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IEEE Standard for Information Technology—
Telecommunications and Information Exchange between Systems
Local and Metropolitan Area Networks—
Specific Requirements

Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

Amendment 4: Enhancements for Wireless LAN Sensing

IEEE Computer Society

Developed by the
LAN/MAN Standards Committee

IEEE Std 802.11bf™-2025
(Amendment to IEEE Std 802.11™-2024
as amended by IEEE Std 802.11bh™-2024,
IEEE Std 802.11be™-2024, and
IEEE Std 802.11bk™-2025)

IEEE

IEEE Std 802.11bf™-2025

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Approved 28 May 2025

IEEE SA Standards Board

Abstract: This amendment defines modifications to the IEEE 802.11 medium access control (MAC); the physical layer (PHY) service interface of High Efficiency (HE) and Extremely High Throughput (EHT) PHYs; and to the Directional Multi Gigabit (DMG) and enhanced DMG (EDMG) PHYs to enhance Wireless Local Area Network (LAN) sensing operation in license-exempt frequency bands between 1 GHz and 7.125 GHz and above 45 GHz.

Keywords: amendment, IEEE 802.11, IEEE 802.11bf, MAC, medium access control, PHY, physical layer, Wireless LAN sensing, wireless local area network, WLAN

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Introduction

This introduction is not part of IEEE Std 802.11bf-2025, IEEE Standard for Information Technology—Telecommunications and Information Exchange between Systems—Local and Metropolitan Area Networks—Specific Requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications—Amendment 4: Enhancements for Wireless LAN Sensing.

This amendment defines modifications to the IEEE 802.11 medium access control (MAC); the physical layer (PHY) service interface of High Efficiency (HE) and Extremely High Throughput (EHT) PHYs; and to the Directional Multi Gigabit (DMG) and enhanced DMG (EDMG) PHYs to enhance Wireless Local Area Network (LAN) sensing operation in license-exempt frequency bands between 1 GHz and 7.125 GHz and above 45 GHz.

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Telecommunications and Information Exchange between Systems
Local and Metropolitan Area Networks—
Specific Requirements

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Amendment 4: Enhancements for Wireless LAN Sensing

NOTE—The editing instructions contained in this amendment define how to merge the material contained herein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editorial instructions, change markings and this NOTE will not be carried over into future editions of the base standard because the changes will be incorporated into the base standard.

3. Definitions, acronyms, and abbreviations

3.2 Definitions specific to IEEE Std 802.11

Insert the following definitions (maintaining alphabetical order):

directional multi-gigabit (DMG) sensing: [DMG sensing] The use of physical layer (PHY) and medium access control (MAC) features of DMG stations (STAs) to obtain measurements that might be useful to estimate features such as range, velocity, and motion of objects in an area of interest.

directional multi-gigabit (DMG) sensing procedure: [DMG sensing procedure] A procedure that allows a DMG station (STA) to perform DMG sensing.

sensing: The use of physical layer (PHY) and medium access control (MAC) features of high-efficiency (HE) stations (STAs) or extremely high throughput (EHT) STAs to obtain measurements that might be useful to estimate features such as range, velocity, and motion of objects in an area of interest.

sensing by proxy (SBP) initiator: [SBP initiator] A non-access point (non-AP) high-efficiency (HE) station (STA) or non-AP extremely high throughput (EHT) STA that transmits an SBP Request frame, or a

non-AP, or non-personal basic service set (PBSS) control point (non-PCP) directional multi-gigabit (DMG) STA that transmits a DMG SBP Request frame.

sensing by proxy (SBP) responder: [SBP responder] A high-efficiency (HE) access point (AP) or extremely high throughput (EHT) AP that is the intended recipient of an SBP Request frame, or a directional multi-gigabit (DMG) AP or a DMG personal basic service set (PBSS) control point (PCP) that is the intended recipient of a DMG SBP Request frame.

sensing initiator: A high-efficiency (HE) station (STA) or extremely high throughput (EHT) STA that initiates a sensing procedure by transmitting a Sensing Measurement Request frame, or a directional multi-gigabit (DMG) STA that initiates a DMG sensing procedure by transmitting a DMG Sensing Measurement Request frame.

sensing procedure: A procedure that allows a high-efficiency (HE) station (STA) or extremely high throughput (EHT) STA to perform sensing.

sensing receiver: A station (STA) that is the intended recipient of physical layer (PHY) protocol data units (PPDUs) sent by a sensing transmitter to obtain sensing measurements in either a sensing procedure or a directional multi-gigabit (DMG) sensing procedure.

sensing responder: A high-efficiency (HE) station (STA) or extremely high throughput (EHT) STA that participates in a sensing procedure by responding to a sensing initiator, or a directional multi-gigabit (DMG) STA that participates in a DMG sensing procedure by responding to a sensing initiator.

sensing transmitter: A station (STA) that transmits physical layer (PHY) protocol data units (PPDUs) used for measurements in a sensing procedure or a directional multi-gigabit (DMG) sensing procedure.

unassociated sensing negotiation and measurement management frame protection required: A security policy that specifies whether sensing frames are required to be protected without association.

unassociated sensing negotiation and measurement management frame protection required exempt 20 MHz: A security policy that specifies whether sensing frames are required to be protected without association if bandwidth greater than 20 MHz is used.

3.4 Acronyms and abbreviations

Insert the following acronym definitions (maintaining alphabetical order):

LUT	lookup table
NDPA	NDP announcement
SBP	sensing by proxy
SI2SR	sensing initiator to sensing responder
SR2SI	sensing responder to sensing initiator
SR2SR	sensing responder to sensing responder
TF	trigger frame
USID	unassociated STA identifier
USNM-MFPR	unassociated sensing negotiation and measurement management frame protection required
USNM-MFPR-X20	unassociated sensing negotiation and measurement management frame protection required exempt 20 MHz

4. General description

Insert the following subclause at the end of Clause 4:

4.11 WLAN sensing

WLAN sensing uses certain IEEE 802.11 PHY and MAC features to make environmental measurements that could be useful to estimate the range, velocity, and motion of objects in an area of interest. Measurements obtained with WLAN sensing might support applications such as presence detection, motion detection, and gesture classification.

WLAN sensing comprises four procedures: sensing procedure (see 11.55.1), sensing by proxy (SBP) procedure (see 11.55.2), DMG sensing procedure (see 11.55.3), and DMG SBP procedure (see 11.55.4).

The sensing procedure allows HE STAs or EHT STAs to perform sensing measurements. The SBP procedure enables a non-AP HE STA or non-AP EHT STA to request an HE AP or EHT AP to perform sensing measurements on its behalf. Similarly, the DMG sensing procedure allows DMG STAs to perform DMG sensing measurements, and the DMG SBP procedure enables a non-AP and non-PCP DMG STA to request a DMG AP or DMG PCP to perform DMG sensing measurements on its behalf.

6. Layer management

6.4 Table of MLME SAP interfaces

Insert the following rows in Table 6-1:

Table 6-1—MLME SAP interface

Service Name	MLME-xxx	Type	References	Comments
Sensing procedure	SENSMSMTSESSION	1	9.6.7.56, 9.6.7.57	See 11.55.1.4
	SENSMSMTQUERY	3	9.6.7.60	See 11.55.1.4.2
	SENSMSMTTERMINATION	2	9.6.7.59	See 11.55.1.6
	SENSTBMSMTRQ	6	9.3.1.22.15.2, 9.3.1.19.6, 9.3.1.22.15.3, 9.3.1.22.15.4, 9.3.1.22.15.5, 9.3.1.22.15.6	See 11.55.1.5.2
	SENSNONTBMSMTRQ	6	9.3.1.19.6, 9.6.7.58	See 11.55.1.5.3
	SENSREPORT	7	9.4.1.81	See 11.55.1.5.2.6, 11.55.1.5.3.3
	SENSREPORTRQ	N/A	6.5.33	
SBP procedure	SBP	1	9.6.7.58, 9.6.39.2	See 11.55.2.2
	SBPREPORT	2	9.6.7.58, 9.6.39.2	See 11.55.2.3
	SBPTERMINATION	2	9.6.7.63	See 11.55.2.4
DMG sensing procedure	DMG-SENSMSMTSESSION	1	9.6.19.24, 9.6.19.25, 9.6.21.8, 9.6.21.9	See 11.55.3.4
	DMG-SENSMSMTTERMINATION	2	9.6.21.11, 9.6.39.5	See 11.55.3.8
	DMG-SENSMSMTSTART	5	9.6.21.3, 9.3.1.26.5, 9.3.1.26.7	See 11.55.3.5, 11.55.3.6
	DMG-SENSMSMT	7	9.6.21.10, 9.6.39.4	See 11.55.3.6, 11.55.3.7
	DMG-SENSREPORT	3		
DMG SBP procedure	DMG-SBP	1	9.6.19.26, 9.6.19.27, 9.6.21.12, 9.6.21.13	See 11.55.4.2
	DMG-SBPREPORT	2	9.6.19.28, 9.6.21.14	See 11.55.4.3
	DMG-SBPTERMINATION	2	9.6.21.15, 9.6.39.6	See 11.55.4.4

6.5 MLME SAP primitives

Insert the following new subclause at the end of 6.5 :

6.5.33 Sensing report request

6.5.33.1 General

The following set of MLME primitives support the reporting of sensing measurement results between an AP and a non-AP STA.

If used in the basic reporting phase of a TB sensing measurement exchange (see 11.55.1.5.2.6.1) or in a non-TB sensing measurement exchange (see 11.55.1.5.3.3), the set of MLME primitives in this subclause assume the general form Type 2 (see 6.3.3).

If used in the threshold-based reporting phase of a TB sensing measurement exchange (see 11.55.1.5.2.6.2), the use of the set of MLME primitives is illustrated in Figure 6-16a.

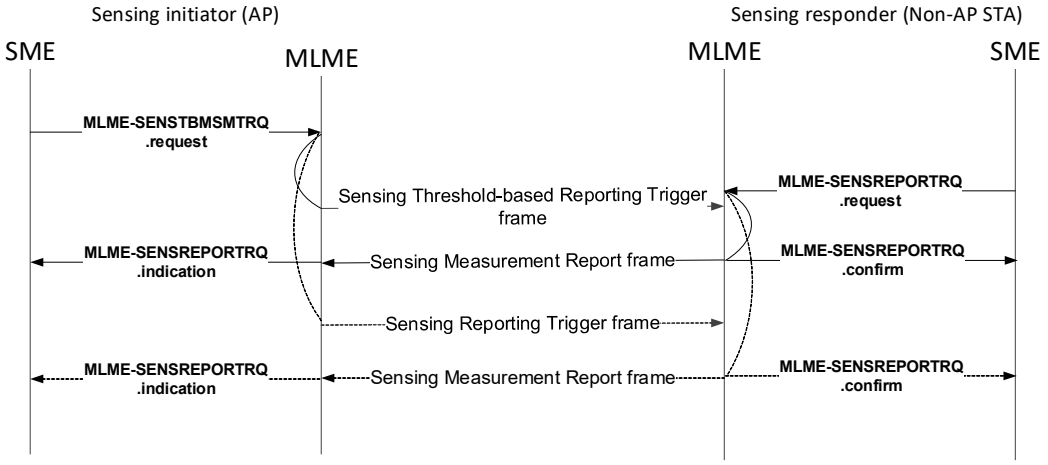

Figure 6-16a—Example of the threshold-based reporting phase of a TB sensing measurement exchange

6.5.33.2 MLME-SENSREPORTRQ.request

6.5.33.2.1 Function

This primitive requests the transmission of a Sensing Measurement Report frame to a peer STA.

6.5.33.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-SENSREPORTRQ.request(
PeerSTAAddress,
SensingMeasurementReportContainer
)

Name	Type	Valid range	Description
PeerSTAAddress	MAC address	Any valid individual MAC address	Specifies the MAC address of the sensing initiator to which the Sensing Measurement Report frame is sent.
SensingMeasurementReportContainer	As defined in 9.4.1.81.	As defined in 9.4.1.81.	As defined in 9.4.1.81.

6.5.33.2.3 When generated

This primitive is generated by the SME to request that a Sensing Measurement Report frame be sent to a peer STA to deliver a sensing measurement report.

6.5.33.2.4 Effect of receipt

On receipt of this primitive during a TB sensing measurement exchange (see 11.55.1.5.2.6), the MLME constructs a Sensing Measurement Report frame and causes it to be transmitted when triggered by the Sensing Reporting Trigger frame (see 11.55.1.5.2.6.1) or the Sensing Threshold-Based Reporting Trigger frame (see 11.55.1.5.2.6.2).

On receipt of this primitive during a non-TB sensing measurement exchange (see 11.55.1.5.3.3), the MLME constructs a Sensing Measurement Report frame and causes it to be transmitted to the non-AP STA in response to the received Sensing NDP Announcement frame and sensing initiator to sensing responder (SI2SR) NDP.

6.5.33.3 MLME-SENSREPORTRQ.confirm

6.5.33.3.1 Function

This primitive reports the results of a request to transmit a Sensing Measurement Report frame.

