IEEE P802.11
Wireless LANs

|  |
| --- |
| Resolution of TDD BF and TDD Sector Switch Related CIDs |
| Date: 2018-4-17 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Oren Kedem | Intel |  |  | oren.kedem@intel.com |
| Carlos Cordeiro  | Intel  |  |  | carlos.cordeiro@intel.com  |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes resolutions for TDD Beamforming and TDD Sector Switch related CIDs.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4251 | 6.3.118.4.2 | Based on Figure 161, TDD route is sent to initiator but MLME-BF-TRAINING.indication is generated at responder. So the indication would not have TxBeamFeedback | remove TxBeamFeedback | **Rejected** Responder is requested to deliver the TxBeamFeedback to the SME via the MLME-BF-TRAINING.indication. Hence need not removed as commenter suggested  |
| 4282 | 11.37.2 | Based on Figure 161, TDD route element has not been received when MLME-TDD-BF-TRAINING.Confirm is generated, but TDDFeedbackResults is defined for the primitive | move the MLME-TDD-BF-TRAINING.Confirm to be after the last Announce frame in the figure 161 | **Accepted** MLME-TDD-BF-TRAINING.indication is sent from the responder MAC to the responder SME after TDD SSW Ack with End of Training field set to 1 (end of TDD beamforming). At this point the responder has the TxBeamFeedback results. Nevertheless, commenter is right with regard to the MLME-TDD-BF-TRAINING.confirm which must delivered after receiving the TDD Route IE from the responder. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4456 | 11.37.2 | "Upon receipt of the MLME-SCAN.request primitive..." Once the request primitive is issued it shall be accomplished with the MLME-SCAN.confirm that reports the discovered BSS. To be compliant with the MLME-SCAN primitives the TDD beamforming initiator shall transmit beacon to the TDD beamforming responder to allow the responder to issue the MLME-SCAN.confirm reporting about the discovered BSS. The beacon can be initiated by protocol in result of successive completion of the initial TDD beamforming if the BSS already exist and is ready to associate one more device, or as result of MLME-START.request primitive issued to establish a new BSS. | Implement normative behavior to comply with the MLME-SCAN procedure | Revised Relevant parameters were added to SCAN.request MLME and relevant rules were added in “11.37.2 TDD beamforming”for scanning STA to issue MLME-SCAN.confirm primitive with succesfuly received DMG Beacon frames Initiator beacon transmission rules are defined in 11.1.3.3.4 Beacon generation under TDD channel access  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4457 |  6.3.3.2.2 | There are new parameters ScanAntennaSectorIDList, and SectorDwellTime appended to the MLME-SCAN.request parameter list. No reference is provided where the parameters are used. | Add reference to 11.37.2 TDD beamforming | **Accepted** Reference was added  |

**Discussion**

Text describes the use of the two commented parameters, added reference section to MLME-SCAN.confirm.

D3.0 include the following:

*“Upon receipt of the MLME-SCAN.request primitive with the ScanType parameter equal to TDD passive, a DMG STA shall passively scan for TDD SSW frames by sweeping its receiver antenna through all the receive sectors specified in ScanSectorIDList parameter while dwelling on each sector for a time equal to SectorDwellTime. This passive scan shall be performed through all channels specified within the ChannelList parameter.”*

Note to the Editor: The following changes are made for CID 4456 and 4457

*Change text at P33 L1 as follow*

**6.3.3 Scan**

**6.3.3.2 MLME-SCAN.request**

**6.3.3.2.2 Semantics of the service primitive**

|  |  |  |  |
| --- | --- | --- | --- |
| …  | …  | …  | …  |
| ScanAntennaSectorIDList  | List of DMG antenna and sector configurations  | Each DMG antenna and sector configuration is a valid configuration for the scanning STA.  | Present if the TDD Channel Access Supported subfield in the STA’ DMG Capabilities element is 1, and is absent otherwise. Contains an ordered list of DMG antennas and sector configurations to be used during the scan using TDD beamforming (see 11.37.2).  |
| SectorDwellTime  | Integer  | N/A  | Present if the TDD Channel Access Supported subfield in the STA’ DMG Capabilities element is 1, and is absent otherwise. The time (in microseconds) to dwell on each sector during TDD beamforming (see 11.37.2).  |

**11.37.2 TDD beamforming**

*Change text at P366 L36 as follow*

Upon receipt of an MLME-TDD-BF-TRAINING.request primitive, a DMG STA shall assume the role of TDD beamforming initiator and, based on the BFType parameter, shall perform TDD individual BF or TDD group BF training with the STA indicated by the PeerSTAAddress parameter according to the procedures defined in 10.43.11. This beamforming training shall start at the time indicated by the BeamformingStartTimestamp parameter.

Upon receipt of the MLME-SCAN.request primitive with the ScanType parameter equal to TDD passive, a DMG STA shall passively scan for TDD SSW frames by sweeping its receiver antenna through all the receive sectors specified in ScanSectorIDList parameter while dwelling on each sector for a time equal to SectorDwellTime according to procedure described in 10.43.11.3.. This passive scan shall be performed through all channels specified within the ChannelList parameter.

A STA that successfully performed scan and TDD beamforming training with a peer STA at the request of MLME-SCAN.request primitive shall issue an MLME-SCAN.confirm primitive containing all succesfuly received DMG Beacon frames that matching the desired SSID in the BSSDescriptionSet parameter of the corresponding MLME-SCAN.confirm primitive as described in 11.1.4.

A STA that receives a MLME-TDD-BF-TRAINING.request primitive with BFRole parameter set to initiator and BFType parameter set to TDD Individual BF or TDD Group BF shall assume the initiator role and perform the TDD individual BF or TDD group BF procedure, respectively, defined in 10.43.11. The STA shall issue an MLME-TDD-BF-TRAINING.confirm primitive on completion of the requested TDD beamforming procedure after transmitting the last TDD SSW Ack frame with End of Training field set to 1. In the primitive, the STA shall set the parameters NumberOfTDDFeedbackPeers and TDDFeedbackResults according to the TDD Route element received from the responder.

A STA that performs TDD beamforming training with a peer STA at the request of the peer STA shall issue an MLME-TDD-BF-TRAINING.indication primitive on completion of the TDD beamforming training procedure as specified in 10.43.11, following the reception of a TDD SSW Ack frame with RA field set to the STA MAC address and with End of Training subfield equal to 1.

Note to the Editor: The following changes in figure are made for CID 4282

*Change figure 161at P367 L17 as follow*



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4030 | 9.3.1.24.2 | TX Antenna ID in TDD Sector Sweep should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4031 | 9.3.1.24.3 | TX Antenna ID and Decoded TX Antenna ID in TDD SSW Feedback should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4032 | 9.3.1.24.4 | Decoded TX Antenna ID in TDD SSW Ack should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4048 | 9.4.2.268 | TX Antenna ID in Tx Beam Feedback subfield format should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4050 | 9.4.2.268 | Decoded RX Antenna ID in Decoded RX Sectors Information subfield format should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4052 | 9.4.2.268 | - Responder RX Antenna ID- Responder TX Antenna ID- Initiator RX Antenna ID- Initiator TX Antenna IDin TDD Switch Sectors field format should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4027 | 6.3.119.2.2 | The variables:- InitiatorTXAntennaID- InitiatorRXAntennaID- ResponderTXAntennaID- ResponderRXAntennaIDShould be 0-7 (3 bit) to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4028 | 6.3.119.3.2 | The variables:- TXAntennaID- RXAntennaIDShould be 0-7 (3 bit) to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |
| 4029 | 6.3.119.4.2 | The variables:- InitiatorTXAntennaID- InitiatorRXAntennaID- ResponderTXAntennaID- ResponderRXAntennaIDShould be 0-7 (3 bit) to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Accepted**  |

**Discussion**

One more bit was added to Antenna ID to allow range 0-7 per comment request.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4049 | 9.4.2.268 | TX Sector ID in Channel Measurement Feedback element should be 11bit to be coherent with EDMG number of sectors | Extend these fields to11bit | Rejected  |
| 4051 | 9.4.2.268 | Decoded RX Sector ID in Decoded RX Sectors Information subfield format should be 11bit to be coherent with EDMG number of sectors | Extend these fields to11bit | Rejected  |
| 4053 | 9.4.2.268 | - Decoded RX Sector ID- Responder TX Sector ID- Initiator RX Sector ID- Initiator TX Sector IDin Decoded RX Sectors Information subfield format should be 11bit to be coherent with EDMG number of sectors | Extend these fields to11bit | Rejected  |

**Discussion**

Since TDD Beamforming frames are transmitted great number of multiple times, limiting the TDD SSW frame size result with shorter procedure time. Extending the Sector ID fields is resulted with increasing the frame size and TXTIME transmission hence not desired. As result, Antenna ID was increased to 3 bits same as EDMG and Sector ID was reduced to 9 bits different from EDMG (11 bits). A note was added to indicates the discrepancy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4047 | 9.4.2.268 | Number of Tx Beams in Tx Beam Feedback subfield format should be 3bit to be coherent with EDMG number of RF chains | Extend these fields to range of 0-7 | **Rejected** Number of Tx Beam is 2 octets field which indicate the number of collected feedbacks. Commenter confused this field with other field. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4413 | 10.43.11.3 | Enable TDD SSW Feedback multiplicity; just similar to multiplicity for TDD SSW and TDD SSW Ack frames (for robustness), TDD SSW Feedback frames can be transmitted multiple times. | Indicate TDD SSW Feedback multiplicity in TdD SSW frames | **Revised**New field was defined in TDD SSW frame to indicate Feedback multiplicity  |

Note to the Editor: The following changes are made for CID 4030, 4031, 4032, 4048, 4050, 4052, 4027, 4028, 4029 and 4413.

