IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CC36 comment resolution for miscellaneous comments part 2 | | | | |
| Date: 2022-03-27 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Liwen Chu | NXP |  |  | Liwen.chu@nxp.com |

Abstract

This submission proposes resolutions for multiple comments related to TGbe D1.0 with the following CIDs:

4763, 4705, 7614, 4762, 5669, 6881, 6550, 5846, 5613, 5935,

5670, 6217, 4761,

6742, 8359, 4486, 6621, 4487, 4702, 4242, 6218,

4423, 4424, 4243, 6779, 5899, 7615,

5847, 6884, 5848, 6659, 8360, 4703,

8050, 6220, 5223, 5224, 6067, 5849, 5860, 6135,

6071, 6066, 6422, 8361

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGbe Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGbe Editor: Editing instructions preceded by “TGbe Editor” are instructions to the TGbe editor to modify existing material in the TGbe draft. As a result of adopting the changes, the TGbe editor will execute the instructions rather than copy them to the TGbe Draft.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 4763 | 283 | 1 | It'll be helpful to add an example for the operation in this mode: for entering this mode, and for the frame sequence, respectively. | As commented | Revised  TGbe editor to make changes in 35.3.18 under CID 4763 |

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

*TGbe editor: Please add the following at the end of 35.3.18: (#4763)*

(#4763)After the initial frame exchange in a TXOP solicited by an AP affiliated with an AP MLD to one STA affiliated with a non-AP MLD on an eMLMR link or to a group of STAs where one or more STAs in the group are affiliated with the non-AP MLDs on eMLMR links, all allowed frame exchanges solicited by an EHT AP to EHT STA(s) with the further restrictions defined in this subclause can be in the remaining TXOP. The following is an example of frame exchange sequence that starts with the QoS Null frame between an AP affiliated with an AP MLD and a STA affiliated with a non-AP MLD on an eMLMR link as shown in Figure 35-xx (An example of a frame exchange sequence between an AP affiliated with an AP MLD and a STA affiliated with a non-AP MLD that is in the EMLMR mode).

Figure 35-xx An example of a frame exchange sequence between an AP affiliated with an AP MLD and a STA affiliated with a non-AP MLD that is in the EMLMR mode

QoS Null

Ack

A-MPDU

BA

AP affiliated with AP MLD

STA affiliated with

non-AP MLD in eMLMR mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 4705 | 282 | 282 | To support a subset of enabled links on the AP MLD needs more complexity to handle the DL traffic since each link may have different mode. It needs AP MLD's capability support. | AP MLD may not be able to support a subset of enabled link in EMLMR mode. Add a capability indication on the AP side to support. Otherwise, AP MLD supporting EMLMR regards all enabled links are EMLMR links | Rejected  This (subset of enabled links) gives non-AP MLD flexibility to decide the number of links in eMLMR mode for power saving, avoiding higher Nss etc. One observation is that eMLSR mode has the similar operation. |
|  |  |  |  |  |  |
| 7614 |  |  | EMLMR mode should be clarified what it is at the beginning of this subclause. | As in comment. | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 7614 |
| 4762 | 282 | 57 | This subclause is lack of a general description of this mode. Please add. | As commented | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 4762 |
| 5669 | 282 | 57 | Give a definition of an Enhanced multi-link multi radio | As in comment | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 5669 |
| 6881 | 282 | 57 | 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  TGbe editor to make changes in 35.3.18 as shown in this document under label 6881 |
| 6550 | 282 | 60 | The EMLMR mode is not defined. Please give a definition | As in comment | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 6550 |
| 5846 | 282 | 60 | What's the EMLMR mode? Could not find a clear definition in the 11be/D1.0 spec, although it is used many times in the spec and also there are capability indicators specified for it. | Add the EMLMR definition at beginning of Section 35.3.16. The following text is just a suggestion: The EMLMR mode is an operation mode for a Multi-Link Multi-Radio Non-AP MLD, where a non-AP STA affiliated with the non-AP MLD uses its spatial multiplexing capability to transmit PPDUs up to a pre-defined supported Tx spatial streams, and/or receive PPDUs up to a pre-defined supported Rx spatial streams, and such pre-defined supported Tx spatial streams and pre-defined supported Rx spatial streams are more than the non-AP STA's Tx spatial stream and Rx spatial streams, respectively. | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 5864 |
| 5613 | 282 | 60 | The section does not clearly define Enhanced multi-link multi-radio operation. | Add a description of the intentions and functionality of Enhanced multi-link multi radio and in what way it is "enhanced". | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 5613 |
|  |  |  |  |  |  |
| 5935 | 282 | 60 | It is not clear where the specified set of enabled links are defined | clarify the signaling of the specified set | Revised  11be D1.5 defines the specific set of enabled links in **9.4.1.74 EML Control field**  Note ot editor: no further change is needed for this CID |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| 5670 | 282 | 61 | How to specify several sets of EMLMR links ? | Specify the corresponding frame format allowing the advertisement of several sets of EMLMR links. | Reject  The inclusion of multiple sets of eMLMR links is complicated, e.g. the relationship among the eMLMR set (the STR/NSTR relation between two links with each in a separate eMLMR set, what are the rules to do simultaneous Tx/Rx between the two links). |
| 6217 | 282 | 61 | The current text considers only one set of EMLMR links, it is restrictive. | The signaling added for EMLMR links must support the non-AP MLD implementations with several sets of radios supporting the EMLMR mode independtly. | Reject  The inclusion of multiple sets of eMLMR links is complicated, e.g. the relationship among the eMLMR set (the STR/NSTR relation between two links with each in a separate eMLMR set, what are the rules to do simultaneous Tx/Rx between the two links). |
|  |  |  |  |  |  |
| 4761 | 283 | 59-62 | There is no descrition/signaling in this subclause describing how to specify the "specified set of the enabled links". Please add. | As commented | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 4761 |