6.5.33.3.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SENSREPORTRQ.confirm(
                    PeerSTAAddress,
                    MeasurementSessionID,
                    MeasurementExchangeID
                    )
```

Name	Type	Valid range	Description
PeerSTAAddress	MAC address	Any valid individual MAC address	Specifies the MAC address of the sensing initiator to which the Sensing Measurement Report frame is sent.
MeasurementSessionID	Integer	As defined in Figure 9-1258c	Identifies the sensing measurement session for the Sensing Measurement Report frame that was sent.
MeasurementExchangeID	Integer	As defined in 11.55.1.5.1	Identifies the sensing measurement exchange for the Sensing Measurement Report frame that was sent.

6.5.33.3.3 When generated

This primitive is generated by the MLME when the STA successfully transmits a Sensing Measurement Report frame.

6.5.33.3.4 Effect of receipt

On receipt of this primitive, the SME may release the resources associated with the sensing measurement report of the reported sensing measurement exchange.

6.5.33.4 MLME-SENSREPORTRQ.indication

6.5.33.4.1 Function

This primitive indicates that a Sensing Measurement Report frame has been received.

6.5.33.4.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-SENSREPORTRQ.indication(
PeerSTAAddress,
SensingMeasurementReportContainer
)

Name	Type	Valid range	Description
PeerSTAAddress	MAC address	Any valid individual MAC address	Specifies the MAC address of the sensing initiator to which the Sensing Measurement Report frame is sent.
SensingMeasurementReportContainer	As defined in 9.4.1.81.	As defined in 9.4.1.81.	Provides sensing measurement results or a CSI variation feedback value obtained from a sensing measurement exchange, as defined in 9.4.1.81.

6.5.33.4.3 When generated

This primitive is generated by the MLME when the STA receives a Sensing Measurement Report frame.

6.5.33.4.4 Effect of receipt

On receipt of this primitive, if received during the basic reporting phase of a TB sensing measurement exchange (see 11.55.1.5.2.6.1) or during a non-TB sensing measurement exchange (see 11.55.1.5.3.3), the SME is notified of sensing measurement results. If received during the threshold-based reporting phase of a TB sensing measurement exchange (see 11.55.1.5.2.6.2), the SME is notified of sensing measurement results or the CSI variation feedback value.

8. PHY service specification

8.3 Detailed PHY service specifications

8.3.4 Basic service and options

8.3.4.4 Vector descriptions

Insert the following row in Table 8-4:

Table 8-4—Vector descriptions

Parameter	Associated vector	Value
EDMG_MS_SENSING_NSTA	PHYCONFIG_VECTOR	Set to the number of STAs that are the intended recipients of the next EDMG multistatic sensing PPDU.

9. Frame formats

9.3 Format of individual frame types

9.3.1 Control frames

9.3.1.19 NDP Announcement frame format

9.3.1.19.1 General description

Change the first paragraph of 9.3.1.19.1 as follows:

The NDP Announcement frame has ~~four~~ five variants, the NDP Announcement frame, the HE NDP Announcement frame, the Ranging NDP Announcement frame, the Sensing NDP Announcement frame, and the EHT NDP Announcement frame. The ~~four~~ five formats are distinguished by the setting of the NDP Announcement Variant subfield in the Sounding Dialog Token field~~.~~ and the presence of the STA Info field with AID11 subfield equal to 2045 and with B31 set to 1 (see Table 9-42b).

Change Table 9-42a as follows:

Table 9-42a—Encoding of the AID11 subfield in an NDP Announcement frame

AID11 subfield	Description	NDP Announcement frame variant applicability (see NOTE)				
		VHT	HE	EHT	Ranging	Sensing
0	STA Info field is addressed to an AP or mesh	Applicable				
1–2006	If the NDP Announcement frame is not a Ranging or a Sensing variant, the STA Info field is addressed to an associated STA whose AID is equal to the value in the AID11 subfield. If the NDP Announcement frame is a Ranging or a Sensing variant, the STA Info field is addressed to an unassociated STA or an associated STA whose RSID/USID/AID is equal to the value in the RSID11/USID11/ AID11 subfield.	Applicable				
2007		Applicable	Applicable (subject to 35.15.1)	Not applicable	Applicable	Applicable
2008–2042	N/A	Not applicable				

Table 9-42a—Encoding of the AID11 subfield in an NDP Announcement frame *(continued)*

AID11 subfield	Description	NDP Announcement frame variant applicability (see NOTE)				
		VHT	HE	EHT	Ranging	Sensing
2043	STA Info field contains a sequence authentication code	Not applicable	Not applicable	Not applicable	Applicable	Not applicable
2044	STA Info field contains a partial TSF	Not applicable	Not applicable	Not applicable	Applicable	Applicable
2045	~~STA Info field contains the I2R NDP Tx Power and R2I NDP Target RSSI subfields if the NDP Announcement frame is a Ranging variant.~~ For Ranging NDP Announcement frame, it contains I2R NDP TX Power and R2I RSSI target. For Sensing NDP Announcement frame, it contains the SI2SR NDP TX power and the Measurement Session ID, and it may contain the sensing responder to sensing initiator (SR2SI) NDP Target RSSI.	Not applicable	Not applicable	Not applicable	Applicable	Applicable
2046	N/A	Not applicable				
2047	STA Info field contains a Disallowed Subchannel Bitmap subfield	Not applicable	Applicable	Not applicable	Not applicable	Not applicable
NOTE—Not applicable means that the particular AID11 value is not used for that variant and is reserved.						

Change the second paragraph below Table 9-42a as follows:

If the NDP Announcement frame contains ~~only~~ exactly one STA Info field with a value less than 2008 in the AID11, AID12 or AID13 subfield, then in the case of VHT, HE or EHT NDP Announcement frames the RA field is set to the address of the STA addressed in the ~~only~~ STA Info field of this NDP Announcement frame (see 10.35.5.2, 26.7, 35.7). In the case of Ranging NDP Announcement frame, the RA address is set to the address of the RSTA or ISTA that is the intended recipient of the frame. In the case of Sensing NDP Announcement frame, the RA is set to the address of the sensing responder that is either an AP in non-TB sensing measurement exchanges (see 11.55.1.5.3) or a non-AP STA in TB sensing measurement exchanges (see 11.55.1.5.2). If the NDP Announcement frame contains more than one STA Info field with a value less than 2008 in the AID11 subfield, then the RA field is set to the broadcast address.

Change Table 9-42b as follows:

Table 9-42b—NDP Announcement frame variant encoding

NDP Announcement Variant subfield	NDP Announcement frame variant
0	VHT NDP Announcement frame
1	Ranging NDP Announcement frame or Sensing NDP Announcement frame
2	HE NDP Announcement frame
3	EHT NDP Announcement frame

Insert a sixth new child subclause within 9.3.1.19 as follows:

9.3.1.19.6 Sensing NDP Announcement frame format

In a Sensing NDP Announcement frame, the STA Info field with AID11 subfield equal to 2045 is always present and it is transmitted as the first STA Info field. The STA Info field with AID11 subfield equal to 2045 is not present in the Ranging NDP Announcement frame used for TB ranging measurement exchange but might be present in the non-TB ranging measurement exchange (see Table 9-42ba).

Table 9-42ba—Ranging NDP Announcement frame and Sensing NDP Announcement frame encoding

Presence of STA Info field with AID11 subfield equal to 2045	B31 in the STA Info field with AID11 subfield equal to 2045	NDP Announcement frame variant
N/A	N/A	Ranging NDP Announcement frame in TB ranging exchange
Yes	Reserved	Ranging NDP Announcement frame in non-TB ranging exchange if negotiated to include TX power for I2R NDP
Yes	1	Sensing NDP Announcement frame in TB/non-TB sensing measurement exchange

The format of the Sensing NDP Announcement frame is the same as the HE NDP Announcement frame shown in Figure 9-74f.

The Sounding Dialog Token Number field in the Sounding Dialog Token field contains a Measurement Exchange ID value in the range 0 to 63 that identifies the measurement exchange that this transmitted Sensing NDP Announcement frame is part of (see 11.55.1.5.2 and 11.55.1.5.3).

The format of the STA Info field in a Sensing NDP Announcement frame if the AID11 subfield is less than 2008 is defined in Figure 9-74p if the frame is sent in a non-TB sensing measurement exchange, and Figure 9-74q if the frame is sent in a TB sensing measurement exchange.

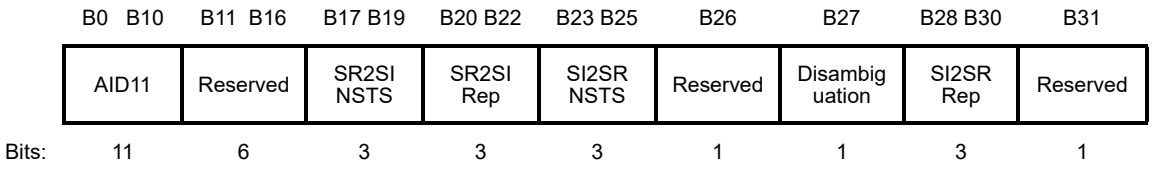

Figure 9-74p—STA Info field format in a Sensing NDP Announcement frame if the AID11 subfield is less than 2008 and if the frame is sent in a non-TB sensing measurement exchange

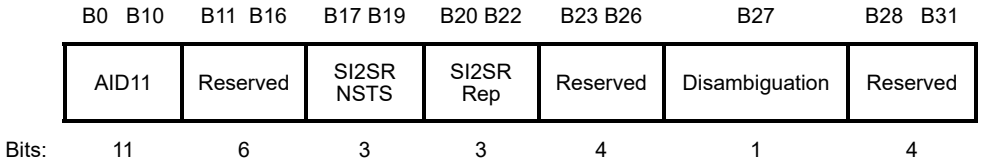

Figure 9-74q—STA Info field format in a Sensing NDP Announcement frame if the AID11 subfield is less than 2008 and if the frame is sent in a TB sensing measurement exchange

A Sensing NDP Announcement frame contains at most one STA Info field with an AID11 subfield less than 2008 per STA that is an intended recipient of this frame.

In a TB sensing measurement exchange (see 11.55.1.5.2), the RA field is set to the broadcast address if more than one STA are intended recipients of this frame; otherwise, the RA field is set to the address of the STA that is the single intended recipient of this frame.

If the AID11 subfield is less than 2008, it identifies a STA that is an intended recipient of this frame and assigns the parameters within this STA Info field to this STA. In case of the TB sensing measurement exchange (see 11.55.1.5.2), the AID11 subfield in Figure 9-74q contains the 11 LSBs of the AID of an associated STA or the unassociated STA identifier (USID) of an unassociated STA that is to process the NDP that follows. In the case of a non-TB sensing measurement exchange (see 11.55.1.5.3), the intended recipient is identified by the RA field and the AID11 subfield in Figure 9-74p is set to 0.

When used in a TB sensing measurement exchange (see 11.55.1.5.2 and Figure 9-74q):

— If the bandwidth of the PPDU carrying the NDP Announcement frame is less than or equal to 160 MHz,
  — The SI2SR NSTS and SI2SR Rep fields are used to indicate the HE-LTF configuration (see 27.3.19.1) of the SI2SR NDP that follows; and
  — The SI2SR Rep field is set to the number of HE-LTF repetitions of the corresponding HE Ranging NDP minus 1 (see 27.3.19.1). If the SI2SR Rep is equal to 0, then there is no HE-LTF repetition in the SI2SR NDP.
— If the bandwidth of the PPDU carrying the NDP Announcement frame is equal to 320 MHz,

— The SI2SR NSTS and SI2SR Rep fields are used to indicate the EHT-LTF configuration (see 36.3.19a.1) of the SI2SR NDP that follows, and the SI2SR Rep field is set the number of EHT-LTF repetitions of the corresponding EHT Ranging NDP minus 1 (see 36.3.19a.1). If the SI2SR Rep is equal to 0, then there is no EHT-LTF repetitions in the SI2SR NDP.

In a non-TB sensing measurement exchange (see 11.55.1.5.3), the single intended recipient STA is an AP and the RA field is set to the address of that STA.

When used in a non-TB sensing measurement exchange (see 11.55.1.5.3 and Figure 9-74p):

— If the bandwidth of the PPDU carrying the NDP Announcement frame is less than or equal to 160 MHz,

  — The SI2SR NSTS and SI2SR Rep fields are used to indicate the HE-LTF configuration (see 27.3.19.1) of the SI2SR NDP that follows;

  — The SR2SI NSTS and SR2SI Rep fields indicate the HE-LTF configuration of the SR2SI NDP sent in response by the AP (i.e., sensing responder); and

  — The SR2SI Rep and SI2SR Rep fields are set to the number of HE-LTF repetitions of the corresponding HE Ranging NDP minus 1 (see 27.3.19.1). If the SI2SR Rep and SR2SI Rep are equal to 0, then there is no HE-LTF repetition in the SI2SR NDP and SR2SI NDP that follow, respectively.

— If the bandwidth of the PPDU carrying the NDP Announcement frame is equal to 320 MHz,

  — The SI2SR NSTS and SI2SR Rep fields are used to indicate the EHT-LTF configuration (see 36.3.19a.1) of the SI2SR NDP that follows, the SR2SI NSTS and SR2SI Rep fields indicate the EHT-LTF configuration of the SR2SI NDP sent in response by the AP (i.e., sensing responder), and the SR2SI Rep and SI2SR Rep fields are set to the number of EHT-LTF repetitions of the corresponding EHT Ranging NDP minus 1 (see 36.3.19a.1). If the SI2SR Rep and SR2SI Rep are equal to 0, then there is no EHT-LTF repetition in the SI2SR NDP and SR2SI NDP that follow, respectively.

The format of the STA Info field with AID11 equal to 2044 is shown in Figure 9-74r.

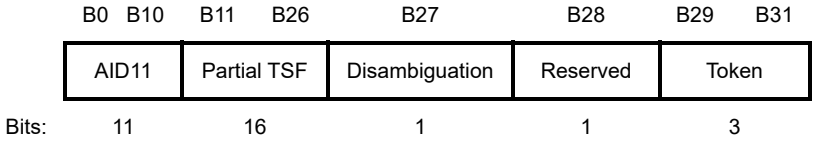

Figure 9-74r— STA Info field format in a Sensing NDP Announcement frame with AID11 subfield equal to 2044

The STA Info field with AID11 subfield equal to 2044 is used in TB sensing measurement exchanges (see 11.55.1.5.2) to carry the Partial TSF field. The Partial TSF field contains 16 bits of the AP's TSF time, TSF[21:6], at the time of transmitting the preceding Sensing Polling Trigger frame.

The Token field is set to the value of the Token field of the Sensing Polling Trigger frame whose partial transmission TSF time is carried.

If the AID11 subfield is equal to 2045, the format of the STA Info field is shown in Figure 9-74s.

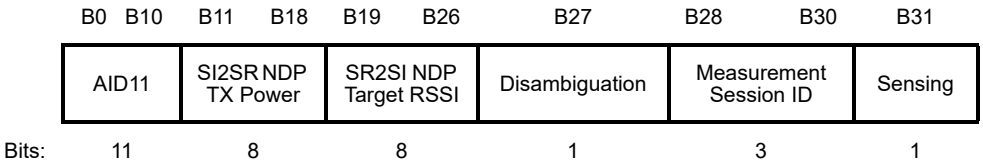

Figure 9-74s—STA Info field format in a Sensing NDP Announcement frame with AID11 subfield equal to 2045

The STA Info field with AID11 subfield equal to 2045 is used in the non-TB sensing measurement exchange (see 11.55.1.5.3) to carry the SI2SR NDP TX Power and SR2SI NDP Target RSSI fields. It is also used in a TB sensing measurement exchange (see 11.55.1.5.2) to carry the SI2SR NDP TX Power, while the SR2SI NDP Target RSSI field is reserved.

The SI2SR NDP TX Power field indicates the average power per 20 MHz bandwidth referenced to the antenna connector of all antennas used to transmit the following SI2SR NDP. The transmit power is reported with a resolution of 1 dB, with values in the range 0 to 60 representing –20 dBm to 40 dBm, respectively. Values above 60 are reserved.

The SR2SI NDP Target RSSI field indicates the preferred receive signal power, averaged over the non-AP STA's antenna connectors, for future SR2SI NDPs to be transmitted by the AP. The preferred receive signal power in units of dBm is Target RSSI $= -110 + FVal$, where $FVal$ is the value of the SR2SI NDP Target RSSI field, except that values above 90 indicate that the non-AP STA has no receive signal power preference for the SR2SI NDPs.

In the STA Info field with AID11 subfield equal to 2045, bit B31 is set to 1 to indicate that the frame is a Sensing NDP Announcement frame, and bits B28 through B30 are set to the Measurement Session ID of the corresponding sensing measurement exchange.

9.3.1.22 Trigger frame format

9.3.1.22.1 General

Change Table 9-47 as follows:

Table 9-47—Trigger Type subfield encoding

Trigger Type subfield value	Trigger frame variant
8	Ranging/Sensing

Change the second paragraph below Table 9-47 as follows:

The More TF subfield of the Common Info field indicates whether or not a subsequent Trigger frame is scheduled for transmission. The More TF subfield is set as defined in 26.8.2, 26.8.3.2, ~~and~~ 11.21.6.4.3, and 11.55.1.5.2.

Change Table 9-46k as follows:

Table 9-46k—UL Target Receive Power subfield in Trigger frame

UL Target Receive Power subfield	Description
127	The STA transmits the TB PPDU at the STA's maximum transmit power for the assigned MCS. If the eliciting trigger frame is a Sounding Ranging Trigger frame, ~~or~~ a Passive Sounding Ranging Trigger frame, an SR2SI Sounding Trigger frame, or an SR2SR Sounding Trigger frame, then the STA uses the maximum transmit power for HE-MCS 0 for an HE TB Ranging NDP and an HE Ranging NDP or EHT-MCS 0 for an EHT TB Ranging NDP and an EHT Ranging NDP. If the eliciting trigger frame is a Secure Sounding Ranging Trigger frame, then the STA uses the maximum transmit power for HE-MCS 6 for an HE TB Ranging NDP or EHTMCS 6 for an EHT TB Ranging NDP. NOTE—The expected receive signal power is then the STA's maximum transmit power for the assigned HE or EHT MCS minus the path loss.