**9.3.1.24.2 TDD Sector Sweep (SSW)**

*Change text at P90 L14 as follow*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | TX SectorID | TX AntennaID | CountIndex | Beamforming TimeUnit | TransmitPeriod | ResponderFeedback Offset | Initiator AckOffset | Number Of Requested Feedback |
| Bits:  | 9 | 3 | 3 | 3 | 8 | 10 | 10 | 2 |

**Figure 11 —TDD Beamforming Information field format (TDD individual BF )**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | TXSectorID | TX AntennaID | CountIndex | AckCountIndex | Beamforming Time Unit | TransmitPeriod | Number ofResponders | ResponderInfo | … | ResponderInfo | Reserved |
| Bits | 9 | 3 | 3 | 3 | 3 | 8 | 8 | 32 |  | 32 | 3 |

**Figure 12 —TDD Beamforming Information field format (TDD group BF)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | TX SectorID | TX AntennaID | CountIndex | Beamforming TimeUnit | TransmitPeriod | TDD Slot CDOWN  | Reserved |
| Bits:  | 9 | 3 | 3 | 3 | 8 | 10 | 12 |

**Figure 13 —TDD Beamforming Information field format (TDD beam measurement)**

*Change text at P90 L26 as follow*

The TX Sector ID subfield is set to indicate the antenna sector through which the TDD SSW frame is transmitted.

Note: The size of Sector ID fields in TDD Beamforming frames are smaller than EDMG Beamfroming frames

*Add text at P91 L21 as follow*

The Number Of Requested Feedback subfield indicates the number of TDD SSW Feedback frames the responder is required to transmit in response. Value of 0 indicates one frame to be sent, value of 1 indicates two frames and so on.

*Change text at P92 L9 as follow*

**9.3.1.24.3 TDD SSW Feedback**

The TDD Beamforming Information field of a TDD SSW Feedback frame is shown in Figure 16.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | TX Sector ID  | TX Antenna ID  | Decoded TX Sector ID  | Decoded TX Antenna ID  | SNR Report  | Feedback Count Index | Reserved  |
| Bits: | 9 | 3 | 9 | 3 | 8 | 2 | 14 |

**Figure 16 —TDD Beamforming Information field format**

*Add text at P92 L25 as follow*

The Feedback Count Index subfield is counter indicating the index of the TDD SSW Feedback frame transmission during TDD slot. Value 0 is used in the first transmitted TDD SSW Feedback frame and this subfield value is increased by 1 for each subsequent transmitted frame.

**9.3.1.24.4 TDD SSW Ack***Change figure 15 as follow*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Decoded TX Sector ID | Decoded TX Antenna ID | CountIndex | TransmitPeriod | SNRReport | InitiatorTransmitOffset | ResponderTransmitOffset | Reserved |
| Bits: | 9 | 3 | 3 | 8 | 8 | 8 | 8 | 1 |

**Figure 15 —TDD Beamforming Information field format**

**9.4.2.268 TDD Route element**

*Change figure 95 as follow*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B8 | B9 B11 | B12 B19 | B20 B23 | B24 B55 | B0 B9 | B10 B11 |
|  | TX Sector ID  | TX Antenna ID  | Number of Decoded RX Sectors  | Reserved  | Decoded RX Sector Information1  | …  | Decoded RX Sector InformationM  |
| Bits: | 9 | 3 | 8 | 4 | 32 |  | 32 |

**Figure 95 —Tx Beam Feedback subfield format**

*Change figure 96 as follow*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 B8 | B9 B11 | B12 B15 | B16 B23 | B24 B31 |
|  | Decoded RX Sector ID  | Decoded RX Antenna ID  | Reserved  | SNR Report  | RSSI Report  |
| Bits:  | 9 | 3 | 4 | 8 | 8 |

**Figure 96 —Decoded RX Sectors Information subfield format**

*Change figure 99 as follow*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | B0 B8 | B9 B11 | B12 B29 | B21 B23 | B24 B32 | B33 B35 | B36 B44 | B45 B47 |
|   | Responder RX Sector ID  | Responder RX Antenna ID | Responder TX Sector ID  | Responder TX Antenna ID | Initiator RX Sector ID  | Initiator RX Antenna ID  | Initiator TX Sector ID  | Initiator TX Antenna ID  |
| Bits : | 9 | 3 | 9 | 3 | 9 | 3 | 9 | 3 |

**Figure 99 - TDD Switch Sectors field format**

**6.3.119.2.2 Semantics of the service primitive**

The primitive parameters are as follows:

t (

*Change rows in table P59 L9 (*MLME-TDD-SECTOR-SWITCH.request)

*Change rows in table P61 L5 (*MLME-TDD-SECTOR-SWITCH.indication)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name**  | **Type**  | **Valid range**  | **Description** |
| InitiatorTXAntennaID | Integer  | 0 – 7 | Indicates the TX Antenna ID to be utilized by the initiator STA.  |
| InitiatorRXAntennaID | Integer  | 0 – 7 | Indicates the RX Antenna ID to be utilized by the initiator STA.  |
| ResponderTXAntennaID | Integer  | 0 – 7 | Indicates the TX Antenna ID to be utilized by the responder STA.  |
| ResponderRXAntennaID | Integer  | 0 – 7 | Indicates the RX Antenna ID to be utilized by the responder STA.  |
| InitiatorTXSectorID | Integer  | 0 – 511 | Indicates the TX Sector ID to be utilized by the initiator STA.  |
| InitiatorRXSectorID | Integer  | 0 – 511 | Indicates the RX Sector ID to be utilized by the initiator STA.  |
| ResponderTXSectorID | Integer  | 0 – 511 | Indicates the TX Sector ID to be utilized by the responder STA.  |
| ResponderRXSectorID | Integer  | 0 – 511 | Indicates the RX Sector ID to be utilized by the responder STA.  |

*Change rows in table P79 L9 (*MLME-TDD-SECTOR-SWITCH.confirm)

