IEEE P802.11  
Wireless LANs

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| **LB234- Multi-band Comments Resolution** | | | | |
| Date: 2018-09-13 | | | | |
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Abstract

This submission proposes resolutions to CIDs 3059, 3060, 3061, 3307, 3356, 3362, 3513, 3514, 3515, 3516, 3517 related to Multi-band.

The CIDs are in reference to Comment database on Draft IEEE 802.11ay/D2.0.

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| **CID** | **PP.LL** | **Comment** | **Proposed Change** |
| 3515 | 11.31.6.2 | There is an editor note about using the word STA and device in the 11.31.6.2 to describe the multi-band capable STA or device, this needs to be clarified | As described in the reference model for a multi-band capable device, a device is used to refer to 2 or more STAs and each can operate on a different band ( Multi-band device). A STA in that sense is part of the multi-band device. STA and multi-band capable device should be used to refer to different things. A contribution will be submitted to remove the confusion between the use of STA and device in the text and fix some miss placed notations |
| 3362 | 11.31.6.2 | There are Editor Notes stating some issue with the text in 11.31.6.2. They need to be clarified before moving to the sponsor ballot. | Refine the text with clear terminology and describe details on unspecified procedures. |
| 3059 | 11.31.6.2 | Not sure if the Editor Note is still valid | If Editor Note is not valid, please remove; else please resolve. |

**Discussion:**

11.31.1 uses the same terms of multi-band capable device and STA same as used in the multi-band reference model 4.9.4 and 11.31.1 in 802.11 RevmdD\_1.0. The multi-band capable device contains STAs that advertise the capability by including the Multi-band element in Beacon and other frames. However the an Update to the text is done to avoid any misunderstanding

**Proposed resolution: Revise**

Change 11.31.6.1 as follows

**11.31.6.1 Multi-band discovery assistance request procedure**

The multi-band discovery assistance procedure allows discovery of DMG BSSs using a STA of a multi-band capable device that operates on a band other than its intended band of communication.

NOTE— A multi-band capable device is composed of multiple STAs. Multi-band discovery assistance procedure is used when a STA of the multi-band capable device is a DMG STA.

A device is multi-band discovery assistance capable if the value of both dot11MultibandImplemented and dot11DiscoveryAssistanceActivated are true. A STA that is part of a multi-band discovery assistance capable device shall advertise the capability of multi-band discovery assistance by setting the Discovery Assistance Enabled subfield in the Multi-band Control field of its Multi-band element to 1.

Figure 149 depicts an example of the overall multi-band discovery assistance procedure.

The SME of a STA of a multi-band capable device that intends to join a DMG BSS issues an MLME-SCAN.request to the *Old Band MLME* of the device. After the scanning procedure completes, the *Old Band MLME* issues an MLME-SCAN.confirm to the SME of the STA. The MLME-SCAN.confirm contains information indicating which STAs support multi-band discovery assistance and for which band, i.e., the Discovery Assistance Enabled subfield in the Multi-band Control field of the Multi-band element.

If a multi-band discovery assistance capable device is found and a STA of the device operates a DMG BSS or an EDMG BSS, the SME of the STA that performed scanning may issue MLME-FST-SETUP.request to the *Old Band MLME* of the STA to request the discovered STA to start the discovery assistance procedure. The *Old Band MLME* receiving the MLME-FST-SETUP.request shall transmit a FST Setup Request frame.

NOTE—If the recipient of a FST Setup Request frame is an AP, the STA transmitting the FST Setup Request frame needs to complete the association and authentication process before transmitting the frame.

The two multi-band capable devices exchange FST Setup Request frame and FST Setup Response frames, as described in 11.31.2 (FST setup protocol), containing the DMG Discovery Assistance element.

Upon reception of the MLME-FST-SETUP.indication, the SME of the STA that received the discovery assistance request determines if it accepts the requested discovery assistance. The SME shall encode the determination results in the DMG Discovery Assistance element, and issue an MLME-FST-SETUP.response to the *Old Band MLME* to send back discovery assistance response.