Insert the following subclauses after 9.3.1.22.14:

9.3.1.22.15 Sensing Trigger frame format

9.3.1.22.15.1 General

The format of the Trigger Dependent Common Info field of the Sensing Polling (see 9.3.1.22.15.2), SR2SI Sounding (see 9.3.1.22.15.3), Sensing Threshold-Based Reporting (see 9.3.1.22.15.4), and Sensing Reporting (see 9.3.1.22.15.5) Trigger frames is shown in Figure 9-103a.

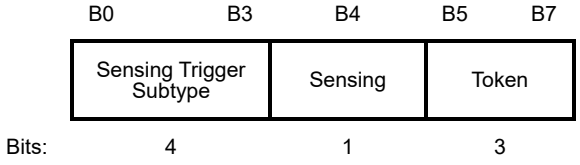

Figure 9-103a—Trigger Dependent Common Info field format of the Sensing Polling, SR2SI Sounding, Sensing Reporting, and Sensing Threshold-Based Reporting Trigger frames

The Token field in the Trigger Dependent Common Info field is used in a Sensing Polling Trigger frame to match it with the partial TSF time in a following Sensing NDP Announcement frame, SR2SI Sounding Trigger frame, or SR2SR Sounding Trigger frame. It is reserved in all other Sensing Trigger subvariants.

The format of the Trigger Dependent Common Info field of the SR2SR Sounding Trigger frame is shown in Figure 9-103b.

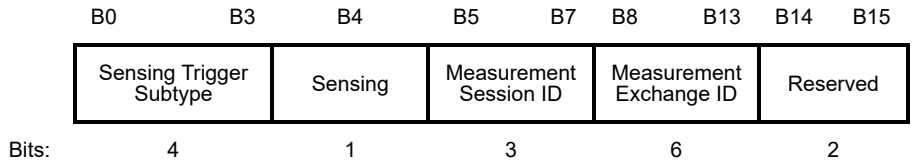

Figure 9-103b—Trigger Dependent Common Info field format of the SR2SR Sounding Trigger frame

The value of the Sensing Trigger Subtype field in the Sensing Trigger frame is defined in Table 9-55a.

Table 9-55a—Sensing Trigger Subtype field encoding

Sensing Trigger Subtype field value	Sensing Trigger frame variant
0	Sensing Polling
1	SR2SI Sounding
2	Sensing Threshold-Based Reporting
3	Sensing Reporting
4	SR2SR Sounding
5–15	Reserved

The Sensing field indicates whether the Trigger frame is of the type Sensing Trigger variant. The Sensing field is set to 1 to indicate whether the Trigger frame with Trigger Type subfield value 8 is a Sensing Trigger variant.

In the Trigger Dependent Common Info field of the SR2SR Sounding Trigger frame, the Measurement Session ID field contains a value in the range 0 to 7 that indicates the Measurement Session ID, and the Measurement Exchange ID field contains a value in the range 0 to 63 that indicates the measurement exchange ID.

The RA field, the CS Required, and the UL BW fields in the Common Info field of the Sensing Trigger frame are identical to the Basic Trigger frame described in 26.5.2, 35.5.2, and 9.3.1.22, except that the RA field in a Sensing Trigger frame with exactly one User Info field that is not a Special User Info field can be either individually addressed or broadcast.

The More Trigger Frame (TF) field of the Common Info field of the Sensing Trigger frame indicates whether a subsequent extra TB sensing measurement exchange is scheduled within a sensing availability window (see 11.55.1.5.2).

The TA of a Trigger frame destined to sensing responders in a TB sensing measurement exchange is set to the transmitting AP's MAC address if these sensing responders have accepted a Sensing Measurement Request frame containing the same transmitting AP's MAC address. The TA of a Trigger frame destined to sensing responders in a TB sensing measurement exchange is set to the transmitted BSSID if these sensing responders have received the Sensing Measurement Request frame containing different BSSID from an AP that support multiple BSSIDs.

9.3.1.22.15.2 Sensing Polling Trigger frame

The format of the User Info field in the Sensing Polling Trigger frame is defined in Figure 9-103c.

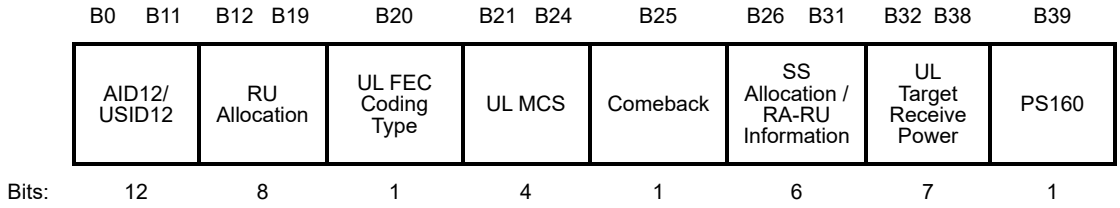

Figure 9-103c—User Info field format for a Sensing Polling Trigger frame

The AID12/USID12 field contains the 12 LSBs of the AID of an associated STA or the USID of an unassociated STA that is the intended recipient of the Sensing Reporting Trigger frame. The UL FEC Coding Type and UL Target Receive Power fields are identical to the corresponding fields in the Basic Trigger frame; see 9.3.1.22.

If the Sensing Polling Trigger frame solicits the transmission of an HE TB PPDU:

— The RU Allocation and SS Allocation/RA-RU Information fields are identical to the corresponding fields in the HE variant User Info field (see 9.3.1.22.4).

— The UL MCS field is identical to the UL HE-MCS field in the HE variant User Info field.

— The PS160 field is reserved.

If the Sensing Polling Trigger frame solicits the transmission of an EHT TB PPDU:

— The RU Allocation, SS Allocation/RA-RU Information, and PS160 fields are identical to the corresponding fields in the EHT variant User Info field (see 9.3.1.22.5).

— The UL MCS field is identical to the UL EHT MCS field in the EHT variant User Info field.

The Comeback field indicates whether the AP requests an unassociated non-AP STA to send a Sensing Measurement Query frame (9.6.7.60) to either establish a sensing measurement session or terminate an existing sensing measurement session(s). The Comeback field is set to 1 to indicate that the AP requests an unassociated non-AP STA to send a Sensing Measurement Query frame, otherwise is set to 0. The Comeback field is reserved for associated STAs.

The Trigger Dependent User Info field is not present in the Sensing Polling Trigger frame.

9.3.1.22.15.3 SR2SI Sounding Trigger frame

The format of the User Info field in the SR2SI Sounding Trigger frame if the AID12/USID12 subfield is not equal to 2008 is defined in Figure 9-103d.

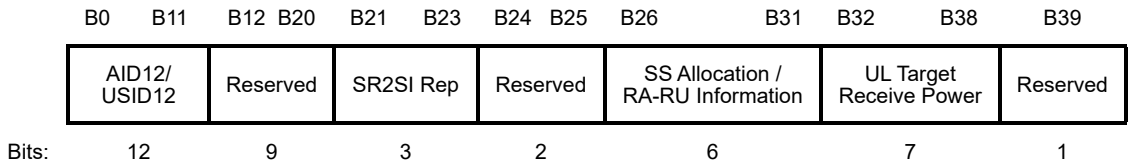

Figure 9-103d—User Info field format for SR2SI Sounding Trigger frame if the AID12/USID12 subfield is not equal to 2008

The AID12/USID12 field contains the 12 LSBs of the AID of an associated STA or the USID of an unassociated STA that is the intended recipient of the SR2SI Sounding Trigger frame.

The SR2SI Rep field indicates the number of LTF repetitions in the corresponding HE TB Ranging NDP or EHT TB Ranging NDP from the non-AP STA indicated in the AID12/USID12 subfield; the SR2SI Rep field is set to the number of LTF repetitions minus 1. The value of the SR2SI Rep field is the same in all User Info fields in a single SR2SI Sounding Trigger frame.

If the SR2SI Sounding Trigger frame is soliciting an HE TB Ranging NDP, the SS Allocation/RA-RU Information and UL Target Receive Power fields are identical to the corresponding fields in the HE variant User Info field of a Basic Trigger frame; see 9.3.1.22.4. If the SR2SI Sounding Trigger frame is soliciting an EHT TB Ranging NDP, the SS-Allocation/RA-RU Information and UL Target Receive Power fields are identical to the corresponding fields in the EHT User Info field of a Basic Trigger frame, see 9.3.1.22.5.

In both the HE variant Common Info field and the EHT variant Common Info field, the UL STBC, LDPC Extra Symbol Segment, Pre-FEC Padding Factor, and PE Disambiguity subfields are reserved.

The GI And HE-LTF Type subfield in the HE variant Common Info field is set to 1 (2x HE-LTF + 1.6 μs GI). The GI And HE/EHT-LTF Type subfield in the EHT variant Common Info field is set to 1 (2x EHT-LTF + 1.6 μs GI). The MU-MIMO HE-LTF Mode subfield in the HE variant Common Info field is set to 0 (HE single stream pilot HE-LTF mode).

The Doppler subfield in the HE variant Common Info field is set to 0.

The format of the User Info field in the SR2SI Sounding Trigger frame if the AID12/USID12 subfield is equal to 2008 is defined in Figure 9-103e.

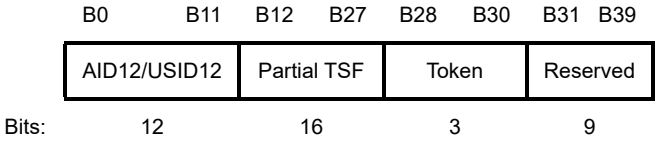

Figure 9-103e—User Info field format for SR2SI/SR2SR Sounding Trigger frame if the AID12/USID12 subfield is equal to 2008

If the AID12/USID12 subfield is equal to 2008, the User Info field is used to carry the Partial TSF field. The Partial TSF field contains 16 bits of the AP's TSF time, TSF[21:6], at the time of the transmission of the Sensing Polling Trigger frame that preceded the SR2SI Sounding Trigger frame carrying this User Info field.

The Token field is set to the value of the Token field of the Sensing Polling Trigger frame whose partial transmission TSF time is carried.

The SR2SI Sounding Trigger frame contains at least one User Info field with AID12/USID12 subfield set to less than 2008, and one User Info field with the AID12/USID12 subfield set to 2008.

The Trigger Dependent User Info field is not present in the SR2SI Sounding Trigger frame.

9.3.1.22.15.4 Sensing Threshold-Based Reporting Trigger frame

The format of the User Info field in the Sensing Threshold-Based Reporting Trigger frame is identical to the Sensing Reporting Trigger frame (see 9.3.1.22.15.5).

The Trigger Dependent User Info field is not present in the Sensing Threshold-Based Reporting Trigger frame.

9.3.1.22.15.5 Sensing Reporting Trigger frame

The format of the User Info field in the Sensing Reporting Trigger frame is defined in Figure 9-103f.

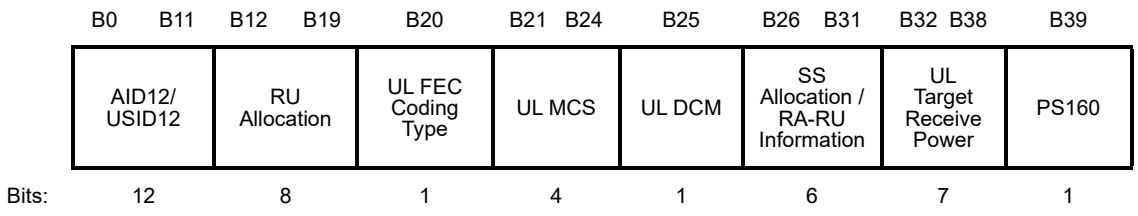

Figure 9-103f—User Info field format for Sensing Reporting Trigger frame

The AID12/USID12 field is identical to the corresponding subfield in the Sensing Polling Trigger frame. The UL FEC Coding Type and UL Target Receive Power fields are identical to the corresponding fields in the Basic Trigger frame; see 9.3.1.22.

If the Sensing Reporting Trigger frame solicits the transmission of an HE TB PPDU:

— The RU Allocation, UL DCM, and SS Allocation/RA-RU Information fields are identical to the corresponding fields in the HE variant User Info field (9.3.1.22.4).

— The UL MCS field is identical to the UL HE MCS field in the HE variant User Info field.

— The PS160 field is reserved.

If the Sensing Reporting Trigger frame solicits the transmission of an EHT TB PPDU:

— The RU Allocation, SS Allocation/RA-RU Information, and PS160 fields are identical to the corresponding fields in the EHT variant User Info field (9.3.1.22.5).

— The UL MCS field is identical to the UL EHT MCS subfield in the EHT variant User Info field.

— The UL DCM field is reserved.

The Trigger Dependent User Info field is not present in the Sensing Reporting Trigger frame.

9.3.1.22.15.6 SR2SR Sounding Trigger frame

The SR2SR Sounding Trigger frame contains one Transmitter User Info field, one or more Receiver User Info fields, and one User Info field with the AID12/USID12 subfield set to 2008.

The format of the Transmitter User Info field is defined in Figure 9-103g.

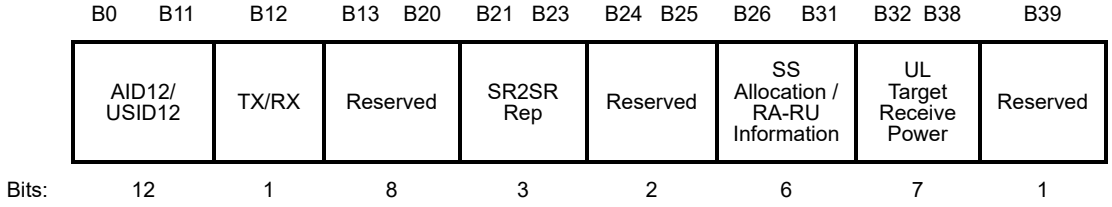

Figure 9-103g—Transmitter User Info field format for SR2SR Sounding Trigger frame if AID/USID is not equal to 2008

The Transmitter User Info field for the SR2SR Sounding Trigger frame follows the definition of the User Info field for the SR2SI Sounding Trigger frame except for the following:

— The TX/RX field is set to 0 to indicate that the addressed sensing responder is a sensing transmitter in the current SR2SR variant of the trigger frame (TF) sounding phase.

— The SR2SR Rep field indicates the number of LTF repetitions in the corresponding HE Ranging NDP or EHT Ranging NDP from the non-AP STA indicated in the AID12/USID12 subfield; the SR2SR Rep field is set to the number of LTF repetitions minus 1.

— If the SR2SR Sounding Trigger frame is soliciting an HE Ranging NDP, the SS Allocation/RA-RU Information field and UL Target Receive Power filed are identical to the same fields in the HE variant User Info field of a Basic Trigger frame; see 9.3.1.22.4 corresponding to the HE Ranging NDP from the non-AP STA indicated in the AID12/USID12 subfield in this SR2SR Sounding Trigger frame. If the SR2SR Sounding Trigger frame is soliciting an EHT Ranging NDP, the

SS-Allocation/RA-RU Information and UL Target Receive Power fields are identical to the corresponding fields in the EHT User Info field of a Basic Trigger frame, see 9.3.1.22.5 corresponding to the EHT Ranging NDP from the non-AP STA indicated in the AID12/USID12 field in the SR2SR Sounding Trigger frame.

The format of the Receiver User Info field is defined in Figure 9-103h.

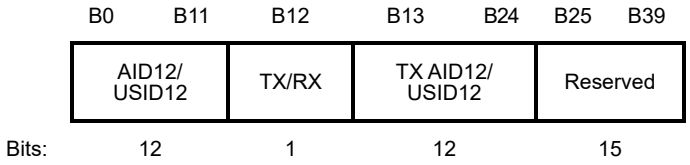

Figure 9-103h—Receiver User Info field format for SR2SR Sounding Trigger frame if AID/USID is not equal to 2008

The AID12/USID12 field contains the 12 LSBs of the AID of an associated STA or the USID of an unassociated STA that is the intended recipient of the SR2SR Sounding Trigger frame.

The TX/RX field is set to 1 to indicate that the addressed sensing responder is a sensing receiver in the current SR2SR variant of the trigger frame (TF) sounding phase.

The TX AID12/USID12 subfield indicates the AID/USID of the sensing transmitter in the current SR2SR variant of the TF sounding phase. The value of the TX AID12/USID12 subfield is the same as the value of the AID12/USID12 subfield in the Transmitter User Info field.

The AID12/USID12 subfield of the Transmitter User Info field or the Receiver User Info field is not equal to 2008.

The format of the User Info field in the SR2SR Sounding Trigger frame is defined in Figure 9-103e if the AID12/USID12 subfield is equal to 2008.

If the AID12/USID12 subfield is equal to 2008, the User Info field is used to carry the Partial TSF field. The Partial TSF field contains 16 bits of the AP's TSF time, TSF[21:6], at the time of transmitting the Sensing Polling Trigger frame that preceded the SR2SR Sounding Trigger frame carrying this User Info field.

The Token field is set to the value of the Token field of the Sensing Polling Trigger frame whose partial transmission TSF time is carried.

In both the HE variant Common Info field and the EHT variant Common Info field, the UL STBC, LDPC Extra Symbol Segment, Pre-FEC Padding Factor, and PE Disambiguity subfields are reserved.

The GI And HE-LTF Type subfield in the HE variant Common Info field is set to 1 (2x HE-LTF + 1.6 μs GI). The GI And HE/EHT-LTF Type subfield in the EHT variant Common Info field is set to 1 (2x EHT-LTF + 1.6 μs GI). The MU-MIMO HE-LTF Mode subfield in the HE variant Common Info field is set to 0 (HE single stream pilot HE-LTF mode).

The Doppler subfield in the HE variant Common Info field is set to 0.

9.3.1.26 TDD Beamforming frame format

9.3.1.26.1 Overview

Change the paragraph below Figure 9-111 as follows:

Collectively, the TDD Group Beamforming, TDD Beam Measurement, and RA field values indicate a TDD Beamforming frame usage, as listed in Table 9-57 and Table 9-57a.

Change the title of Table 9-57 from "TDD Beamforming frame usage" to "TDD Beamforming frame usage if TDD Beamforming frame type subfield is not set to 3 (DMG Sensing)".

Insert the following table after Table 9-57:

Table 9-57a—TDD Beamforming frame usage if the TDD Beamforming frame type subfield is set to 3 (DMG Sensing)

TDD Group Beamforming field value	TDD Beam Measurement field value	Frame usage
0	0	DMG Sensing Request
0	1	DMG Sensing Response
1	0	DMG Sensing Poll
1	1	Reserved

Change the last row in Table 9-58 as follows:

Table 9-58—TDD Beamforming Frame Type subfield definition

Value	Meaning
3	~~Reserved~~ DMG Sensing.

Insert the following subclauses after 9.3.1.26.4:

9.3.1.26.5 DMG Sensing Request frame

The TDD Beamforming Information field of a DMG Sensing Request frame is shown in Figure 9-118a.

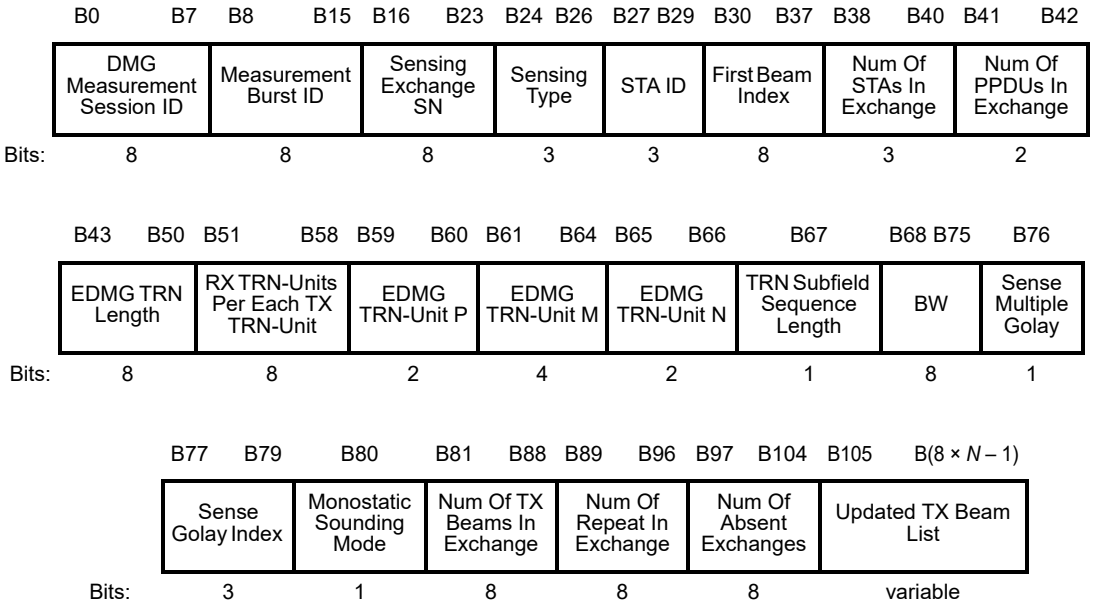

Figure 9-118a—TDD Beamforming Information field format for a DMG Sensing Request frame

The DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN fields identify the DMG sensing measurement session, the DMG sensing burst, and the DMG sensing measurement exchange, respectively.

The Sensing Type field indicates the type of sensing requested by the DMG Sensing Request frame and is defined in Table 9-59a. It takes values indicated in Table 9-417ac with the exception of the value of 2 (Bistatic), which is invalid in a DMG Sensing Request frame.

