IEEE P802.11
Wireless LANs

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| Comment Resolution on the SISO phase of SU/MU-MIMO BF  |
| Date: 2017-9-4 |
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Abstract

This submission proposes resolution of comment received from TGay comment collection (TGay Draft 0.3).

- 10 CIDs: 44, 45, 93, 193, 349, 351, 353, 393, 504, 550

1. **Introduction**

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGay Draft. The introduction and the explanation of the proposed changes are not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGay Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGay Editor: Editing instructions preceded by “TGay Editor” are instructions to the TGay editor to modify existing material in the TGay draft. As a result of adopting the changes, the TGay editor will execute the instructions rather than copy them to the TGay Draft.***

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| CID | Page Number | Line Number | Comment | Proposed Change | Resolution |
| 550 | 67 | 37 | "Figure 49 depicts the SISO phase, which consists of three subphases: an optional initiator TXSS subphase, an optional responder TXSS subphase, and an SISO Feedback subphase.", when both initiator TXSS and responder TXSS subphases are absent, how to set sector ID or antenna ID or CDOWN in BRP SISO feedback? | Need to illustrate how to set sector ID or antenna ID or CDOWN in BRP SISO feedback when both initiator TXSS and responder TXSS subphases are absent. | Revised-TGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 550. |
| 393 | 68 | 5 | It is not clear whether the SISO phase training could be perfromed on multiple channel together | If it could be performed on multiple channel, Table 9 in 30.3.3.2.6 should be updated to include short SSW and BRP frames when B0=1 | Revised-It is proposed that MIMO BRP TXSS shall be used in the SISO phase training of SU-MIMO beamforming. In this case, the TRN field of EDMG BRP-TX packet is transmitted over the entire channel bandwidth.TGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 393. |
| 44 | 68 | 9 | "The Short SSW packet shall be used during the initiator TXSS" - More efficient to use a BRP frame | Replace with "The Short SSW pakcet shall be used during the initiator RXSS" with " The short SSW packet or BRP-TX packets shall be used during the initiator sector sweep" | Revised-It is proposed that MIMO BRP TXSS shall be used in the SISO phase training of SU-MIMO beamforming. The Short SSW packet is no longer used in the SISO phase training.TGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 44. |
| 93 | 68 | 25 | What is the "Short SSW Feedback field"? Where is it defined? Do you mean Sector Sweep Feedback field in 9.5.3 with EDMG Extension Flag subfield set to 1? If so, then say so. | Please clarify | Rejected-It is proposed that MIMO BRP TXSS shall be used in the SISO phase training of SU-MIMO beamforming. The Short SSW packet is no longer used in the SISO phase training of SU-MIMO beamforming. |
| 45 | 68 | 27 | "The BRP frame shall contain a list of CDOWN values and SNRs of the transmit sectors received during the last responder TXSS" the text should refer to the correct elemnts | Refere to a BRP frame with TXSS FBCK request for the polling frame and the sector order and SNRS sent in the DMG channel feedback and EDMG sector ID order | Revised-TGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 45. |
| 353 | 10.38.9.2.3.2 | 68.15 | For SU-MIMO beamforming training, if the initiator TXSS subphase was not present in the SISO phase, the responder shall not initiate the responder TXSS subphase. | Change"Otherwise the responder shall not initiate the responder TXSS subphase following the completion of the initiator TXSS subphase"to"Otherwise the responder shall not initiate the responder TXSS subphase" | RevisedTGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 353. |
| 504 | 68 | 28 | During SISO feedback subphase, it is sufficient to feedback only a few sectors which have been received best. | Add "The list within both initiator and responder BRP frame shall either comprise information of all received transmit sectors or a subset of the best received transmit sectors." | RevisedTGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 353. |
| 349 | 10.38.9.2.3.2 | 68.06 | To avoid confusion with SISO phase of MU-MIMO beamforming, it is better to change the title of Figure 49 to "The SISO phase of SU-MIMO beamforming training" | As per comment | RevisedTGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 349. |
| 351 | 10.38.9.2.4.2 | 72.18 | To avoid confusion with SISO phase of SU-MIMO beamforming, it is better to change the title of Figure 51 to "The SISO phase of MU-MIMO beamforming training" | as per comment | RevisedTGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 351. |
| 193 | 10.38.9.2.3.2 | 67.33 | There is no SISO definition in IEEE 802.11-2016 spec. | Define the term SISO in 3.2 Definitions specific to IEEE Std 802.11 | RevisedAgreed in principle. The definition of SISO is added.TGay editor to make the changes shown in 11-17/1234r0 under all headings that include CID 193. |

**Discussion:**

Propose:

Revised for 9 CIDs 44, 45, 193, 349, 351, 353, 393, 504, 550 as per discussion and editing instructions in 11-17/1234r0.

