IEEE P802.11
Wireless LANs

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| Recirculation SA Ballot Issue on EMLSR and TXS (CID 23167) |
| Date: 2024-06-26 |
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Abstract

This submission explains remaining issue for CID 23167 received in recirculation SA ballot of 11be.

R0: Initial version.

R1: Modified discussions.

R2: Modified discussions.

R3: Modified discussions and proposed text.

## Related Comment

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **P.L** | **Comment** | **Proposed Change** |  |
| 23167 | Yongho Kim | 35.3.17 | 599.65 | When a non-AP STA affiliated with an EMLSR non-AP STA performs a TXS operation as defined in 35.2.1.2 and transmits a CTS response to a MU-RTS frame, since it shall switch back after the end of the frame exchanges as defined in 35.3.17 due to not receiving PHY-RXSTART.indication in shared TXOP, it can not perform TXS operation. Therefore, the EMLSR non-AP STA's transmission to the AP or to a peer STA is not possible. The 802.11be draft shall define an EMLMR non-AP MLD's TXS operation. The related comment was rejected in the last resolution. However, the issue still exists in the 11be D6.0. | Add the following paragraph:When a non-AP STA affiliated with the non-AP MLD gets the time allocation from the AP with the MU-RTS TXS Trigger frame specified in 35.2.1.2 (Triggered TXOP sharing procedure), it can be considered that the non-AP STA initiates a TXOP, and the item l) is applied to the non-AP STA. When the non-AP STA returned the time allocation or the time allocation ends, The non-AP MLD shall be switched back to the listening operation on the EMLSR links after the EMLSR transition delay time indicated by the non-AP MLD. |  |

## Discussion

**[Issue #1]**



When a non-AP STA, which is operating in EMLSR operation, **1)** received an initial Control frame and received an MU-RTS TXS Trigger frame from an AP, the time is allocated to the non-AP STA by the AP. **2)** The non-AP STA transmits a CTS frame to the AP if it received the MU-RTS TXS Trigger frame. **3)** In this case, the non-AP STA’s MAC cannot receive PHY-RXSTART.indication in the allocated time in the MU-RTS TXS Trigger frame. Therefore, the non-AP STA shall be switched back to the listening operation by the rules defined in subclause 35.3.17.

**“**

* + 1. **Enhanced multi-link single-radio (EMLSR) operation**

(…)

 e) **1)**After receiving the initial Control frame of frame exchanges and transmitting an immediate response frame as a response to the initial Control frame, a non-AP STA affiliated with the non-AP MLD that was listening on the corresponding link shall be able to transmit or receive frames on the link on which the initial Control frame was received and shall not transmit or receive on the other EMLSR link(s) until the end of the frame exchanges, and subject to its spatial stream capabilities, operation mode, and the minimum MAC frame padding duration of the Padding field of the initial Control frame, the non-AP STA affiliated with the non-AP MLD shall be capable of receiving a PPDU that is sent using more than one spatial stream on the link on which the initial Control frame was received a SIFS after the end of its response frame transmission solicited by the initial Control frame. During the frame exchanges, the other AP(s) affiliated with the AP MLD shall not transmit frames to the other non-AP STA(s) affiliated with the non-AP MLD on the other EMLSR link(s).

(…)

i) **3)**The non-AP MLD shall be switched back to the listening operation on the EMLSR link(s) after the EMLSR transition delay time most recently indicated by the non-AP MLD if any of the following conditions is met, and this is defined as the end of the frame exchanges:

* + **3) The MAC of the non-AP STA affiliated with the non-AP MLD that received the initial Control frame does not receive a PHY-RXSTART.indication primitive during a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay**, where aRxPHYStartDelay is equal to 20 µs, **2) starting at the end of the PPDU transmitted by the non-AP STA affiliated with 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 non-AP STA from the AP affiliated with the AP MLD that does not require immediate acknowledgement.