|  |  |  |  |
| --- | --- | --- | --- |
| TXAntennaID  | Integer  | 0 – 7 | Indicates the TX Antenna ID to be utilized by the STA.  |
| RXAntennaID  | Integer  | 0 – 7  | Indicates the RX Antenna ID to be utilized by the STA.  |
| TXSectorID  | Integer  | 0 – 511  | Indicates the TX sector ID to be utilized by the STA.  |
| RXSectorID  | Integer  | 0 – 511  | Indicates the RX sector ID to be utilized by the STA.  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4111 | 10.43.11.2 | The announce frame is not necessary if BF training is performed while scheduling exists | Either remove the shall or indicate that it is necessary only when scheduling does not exist | **Revised** TDD beamforming procedure is required to incorporate the beamforming scheduling method through TDD Schedule IE as adopted by 11ay D2.0 Draft. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4112 | 10.43.11.3 | "A responder STA that has lost its network configuration" how does a STA know it has lost its "network configuration" | Clarify or point to 11.53 | **Revised**Network configuration should be clarified further using the new terms and states introduced in section 11.53  |
| 4118 | 10.43.11.3 | "A responder STA that has lost its network configuration" what does a network configuration mean? | Point to specific state in 11.53 state machine | **Revised** Network configuration should be clarified further using the new terms and states introduced in section 11.53 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4272 | 10.43.11.2 | "the initiator shall set its receive antenna to thesame DMG antenna and sector as was indicated, respectively, in the TX Antenna ID and TX Sector ID subfield of the respective TDD SSW frame at the time offset indicated by the following equation:" This should not be applicable to TDD BF with active linkFurthermore, there is no mention that the output of eq (3) is the time offset from the end of the received TDD SSW frame till the beginning of TDD SSW feedback | change to "To receive the TDD SSW Feedback frame from the responder without an active link, the initiator shall set its receive antenna to thesame DMG antenna and sector as was indicated, respectively, in the TX Antenna ID and TX Sector ID subfield of the respective TDD SSW frame at the time offset indicated by the following equation, after the reception of a TDD SSW frame" | **Revised** The initiator is required to set its receive antenna to the same DMG antenna and sector as was indicated in the respective TDD SSW in order to receive the TDD SSW Feedback frame also when TDD BF is performed in active state. This should not be changed hence first part of the comment is rejected.Second part of the comment was resolved by adding proper text that clarify the use of the equation only in case of unscheduled TDD BF |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4275 | 10.43.11.2 | "The initiator may also set the End of Training subfield in SSW Ack frames to 1 even if the End of Training subfield in a received TDD SSW Feedback frame was not set to 1."why would this happen? In this case End of Training in TDD SSW would be set to 1 and End of Training subfield in a received TDD SSW Feedback frame will be 1. | remove the sentence | **Accepted** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4298 | 10.43.11.2  | It is not stated of clear from the text why intiator needs to send multiple SSW ACK since one should be enough | Please describe why the intiator needs to send multiple SSW ACKs | **Revised**Sending multiple TDD SSW Ack is allowed for receive robustnas purposes and is indicated by Count Index. Spec modified to indicate reasoning. |
| 4299 | 10.43.11.2  | The text is mentioning a case if the intaiator is an AP or PCP, it shall use TDD SSW slots for SSW frame exchange. It is not mentioned what is the case when theintiator is not AP or PCP | Please describe the case when the intiator is not an AP or PCP | **Revised** Text was modified to accommodate only AP/PCP as initiator  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4301 | 10.43.11.3 | "A responder STA that receives a TDD SSW frame with RA field set to its MAC address or to the broadcast address may sweep its receiver antenna configuration.." It is not clear why it is a may | change may to shall or describe why it is a may | **Accepted**“May” was changed to “Shall”  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4302 | 10.43.11.3 | "Upon reception of one or more TDD SSW frames on a single receive sector, the responder may switch within the TDD slot to its next receive sector to be.." it is not clear what it is a may not shall | Consider adding illustration whatn the responder will switch and when not | **Revised** Note was added for further explanation  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4308 | 10.43.11.3 | The intiator is expecting the SSW FB in the offset defined by the SSW frame in case the antenna configuration used is no longer result in active connection. If the responder uses the old antenna configuation, it might not be received in cases where the old antenna configuration is intrupted | the responder should send the SSW frame feedback always at the offset defined by the intiator | **Revised**The commented section address the usecase in which the initiator don’t know the responder MAC Address it is searching for. In this case, the TDD beamforming is starts as Broadcast TDD Beamforming where multiple TDD SSW Feedbacks are received and switching back to Individual TDD beamforming once the proper STA sent its TDD SSW Feedback and was found. In this case, the responder should not change its sectors and revert to the sector it utilized before the beamforming started. It is up to the initiator to end the TDD beamforming properly with End of Training=1 to establish new connection.Note was added to further explain the scenario |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4271 | 10.43.11.1 | "The primary difference between TDD beam measurement and other TDDbeamforming procedures is that responders do not transmit any frame to the initiator during the procedure, but instead report the measurement results to the SME.", but 'Feedback Requested subfield' was added to TDD SSW frame for beam measurement | change to "The primary difference between TDD beam measurement with Feedback Requested subfield set to 0 and other TDDbeamforming procedures is that responders do not transmit any frame to the initiator during the procedure, but instead report the measurement results to the SME" | **Accepted**  |

**10.43.11 TDD beamforming**

**10.43.11.1 General**

*Change text at P323 L9 as follow*

* TDD beam measurement: a single STA (initiator) transmits a series of TDD SSW frames while a single target STA (responder), or alternatively a group of target STAs (responders), sweep their respective receive sectors. The primary difference between TDD beam measurement and other TDD beamforming procedures is that in TDD beam measurement responders transmit an Announce frame with a TDD Route element to the initiator during the procedure only upon request, and additionally report the measurement results to the SME.

*Change text at P323 L15 as follow*

As specified in 11.53.2, unscheduled TDD beamforming is refered to the TDD beamforming scheduled via the Transmit Period field within a TDD SSW frames. If TDD beamforming is scheduled via the TDD Slot Schedule element, it is referred as scheduled TDD beamforming.

After the completion of the TDD beamforming procedure, responder shall send the initiator Announce framescontaining TDD Route IE with the results of the TDD beamforming , in case of unscheduled TDD beamforming the initiator and responder may perform the authentication and association procedure described in 11.53.

*Change text at P323 L27 as follow*

During TDD individual beamforming training, a STA that has not established a DMG control mode connection with an intended peer switches its antenna configuration through all its receive sectors. In order to establish a DMG control mode connection, an initiator sends multiple TDD SSW frames during its assigned TDD slots. A TDD SSW frame indicates to the responder the TX Sector ID used by the initiator for the transmission of the TDD SSW frame; in case of unscheduled TDD beamforming, the frame includes also the time offset for which the responder should send its TDD SSW Feedback frame as response and the time offset the responder shall be ready to receive a TDD SSW Ack frame. The responder sends its TDD SSW Feedback frame with the same sector it received the TDD SSW frame with best quality. Following the reception of a TDD SSW Feedback frame, the initiator sends a TDD SSW Ack frame that acknowledges the received configuration.

During TDD individual BF training, the TDD SSW frame is sent periodically and is repeated multiple times for each TX Sector ID. The TDD individual BF training sequence continues until the initiator sets the End of Training subfield in the TDD SSW Ack frame to 1. In unscheduled TDD beamforming, the TDD SSW Ack frame includes also a time offset indication in the Initiator Transmit Offset subfield on when the responder obtains the network configuration parameters and time offset indication in the Responder Transmit Offset subfield on when the responder reports the results of the TDD individual BF procedure.

*Change text at P324 L1 as follow*

Feedback frame as response and the time offset the responder shall be ready to receive one or multiple TDD SSW Ack frames sent to increase robustnace. The responder sends its TDD SSW Feedback frame with the same sector it received the TDD SSW frame with best quality. Following the reception of a TDD SSW Feedback frame, the initiator sends a TDD SSW Ack frame that acknowledges the received configuration.

*Change text at P324 L11 as follow*

*Change text at P324 L19 as follow*

A STA participating in TDD group beamforming training and that has not established a DMG control mode connection with an intended peer switches its antenna configuration through all its receive sectors. In order to establish a DMG control mode connection, an initiator sends multiple TDD SSW frames during its assigned TDD slots. A TDD SSW frame indicates to the responders the TX Sector ID used by the initiator for the transmission of the TDD SSW frames; in unscheduled TDD beamforming, the frames also include the time offset for which each responder should send its TDD SSW Feedback frame as response and the time offset each responder shall be ready to receive a TDD SSW Ack frame. Each responder sends its TDD SSW Feedback frame with the same sector it received the TDD SSW frame with the best quality. Following the reception of a TDD SSW Feedback frame, the initiator sends a TDD SSW Ack frame to each responder that acknowledges the received configuration.

*Change text at P325 L1 as follow*

During the TDD group BF training, the TDD SSW frame is sent periodically and is repeated multiple times for each TX Sector ID. The TDD group BF training sequence for each responder continues until the initiator sets the End of Training subfield in the TDD SSW Ack frame to 1 for the corresponding responder. In case of unscheduled beamforming, the initiator also indicates in the Initiator Transmit Offset subfield the time offsets on when the corresponding responder obtains the TDD Slot Schedule element for allocated TDD slots for further TDD link access operation and in the Responder Transmit Offset subfield the time offset on when the corresponding responder reports the results of the TDD group BF procedure. The initiator can end a TDD group BF training with the responders simultaneously or individually. This is implementation dependent, and out of scope of this standard.

*Change text at P326 L1 as follow*

To receive the TDD SSW Feedback frame from the responder, the initiator shall set its receive antenna to the same DMG antenna and sector as was indicated, respectively, in the TX Antenna ID and TX Sector ID subfield of the respective TDD SSW frame at the time offset indicated by the following equation that indicates the start transmission time of the TDD SSW Feaadback frame by the responder:

*ResponderFeedbackOffset* – [(*CountIndex* + 1) × TXTIME(TDD SSW) + (*CountIndex* × SBIFS)] (3)

*Change text at P326 L14 as follow*

**10.43.11.2 Initiator operation for TDD individual beamforming**

Figure 153 depicts the timing to transmit the TDD SSW Feedback frame for unscheduled TDD individual BF.

*Change text at P325 L19 as follow*

TDD SSW frames that are sent from the same transmit DMG antenna shall have the same TX Antenna ID subfield value. TDD SSW frames that are sent from the same transmit antenna sector shall have the same TX Sector ID subfield, Beamforming Time Unit, Transmit Period, Responder Feedback Offset, Initiator Ack Offset and Number of Requested Feedback values. These frames shall be transmitted with the same transmit power and the PPDUs carrying these frames shall not include TRN fields.

