IEEE P802.11
Wireless LANs

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| LB266 Comment Resolution Miscellaneous CIDs |
| Date: 2022-11-1 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Minyoung Park | Intel Corporation |  |  | Minyoung.park@intel.com |
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Abstract

This submission proposes comment resolution(s) for the following 31 CID(s) received in LB266 on TGbe D2.0 related to multi-link traffic indication, EMLSR, misc.:

CIDs:

10865, 10585, 10040, 13379, 13921, 10919, 10247, 13796, 10029,

11643, 13072, 10428, 10427, 11572, 10864, 14069, 14070, 11593,

12416, 13948, 13585, 13584, 13420, 11460, 13704, 12156, 13852,

14006

Revisions:

* Rev 0: Initial version of the document.

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 10865 | Yousi Lin | x.y | 0.00 | STA affiliated with the non-AP MLD that is in EMLSR mode may be unavailable due to coexistence or other reasons, while the associated AP does not know when such case happens. May need a scheme to inform the AP MLD about this situation. | the commenter will bring a contribution to resolve it. | RejectedA non-AP MLD can use the existing power management signaling (i.e. PM=1). |
| 10585 | Abhishek Patil | 11.2.3.9 | 304.43 | The original intention of the paragraph was to cover the scenario where an HE AP sets-up OPS SP or TWT SP with a non-AP STA and can serve the STA during those SPs. Intra-PPDU PS mechanism allows the STAs to save power while there is an on-going transmission within the STA's BSS. Therefore, skipping TIM element for such cases is OK. However, in case of eMLSR or eMLMR the non-AP MLD must read the TIM on the link it is currently active on. | Split the sentence to separately handle eMLSR and eMLMR case. For the eMLSR and eMLMR case, clarify that a STA affiliated with a non-AP MLD that is operating on an inactive link is not required to receive the Beacon frame and interpret the TIM element. | RevisedFor a non-AP MLD that is in EMLSR mode, group addressed frames are delivered after DTIM. Therefore, even if a non-AP MLD is in active mode, the non-AP MLD has to receive a beacon frame and interpret the TIM element. For EMLMR, no such requirement is needed.TGbe editor to make the changes with the CID tag (#10585) in doc.: IEEE 802.11-22/1848r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1848-00-00be-lb266-cr-misc.docx] |
| 10040 | Morteza Mehrnoush | 11.2.3.9 | 304.52 | Please use "or" consistently in this sentence. There should be one "or" before the last phrase "or through the enhance multi-link multi-radio ..." and remove the others | as in comment | RevisedAgree with the comment.TGbe editor to make the changes with the CID tag (#10040) in doc.: IEEE 802.11-22/1848r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1848-00-00be-lb266-cr-misc.docx] |

**11.2.3.9 STAs operating in active mode
*Change as follows:***A STA operating in this mode shall have its receiver activated continuously, unless the STA is allowed to be
temporarily unavailable through the opportunistic power save mechanism defined in 26.14.3 (Opportunistic
power save), through the intra-PPDU power save mechanism defined in 26.14.1 (Intra-PPDU power save
for non-AP HE STAs), 26.8.4.4 (TWT Information frame exchange for flexible wake time), 35.12
(Intra-PPDU power save for non-AP EHT STAs), through the enhanced multi-link single radio operation
defined in 35.3.17 (Enhanced multi-link single radio operation), or through the enhanced multi-link multi-radio operation defined in 35.3.18 (Enhanced multi-link multi-radio operation); such STAs do not need to
interpret the TIM elements in Beacon frames(#10585), except when a non-AP MLD is in EMLSR mode in which case such a STA affiliated with the non-AP MLD operating on a corresponding EMLSR link needs to interpret the TIM elements in DTIM Beacon frames.