35.3.18 Enhanced multi-link multi-radio operation

*TGbe editor: Please change the first paragraph in 35.3.18 as follows:*

(#4762, 5669, 6881, 6550, 5864, 5613, 7614) The EMLMR mode is an operation mode for a Multi-Link Multi-Radio non-AP MLD, where through switching receive chains and transmit chains among the links in a TXOP after finishing its backoff procedure or after receiving the initial frame from the AP affiliated with the AP MLD, a non-AP STA affiliated with the non-AP MLD uses its spatial multiplexing capability to transmit PPDUs up to the Tx spatial streams announced in the EML Control field by the non-AP MLD, and/or receive PPDUs up to the Rx spatial streams announced in the EML Control field by the non-AP MLD, and such Tx spatial streams and Rx spatial streams are more than the Tx spatial stream and Rx spatial streams announced in EHT Capabilities element by each non-AP STA affiliated with the non-AP MLD when the non-AP MLD is not in eMLMR mode, respectively.

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) (#4761)** 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. (#4425)The EMLMR links shall be indicated in the EMLMR Link Bitmap subfield of the EML Control field of the EML Operating Mode Notification frame by setting the bit positions of the EMLMR Link Bitmap subfield to 1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 6742 | 283 | 1 | From this paragraph, it would appear that the EML Capabilities field is always present in the Basic variant MLE regardless of the value of the MIB variable (dot11EHTEMLMROptionImplemented) since the EMLMR Support subfield needs to be set in both cases. If that is indeed the intention, the text can be rephrased better. | In the otherwise section, add text that the EML Capabilities Present subfield is still set to 1. | Revised  D1.5 P422L48 makes the change requested by this CID.  Note to editor: no further change is needed. |
| 8359 | 283 | 3 | If dot11EHTEMLMROptionImplemented equal to false and other condition (dot11EHTEMLSROptionImplemented set to false) is met, the EML Capablities Present subfield will be set to 0 and EMLSR Support subfield is not present.So in the otherwise, there are two cases: set the EMLMR Support subfield to 0 or not this field is not present | Please clarify it | Revised  D1.5 P422L48 makes the change requested by this CID.  Note to editor: no further change is needed. |
|  |  |  |  |  |  |
| 4486 | 283 | 6 | Add s after the word "equal" in the following sentence "A non-AP MLD with dot11EHTEMLMROptionImplemented equal to true shall set ..." | The revised sentence shall be " A non-AP MLD with dot11EHTEMLMROptionImplemented equals to true shall set ..." | Rejected  “with… equal to…” is correct and widely used in 802.11 specification. |
| 6621 | 283 | 6 | For the EMLMR Rx NSS and EMLMR Tx NSS, if the indicated value is larger than the NSS capability of a specific link, then it seems that there are problems for sounding because sounding is per link and is based on the NSS capabilty of each link. | Specify that the EMLMR Rx NSS and EMLMR Tx NSS can not be larger than the per link maximum NSS capability. | Rejected  The sounding under eMLMR in one link is done after the receive chains and transmit chains of the other links switch to the link. |
|  |  |  |  |  |  |
| 4487 | 283 | 13 | Add s after the word "equal" in the following sentence "If a non-AP MLD with dot11EHTEMLMROptionImplemented equal to true intends to ..." | The revised sentence shall be "If a non-AP MLD with dot11EHTEMLMROptionImplemented equals to true intends to..." | Rejected  “with… equal to…” is correct and widely used in 802.11 specification. |
| 4702 | 283 | 13 | It is not clear the mode the MLD to operate after disabling EMLMR. | Specify the mode of the non-AP MLD to operate after disabling the EMLMR mode | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 4720 |
| 4242 | 283 | 14 | What is the mode that the MLD has immediately after association? Please explictly call it out. | As in comment. | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 4242 |
| 6218 | 283 | 13 | Currently, the EMLMR mode can be enable/disable only by the non-AP MLD, by sending an EML OMN frame to the AP MLD which cannot refused the notification. In some cases, it seems interesting that the AP MLD has the possibility to refused the notification and also has the possibility to initiate the EMLMR mode enable/disable. | For an AP MLD, add the possibility: 1-To refuse the EMLMR mode enable/disable notified within the EML OMN frame sent by the non-AP MLD 2-To initiate the EMLMR mode enable/disable | Rejected  Normally the non-AP MLD has more restriction, e.g. power save, worse performance when using higher Nss. It is better to let the non-AP MLD to initiate the enabling/disabling eMLMR mode. |
|  |  |  |  |  |  |

