IEEE P802.11
Wireless LANs

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| TGbd D2.0 Comment Resolution clause 6 and 11 related to DMG and MLME |
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Abstract

This submission proposes resolution of comments on clauses 6 and 11 related to DMG and MLME on TGbd Draft 2.0.

7 CIDs 2072, 2255, 2144, 2226, 2074, 2075, 2066

Revision history:

r0 initial version

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2072 | 6.3.127.2 | 28.31 | MLME-DMG-OCB-START.request primitive should include the Unsolicited Block Ack Extension parameter to configure EDMG STA feature. | Add the parameter to the primitive, as in comment. The definition for the Unsolicited Block Ack Extension parameter is the same as the parameters in MLME.scan primitive defined in 11ay. | **Revised**TGbd Editor: Incorporate the change in <https://mentor.ieee.org/802.11/dcn/21/11-21-1482-00-00bd-cr-clauses-6-and-11-related-to-dmg-and-mlme.docx> for CID 2072. |

**Discussion**

**Unsolicited block ack extension (Subclause 10.25.10 of 11ay) was introduced for an EDMG STA, as an optional feature, in 11ay. The mechanism is an extension to the HT-Immediate block ack mechanism that allows transmission of A-MPDUs without ADDBA Request/Response exchange to setup the agreement. The information necessary to set up an unsolicited block ack extension agreement is exchanged using Information Request and Information Response frame exchange between a pair of non-AP and non-PCP STAs, as described in 9.4.2.279 (Unsolicited Block Ack Extension element) of 11ay.**

**This mechanism is implementable for an EDMG STA communicating OCB, by adding the same parameter as one in MLME-SCAN.request and MLME-START.request to MLME-EDMG-OCB-START.request.**

**Conclusion: Agreed in principle to the commenter, but typo in Proposed Change should be fixed. (MLME.scan to MLME-Scan.request)**

**Proposed changes to D2.0**

6.3.127.2 MLME-DMG-OCB-START.request

6.3.127.2.2 Semantics of the service primitive

*TGbd Editor: Please add the parameter Unsolicited Block Ack Extension to the primitive as follows:*

MLME-DMG-OCB-START.request(
 Channel Number,
 Discovery Beacon,
 DMG Parameters,
 DMG Capabilities,
 EDMG Capabilities,
 Unsolicited Block Ack Extension,
 VendorSpecificInfo
 )

*TGbd Editor: Please add the parameter Unsolicited Block Ack Extension to the primitive as follows:*

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| ... |  |  |  |
| Unsolicited Block Ack Extension | Unsolicited Block Ack Extension element | As defined in 9.4.2.279 (Unsolicited Block Ack Extension element(11ay)) | Specifies the parameters within the Unsolicited Block Ack Extension element that are supported by the MAC entity. Optionally present if dot11UnsolicitedBAActivated is true and is absent otherwise. |
| VendorSpecificInfo | A set of elements | As defined in 9.4.2.25 (Vendor Specific element) | Zero or more elements |

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2255 | 6.3.127.4.3 | 30.09 | Themeaning of the term "successful use" in the phrase "only after successful use of an MLME-DMG-OCB-START.confirm primitive" is unclear. The wording can be improved. | change "only after successful use of an MLME-DMG-OCB-START.confirm primitive" to "only after the SME receives an MLME-DMG-OCB-START.confirm primitive with result code set to SUCCESS" | **Accepted** |

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2144 | 6.3.127.5.2 | 30.52 | The parameter "PeerInfoSet" has been introduced for MLME-OCM-DMGDISCOVERY.indication primitive. Hence, replace "PeerInfo" with "PeerInfoSet" | as in comment | **Revised**TGbd Editor: Incorporate the change in <https://mentor.ieee.org/802.11/dcn/21/11-21-1482-00-00bd-cr-clauses-6-and-11-related-to-dmg-and-mlme.docx> for CID 2144. |

**Discussion**

A PeerInfo includes information for a single peer STA, and a PeerInfoSet includes information of one or multiple peer STA(s). To clarify it, we propose to change the term “PeerInfo” to “PeerInfo vector.” Also, typo in the related figure should be fixed.