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10.38.9.2.3.2 SISO phase

***#1: Change this clause as follows (CID#353, #44, #45, #349, #393, #504, #550):***

The objective of the SISO phase is to enable the initiator to collect feedback of the last initiator TXSS from the responder and also enables the responder to collect feedback of the last responder TXSS from the initiator.



Figure 56—The SISO feedback procedure of SU-MIMO beamforming

The SISO phase comprises either a MIMO BRP TXSS procedure or a SISO feedback procedure. When the SISO phase comprises a MIMO BRP TXSS procedure, it includes a setup phase, an Initiator BRP TXSS, a Responder BRP TXSS, and a feedback phase as defined in 10.38.9.5. In particular, the BRP frame sent by the initiator during the setup phase to start the SISO phase shall have the BRP-TXSS, TXSS-INITIATOR, and the TXSS-MIMO fields within the EDMG BRP Request element all set to 1. In the BRP frame sent by the initiator during the feedback phase, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicate AWV feedback IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the Responder BRP TXSS. The BRP CDOWN subfield in the EDMG Channel Measurement Feedback element indicate BRP CDOWNs of the packets in which these sectors were received. The SNR subfield in the Channel Measurement Feedback element indicates the SNRs with which these sectors were received. The BRP frame sent by the initiator during the feedback phase shall contain feedback information for more than one sector per TX antenna that were received in the Responder BRP TXSS. In the BRP frame sent by the responder during the feedback phase, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicate AWV feedback IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the Initiator BRP TXSS. The BRP CDOWN subfield in the EDMG Channel Measurement Feedback element indicate BRP CDOWNs of the packets in which these sectors were received. The SNR subfield in the Channel Measurement Feedback element indicates the SNRs with which these sectors were received. The BRP frame sent by the responder during the feedback phase shall contain feedback information for more than one sector per TX antenna that were received in the Initiator BRP TXSS.

When the SISO phase comprises a SISO feedback procedure as shown in Figure 56, the initiator shall send a BRP frame to the responder with the TXSS-FBCK-REQ field set to 1, the SNR Requested subfield within the FBCK-REQ field set to 1, the Sector ID Order Requested field within the FBCK-REQ field set to 1, the Channel Measurement Requested subfield within the FBCK-REQ field set to 0, the SNR Present subfield within the FBCK-TYPE field set to 1, the Sector ID Order Present subfield within the FBCK-TYPE field set to 1, the Channel Measurement Present subfield within the FBCK-TYPE field set to 0, the Tap Delay Present subfield within the FBCK-TYPE field set to 0, the Link Type subfield within the FBCK-TYPE field set to 1, the EDMG Extension Flag field set to 1 and the EDMG Channel Measurement Present field set to 1. The last responder TXSS may have been performed using DMG Beacons, SSW frames, Short SSW packets or EDMG BRP-TX packets. If the last responder TXSS has been performed using DMG Beacons or SSW frames, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicates the sector IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the last responder TXSS. If the last responder TXSS has been performed using Short SSW packets, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicates the CDOWNs, TX antennas and RX antennas of all or a subset of sectors that were received in the last responder TXSS. If the last responder TXSS has been performed using EDMG BRP-TX packets, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicate AWV feedback IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the last responder TXSS. The BRP CDOWN subfield in the EDMG Channel Measurement Feedback element indicates the BRP CODWNs of the packets in which these sectors were received. The SNR subfield in the Channel Measurement Feedback element indicates the SNRs with which these sectors were received. The BRP frame shall contain feedback information for more than one sector per TX antenna that were received in the last responder TXSS.

The responder shall send a BRP frame to the initiator a SIFS following the reception of the BRP frame from the initiator, in which all the subfields within the FBCK-REQ field are set to 0, the SNR Present subfield within the FBCK-TYPE field set to 1, the Sector ID Order Present subfield within the FBCK-TYPE field set to 1, the Channel Measurement Present subfield within the FBCK-TYPE field set to 0, the Tap Delay Present subfield within the FBCK-TYPE field set to 0, the Link Type subfield within the FBCK-TYPE field set to 0, the EDMG Extension Flag field set to 1 and the EDMG Channel Measurement Present field set to 1. The last initiator TXSS may have been performed using DMG Beacons, SSW frames, Short SSW packets or EDMG BRP-TX packets. If the last initiator TXSS has been performed using DMG Beacons or SSW frames, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicates the sector IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the last initiator TXSS. If the last initiator TXSS has been performed using Short SSW packets, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicates the CDOWNs, TX antennas and RX antennas of all or a subset of sectors that were received in the last initiator TXSS. If the last initiator TXSS has been performed using EDMG BRP-TX packets, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicate AWV feedback IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the last initiator TXSS. The BRP CDOWN subfield in the EDMG Channel Measurement Feedback element indicates the BRP CODWNs of the packets in which these sectors were received. The SNR subfield in the Channel Measurement Feedback element indicates the SNRs with which these sectors were received. The BRP frame shall contain feedback information for more than one sector per TX antenna that were received in the last initiator TXSS.

During the SISO Feedback procedure, all transmissions should use the DMG control mode.

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10.38.9.2.4.2 SISO phase

***#2: Change this clause as follows (CID#351):***

The goal of the SISO phase is to collect feedback on one or more suitable initiator’s TX and responder’s RX DMG antennas and sectors between the initiator and each responder in the MU group. This information is then used to perform the following MIMO phase. All transmissions during the SISO phase should use the DMG control mode.

Figure 58 depicts the SISO phase, which consists of two subphases, namely, an I-TXSS subphase and a SISO Feedback subphase. The initiator may perform the I-TXSS subphase. The I-TXSS subphase enables the initiator to obtain feedback from the responders in the MU group on one or more sectors for each of the initiator’s TX DMG antenna.

The initiator performs the I-TXSS subphase through the use of the Short SSW packet (see 30.9.1). In each Short SSW packet transmitted as part of the I-TXSS, the initiator shall set the Direction field to zero, shall set the Addressing Mode field to indicate MU-MIMO and shall set the Destination AID field to contain a group ID announced by the PCP or AP in the last transmitted EDMG Group ID Set element. In addition, the CDOWN field shall be set to the number of Short SSW packets remaining until the end of the I-TXSS subphase and the Setup Duration field shall be set to the duration of the following SISO Feedback subphase.

A MU-MIMO capable EDMG STA that receives a Short SSW packet indicating MU-MIMO transmission determines that it is an intended recipient of the packet by matching the value of the Destination AID field in the packet with a value of the EDMG Group ID field contained in the last received EDMG Group ID Set element. In case a match is found, the EDMG STA is an intended recipient of the packet if its AID is included in the EDMG Group ID field of the corresponding group. Otherwise, the EDMG STA is not an intended recipient of the packet and can ignore the remaining of the I-TXSS and SISO Feedback subphase, which can be done through the use of the value of the CDOWN and Setup Duration fields contained in the received Short SSW packet.

The initiator shall perform the SISO Feedback subphase. If the I-TXSS is present, the SISO Feedback subphase shall start MBIFS following the end of the I-TXSS subphase. During the SISO Feedback subphase, the initiator transmits a BRP frame to poll each responder in the MU group with the TXSS-FBCK-REQ field set to 1, the SNR Requested subfield with the FBCK-REQ field set to 1, the Sector ID Order Requested field within the FBCK-REQ field set to 1, the Channel Measurement Requested subfield within the FBCK-REQ field set to 0, all the subfields within the FBCK-TYPE field set to 0 and the EDMG Channel Measurement Present field set to 0. A responder shall respond to a received BRP frame with a BRP frame, in which all the subfields within the FBCK-REQ field are set to 0, the SNR Present subfield within the FBCK-TYPE field is set to 1, the Sector ID Order Present subfield within the FBCK-TYPE field is set to 1, the Channel Measurement Present subfield within the FBCK-TYPE field is set to 0, the Tap Delay Present subfield within the FBCK-TYPE field is set to 0, the Link Type subfield within the FBCK-TYPE field is set to 0, the EDMG Extension Flag field is set to 1 and the EDMG Channel Measurement Present field is set to 1. The last initiator TXSS may have been performed using DMG Beacons, SSW frames, Short SSW packets or EDMG BRP-TX packets. If the last initiator TXSS has been performed using DMG Beacons or SSW frames, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicates the sector IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the last initiator TXSS. If the last initiator TXSS has been performed using Short SSW packets, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicates the CDOWNs, TX antennas and RX antennas of all or a subset of sectors that were received in the last initiator TXSS. If the last initiator TXSS has been performed using EDMG BRP-TX packets, the EDMG Sector ID Order subfield in the EDMG Channel Measurement Feedback element indicate AWV feedback IDs, TX antennas and RX antennas of all or a subset of sectors that were received in the last responder TXSS. The BRP CDOWN subfield in the EDMG Channel Measurement Feedback element indicates the BRP CODWNs of the packets in which these sectors were received. The SNR subfield in the Channel Measurement Feedback element indicates the SNRs with which these sectors were received. The BRP frame shall contain feedback information for more than one sector per TX antenna that were received in the last initiator TXSS.

. The BRP frame shall be transmitted SIFS following the reception of the corresponding BRP frame.



Figure 58—The SISO phase of MU-MIMO beamforming

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3.1 Definitions

***#3: Insert the following paragraph after the definition of “serving access point (AP)” of IEEE802.11-2016 (CID193)***

single input, single output (SISO): A physical layer (PHY) configuration in which both transmitter and receiver use a single antenna.

**Straw Poll:**

* **Do you agree to accept the comment resolutions as proposed in doc 11-17/1234r0?**