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

*TGbe editor: Please make the following change in 35.3.18 (the text not shown is not changed):*

……

An MLD with dot11EHTEMLMROptionImplemented equal to true shall set the EML Capabilities Present subfield to 1 and shall set the EMLMR Support subfield of the Common Info field of transmitted Basic variant Multi-Link elements to 1; otherwise, the MLD shall set the EMLMR Support subfield to 0.

……

(#4720, 4242)When a non-AP MLD with dot11EHTEMLMROptionImplemented equal to true (re)associates with an AP MLD, the EMLMR mode is disabled by default. If a non-AP MLD with dot11EHTEMLMROptionImplemented equal to true intends to switch EMLMR mode after MLD association(#6608), then a non-AP STA affiliated with the non-AP MLD shall transmit an EML Operating Mode Notification frame with EMLMR Mode subfield equal to 1 or 0 to enable or disable EMLMR mode, respectively.

……

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 4423 | 283 | 19 | It is not clear why we need transition time delay in case that EMLMR mode is disabled (i.e. the EMLMR Mode subfiueld is set to 0 in the EML Operation Mode Notification frame), according to the following sentence: "After successful transmission of the EML Operating Mode Notification frame from the non-AP STA affiliated with the non-AP MLD to an AP affiliated with an AP MLD, the non-AP STA and the AP initialize the transition timeout timer with the Transition Timeout subfield value in the EML Capabilities subfield of the Basic variant Multi-Link element received from the AP" | Please clarify why transition timeout counter is required in case that EMLMR Mode is disabled or correct the cited sentence so that the transition timeout will be done only after EMLMR Mode is enabled. | Rejected  The transition time delay for disabling eMLMR mode can guarantee that both AP MLD and non-AP MLD assume that the non-AP MLD disables eMLMR mode at the same time. |
| 4424 | 283 | 19 | According to P131L47, there is a distinction in the Transition Timeout subfields if it sent by AP or by non-AP (in MLE). It is not clear according to wehcih of the values the transition timeout timer is initialzed in the following sentence: "After successful transmission of the EML Operating Mode Notification frame from the non-AP STA affiliated with the non-AP MLD to an AP affiliated with an AP MLD, the non-AP STA and the AP \*initialize the transition timeout timer with the Transition Timeout subfield value\* in the EML Capabilities subfield of the Basic variant Multi-Link element received from the AP" - according to the value set by the AP or the value set by the STA? | Please clarify according to which Transition Timeout value, the transition timeout timer is initialized (as in the comment) | Rejected  the sentence mentioned that the value is in the element RECEIVED from the AP. |
| 4243 | 283 | 25 | Need to clarify that the EML OMN frame sent by the AP is confirming the mode switch at the AP MLD side. A note suffices for this. | As in comment. | Revised  TGbe editor to make changes in 35.3.18 as shown in this document under label 4243 |
| 6779 | 283 | 25 | Please replace should by shall | as in comment | Rejected  Since the transition timeout timer can be used for mode switch even if the AP doesn’t send the EML OMN frame. It seems not good to mandate the AP to send the EML OMN frame. |
| 5899 | 283 | 3 | in "The non-AP MLD shall transition to", change "transmistion" to "transit" | same as in the comment | Accepted  Note to editor: the sentence is in P427L42 of D1.5 |
| 7615 | 283 | 30 | "The non-AP MLD shall transition to ..." "transition" is a noun, not a verb. | Change it to read "The non-AP MLD shall transit to ...". | Accepted  Note to editor: the sentence is in P427L42 of D1.5 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