**Proposed changes to D2.0**

6.3.127.5 MLME-OCB-DMGDISCOVERY.indication

6.3.127.5.2 Semantics of the service primitive

*TGbd Editor: Please change the table under the definition of MLME-OCB-DMGDISCOVERY.indication primitive as follows:*

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| PeerInfoSet | Set of PeerInfo vectors as defined below | N/A | The PeerInfoSet is returned to indicate the results of the discovery request outside the context of a BSS as described in 11.1.4.X (DMG Discovery outside the context of a BSS). It is a set containing zero or more instances of a PeerInfo vector. |
| VendorSpecificInfo | A set of elements | As defined in 9.4.2.25 (Vendor Specific element) | Zero or more elements |

*TGbd Editor: Please change the paragraph after the table as follows:*

Each PeerInfo vector consists of the parameters shown in the following table, in which the term peer STA refers to the STA that transmitted the received DMG Beacon frame, SSW frame, SSW Feedback frame, or SSW Ack frame.

11.1.4.~~8~~7 DMG Discovery outside the context of a BSS

*TGbd Editor: Please change the 3rd paragraph as follows:*

When the STA receives one or more SSW frames with the OCB subfield set to 1 during an A-BFT or DTI and completes SLS with the peer STA, and the address of the peer STA is an address that is newly discovered, the STA shall issue an MLME-OCB-DMGDISCOVERY.indication with the PeerInfoSet parameter including the PeerInfo vector defined in 6.3.127.5 (MLME-OCB-DMGDISCOVERY.indication) for the peer STA that transmitted the SSW frame.

*TGbd Editor: Please replace* MLME-OCB-DMGDISCOVERED.indication *with* MLME-OCB-DMGDISCOVERY.indication *at two locations, and replace “PeerInfo” with “PeerInfo vector content” at one location in Figure 11-10b, and change the caption of the figure as follows:*



**Figure 11-10b – ~~DMG~~Beamforming training during the DMG Discovery outside the context of a BSS**

*Note to TGbd Editor: the following shows figure with redline, for Editor’s convenience.*



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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2226 | 11.1.3.4 | 41.21 | The behavior of a STA with dot11OCBActivated equal to true that is transmitting DMG Beacon Frames is not very clear. The STA's behavior is different then a typical DMG STA as it need not stop transmitting DMG Beacon Frames when it receives a DMG Beacon Frame from another STA. But it doesn't need to continue transmitting the frames. | Change: "A STA with dot11OCBActivated equal to true that is transmitting DMG Beacon frames with the Discovery Mode field equal to 1 should continue transmitting these beacons for discovery of peer DMG STAs outside the context of a BSS."To: "A STA with dot11OCBActivated equal to true that is transmitting DMG Beacon frames with the Discovery Mode field equal to 1 may continue transmitting beacons for discovery even if it has received a DMG Beacon frame from another STA." | **Revised**TGbd Editor: Incorporate the change in <https://mentor.ieee.org/802.11/dcn/21/11-21-1482-00-00bd-cr-clauses-6-and-11-related-to-dmg-and-mlme.docx> for CID 2144. |

**Discussion**

Agreed in principle. In addition to the proposed change by the commenter, we propose to add “as described in 11.1.4.8 (DMG Discovery outside the context of a BSS)” after “discovery” to clarify what “discovery” means.

**Proposed changes to D2.0**

11.1.3.4 DMG beacon generation before establishment of a BSS

*TGbd Editor: Please change the 2nd paragraph as follows:*

A STA with dot11OCBActivated equal to true that is transmitting DMG Beacon frames with the Discovery Mode field equal to 1 ~~should~~may continue transmitting these beacons for discovery ~~of peer DMG STAs outside the context of a BSS~~ as described in 11.1.4.8 (DMG Discovery outside the context of a BSS) even if it has received a DMG Beacon frame from another STA.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2074 | 11.1.4.8 | 41.58 | A DMG STA notify the higher layer of successful discovery of a peer STA, based on procedure defined in 11.1.4.8, but doesn't notify of disconnection. | Mandate Beamformed link maintenance defined in 11.27.1 of REVme between two DMG STAs outside the context of a BSS.A STA should notify the higher layer of failure of an SLS that is performed after the expiration of the link maintenance timer.When Beamformed link maintenance is mandated, a STA may omit transmission of a groupcast frame over the sector where any maintained links do not exist. | **Revised**TGbd Editor: Incorporate the change in <https://mentor.ieee.org/802.11/dcn/21/11-21-1482-00-00bd-cr-clauses-6-and-11-related-to-dmg-and-mlme.docx> for CID 2074. |

**Discussion**

(1) Beamformed link maintenance (subclause 11.27.1 in REVme) procedure was defined in 11ad, and enhanced in 11ay. The expiration of the timer indicates that a certain duration elapsed after the last successful reception of a frame or beamforming training. It is specified that a DMG STA may perform beamforming training to maintain or recover the link, but it is not mandatory. 11ad/ay didn’t specify any indication of status of the timers to the higher layer.

