IEEE P802.11
Wireless LANs

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| LB234 Comment Resolutions – PHY and BF III |
| Date: 2018-12-12 |
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Abstract

This submission proposes resolutions to PHY and BF CIDs. The text used as reference is D2.0.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed change** |
| 3232 | 10.43.7 | 245.50 | When beam tracking is performed with BRP TX and especially with BRP-RX-TX packet, it is important to define when do the transmitter and receiver switch AWV to the AWV that are the results of the tracking - otherwise, link may be lost when only one side switches. | define that the change occurs immediately after the feedback is sent or (better) in the next TxOP |

**Proposed resolution**: Revised

**Modifications:** Please add the following paragraph at the end of 10.43.7

If the beam tracking procedure includes the transmission of BRP-TX, EDMG BRP-TX, or EDMG BRP-RX/TX packets, both STAs (beam tracking initiator and responder) shall not change their antenna settings, except during the transmission of the TRN field in PPDUs used to perform beam tracking, during the procedure. The STAs shall use the beam tracking procedure feedback and then update their antenna settings before their next TXOP or SP.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed change** |
| 3228 | 10.43.7 | 245.7 | "the beam tracking initiator may append the feedback to any packet to the responder" - what does "append" mean. Does it mean aggregate in the same A-MPDU. And if It does, what is aggregated? Currently the text allows aggregation of BRP frames only with ACK, BACK and QOS null frames, not with data frames, which I assume was the intent, although it is not written | Simple option is to disallow the use of BRP-RT-TX frames as a response to RX beam tracking request. Another option is to actually say that a BRP frame with channel measurement feedback is aggregated and define where is it aggregated. If so, the text defining with what BRP frames are aggregated needs to be changed |
| 3230 | 10.43.7 | 245.34 | "The beam tracking responder may append the feedback to any packet from the responder to the initiator." - specify what is feedback - (BRP frame with channel measurement feedback), and what type of frames it is aggregated with. Also, in current text aggregation is allowed only with ACK, BACK and QOS null This rule may have to be changed | define that a BRP frame with channel measurement feedback is aggregated and define where is it aggregated. If so, the text defining with what BRP frames are aggregated needs to be changed |

**Proposed resolution**: Revised

**Modifications:** Modify lines 6-7 of page 245 as follows

If a beam tracking responder sends an EDMG BRP-RX/TX packet in response to an analog receive beam tracking request, the beam tracking initiator may ~~append the feedback to any packet to the responder.~~ aggregate in an A-MPDU a BRP frame that contains a Channel Measurement Feedback element with the feedback (see 10.43.6.4.1).

Modify line 34 of page 245 as follows

The beam tracking responder may ~~append the feedback to any packet from the responder to the initiator.~~ aggregate in an A-MPDU a BRP frame that contains a Channel Measurement Feedback element with the feedback (see 10.43.6.4.1).

Change the penultimate paragraph of 10.43.6.4.1 (lines 40 and 41, page 2018, P802.11-REVmd/D1.5) as follows

Two or more BRP frames shall not be aggregated in the same A-MPDU. A BRP frame that contains a beam refinement request may be aggregated with another frame in the same A-MPDU only if the other frame is a single Ack, BA or QoS Null frame. A BRP frame that does not contain a beam refinement request may be aggregated with another frame in the same A-MPDU only if the other frame is a single data, management (except BRP), Ack, BA or QoS Null frame.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed change** |
| 3235 | 9.4.2.253 | 120.29 | It is not clear how a BF initiator or respodner can determine the SNR for each spatial stream in a specific TX sector combination. Each TX sector in each antena can be received by all RX antennas and there is no way which RX antenna will be chosen for each TX sector if that combination is used. The link transmitter cannot know what is the expected SNR on this link | Find a way to indicate which antenna will be used in MIMO for each sector, may be using the antenna ID field |

**Proposed resolution**: Rejected

**Discussion:** Because the TRN is composed of *N* orthogonal sequences, where *N* is the number of transmit antennas, together with the way the MIMO BF procedure (including feedback) is defined, it is possible for the responder to measure and send feedback for a given transmit antenna setting and each receive antenna. Thus, the transmitter does have the information necessary to make a decision on its MIMO transmit configuration.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed change** |
| 3390 | 10.43.9.5.2.2.2 | 282.4 | This paragraph is confusing. the best AWV configuration identified in the Responder BRP TXSS is a TX AWV of Responder, not RX AWV of initiator. | delete whole paragraph |

**Proposed resolution**: Revised

**Discussion:** Paragraph cannot be deleted because it defines the DMG antenna used by the initiator during the penultimate BRP TXSS phase (RX training of the initiator) for a given reciprocity case.