Table 9-59a—Sensing Type field definition

Value	Description
0	Coordinated Monostatic
1	Coordinated Bistatic
2	Multistatic
3–7	Reserved

The STA ID field identifies the index of the receiving STA sync field in the EDMG multistatic sensing PPDU (see 28.9.4.4.2). The STA ID field also indicates the order in which DMG Sensing Request frames are sent in sensing measurement exchanges that use such frame.

The First Beam Index field is an index into the TX Beam List in the DMG Sensing Measurement Session element. It indicates the first beam to be used in the DMG sensing measurement exchange. It is reserved if the Sensing Type field is set to Coordinated Bistatic.

The Num Of STAs In Exchange field indicates the number of STAs participating in the DMG sensing measurement exchange.

The Num Of PPDUs In Exchange field indicates the number of EDMG multistatic sensing PPDUs present in the DMG sensing measurement exchange. The Num Of PPDUs In Exchange field is reserved if the Sensing Type field is set to Coordinated Monostatic.

The EDMG TRN Length, RX TRN-Units Per Each TX TRN-Unit, EDMG TRN-Unit P, EDMG TRN-Unit M, EDMG TRN-Unit N, and TRN Subfield Sequence Length fields contain the values of the corresponding header fields in the EDMG multistatic sensing PPDU. These fields are reserved if the Sensing Type field is set to Coordinated Monostatic or Coordinated Bistatic.

The Sense Multiple Golay field indicates that the Golay sequence used in the TRN field of EDMG BRP PPDUs or EDMG multistatic sensing PPDUs sent in the DMG sensing measurement exchange is based on the sequence index specified in the Sense Golay Index field. For the coordinated monostatic sensing type, if sensing is performed with the TRN field, this field indicates that the Golay sequence suggested to be used in the TRN field of DMG Monostatic sensing PPDUs is based on the Sense Golay Index field. Otherwise, this field is reserved. The Sense Golay Index field indicates the index of the Golay sequence of the TRN field (see 28.10.2).

The Monostatic Sounding Mode field indicates whether the sounding phase of the coordinated monostatic DMG sensing measurement exchange is performed in sequential or parallel mode. A value of 1 indicates the sequential mode, a value of 0 indicates the parallel mode. This field is reserved if the Sensing Type field is not set to Coordinated Monostatic.

The BW field is set to a nonzero value, in which “one” indicates the channel over which in the sounding phase, a Monostatic PPDU is transmitted if the Sensing Type field is set to Coordinated Monostatic with the Monostatic Sounding Mode field set to 0. The BW fields carried within different DMG Sensing Request frames are set to different nonzero values. The operating channel indicated in the BW field is one of the channels as specified in the BSS Operating Channels field and Primary Channel field within the EDMG Operation element (see 9.4.2.266) transmitted by an EDMG AP or an EDMG PCP (see 10.23.2.14). The BW field is set to all 0s if the Sensing Type field is set to Coordinated Monostatic with the Monostatic Sounding Mode field set to 0 to indicate that in the sounding phase Monostatic PPDUs are transmitted solely on the primary channel. The BW field is reserved if the Sensing Type field is set to Coordinated Bistatic or Coordinated Monostatic with the Monostatic Sounding Mode field set to 1.

The Num Of TX Beams In Exchange, Num Of Repeat In Exchange, and Updated TX Beam List fields are present if the Sensing Type field is set to the Coordinated Monostatic; otherwise, they are not present.

The Num Of TX Beams In Exchange field indicates the number of TX beams to be used in the next DMG sensing measurement exchange. The Num Of TX Beams In Exchange field in the last DMG sensing measurement exchange of a burst indicates the number of TX beams to be used in the first DMG sensing measurement exchange of the next burst. This field is reserved in the last DMG sensing measurement exchange of the last burst.

The Num Of Repeat In Exchange field indicates the number of times to repeat the transmission in the next DMG sensing measurement exchange. The Num Of Repeat In Exchange field in the last DMG sensing measurement exchange of a burst indicates the number of times to repeat the transmission in the first DMG sensing measurement exchange of the next burst. This field is reserved in the last DMG sensing measurement exchange of the last burst.

The Num Of Absent Exchanges field indicates the number of consecutive DMG sensing measurement exchanges that the addressed STA does not need to participate from the next DMG sensing measurement exchange.

The Updated TX Beam List field contains a list of transmit beam indices. The beam indices represent indices into the Beam Descriptors list sent within the DMG Sensing Beam Descriptor element (see 9.4.2.335) with the TX Flag field set to 1. The Updated TX Beam List field is defined in Figure 9-118b. If the Number Beam Indices field is equal to 0, none of the Beam Index field are present.

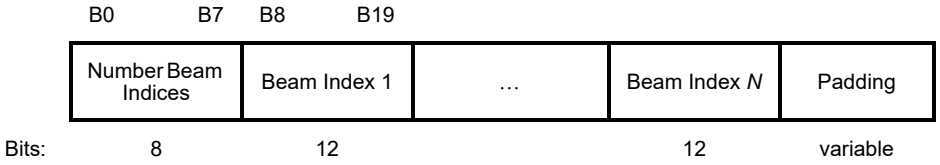

Figure 9-118b—Updated TX Beam List field format

The Padding field length is set to make the length of the TDD Beamforming Information field an integer number of octets. If the Updated TX Beam List subfield is sent to different STAs in a DMG sensing measurement exchange and it does not have the same length, it is adapted to have the same length by adjusting the length of the Padding field.

9.3.1.26.6 DMG Sensing Response frame

The TDD Beamforming Information field of a DMG Sensing Response frame if the Sensing Type field in the DMG Sensing Request frame is set to Coordinated Monostatic is shown in Figure 9-118c. Otherwise, the TDD Beamforming Information field of a DMG Sensing Response frame is not present.

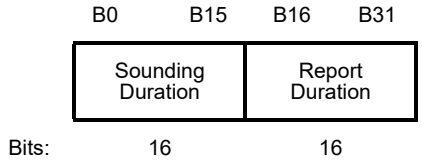

Figure 9-118c—TDD Beamforming Information field format if the Sensing Type field is Coordinated Monostatic

The Sounding Duration field indicates the duration of sounding in the next DMG sensing measurement exchange. This field is in the unit of microsecond. A value of 0 indicates that the sensing responder does not transmit any sounding PPDUs.

The Report Duration field indicates the duration of the report frame transmitted by the sensing responder in the next DMG sensing measurement exchange. This field is in the unit of microsecond. A value of 0 indicates that the sensing responder does not transmit any report frames.

Both the Sounding Duration field and the Report Duration field are set to 0s in a DMG Sensing Response frame when the sensing responder is unable to participate in parallel coordinated monostatic DMG sensing or sequential coordinated monostatic DMG sensing.

9.3.1.26.7 DMG Sensing Poll frame

The TDD Beamforming Information field of a DMG Sensing Poll frame is shown in Figure 9-118d.

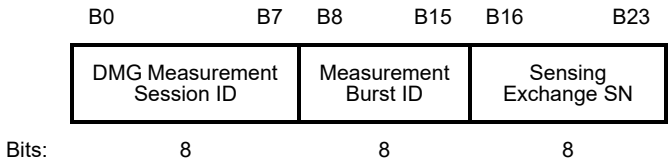

Figure 9-118d—TDD Beamforming Information field format for the DMG Sensing Poll frame

The DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN fields identify the DMG sensing measurement session, DMG sensing burst, and DMG sensing measurement exchange.

9.3.3 (PV0) Management frames

9.3.3.5 Association Request frame format

Insert the following rows in Table 9-64:

Table 9-64—Association Request frame body

Order	Information	Notes
66	Sensing Capabilities	The element is defined in 9.4.2.332 and is present if dot11SensingImplemented is true. Otherwise, the element is not present.
67	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
68	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
69	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.3.3.6 Association Response frame format

Insert the following rows in Table 9-65:

Table 9-65—Association Response frame body

Order	Information	Notes
87	Sensing Capabilities	The element is defined in 9.4.2.332 and is present if dot11SensingImplemented is true. Otherwise, the element is not present.
88	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
89	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
90	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.3.3.7 Reassociation Request frame format

Insert the following rows in Table 9-66:

Table 9-66—Reassociation Request frame body

Order	Information	Notes
68	Sensing Capabilities	The element is defined in 9.4.2.332 and is present if dot11SensingImplemented is true. Otherwise, the element is not present.
69	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
70	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
71	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.3.3.8 Reassociation Response frame format

Insert the following rows in Table 9-67:

Table 9-67—Reassociation Response frame body

Order	Information	Notes
87	Sensing Capabilities	The element is defined in 9.4.2.332 and is present if dot11SensingImplemented is true. Otherwise, the element is not present.
88	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
89	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
90	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.3.3.9 Probe Request frame format

Insert the following rows in Table 9-68:

Table 9-68—Probe Request frame body

Order	Information	Notes
46	Sensing Capabilities	The element is defined in 9.4.2.332 and is optionally present if dot11SensingImplemented is true. Otherwise, the element is not present.
47	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
48	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
49	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.3.3.10 Probe Response frame format

Insert the following rows in Table 9-69:

Table 9-69—Probe Response frame body

Order	Information	Notes
118	Sensing Capabilities	The element is defined in 9.4.2.332 and is present if dot11SensingImplemented is true. Otherwise, the element is not present.
119	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
120	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
121	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.3.4 Extension frames

9.3.4.2 DMG Beacon

Insert the following row in Table 9-75:

Table 9-75—DMG Beacon frame body

Order	Information	Notes
64	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is optionally present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
65	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Two DMG Sensing Beam Descriptor elements may be present, one for TX beams and one for RX beams. If dot11DMGSensingMsmtImplemented is false, the element is not present.
66	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.4 Management and Extension frame body components

9.4.1 Fields that are not elements

9.4.1.9 Status Code field

Insert the following row in Table 9-80:

Table 9-80—Status codes

Status code	Name	Meaning
144	REJECTED_WITH_SUGGEST-ED_SENSING_PARAMETERS	Rejected with suggested sensing parameters.

9.4.1.11 Action field

Insert the following row in Table 9-81:

Table 9-81—Category values

Code	Meaning	See subclause	Robust	Group addressed privacy
38	Protected Sensing frame	9.6.39	Yes	No

Insert the following subclause at the end of 9.4.1:

9.4.1.81 Sensing Measurement Report Container field

9.4.1.81.1 General

The Sensing Measurement Report Container field is used to carry sensing measurement results obtained from a single sensing measurement exchange (see 11.55.1.5). The format of the Sensing Measurement Report Container field is defined in Figure 9-207i.

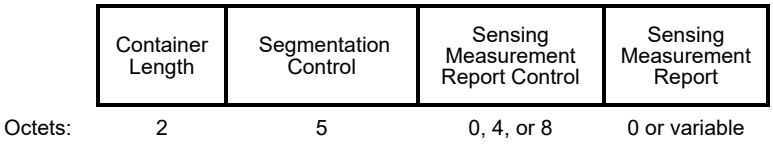

Figure 9-207i—Sensing Measurement Report Container field format

The Container Length field indicates the number of octets in the Sensing Measurement Report Container field, including the two octets for the Container Length field.

The Segmentation Control field provides the information related to the type and segments of the Sensing Measurement Report frame. The fields of the Segmentation Control field are specified in Table 9-129g.

Table 9-129g—Segmentation Control field

Field	Size (bits)	Definition
Measurement Session ID	3	Identifies the sensing measurement session corresponding to the Sensing Measurement Report frame.
Measurement Exchange ID	6	Identifies the sensing measurement exchange corresponding to the Sensing Measurement Report frame.
Sensing Transmitter STA ID	12	For TB measurement reporting: Set to the 12 LSBs of the AID or USID of the sensing transmitter corresponding to the Sensing Measurement Report frame if the sensing transmitter is a non-AP STA. Set to 0 if the sensing transmitter is an AP. For non-TB measurement reporting: Reserved.
Sensing Receiver STA ID	12	For TB measurement reporting: Set to the 12 LSBs of the AID or USID of the sensing receiver corresponding to the Sensing Measurement Report frame if the sensing receiver is a non-AP STA. Set to 0 if the sensing receiver is an AP. For non-TB measurement reporting: Reserved.
Remaining Report Segments	5	Indicates the number of remaining report segments corresponding to the Sensing Measurement Report frame: Set to 0 for the last report segment of a segmented report or the only report segment of an unsegmented report. Set to a value between 1 and 31 for a feedback segment that is not the last report segment of a segmented report.
First Report Segment	1	Set to 1 for the first report segment of a segmented report or the only feedback segment of an unsegmented report. Otherwise set to 0.
Invalid Indication	1	The Invalid Indication field indicates whether the reported measurement result is invalid for basic reporting or the CSI variation feedback value is invalid for the threshold-based reporting. An Invalid Indication field value of 1 indicates that the reported measurement result or the reported CSI variation feedback value is invalid, in which case the Remaining Report Segments field is set to 0 and the Sensing Measurement Report Control field and Sensing Measurement Report field are not included in the frame. A value of 0 indicates that the reported measurement result or the reported CSI variation feedback value is valid.

The Sensing Measurement Report Control field contains information necessary to interpret the Sensing Measurement Report field, and the Sensing Measurement Report field is used to report sensing measurements obtained by a sensing receiver.

The Sensing Measurement Report Control field is defined in 9.4.1.81.3 and the Sensing Measurement Report field is defined in 9.4.1.81.4. The process of encoding and decoding the CSI sent within a Sensing Measurement Report field is described in 9.4.1.81.2.

9.4.1.81.2 CSI encoding and decoding

9.4.1.81.2.1 General

Subclause 9.4.1.81.2.2 describes the encoding of the measured CSI that involves scaling and quantizing the measured CSI for inclusion in the Sensing Measurement Report field. Subclause 9.4.1.81.2.3 describes the decoding of the scaled and quantized CSI that is received in the Sensing Measurement Report field.

The measured CSI for the r^{th} receive chain, the t^{th} transmit chain, and the k^{th} subcarrier is the complex value indicated by $H(r, t, k)$. The real part of the CSI is indicated by $H^{(R)}(r, t, k)$, and the imaginary part of the CSI is indicated by $H^{(I)}(r, t, k)$. The real and imaginary parts of the CSI are represented as 2s complement binary integers.

The encoded CSI is denoted as $H_e(r, t, k)$ and the decoded CSI is denoted as $H_d(r, t, k)$.

9.4.1.81.2.2 CSI encoding procedure

The number of receive chains is indicated by N_{RX} and the number of transmit chains is indicated by N_{TX}.

a) For a given tuple of receive and transmit chains, (r, t), the positive 12-bit scaling factor $\gamma(r, t)$ (see 9.4.1.81.4) is selected to avoid overflow when scaling and quantizing the measured CSI using Equation (9-5b) and Equation (9-5c). The sensing receiver selects the exact value of the scaling factor, and the selection is left to implementation.