The SME that received the MLME-FST-SETUP.confirm including the DMG Discovery Assistance element shall determine if the discovery assistance response indicates that the discovery assistance is accepted. If it has been accepted, the device shall start its DMG STA on the channel specified in the Multi-band element. Further, the SME of the DMG STA shall issue an MLME-SCAN.request to its *New Band MLME* in accordance with the parameters contained in the elements in the received frame.

Upon the successful completion of the on-demand sector sweeping, the two multi-band devices may complete the FST procedure as described in 11.31.2 (FST setup protocol).

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| **CID** | **PP.LL** | **Comment** | **Proposed Change** |
| 3516 | 11.31.6.2 | There is an editor note about the actions taken by the DMG STA that has received and accepted a discovery assistance request. It is not clear if the bullets that states the actions taken by the DMG STA that is operating non-TDD channel access indicating actions that all should be performed or if one of them should be selected. | Consider changing "If the DMG STA operates non-TDD channel access: " to " If the DMG STA operates non-TDD channel access, the DMG can provide discovery assistance through one of the following two options:" |
| 3517 | 11.31.6.2 | There is an editor note about the actions taken by the DMG STA that has received and accepted a discovery assistance request. It is not clear if the bullets that states the actions taken by the DMG STA that is operating TDD channel access indicating actions that all should be performed or if one of them should be selected. | Consider changing "If the DMG STA operates TDD channel access: " to " If the DMG STA operates TDD channel access, the DMG can provide discovery assistance through one of the following two options:" |
| 3514 | 11.31.6.2 | There is an editor note about the Discovery Assistance Window field value determination. This needs to be clarified | The Discovery Assistance Window should be big enough to make sure that the receiver gets opportunity to receive all possible SSW frames transmitted in its receive antenna directions. A contribution will be submitted to provide more information on setting up the Discovery Assistance Window. |
| 3307 | 11.31.6.2 Discovery assistance action determinatio | The editors note points out the lack of clarification regarding the setting of the Discovery Assistance Window Length. | The paragraphs above the editors note should be expanded to include the processes for determining the appropriate time value calculations and limits, plus the STA capabilities infuencing the calculation/descision. The Editors satisafaction for the correct change/additions would change my "Must Be Satisfied" to a "No". |
| 3060 | 11.31.6.2 | Not sure if the Editor Note is still valid | If Editor Note is not valid, please remove; else please resolve. |

**Discussion:**

1. Text is updated to show that the DMG STA has option to select from in regard to providing discovery assistance
2. Discovery Assistance Window Length determination is described in more details in each case to be more specific and the calculation of the beamforming period duration is described

**Proposed resolution: Revise**

Update 11.36.6.2 P 326 L5 as follows

**11.31.6.2 Discovery assistance action determination and on-demand sector sweeping**

When the SME receiving the discovery assistance request accepts the request, it shall set the Discovery Assistance Request Status Code field of the DMG Discovery Assistance element transmitted in the FST Setup Response frame containing the discovery assistance response to SUCCESS and take one of the following actions with the corresponding DMG STA.

If the DMG STA operates non-TDD channel access, the DMG STA shall provide discovery assistance through one of the following two options:

* Option 1: The DMG STA schedules DMG Beacon frame transmissions sweeping all of its sectors so that the STA requesting discovery assistance can attempt to receive it. The DMG STAsets fields in the DMG Discovery Assistance element as follows, and includes it in transmitting response:
  + Sets the Discovery Assistance Type subfield in the Discovery Assistance Control field to 0
  + Sets the Sector Sweep Start Time field to the TSF value indicating its TBTT when the discovery assistance starts
  + Sets the Discovery Assistance Window Length to the time duration of the discovery assistance, i.e., DMG Beacon sweeping. The number of transmit antenna sectors in the STA requesting discovery assistance is used to determine the exact number of slots needed in the A-BFT period for the responder TXSS. The DMG STA might use multiple beacon intervals to complete full DMG Beacon sweeping. The Discovery Assistance Window Length might include one or more complete full DMG Beacon Sweep.
* Option 2: The DMG STA schedules a beamforming training period with the ~~an ISS of its own or DMG Beacon transmission to the~~ discovery assistance requesting DMG STA. The DMG STA adds the beamforming training period allocation to the Extended Schedule element and includes this element in its response. The total duration of the beamforming period shall at least cover the initiator TXSS and the responder TXSS. The DMG STA shall assign a temporary AID to the DMG STA that is requesting discovery assistance, in order to identify the STA in the element. The DMG STA sets fields in the Extended Schedule element sent in its response as follows:
  + Sets the Beamforming Training field, the IsInitiatorTXSS and IsResponderTXSS subfields in the BF Control subfield in the Allocation field to 1 to indicate that beamforming training is initiated at the start of the allocation
  + If the DMG STA is offering discovery assistance with active scanning, it sets the Source AID subfield in the Allocation filed to the temporary AID value that is assigned to the requesting DMG STA. If the DMG STA is offering discovery assistance with passive scanning, it sets the Destination AID subfield in the Allocation field to the temporary AID value that is assigned to the requesting DMG STA.