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 13379 | Liwen Chu | 35.3.12.4 | 442.28 | The rules for an AP MLD to set bits for a non-AP MLD with buffered Bus for the non-AP MLD should be defined when the non-AP MLD egotiated a TID -to-link mapping where all TIDs are mapped to different links:1, when there is at least buffered data frame, the bits setting should be set per the TIDs of buffered data frame.2, when there are only yhe buffered Management frame, the bits should be set per the management frame. | update the text according to the comment. | RejectedIn D3.0 (prerelease-0401), the following two paragraphs already describes how a TIM bit is set:“An AP MLD shall buffer a BU with a TID at the AP MLD if the TID is not mapped to any link on which the corresponding (#12641)(#12642)non-AP STA affiliated with a non-AP MLD is in active mode, and it shallset the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLDto 1.”“An AP MLD shall buffer an MMPDU (#10581)(see Table 11-3 (Bufferable/nonbufferable classification of MMPDUs)) and intended for receipt by a (#12242)non-AP STA affiliated with a non-AP MLD in the APMLD when all STAs affiliated with the non-AP MLD are in power save mode. In this case, the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD shall be set to 1.” |
| 13921 | Ming Gan | 35.3.12.4 | 443.17 | besides default mapping mode, please add TID to same link subset mapping here | add TID to same link subset mapping | RevisedAdded the case when all TIDs mapped to all enabled links.TGbe editor to make the changes with the CID tag (#13921) in doc.: IEEE 802.11-22/1848r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1848-00-00be-lb266-cr-misc.docx] |

***TGbe editor: Please modify following sentence in subclause 35.3.12.4 Traffic indication as follows in D3.0 (prelease-0401)*** P481L24:

…If a non-AP MLD is in the default mapping mode (see 35.3.7.1.2 (Default mapping mode)) (#13921) or all TIDs are mapped to all enabled links, the bit position *i* of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to *i* on which a (#12242)non-AP STA affiliated with the non-AP MLD is operating may be set to 1 to indicate to the non-AP MLD a link on which buffered BU(s) should be retrieved. …