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

*TGbe editor: Please make the following change in 35.3.18 (the text not shown is not changed):*

……

After successful transmission of the EML Operating Mode Notification frame from the non-AP STA affiliated with the non-AP MLD to an AP affiliated with an AP MLD, the non-AP STA and the AP initialize the transition timeout timer with the Transition Timeout subfield value in the EML Capabilities subfield of the (#6700)Basic Multi-Link element received from the AP. The transition timeout timer begins counting down from the end of the PPDU containing the immediate response to the EML Operating Mode Notification frame. The AP should send an EML Operating Mode Notification frame for confirming the mode switch at the AP MLD side (#4243) to the non-AP STA with EML Control field set to the same value as EML Control field in the received EML Operating Mode Notification frame from the non-AP STA before the transition timeout expires.

The non-AP MLD shall transition to the indicated mode immediately after successfully receiving the EML Operating Mode Notification frame from the AP or immediately after the transition timeout timer expires, whichever comes first.

……

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 5847 | 283 | 36 | What does it mean by "EMLMR link switch"? There are two occurrences of this term, one in Section "9.4.2.295b.2 Basic variant Multi-Link element", another one is in Section 35.3.16, where the former refers to the later. | Please explicitly specify what is "EMLMR link switch". | Revised  TGbe editor to make changes in this document under CID 5847 |
| 6884 | 283 | 36 | what is meant by "EMLMR link switch" ? the process of "EMLMR link switch" is not defined. Please clarify | as in comment | Revised  TGbe editor to make changes in this document under CID 6884 |
| 5848 | 283 | 39 | Does the "link switching" in line 39 page 283 mean "EMLMR link switch"? If so, please use "EMLMR link switch" consistently. If not, please clarify what it means by "link switching" here. | As provided in the comment. | Revised  TGbe editor to make changes in this document under CID 5848 |
|  |  |  |  |  |  |
| 6659 | 283 | 39 | "NOTE -- The link switching can happen during the transmission time of the initial response frame. However, the duration of the initial response frame can be different depending on the initial frame." It's not clear what the initial frame and initial response frame are. | Please revise the sentence to clarify what the initial frame and initial response frame are, respectively. | Revised  The initial frame exchange can be any frame exchange with the requirement the soliciting frame needs to satisfy the padding requirement, e.g. through Trigger frame padding if the soliciting frame is Trigger frame, through MPDU Delimiter padding if the soliciting frme is carried in A-MPDU.  TGbe editor to make changes in this document under CID 6659 |
| 8360 | 283 | 40 | What is the initial response frame and the initial frame exchange?It means the EML Operating Mode Notification frame or other frame? Based on the description in the last paragraph in this page, the initial frame is not Operating Mode Notification frame | Please clarify it | Revised  The initial frame exchange can be any frame exchange with the requirement the soliciting frame needs to satisfy the padding requirement, e.g. through Trigger frame padding if the soliciting frame is Trigger frame, through MPDU Delimiter padding if the soliciting frme is carried in A-MPDU.  TGbe editor to make changes in this document under CID 8360 |
| 4703 | 283 | 44 | It is not clear the PPDU's content to initialize the frame exchange with the non-AP MLD in EMLMR mode. It may need to contain frames, such as MU-RTS or other specific control frames, | Specify the type and constraints of the initial control frames. | Revised  The initial frame exchange can be any frame exchange with the requirement the soliciting frame needs to satisfy the padding requirement, e.g. through Trigger frame padding if the soliciting frame is Trigger frame, through MPDU Delimiter padding if the soliciting frme is carried in A-MPDU.  TGbe editor to make changes in this document under CID 4703 |

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

*TGbe editor: Please make the following change in 35.3.18 (the text not shown is not changed):*

**……**

A non-AP MLD with dot11EHTEMLMROptionImplemented equal to true shall indicate the minimum padding duration required for the non-AP MLD for EMLMR link switch in the EMLMR Delay subfield in the Common Info field of transmitted (#6700)Basic Multi-Link elements.

