IEEE P802.11
Wireless LANs

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| CR on EDMG Channel Measurement Feedback |
| Date: 2018-3-3 |
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Abstract

This submission proposes resolution of comments on EDMG channel measurement feedback received from LB# 231 (TGay Draft 1.0) as well as some clarifications.

- 5 CID: 1975, 1996, 2018, 2237, 2019

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| **CID** | **Page** | **Line** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 1975 | 68 | 3 | N\_TXxN\_RX - neither are defined in the subclause. Either reference to another place in which they were defined or better, define the values here | Define or reference N\_TX, N\_RX, N\_Tsc. | RevisedNTX and NRX have been defined in D1.1. |
| 1996 | 67 | 1 | In the EDMG Sector Order field, subscript Nmeas may be not consistent with its original definition in 802.11-2016 (The number of channel/SNR measurements reported, Nmeas, is equal to the number of TRN-T subfields). In 11ay D1.0 P77L13: The number of measurements, Nmeas, is NTX \*NRX multiples of the number of TX sector combinations, Ntsc. | Use another variable instead of Nmeas if necessary. | RevisedAgreed that there is inconsistency between two definitions of Nmeas in DMG Beam Refinement element (see P72 of D1.1) and MIMO Feedback Control element (see P100 of D1.1).TGay editor to make the changes shown in 11-18/0430r1 under all headings that include CID 1996. |
| 2018 | 68 | 21 | The part "where the AWV feedback ID\_i indicates the AWV for a TX DMG antenna having its TX antenna ID equal to the TX antenna ID value, which is used to transmit the BRP\_TX/RX packet" is only applicable if the BRP packet was sent with just one antenna. If more antennas are used simultaneously this behaviour can be ambiguous. | Please clarify the definition of the AWV when multiple TX antennas are used simultaneously. An easy fix can be to define the AWVs as MIMO AWVs so the same value is used for the j TX-RX configuration, when the bitmap indicating the TX mask contains more than a "1". | RejectedThe part mentioned in the comment is also applicable if the EDMG BRP packet is transmitted through multiple antennas simultaneously. In this case, a TRN subfield of EDMG BRP packet is transmitted using AWVs of multiple antennas simultaneously which have the same AWV feedback ID value.  |
| 2237 | 68 | 19 | Not clear why the RX antenna id is needed by transmitter when reporting SISO id subset for the purpose of tx sector combination. The responder maintains an association between SISO id subset index and the rx antenna/awv setting | Add a sentence to describe that RX antenna id is reserved in EDMG sector ID order when included in MIMO BF Feedback frame | RevisedAgreed in principle. TGay editor to make the changes shown in 11-18/0430r1 under all headings that include CID 2237. |
| 2019 | 69 | 2 | There seems to be something missing in the sentence | after the equation insert: where h\_(m,n)^(j) (m=1,.., n=..) represents ... | AcceptedTGay editor to make the changes shown in 11-18/0430r1 under all headings that include CID 2019. |

**Proposed changes to D1.1:**

9.4.2.130 DMG Beam Refinement element

***Change Table 9-235 as follows (CID #1996)***

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| --- | --- |
| Subfield | Meaning |
| Number of Measurements | The size in bits of the Number of Measurements subfield depends on the value of the EDMG Extension Flag field. If the EDMG Extension Flag field is set to 1, the Number of Measurements MSB field is prepended to the Number of Measurements subfield to form a single Number of Measurements field of size 11 bits. Otherwise, the Number of Measurements MSB field is reserved.The Number of Measurements subfield indicates the n~~N~~umber of measurements in the SNR subfield and the Channel Measurement subfield. If the EDMG Extension Flag field is set to 0, the number of measurements ~~It~~ is equal to the number of TRN-T subfields in the BRP-TX packet on which the measurement is based, or the number of received sectors if TXSS result is reported by setting the TXSS-FBCK-REQ subfield to 1. 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 packets or EDMG BRP-RX/TX packets on which the measurement is based, multiplied by *NTX*×*NRX* (see 9.4.2.253), or the number of received sectors if TXSS result is reported by setting the TXSS-FBCK-REQ subfield to 1. |

**9.4.2.253 EDMG Channel Measurement Feedback element**

***Change this clause as follows (CID 2019, 2237)***

The EDMG Channel Measurement Feedback element is used to carry channel measurement feedback data that an EDMG STA has measured on DMG Beacon frames, SSW frames, Short SSW packets or TRN fields of EDMG BRP packets. This channel measurement feedback data is provided in addition to what is provided in the Channel Measurement Feedback element (see 9.4.2.136). The EDMG Channel Measurement Feedback element provides a list of sectors per transmit DMG antenna identified during sector sweep or during beam combination or a list of TX sector combinations identified during SU-MIMO or MU-MIMO beamforming training and that can be used to establish a beamformed SISO, SU-MIMO or MU-MIMO link, as well as AWV information obtained during beam tracking.

