IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Resolution to 11ay related CIDs | | | | |
| Date: 2017-07-26 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Cheng Chen | Intel |  |  | cheng.chen@intel.com |

Abstract

This submission proposes a resolution to several CIDs submitted on the 11ay draft text. These CIDs are:

35, 81, 111, 112, 178, 192, 250, 354, 370, 372, 492, 493, 506, 507, 508, 509, 510, 515, 542, 543, 544

The discussion is in reference to Draft IEEE P802.11ay/D0.3.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 35 | 9.4.2.252 | The concept of direction for an allocation is too limited. Propose to replace that with an allocation associated with a group. It is not the business of STA what antennas and AWVs are used for reception. | Replace with a group id. |

**Discussion**: The receive direction here is to indicate the receive antenna ID and sector ID that the PCP or AP uses during a directional allocation, which is particularly important for those STAs that have insufficient link budget to talk to the PCP/AP. Moreover, it applies to all cases. The Group ID, however, is used to define groups of EDMG STAs associated with the PCP/AP to perform MU-MIMO transmissions, and therefore only applies to MU-MIMO case. As a result, it does not make sense to use the Group ID to signal the receive direction of an allocation.

**Proposed resolution**: Rejected.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 81 | 10.36.11.2 | What is difference between an antenna and DMG antenna? We should be consistent and use "DMG antenna" where appropriate | Please be consistent throughout draft. This also happens in 10.36.11.4 line 43 |

**Proposed resolution**: Accepted.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 111 | 10.36.11.4 | "Among other things" is colloquial. Please remove. | As in comment |

**Proposed resolution**: Accepted

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 112 | 10.36.11.4 | Remove ambiguous behaviour in MIMO channel access. | Replace "may" with "shall" |

**Discussion**: Comment already resolved in D0.35.

**Proposed resolution**: Accepted

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 178 | 9.4.2.252 | The Receive Direction should also be present if IsDirectional = 1 but AsymmetricTraining=0. This allows for STAs that have an asymmetric link to access the channel for e.g., send RTS/CTS and be heard by the AP. | Change text as suggested in comment. |

**Discussion**: “The Receive Direction subfield is reserved if the Asymmetric Beamforming Training is zero” is a typo, and the correct sentence should be “The Receive Direction subfield is reserved if the Asymmetric Beamforming Training is one”. This has been corrected in D0.35.

**Proposed resolution**: Rejected

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 192 | 10.36.11.4 | The parameters for CT-TYPE in Table 7 only include CTS\_DTS, GRANT\_RTS\_CTS2self, SPR. There is no CT\_TYPE of "Grant" or "RTS". | Change Grant in P56L42, RTS in P57L8 and DMG CTS-to-self in P57L9 to the values defined as in Table 7. |

**Discussion**: This comment (CID 192) resolution also applies to CID 542, 543, 544.

**Proposed resolution**: Accepted

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 250 | 9.4.2.252 | Why is the Allocation field 8x15 bits long? Isn't one Channel Allocation field for one allocation? Or at the least, it should allow to include only one allocation information | Resize Allocation field to 15 bits.  Or clarify why 8x15 is correct |

**Discussion:** In Figure 39, the Allocation subfield is defined as in Figure 9-517, where the Allocation subfield is 15 octets long. That is why Figure 39 says the Allocation subfield occupies 8\*15 bits.

**Proposed resolution:** Revised

*Change Figure 39 as follows to avoid confusion:*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 B9 | B10 | B11 B19 | B20 B23 | B24 B143 |
|  | Scheduling Type | Channel Aggregation | BW | Asymmetric Beamforming Training | Receive Direction | Reserved | Allocation |
| Bits: | 1 | 1 | 8 | 1 | 9 | 4 | ~~8×15~~ 120 |

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 354 | 9.4.2.252 | What does incremental signaling mean? Also in addition to the bandwidth that the allocation occupies, the Channel Allocation field with the Scheduling Type subfield equal to 0 contains other supplemental allocation information to the Allocation field in the Extended Schedule element for the same allocation. | change  "If the Scheduling Type subfield is 0, the Channel Allocation field contains incremental signaling to the Extended Schedule element. In this case, the Channel Allocation field is defined in Figure 36 and specifies the allocation and the bandwidth that the allocation occupies."  to  "If the Scheduling Type subfield is 0, the Channel Allocation field contains supplemental allocation information (e.g., the bandwidth that the allocation occupies) to the Allocation field in the Extended Schedule element for the same allocation. In this case, the Channel Allocation field is defined in Figure 36." |