The DMG STA sets fields in the DMG Discovery Assistance element sent in its response as follows:

* + Sets the Discovery Assistance Type subfield in the Discovery Assistance Control field to 1
  + Sets the Temporary AID field to the temporary value that is assigned to the requesting DMG STA
  + Sets the Discovery Assistance Window Length to the time duration of the beamforming period, including all time blocks if more than one time block is scheduled

If the DMG STA operates TDD channel access, the DMG STA shall provide discovery assistance through one of the following two options:

* Option 1: The DMG STA initiates TDD beamforming, as specified in 10.43.10, with the STA that requested discovery assistance. The DMG STA sets fields in the DMG Discovery Assistance element sent in the response as follows:
  + Sets the Discovery Assistance Type subfield in the Discovery Assistance Control field to 0
  + Sets the Sector Sweep Start Time field to the TSF value when the STA starts TDD beamforming procedure
  + Sets the Dwelling Time field to the recommended time to sweep the receive antenna pattern during the scanning
  + Sets the Discovery Assistance Window Length to the time duration for the TTD beamforming. The number of DMG STA transmit antenna sectors, the number of receive antenna sectors in the STA requesting discovery assistance and the dwelling time are used to calculate the time required for TDD beamforming as described in 10.43.10
* Option 2: The DMG STA schedules TDD beamforming with the STA that requested discovery assistance. The DMG STA schedules the allocation as part of an Extended Schedule element and includes this element in its response. The TDD Applicable SP subfield in the Allocation Control subfield in the Allocation field in the Extended Schedule field is set to 1 and either the Source AID or the Destination AID subfields in the Allocation field in the Extended schedule element is set to the DMG STA requesting Discovery Assistance temporary AID. The DMG STA may include a TDD Slot Structure element and a TDD Slot Schedule element in its response. The DMG STA sets fields in the DMG Discovery Assistance element sent its response as follows:
  + Sets the Discovery Assistance Type subfield in the Discovery Assistance Control field to 1
  + Sets the Temporary AID field to a temporary value that is assigned to the requesting DMG STA. This temporary AID value is used to identify the requesting DMG STA in the Extended Schedule element
  + Sets the Dwelling Time field to the recommended time to sweep the receive antenna pattern during the scanning
  + Sets the Discovery Assistance Window Length to the time duration of the TDD beamforming period, including all time blocks if more than one time block is scheduled

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| **CID** | **PP.LL** | **Comment** | **Proposed Change** |
| 3513 | 11.31.6.2 | There is an editor note stating "What does "to determine its receive antenna pattern sweeping for scanning" mean?" This needs to be clarified | Consider changing the sentence "The DMG STA uses the Dwelling Time field, if available, to determine its receive antenna pattern sweeping for scanning" to "The DMG STA uses the Dwelling Time field, if available, to determine the dwelling time on each sector while sweeping its receive antenna through all its antenna receive sectors." |
| 3061 | 11.31.6.2 | Please have author of sentence referenced by Editor Note resolve the ambiguity of the sentence | Please have author of sentence referenced by Editor Note resolve the ambiguity of the sentence |

**Discussion:**

1. Text is updated to exactly describe all action that can be taken by the DMG STA requesting discovery assistance to remove the ambiguity

**Proposed resolution: Revise**

Update 11.36.6.2 P327 L42 as follows

When a STA that is a part of a multi-band capable device receives a discovery assistance response indicating SUCESS in the Discovery Assistance Request Status Code field in the received DMG Discovery Assistance element, it shall take the following actions with the corresponding peer DMG STA:

The SME shall issue MLME-SCAN.request to its New Band MLME setting BSSID and ChannelList to values captured from fields in the Multi-band element and MinChannelTime to the Discovery Assistance Window Length field in the received DMG Discovery Assistance element.