$$H_e^{(R)}(r, t, k) = \text{round}\left(\frac{H^{(R)}(r, t, k)}{\gamma(r, t)}\right) \quad (9\text{-}5b)$$

$$H_e^{(I)}(r, t, k) = \text{round}\left(\frac{H^{(I)}(r, t, k)}{\gamma(r, t)}\right) \quad (9\text{-}5c)$$

This calculation is performed for each tuple of receive and transmit chains, (r, t).

b) Each real and imaginary part of the CSI is scaled and quantized to 8 bits using Equation (9-5b) and Equation (9-5c), respectively.

9.4.1.81.2.3 CSI decoding procedure

The received encoded CSI is decoded as follows:

a) The received real and imaginary parts of the scaled and quantized CSI are decoded as a pair of 2s complement numbers and are combined to form the complex CSI, $H_e(r, t, k)$.

b) Each CSI value is rescaled according to Equation (9-5d).

$$H_d(r, t, k) = \gamma(r, t) H_e(r, t, k) \quad (9\text{-}5d)$$

9.4.1.81.3 Sensing Measurement Report Control field

The Sensing Measurement Report Control field is not included in a Sensing Measurement Report Container field in which the Invalid Indication field in the Segmentation Control field is 1.

The fields of the Sensing Measurement Report Control field are specified in Table 9-129h.

Table 9-129h—Sensing Measurement Report Control field definition

Field	Size (bits)	Definition	Meaning
Presence and Control Bitmap	8	Includes fields to indicate presence of optional fields in the Sensing Measurement Report Control field, or other control bits	The fields of the Presence and Control Bitmap field are specified in Figure 9-207j.
BW	3	Bandwidth	Set to a value that corresponds to the bandwidth as defined in Table 9-129j.
N_t	3	Indicates the number of transmit chains	Set to the number of transmit chains N_{TX} minus 1.
N_r	3	Indicates the number of receive chains	Set to the number of receive chains N_{RX} minus 1.
I_{Ng}	1	Indicates the subcarrier grouping setting	Set to 0 to indicate a subcarrier grouping of $N_g = 4$ except when there are five or more transmit chains and the bandwidth is greater than or equal to 160 MHz. Set to 0 to indicate a subcarrier grouping of $N_g = 8$ when there are five or more transmit chains and the bandwidth is greater than or equal to 160 MHz. Set to 1 to indicate a subcarrier grouping of $N_g = 16$. NOTE 1—$N_g = 16$ is optionally supported. NOTE 2—For the case of $N_g = 16$, in order to avoid time domain delay tap aliasing, anti-aliasing pre-processing on estimated frequency channel response might be needed before the down-sampling operation.
Rx_OP_Gain_Type	2	Indicates the type of report in Rx_OP_Gain_Index	The same type of report is indicated for all receive chains. Set to 0 to indicate neither Rx operating point index nor Rx gain index is reported. Set to 1 to indicate the Rx operating point index is reported and the value set in the Rx_OP_Gain_Index field(s) represent an RX operating point index mapping. Set to 2 to indicate the Rx gain index is reported and the value set in the Rx_OP_Gain_Index field(s) represent an RF/ Analog Gain Index field and a Digital Gain Index field. The value of 3 is reserved.

Table 9-129h—Sensing Measurement Report Control field definition *(continued)*

Field	Size (bits)	Definition	Meaning
CSI Variation Feedback	4	Indicates the CSI variation feedback	The value between 0 and 10 reflects the CSI variation value obtained by the sensing receiver. The above values are used for the feedback of CSI variation triggered by the Sensing Threshold-Based Reporting Trigger frame. In this case, the Remaining Report Segments field is set to 0 to indicate this is the last segment with no Sensing Measurement Report Control and Sensing Measurement Report fields within the frame. The value equal to 15 indicates that the CSI variation feedback is not reported and instead the corresponding frame provides the feedback of sensing measurement result during the threshold-based reporting phase or the basic reporting phase. See Table 9-129i.
Puncturing Pattern	16	Indicates the puncturing pattern as defined by the Disabled Subchannel Bitmap subfield of the EHT Operation element	If the transmission of the PPDU carrying the SI2SR, SR2SI, or SR2SR NDP was punctured, this value is set to the EHT puncturing pattern as indicated in the Disabled Subchannel Bitmap subfield of the EHT Operation element. Otherwise, this value is reserved.
Reference Timestamp	0 or 32	Optionally present, inclusion signaled by the Timestamp Present field within the Presence and Control Bitmap field.	If included, set to TSF[31:0] of the sensing receiver's local clock, sampled when the PHY-RXSTART.indication corresponding to the SI2SR NDP, SR2SI NDP, or SR2SR NDP is received.

Table 9-129i—CSI Variation Feedback field

Value	Description
0	$0 \leq$ CSI variation value < 0.1
1	$0.1 \leq$ CSI variation value < 0.2
2	$0.2 \leq$ CSI variation value < 0.3
3	$0.3 \leq$ CSI variation value < 0.4
4	$0.4 \leq$ CSI variation value < 0.5
5	$0.5 \leq$ CSI variation value < 0.6
6	$0.6 \leq$ CSI variation value < 0.7
7	$0.7 \leq$ CSI variation value < 0.8
8	$0.8 \leq$ CSI variation value < 0.9
9	$0.9 \leq$ CSI variation value < 1.0
10	CSI variation value = 1

Table 9-129i—CSI Variation Feedback field *(continued)*

Value	Description
11–14	Reserved
15	Basic reporting (CSI variation feedback is not used)

The format of the Presence and Control Bitmap field is defined in Figure 9-207j.

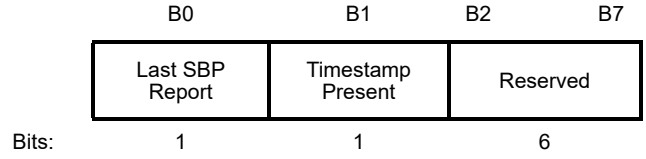

Figure 9-207j—Presence and Control Bitmap field format

The Last SBP Report field indicates the last SBP report in the current sensing availability window. The Last SBP Report field is set to 1 in a Sensing Measurement Report frame sent in the SBP reporting procedure if there are no additional Sensing Measurement Report frames to be sent in the current sensing availability window. Otherwise, it is set to 0. This field is reserved if sent in a Sensing Measurement Report frame.

The Timestamp Present field indicates the presence of the reference timestamp within the Sensing Measurement Report Control field. The Timestamp Present field is set to 1 if the reference timestamp is present. Otherwise, it is set to 0.

The format of the BW field is defined in Table 9-129j.

Table 9-129j—BW field format

Value	Description
0	20 MHz
1	40 MHz
2	80 MHz
3	160 MHz
4	320 MHz
5–7	Reserved

9.4.1.81.4 Sensing Measurement Report field

The size of the measured CSI depends on the values in the Sensing Measurement Report Control field. The Sensing Measurement Report field contains the measured CSI or successive segments of the measured CSI in the case of segmented sensing measurement report.

The Sensing Measurement Report field is not included in a Sensing Measurement Report Container field in which the Invalid Indication field in the Segmentation Control field is 1.

The measured CSI consists of scaled and quantized CSI values.

The fields of the measured CSI are specified in Table 9-129k.

Table 9-129k—Measured CSI

Field	Size (bits)	Meaning
$\gamma(1,1)$	12	Scaling factor for receive chain 1 and transmit chain 1.
$\gamma(1,2)$	12	Scaling factor for receive chain 1 and transmit chain 2.
…	…	…
$\gamma(1,N_{TX})$	12	Scaling factor for receive chain 1 and transmit chain N_{TX}.
$\gamma(2,1)$	12	Scaling factor for receive chain 2 and transmit chain 1.
$\gamma(2,2)$	12	Scaling factor for receive chain 2 and transmit chain 2.
…	...	…
$\gamma(2,N_{TX})$	12	Scaling factor for receive chain 2 and transmit chain N_{TX}.
…	...	…
$\gamma(N_{RX},1)$	12	Scaling factor for receive chain N_{RX} and transmit chain 1.
$\gamma(N_{RX},2)$	12	Scaling factor for receive chain N_{RX} and transmit chain 2.
…	...	…
$\gamma(N_{RX},N_{TX})$	12	Scaling factor for receive chain N_{RX} and transmit chain N_{TX}.
Padding	0 or 4	The Padding field is used so that the next field is aligned on an octet boundary.
$H_e(1,1,k)$	$16 \times N_{SC}$	CSI for receive chain 1 and transmit chain 1, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
$H_e(1,2,k)$	$16 \times N_{SC}$	CSI for receive chain 1 and transmit chain 2, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
…	…	…
$H_e(1,N_{TX},k)$	$16 \times N_{SC}$	CSI for receive chain 1 and transmit chain N_{TX}, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
$H_e(2,1,k)$	$16 \times N_{SC}$	CSI for receive chain 2 and transmit chain 1, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
$H_e(2,2,k)$	$16 \times N_{SC}$	CSI for receive chain 2 and transmit chain 2, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
…	…	…

Table 9-129k—Measured CSI *(continued)*

Field	Size (bits)	Meaning
$H_e(2,N_{TX},k)$	$16 \times N_{SC}$	CSI for receive chain 2 and transmit chain N_{TX}, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
…	…	…
$H_e(N_{RX},1,k)$	$16 \times N_{SC}$	CSI for receive chain N_{RX} and transmit chain 1, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
$H_e(N_{RX},2,k)$	$16 \times N_{SC}$	CSI for receive chain N_{RX} and transmit chain 2, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
$H_e(N_{RX},N_{TX},k)$	$16 \times N_{SC}$	CSI for receive chain N_{RX} and transmit chain N_{TX}, for subcarrier k in $\{1, 2, \ldots, N_{SC}\}$.
RSSI_1	8	RSSI at receive chain 1.
RSSI_2	8	RSSI at receive chain 2.
…	…	…
RSSI_N	8	RSSI at receive chain N_{RX}.
Rx_OP_Gain_Index(1)	8	If the Rx_OP_Gain_Type field is 1, the Rx_OP_Gain_Index(1) field contains the Rx operating point index for receive chain 1. If the Rx_OP_Gain_Type field is 2, the Rx_OP_Gain_Index(1) field contains the Rx gain index for receive chain 1. If the Rx_OP_Gain_Type field is 0 or 3, the Rx_OP_Gain_Index(1) field is reserved.
Rx_OP_Gain_Index(2)	8	If the Rx_OP_Gain_Type field is 1, the Rx_OP_Gain_Index(2) field contains the Rx operating point index for receive chain 2. If the Rx_OP_Gain_Type field is 2, the Rx_OP_Gain_Index(2) field contains the Rx gain index for receive chain 2. If the Rx_OP_Gain_Type field is 0 or 3, the Rx_OP_Gain_Index(2) field is reserved.
…	…	…
Rx_OP_Gain_Index(N_{RX})	8	If the Rx_OP_Gain_Type field is 1, the Rx_OP_Gain_Index(N_{RX}) field contains the Rx operating point index for receive chain. If the Rx_OP_Gain_Type field is 2, the Rx_OP_Gain_Index(N_{RX}) field contains the Rx gain index for receive chain. If the Rx_OP_Gain_Type field is 0 or 3, the Rx_OP_Gain_Index(N_{RX}) field is reserved.

The scaling and quantization is performed independently for each receive chain and transmit chain pair. The measured CSI begins with the set of scaling factors for each receive chain and transmit chain pair, which is a 12-bit positive scaling factor. If there is an odd number of scaling factors, then the set of scaling factors is followed by a 4-bit padding field.

For each receive chain and transmit chain pair, the real component of the CSI is encoded in the first 8 bits and the imaginary component of the CSI encoded in the second 8 bits. This begins with the lowest frequency

subcarrier and is repeated for each subcarrier. The number of subcarriers (N_{SC}) included in the measured CSI is defined in Table 9-129l.

Table 9-129l—Number of subcarriers as a function of bandwidth, puncturing, and N_g

Bandwidth	N_g	Number of subcarriers (N_{SC})
20 MHz	4	64
	16	20
40 MHz	4	122
	16	32
80 MHz	4	250
	16	64
160 MHz	4	500
	8	252
	16	128
320 MHz (unpunctured)	4	1000
	8	504
	16	265
320 MHz (40 MHz punctured)	4	875
	8	441
	16	231
320 MHz (80 MHz punctured)	4	750
	8	378
	16	198
320 MHz (40 + 80 MHz punctured)	4	625
	8	315
	16	165

The subcarrier indices for a bandwidth up to 160 MHz with $N_g = 4$ and $N_g = 16$ are provided in Table 9-126. The subcarrier indices for a bandwidth of 160 MHz and $N_g = 8$ are provided in Table 9-129m.

Table 9-129m—Subcarrier indices for bandwidth of 160 MHz and N_g = 8

Bandwidth	N_g	Subcarrier Indices
160 MHz	8	–1012, –1004, … –20, –12, 12, 20, … 1004, 1012

The subcarrier indices for a bandwidth of 320 MHz and $N_g = 4$ are provided in Table 9-129c.

The subcarrier indices for a bandwidth of 320 MHz and $N_g = 8$ are provided in Table 9-129n.

Table 9-129n—Subcarrier indices for unpunctured channels with bandwidth of 320 MHz and N_g = 8

996-tone RU Index	Subcarrier Indices
1	[–2036 : 8 : –1540, –1532 : 8 : –1036]
2	[–1012 : 8 : –516, –508 : 8: –12]
3	[12 : 8: 508, 516 : 8 : 1012]
4	[1036: 8 : 1532, 1540: 8 : 2036]

The subcarrier indices for a bandwidth of 320 MHz and $N_g = 16$ are provided in Table 9-129d.

The reported subcarrier indices for 320 MHz bandwidth for $N_g = 4$ for all the puncturing patterns are provided in Table 9-129o.

Table 9-129o—Reported subcarriers for 320 MHz and N_g = 4 for all preamble puncturing patterns

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00000000 00000000	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
11000000 00000000	[–1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00110000 00000000	[–2036 : 4 : –1540]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00001100 00000000	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00000011 00000000	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00000000 11000000	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00000000 00110000	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00000000 00001100	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1540 : 4 : 2036]
00000000 00000011	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532]
11110000 00000000		[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
00001111 00000000	[–2036 : 4 : –1540, –1532 : 4 : –1036]		[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]

Table 9-129o—Reported subcarriers for 320 MHz and N_g = 4 for all preamble puncturing patterns *(continued)*

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00000000 11110000	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]		[1036 : 4 : 1532, 1540 : 4 : 2036]
00000000 00001111	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	
11111100 00000000		[–508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
11110011 00000000		[–1012 : 4 : –516]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
11110000 11000000		[–1012 : 4 : –516, –508 : 4 : –12]	[516 : 4 : 1012]	[1036 : 4 : 1532, 1540 : 4 : 2036]
11110000 00110000		[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508]	[1036 : 4 : 1532, 1540 : 4 : 2036]
11110000 00001100		[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1540 : 4 : 2036]
11110000 00000011		[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	[1036 : 4 : 1532]
11000000 00001111	[–1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	
00110000 00001111	[–2036 : 4 : –1540]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	
00001100 00001111	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–508 : 4 : –12]	[12 : 4 : 508, 516 : 4 : 1012]	
00000011 00001111	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516]	[12 : 4 : 508, 516 : 4 : 1012]	
00000000 11001111	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[516 : 4 : 1012]	
00000000 00111111	[–2036 : 4 : –1540, –1532 : 4 : –1036]	[–1012 : 4 : –516, –508 : 4 : –12]	[12 : 4 : 508]	

The reported subcarrier indices for 320 MHz bandwidth for $N_g = 8$ for all the puncturing patterns are provided in Table 9-129p.

The reported subcarrier indices for 320 MHz bandwidth for $N_g = 16$ for all the puncturing patterns are provided in Table 9-129q.

The measured CSI (see Table 9-129k) includes the RSSI for each receive chain. The format of each RSSI field is defined in Table 9-129r.

Table 9-129p—Reported subcarriers for 320 MHz and Ng = 8 for all preamble puncturing patterns

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00000000 00000000	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