*Change text at P325 L35 as follow*

If the link between the initiator and responder is in the active state (see 11.53), and the initiator has sent the responder at least one frame with a TDD Slot Structure element and a TDD Slot Schedule element, then the initiator should use TDD BF slots to send TDD SSW and TDD SSW Ack frames to the responder. In this case, the Transmit Period, Responder Feedback Offset, Initiator Ack Offset, Initiator Transmit Offset and Responder Transmit Offset, subfields shall be set to zero.

*Add text at P326 L1 as follow*

Equations (3), (4), (5) and (6) indicate the time offset calculation in case unscheduled TDD beamforming is performed. In case scheduled TDD beamforming is performed, the initiator shall send TDD SSW and TDD SSW Ack frames in the TDD slots assigned for BF TDD slots from the initiator to the responder. The responder shall send TDD SSW Feedback and the Announce frames, with a TDD Route element containing the results of the TDD beamforming, in the first TDD slot assigned to BF TDD slot from the responder to the initiator.

*Change text at P326 L14 as follow*

Figure 153 depicts the timing to transmit the TDD SSW Feedback frame for unscheduled TDD individual BF.

*Change text at P327 L8 as follow*

The TDD SSW Ack frame shall include the sector used by the initiator to transmit the TDD SSW Ack in the TX Sector ID subfield, the sector used by the responder to transmit the TDD SSW Feedback frame in the Decoded TX Sector ID subfield, the measured SNR of the decoded TDD SSW Feedback frame in the SNR Report subfield and, in the case of unscheduled TDD beamforming, the time offsets for the future exchange of Announce frames containing the responder’s TDD Route element and the initiator’s TDD Slot Structure and TDD Slot Schedule elements.

For TDD individual BF, an initiator may request the responder to stop its receive sector sweeping by setting the End of Training subfield to 1 in transmitted TDD SSW frames. Upon reception of a TDD SSW Feedback frame with the End of Training subfield equal to 1, the initiator shall send one or more TDD SSW Ack frames to the responder with End of Training subfield set to 1 at the time offset indicated by equation (4) or alternatively during its assigned BF TDD slots.. After sending a TDD SSW Ack frame with End of Training subfield equal to 1, the initiator shall configure its receive and transmit DMG antenna and sector index as indicated, respectively, in the Decoded TX Antenna ID and Decoded TX Sector ID subfields of the TDD SSW Feedback frame received from the responder in which its End of Training subfield was set to 1. The initiator shall use this DMG antenna and sector for its subsequent transmissions and receptions with the responder, until another sector is negotiated.

**10.43.11.3 Responder operation for TDD individual beamforming**

*Change text at P328 L4 as follow*

A responder STA that is in the inactive state (see 11.53) (see 11.53), or has not yet received a TDD SSW frame, or has not yet acquired the TDD Slot Structure element used by the BSS shall sweep its receiver antenna through all its receive sectors while dwelling on each sector for a time equal to SectorDwellTime as indicated by the MLME-TDD-BF-SCAN.request primitive.

*Change text at P328 L4 as follow*

A responder STA that receives a TDD SSW frame with RA field set to its MAC address or to the broadcast address shall sweep its receiver antenna configuration through its receive sectors between TDD beamforming frames received in a TDD slot and shall switch its receive sectors at the beginning of every TDD slot used for BF training according to the time interval indicated by a nonzero Transmit Period subfield of the received TDD SSW frame.

*Change text at P328 L15 as follow*

Figure 154 gives an example of the responder’s receiver sweeping procedure for unscheduled TDD individual BF.

*Change text at P328 L22 as follow*

Upon reception of one or more TDD SSW frames on a single receive sector, the responder may switch within the TDD slot to its next receive sector to be ready to receive the next TDD SSW frame transmission within SBIFS interval. The responder shall switch its receive sectors at the beginning of every TDD slot used for BF training at the time specified by a nonzero Transmit Period subfield in the TDD SSW frame . While sweeping through its receive sectors, the responder shall continue decoding all the received TDD SSW frames.

Note: Switching the receive sectors after reception of each TDD SSW frame increases the number of trained receive sectors at the expense of receive sector measurement quality.

The responder shall transmit a TDD SSW Feedback frame using the DMG antenna and sector from which the responder received the TDD SSW with the best link quality at the time indicated by equation (3) or alternatively during its assigned BF TDD slot. The TDD SSW Feedback frame shall include the DMG antenna index and sector index used by the initiator to transmit the TDD SSW frame in the, respectively, Decoded TX Antenna ID and Decoded TX Sector ID subfields, the DMG antenna index and sector index used by the responder to transmit the TDD SSW Feedback frame in the, respectively, TX Antenna ID and TX Sector ID subfields, and the SNR of the TDD SSW frame received with best quality in the SNR Report subfield. The number of transmitted TDD SSW Feedback frames shall be equal to the value indicated in the Number of Requested Feedback subfield plus one of the received TDD SSW frame. The Feedback Count Index subfield in each transmitted TDD SSW Feedback frame shall contain the index of the TDD SSW Feedback frame transmitted in the same TDD slot, with the first TDD SSW Feedback frame having an index equal to 0. Except for the value of the Feedback Count Index subfield, all subfields of TDD SSW Feedback frames transmitted in a TDD slot shall have the same value of the corresponding field transmitted in the first TDD SSW Feedback frame within the TDD slot.

At the time offset indicated by equation (4) of the decoded TDD SSW frame or alternatively during its assigned BF TDD slot, the responder shall set its receiver to the same DMG antenna and to the same sector that was indicated in the, respectively, TX Antenna ID and TX Sector ID subfields of the TDD SSW Feedback frame in order to be ready to receive a TDD SSW Ack frame from the initiator.

*Change text at P329 L16 as follow*

In unscheduled TDD beamforming, upon reception of a TDD SSW Ack frame with End of Training subfield equal to 1, the responder shall be ready to receive an Announce frame from the initiator at the time offset indicated by equation (5). The responder shall then, at the time offset indicated by equation (6), transmit to the initiator an Announce frame containing a TDD Route element listing the ordered pairs of TX sector IDs and decoded TX sector IDs obtained from the TDD beamforming training with the initiator. In scheduled TDD beamforming, the exchange of Announce frames takes place during TDD slots indicated by the TDD Slot Schedule element sent to the responder.

A STA that has started to sweep its receive DMG antenna configuration in response to a TDD SSW frame with RA field set to the broadcast address and, during the same beamforming process, receives a TDD SSW frames with RA field set to an individual address different than the STA’s MAC address shall stop its receive sweeping and shall configure its DMG antenna to the sector as indicated in the last successful TDD beamforming or TDD sector switch procedure and shall use this sector for its subsequent frame exchanges with the initiator, until another sector is negotiated.

Note: Switching from group addressed to individual addressed TDD beamforming is used as method to discover a new STA in vicinity. In this case, other responders remain connected and reverts to previously negotiated sectors.

**10.43.11.4 Initiator operation for TDD group beamforming**

*Change text at P330 L37 as follow*

The Transmit Period subfield value within TDD SSW frames shall remain the same throughout a TDD beamforming training. If the value of the Transmit Period subfield is nonzero, at the time offset equal to the Transmit Period subfield value the initiator shall transmit a TDD SSW or a TDD SSW Ack frame of the TDD beamforming training with the same Count Index value.

*Add text at P330 L37 as follow*

Equations (7), (8), (9) and (10) indicate the time offset calculation in case unscheduled TDD beamforming is performed. In case scheduled TDD beamforming is performed, the initiator shall send TDD SSW and TDD SSW Ack frames in TDD slots assigned to BF TDD from the initiator to the responder. A responder shall send TDD SSW Feedback and Announce frames, with a TDD Route element containing the results of the TDD beamforming, in the first TDD slot assigned to BF TDD slots from the responder to the initiator.

*Change text at P331 L14 as follow*

Figure 156 depicts the calculation of time to transmit a TDD SSW Feedback frame for unscheduled TDD group BF.

*Change text at P332 L10 as follow*

The TDD SSW Ack frame shall include the DMG antenna and the sector used by the initiator to transmit the TDD SSW Ack frame in, respectively, the TX Antenna ID and TX Sector ID subfields, the DMG antenna and sector used by the responder to transmit the TDD SSW Feedback frame in, respectively, the Decoded TX Antenna ID and Decoded TX Sector ID subfields, the measured SNR of the decoded TDD SSW Feedback frame in the SNR Report subfield and the optionally the time offsets to exchange Announce frames in case of unscheduled TDD beamforming.

For TDD group BF, an initiator may request one or more responders to stop their receive sector sweeping by setting the End of Training subfield to 1 in the Responder Info subfield corresponding to each responder in a transmitted TDD SSW frame. Upon reception of a TDD SSW Feedback frame with the End of Training subfield equal to 1 from a responder, the initiator shall send one or more TDD SSW Ack frames to the corresponding responder with the End of Training subfield set to 1 at the time offset indicated by equation (8) or in an appropriate TDD slot allocated via the TDD Slot Schedule element. The initiator may also set the End of Training subfield in SSW Ack frames to 1 even if the End of Training subfield in a received TDD SSW Feedback frame was not set to 1. After sending a TDD SSW Ack frame with End of Training subfield equal to 1, the initiator shall configure its receive and transmit DMG antenna and sector index as indicated in the Decoded TX Antenna ID and Decoded TX Sector ID subfields of the TDD SSW Feedback frame received from the corresponding responder in which its End of Training subfield was set to 1. The initiator shall use this DMG antenna and sector for its subsequent transmissions and receptions with the corresponding responder, until another sector is negotiated.