NOTE—The EMLMR(#5848) link switching, which is the action of switching transmit chains and receive chains from one link to another link (#5847, 6884), can happen during the transmission time of the initial response frame. However, the duration of initial response frame can be different depending on the initial frame. The non-AP MLD might determine the minimum padding duration such that it can be satisfied even when the shortest initial response frame is used on EMLMR links (e.g., a CTS frame in non-HT PPDU with the highest rate in the BSSBasicRateSet parameters).

When an AP of an AP MLD transmits a PPDU that initiates a frame exchange with a non-AP MLD operating in EMLMR mode, the AP shall ensure that the padding duration of the PPDU is longer than or equal to the minimum padding duration value indicated by the EMLMR Delay field of the (#6700)Basic Multi-Link element received from the non-AP MLD.

(#6659, 8360, 4703)NOTE—The initial frame exchange can be any frame exchange with the requirement the soliciting frame needs to satisfy the padding requirement, e.g. through Trigger frame padding if the soliciting frame is Trigger frame, through MPDU Delimiter padding if the soliciting frme is carried in A-MPDU.

……

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 8050 | 283 | 50 | After the initial control frame is received, the behavior on the other link is missing. | Please clarify | Revised  After initial frame exchange in one link in eMLMR mode, the transmit and receive chains of the other links of non-AP MLD will switch to the link. The other links of non-AP MLD will not be used for frame exchanges.  TGbe editor to make changes in 35.3.18 under CID 8050 |
| 6220 | 283 | 50 | In case of an initial frame exchange happening simultaneously over 2 EMLMR links, it is not clearly indicated how it is managed: -Can a frame exchange sequence be initiated over both links (meaning no switch to EMLMR mode)? If yes, how are managed the Tx/Rx NSS resources over the 2 links? -Is a choice made between the 2 EMLMR links where initial frames exchange happened (meaning switch to EMLMR mode on one of the EMLMR links)? | Please clarify the behavior/rule regarding an initial frame exchange happening simultaneously over at least 2 EMLMR links between an AP MLD and a non-AP MLD | Revised  After initial frame exchange in one link in eMLMR mode, the transmit and receive chains of the other links of non-AP MLD will switch to the link. The other links of non-AP MLD will can not be used for frame exchanges.  TGbe editor to make changes in 35.3.18 under CID 6220 |
| 5223 | 283 | 50 | The support from EMLMR STA should last until the TXOP expired or terminated, The TXOP is established by the initial frame exchange. | TXOP multiple frame exchanges should be honored for EMLMR operation | Revised  TGbe editor to make changes in 35.3.18 under CID 5223 |
| 5224 | 284 | 1 | The support from EMLMR STA should last until the TXOP expired or terminated, The TXOP is established by the initial frame exchange. | TXOP multiple frame exchanges should be honored for EMLMR operation | Revised  TGbe editor to make changes in 35.3.18 under CID 5224 |
| 6067 | 286 | 57 | The ending of eMLMR frame exchange sequence should be defined. The possible method could be similar to dynamic SM power operation. | Change the text according to the comment. | Revised  TGbe editor to make changes in 35.3.18 under CID 6067 |
|  |  |  |  |  |  |
| 5849 | 283 | 51 | What dose the "operating mode" in line 51 page 283 refer to? Is it the operating mode in operation mode indication (OMI) operation/messages or the EML operating mode in EML Operating Mode Notification frame? | Please clarify which operating mode it refers to in line 51 page 283.  Similar clarification is also needed for the occurrence of "operating mode" in line 2 page 284 | Revised  TGbe editor to make changes in this document under CID 5849 |
| 5680 | 283 | 55 | For EMLMR mode, please specify the capabilityies of EMLMR Rx NSS and EMLMR Tx NSS on the link for which the initial frame exchange was made. | As in comment | Revised  11be D1.5 defines eMLMR Rx Nss, Tx Nss in **9.4.1.74 (EML Control field)**. D1.5 clarifies it by changing to “…the EMLMR Supported MCS And NSS Set subfield of the EML Control field of the EML Operating Mode Notification frame…”  Note to editor: No further change is needed |
| ~~8361~~ | ~~283~~ | ~~56~~ | ~~In the frame exchange sequence, the AP MLD transmits a frame with 4 NSS and if the AP MLD wants to transmit other frame, the NSS number cannot be larger than 4 NSS.Maybe the the value as indicated in the EMLMR Rx NSS subfield of the Common Info field is larger than 4. It's better to add a rule like this,it's good for power saving.~~ | ~~Please clarify it~~ | ~~Rejected~~  ~~The allowed Nss is subject to operating mode as defined in the draft. The OM can change the Nss.~~ |
| 6135 | 282 | 60 | Is it possible for one link of an MLMR pair of links to become completely disabled, e.g. "deaf", during the RX operation on the other link? I.e. is it possible to allocate all of the NSS for RX operation to one of the links at least some of the time? If it is allowed, then what is the recovery procedure from such deafness? One possible answer is that is is probably the same as for NSTR, in which case, there should be a few sentences in the MLMR subclause which state that if an MLMR STA becomes deaf during an RX operation on another STA of the same MLMR MLD, then it must use the deafness recovery mechanism specified in 35.3.14.7 Medium access recovery procedure - alternatively, the condition of a complete lack of RX resources could be forbidden in the MLMR case. | Add language that describes the possibility of the STA of one link of an MLMR pair becoming completely unable to RX anything when all of its RX resources have been allocated to the other link, in which case, the STA has lost medium synchronization and then require that such a STA must follow the 35.3.14.7 medium access recovery procedure. Note that the AP and MLMR clients must either use the eMLSR medium recovery parameters for both eMLSR and MLMR medium recovery operations, or another set of MLMR specific parameters must be created. | Revised  When a eMLMR non-AP MLD uses one link to do frame exchanges in one link, the other links will be in deaf state. As indicated by the commenter, the method similar to NSTR can be used in this case.  TGbe editor to make changes in 35.3.18 under CID 6135 |

