IEEE P802.11
Wireless LANs

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| Proposed Draft TextMAC MLO Enhanced Multi-link Single-Radio Operation |
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Abstract

This submission proposes draft text to be included in 802.11be Draft 0.1 for the following topic:

* MAC MLO Enhanced Multi-link Single-radio Operation
	+ Based on the following motions: Motion 119 #SP125 and Motion 119 #SP126.
	+ Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only receive, or transmit frames on one link at a time.

[Motion 119, #SP118, [3] and [179]]

[Motion 119, #SP125, [3] and [180]]

* + 802.11be supports the multi-link operation for a non-AP MLD that is defined as follows to be included in R1.
* A non-AP MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links.
	+ The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS).
	+ The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type.
	+ Link switch delay may be indicated by the non-AP MLD.

[Motion 119, #SP126, [3] and [181]]

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on the comments from Young Hoon Kwon. Added motion texts in the abstract.
* Rev 2: Updated based on the comments from Yongho, Young Hoon, Liwen, Sharan, Yonggang.
* Rev 3: Updated based on the comments from Sanghyun
* Rev 4: Updated based on the comments from Xiandong and Zhiqiang

**3.2 Definitions specific to IEEE 802.11**

A single-link/radio (*name is TBD*) non-AP MLD is a non-AP MLD that supports operation on more than one link but receives or transmits frames only on one link at a time.

**33.x.y Enhanced multi-link single-radio operation**

A non-AP MLD may operate in the enhanced multi-link single-radio (EMLSR) mode. (*name of the mode is TBD*)

An MLD with dot11EMLSROptionImplemented equal to true shall set the EMLSR mode subfield of the TBD Capabilities element, which is an MLD level capabilities element, to 1; otherwise, the MLD shall set the EMLSR mode subfield to 0.

When a non-AP MLD is operating in the EMLSR mode, the non-AP MLD shall be able to listen on more than one enabled link, by having its affiliated STA(s) corresponding to those links in the awake state. The listening operation includes CCA and receiving the initial Control frame of a frame exchange sequence that is initated by an AP MLD. The non-AP MLD shall indicate to the AP MLD a specified set of enabled links on which the non-AP MLD performs the listening operation.

The initial Control frame of a frame exchange sequence may have one or more limitations for the following parameters: the number of spatial streams, MCS(s) (or data rate(s) for non-HT PPDU), PPDU type(s), and frame type(s). The limitations for the initial Control frame shall be indicated by the non-AP MLD to the AP MLD. The non-AP MLD may indicate its link switch delay in a TBD management frame.

Note – For example, the limitations of the initial Control frame can be as follows: one spatial stream, data rate less than or equal to 24 Mbps, non-HT PPDU, and RTS or MU-RTS frame.

The AP MLD shall initiate a frame exchange sequence with the non-AP MLD on one of the specified set of enabled links in which the EMLSR mode is applied by transmitting an initial Control frame to the non-AP MLD with the limitations indicated by the non-AP MLD.

After receiving the initial Control frame of a frame exchange sequence, the non-AP MLD shall transmit or receive frames on the link in which the initial Control frame was received and shall not transmit or receive on the other link(s) of the specified set of enabled links in which the EMLSR mode is applied until the end of the frame exchange sequence, and subject to its spatial stream capabilities, operation mode, and link switch delay, the non-AP MLD shall be capable of receiving a PPDU that is sent using more than one spatial stream a SIFS after the end of its response frame transmission solicited by the initial Control frame. During the frame exchange sequence, the AP MLD shall not transmit frames on the other link(s) of the specified set of enabled links in which the EMLSR mode is applied. The non-AP MLD switches back to the listening operation on the specified set of enabled links in which the EMLSR mode is applied immediately after the end of the frame exchange sequence.