IEEE P802.11
Wireless LANs

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| [Draft text for MU-MIMO Power Save for 11ay] |
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Abstract

This document proposes draft changes to include MU-MIMO power save for EDMG STAs.

**10.3.2.10 MU acknowledgment procedure**

*Add the following paragraphs before NOTE 2*

The acknowledgment procedure performed by EDMG STAs that receive an MPDU within an EDMG MU PPDU from an MU-MIMO initiator shall follow an ordered process as follows:

* The first STA, if applicable, to transmit an immediate BlockAck frame in response to its received MPDUs within the EDMG MU PPDU shall be the STA whose AID appears first in the group description present in the EDMG Group ID Set element (See 9.4.2.254) and that corresponds to the MU group corresponding to the MU-MIMO transmission.
* Responses to MPDUs within the EDMG MU PPDU that are not immediate responses to the EDMG MU PPDU are transmitted in response to explicit BlockAckReq frames sent by the indicator. The initiator shall send the BlockAckReq frames to the responders in the same order that AIDs appear in the group description present in the EDMG Group ID Set element.
* If the initiator decides to retransmit the BAR addressed to a responder in the same frame exchange sequence, it shall retransmit it immediately in the original sequence order.

Example of EDMG MU PPDU frame exchange sequences are shown in Figure 1 and Figure 2, assuming the AID order in the corresponding EDMG Group ID Set element is: STA 1, STA 3, and STA 2.



Figure 1: Example of TXOP containing EDMG MU PPDU transmission with immediate acknowledgement of EDMG MU PPDU.



Figure 2: Example of TXOP containing EDMG MU PPDU transmission with no immediate acknowledgement of EDMG MU PPDU.

*Insert the following subclause*

**11.2.7.5 MU-MIMO Power Save**

The MU-MIMO power save mechanism allows a non-AP and non-PCP EDMG STA in an infrastructure BSS or PBSS to go to PS mode during a TXOP where the STA is involved in a MU-MIMO transmission and acknowledgement procedure.

An EDMG STA that receives A-MPDUs within an EDMG MU PPDU may go to PS mode during two periods:

* From the time of detecting the EOF field in its individual A-MPDU within the EDMG MU PPDU to the time before its order to perform BAR/BA exchange with the initiator (See 10.3.2.10).
* From the time of successfully sending back the BA to the end of the current EDMG MU PPDU frame exchange.

When determining the time to wake up before its turn to perform BAR/BA exchange with the initiator, an EDMG STA shall use the most conservative estimate so that it does not miss its corresponding BAR/BA exchange with the initiator. The EDMG STA shall assume other initiator-responder pairs in the same MU group use the highest MCS value allowed to perform the BAR/BA exchange with the initiator, and the BAR/BA frame size used between other initiator-responder pairs is of the shortest size.

Once awake, the EDMG STA shall stay in awake state until it receives the BAR addressed to it and sends back the BA to the initiator or until the end of the current TXOP, whichever comes first. After sending back the BA to the initiator, the EDMG STA shall stay in awake state for an additional AckTimeout interval to account for any possible BAR frame retransmissions from the initiator.

Figure 3 illustrates an example of MU-MIMO power save performed in a MU group with 3 EDMG STAs with no immediate acknowledgement of EDMG MU PPDU, assuming the AID order in the corresponding EDMG Group ID Set element is: STA 1, STA 3, and STA 2.



Figure 3: Example of MU-MIMO power save performed in a MU group with 3 EDMG STAs with no immediate acknowledgement of EDMG MU PPDU.