Since there’s no association/disassociation procedure for OCB and it is a useful information for higher layer regarding reachable STAs, we propose to define an indication to the higher layer (MLME-OCB-LINKSTATUS.indication) in the TGbd draft.

(2) For 11ad and 11ay STAs, negotiation of dot11BeamLinkMaintenanceTime timer is mandatory, but support of Beamformed link maintenance procedure is optional. Thus a STA doesn’t run a timer with a peer STA after negotiation process if the peer STA doesn’t support the procedure.

We propose to mandate support of the procedure for a DMG STA communicating OCB so the higher layer can obtain status of the links.

**(3) A STA that performs Beamformed link maintenance procedure maintains a list of reachable STAs.**

**Transmission of group addressed (especially broadcast) frames is well-used in V2X use cases. (E.g. transmission of WSA, basic massages, and/or any other service advertisement by network and application layer.) The current spec (REVme) specifies about group addressed transmission over 60 GHz as follows:**

***REVme D0.4 P2126L57 (in 10.3.6 Group addressed MPDU transfer procedure)***

*A DMG STA may transmit a copy of the same group addressed MPDU using different antenna configurations. This might be needed to provide a quasi-omni coverage or to enable transmission by an MCS that is higher than MCS 0. If multiple copies of a group addressed MPDU with a To DS subfield equal to 0 are transmitted, the STA shall not transmit a different frame before the completion of the transmission of all copies of the group addressed MPDU.*

**Since each beam may have a coverage of a few degrees for V2X implementations where communication range of several hundred meters is required (see figure below), a STA would need to transmit tens to hundreds of the same copies of a broadcast frame to cover 360 degree coverage. This is problematic for using 60 GHz band communication for V2X.**

**Figure from 20/1302r3**

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**Thus, we propose to inform that STAs communicating OCB may omit transmission to the direction where existence of any peer STA is not anticipated. How to decide whether omit transmission or not for each direction is implementation dependent.**

**Proposed changes to D2.0**

*Note: (1) STA behavior upon expiration of the beamlink maintenance timer:*

*TGbd Editor: Please add the following subclause to TGbd draft:*

6.3.127.6 MLME-OCB-LINKSTATUS.indication

6.3.127.6.1 Function

This primitive indicates the status change of beamformed link and beam link maintenance timer with a peer STA.

6.3.127.6.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-OCB-LINKSTATUS.indication(
 PeerSTAAddress,
 BeamLinkStatus,
 VendorSpecificInfo
 )

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| PeerSTAAddress | MAC Address | Any valid individual MAC address | Specifies the MAC address of the peer STA for which the status of beamformed link is reported.  |
| BeamLinkStatus | Enumeration | ESTABLISHED, EXPIRED, NOT\_ESTABLISHED | Indicates the status of beamformed link and the beam link maintenance timer as described in 11.27.1.1(General). |
| VendorSpecificInfo | A set of elements | As defined in 9.4.2.25 (Vendor Specific element) | Zero or more elements |

6.3.127.6.3 When generated

This primitive is generated by the MLME when the MAC entity detects the expiration of a beam link maintenance timer or any status change on a beamformed link with peer MAC entity.

6.3.127.6.4 Effect of receipt

The SME is notified of the status of the beamformed link and beam link maintenance timer with the peer MAC entity.

*TGbd Editor: Please add the following subclause to TGbd draft:*

11.27 DMG beamformed link and BSS maintenance

11.27.1 Beamformed link maintenance

11.27.1.1 General(11ay)

*Insert the following paragraph after the 14th paragraph (“Any time after dot11BeamLinkMaintenancetime has elapsed, the initiator...”):*

Upon expiration of dot11BeamLinkMaintenanceTime, a DMG STA communicating OCB shall generate an MLME-OCB-LINKSTATUS.indication primitive with BeamLinkStatus parameter set to EXPIRED to inform the SME of the expiration of the beam link maintenance timer with the peer STA.