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

*TGbe editor: Please make the last two paragraphs in 35.3.18 as follows:*

(#8050, 6220)After an eMLMR STA affiliated with an non-AP MLD on a link transmits an immediate response frame solicited by the initial frame of a TXOP that an AP affiliated with an AP MLD is the TXOP holder, another eMLMR STA affiliated with the non-AP MLD shall not transmit or receive on another EMLMR link until the end of the frame exchange sequence. During the frame exchange sequence, the other AP(s) affiliated with the AP MLD shall not transmit frames to the other eMLMR STA(s) affiliated with the non-AP MLD.

When a non-AP MLD operates in the EMLMR mode, after initial frame exchange subject to its per-link spatial stream capabilities and operating mode defined by the exchanged Operating Mode Notification frame, (EHT) OM Control (#5849) on one of the EMLMR links, the non-AP MLD shall be able to support the following until the end of the frame exchange sequence initiated by the initial frame exchange:

—Receive PPDUs with the number of spatial streams up to the value as indicated in (#4425)the EMLMR Supported MCS And NSS Set subfield of the EML Control field of the EML Operating Mode Notification frame at a time on the link for which the initial frame exchange was made.

—Transmit PPDUs with the number of spatial streams up to the value as indicated in (#4425)the EMLMR Supported MCS And NSS Set subfield of the EML Control field of the EML Operating Mode Notification frame at a time on the link for which the initial frame exchange was made.

After the end of the frame exchange sequence, each STA of the non-AP MLD in the EMLMR mode shall be able to transmit or receive PPDU, subject to its per-link spatial stream capabilities and operating mode defined by the exchanged Operating Mode Notification frame, (EHT) OM Control (#5849) and subject to any switching delay indicated by the non-AP MLD.

(#5223, 5224, 6067) Within a TXOP initiated by an AP affiliated with AP MLD, the non-AP MLD shall switch back to do the CCA operation on the EMLMR links after the time indicated in the EMLMR Transition Delay subfield of the EML Capabilities subfield in the Common Info field of the Basic Multi-Link element if any of the following conditions is met and this is defined as the end of the frame exchanges:

* The MAC of the STA affiliated with the non-AP MLD that received the initial frame does not receive a PHY-RXSTART.indication primitive during a timeout interval of aSIFSTime

+ aSlotTime + aRxPHYStartDelay starting at the end of the PPDU transmitted by the STA of the non-AP MLD as a response to the most recently received frame from the AP affiliated with the AP MLD or starting at the end of the reception of the PPDU containing a frame for the STA from the AP affiliated with the AP MLD that does not require immediate acknowledgement.