**Modifications:** Please modify lines 4-7 of page 282 as follows:

If the initiator is not antenna pattern reciprocal and is not DMG antenna reciprocal, and the responder is not antenna pattern reciprocal, the EDMG BRP-RX packet sent in the receive training of the initiator is received ~~using~~ by the initiator with the DMG antenna corresponding to the best transmit AWV ~~configuration~~ of the responder as identified in the Responder BRP TXSS.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed change** |
| 3398 | 9.5.4 | 159.31 | TX Antenna ID should have an MSB | use a reserved bit for MSB |

**Proposed resolution**: Revised

**Discussion:** The EDMG BRP field was defined to signal information that is not present in the BRP request field and also to “extend” subfields present in the BRP request field. For example, the EDMG BRP field includes a 12 bit TX sector ID which “extends” the 6 bit TX sector ID present in the BRP request field. Similarly, a 3 bit-equivalent indication of “TX Antenna ID” can be found in the EDMG BRP field (TX Antenna Mask). It is unclear if there is a case (BRP flow and/or implementation) that would require an “extended” TX Antenna ID signalled in the BRP request field instead of in the EDMG BRP field.

For the case in which the BRP request field is transmitted within a SSW-Feedback frame or a SSW-Ack frame, the feedback (best sector, best DMG antenna) is not carried within the BRP request field but instead in the SSW feedback field. The BRP request field is included in SSW-Feedback and SSW-Ack frames to request/start a BRP to be performed after the sector sweep. The SSW field (specifically, "Sector Select" and "DMG Antenna Select" subfields) was extended to EDMG values.

**Modifications:** Please include the following before line 2 of page 159 (D2.1):

*Change the antepenultimate and last paragraphs of 9.5.4 BRP Request field as follows:*

The TX sector ID subfield indicates the sector ID that is used when transmitting the PPDU. If the

PPDU is transmitted using a pattern that is not a sector that has been used in the sector sweep, the

value of this subfield is set to 0x63. This subfield is reserved if the BRP request field is transmitted within a SSW-Feedback frame with the EDMG Extension Flag subfield set to 1 or within a SSW-Ack frame with the EDMG Extension Flag subfield set to 1.

The TX Antenna ID subfield indicates the DMG antenna ID that is used when transmitting the PPDU. This subfield is reserved if the BRP request field is transmitted within a SSW-Feedback frame with the EDMG Extension Flag subfield set to 1 or within a SSW-Ack frame with the EDMG Extension Flag subfield set to 1.

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| 3449 | 10.43.6.3.3 | 241.22 | suggest to move 'or the AWV ID (if an EDMG BRP-TX or EDMG BRP-RX/TX packet was used)' to after 'BRP-RX packet received with the highest link quality' | as in comment |

**Proposed resolution**: Revised

**Modifications:** Please modify lines 19-25 of page 241 as follows:

In the R-MID subphase, the initiator shall send a BRP frame with feedback. This BRP frame should be sent using the best TX sector as determined in the SLS phase, while the responder should use a quasi-omni pattern to receive this frame. The feedback included in this BRP frame should be (a) the BS-FBCK field set to the TX sector ID or the AWV ID (if an EDMG BRP-TX or EDMG BRP-RX/TX packet was used) of the ~~BRP-RX packet received with the highest link quality~~ sector or AWV received with best quality, and (b) the ordered list of transmit sectors (based on received link quality during the R-MID) using the Sector ID Order subfield. An EDMG STA returns the ordered list in the EDMG Sector ID Order subfield.

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| 3710 | 29.9.1.3 | 529.5 | LSB and MSB terminology might be confusing. | Would suggest to change to "from left to right in the sense of Fig. 194" |

**Proposed resolution**: Revised

**Modifications:** Please modify line 5 of page 529 as follows

Using the above configuration, the Short SSW Payload field encoding ~~from LSB to MSB~~ using the convention in 9.2.2 is as follows:

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed change** |
| 3084 | 9.4.2.253 | 120.29 | This presentation would benefit a lot from being presented more in the style of the first equation in Clause 9.4.2.147. Presently, the index sets for j and m are given twice, N\_tsc is defined after it's referred to the first time, and there is no structured overview of N\_TX, N\_RX, N\_tsc. The value of N\_tsc is presented as having either of two possible values, the first of which is not given until Clause 9.4.2.260. There should be some referens here. The other possible value for N\_tsc is only given (seemingly) in Clause 9.4.2.129. Again there should be a referens. | As in comment. |