11000000 00000000	[–1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00110000 00000000	[–2036 : 8 : –1540]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00001100 00000000	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00000011 00000000	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00000000 11000000	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00000000 00110000	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00000000 00001100	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1540 : 8 : 2036]
00000000 00000011	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532]
11110000 00000000		[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00001111 00000000	[–2036 : 8 : –1540, –1532 : 8 : –1036]		[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
00000000 11110000	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]		[1036 : 8 : 1532, 1540 : 8 : 2036]
00000000 00001111	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	
11111100 00000000		[–508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
11110011 00000000		[–1012 : 8 : –516]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
11110000 11000000		[–1012 : 8 : –516, –508 : 8 : –12]	[516 : 8 : 1012]	[1036 : 8 : 1532, 1540 : 8 : 2036]
11110000 00110000		[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508]	[1036 : 8 : 1532, 1540 : 8 : 2036]
11110000 00001100		[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1540 : 8 : 2036]
11110000 00000011		[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	[1036 : 8 : 1532]
11000000 00001111	[–1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	

Table 9-129p—Reported subcarriers for 320 MHz and Ng = 8 for all preamble puncturing patterns *(continued)*

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00110000 00001111	[–2036 : 8 : –1540]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	
00001100 00001111	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–508 : 8 : –12]	[12 : 8 : 508, 516 : 8 : 1012]	
00000011 00001111	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516]	[12 : 8 : 508, 516 : 8 : 1012]	
00000000 11001111	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[516 : 8 : 1012]	
00000000 00111111	[–2036 : 8 : –1540, –1532 : 8 : –1036]	[–1012 : 8 : –516, –508 : 8 : –12]	[12 : 8 : 508]	

Table 9-129q—Reported subcarriers for 320 MHz and Ng = 16 for all preamble puncturing patterns

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00000000 00000000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
11000000 00000000	[–1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00110000 00000000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00001100 00000000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]

Table 9-129q—Reported subcarriers for 320 MHz and Ng = 16 for all preamble puncturing patterns *(continued)*

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00000011 00000000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00000000 11000000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00000000 00110000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00000000 00001100	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00000000 00000011	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532]
11110000 00000000		[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00001111 00000000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]		[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
00000000 11110000	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]		[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]

Table 9-129q—Reported subcarriers for 320 MHz and Ng = 16 for all preamble puncturing patterns *(continued)*

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00000000 00001111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	
11111100 00000000		[–508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
11110011 00000000		[–1012 : 16 : –772, –764 : 16 : –524, –516]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
11110000 11000000		[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
11110000 00110000		[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532, 1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
11110000 00001100		[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1540, 1548 : 16 : 1788, 1796 : 16 : 2036]
11110000 00000011		[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	[1036 : 16 : 1276, 1284 : 16 : 1524, 1532]
11000000 00001111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	
00110000 00001111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	

Table 9-129q—Reported subcarriers for 320 MHz and Ng = 16 for all preamble puncturing patterns *(continued)*

Disabled Subchannel Bitmap subfield	Subcarrier Indices (996 RU Tone Index = 1)	Subcarrier Indices (996 RU Tone Index = 2)	Subcarrier Indices (996 RU Tone Index = 3)	Subcarrier Indices (996 RU Tone Index = 4)
00001100 00001111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	
00000011 00001111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516]	[12 : 16 : 252, 260 : 16 : 500, 508, 516, 524 : 16 : 764, 772 : 16 : 1012]	
00000000 11001111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[516, 524 : 16 : 764, 772 : 16 : 1012]	
00000000 00111111	[–2036 : 16 : –1796, –1788 : 16 : –1548, –1540, –1532, –1524 : 16 : –1284, –1276 : 16 : –1036]	[–1012 : 16 : –772, –764 : 16 : –524, –516, –508, –500 : 16 : –260, –252 : 16 : –12]	[12 : 16 : 252, 260 : 16 : 500, 508]	

Table 9-129r—RSSI field format

Value	RSSI (dBm)
0	≤ –82
1	–81
2	–80
…	…
61	–21
62	≥ –20
63–255	Reserved

Rx_OP_Gain_Index fields are contained in the Sensing Measurement Report field. The Rx_OP_Gain_Index fields are ordered by receive chain index. Valid value of each 8 bits Rx_OP_Gain_Index field indicates a receive chain's operating point index or gain index used to obtain CSI estimates in this sensing measurement report field depending on the setting of Rx_OP_Gain_Type field in the Sensing Measurement Report Control field (see Table 9-129h).

If the Rx_OP_Gain_Type field is 1, each Rx_OP_Gain_Index field represents an Rx operating point index mapped to a value in the range 0 to 255. The Rx operating point index indicates the level of impact the sensing receiver operating point has on corresponding CSI estimation.

If Rx_OP_Gain_Type field is 2, each Rx_OP_Gain_Index field represents an Rx gain index. The Rx gain index indicates the sensing receiver RF/analog and digital gain indexes. The format of the Rx_OP_Gain_Index field if the Rx_OP_Gain_Type field is 2 is defined in Figure 9-207k. The RF/Analog Gain Index field and the Digital Gain Index field within the Rx_OP_Gain_Index field indicate a mapping to the sensing receiver RF/analog and digital gains, respectively.

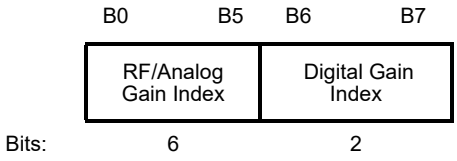

Figure 9-207k— Rx_OP_Gain_Index field format if the Rx_OP_Gain_Type is 2

If the Rx_OP_Gain_Type field is 0 or 3, then each Rx_OP_Gain_Index field is reserved.

NOTE—The size of the measured CSI, in octets, is given by Equation (9-5e).

$$\text{CSI Size} = \lceil 1.5 \times N_{TX} \times N_{RX} \rceil + 2 \times N_{TX} \times N_{RX} \times N_{SC} + 2 \times N_{RX} \quad (9\text{-}5e)$$

The size of the measured CSI increases with the number of transmit chains, the number of receive chains, the bandwidth, and the smaller subcarrier grouping size. The smallest Sensing Measurement Report field is 44 octets, which is obtained when $N_{TX} = 1$, $N_{RX} = 1$, and $N_{SC} = 20$ for 20 MHz bandwidth and $N_g = 16$. And the largest Sensing Measurement Report field is 64 624 octets, which is obtained when $N_{TX} = 8$, $N_{RX} = 8$, and $N_{SC} = 504$ for 320 MHz bandwidth unpunctured and $N_g = 8$.

9.4.2 Elements

9.4.2.1 General

Insert the following rows in Table 9-130:

Table 9-130—Element IDs

Element	Element ID	Element ID Extension	Extensible	Fragmentable
Sensing Measurement Parameters (see 9.4.2.331)	255	117	Yes	No
Sensing Capabilities (see 9.4.2.332)	255	118	Yes	No
SBP Parameters (see 9.4.2.333)	255	119	Yes	No
DMG Sensing Capabilities (see 9.4.2.334)	255	120	Yes	No
DMG Sensing Beam Descriptor (see 9.4.2.335)	255	121	Yes	Yes

Table 9-130—Element IDs *(continued)*

Element	Element ID	Element ID Extension	Extensible	Fragmentable
DMG Sensing Short Capabilities (see 9.4.2.336)	255	122	Yes	No
DMG Sensing Measurement Session (see 9.4.2.337)	255	123	Yes	Yes
DMG Sensing Image Range Axis lookup table (LUT) (see 9.4.2.338)	255	124	Yes	Yes
DMG Sensing Image Doppler Axis LUT (see 9.4.2.339)	255	125	Yes	Yes
DMG Sensing Report Control (see 9.4.2.340)	255	126	Yes	No
DMG Sensing Report (see 9.4.2.341)	255	127	Yes	No
BRP Sensing (see 9.4.2.342)	255	128	Yes	Yes
DMG Passive Sensing Beacon (see 9.4.2.343)	255	129	Yes	No
DMG Beacon Sector Descriptor (see 9.4.2.344)	255	130	Yes	Yes
DMG Sensing Measurement Exchange Duration (see 9.4.2.345)	255	131	Yes	No
DMG SBP Parameters (see 9.4.2.346)	255	132	Yes	No

9.4.2.25 Extended Capabilities element

Insert the following rows to Table 9-192:

Table 9-192—Extended Capabilities field

Bit	Information	Notes
106	Sensing	A STA sets the Sensing field to 1 if dot11SensingImplemented is true, and sets it to 0 otherwise. See 11.55.1.
107	SBP	A STA sets the SBP field to 1 if both dot11SensingImplemented and dot11SB-PImplemented are true, and sets it to 0 otherwise. See 11.55.2.

9.4.2.35 Neighbor Report element

Change Figure 9-417 follows:

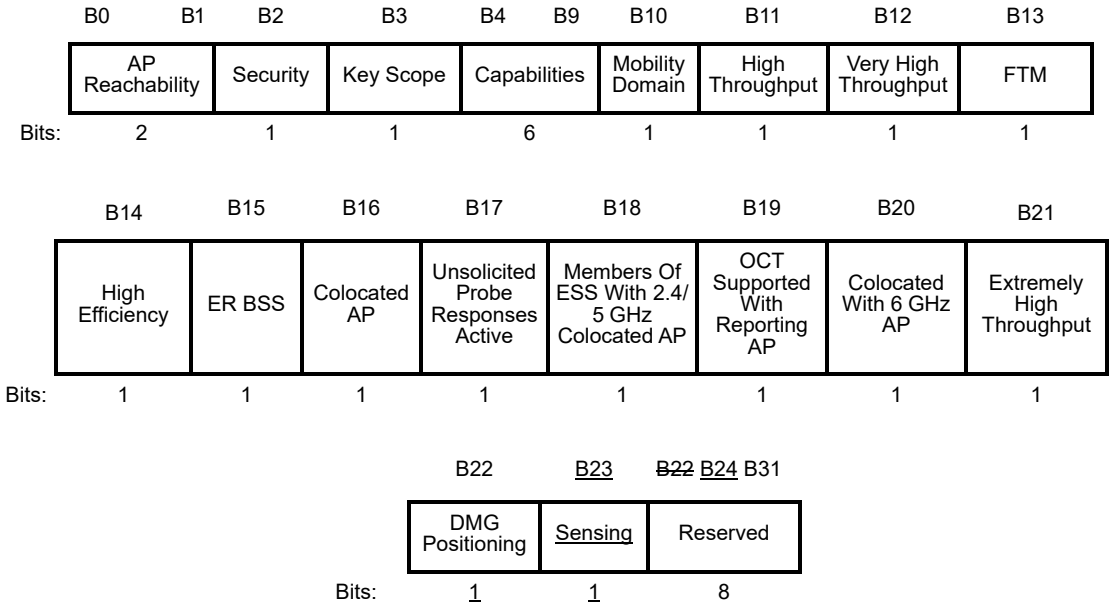

Figure 9-417—BSSID Information field format

Insert the following paragraph after the paragraph "The DMG Positioning field indicates that...":

The Sensing field is set to 1 if the AP identified by this BSSID is a sensing STA. The Sensing field is set to 0 if the AP identified by this BSSID is not a sensing STA or if information about its support of the WLAN sensing procedure is not available.

9.4.2.130 Extended Schedule element

Insert the following row to Table 9-297:

Table 9-297—AllocationType subfield values

Bit 4	Bit 5	Bit 6	Meaning
0	0	1	SP for DMG sensing

Change the following paragraph in 9.4.2.130 and insert a new figure:

If the AllocationType subfield is equal to SP for DMG sensing, the Allocation Start subfield contains two subfields: Allocation Start For DMG Sensing and Distance Between DMG Sensing Bursts, as depicted in Figure 9-652a. Otherwise, the ~~The~~ Allocation Start subfield contains the lower 4 octets of the TSF at the

time the SP or CBAP starts. The Allocation Start subfield can be specified at a future beacon interval when the Pseudo-static subfield is set to 1.

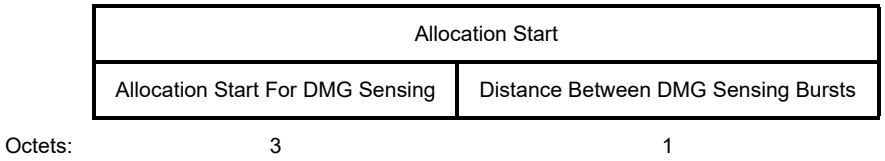

Figure 9-652a—Allocation Start subfield if the AllocationType subfield is set to SP for DMG sensing

Insert the following after the paragraph that ends with "The Allocation Start subfield can be specified at a future beacon interval when the Pseudo-static subfield is set to 1":

The Allocation Start For DMG Sensing subfield contains the lower 3 octets of the TSF at the time the SP starts. The Allocation Start For DMG Sensing subfield is specified at a future beacon interval if the Pseudo-static subfield is set to 1.

The Distance Between DMG Sensing Bursts subfield, if set to a nonzero value, indicates the number of beacon intervals between the beacon intervals in which the successive DMG sensing bursts lie. A value of 0 indicates that the distance between DMG sensing bursts is unspecified.

9.4.2.240 RSNXE

Insert the following rows in Table 9-373:

Table 9-373—Extended RSN Capabilities field

Bit	Information	Notes
19	USNM-MFPR-X20	A STA sets the unassociated sensing negotiation and measurement management frame protection required exempt 20 MHz (USNM-MFPR-X20) field to 1 if dot11APRequiresPMFActivated is set to 1. Otherwise, it sets the field to 0. See 11.55.1.2 and C.3.
20	USNM-MFPR	A STA sets the unassociated sensing negotiation and measurement management frame protection required (USNM-MFPR) field to 1 if dot11APRequiresPMFActivated is set to 2. Otherwise, it sets the field to 0. See 11.55.1.2 and C.3.

9.4.2.298 ISTA Availability Window element

Change the three paragraphs before the last one as follows:

~~Each~~ If used in a FTM procedure (see 11.21.6), each Availability Bit in the Availability Bitmap subfield indicates the ISTA's availability for TB ranging with the recipient RSTA. The value indicated by each bit in the Availability Bitmap is in units of 10 TUs. Bit B_k (where $0 \le k \le \text{count} - 1$) represents the ISTA's periodic availability for TB ranging with the RSTA in the interval $[t_{\text{start},\,k}, t_{\text{end},\,k}]$ repeated every N TUs; see Equation (9-12)~~:~~.

If used in a sensing procedure (see 11.55.1), each Availability Bit in the Availability Bitmap subfield indicates the transmitting STA's availability for SBP reporting and/or TB sensing measurement exchange with the recipient STA. The value indicated by each bit in the Availability Bitmap is in units of 10 TUs. Bit B_k (where $0 \le k \le \text{count} - 1$) represents the transmitting STA's periodic availability in the interval $[t_{\text{start},\,k}, t_{\text{end},\,k}]$ repeated every N TUs; see Equation (9-12).

$$t_{\text{start},\,k} = t_{\text{start},\,0} + 10k \text{ TU},$$

$$t_{\text{end},\,k} = t_{\text{start},\,0} + 10(k+1) \text{ TU},$$

$t_{\text{start},0}$ = time 0 per RSTA's TSF if used in FTM or per the AP's TSF if used in sensing. (9-12)

$$N = 10 \times \text{count}$$

~~A~~ If used in a FTM procedure, a value of 1 in an Availability Bit indicates ISTA's availability at time $t_{\text{start},\,k}$ for a duration of 10 TUs, while a value of 0 indicates ISTA's unavailability at time $t_{\text{start},\,k}$ for a duration of 10 TUs.

If used in a sensing procedure, a value of 1 in an Availability Bit indicates transmitting STA's availability at time $t_{\text{start},\,k}$ for a duration of 10 TUs, which is a sensing availability window, while a value of 0 indicates transmitting STA's unavailability at time $t_{\text{start},\,k}$ for a duration of 10 TUs.

9.4.2.299 RSTA Availability Window element

Change the paragraph below Figure 9-1038 as follows:

~~The~~ If used in a FTM procedure (see 11.21.6), the Partial TSF Timer subfield is derived as described in 9.4.2.166 and indicates the TSF timer of the RSTA at the start of first availability window. If used in a sensing procedure (see 11.55.1), the Partial TSF Timer subfield is derived as described in 9.4.2.166 and indicates the TSF timer of the transmitting STA (i.e., AP) at the start of first sensing availability window.

Insert the following subclauses at the end of 9.4.2:

9.4.2.331 Sensing Measurement Parameters element

The Sensing Measurement Parameters element indicates operational parameters associated with sensing measurement exchange(s). The format of the Sensing Measurement Parameters element is defined in Figure 9-1074bn.

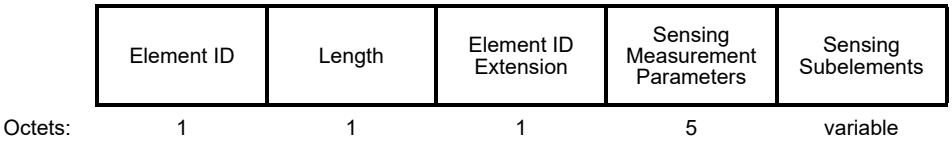

Figure 9-1074bn— Sensing Measurement Parameters element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The format of the Sensing Measurement Parameters field is defined in Figure 9-1074bo.

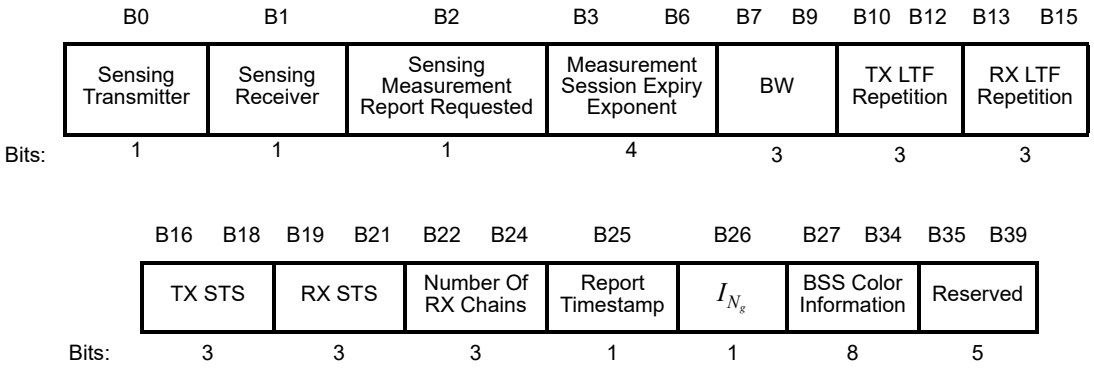

Figure 9-1074bo—Sensing Measurement Parameters field format

The Sensing Transmitter field is set to 1 to indicate a sensing transmitter role for the sensing responder; and is set to 0 otherwise. The Sensing Transmitter field is reserved in the Sensing Measurement Parameters element included in the SBP Request frame when the Preferred Responder Role Bitmap Present field is set to 1 in the SBP Parameters Control field of the SBP Parameters element in the same SBP Request frame.

The Sensing Receiver field is set to 1 to indicate a sensing receiver role for the sensing responder; and is set to 0 otherwise. The Sensing Receiver field is reserved in the Sensing Measurement Parameters element included in the SBP Request frame when the Preferred Responder Role Bitmap Present field is set to 1 in the SBP Parameters Control field of the SBP Parameters element in the same SBP Request frame.