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During the TXS period, the non-AP STA is supposed to trasnsmit a PPDU. According to the current spec, the EMLSR non-AP STA will be switched back to listening operation while transmitting the PPDU. We need a condition not switching into listening operation when the EMLSR non-AP STA transmits a frame during a timeout interval of aSIFSTime+aSlotTime+aRXPHYStartDelay.

**[Issue #2]**

There is another issue. when the non-AP STA received the MU-RTS TXS Trigger frame from its associated AP, it may receive frames from another non-AP STA (e.g., P2P communication) rather than transmit frame in the allocated time. The non-AP STA operating EMLSR should not return to the listening operation in this case. Also, in this case, the AP cannot know when the non-AP STA returns to the listening operation. Therefore, to address this issue, a behavior that the non-AP shall not return to the listening operation in the allocated time can be added to 11be D6.0

**[Options for the resolution of the issues]**

To solve the issues above, this document suggests 4 options for 11be D6.0.

1. No changes to 11be D6.0
	1. This option leaves these issues as it as.
2. Exclude non-AP MLD with EMLSR operation from TXS operation
	1. This option can solve all these issues because non-AP MLD with EMLSR cannot use the TXS procedures in 11be D6.0.
3. Add a new concept: non-AP STA is considered as TXOP holder during allocated time in TXS
	1. This option can solve all these issues, but it adds a new concept to 11be D6.0.
4. Add the minimal change to subclause 35.3.17 (EMLSR operation)
	1. Adding a condition related to the PHY-TXSTART primitive to the end of the frame exchange rules in the EMLSR operation.
	2. This option can solve the issue #1, but it cannot solve the issue #2.

## Proposed Text for 11be D6.0

**<Option 1: No changes to 11be D6.0>**

**<Option 2: Exclude non-AP MLD with EMLSR operation from TXS operation>**

**35.2.1.2 Triggered TXOP sharing (TXS) procedure**

**35.2.1.2.1 General**

**(P512 L12)**

An EHT STA which is affiliated with a non-AP MLD operating in EMLSR mode shall not follow the rules defined in 35.2.1.2.3 (Non-AP STA behavior).

**35.2.1.2.2 AP behavior**

**(P512 L40)**

An EHT AP shall not send an MU-RTS TXS Trigger frame with TXS Mode subfield equal to 1 or 2 and with the User Info field that is addressed to an associated non-AP STA which is affiliated with a non-AP MLD operating in EMLSR mode.

**<Option 3: Add a new concept: non-AP STA is considered as TXOP holder during allocated time in TXS>**

**35.2.1.2 Triggered TXOP sharing (TXS) procedure**

**35.2.1.2.3 Non-AP STA behavior**

**(P514 L38)**

When the time allocation starts, the non-AP STA considered to initiate a TXOP and to hold the TXOP until the time allocation ends or the time point when the non-AP STA transmitted a QoS Data or QoS Null Frame that includes an HE variant HT Control field with a CAS Control subfield with the RDG/More PPDU subfield equal to 0 to the associated AP from which it has received an EHT Capabilities element with the TXOP Return Support In TXOP Sharing Mode 2 subfield set to 1.

**<Option 4: Add the minimal change to subclause 35.3.17 (EMLSR operation)>**

**35.3.17 Enhanced multi-link single-radio (EMLSR) operation**

**(P599 L19)**

i) The non-AP MLD shall be switched back to the listening operation on the EMLSR link(s) after the EMLSR transition delay time most recently indicated by the non-AP MLD if any of the following conditions is met, and this is defined as the end of the frame exchanges:

* + The MAC of the non-AP STA affiliated with the non-AP MLD that received the initial Control frame does not receive a PHY-RXSTART.indication primitive or does not transmit a PHY-TXSTART.request and receive a PHY-TXSTART.confirm during a timeout interval of aSIFSTime + aSlotTime + aRxPHYStartDelay, where aRxPHYStartDelay is equal to 20 µs, starting at the end of the PPDU transmitted by the non-AP STA affiliated with 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 non-AP STA from the AP affiliated with the AP MLD that does not require immediate acknowledgement.