*Change text at P332 L31 as follow*

Once the initiator sends a TDD SSW Ack frame with the End of Training subfield equal to 1 to a target responder, after the time offset indicated by the following equation or alternatively in its assigned BF TDD slot, the initiator shall set its DMG antenna to the same sector that was used to transmit the respective TDD SSW Ack frame to transmit an Announce frame to the responder:

**10.43.11.5 Responder operation for TDD group beamforming**

*Change text at P333 L19 as follow*

A responder STA that is in the inactive state (see 11.53) or has not yet received a TDD SSW frame or has not yet acquired a TDD Slot Structure element used by the BSS shall sweep its receiver antenna through all its receive sectors while dwelling on each sector for a time equal to SectorDwellTime as indicated by the MLME-TDD-BF-SCAN.request primitive.

*Change text at P333 L25 as follow*

A responder STA that receives a TDD SSW frame with Responder ID subfield matches its ID shall sweep its receiver antenna configuration through its receive sectors between TDD beamforming frames received in a TDD slot and shall switch its receive sectors at the beginning of every TDD slot used for BF training according to the time interval indicated by a nonzero Transmit Period subfield value of the received TDD SSW frame.

*Change text at P334 L11 as follow*

The responder shall transmit a TDD SSW Feedback frame using the DMG antenna and sector from which the responder received the TDD SSW with the best link quality at the time indicated by equation (7) in case of unscheduled TDD beamforming or alternatively during its assigned BF TDD slot. The TDD SSW Feedback frame shall include the DMG antenna and sector index used by the initiator to transmit the TDD SSW frame in, respectively, the Decoded TX Antenna ID and Decoded TX Sector ID subfields, the antenna index and sector index used by the responder to transmit the TDD SSW Feedback frame in, respectively, the TX Antenna ID and TX Sector ID subfields, and the SNR of the TDD SSW frame received with best quality in the SNR Report subfield.

At the time offset indicated by equation (8) of the decoded TDD SSW frame or alternatively during its assigned BF TDD slot, the responder shall set its receiver to the same DMG antenna index and to the same sector that was indicated in, respectively, the TX Antenna ID and TX Sector ID subfields of the TDD SSW Feedback in order to be ready to receive a TDD SSW Ack frame from the initiator.

*Change text at P335 L1 as follow*

In unscheduled TDD beamforming, upon reception of a TDD SSW Ack frame with End of Training subfield equal to 1, the responder shall be ready to receive an Announce frame from the initiator at the time offset indicated by equation (9). The responder shall then, at the time offset indicated by equation (10), transmit to the initiator an Announce frame containing a TDD Route element listing the ordered pairs of TX Sector IDs and Decoded TX Sector IDs obtained from the TDD beamforming training with the initiator. In scheduled TDD beamforming, the Announce frames are transmitted during the STA assigned Basic TDD slots.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4117 | 10.43.11.2 | What Tx Sector and Antenna should be used if the End of Training subfield was not equal to 1 in the SSW Feedback frame? | Clarify | **Rejected**  |

**Discussion**

Transmission of TDD SSW Ack frame is always done by utilizing the same Tx Sector and Antenna ID used to transmit the TDD SSW frames beforehand and this is true regardless the value of End of Training. When End of Training is 1, the procedure is ended with the TX Sector and Antenna ID indicated in the TDD SSW Ack. The same is true for the TDD SSW Feedback. As long as no TDD SSW Ack with “End of Training = 1” was received, responder is expected to keep its receive sector training during TDD Slots used for beamforming.

*text referred by CID 4117 at P327 L8*

The TDD SSW Ack frame shall include the sector used by the initiator to transmit the TDD SSW Ack in the TX Sector ID subfield, the sector used by the responder to transmit the TDD SSW Feedback frame in the Decoded TX Sector ID subfield, the measured SNR of the decoded TDD SSW Feedback frame in the SNR Report subfield and the time offsets to exchange Announce frames containing STA capabilities and network configuration.

For TDD individual BF, an initiator may request the responder to stop its receive sector sweeping by setting the End of Training subfield to 1 in transmitted TDD SSW frames. Upon reception of a TDD SSW Feedback frame with the End of Training subfield equal to 1, the initiator shall send one or more TDD SSW Ack frames to the responder with End of Training subfield set to 1 at the time offset indicated by equation (4). After sending a TDD SSW Ack frame with End of Training subfield equal to 1, the initiator shall configure its receive and transmit DMG antenna and sector index as indicated, respectively, in the Decoded TX Antenna ID and Decoded TX Sector ID subfields of the TDD SSW Feedback frame received from the responder in which its End of Training subfield was set to 1. The initiator shall use this DMG antenna and sector for its subsequent transmissions and receptions with the responder, until another sector is negotiated.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4254 | 9.3.1.24.2 | The Transmit Period subfield indicates the time interval, in units of BTUs, between TDD SSW transmissions with the same Count Index subfield value in different TDD slots.'This sentence does not take into account of TDD group BF where some TDD SSW ack is sent before TDD SSW frames, while two types of frames have different length | change it to say Transmit Period indicates the in units of BTUs between the beginning of 2 slots both of which carry the TDD SSW or TDD SSW ack frames with the same Count Indexalso suggest this change for P330.L31 | **Reject** Adding “or TDD SSW Ack” create ambiguity whether the “Transmit Period” is have to be between to identical frames  |

**Discussion**

Below is the graphic description of Transmit Period

****

*Change text in P91 L1 as follow*

The Transmit Period subfield indicates the time interval, in units of BTUs, between TDD SSW transmissions with the same Count Index subfield value in different TDD slots. If the Transmit Period Offset subfield is 0, the transmission periodicity is unknown.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4255 | 9.3.1.24.2 | "The Responder Feedback Offset subfield indicates the offset, in units of BTUs, beginning immediately after the end of the TDD SSW frame, to the TDD slot in which the TDD SSW Feedback frame is to be transmitted by the responder." is not entirely accurate | change to "The Responder Feedback Offset subfield indicates the offset, in units of BTUs, from the beginning of the slot carrying the TDD SSW frame to the beginning of TDD SSW feedback frame to be transmitted by the responder" | **Revised**  |
| 4273 | 10.43.11.2 | "a) the first factor is the duration from the end of the first TDD SSW frame or TDDSSW Ack frame to the start of the corresponding TDD SSW Feedback frame", but figure 153 show it is to the end of TDD SSW feedback | change to "(a) the first factor is the duration from the beginning of the first TDD SSW frame or TDD SSW Ack frame to the start of the corresponding TDD SSW Feedback frame" | **Revised**  |

**Discussion**

Below is the graphic description of Responder Feedback Offset

****

*Change text in P91 L14 as follow*

The Responder Feedback Offset subfield indicates the offset, in units of BTUs, beginning immediately after the end of the first TDD SSW frame, to the end of the first TDD SSW Feedback frame is to be transmitted by the responder. This subfield is reserved when the TDD SSW frame is transmitted exclusively for beam measurement.

*Change text in P91 L18 as follow*

The Initiator Ack Offset subfield indicates the offset, in units of BTUs, beginning immediately after the end of the first TDD SSW frame, to the end of the first TDD SSW Ack frame is to be transmitted by the initiator. This subfield is reserved when TDD SSW frame is transmitted exclusively for beam measurement.

*Change text in P326 L7 as follow*

*ResponderFeedbackOffset* is the Responder Feedback Offset subfield value, in microseconds, in the TDD SSW frame with the same TX Sector ID within the same TDD slot. This value is the summation of two factors: a) the first factor is the duration from the end of the first TDD SSW frame or TDD SSW Ack frame to the end of the corresponding TDD SSW Feedback frame; b) the second factor is TXTIME(TDD SSW), which is a fixed value.

*Change text in P327 L1 as follow*

*InitiatorAckOffset* is the Initiator Ack Offset subfield value, in microseconds, in the TDD SSW frame with the same TX Sector ID within the same TDD slot. This value is the summation of two factors: a) the first factor is the duration from the end of the first TDD SSW frame or TDD SSW Ack frame to the end of the corresponding TDD SSW Ack frame; b) the second factor is TXTIME(TDD SSW), which is a fixed value.