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 10919 | Kiseon Ryu | 35.3.12.4 | 444.17 | "if one is available" is not clear. Clarify the text. | Replace "When an AP affiliated with an AP MLD receives a PS-Poll frame or a U-APSD trigger frame from a STA affiliated with an associated non-AP MLD that is in power save mode, it shall transmit buffered BU(s) to the STA, if one is available and not discarded for implementation dependent reasons, otherwise it may transmit a QoS Null frame."with "When an AP affiliated with an AP MLD receives a PS-Poll frame or a U-APSD trigger frame from a STA affiliated with an associated non-AP MLD that is in power save mode, it shall transmit buffered BU(s) to the STA, if the buffered BU(s) are available and not discarded for implementation dependent reasons, otherwise it may transmit a QoS Null frame." | Accepted |
| 10247 | John Wullert | 35.3.12.4 | 444.30 | It does not seem reasonable to base the setting of a MIB variable on whether or not the AP has BUs buffered. This could result in the AP setting and resetting dot11MultiLinkTIMActivated as packets arrive and frames are transmitted, which seems to be much more dynamic than other MIB variables. | Remove "and the AP MLD has buffered BU(s) for that non-AP MLD" from the end of the sentence.Alternatively, could replace this entire bullet with a note indicating that AP MLDs should track negotiation status and buffer status of associated non-AP MLDs to determine whether or not they need to transmit multi-link TIM information. | RejectedIn D2.2, the MIB variable is used in Clause 9, Beacon frame format, to indicate whether MLTI element is included in a beacon and that depends on whether BUs are buffered or not so deleting that condition will break the operation. |
| 13796 | Yuchen Guo | 35.3.12.4 | 444.34 | This bullet is not needed since we have the next bullet, the next bullet is a superset of this bullet | delete this bullet | RejectedIn D2.0, the 2nd bullet point is for the case of TID-to-link mapping but all TIDs are mapped to all enabled links (not necessarily all available links are enabled) and the 3rd bullet point is for the case when the default mapping (all available links indicated by a non-AP MLD are enabled) is used and in previous discussions in the group there were comments to clarify these two cases:“— The AP MLD intends to provide link recommendations to at least one of the associated non-AP MLD(s) that has successfully negotiated a TID-to-link mapping with the AP MLD and all TIDs are mapped to all the enabled links and the AP MLD has buffered BU(s) for that non-AP MLD— The AP MLD intends to provide link recommendations to at least one of the associated non-AP MLD(s) that is in the default mapping mode (see 35.3.7.1.2 (Default mapping mode)) and the AP MLD has buffered BU(s) for that non-AP MLD.” |
| 10029 | Morteza Mehrnoush | 35.3.12.4 | 444.36 | In this sentense it should be changed to "not all TIDs" because it's already negotiated a mapping and so it's not all TID to all link mapping. Please change it to: "negotiated a TID-to-link mapping with the AP MLD and not all TIDs are mapped to all the enabled links" | as in comment | RejectedIn D3.0 (pre-release), the sentence is referring to the case when TID-to-link mapping is done in a way that all TIDs are mapped to all enabled links:“— The AP MLD intends to provide link recommendations (#12808)in a Beacon frame to retrieve individually addressed buffered BUs to at least one of the associated non-AP MLD(s) that has successfully negotiated a TID-to-link mapping with the AP MLD and all TIDs are mapped to all the enabled links and the AP MLD has buffered BU(s) for that non-AP MLD” |
| 11643 | Morteza Mehrnoush | 35.3.12.4 | 444.36 | In this sentence it should be changed to "not all TIDs" because it's already negotiated a mapping and so it's not all TID to all link mapping. Please change it to: "negotiated a TID-to-link mapping with the AP MLD and not all TIDs are mapped to all the enabled links" | as in comment | RejectedIn D3.0 (pre-release), the sentence is referring to the case when TID-to-link mapping is done in a way that all TIDs are mapped to all enabled links:“— The AP MLD intends to provide link recommendations (#12808)in a Beacon frame to retrieve individually addressed buffered BUs to at least one of the associated non-AP MLD(s) that has successfully negotiated a TID-to-link mapping with the AP MLD and all TIDs are mapped to all the enabled links and the AP MLD has buffered BU(s) for that non-AP MLD” |
| 13072 | Chittabrata Ghosh | 35.3.12.4 | 444.36 | In this sentense it should be changed to "not all TIDs" because it's already negotiated a mapping and so it's not all TID to all link mapping. Please change it to: "negotiated a TID-to-link mapping with the AP MLD and not all TIDs are mapped to all the enabled links" | as in comment | RejectedIn D3.0 (pre-release), the sentence is referring to the case when TID-to-link mapping is done in a way that all TIDs are mapped to all enabled links:“— The AP MLD intends to provide link recommendations (#12808)in a Beacon frame to retrieve individually addressed buffered BUs to at least one of the associated non-AP MLD(s) that has successfully negotiated a TID-to-link mapping with the AP MLD and all TIDs are mapped to all the enabled links and the AP MLD has buffered BU(s) for that non-AP MLD” |
| 10428 | yan li | 35.3.12.4 | 444.54 | In this and the following two paragraphs,'should issue a PS-Poll...'is used in the second paragraph,while 'may issue a PS-Poll...'is used in the other two paragraphs.what is the difference between these paragraphsï¼ Please clarify it | as the comment | RevisedFor consistency, replaced ‘should’ to ‘may in the second paragraph.TGbe editor to make the changes with the CID tag (#10428) in doc.: IEEE 802.11-22/1848r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1848-00-00be-lb266-cr-misc.docx] |
| 10427 | yan li | 35.3.12.4 | 444.61 | The Multi-link Traffic element should be modified to Multi-link Traffic Indication element in this and the following paragraph | as the comment | RevisedThe commented part is already revised as follows in D3.0 (pre-release): “When a non-AP MLD that is in the default mapping mode (see 35.3.7.1.2 (Default mapping mode)) detectsthat the bit corresponding to its AID is 1 in the TIM element and the (#13992)Multi-Link Traffic Indication…”TGbe editor to make the changes with the CID tag (#13922) in 22/1381r3. |