* The MAC of the STA affiliated with the non-AP MLD that received the initial frame receives a PHY-RXSTART.indication primitive during a timeout interval of aSIFSTime + aSlot- Time + aRxPHYStartDelay starting at the end of the PPDU transmitted by the STA of the non- AP MLD as a response to the most recently received frame from the AP affiliated with the AP MLD or starting at the end of the reception of the PPDU containing a frame for the STA from the AP affiliated with the AP MLD that does not require immediate acknowledgement and the STA affiliated with the non-AP MLD does not detect, within the PPDU corresponding to the PHY- RXSTART.indication any of the following frames:
  + an individually addressed frame with the RA equal to the MAC address of the STA affili- ated with the non-AP MLD
  + a Trigger frame that has one of the User Info fields addressed to the STA affiliated with the non-AP MLD
  + a CTS-to-self frame with the RA equal to the MAC address of the AP affiliated with the AP MLD
  + a Multi-STA BlockAck frame that has one of the Per AID TID Info fields addressed to the STA affiliated with the non-AP MLD
  + a NDP Announcement frame that has one of the STA Info fields addressed to the STA affil- iated with the non-AP MLD
* The STA affiliated with the non-AP MLD that received the initial frame does not respond to the most recently received frame from the AP affiliated with the AP MLD that requires immediate response after a SIFS.

(6135) A STA affiliated with eMLMR non-AP MLD does the medium synchronization recovery as defined in **35.3.16.8 (Medium access recovery procedure)** with the following additional changes:

* When comparing with aMediumSyncThreshold to decide whether starting the MediumSyncDelay timer, the transmission event, receiving event, the IFS between the transmission event and receiving event, and the eMLMR link switch event are counted.
* Replacing STA operating on NSTR link pair by STA operating on an eMLMR link
* Replacing NSTR non-AP MLD by eMLMR non-AP MLD

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 6071 | 286 | 57 | the P2P, TDLS etc. may require that eMLMR operation allows both sides support eMLMR operation. | Change the text to allow such operation. | Rejected  Currently eMLMR mode is allowed between AP MLD and non-AP MLD. The group can’t get consensus to extend eMLMR to TDLS and P2P. |
| 6422 | 282 | 57 | The behavior of a non-AP STA in EMLMR mode and its associated AP on a link which is EMR with another link on which the STA has an r-TWT agreement needs to be defined. This behavior should encompass r-TWT SP start boundary and transmissions of EMLMR STA within the r-TWT SP. | Define channel access rules for EMLMR non-AP STA as TXOP holder and responder on one link which is EMR with another link on which an r-TWT SP occurs of which the non-AP STA is a member. The defined behavior should encompass r-TWT SP start boundary such that the STA of the non-AP MLD in the EMLMR mode is able to transmit or receive PPDUs during r-TWT SP. Moreover, latency sensitive traffic delivery should be prioritized during r-TWT SP. | Revised  Generally agree with the commenter. Additionally the text about AP’s behavior is added when an AP is the TXOP holder and starts its TXOP before a r-TWT SP broadcasted by the AP.  TGbe editor to make changes in this document under CID 6422 |

**35.9.4.1 TXOP rules for r-TWT SPs**

*TGbe editor: Please add the following text in 35.9.4.1: (#6422)*

~~An EHT AP with dot11RestrictedTWTOptionImplemented set to true as a TXOP holder shall ensure the TXOP ends before the start time of each r-TWT SP advertised by itself unless the EHT AP transmits frames of latency sensitive traffic at the beginning of the r-TWT SP.~~

A first AP affiliated with an AP MLDas a TXOP holder in a first link should ensure the TXOP ends before the start time of any r-TWT SPs in a second link advertised by a second AP affiliated with same AP MLD as the first AP if the TXOP responder is a first STA affiliated with a non-AP MLD working on the first link in eMLMR mode and the STA affiliated with the non-AP MLD works on second link in eMLMR mode and has dot11RestrictedTWTOptionImplemented equal to true.