**Proposed resolution**: Accepted.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 370 | 9.4.2.252 | Should Destination AID be set to 0 when Asymmetric Beamforming Training set to 1? | add a requirement that Destination AID is set to 0 if Asymmetric Beamforming Training subfield is set to 1 |

**Discussion**: It is up to the AP/PCP to decide how to set the Destination AID when Asymmetric Beamforming Training is set to 1, which is implementation dependent. When STAs see Asymmetric Beamforming Training is set to 1, they already know this allocation is dedicated to performing asymmetric beamforming. Therefore there is no need to require that the Destination AID should be set to a specific value in this case.

**Proposed resolution**: Rejected

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 372 | 9.4.2.252 | It is not clear whether the ack transmissions in Fig 53 is the same SP of the preceding space-time slots. Currently the EDMG extended schedule element Channel Allocation field only assigns receiving direction for asymmetric assignment | Define the remaining duration of the channel allocation not occupied by space-time slots as the duration for ack transmission from AP, or  Specify the Channel allocation field immediately following the Channel allocation field for asymmetric beamforming training assignment, is the SP for ack from AP.  Revise fig 53 to separate Ack transmission into another SP |

**Discussion**:

1. The ACK transmissions in Figure 53 is in the same Beamforming SP of the preceding space-time slots for directional listening on each sector.
2. The allocation dedicated to asymmetric beamforming consists of two parts. In the first part STAs transmit to AP/PCP. In the second part, AP/PCP transmits a Sector ACK frame in each sector it received an SSW/Short SSW frame. Both parts are in the same allocation.

**Proposed resolution**: Revised.

*Change the second paragraph of subclause 10.38.9.3.3 as follows:*

An example of beamforming training for asymmetric links of two EDMG STAs and an EDMG PCP or AP is shown in Figure 53. In the example, the AP/PCP allocates a dedicated SP to perform the asymmetric beamforming training, which consists of the sequential listening on each sector, followed by the Sector ACK transmissions by the PCP or AP. STA#1, which selected SectorID equal to 0 during the BTI, transmits the SSW frame with a beamforming link determined by the TRN-R appended during the last BTI. For the transmission, STA#1 selects the second (out of four) slot corresponding to the SectorID equal to 0 slot time. After the reception of all slots, the AP or PCP determines the sectors of each discovered STA and can transmit a Sector ACK frame using a directional antenna pattern, A Sector ACK is sent through each desired sector sequentially, while responder STAs listen directionally with their beamforming link.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 492 | 9.4.2.252 | Extended schedule element does not hold directional information in other modes as "Asymmetric Beamforming Training". | The "The Receive Direction subfield" should be always present. Remove sentence that this field can be reserved. |
| 493 | 9.4.2.252 | (This comment is mutually exclusive to the previous): The isDirectional bit is not needed if the receive direction subfield is only present in assymmetric beamforming training. | Remove the "isDirectional" indication |

**Discussion**:

1. The Receive Direction subfield shall be reserved if Asymmetric Beamforming Training is 1. This is already corrected in D0.35.
2. These two CIDs talk about the same issue as stated in CID 178.

**Proposed resolution**: Rejected.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 506 | 10.38.9.3.2 | It is not clear how a non-PCP or non-AP STA shall decide to perform asymmetric BF training | Please define an appropriate decision algorithm. |

**Discussion:** In D0.35, there is already a section 10.36.11.6 “Near-Far” self-classification that describes how a non-PCP and non-AP EDMG STA determines whether to access the A-BFT or to use asymmetric beamforming.

**Proposed resolution**: Revised.

*Change the second paragraph of 10.38.9.3.1 as follows:*

The procedure defined in this subclause enables an initiator and a responder that would otherwise have an asymmetric link if a quasi-omni antenna configuration were to be used for communication between them, to perform beamforming according to the procedure described in this subclause. Following the establishment of the beamformed link, all frame exchanges between the STAs take place using the established beamformed link. STAs may determine whether to perform asymmetric beamforming according to the “Near-Far” self-classification described in 10.36.11.6.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 507 | 10.38.9.3.2 | It is not clear what "The STA may then use one or more of the allocations announced in the EDMG Extended Schedule Element..." refers to. Does this refer to slots or space-time slots | Comment resolution will be provided |

**Discussion:** This refers to the allocations that has the Asymmetric Beamforming Training subfield set to 1, and therefore are dedicated to performing the asymmetric beamforming training procedures described in 10.38.9.3.