The Sensing Measurement Report Requested field is reserved if the Sensing Receiver field is set to 0. If the Sensing Receiver field is set to 1, then:

— The Sensing Measurement Report Requested field is set to 1 to indicate that the sensing responder sends Sensing Measurement Report frames in sensing measurement exchanges that result from the sensing measurement session.

— The Sensing Measurement Report Requested field is set to 0 to indicate that the sensing responder does not send Sensing Measurement Report frames in sensing measurement exchanges that result from the sensing measurement session.

The Measurement Session Expiry Exponent field contains an unsigned integer. It is encoded according to the conventions in 9.2.2. The Measurement Session Expiry value is equal to $2^{(\text{Measurement Session Expiry Exponent} + 8)}$ ms. It is a time after which the sensing measurement session is terminated, if there are no frame exchange sequences (see 11.55.1.6).

The BW field indicates the requested bandwidth to be used in the transmission of SI2SR NDPs, SR2SI NDPs, and SR2SR NDPs. The encoding of this field is given in Table 9-129j.

The TX LTF Repetition field is set to the requested number of LTF repetitions that the sensing responder uses in the transmission of an SR2SI NDP or SR2SR NDP that is an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP or an EHT TB Ranging NDP. The field is set to the number of LTF repetitions minus 1.

The RX LTF Repetition field is set to the requested number of LTF repetitions that the sensing responder receives in an SI2SR NDP or SR2SR NDP that is an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP or an EHT TB Ranging NDP. The field is set to the number of LTF repetitions minus 1.

The TX STS field indicates for bandwidths less than or equal to the value signaled in the BW field, the requested number of space-time streams that the sensing responder uses in the transmission of an SR2SI NDP or SR2SR NDP in TB or non-TB sensing measurement exchanges minus 1.

The RX STS field indicates for bandwidths less than or equal the value signaled in the BW field, the requested number of space-time streams that the sensing responder receives in an SI2SR NDP or SR2SR NDP in TB or non-TB sensing measurement exchanges minus 1.

The Number Of RX Chains field indicates the number of chains that the sensing responder uses in the reception of an SR2SR NDP or an SI2SR NDP in TB or non-TB sensing measurement exchanges minus 1.

The TX LTF Repetition and TX STS fields are reserved if the Sensing Transmitter field is set to 0.

The RX LTF Repetition, RX STS, and Number Of RX Chains fields are reserved if the Sensing Receiver field is set to 0.

The Report Timestamp field is reserved if the Sensing Receiver field is set to 0, or if the Sensing Measurement Report Requested field is set to 0. If the Sensing Receiver field is set to 1 and the Sensing Measurement Report Requested field is set to 1,

— The Report Timestamp field is set to 1 to indicate that the Reference Timestamp is to be included in the Sensing Measurement Report Control field.

— The Report Timestamp field is set to 0 to indicate that the Reference Timestamp field is not to be included in the Sensing Measurement Report Control field.

— The I_{N_g} field indicates the subcarrier grouping used in a Sensing Measurement Report frame. It is set to 1 to indicate a subcarrier grouping of 16; otherwise, it is set to 0.

The I_{N_g} field is reserved if the Sensing Measurement Report Requested field is set to 0.

The BSS Color Information field has the same format as in the BSS Color Information field in the HE Operation element. The BSS Color Information field is reserved in a Sensing Measurement Request frame or

Sensing Measurement Response frame if the transmitter of the frame is a non-AP STA. Otherwise, each field of the BSS Color Information field is set to the same value, as in the HE Operation element transmitted by the transmitter AP.

The Sensing Subelements field contains 0, 1 or more subelements. The subelement format and ordering of the subelements are defined in 9.4.3. The Subelement ID field values for the defined subelements are shown in Table 9-417y.

Table 9-417y—Sensing subelement IDs for Sensing Parameters

Subelement ID	Name	Extensible
0	Non-TB Sensing Specific subelement	Yes
1	TB Sensing Specific subelement	Yes
2	SBP Specific subelement	Yes
3–255	Reserved	—

A Sensing Subelements field contains either one Non-TB Sensing Specific subelement, one TB Sensing Specific subelement, or one SBP Specific subelement and one TB Sensing Specific subelement.

If the Sensing Measurement Parameters element is included in an SBP Request frame or SBP Response frame, the Sensing Subelements field contains no subelements.

If the sensing initiator is a non-AP STA, it includes a Non-TB Sensing Specific subelement in the Sensing Measurement Parameters element to describe the set of parameters that the sensing initiator assigns for the sensing measurement session. The format of the Non-TB Sensing Specific subelement is as shown in Figure 9-1074bp.

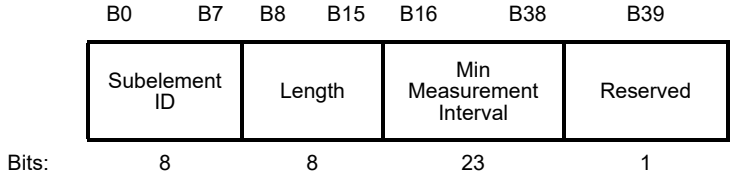

Figure 9-1074bp—Non-TB Sensing Specific subelement format

The Min Measurement Interval field indicates the minimum time between two consecutive non-TB sensing measurement exchanges in units of 100 μs.

If the sensing initiator is an AP, it includes a TB Sensing Specific subelement in the Sensing Measurement Parameters element. The format of the TB Sensing Specific subelement is as shown in Figure 9-1074bq.

The AID/USID field contains an identifier for the sensing responder for the duration of the sensing measurement session. If the sensing responder is associated with the sensing initiator, the value is set to the sensing responder's AID. If the sensing responder is not associated with the sensing initiator, the AID/USID field is set to the USID, which is assigned by the sensing initiator to identify the sensing responder and has the same length as the AID.

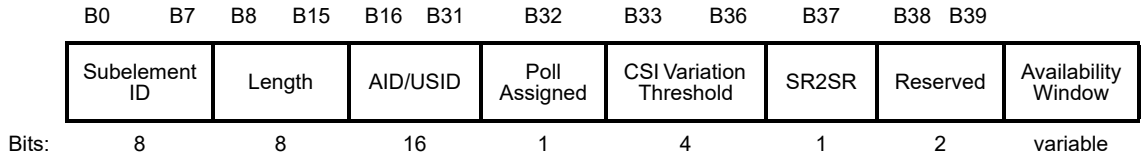

Figure 9-1074bq— TB Sensing Specific subelement format

The Poll Assigned field is set to 1 to indicate that the sensing initiator polls the sensing responder in each sensing measurement exchange; and it is set to 0 otherwise.

The CSI Variation Threshold field is reserved if the Sensing Receiver field within the Sensing Measurement Parameters field of the same frame is set to 0. Otherwise, the CSI Variation Threshold field values are defined in Table 9-417z.

Table 9-417z—CSI Variation Threshold field definition

Value	Meaning
0	CSI variation threshold = 0
1	CSI variation threshold = 0.1
2	CSI variation threshold = 0.2
3	CSI variation threshold = 0.3
4	CSI variation threshold = 0.4
5	CSI variation threshold = 0.5
6	CSI variation threshold = 0.6
7	CSI variation threshold = 0.7
8	CSI variation threshold = 0.8
9	CSI variation threshold = 0.9
10	CSI variation threshold = 1
11–14	Reserved
15	Basic reporting

In the case that the Sensing Receiver field within the Sensing Measurement Parameters field of the same frame is set to 1, the CSI Variation Threshold field value between 0 and 10 indicates that threshold-based reporting is used in the corresponding TB sensing measurement exchanges, and indicates the corresponding CSI variation threshold value. The CSI Variation Threshold field value 15 indicates that basic reporting (see 11.55.1.5.2.6.1) is used in the corresponding TB sensing measurement exchanges.

The SR2SR field is set to 1 to indicate that the TB sensing measurement exchange includes an SR2SR variant of the TF sounding phase; and it is set to 0 otherwise.

The Availability Window field contains an RSTA Availability Window element (see 9.4.2.299) if it is included in a Sensing Measurement Request frame or an ISTA Availability Window element (see 9.4.2.298) if it is included in a Sensing Measurement Response frame.

If the sensing initiator is an AP, and if the Sensing Measurement Request frame is transmitted to satisfy an SBP request, it also includes an SBP Specific subelement in the Sensing Measurement Request frame to describe the set of parameters associated with the SBP request. The format of the SBP Specific subelement is as shown in Figure 9-1074br.

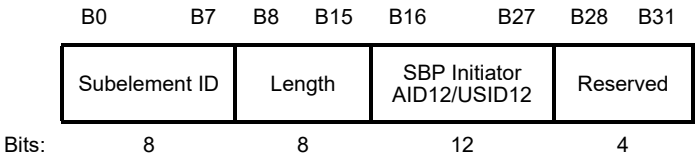

Figure 9-1074br—SBP Specific subelement format

The SBP Initiator AID12/USID12 field indicates the 12 LSBs of either the AID or the USID for the SBP initiator that requested the AP (i.e., SBP responder) to transmit the corresponding Sensing Measurement Request frame to satisfy the SBP request from the SBP initiator.

9.4.2.332 Sensing Capabilities element

The Sensing Capabilities element contains fields that are used to advertise optional sensing capabilities and sensing operation information. The Sensing Capabilities element is defined in Figure 9-1074bs.

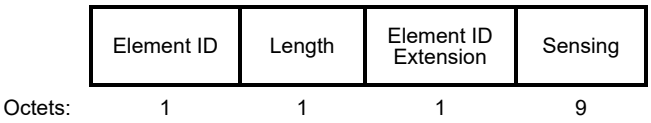

Figure 9-1074bs—Sensing Capabilities element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The Sensing field is defined in Figure 9-1074bt.

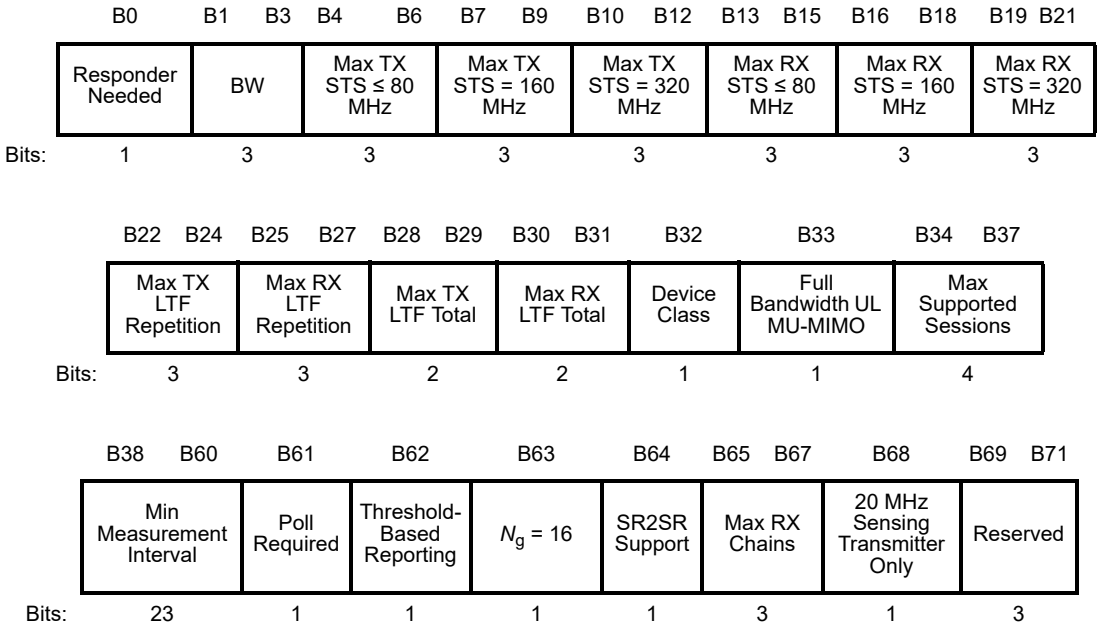

Figure 9-1074bt—Sensing field format

The Responder Needed field is set to 1 in Probe Response frames to indicate the need for new sensing responders, and is set to 0 to indicate that new sensing responders are not needed. The Responder Needed field is reserved in Association Request, Association Response, Reassociation Request, Reassociation Response, Probe Request, and Sensing Measurement Query frames.

The BW field indicates the maximum bandwidth supported by the STA for the transmission of SI2SR NDPs, SR2SI NDPs, and SR2SR NDPs during a sensing measurement exchange (see 11.55.1.5). The encoding of this field is given in Table 9-129j.

The Max TX STS ≤ 80 MHz field indicates for bandwidths less than or equal to 80 MHz the maximum number of space-time streams that the STA supports in the transmission of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in TB and non-TB sensing measurement exchanges minus 1.

The Max TX STS = 160 MHz field indicates for bandwidth equal to 160 MHz the maximum number of space-time streams that the STA supports in the transmission of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in TB and non-TB sensing measurement exchanges minus 1. This field is reserved if the value of the BW field is not 3 or 4.

The Max TX STS = 320 MHz field indicates for bandwidth equal to 320 MHz the maximum number of space-time streams that the STA supports in the transmission of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in TB and non-TB sensing measurement exchanges minus 1. This field is reserved if the value of the BW field is not 4.

The Max RX STS ≤ 80 MHz field indicates for bandwidths less than or equal to 80 MHz the maximum number of space-time streams that the STA supports in the reception of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in TB and non-TB sensing measurement exchanges minus 1.

The Max RX STS = 160 MHz field indicates for bandwidth equal to 160 MHz the maximum number of space-time streams that the STA supports in the reception of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in TB and non-TB sensing measurement exchanges minus 1. This field is reserved if the value of the BW field is not 3 or 4.

The Max RX STS = 320 MHz field indicates for bandwidth equal to 320 MHz the maximum number of space-time streams that the STA supports in the reception of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in TB and non-TB sensing measurement exchanges minus 1. This field is reserved if the value of the BW field is not 4.

The Max TX LTF Repetition field is set to the maximum number of LTF repetitions that the STA supports in the transmission of an SI2SR NDP, SR2SI NDP, or SR2SR NDP that is either an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP or an EHT TB Ranging NDP. The field is set to the number of LTF repetitions minus 1.

The Max RX LTF Repetition field is set to the maximum number of LTF repetitions that the STA supports in reception of an SI2SR NDP, SR2SI NDP, or SR2SR NDP that is either an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP or an EHT TB Ranging NDP. The field is set to the number of LTF repetitions minus 1.

The Max TX LTF Total field and the Max RX LTF Total field indicate the maximum number of HE-LTFs or EHT-LTFs that the STA supports in the transmission and the reception, respectively, of an SI2SR NDP, SR2SI NDP, or SR2SR NDP that is either an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP or an EHT TB Ranging NDP. The encoding of the Max TX LTF Total and the Max RX LTF Total fields is given in Table 9-411.

NOTE—The maximum number of HE-LTFs or EHT-LTFs limits the allowed combinations of number of space-time streams and LTF repetitions in an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP, and an EHT TB Ranging NDP.

The Device Class and Full Bandwidth UL MU-MIMO fields correspond to the Device Class and Full Bandwidth UL MU-MIMO fields defined in Table 9-374.

The Max Supported Sessions field indicates the maximum number of concurrent sensing measurement sessions that the STA supports as a sensing responder with the STA that is the recipient of the Sensing Capabilities element as the sensing initiator.

The Min Measurement Interval field indicates the minimum time between two consecutive non-TB sensing measurement exchanges, in units of 100 μs, that the STA supports. This field is reserved in a frame sent by a non-AP STA.

The Poll Required field is set to 1 by a non-AP STA to indicate that the STA requires to be polled for any TB sensing measurement exchange that it participates as a sensing responder; and is set to 0 otherwise. The field is reserved in a frame sent by an AP.

The Threshold-Based Reporting field is set to 1 to indicate that the STA supports threshold-based reporting; and it is set to 0 otherwise.

The $N_g = 16$ field is set to 1 to indicate that subcarrier grouping of 16 is supported in the Sensing Measurement Report frame; and it is set to 0 otherwise.

The SR2SR Support field is set to 1 to indicate that the STA supports SR2SR sounding (see 11.55.1.5.2.5); and it is set to 0 otherwise.

The Max Rx Chains field indicates the maximum number of chains the STA supports in the reception of an SR2SI NDP, SR2SR NDP, or SI2SR NDP in TB and non-TB sensing measurement exchanges minus 1.

The 20 MHz Sensing Transmitter Only field is set to 1 by a non-AP STA to indicate that it only supports the sensing transmitter role in a 20 MHz bandwidth, not the sensing receiver role nor any wider bandwidth. For an AP, the 20 MHz Sensing Transmitter Only field is reserved.

9.4.2.333 SBP Parameters element

The SBP Parameters element indicates operational parameters associated with a requested SBP procedure. The format of the SBP Parameters element is defined in Figure 9-1074bu.

	Element ID	Length	Element ID Extension	SBP Parameters Control	Sensing Responder Addresses	Sensing Responder IDs	Sensing Responder Role Bitmap
Octets:	1	1	1	4	0 or $n \times 6$	0 or variable	0 or variable

Figure 9-1074bu— SBP Parameters element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The format of the SBP Parameters Control field is defined in Figure 9-1074bv.

	B0	B1 B4	B5	B6 B9	B10	B11
	SBP Request	SBP Procedure Expiry Exponent	Sensing Responder	Number Of Sensing Responders	Mandatory Number Of Responders	Preferred Responder List
Bits:	1	4	1	4	1	1

	B12 B15	B16	B17	B18	B19	B20 B23	B24 B31
	Number Of Preferred Responders	Mandatory Preferred Responder	SR2SR Sounding Request	Preferred Responder Role Bitmap Present	Poll Assigned	CSI Variation Threshold	Reserved