*CountIndex* is the Count Index subfield value from the received TDD SSW or TDD SSW Ack frame

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4269 | 10.43.11.2 | There should be a requirement that TDD SSW and TDD SSW Ack frames in the same slot shall use the same MCS | add the requirement | **Rejected** All TDD Beamforming frames are sent in MCS0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4277 | 10.43.11.3 | "Upon the reception of TDD SSW Ack frame with End of Training subfield equal to 1, the responder shall stop its receive sweeping and shall configure its DMG antenna as indicated in the Decoded TX Antenna ID subfield and its sector as indicated in the Decoded TX Sector ID subfield of the TDD SSW Ack frame received from the initiator that has the End of Training subfield equal to 1"This sentence may need to be revised as in TDD BF with active link, the Decoded TX Sector in TDD SSW Ack is the responder sector of the existing active link | "Upon the reception of TDD SSW Ack frame with End of Training subfield equal to 1, the responder shall stop its receive sweeping and shall configure its DMG antenna and its sector to the antenna and sector used to receive the TDD SSW frame from the initiator that has the End of Training subfield equal to 1" | **Reject** |
| 4270 | 10.43.11.2 | For TDD BF with active link, it should be clear what is the awv used to send TDD SSW ack: the current active link awv or the awv fedback by the STA?In p329.L3, it seems to imply that TDD SSW ack is sent with the eixting active link awv, but it is not clear whether that requirement is meant for BF with active link. | clarify the sender awv for TDD SSW ack in case of active link BF | **Reject**  |

**Discussion**

Below rules in D3.0 Text make it clear that TDD SSW Feedback need to be transmitted with the same AWV it receives the best the TDD SSW sent by the initiator and that initiator should receive the TDD SSW Feedback with the same AWV it transmits the TDD SSW frames. In none of the TDD BF text there is reference to Active state AWV.

*Page 326 line 1 text:*

To receive the TDD SSW Feedback frame from the responder, **the initiator shall set its receive antenna to the same DMG antenna and sector as was indicated, respectively, in the TX Antenna ID and TX Sector ID subfield of the respective TDD SSW frame** at the time offset indicated by the following equation:

*Page 328 line 27 text:*

**The responder shall transmit a TDD SSW Feedback frame using the DMG antenna and sector from which the responder received the TDD SSW with the best link quality** at the time indicated by equation (3). The TDD SSW Feedback frame shall include the DMG antenna index and sector index used by the initiator to transmit the TDD SSW frame in the, respectively, Decoded TX Antenna ID and Decoded TX Sector ID subfields, the DMG antenna index and sector index used by the responder to transmit the TDD SSW Feedback frame in the, respectively, TX Antenna ID and TX Sector ID subfields, and the SNR of the TDD SSW frame received with best quality in the SNR Report subfield.

*Page 329 line 3 text:*

At the time offset indicated by equation (4) of the decoded TDD SSW frame, **the responder shall set its receiver to the same DMG antenna and to the same sector that was indicated in the, respectively, TX Antenna ID and TX Sector ID subfields of the TDD SSW Feedback frame** in order to be ready to receive a TDD SSW Ack frame from the initiator.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4278 | 10.43.11.4 | Is it possible some STA's responder ID is 0? | If such possibility exists, suggest to use the reserved bit in Responder Info subfield to signal whether the responder Info is valid | Revised |

The length of a TDD SSW frame shall remain the same during TDD group beamforming. For each target responder that has completed TDD beamforming training, the corresponding Responder ID subfield shall be set to 0.

**Discussion**

Commenter is correct, the value of the Responder ID can be 0 with similar probability of any one of other values.

As result, new field was defined to indicate valid responder info field.

*Change Text in p91 L27 as follow*

The Responder Info subfield is defined in Figure 15. The number of times this subfield appears in the frame is equal to the value of the Number of Responders subfield.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Responder ID  | Responder Feedback Offset  | Initiator Ack Offset  | End of Training  | Responder Info Valid |
| Bits: | 10 | 10 | 10 | 1 | 1 |

**Figure 15 —Responder Info subfield format**

The Responder ID subfield indicates the ID of the responder. The content of this subfield is derived from the responder’s MAC address, based on the scheme in 10.43.11.4.

The Responder Info Valid subfield is set to 1 to indicate that the Responder Info subfield values are valid and is set to 0 otherwise.

*Change Text in p90 L9 as follow*

The length of the TDD Beamforming Information field is 6 octets when the TDD Group Beamforming subfield is 0 and is 5 + 4×*R* octets otherwise, where *R* is the number of target responders. The length of TDD Beamforming Information field does not change during TDD group BF, even after beamforming training with one or more of target responders has completed. For the target responder which has completed beamforming training, the corresponding Responder Info subfield which has its related Responder Info Valid subfield set to 0 is reserved.

*Change Text in p332 L763 as follow*

The length of a TDD SSW frame shall remain the same during TDD group beamforming. For each target responder that has completed TDD beamforming training, the corresponding Responder Info subfields shall be set to 0, and the Responder Info Valid subfield shall be set to 0 to indicate an invalid Responder Info subfield.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4252 | 6.3.120.3.2 | Not clear what would cause FAILURE as there is no feedback from the responder for beam measurement | add a note that FAILURE is only applicable for the case Feedback requested is set to 1 and no TDD route element is received. | **Revised**  |
| 4253 | 6.3.120.3.2 | PeerSTAAddress being a list of MAC addresses does not seem possible because group beam measurement is removed | remove 'or a list of MAC addresses' in Valid Range column | **Revised**  |

**Discussion**

Following the comment, proposed below also to add the TxBeamFeedback results from the initiator to its SME

**6.3.120.3.2 Semantics of the service primitive**

*Change text and table in P63 L7 as follow*

The primitive parameters are as follows:

MLME-TDD-BEAM-MEASUREMENT.confirm (

BFRole,

PeerSTAAddress,

NumberOfTDDFeedbacks,

TxBeamFeedback,

ResultCode

)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name**  | **Type**  | **Valid range**  | **Description**  |
| BFRole  | Enumeration  | Initiator or Responder  | Set to Initiator or Responder.  |
| PeerSTAAddress  | MACAddress  | Any valid individual MAC address or broadcast MAC address | Set to the address of the peer MAC entity specified in request.  |
| NumberOfTDDFeedbacks  | Integer  | 0 – 1024  | Indicates the number of TDD Feedbacks included.  |
| TxBeamFeedback  | Set of Tx Beam Feedback fields  | As defined in 9.4.2.268  | One or more Tx Beam Feedback fields are present.  |
| ResultCode  | Enumeration  | SUCCESS, FAILURE  | Indicates the result of the TDD beam measurement procedure. SUCCESS in case TxBeamFeedback were requested by the initiator and successfully received, and FAILURE otherwise.  |

*Change last row in table at P64 L9 as follow (*MLME-TDD-BEAM-MEASUREMENT.indication)

*Change last row in table at P57 L1 as follow (*MLME-TDD-BF-TRAINING.confirm)

*Change last row in table at P58 L4 as follow (*MLME-BF-TRAINING.indication)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name**  | **Type**  | **Valid range**  | **Description**  |
| ResultCode  | Enumeration  | SUCCESS, FAILURE  | Indicates the result of the TDD beam measurement procedure. SUCCESS in case feedback result were successfully received and FAILURE otherwise. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4368 | 6.3.118 | TDD Beamforming MLME should indicate the TDD slots scheduling method to be used during the training and the actual TDD Slots to be used | please define | **Accepted**  |
| 4374 | 6.3.118.4 | MLME-TDD-BF-TRAINING.indication to the recipient STA SME should include "Initiator Transmit Offset" and "Responder TransmitOffset" | Add fields to the MLME command | **Reject**.MLME-TDD-BF-TRAINING.indication is sent by the responder MAC to its SME after beamforming is completed. SME need not be involved with the transmission of every TDD SSW Feedback  |
| 4297 | 6.3.118.2.2 | The primative parameter "peerSTAAddress" should be a list and of type list. The same primitive paramter is used in other locations | change the name to reflects it is a list and change the type to list MACAddresses | Accepted  |

*Change text at P55 L8 and following table as follow*

**6.3.118.2.2 Semantics of the service primitive**

The primitive parameters are as follows:

MLME-TDD-BF-TRAINING.request (

BFType,

SchedulingMethod,

PeerSTAAddressList,

BeamformingStartTimestamp,

TXAntennaSectorIDList,

NumOfTDDSlotPerTXSector,

NumOfSSWPerTDDSlot,

NumOfAckPerTDDSlot,

NumOfFeedbackPerTDDSlot,

TDDSlotScheduleList

)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name**  | **Type**  | **Valid range**  | **Description**  |
| BFType  | Enumeration  | TDD Individual BF, TDD Group BF  | Indicates TDD individual BF or TDD group BF  |
| SchedulingMethod | Enumeration | Unscheduled, Scheduled | Unscheduled in case transmission offset is indicated in TDD SSW frames, Scheduled in case via TDD Slot Schedule element  |
| PeerSTAAddressList  | MACAddress  | Any valid individual MAC address or a list of MAC addresses  | For TDD individual BF, specifies the address of the peer MAC entity with which to perform TDD beamforming training or none if the address of the peer MAC entity is unknown. For TDD group BF, specifies the address list of the peer MAC entities with which to perform TDD beamforming training.  |
| …….. | ……….. | ………… | ……….. |
| NumOfAckPerTDDSlot  | Integer  | 1 – 7  | Indicates the number of TDD SSW Ack frame transmissions using a DMG antenna configuration during a TDD slot. The sum of NumOfSSWPerTDDSlot and NumOfAckPerTDDSlot is limited to 8.  |
| NumOfFeedbackPerTDDSlot | Integer  | 1-4 | Indicates the number of TDD SSW Feedback frame transmissions using a DMG antenna configuration during a TDD slot. |
| TDDSlotScheduleList  | A set of TDD Slot Schedule elements  | As defined in 9.4.2.267  | Indicates the TDD slots to be used for transmitting TDD SSW frames, or the TDD slots used for TDD beamforming. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4373 | 6.3.118.3 | Description doesn't include references to section 11.37.2, please add | As in comment | Accepted  |

*Add text in the end of the line at P55 L6 as follow*

*Add text in the end of the line at P56 L10 as follow*

*Add text in the end of the line at P57 L10 as follow*

, as defined in 11.37.2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4395 | 10.3.2.3.8 | Spacing between all TDD SSW and TDD SSW Ack frame transmissions in a single TDD slot is SBIFS (P325L39), but SBIFS definition in 10.3.2.3.8 does not capture this usage (case (a) on L32 is broadly related but still doesn't capture the TDD use) | List/describe SBIFS usage between TDD SSW / TDD SSW Ack frames sent in a single TDD slot. | Revised  |

*Change text at P203 L32 as follow*

**10.3.2.3.8 SBIFS**

The SBIFS shall be used to separate:

1. multiple transmissions from a single transmitter during a receive sector sweep, TDD beamforming or

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4401 | 9.4.2.268 | TDD beam measurement operations need a set up phase before beam sweep to configure the beams that will be used, using messages over the air for operation without out-of-band logic. | Define a "TDD Sector Config" subelement under TDD Route element, together with its usage. Submission will be provided. | **Revised**  |
| 4009 | 6.3.120.2.2 | In table: primitive SlotSchedule is used for transmitting TDD Slots used for measurement. The term "measurement" should state what type of measurement e.g. TDD beam. | Change text to read: "...or the TDD slots used for TDD beam measurement." | **Accepted**  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4369 | 6.3.120 | TDD beam measurement MLME should indicate the TDD slots scheduling method to be used during the training and the actual TDD Slots to be used | please define | **Accept** |
| 4370 | 6.3.120 | variable Slot Schedule content and format is not defined | please define | **Accept** |

*Change text at P62 L4 as follow*

**6.3.120.2.2 Semantics of the service primitive**

The primitive parameters are as follows:

MLME-TDD-BEAM-MEASUREMENT.request (

BFRole,

SchedulingMethod,

PeerSTAAddress,

BeamMeasurementStartTime,

InitiatorAntennaSectorIDList,

ResponderAntennaSectorIDList,

NumOfTDDSlotPerTXSector,

NumOfSSWperTDDSlot,

TDDSlotScheduleList

|  |  |  |  |
| --- | --- | --- | --- |
| ) **Name**  | **Type**  | **Valid range**  | **Description**  |
| BFRole  | Enumeration  | Initiator or Responder  | Set to Initiator or Responder.  |
| SchedulingMethod | Enumeration | Unscheduled, Scheduled | Unscheduled in case transmission offset is indicated in TDD SSW frames, Scheduled in case via TDD Slot Schedule element  |
| PeerSTAAddress  | MACAddress  | Any valid individual MAC address or the broadcast MAC addresses  | Specifies the individual address of the peer MAC entity with which to perform TDD beam measurement, or the broadcast address if all MAC entities within reach are targeted.  |
| BeamMeasurementStartTime  | Integer  | N/A  | TDD beam measurement procedure start time.  |
| InitiatorAntennaSectorIDList  | A set of TDD Sector Config subelement  | As defined in 9.4.2.268  | Ordered list of DMG antenna and sector configurations to be used by the Initiator during TDD beam measurement.  |
| Responders AntennaSectorIDList  | Multiple sets of TDD Sector Config subelement  | As defined in 9.4.2.268  | Ordered list of DMG antenna and sector configurations to be used by the responders during TDD beam measurement.  |
| NumOfTDDSlotPerTXSector  | Integer  | 1 – 1024  | Indicates the number of TDD slot repetitions for each TX sector ID being utilized. Applicable only when BFRole is set to Initiator.  |
| NumOfSSWperTDDSlot  | Integer  | 1 – 7  | Indicates the number of TDD SSW frame transmissions using a DMG antenna configuration during a TDD slot. Valid only if BFRole is set to Initiator.  |
| TDDSlotScheduleList  | A set of TDD Slot Schedule elements  | As defined in 9.4.2.267  | Indicates the TDD slots to be used for transmitting TDD SSW frames, or the TDD slots used for TDD beam measurement.  |

*Change text at P161 L10 as follow*

The TDD Route Subelements field is defined in Table 24. The TDD Route element contains one or more of the subelements indicated in Table 24.

**Table 24 —TDD Route Subelements field format**

|  |  |  |
| --- | --- | --- |
| Subelement ID  | Name  | Length  |
| 0  | TDD Feedback Results  | Variable  |
| 1  | TDD Sector Setting  | 25  |
| 2 | TDD Sector Config | Variable |
| 3 – 220  | Reserved  |  |
| 221  | Vendor specific  |  |
| 222 – 225  | Reserved  |  |

*Add text at P164 L11 as follow*

The TDD Sector Config subelement is used to communicate the RX Sector IDs and RX Antenna ID to be used by the responder during the next upcoming beam measurements procedure described in 10.43.11. The format of the TDD Sector Config subelement is shown in Figure TBD1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Subelement ID  | Length  | Number of Config Sectors  | Configured Sector1  | …  | Configured SectorN |
| Octets:  | 1 | 1 | 2 | 2 |  | 2 |

**Figure TBD1 —TDD Sector Config subfield format**

The Subelement ID subfield is defined in Table 24.

The Length subfield is defined in 9.4.2.1.

The Number of Config Sectors subfield indicates the number of Configured Sector subfields, *N*, included in the subelement.

The Configured Sector subfield is defined in Figure TBD2.

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 B8 | B9 B11 | B12 B15 |
|  | Configured RX Sector ID  | Configured RX Antenna ID  | Reserved  |
| Bits : | 9 | 3 | 4 |

**Figure TBD2 —Configured Sector subfield format**

The Configured RX Sector ID subfield indicates the receive sector index to be used by the responder in the upcoming beam measurement procedure.

The Configured RX Antenna ID subfield indicates the receive DMG antenna index to be used by the responder in the upcoming beam measurement procedure.

*Change text at P164 L11 as follow*

**10.43.11.6 Initiator operation for TDD beam measurement**

The initiator operation during a TDD beam measurement is the same as the initiator operation for TDD individual BF, with the following differences:

* TDD beam measurement is started upon receiving an MLME-TDD-BEAM-MEASUREMENT.request primitive with BFRole parameter set to Initiator.
* The Initiator may send responders an Announce frame containing a TDD Route element with a TDD Sector Config subelement indicating the RX Sectors ID and RX Antenna ID to be used by the responder in the TDD beam measurement.
* During a TDD beam measurement, the TDD Slot CDOWN field in each transmitted frame shall contain the total number of TDD BF slots remaining until the end of the initiator TDD beam measurement, such that the last TDD SSW frame transmission by the initiator has the TDD Slot CDOWN field equal to 0.
* The initiator may set the Feedback Requested subfield in the TDD Beamforming Information field to 1 to request that the responder(s) send, following the completion of the TDD beam measurement, an Announce frame with a TDD Route element containing the measurement results.
* No TDD SSW Ack frame shall be transmitted.