**Proposed resolution:**

*Change the second paragraph in 10.38.9.3.2 as follows:*

A non-PCP and non-AP STA receiving a DMG Beacon with appended TRN-R fields and that decides to perform beamforming using the procedure described in this subclause shall use the TRN-R fields to perform receive beamforming as specified in 10.38.2. The STA may then use one or more of the allocations announced in the EDMG Extended Schedule element that have the Asymmetric Beamforming Training subfield equal to 1 (see 9.4.2.252) to perform the procedure specified in 10.38.9.3.3.

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 508 | 10.38.9.3.3 | "Antenna reciprocity" is not sufficient to perform this kind of BF training | Change "(some level of antenna reciprocity is required)" to "(antenna and beam reciprocity is required)" |

**Discussion:**

1. In 11ad and 11ay, there is no definition of “beam reciprocity”. 11ad defines the DMG Antenna Reciprocity and Antenna Pattern Reciprocity in DMG STA Capability Information field format (Figure 9-504). 11ay uses the same definitions of reciprocity.
2. For the indicated paragraph, the “Antenna reciprocity” is actually referring to both DMG Antenna Reciprocity and Antenna Pattern Reciprocity, since it assumes the best RX antenna and sector is also the best TX antenna and sector.

**Proposed resolution:** Revised

*Change the second bullet of the first paragraph in 10.38.9.3.3 as follows:*

A responder transmits an SSW or Short SSW packet during the initiator’s listen period that corresponds to the best sector during the last BTI. The responder’s transmission is performed in directional mode using the sector trained by TRN-R in the last BTI (~~some level of~~ DMG antenna reciprocity and antenna pattern reciprocity are ~~is~~ required)

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 509 | 10.38.9.3.3 | Short SSW can only be used for associated STAs | Clarify by e.g. "...short SSW (for associated STAs only) ..." |

**Discussion**: This comment (CID 509) resolution is resolved with the changes proposed in response to CID 510.

**Proposed resolution**: Revised

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 510 | 10.38.9.3.3 | What is the advantage of short SSW as the initiator's listening period and space-time slots are predefined in extended schedule element? | Do we need short SSW for this method if there is no use? Proposal: Omit short SSW packets in entire subclause |

**Proposed resolution**: Accepted

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 515 | 10.38.9.3.3 | In Figure 53 EDMG STA #2 should listen from the beginning of the ACK transmission period with a directional beam as this STA can not predict that it's ACK transmission is second | Change Figure 53 accordingly. |

**Discussion**:

1. STA#2 transmitted the SSW frame to the AP/PCP when AP/PCP is listening in the sector with ID=1, therefore it knows it will receive the Sector ACK frame from the AP/PCP in the second slot during the ACK transmissions.
2. 10.38.9.3.3, Line 3-4 says: “After transmitting the SSW or Short SSW packet, the responder switches to directional receive in the sector trained by TRN-R in the last BTI.”

**Proposed resolution**: Rejected

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 542 | 10.36.11.4 | The expression "CT\_TYPE shall be set to Grant" does not match Table 7 in page 98, where GRANT\_RTS\_CTS2self is used | Suggested change: "CT\_TYPE shall be set to GRANT\_RTS\_CTS2self" |

**Discussion**: This comment (CID 542) resolution is resolved with the changes proposed in response to CID 192.

**Proposed resolution**: Accepted

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 543 | 10.36.11.4 | The expression "CT\_TYPE shall be set to RTS" does not match Table 7 in page 98, where GRANT\_RTS\_CTS2self is used | Suggested change: "CT\_TYPE shall be set to GRANT\_RTS\_CTS2self" |

**Discussion**: This comment (CID 543) resolution is resolved with the changes proposed in response to CID 192.

**Proposed resolution**: Accepted

|  |  |  |  |
| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed change |
| 544 | 10.36.11.4 | The expression "CT\_TYPE shall be set to CTS-to-self" does not match Table 7 in page 98, where GRANT\_RTS\_CTS2self is used | Suggested change: "CT\_TYPE shall be set to GRANT\_RTS\_CTS2self" |

**Discussion**: This comment (CID 544) resolution is resolved with the changes proposed in response to CID 192.

**Proposed resolution**: Accepted

**References:**

[1] IEEE 802.11ay D0.35

**Straw Poll:**

* **Do you agree to accept comment resolutions as proposed in doc 11-17/1112r2?**