Depending on the values contained in the Discovery Assistance Control field in the received DMG Discovery Assistance element, the MLME-SCAN.request is issued in one of the following manner:

* If the Dwelling Time Present subfield is 0 and the Discovery Assistance Type subfield is 0, the MLME-SCAN.request is issued before the time specified in the Sector Sweep Start Time field in the received DMG Discovery Assistance element and the ScanType is set to passive scanning.
* If the Dwelling Time Present subfield is 0 and the Discovery Assistance Type subfield is 1, the MLME-SCAN.request is issued before the time of the scheduled beamforming period specified by the Allocation field in the received Extended Schedule element. The ScanType is set to active scanning if the Source AID subfield in the Allocation field in the received Extended Scheduled element is equal to the Temporary AID field in the received DMG Discovery Assistance element. The ScanType is set to passive scanning otherwise. When transmitting DMG Beacon frames or responder TXSS, the STA shall transmit its frames within allocated time specified in the received Extended Schedule element.
* If the Dwelling Time Present subfield is 1 and the Discovery Assistance Type subfield is 0, the MLME-SCAN.request is issued before the time specified in the Sector Sweep Start Time field in the received DMG Discovery Assistance element. The ScanType is set to TDD passive scanning, and SectorDwellTime is set to the value specified in the Dwelling Time field in the received DMG Discovery Assistance element.
* If the Dwelling Time Present subfield is 1 and the Discovery Assistance Type subfield is 1, the MLME-SCAN.request is issued before the time of the scheduled beamforming period specified by the Allocation field in the received Extended Schedule element. The ScanType is set to TDD passive scanning.

The New Band MLME reports the results of the beamforming training procedure by sending MLME-BF-TRAINING.indication or MLME-TDD-BF-TRAINING.indication to its SME, when the STA receives beamforming frames. After the scanning procedure, the New Band MLME responds back with MLME-SCAN.cofirm to its SME notifying the completion of the scanning on the New Band.

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| **CID** | **PP.LL** | **Comment** | **Proposed Change** |
| 3356 | B.4 | In Annex B, PICS table entry for DMG discovery assistance is missing. | Add proper table entry for the DMG discovery assistance procedure. |

**Proposed resolution: Revise**

Add the following row to MAC protocol capabilities Table at P2692 at 802.11 Revmd D1.0

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| \*PC40 | Multi-band Operation | 11.33 | CFMBO:O | Yes  No  N/A  |
| \*PC40.1 | FST Setup | 9.4.2.138,  9.4.2.151,  9.4.2.152,  9.6.21.2,  9.6.21.3,  9.6.21.5,  9.6.21.6,  11.33.2.1,  11.33.2.2 | PC40:M | Yes  No  N/A  |
| PC40.2 | FST TS switching | 9.4.2.30,  9.4.2.141,  9.6.3.2.2,  9.6.3.3.2, 9.6.3.4,  9.6.5.2, 9.6.5.3,  9.6.5.4, 11.33.2.3 | PC40.1:M | Yes  No  N/A  |
| PC40.3 | FST Teardown |  |  | Yes  No  N/A  |
| PC40.3.1 | Transmission of FST Teardown | 9.6.21.4, 11.33.3 | PC40.1:O | Yes  No  N/A  |
| PC40.3.2 | Reception of FST Teardown | 9.6.21.4, 11.33.3 | PC40.1:M | Yes  No  N/A  |
| PC40.4 | Multi-band Discovery Assistance | 9.4.2.273  11.31.6 | (CFDMG AND PC40.1) : O | Yes  No  N/A  |

**Straw Poll:**

* **Do you agree to accept comment resolutions as proposed in doc 11-18/1584r0?**