IEEE P802.11
Wireless LANs

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| Beam tracking request for EDMG SC mode |
| Date: 2017-02-15 |
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Abstract

This document defines a new beam tracking field to be included in the EDMG-Header-A and proposes related modifications necessary to incorporate it in the 11ay draft.

**Discussion**

* In 11ad, a STA may request a peer STA to perform receive beam tracking by setting in a transmitted packet
	+ Beam Tracking Request field in the header equal to 1
	+ TRN-LEN to the number of requested TRN fields
	+ Packet Type field in the header equal to 0 (TRN-R-PACKET)
* In this case (beam tracking), even though TRN-LEN > 0, the transmitted packet does not include a training field.
* Problem: If an EDMG STA requests a peer EDMG STA to perform receive beam tracking by following the same procedure, DMG STAs that receive the packet would assume that it doesn’t contain a training field and obtain a wrong estimate for TXTIME if TRN-LEN is used for spoofing. Spoofing would fail in this case.
* Solution: We propose to define a new “EDMG Beam tracking request” field in the EDMG-Header-A and that the “Beam tracking request field” in the L-Header shall be set to zero.

# Proposed changes

*Add the following field to “Table 13—EDMG-Header-A field structure and definition for a SU PPDU”*

|  |  |  |  |
| --- | --- | --- | --- |
| **Field** | **Number of bits** | **Start bit** | **Description** |
| EDMG BeamTrackingRequest | 1 |  | Corresponds to the TXVECTOR parameterEDMG\_BEAM\_TRACKING\_REQUEST.Set to 1 to indicate the need for beam tracking (10.38.7); otherwise, set to 0.The EDMG Beam Tracking Request field is reserved when the EDMG TRN Length field is 0. |

*Add the following to “Table 6 —TXVECTOR and RXVECTOR parameters”*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Condition** | **Value** | **TXVECTOR** | **RXVECTOR** |
| EDMG\_BEAM\_TRACKING\_REQUEST | FORMAT is EDMG | This parameter indicates whether beam tracking is requested.Enumerated type: Beam Tracking Requested or Beam Tracking Not Requested | Y | Y |

**10.38.7 Beam tracking**

*Insert the following paragraph after the first paragraph*An EDMG STA (beam tracking initiator) may request a peer EDMG STA (beam tracking responder) to perform receive beam tracking by setting, in a transmitted packet, the TXVECTOR parameter EDMG\_BEAM\_TRACKING\_REQUEST to Beam Tracking Requested,

BEAM\_TRACKING\_REQUEST to Beam Tracking Not Requested, EDMG\_TRN\_LEN to the number of requested TRN subfields as described in 30.9.2.2, and packet type to TRN-R-PACKET. Otherwise, the EDMG\_BEAM\_TRACKING\_REQUEST parameter shall be set to Beam Tracking Not Requested.

*Change the second, third, and fourth paragraphs as follows*

A beam tracking responder that receives a packet requesting beam tracking ~~with the Beam Tracking Request field in the PHY header equal to 1~~ (corresponding to the BEAM\_TRACKING\_REQUEST or EDMG\_BEAM\_TRACKING\_REQUEST parameter in the RXVECTOR set to Beam Track Requested) and the Packet Type field in the PHY header equal to 0 (corresponding to PACKET-TYPE field in the RXVECTOR set to TRN-R-PACKET) shall:

* If BEAM\_TRACKING\_REQUEST parameter in the RXVECTOR is Beam Tracking Requested, follow the rules described in 20.10.2.2 and shall include a beam refinement AGC field and TRN-R subfields appended to the following packet transmitted to the initiator in the same allocation, with an MCS index greater than 0. The value of TXVECTOR parameter TRN-LEN in the following packet from the responder to the initiator shall be equal to the value of the TRN-LEN parameter in the RXVECTOR of the packet from the initiator.
* If EDMG\_BEAM\_TRACKING\_REQUEST parameter in the RXVECTOR is Beam Tracking Requested, follow the rules described in 30.9.2.2 and shall include TRN-R subfields to the following packet transmitted to the initiator in the same allocation, with an MCS index greater than 0. The value of TXVECTOR parameter EDMG\_TRN\_LEN in the following packet from the responder to the initiator shall be equal to the value of the EDMG\_TRN\_LEN parameter in the RXVECTOR of the packet from the initiator.

A responder may ignore a request for beam tracking within an allocation if no packets with an MCS index greater than 0 are transmitted from the responder to the initiator within the allocation.

A beam tracking initiator requesting transmit beam tracking shall either:

* ~~s~~Set the BEAM\_TRACKING\_REQUEST parameter in the TXVECTOR to Beam Tracking Requested, Packet Type to TRN-T-PACKET, TRN-LEN to the number of TRN-Units as described in 20.10.2.2.3, and append an AGC field and TRN-T subfields to the packet.
* Set the EDMG\_BEAM\_TRACKING\_REQUEST parameter in the TXVECTOR to Beam Tracking Requested, BEAM\_TRACKING\_REQUEST to Beam Tracking Not Requested, Packet Type to TRN-T-PACKET, and EDMG\_TRN\_LEN, EDMG\_TRN\_P, EDMG\_TRN\_M and EDMG\_TRN\_N as described in 30.9.2.2, and append TRN-T subfields to the packet.

The beam tracking responder may append the feedback to any packet from the responder to the initiator. The initiator may allocate time for the feedback through a reverse direction grant, provided the reverse direction protocol is supported by both the initiator and responder. The feedback type shall be the same as the feedback type in the last BRP frame that was transmitted from the initiator to the responder with TX-TRN-REQ equal to 1. If the responder has never received a BRP frame from the initiator with TX-TRN-REQ equal to 1, the responder shall respond with all subfields of the FBCK-TYPE field equal to 0 and set the BS-FBCK field to the index of the TRN-T subfield that was received with the best quality.

A beam tracking initiator may ~~also~~ request a beam tracking responder that the responder to perform receive beam tracking by setting, in the PHY header of a transmitted packet, the Beam Tracking Request field to 0, the Training Length field to a nonzero value, the Packet Type field to 0, and append an AGC field and TRN-R subfields to the transmitted packet.

*Insert the following after the fifth paragraph*

A beam tracking initiator may request a beam tracking responder that the responder perform receive beam tracking by setting the TXVECTOR parameter EDMG\_BEAM\_TRACKING\_REQUEST to Beam Tracking Not Requested, BEAM\_TRACKING\_REQUEST to Beam Tracking Not Requested, Packet Type to TRN-R-PACKET, EDMG\_TRN\_LEN to a nonzero value, and appending TRN-R subfields to the packet.

A beam tracking responder that receives a packet with RXVECTOR parameter EDMG\_BEAM\_TRACKING\_REQUEST equal to Beam Tracking Not Requested, BEAM\_TRACKING\_REQUEST equal to Beam Tracking Not Requested, Packet Type equal to TRN-R-PACKET, and EDMG\_TRN\_LEN to a nonzero value shall follow the rules described in 30.9.2.2 and may use the TRN-R subfields appended to the received packet to perform receive beam training.

A beam tracking initiator may use the procedures specified above to request a beam tracking responder to perform both transmit and receive beam tracking on the same packet. This is done by, on top of the corresponding TXVECTOR parameter configuration specified above, setting the TXVECTOR parameter RX\_TRN\_PER\_TX\_TRN to a value greater than zero and the Packet Type to TRN-T-PACKET. In this case, the beam tracking initiator and beam tracking shall use the rules described in 30.9.2.2 to perform both transmit and receive training over the TRN subfields appended to the transmitted packet.

**29.9.3.26.5 (EDMG BRP packet structure)**

*Change the first paragraph as follows*

 “The EDMG\_TRN\_LEN parameter in the TVXVECTOR or RXVECTOR of an EDMG BRP packet shall be greater than zero. If the PACKET-TYPE parameter in the RXVECTOR or TXVECTOR is equal to TRN-R-PACKET, then ~~the~~ both BEAM\_TRACKING\_REQUEST and EDMG\_BEAM\_TRACKING\_REQUEST parameters in the corresponding RXVECTOR or TXVECTOR shall be set to Beam Tracking Not Requested.”

**29.9.3.26.6 (EDMG BRP packet header fields)**

*Change the second paragraph as follows*

 “A value of 0 in the Packet Type field, a value of 0 in the Beam Tracking Request field, a value of 0 in the EDMG Beam Tracking Request field, and a value of 0 in the RX TRN-Units per Each TX TRN-Unit field indicate an EDMG BRP-RX packet. A value of 1 in the Packet Type field and a value of 0 in the RX TRN-Units per Each TX TRN-Unit field indicate an EDMG BRP-TX packet. A value greater than 0 in the RX TRN-Units per Each TX TRN-Unit field indicates an EDMG BRP-RX/TX packet.”

**References:**