IEEE P802.11
Wireless LANs

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| PDT DMG sensing: monostatic configurations |
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Abstract

This submission proposes the draft text for the DMG sensing: monostatic configurations

R0: initial version.

R1: revised based on 22/0243r6, an example is added.

R2: the document has been further refined.

R3: the measurement setup with for coordinated monostaic sensing is added, reference: 22/0295r5

R4: the document has been further refined based on some comments.

R5: the document has been further refined based on some comments and suggestions.

R6: the document has been further refined.

The following Motion is related to this PDT:

[Motion 40] (Motion passed)

**Move to add the following to 11bf SFD:**

* DMG/EDMG-based WLAN sensing supports both monostatic sensing and monostatic sensing with coordination configurations.
* In the monostatic sensing with coordination configuration, the transmissions of one or more devices that perform monostatic sensing are coordinated by a PCP/AP.

***Proposed draft text:***

***TGbe editor: Insert the following part of monostatic sensing to 11.21.18.x.1 Overiew***

**Notes: The text in black comes from the contribution 22/0243r6 and 22/0295r5. New paragraphs are added in revision mode.**

## 11.21.20 DMG sensing (SENS) procedure

### 11.21.20.1 Overview (Motion 55, 21/2015r4)

DMG sensing types include monostatic, bistatic, multistatic, monostatic sensing with coordination, bistatic sensing with coordination, and passive sensing

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**Figure 11-41m: DMG sensing instance of the coordinated monostatic type with PCP/AP as sensing initiator and two monostatic sensing devices as sensing responders who perform sensing in parallel.**

Figure 11-41l and Figure 11-41m (DMG sensing instance) illustrate one DMG sensing instance presented in Figure 11-41k (DMG sensing procedure with three sensing responders), which is identified by the DMG measurement ID equal to 1, DMG Sensing Burst ID equal to 1, and DMG sensing instance Nmb equal to 1. In both Figure 11-41l and Figure 11-41m (DMG sensing instance), the DMG sensing instance is of the coordinated monostatic type, the PCP/AP is the sensing initiator, and the two monostatic sensing devices are sensing responders. The example is about the coordinated monostatic sensing type with the not-sensing capable initiator and two sensing responders STA A and STA B.

In both Figure 11-41l and Figure 11-41m, the examples start with the initiation phase. The handshake between the initiator and the responder provides the responders with the order of the sounding and reporting. It also indicates to the initiator the readiness of the responders to participate in the sounding and reporting phases. The sounding phase of both monostatic devices in the instance may happen in parallel. In Fgiure 11-41l, the sounding phase is followed by the reporting phase of the same responder and the sounding phases of the two responders are sequential. In its sounding phase, the sensing responders (STA A and STA B) transmits the PPDU and receives the reflected signal.In the immediately following reporting phase it reports with the results that are labeled with the DMG Measurement Setup ID equal to 1, DMG Sensing Burst ID equal to 1 and the DMG sensing instance Nmb equal to 1 to the sensing initiator. In Figure 11-41m, the sounding phase is followed by the reporting phase of the responders and the sounding phases of the two responders are parallel. In its sounding phase, the sensing responders (STA A and STA B) transmit the PPDU and receive the reflected signal in parallel. In the immediately following reporting phase they report with the results that are labeled with the DMG measurement setup ID equal to 1, DMG sensing burst ID equal to 1 and the DMG sensing instance Nmb equal to 1 to the sensing initiator.

The illustration in Figure 11-41l and Figure 11-41m (DMG sensing instance) applies to any instance depicted in Figure 11-41k (DMG sensing procedure with three sensing responders) by replacing the DMG Measurement Setup ID, DMG Sensing Burst ID, and DMG sensing instance Nmb as per values indicated in the DMG sensing instances in Figure 11-41k (DMG sensing procedure with three sensing responders).

### 11.21.18.x.2 DMG sensing session setup (Motion 56, 22/0031r0)

In a DMG sensing session setup of a DMG sensing procedure, the sensing initiator and the sensing responder exchange DMG sensing capabilities. The capabilities may include the types of DMG sensing and the roles the STA may assume for each of the supported DMG sensing types.

### 11.21.20.3 DMG measurement setup (Motion 56, 22/0031r0)

**11.21.20.3.1 General**

DMG measurement setup may require an accomplishment of beamforming training between the sensing initiator and the sensing responder(s) in advance.

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**11.21.20.3.2 Monostatic and coordinated monostatic**

The sensing initiator of a coordinated monostatic DMG sensing measurement may be a STA not capable of monostatic DMG sensing.

The DMG Sensing Measurement Setup element is defined in 9.4.2.x3.1.

In coordinated monostatic sensing mode, the sensing initiator may request the sensing responder(s) to transmit and receive monostatic PPDU to specific directions by indicating the Tx/Rx beams to be used in each measurement burst. The Num Tx Beams field and the Num Rx Beams field shall be equal to the number of Tx beams and Rx beams that are listed in the Beam List subelements. The Num Tx Beams field shall be set equal to the Num Rx Beams field. The Transmit Beam Index axis represents the Beam Index used by the STA to transmit and receive the monostatic sensing PPDU and the Receive Beam Index axis will not be present. Each beam index in the Tx Beam List is an index into the list of beams the sensing responder published in their Sensing Beam Descriptor elements for Tx and Rx.

The Tx Beam List subelement is defined in 9.4.2.x3.1. The DMG Sensing Scheduling subelement is defined in 9.4.2.x3.3

Other parameters for coordinated monostatic sensing are TBD.

~~In coordinated monostatic sensing mode, the TRN-M, TRN-P, TRN-N fields are used to indicate the TRN field appended to the sensing PPDUs in coordinated monostatic sensing mode.~~

### 11.21.20.5 DMG sensing instance (Motion 56, 22/0031r0)

**11.21.20.5.1 General**

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**11.21.20.5.2 Coordinated monostatic instance**

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*11.21.20.5.2a Initiation*

In a coordinated monostatic instance of one or more sensing responders the following rules shall apply:

* The number of sensing responders in each instance of the same DMG Measurement Setup ID may be different
* The sensing initiator shall send a Coordinated Monostatic Instance Request frame to each sensing responder it requests to participate in the instance
* The sensing responder shall not respond with the Coordinated Monostatic Instance Response frame to the sensing initiator later than SIFS time after the request
* The sensing responder that responded to the sensing initiator shall proceed with monostatic sensing
* The order of sounding is indicated in the Coordinated Monostatic Instance Request frame, the sounding may be performed sequentialy or simultaneously.
* The format of the Coordinated Monostatic Instance Request frame and the Coordinated Monostatic Instance Response frame is TBD

*11.21.18.x.5.2.2 Sounding*

The RA shall be set equal to the TA in the PSDU contained in the monostatic PPDU (name of this PPDU is TBD).

*11.21.18.x.5.2.3 Reporting*

* If the responses are configured to happen during the DMG measurement instance, each sensing responder shall respond in no longer than SIFS time after the monostatic PPDU, and
* If the polled responses are configured, each sensing responder shall respond in no longer than SIFS time after the polling by the sensing initiator.