When a non-AP MLD that is in the default mapping mode (see 35.3.7.1.2 (Default mapping mode)) detects
that the bit corresponding to its AID is 1 in the TIM element, any (#12242)non-AP STA affiliated with the

non-AP MLD may issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all
ACs are delivery enabled, to retrieve buffered BU(s) from the AP MLD.

***TGbe editor: Please modify following sentence in subclause 35.3.12.4 Traffic indication as follows in D3.0 (prelease-0401)*** P482L11:

When a non-AP MLD that is in the default mapping mode (see 35.3.7.1.2 (Default mapping mode)) detects
that the bit corresponding to its AID is 1 in the TIM element and the (#13992)Multi-Link Traffic Indication
element is present in a Beacon frame and the Multi-Link Traffic Indication element includes a Per-Link
Traffic Indication Bitmap subfield that corresponds to the non-AP MLD, any (#12242)non-AP STA
affiliated with the non-AP MLD that operates on the link(s) indicated as 1 in the Per-Link Traffic Indication
Bitmap subfield (#10428)may issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and
all ACs are delivery enabled, to retrieve buffered BU(s) from the AP MLD.

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 11572 | Xiaofei Wang | 35.2.16.2 | 452.37 | Since a single radio non-AP MLD with dot11EHTEMLSROptionImplemented equal to true is a subset of "single radio non-AP MLD", this paragraph is redundant and should be deleted | as in comment | Rejected.The 2nd sentence below was based on the long discussion in the group and keeping the sentence will give more clarity in the spec then removing the sentence.“A single radio non-AP MLD shall set the Maximum Number Of Simultaneous Links subfield in the BasicMulti-Link element carried in transmitted Management frames to 0.A single radio non-AP MLD with dot11EHTEMLSROptionImplemented equal to true shall set theMaximum Number Of Simultaneous Links subfield in the Basic Multi-Link element to 0.”One example is in D1.2 the following sentence was added and this created a long debate in the group, which the group doesn’t need to repeat: “(#7623)An non-AP MLD with dot11EHTEMLSROptionImplemented equal to true shall set the MaximumNumber Of Simultaneous Links subfield in the (#6700)Basic Multi-Link element to 0.” |
| 10864 | Yousi Lin | 35.3.17 | 461.56 | The EMLSR mode is designed to provide enhanced mechanisms for single radio non-AP MLD. It is expected that STAs may have different capabilities on single radio. For example, the STA affiliated with a non-AP MLD in the EMLSR mode can transmit and receive with single radio while the other affiliated STAs may have constrained single radio. For the STA with full capability on single radio, it is able to receive the intial frame not limited to initial Control frame initiated by an AP MLD, which can save some overhead from the Control frames. | the commenter will bring a contribution to resolve it. | RejectedThe capability/constraint for the initial control frame was discussed in the group and consensus was to have fixed capability in the spec for simplicity rather than signaling different capability from non-AP MLDs. The initial control frame also provides power save gain. |
| 14069 | Pooya Monajemi | 35.3.17 | 461.58 | Traffic with short and frequent PPDUs will waste too much air time with initial Control frames. We need a method to reduce these frames in adverse conditions. | Add mechanism for AP to recommend an EMLSR STA to stay on the same link for a defined period of time after the first TXOP initiated by an initial Control frame | RejectedA similar timer-based approach was discussed in the group in doc 11-21/287r0 but the group decided to use the SIFS separation based approach for simplicity. A non-AP MLD can also disable the EMLSR mode and operate on one link for a duration of time based on link recommendation from the AP. |