The format and size of the EDMG Channel Measurement Feedback element are defined by the parameter values specified in the accompanying DMG Beam Refinement element (see 9.4.2.130) or MIMO Feedback Control element (see 9.4.2.261). The EDMG Channel Measurement Feedback element is shown in Table 9.

….

When the EDMG Channel Measurement Feedback element is included in a BRP frame (see 9.6.22.3), the EDMG Sector ID Order field indicates the TX sector IDs, TX antenna IDs and RX antenna IDs corresponding to the SNRs in the SNR field when the SNR Present subfield of the FBCK-TYPE field is equal to 1 and the Sector Sweep Frame Type field is equal to 0 in the DMG Beam Refinement element contained in the frame. The EDMG Sector ID Order field indicates the CDOWN values and RX antenna IDs corresponding to the SNRs in the SNR field when the SNR Present subfield of the FBCK-TYPE field is equal to 1 and the Sector Sweep Frame Type field is equal to 1 in the DMG Beam Refinement element contained in the frame. The TX Antenna ID subfields of the EDMG Sector ID Order field are reserved when the Sector Sweep Frame Type field is equal to 1 in the DMG Beam Refinement element contained in the frame.

When the EDMG Channel Measurement Feedback element is included in a MIMO BF Feedback frame (see 9.6.22.6) 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, each comprising an AWV feedback ID, a TX antenna ID, a RX antenna ID and a BRP CDOWN value. 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. 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 (see 9.4.2.250) 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 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:

Here, (*m* =1,2,…, *NTX* and *n* = 1,2,…, *NRX*) represents the channel between the *m* TX DMG antenna and the *n* RX DMG antenna and is indicated by the ((*j*-1)×*NTX*×*NRX*+(*m*-1)×*NRX*+*n*) SISO ID subset. In particular, for the *j* TX sector combination (*j* = 1, 2, …, *Ntsc*), the AWV used by the *m* TX antenna (*m* =1,2,…, *NTX*) is indicated by the values of the AWV feedback IDl and BRP CDOWNl subfields, where *l* = ((*j*-1)×*NTX*×*NRX*+(*m*-1)×*NRX*+*n* and *n* is any integer between 1 and *NRX*.

NOTE—Since a DMG Beacon frame, SSW frame or Short SSW packet transmitted through a TX sector or a TRN subfield of EDMG BRP-TX packet or EDMG BRP-TX/RX packet transmitted using a TX AWV can be received by several RX DMG antennas, reception of each DMG Beacon frame, SSW frame, Short SSW packet or TRN subfield of EDMG BRP-TX packet or EDMG BRP-TX/RX packet through an RX DMG antenna has an entry in the SNR field, the EDMG Sector ID Order field, the Additional SNR field (if present) and the Additional EDMG Sector ID Order field (if present).

If both the Aggregation Present field and the EDMG Extension Flag field in the accompanying DMG Beam Refinement element are 1 or if the Channel Aggregation Present subfield of the MIMO FBCK-TYPE field in the accompanying MIMO Feedback Control element is 1, the following apply:

* The EDMG Sector ID Order, BRP CDOWN and Tap Delay fields are for the channel which includes the primary channel in case of channel aggregation. Otherwise, the EDMG Sector ID Order, BRP CDOWN and Tap Delay fields are for the channel in which the measurement is taken.
* The Additional EDMG Sector ID Order, Additional BRP CDOWN and Additional Tap Delay fields are for the channel which does not include the primary channel in case of channel aggregation. Otherwise, the Additional EDMG Sector ID Order, Additional BRP CDOWN and Additional Tap Delay fields are not present.

**9.4.2.261 MIMO Feedback Control element**

***P100L17: Change the paragraph as follows:***

The value of the Number of TX Sector Combinations Present subfield plus one indicates the number of TX sector combinations, *Ntsc*, for the MIMO BF feedback. The number of measurements, *Nmeas*, is NTX×NRX (see 9.4.2.253)multiples of the number of TX sector combinations, *Ntsc*.

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**SP**: Do you agree to accept the comment resolution as proposed in IEEE 802.11-18/0430r1?