*Note: (2) Mandatory support of Beamformed link maintenance by a DMG STA communicating OCB:*

31.3.1 DMG Beamforming outside the context of a BSS

*TGbd Editor: Please add the following paragraph at the last in 31.3.1:*

A DMG STA for which dot11OCBActivated is true shall support Beamformed link maintenance procedure as described in 11.27.1.1(General)(11ay).

*TGbd Editor: Please add the following subclause to TGbd draft:*

*Note: Item NGVM1.2 is for “NGV operation in the 60 GHz band”*

B.4.24.1 DMG MAC features

*Change the table in B.4.24.1 as follows (not all rows are shown):*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **IUT configuration** | **References** | **Status** | **Support** |
| .. | .. | .. | .. | .. |
| DMG-M15DMG-M15.1\*DMG-M15.1.1DMG-M15.1.2 | DMG beamformed link and BSS maintenanceBeamformed link maintenanceNegotiation of dot11BeamLinkMaintenanceTime timerBeamformed link maintenance procedure | 9.5.611.27.1 | CFDMG:MDMG-M15.1.1:O, NGVM1.2:M | Yes  No  N/A Yes  No  N/A  |
| ... |  |  |  |  |

*Note: (3) Regarding beamformed groupcast frame transmission utilizing beamformed link maintenance (Changes to Clause 10):*

*TGbd Editor: Please add the following subclause to TGbd draft:*

10.3.6 Group addressed MPDU transfer procedure

*Change the 4th paragraph as follows:*

A DMG STA may transmit a copy of the same group addressed MPDU using different antenna configurations. This might be needed to provide a quasi-omni coverage or to enable transmission by an MCS that is higher than MCS 0. A DMG STA communicating OCB may transmit copies of the same group addressed MPDU using different antenna configurations to provide sufficient coverage to communicate with each peer STAs with which a beam link is maintained and may omit transmission in the directions where presence of any peer STA is not anticipated. If multiple copies of a group addressed MPDU with a To DS subfield equal to 0 are transmitted, the STA shall not transmit a different frame before the completion of the transmission of all copies of the group addressed MPDU.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2075 | 11.1.4.8 | 41.60 | A DMG STA should issue an indication when it completes SLS using short SSW PPDUs, not only SSW frames.Note that an EDMG STA may set the RX Unassociated Short SSW subfield in a DMG Beacon frame and perform SLS using Short SSW PPDUs outside the context of a BSS. | Replace "SSW frame(s)" with "SSW frame(s) or Short SSW PPDU(s)" throughout the subclauses 11.1.4.8 and 31.3.1. | **Rejected**Discussion: There is no reserved bit in a Short SSW PPDU(11ay) to indicate OCB, nor the commenter has not provided any alternative signaling implementation. Such signaling is required to implement the proposed changes. |
| 2066 | 5.2.3.2 | 21.42 | The radio environment request/report vector parameters are defined for use in NGV transmission and should also be defined for 60GHz band operation. | P21L41 Replace "This parameter is presentwhen dot11OCBActivated is true and absent otherwise." with"This parameter is presentwhen dot11NGVActivated is true or dot11DMGOptionImplemented is true and dot11OCBActivated is true, and absent otherwise.P23L64 Replace "This parameter is presentwhen dot11NGVActivated is true and absent otherwise." with"This parameter is presentwhen dot11NGVActivated is true or dot11DMGOptionImplemented is true and dot11OCBActivated is true, and absent otherwise.Change the definition of each member in the vectors to support values for 60GHz band. Submission will be provided. | **Rejected**Discussion: For 60 GHz operation, DMG MAC features such as channel access and beamforming protocol are reused for 11bd, and MLME SAP interfaces defined in TGbd D2.1 combined with the proposed resolution for CID2074 (above in this submission) provide sufficient interface to higher layer. The commenter didn’t provide clear reason of needs to define radio environment request/report vector parameters for 60 GHz operation. |

**References**

[1] Draft P802.11bd D2.0

[2] IEEE802.11-2020

[3] IEEE802.11ay-2021