (#12242)non-AP STA affiliated with the non-AP MLD shall
transmit an EML Operating Mode Notification frame with the EMLSR Mode subfield of the EML Control
field of the frame set to 1 to an AP affiliated with an AP MLD with dot11EHTEMLSROptionImplemented
equal to true. An AP affiliated with the AP MLD that received the EML Operating Mode Notification frame
from the (#12242)non-AP STA affiliated with the non-AP MLD should transmit an EML Operating Mode
Notification frame (#11456)with the EML Control field set to the same value as the EML Control field in
the received EML Operation Mode Notification frame, after the AP MLD is ready to serve the non-AP MLD
in the EMLSR mode operation, to one of the (#12242)non-AP STAs affiliated with the non-AP MLD within
the timeout interval indicated in the Transition Timeout subfield in the EML Capabilities subfield of the
Basic Multi-Link element starting at the end of the PPDU (#12676)that is transmitted by the AP affiliated with the AP MLD (#11582)carrying the immediate acknowledgement to the EML Operating Mode Notification frame
transmitted by the STA affiliated with the non-AP MLD. After the successful transmission of the EML
Operating Mode Notification frame (#13411)(#11454)(#14000)by the (#12242)non-AP STA affiliated with
the non-AP MLD, the non-AP MLD shall operate in the EMLSR mode and the other STAs operating on the
corresponding EMLSR links shall transition to active mode after the transition delay indicated in the Transition Timeout subfield in the EML Capabilities subfield of the Basic Multi-Link element or
immediately after receiving an EML Operating Mode Notification frame from one of the APs operating on the EMLSR links and affiliated with the AP MLD. Any of the other STAs operating on the corresponding EMLSR link shall not transmit a frame with the Power Management subfield set to 1 before receiving the EML Operating Mode Notification frame from (#13415)one of the APs operating on the EMLSR links and affiliated with the AP MLD or before the end of the timeout interval.

When a non-AP MLD with dot11EHTEMLSROptionImplemented equal to true intends to disable the
EMLSR mode, a (#12242)non-AP STA affiliated with the non-AP MLD shall transmit an EML Operating

Mode Notification frame with the EMLSR Mode subfield of the EML Control field of the frame set to 0 to
an AP affiliated with an AP MLD with dot11EHTEMLSROptionImplemented equal to true. An AP
affiliated with the AP MLD that received the EML Operating Mode Notification frame from the
(#12242)non-AP STA affiliated with the non-AP MLD should transmit an EML Operating Mode
Notification frame (#11456)with the EML Control field set to the same value as the EML Control field in
the received EML Operation Mode Notification frame, after the AP MLD is no longer serving the non-AP
MLD in the EMLSR mode operation, to one of the (#12242)non-AP STAs affiliated with the non-AP MLD
within the timeout interval indicated in the Transition Timeout subfield in the EML Capabilities subfield of
the Basic Multi-Link element starting at the end of the PPDU (#12678)that is transmitted by the AP affiliated with the AP
MLD (#11582)carrying the immediate acknowledgement to the EML Operating Mode Notification frame
transmitted by the (#12242)non-AP STA affiliated with the non-AP MLD. After the successful transmission
of the EML Operating Mode Notification frame (#13416)(#11455)(#14000)by the (#12242)non-AP STA
affiliated with the non-AP MLD, the non-AP MLD shall disable the EMLSR mode and the other STAs
operating on the corresponding EMLSR links shall transition to power save mode after the transition delay indicated in the Transition Timeout subfield in the EML Capabilities subfield of the Basic Multi-Link element or immediately after receiving an EML Operating Mode Notification frame from one of the APs operating on the EMLSR links and affiliated with the AP MLD. Any of the other STAs operating on the corresponding EMLSR link shall not transmit a frame with the Power Management subfield set to 0 before receiving the EML Operating Mode Notification frame from (#13415)one of the APs operating on the EMLSR links and affiliated with the AP MLD or before the end of the timeout interval.

***TGbe editor: Please modify the following paragraph in TGbe D2.2,*** P502L62:

— When a (#12242)non-AP STA (#12682)affiliated with the non-AP MLD initiates a TXOP(#12521), the
following applies: