IEEE P802.11
Wireless LANs

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| DMG Measurement Setup frames |
| Date: 2022-01-25 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Assaf Kasher | Qualcomm |  |  | akasher@qti.qualcomm.com |
|  |  |  |  |  |

Abstract

This document presents draft text for a DMG Measurement setup frame

**Discussion**

(Motion 48, 21/1865r1) In an DMG/EDMG bistatic and multistatic measurement setup exchange (at least) the following parameters may be exchanged:

* set of beam directions in TX (sets of TX AWV settings to be used in the measurements)
* set of beam directions in RX (sets of RX AWV settings to be used in the measurements)
* beamforming TRN field information such as TRN-P, TRN-M, TRN-N
* location and orientation of each of the STAs
* coordinates can be local or earth coordinates
* relative locations orientation may be estimated using TGaz based exchanges or available from management layer
* Scheduling

***TGbf Editor: insert the following text as a new clause 9.4.2.x***

***Editor: insert the following new subclause:***

**9.4.2.x3** **DMG Sensing Measurement Setup element**

The DMG Sensing Measurement Setup element carries information needed for a setup of a DMG sensing measurement. The DMG Sensing Measurement Setup element is contained in Sensing Setup frames.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element Id | Length | Element Id Extension | Measurement Setup Control | Status code | Num Tx Beams | Num Rx Beams |
| octets: | 1 | 1 | 1 | 1 | 2 | 2 | 2 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | TRN-M | TRN-P | TRN-N | LCI | Peer Orientation | Optional subelements |
| octets: | 1 | 1 | 1 | 0 or 16 | 3 | variable |

The Element ID, Element Length, Element Id Extension fields are defined in 9.4.2.1 (General).

The Measurement Setup Control field is shown in

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 | B3 | B4 | B5 B7 |
|  | Sensing Type | Rx Initiator | LCI Present | Orientation Present | Reserved |
| bits: | 2 | 1 | 1 | 1 | 1 |

Figure 1 - DMG Measurement Setup Element

The Sensing Type subfield is set according to the following table:

Table 1 - Sensing Type Subfield

|  |  |
| --- | --- |
| value  | Sensing Type |
| 0 | Reserved |
| 1 | Coordinated Monostatic |
| 2 | Bi-Static |
| 3 | Multi-Static |

The Rx Initiator subfield is set to 1 if the initiator is the receiver in bi-static sensing and to 0 if the initiator is the transmitter in bi-static sensing. This field is reserved if the Sensing Type subfield is not set to 2 (Bi-Static).

The LCI Present subfield is set to 1 if the LCI field is present in the DMG Sensing Measurement Setup element, it is set to 0 otherwise.

The Orientation Present subfield is set to 1 if the Peer Orientation is present in the DMG Sensing Measurement Setup element, it is set to 0 otherwise.

The status code field is defined in 9.4.1.9 (Status Code field).

The Num Tx Beams field and the Num Rx Beams field indicate the number of Tx AWVs and Rx AWVs that are listed in the Beam List subelements.

The TRN-M, TRN-P, TRN-N are used to indicate the values of EDMG-TRN-M, EDMG-TRN-P and EDMG-TRN-N that will be used in EDMG Bi-Static and EDMG Multi-Static sensing. If the addressed STA is a non-EDMG STA, TRN-M and TRN-P are reserved and set to 0 and TRN-N indicate the number of repetitions for each receive pattern (see DMG Bi-static sounding instance)

The LCI field is defined in 9.4.2.21.10.

The peer orientation field is shown in Figure 2.

|  |  |  |
| --- | --- | --- |
|  | B0 B11 | B12 B23 |
|  | Azimuth | Elevation |
| bits: | 12 | 12 |

Figure 2 - Peer Orientation field

The Azimuth subfield contains the azimuth orientation of the addressed STA as measured by the transmitting STA in 360º/4096 units with values from 0 to 4095.

The Elevation subfield contains the elevation orientation of the addressed STA as measured by the transmitting STA in 180º/4096 units with values from -2048 to 2047.

The Optional Subelements field contains zero or more subelements. The subelement format and ordering of subelements are defined in 9.4.3 (Subelements). The Subelement ID field values for the defined subelements are shown in Table 1.

Table 2 - Subelements of DMG Sensing Measurement Setup

|  |  |
| --- | --- |
| Subelement Id | Subelement Name |
| 1 | TxBeamList |
| 2 | RxBeamList |
| 3 | DMG Sensing Scheduling |

**9.4.2.x3.1 TxBeamList subelement**

The TxBeamList subelement contains a list of Tx beam indices. The beam indices represent indices in the Beam Descriptors sent with DMG Sensing Capabilities Element.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Subelement Id | Length | Num Beam Indices | Beam Index Field 1  | … | Beam Index Field N | Pad to Multiple of 8 bits |
| octets: | 1 | 1 | 1 |  | … |  |  |

Each Bean Index Field is 12bit long.

**9.4.2.x3.2 RxBeamList subelement**

The RxBeamList subelement contains a list of Rx beam indices. The beam indices represent indices in the Beam Descriptors sent with DMG Sensing Capabilities Element.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Subelement Id | Length | Num Beam Indices | Beam Index Field 1  | … | Beam Index Field N | Pad to Multiple of 8 bits |
| octets: | 1 | 1 | 1 |  | … |  |  |

Each Bean Index Field is 12bit long.

**9.4.2.x3.3 DMG Sensing Scheduling subelement**

The Scheduling subelement contains scheduling information for the measurement defined in the measurement setup.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Subelement Id | Length | Start Of Burst | Inter Burst Time | Intra Burst Time | Num Tx Beams Per Instance | Repeat per Instance | Num Bursts |
| octets: | 1 | 1 | 4 | 2 | 1 | 1 | 1 |  |

The Start of Burst field contains the time for the start of the first burst in TSF units.

The Inter Burst Time Field contains the time between the start of successive instances in a burst. This field is in TSF field units.

The Intra Burst Time contains the time between the start of successive bursts of TSF Units.

The Num Tx Beams Per Instance field contain the number of TX beams to be used in one instance. The use of this field is described in 11.21.18.3.5

The Repeat per Instance field indicates the number of times to repeat the transmission.

The Num Bursts field contains the number of times to repeat the Burst. A value of 0 indicates repeat until another measurement setup or tear down.

***TGbf Editor: insert the new text as follows***

**9.6.19.1 DMG Action frame details**

***Editor: Add the following lines to Table 9-540—DMG Action field values***

|  |  |
| --- | --- |
| **DMG Action field value** | **Meaning** |
| 21 | Sensing Measurement Setup Request. The format of the frame after the action field is identical to the format of the Sensing Measurement Setup Request unprotected DMG Action frame. It is carried in a Management Action frame. |
| 22 | Sensing Measurement Setup Response. The format of the frame after the action field is identical to the format of the Sensing Measurement Setup Response unprotected DMG Action frame. It is carried in a Management Action frame. |

**9.6.21.1 Unprotected DMG Action field**

**Editor: change table 9-569 as follows**

**Table 9-569—Unprotected DMG Action field values**

|  |  |
| --- | --- |
| **Unprotected DMG Action field value**  | **Meaning** |
| 6 | Sensing Measurement Setup Request |
| 7 | Sensing Measurement Setup Response |
| 8 | Sensing Measurement Report |

***Editor: Insert the following after 9.6.21.7***

**9.6.21.8** Sensing Measurement Setup Request frame format

TBD

**9.6.21.9** Sensing Measurement Setup Response frame format

TBD

**9.6.21.10** Sensing Measurement Report frame format

TBD

**9.6.X.1 Protected Sensing Action field**

***TGbf Editor: insert the following line to the Protected Sensing action field table:***

|  |  |
| --- | --- |
| **Unprotected DMG Action field value**  | **Meaning** |
| TBD | Sensing Measurement Report - The format of the frame after the action field is identical to the format of the Sensing Measurement Report unprotected DMG Action frame. It is carried in a Management Action frame. |

***TGaz Editor: insert the following text at the end of 11.21.18.3.3.1***

A DMG Sensing Measurement setup starts with the initiator STA sending a Sensing Measurement Setup Request frame containing a DMG Sensing Measurement Setup element to the responder.

In the DMG Sensing Measurement Setup element the initiator shall set Sensing Type subfield to the sensing that will be used in the measurement. The initiator shall not request a sensing type that the responder has not indicated it is capable of. For sensing type of Bi-Static the Rx Initiator subfield is set to 1 to indicate that the initiator is the receiver in the Bi-Static measurements. It is set to 0 if the initiator is the transmitter in the Bi-Static measurements.

The initiator shall set the Num Tx Beams field to the number of Tx beams that will be used by the transmitter in each measurement burst. The Num Tx Beams shall be equal to the number of beams indices in the TxBeamList subelement. The initiator shall set the Num Rx Beams field to the number of receiver beam per each transmit beam in the Bi-Static and Multi-Static measurements. The Num Rx Beams shall be equal to the number of beams indices in the RxBeamList subelement. Each beam index in the TxBeamList and RxBeamList is an index into the list of beams the transmitting and receiving STA published in their Sensing Beam Descriptor elements for Tx and Rx respectively.

If present the Peer Orientation field contains the azimuth and elevation of the responder as measured by initiator. If present the LCI field contains the location of the initiator.

The Schedule subelement contains the scheduling of the measurement as proposed by the initiator.

After receiving a Sensing Measurement Setup frame with a DMG Sensing Measurement Setup element a DMG STA responds with a Sensing Measurement Response Request frame containing a DMG Measurement Setup Element.

In the DMG Sensing Measurement Setup element the responder shall the set the Status Code field to 1 if it agrees to SUCCESS if it accepts the Measurement Setup Request. It shall set the Status Code to REJECT\_WITH\_SCHEDULE if it rejects the request but will accept with the schedule that is included in Scheduling subelement included in the DMG Sensing Measurement Setup element. It shall set the Status Code field to REFUSED, REFUSED\_REASON\_UNSPECIFIED if it rejects the request.

The responder shall set Sensing Type Rx Initiator subfield to the same value that was in the Sensing Measurement Setup frame. If present the Peer Orientation field contains the azimuth and elevation of the responder as measured by initiator. If present the LCI field contains the location of the initiator.

If the responder indicated REJECT\_WITH\_SCHEDULE, the Scheduling subelement indicates the proposed schedule from the responder.

***TGbf Editor: insert the following text at 9.4.2.1***

***Editor: Insert the following lines to table 9-128 Elements IDs as last lines***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | **Element ID** | **Element ID Extension** | **Extensible** | **Fragmentable** |
| DMG Sensing Measurement Setup element | <ANA> | <ANA> | subelements | NO |

**References:**

<https://mentor.ieee.org/802.11/dcn/21/11-21-0504-07-00bf-specification-framework-for-tgbf.docx>