**10.43.11.7 Responder operation for TDD beam measurement**

The responder operation during a TDD beam measurement procedure is the same as the responder operation for TDD individual BF, with the following differences:

* TDD beam measurement is started upon receiving an MLME-TDD-BEAM-MEASUREMENT.request primitive with BFRole parameter set to Responder, or by receiving a TDD SSW frame with the RA field equal to STA’s MAC address or the broadcast address, and with the TDD Beam Measurement field set to 1.
* If a TDD Sector Config subelement was received for this TDD beam measurement, the responder shall utilize the RX Sector ID and RX Antenna ID configurations as indicated in the TDD Sector Config subelement.
* If the Feedback Requested subfield in a TDD SSW frame received by the responder is 0, the responder shall not transmit any frames to the initiator and shall report the measurement results to the SME instead.
* If the Feedback Requested subfield in a TDD SSW frame received by the responder is 1, the responder shall send an Announce frame with a TDD Route element containing the results of the TDD beam measurement on all received sectors. The Announce frame shall be sent in the first TDD slot allocated for transmission from the responder to the initiator.
* TDD beam measurement ends at the end of the TDD slot during which the initiator transmits the last TDD SSW frames with the TDD Slot CDOWN field equal to 0.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4017 | 9.3.1.24.1 | Structure of the "run on" sentence needs more clarification | As commented | **Rejected**  |

**Discussion**

It is not understood what is the “**Structure of the "run on" sentence”** from the text refered by the comment

*Below is the text at P90 L9*

The length of the TDD Beamforming Information field is 6 octets when the TDD Group Beamforming subfield is 0 and is 5 + 4×*R* octets otherwise, where *R* is the number of target responders. The length of TDD Beamforming Information field does not change during TDD group BF, even after beamforming training with one or more of target responders has completed. For the target responder which has completed beamforming training, the corresponding Responder Info subfield is reserved.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4018 | 9.3.1.24.2 | The sentence: "This subfield also defines the time unit." needs to call out a specific subfield. There are several subfields called out in previous sentence. | Change " This subfield" to "The BTU subfield" | Accepted |

*Change the text at P91 L6 as follow*

The Beamforming Time Unit (BTU) subfield is defined in Table 7. The BTU subfield indicates the beamforming time unit for the Transmit Period, Responder Feedback Offset and Initiator Ack Offset subfields in the TDD Beamforming Information field of TDD SSW frames. The BTU subfield also defines the time unit for the Transmit Period, Initiator Transmit Offset and Responder Transmit Offset subfields in the TDD Beamforming Information field of TDD SSW Ack frames.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4019 | 9.3.1.24.2 | add clarity to what type of beam measurement for the responder | Change "beam measurement" to "TDD beam measurement" | Accepted  |

*Change text at P91 L16 as follow*

The Responder Feedback Offset subfield indicates the offset, in units of BTUs, beginning immediately after the end of the TDD SSW frame, to the TDD slot in which the TDD SSW Feedback frame is to be transmitted by the responder. This subfield is reserved when the TDD SSW frame is transmitted exclusively for TDD beam measurement.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4020 | 9.3.1.24.2 | add clarity to what type of beam measurement for the initiator | Change "beam measurement" to "TDD beam measurement" | Accepted  |

*Change text at P91 L20 as follow*

The Initiator Ack Offset subfield indicates the offset, in units of BTUs, beginning immediately after the end of the TDD SSW frame, to the TDD slot in which the TDD SSW Ack frame is to be transmitted by the initiator. This subfield is reserved when TDD SSW frame is transmitted exclusively for TDD beam measurement.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4022 | 9.3.1.24.2 | Clarify beam measurement | Change text to read: "feedback to the TDD beam measurement" | Accept  |

*Change text at P92 L8 as follow*

The Feedback Requested subfield set to 1 requests that the responder(s) send a TDD Route element to the initiator as a feedback to the TDD beam measurement.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4008 | 9.3.1.24.2 | In table for primitive SectorSwitchTimestamp the description column calls suggests a Future timestamp. Future is ambiguous. | Remove "Future" and change to text to read "switch should take effect as described in 11.27.3." | **Accept** |

*Change text at P61 L5 as follow*

|  |  |  |  |
| --- | --- | --- | --- |
| SectorSwitchTimestamp  | Integer  | N/A  | Future Timestamp which indicates when the sector switch should take effect as described in 11.27.3.  |
| SectorRevertTimestamp  | Integer  | N/A  | Timestamp that indicates when the sector revert should take effect in case of failure as described in 11.27.3. The timestamp indicated by SectorRevertTimestamp is always later than the timestamp indicated by SectorSwitchTimestamp.  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Comment** | **Proposed change** | **Resolution**  |
| 4289 | 11.37.3 | Issuing an .indication primitive on the same STA that did the .request primitive is completely unusual. | This needs to be explained thoroughly and explicitly (here and in the MLME primitive in clause 6), or an alternative MLME primitive mechanism needs to be used (such use the .confirm, and create a new primitive for indicating the receipt of the TDD sector switch response, see MLME-LOCATIONCFG.confirm for an example). | AcceptFlow figure was modified to remove the MLME.indication sent by the Initiator SME Ack |
| 4290 | 11.37.3 | It's sometimes called "TDD sector response" and sometimes "TDD sector switch response". Align these, and the same with the acknowledge. | Align "TDD sector response" and sometimes "TDD sector switch response" and "TDD sector acknowlege" and sometimes "TDD sector switch acknowledge" | AcceptName is aligned to “TDD sector switch…” |

**6.3.119.3.2 Semantics of the service primitive**

*Change text at P60 11 as follow (*MLME-TDD- SECTOR-SWITCH.confirm)

|  |  |  |  |
| --- | --- | --- | --- |
| ResultCode  | Enumeration  | SUCCESS, FAILURE  | Indicates the result of the TDD sector switch procedure. SUCCESS in case new sectors were adopted succsusfuly and FAILURE otherwise  |

*Change text at P60 11 as follow*

**6.3.119.4 MLME-TDD-SECTOR-SWITCH.indication**

**6.3.119.4.1 Function**

This primitive indicates that a TDD sector switch request has been received, successfully delivered or failed.

*Add row to the end of table at P61 L6 as follow*

|  |  |  |  |
| --- | --- | --- | --- |
| ResultCode  | Enumeration  | SUCCESS, FAILURE  | Indicates the result of the TDD sector switch procedure. SUCCESS in case new sectors were adopted successfully and FAILURE otherwise  |

**11.37.3 TDD sector switch procedure**

*Change text at P368 L11 as follow*

Upon receipt of an MLME-TDD-SECTOR-SWITCH.request primitive, a DMG STA shall send to the peer STA indicated by the PeerSTAAddress parameter an Announce frame of subtype Action with a TDD Route element that includes a TDD Sector Setting subelement with the Set Sector Request subfield set to 1. This is referred to as a TDD sector switch request message. Messages with Set Sector Response subfield set to 1 and messages with Set Sector Acknowledge subfield set to 1 are referred to as TDD sector switch response and TDD sector switch acknowledge messages, respectively. A STA shall not set to 1 more than one subfield of the TDD Sector Setting Control field in a given transmitted element.

*Change text at P369 L13 as follow*

The Revert Timestamp subfield in the TDD Sector Setting subelement shall be set to the value of the SectorRevertTimestamp parameter of the request primitive. The Revert Timestamp subfield value shall be set to a time value that allows the responder at least three retransmissions of a TDD sector switch response message, for the case the responder does not receive the TDD sector switch acknowledge message from the initiator, plus time to allow the initiator at least three retransmissions of a TDD sector acknowledge message, for the case the initiator does not receive the Ack frame from the responder.

*Change text at P369 L37 as follow*

* Send to the initiator a TDD sector switch response message by transmitting an Announce frame of subtype Action No Ack with the same Sector Setting subelement that was received by the responder, except that the Set Sector Request subfield shall be set to 0 and the Set Sector Response subfield shall be set to 1. The TDD sector switch response message should be sent at the earliest TDD slot occurring after the time indicated by the value of the Switch Timestamp subfield.

*Change text at P369 L43 as follow*

An initiator transmitting a TDD sector switch request message shall set its receive and transmit antenna configuration corresponding to the Initiator TX Antenna ID, Initiator TX Sector ID, Initiator RX Antenna ID and Initiator RX Sector ID subfield values, respectively, at the time indicated by the value of the Switch Timestamp subfield.

*Change text at P370 L16 as follow*

A responder receiving a TDD sector switch acknowledge message before the time indicated by the Revert Timestamp value shall issue an MLME-TDD-SECTOR-SWITCH.indication primitive. The TXAntennaID, RXAntennaID, TXSectorID and RXSectorID parameters of the primitive shall be set to the new transmit DMG antenna and sector index and to the receive DMG antenna and sector indexes, respectively, and the ResultCode parameter shall be set to SUCCESS.

*Change text at P370 L26 as follow*

A responder that did not receive a TDD sector switch acknowledge message in response to a transmitted TDD sector switch response message should retransmit the TDD sector switch response message before the time indicated by the Revert Timestamp subfield value.

*Change text at P370 L32 as follow*

A responder that did not receive a TDD sector switch acknowledge message by the time indicated by the Revert Timestamp subfield value shall issue an MLME-TDD-SECTOR-SWITCH.indication primitive with the ResultCode parameter set to FAILURE and shall revert to the antenna configuration used at the start of the TDD sector switch procedure.

*Change text at P371 L1 as follow*

A responder receiving a PPDU after the time indicated by the Revert Timestamp subfield value shall issue an MLME-TDD-SECTOR-SWITCH.indication primitive. The TXSectorID and RXSectorID parameters of the primitive shall be set to the sectors used at the start of the TDD sector switch procedure and the ResultCode parameter shall be set to SUCCESS.

*Change figure at P371 L11 as follow*



**SP/M:** Do you accept the resolutions given in this document?