**Proposed resolution**: Revised

**Modifications:** *Please modify lines 11-37 of page 120 as follows*

When the EDMG Channel Measurement Feedback element is included in a MIMO BF Feedback frame or when the EDMG Channel Measurement Feedback element is included in a BRP frame with the Sector Sweep Frame Type field of the DMG Beam Refinement element contained in the frame equal to 2, the EDMG Sector ID Order field indicates AWV feedback IDs, TX antenna IDs and RX antenna IDs. The RX Antenna ID subfields of the EDMG Sector ID Order field are reserved when the EDMG Channel Measurement Feedback element is included in the MIMO BF Feedback frame. The BRP CDOWN field indicates BRP CDOWN values. The EDMG Sector ID Order field and the BRP CDOWN field can be divided into *Nmeas* SISO ID subsets. Specifically, the *i* SISO ID subset (*i* = 1,2,…, *Nmeas*) comprises the values of the AWV feedback IDi, TX antenna IDi, RX antenna IDi and BRP CDOWNi subfields, where the AWV feedback IDi subfield indicates the AWV for a TX DMG antenna having its TX antenna ID equal to the TX antenna IDi value, which is used to transmit an EDMG BRP-RX/TX packet or EDMG BRP-TX packet with the BRP CDOWN field set to the BRP CDOWNi value.

The number of measurements *Nmeas* is given by

$$N\_{meas}= N\_{tsc}×N\_{TX}×N\_{RX}$$

where *Ntsc* is given either by the Number of Measurements field together with the Number of Measurements MSB field of the accompanying DMG Beam Refinement element of the BRP frame (as defined in 9.4.2.129) or by the Number of TX Sector Combinations Present field in the accompanying MIMO Feedback Control element of the MIMO BF Feedback frame. Also, *NTX* refers to the value indicated by the Number of Concurrent RF Chains subfield of the PHY Capability field in the EDMG Capabilities element of the receiver of the EDMG Channel Measurement Feedback element; and *NRX* refers to the value indicated by the Number of Concurrent RF Chains subfield of the PHY Capability field in the EDMG Capabilities element of the transmitter of the EDMG Channel Measurement Feedback element.

Every *NTX*×*NRX* consecutive SISO ID subsets constitute a set which corresponds to a specific TX sector combination (or equivalently a specific TX-RX AWV configuration). *~~NTX~~* ~~refers to the value indicated by the Number of Concurrent RF Chains subfield of the PHY Capability field in the EDMG Capabilities element of the receiver of the EDMG Channel Measurement Feedback element.~~ *~~NRX~~* ~~refers to the value indicated by the Number of Concurrent RF Chains subfield of the PHY Capability field in the EDMG Capabilities element of the transmitter of the EDMG Channel Measurement Feedback element.~~ Each TX sector combination comprises a single TX sector for each of *NTX* TX DMG antennas. *Ntsc* TX sector combinations are ranked in the decreasing order of an implementation dependent metric. ~~, where~~ *~~Ntsc~~* ~~is the value of the Number of TX Sector Combinations Present field in the accompanying MIMO Feedback Control element of the MIMO BF Feedback frame or equals to~~ *~~Nmeas~~* ~~the number of measurements, which is specified by the Number of Measurements field and the Number of Measurements MSB field of the accompanying DMG Beam Refinement element of the BRP frame, divided by (~~*~~NTX~~*~~×~~*~~NRX~~*~~).~~ Specifically, the *j* set (*j* = 1, 2, …, *Ntsc*), which corresponds to the *j* TX-RX AWV configuration, comprises the ((*j*-1)×*NTX*×*NRX*+1) SISO ID subset to the (*j*×*NTX*×*NRX*) SISO ID subset. Assume that the MIMO channel corresponding to the *j* TX-RX AWV configuration is defined by:

*Please modify the last sentence in the "meaning" of the Number of Measurements subfield in page 94 as follows*

If the EDMG Extension Flag field is set to 1, the number of measurements is equal to the number of TX-RX AWV configurations trained with the EDMG BRP-TX or EDMG BRP-RX/TX packets on which the measurement is based ~~multiplied by NTX×NRX~~ (see 9.4.2.253), or is equal to the number of received sectors if a TXSS result is reported by setting the TXSS-FBCK-REQ subfield to 1.