| 14070 | Pooya Monajemi | 35.3.17 | 463.18 | We can require the EMLSR STA to wait on the link where it received the initial frame for the NAV duration set by MU-RTS | As in comment | RejectedThe NAV timer-based approach was discussed in the group in doc 11-21/287r0 but the group decided to use the SIFS separation based approach for simplicity.  |
| 11593 | Vishnu Ratnam | 35.3.17 | 463.59 | After ending a frame exchange sequence in EMLSR mode, currently the nonAP has to switch to listening on all links. However, a nonAP MLD may instead want to indicate a preferred link for the next frame exchange sequence and may contend/listen on only that link till the next frame exchange sequence. Such an indication is beneficial, for example, if the nonAP intends to receive the next beacon frame on the preferred link. | Define a mechanism using which, in the end of current frame exchange sequence, a EMLSR nonAP MLD can recommend a (temporary) preferred link for next frame exchange sequence from the AP MLD. | RejectedA timer-based approach (staying on the link for a period of time) was discussed in the group in doc 11-21/287r0 but the group decided to use the SIFS separation based approach to determine the end of frame exchanges for simplicity.  |
| 12416 | Juseong Moon | 35.3.17 | 463.59 | Since EMLSR operation starts with initial control frame, frame reception procedure takes longer time than normal frame reception procedure. In a certain case, which link will be used to transmit frame can be known beforehand. In this case, EMLSR STA MLD doesn't need to return to EMLSR listening operation and stay on that link to receive frames. During EMLSR operation (while transmitting data to EMLSR STA MLD), if AP has more data, which maybe a different AC mapped to the same link or same AC requiring another TXOP due to TXOP limit, to transmit to an EMLSR STA MLD. If then, the EMLSR STA MLD doesn't need to return to EMLSR linstening operation. In this case, More Data subfield can be set to one(True), and the EMLSR STA MLD can stay on the same link without returning to listening operation. In this case, transmission procedure doesn't need to start with initial control frame. | As in comment | RejectedA timer-based approach (staying on the link for a period of time) was discussed in the group in doc 11-21/287r0 and using the more data bit or a new field was also considered but the group decided to use the SIFS separation based approach to determine the end of frame exchanges for simplicity.  |
| 13948 | Chien-Fang Hsu | 35.3.17 | 461.56 | For a multi-radio device assigning a single radio to operate in EMLSR mode, the corresponding rules to operate are not clear. | Specify the rules allowing a multi-radio devices to allocate one radio to operate in the EMLSR mode. | RejectedThe current spec doesn’t disallow a multi-radio non-AP MLD from using the EMLSR operation on a set of enabled links.  |
| 13585 | Yongho Seok | 35.3.17 | 462.08 | Since the EMLSR is defined on a specified set of the enabled links.So, the multi-radio non-AP MLD can enable the EMLSR on the specified set of the enabled links. | As in the comment. | Rejected.The current spec doesn’t disallow a multi-radio non-AP MLD from using the EMLSR operation on a set of enabled links. It fails to identify changes in sufficient detail so that the specific wording of the changes can be determined. |
| 13584 | Yongho Seok | 35.3.17 | 462.08 | "For the EMLSR mode enabled in a single-radio non-AP MLD, the STA(s) affiliated with the non-AP MLD that operates on the link(s) that corresponds to the bit position(s) of the EMLSR Link Bitmap subfield set to 0 shall be in doze state if a STA affiliated with the non-AP MLD that operates on one of the EMLSR links is in awake state."Please add the following: Otherwise, one of the STA(s) that operates on one of the non-EMLSR links can be awake state. | As in the comment. | RejectedThis invalid comment. It fails to locate and identify the issue.  |