A first STA affiliated with a non-AP MLDas a TXOP holder on a first link in eMLMR mode should ensure the TXOP ends where a first AP is the TXOP responder before the start time of any r-TWT SPs in a second link advertised by a second AP affiliated with same AP MLD as the first AP if a second STA affiliated with the same non-AP MLD as the first STA on the second link in eMLMR mode has dot11RestrictedTWTOptionImplemented equal to true.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **PP** | **LL** | **Comment** | **Proposed Change** | Resolution |
| 6066 | 286 | 57 | The operating mode change within eMLMR mode should be defined. | Change the text according to the comment. | Revised  Each link in eMLMR mode may have different BW, Nss capabilities. The eMLMR mode has MLD level Nss capabilities. The current operating mode change is per link basis. Several options can be used to address this issue:  Option 1), reusing the OM and EHT OM to update per link parameters and using the propotional rules to figure out the eMLMR Nss parameters.  Option 2), defining a new OM to announce the eMLMR Nss update. The current OM is used to announce the per link Nss, BW change. At least two frame exchanges are used to update one link parameters and eMLMR parameters.  Option 3) defining an Action frame to announcing the per link operating parameters and eMLMR operating parameters in one frame.  Option 1 is simple.  TGbe editor to make changes in this document under CID 6066 |
| 8361 | 283 | 56 | In the frame exchange sequence, the AP MLD transmits a frame with 4 NSS and if the AP MLD wants to transmit other frame, the NSS number cannot be larger than 4 NSS.Maybe the the value as indicated in the EMLMR Rx NSS subfield of the Common Info field is larger than 4. It's better to add a rule like this,it's good for power saving. | Please clarify it | Revised  Each link in eMLMR mode may have different BW, Nss capabilities. The eMLMR mode has MLD level Nss capabilities. The current operating mode change is per link basis. Several options can be used to address this issue:  Option 1), reusing the OM and EHT OM to update per link parameters and using the propotional rules to figure out the eMLMR Nss parameters.  Option 2), defining a new OM to announce the eMLMR Nss update. The current OM is used to announce the per link Nss, BW change. At least two frame exchanges are used to update one link parameters and eMLMR parameters.  Option 3) defining an Action frame to announcing the per link operating parameters and eMLMR operating parameters in one frame.  Option 1 is simple.  TGbe editor to make changes in this document under CID 8361 |

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

*TGbe editor: Please at the following text at the end of 35.3.18:*

(#6066, 8361) When a STA affiliated with a non-AP MLD on an eMLMR link updates its Rx Nss through (EHT) OM as in 35.10 (**Operating mode indication**), the eMLMR Rx Nss for the BW that is one of <=80MHz, 160MHz if supported, 320MHz if supported is defined as follows:

floor(Announced\_eMLMR\_RxNss\_BW \* OM\_RxNss\_Sum\_BW/Announced\_RxNss\_Sum\_BW)

where

Announced\_eMLMR\_RxNss\_BW is the Rx Nss in eMLMR mode with bandwidth of BW per the announced EMLMR Supported MCS And NSS Set field.

OM\_RxNss\_Sum\_BW is the total Rx Nss of all links in eMLMR mode with bandwidth of BW as defined in 35.10 (**Operating mode indication**) after transmitting (EHT) OM Notification correctly.

Announced \_RxNss\_Sum\_BW is the total Rx Nss of all links with bandwidth of BW in eMLMR mode per the announced EHT Capabilities elements of the links.

(#6066, 8361) When a STA affiliated with a non-AP MLD on an eMLMR link updates its Tx Nss through (EHT) OM as in 35.10 (**Operating mode indication**), the eMLMR Tx Nss for the BW that is one of <=80MHz, 160MHz if supported, 320MHz if supported is defined as follows:

floor(Announced\_eMLMR\_TxNss\_BW \* OM\_TxNss\_Sum\_BW/Announced\_TxNss\_Sum\_BW)

where

Announced\_eMLMR\_TxNss\_BW is the Tx Nss in eMLMR mode with bandwidth of BW per the announced EMLMR Supported MCS And NSS Set field.

OM\_TxNss\_Sum\_BW is the total Tx Nss of all links in eMLMR mode with bandwidth of BW as defined in 35.10 (**Operating mode indication**) after transmitting (EHT) OM Notification correctly.

Announced \_TxNss\_Sum\_BW is the total Tx Nss of all links with bandwidth of BW in eMLMR mode per the announced EHT Capabilities elements of the links.

.