| 13420 | Liwen Chu | 35.3.17 | 463.62 | The following case is missing from the description: an eMLSR STA acquires part of the TXOP for P2P frame exchange or UL frame exchanges controlled by the eMLSR MLD. Another option (not preferable) is to disallow such operation explicitly. | Fix the issues mentioned in the comment | RejectedThe current rules to switch back to listening operation covers the case when a STA uses a part of TXOP for UL or P2P through MU-RTS TXS since during a frame transmission the STA stays on the link and after receiving a frame as response to the transmitted frame, it follows the current rules to determine whether to switch back to listening or stay on the links.  |
| 11460 | Gaurang Naik | 35.3.17 | 464.04 | The value of aRxPHYStartDelay depends on the PPDU type. Until what value of aRxPHYStartDelay must the non-AP STA remain on the link for a frame from the AP MLD? | Pls clarify | RejectedThis is an invalid comment. The commenter is asking a question.Depending on a PPDU type being received, a STA may wait until the corresponding aRxPHYStartDelay to determine whether to assert PHY-RXSTART.indication primitive. (see 36.3.23 EHT receive procedure) |
| 13704 | Yunbo Li | 35.3.17 | 464.08 | the switch back rules don't cover broadcast frame. A broadcast frame doesn't belong to any of following frames in the subbullets. So after a broadcast frame is received, the non-AP MLD will switch back to listen mode. | add a bullet to cover broadcast/groupcast frames | RejectedA group addressed frame(s) is delivered after a DTIM beacon.  |
| 12156 | Michail Koundourakis | 35.3.17 | 464.40 | What happens if the AP MLD does not keeps SIFS timing for the response frame (during the TxOp) and the end of the TxOp drifts so that the STA cannotcope with the Transition Delay to switch.We should probably allow the non-AP MLD to either update the TransitionDelay with the AP MLD dynamically. | Update spec to allow for a dynamic update of the Transition Delay to cope with delayed SIFS. | RejectedFor an AP MLD that complies with the 802.11 standard, when an AP affiliated with an AP MLD receives a frame that requires an immediate response, it has to transmit a response frame SIFS after the received frame.  |
| 13852 | Sanghyun Kim | 35.5.2.2.3 | 485.35 | Typo "EMLSR Delay subfield" | Replace "EMLSR Delay subfield" with "EMLSR Padding Delay subfield" | RevisedAgree with the comment. EMLSR Delay subfield is changed to EMLSR Padding Delay subfield and EMLSR\_DELAY is changed to EMLSR\_PADDING\_DELAY.TGbe editor to make the changes with the CID tag (#13852) in doc.: IEEE 802.11-22/1848r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1848-00-00be-lb266-cr-misc.docx] |
| 14006 | Geonjung Ko | 35.5.2.2.3 | 485.35 | The subfield name is wrong. | "the EMLSR Delay subfield" should be "the EMLSR Padding Delay subfield". | RevisedAgree with the comment. EMLSR Delay subfield is changed to EMLSR Padding Delay subfield and EMLSR\_DELAY is changed to EMLSR\_PADDING\_DELAY.TGbe editor to make the changes with the CID tag (#14006) in doc.: IEEE 802.11-22/1848r0[https://mentor.ieee.org/802.11/dcn/22/11-22-1848-00-00be-lb266-cr-misc.docx] |

**35.5.2.2.3 Padding for a triggering frame**

**…**

***TGbe editor: Please modify the following equation and the sentence in subclause 35.5.2.2.3 Padding for a triggering frame as follows in D3.0 (prelease-0401)*** P526L39, L43 (CID #13852, 14006):

$$m\_{PAD}=\left\{\begin{array}{c}0 , \& if EMLSR\\_PADDING\\_DELAY is 0\\2^{EMLSR\\_PADDING\\_DELAY+2}, \&Otherwise\end{array}\right.$$

(#13852, 14006)EMLSR\_PADDING\_DELAY is the value of the EMLSR Padding Delay subfield in the EML Capabilities subfield in the Multi-Link element.