Bits:	4	1	1	1	1	4	8

Figure 9-1074bv—SBP Parameters Control field format

The SBP Request field is set to 1 to indicate that the SBP Parameters element is carried within an SBP Request frame, and it is set to 0 to indicate that the SBP Parameters element is carried within an SBP Response frame or an SBP Termination frame.

If the SBP Request field is equal to 1,

— The SBP Procedure Expiry Exponent field contains an unsigned integer. It is encoded according to the conventions in 9.2.2. The SBP procedure expiry value is equal to $2^{(\text{SBP Procedure Expiry Exponent} + 8)}$ ms. It is a time after which the SBP procedure is terminated, if there are no frame exchange sequences (see 11.55.2.4).

— The Sensing Responder field is set to 1 to indicate that the SBP initiator requests to participate as a sensing responder in the sensing procedure used by the SBP responder to satisfy the SBP request. The Sensing Responder field is set to 0 to indicate that the SBP initiator requests to not participate in the sensing procedure as a sensing responder used by the SBP responder to satisfy the SBP request.

— The value of the Number Of Sensing Responders field indicates the requested number of sensing responders to participate in the sensing procedure used by the SBP responder to satisfy the SBP request. If the Sensing Responder field is set to 1, the value indicated in the Number Of Sensing Responders field includes the SBP initiator.

— The Mandatory Number Of Responders field indicates whether the requested number of sensing responders indicated in the Number Of Sensing Responders field is interpreted as mandatory by the SBP responder. A value of 0 indicates that the requested number of sensing responders is a maximum number, and the SBP initiator accepts measurements taken with a smaller number of sensing responders. A value of 1 indicates that the requested number of sensing responders is a mandatory requirement.

— The Preferred Responder List field is set to 1 to indicate that the SBP initiator provides a set of preferred sensing responders for which the SBP responder is requested to include in the sensing procedure used to satisfy the SBP request. Otherwise, the Preferred Responder List field is set to 0. If the Preferred Responder List field is set to 0, the Sensing Responder Addresses field is not present.

— The value of the Number Of Preferred Responders field, i.e., n, indicates the number of preferred sensing responders with MAC addresses included in the Sensing Responder Addresses field within the SBP Parameters element if the Preferred Responder List field is set to 1. In this case, if the Sensing Responder field is set to 1, the value indicated in the Number Of Preferred Responders field includes the SBP initiator. It is reserved if the Preferred Responder List field is set to 0.

  1) If the Sensing Responder field and the Preferred Responder List fields are both set to 1, the MAC address of the SBP initiator is included in the Sensing Responder Addresses field within the SBP Parameters element.

— The Mandatory Preferred Responder field indicates whether the set of preferred sensing responders is interpreted as mandatory by the SBP responder if the Preferred Responder List field is set to 1. A value of 1 indicates that the SBP responder is requested to only include STAs listed in the Sensing Responder Addresses field within the SBP Request frame in the sensing procedure used to satisfy the SBP request. A value of 0 indicates that the SBP responder might include STAs that are not listed in the Sensing Responder Addresses field within the SBP Request frame in the sensing procedure used to satisfy the SBP request. It is reserved if the Preferred Responder List field is 0.

  1) If the Mandatory Preferred Responder fields is set to 1, the Number Of Sensing Responders and Mandatory Number Of Responders fields are reserved.

— The SR2SR Sounding Request field is set to 1 to indicate that the SBP initiator requests the SR2SR variant of the TF sounding phase to be used in the sensing procedure used by the SBP responder to satisfy the SBP request. Otherwise, it is set to 0.

— The Preferred Responder Role Bitmap Present field is set to 1 to indicate that the Preferred Responder Role Bitmap field is present. Otherwise, it is set to 0. It is reserved if the Preferred Responder List field is set to 0.

— The Sensing Responder Addresses field is present if the Preferred Responder List field is set to 1, and not present otherwise. The Sensing Responder Addresses field contains one or more MAC addresses that indicate the set of preferred sensing responders to include in the sensing procedure used by the SBP responder to satisfy the request.

— The Sensing Responder IDs field is not present.

— The Poll Assigned field is reserved.

— The CSI Variation Threshold field values are defined in Table 9-417z.

— The Sensing Responder Role Bitmap field is present if the Preferred Responder Role Bitmap Present field is set to 1, and not present otherwise. The Sensing Responder Role Bitmap field indicates the role (sensing transmitter, sensing receiver, or both sensing transmitter and sensing receiver) of each of the preferred sensing responders with MAC addresses included in the Sensing Responder Addresses field. The format of the Sensing Responder Role Bitmap field is shown in Figure 9-1074bw. The Padding field contains 0, 2, 4, or 6 bits to make the total number of bits in the Sensing Responder Role Bitmap field an integer number of octets. If the Padding field is present, the value of the Padding field is set to 0. The Preferred Responder Role Bitmap field uses $2n$ bits to indicate the role for the n preferred sensing responders. The role of each preferred sensing responder is encoded by 2 bits. The roles of the n preferred sensing responders are listed in the same order as the n corresponding MAC addresses in the Sensing Responder Addresses field. The encoding of the sensing transmitter and/or sensing receiver role is given in Table 9-417aa.

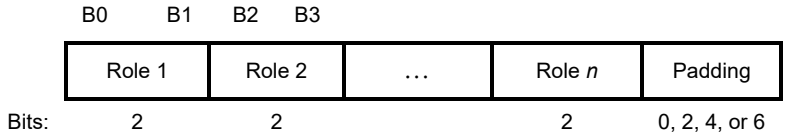

Figure 9-1074bw—Sensing Responder Role Bitmap field format

Table 9-417aa—Role Encoding in the Sensing Responder Role Bitmap field

Encoding	Meaning
00	Reserved
01	Sensing receiver
10	Sensing transmitter
11	Sensing receiver and sensing transmitter

If the SBP Request field is equal to 0,

— The SBP Procedure Expiry Exponent field is reserved.

— The Sensing Responder field is set to the same value of the Sensing Responder field within the corresponding SBP Request frame with the same Dialog Token.

— The value of the Number Of Sensing Responders field indicates the actual number of sensing responders used in the sensing procedure used by the SBP responder to satisfy the SBP request if the Status Code field within the SBP Response frame is equal to SUCCESS. The value of the Number Of Sensing Responders field indicates a suggested number of sensing responders if the Status Code field within the SBP Response frame is equal to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS or if the SBP Parameters element is included in the SBP Termination frame.

— The Mandatory Number Of Responders field is reserved.

— The Preferred Responder List field is set to 1 to indicate that the Sensing Responder Addresses field and the Sensing Responder IDs field is present. If the Preferred Responder List field is set to 0, neither the Sensing Responder Addresses field nor the Sensing Responder IDs field is present.

— The value of the Number Of Preferred Responders field indicates the number of MAC addresses within the Sensing Responder Addresses field and the number of AID/USIDs within the Sensing Responder IDs field if the Preferred Responder List field is set to 1. It is reserved if the Preferred Responder List field is set to 0.
  — If the Sensing Responder field and the Preferred Responder List fields are both set to 1, the MAC address and the AID/USID of the SBP initiator are included in the Sensing Responder Addresses field and the Sensing Responder ID field, respectively. The value of the AID/USID field corresponding to the SBP initiator in the Sensing Responder IDs field is the same as the SBP initiator AID/USID field within the SBP Response frame.
— The Mandatory Preferred Responder field is reserved.
— The SR2SR Sounding Request field is reserved.
— The Preferred Responder Role Bitmap Present field is set to 0 to indicate that the Preferred Responder Role Bitmap field is not present.
— The Sensing Responder Addresses field is present if the Preferred Responder List field is set to 1, and not present otherwise. The field contains one or more MAC addresses that indicate the set of preferred sensing responders used to satisfy the request.
— The Sensing Responder IDs field is present if the Preferred Responder List field is set to 1 and if it is included in an SBP Response frame with a Status Code equal to SUCCESS, and not present otherwise. The Sensing Responder IDs field contains the list of the AID/USID of the sensing responders that participate in the sensing procedure used by the SBP responder to satisfy the request. The format of the Sensing Responder IDs field is shown in Figure 9-1074bx. The AID/USIDs values are listed in the same order as the corresponding MAC addresses in the Sensing Responder Addresses field. The number of AID/USID fields present in the field, n , is equal to the value in the Number Of Preferred Responders field. The Padding field contains 0 or 4 bits to make the total number of bits in the field equal to an integer number of octets. If present, the value of the 4 bits is set to 0.

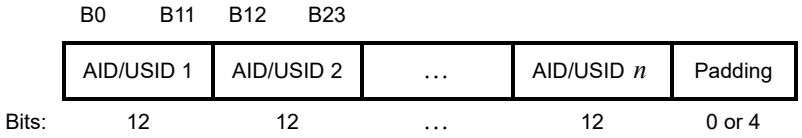

Figure 9-1074bx— Sensing Responder IDs field format

— The Preferred Responder Role Bitmap field is not present.
— The Poll Assigned field is set to 1 to indicate that the SBP responder polls the SBP initiator in each availability window; and it is set to 0 otherwise.
— The CSI Variation Threshold field values are defined in Table 9-417z.

9.4.2.334 DMG Sensing Capabilities element

The DMG Sensing Capabilities element contains fields that are used to advertise optional DMG sensing capabilities. The DMG Sensing Capabilities element is defined in Figure 9-1074by.

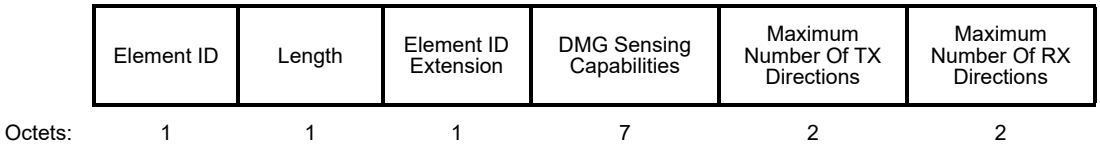

Figure 9-1074by—DMG Sensing Capabilities element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The DMG Sensing Capabilities field is defined in Figure 9-1074bz.

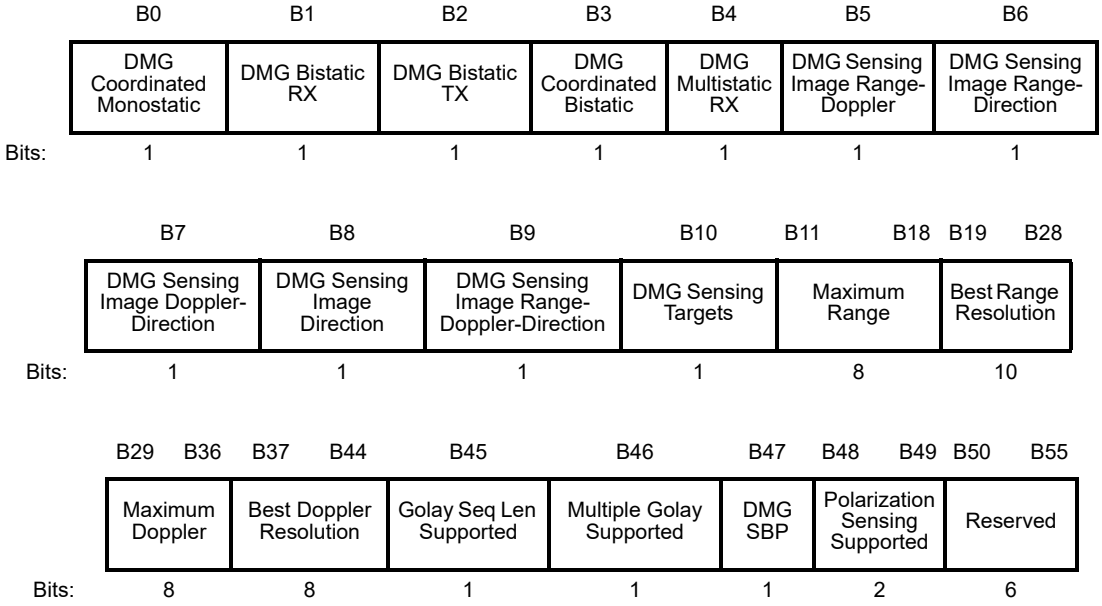

Figure 9-1074bz—DMG Sensing Capabilities field format

The DMG Coordinated Monostatic field is set to 1 to indicate the capability of DMG coordinated monostatic sensing as a sensing responder.

The DMG Bistatic RX field is set to 1 to indicate the capability to participate in DMG bistatic sensing as a sensing receiver.

The DMG Bistatic TX field is set to 1 to indicate the capability to participate in DMG bistatic sensing as a sensing transmitter.

The DMG Coordinated Bistatic field is set to 1 to indicate the capability to participate in DMG coordinated bistatic sensing.

The DMG Multistatic RX field is set to 1 to indicate the capability to participate in DMG multistatic sensing as a sensing responder.

The DMG Sensing Image Range-Doppler field is set to 1 to indicate the capability to report two dimensional Range-Doppler image as a sensing responder.

The DMG Sensing Image Range-Direction field is set to 1 to indicate the capability to report three dimensional Range-Direction image as a sensing responder where direction is composed of Transmit Beam Index and Receive Beam Index. These are indices into the Beam Descriptors lists in the DMG Sensing Beam Descriptor elements of the TX and RX, respectively. Direction can also be represented as Transmit Beam Index, azimuth and elevation.

The DMG Sensing Image Direction field is set to 1 to indicate the capability to report two dimensional direction image as a sensing responder (where Direction includes both Transmit Beam Index and Receive Beam Index or Azimuth and Elevation).

The DMG Sensing Image Range-Doppler-Direction field is set to 1 to indicate the capability to report four dimensional Range-Doppler-Direction image as a sensing responder (where Direction includes both Transmit Beam Index and Receive Beam Index or Azimuth and Elevation).

The DMG Sensing Targets field is set to 1 to indicate the capability to report detected targets as a sensing responder.

The Maximum Range field indicates the maximum supported range in units of meters for coordinated monostatic sensing, it is reserved otherwise.

The Best Range Resolution field indicates the minimum supported range resolution in units of millimeters.

The Maximum Doppler field indicates the maximum supported Doppler in units of 256 mm/s.

The Best Doppler Resolution field indicates the minimum supported Doppler resolution in units of 1 mm/s.

The Maximum Number Of TX Directions is set to the maximum number of transmit AWV settings supported.

The Maximum Number Of RX Directions is set to the maximum number of receive AWV settings supported.

The Golay Seq Len Supported field is set to 1 to indicate support for EDMG Golay sequences of length $256 \times N_{CB}$. It is set to 0 if only EDMG Golay sequences of length $128 \times N_{CB}$ are supported.

The Multiple Golay Supported field is set to 1 to indicate the capability to use different Golay sequences in the TRN fields of PPDUs sent in different DMG sensing measurement exchanges.

A DMG STA sets the DMG SBP field to 1 if both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true and sets it to 0 otherwise. See 11.55.4.

The Polarization Sensing Supported subfield is set to 0 to indicate polarization sensing is not supported in DMG sensing. This subfield is set to 1 to indicate linear polarization sensing is supported in DMG sensing and set to 2 to indicate circular polarization sensing is supported in DMG sensing. Value 3 of this subfield is reserved.

9.4.2.335 DMG Sensing Beam Descriptor element

The DMG Sensing Beam Descriptor element contains a set of descriptors of the beam patterns. The DMG Sensing Beam Descriptor element is present in frames in which the DMG Sensing Capabilities element (see 9.4.2.334) is present. The number of beam patterns is the number set in Maximum Number Of TX Directions or Maximum Number Of RX Directions fields (see 9.4.2.334). The DMG Sensing Beam Descriptor element is defined in Figure 9-1074ca.

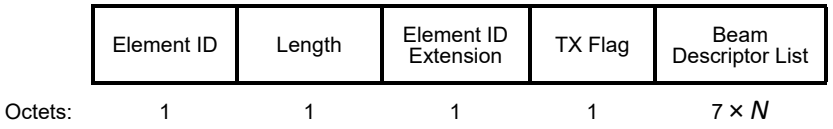

Figure 9-1074ca—DMG Sensing Beam Descriptor element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The TX Flag field indicates the type of a beam descriptor. The definitions of the TX Flag field are shown in Table 9-417ab. The position of the beam descriptor in the Beam Descriptor List field is the index of the beam descriptor. The indexing of the beams is separate for the RX and TX beams.

Table 9-417ab—TX Flag field definition

Value	Description
0	RX beam descriptor
1	TX beam descriptor
2–255	Reserved

The Beam Descriptor List field contains N Beam Descriptor fields. The Beam Descriptor field is defined in Figure 9-1074cb.

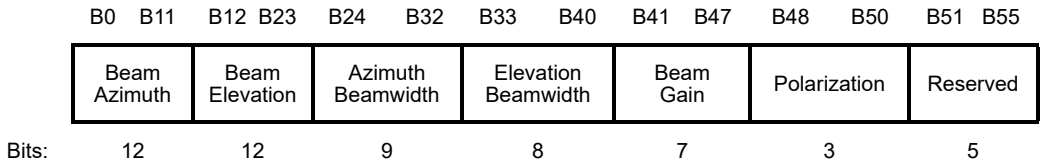

Figure 9-1074cb—Beam Descriptor field format

The Beam Azimuth and Beam Elevation fields contain the direction of the beam in azimuth and elevation, respectively. The Beam Azimuth field is specified in units of $(360/4096)°$ and takes values from 0 to 4095. The Beam Elevation field is encoded as a 2s complement number taking values from –2048 to 2047 in units of $(180/4096)°$.

The Azimuth Beamwidth and Elevation Beamwidth fields contain the beam 3 dB bandwidth in azimuth in units of (360/512)° and in elevation in units of (180/256)°, respectively.

The Beam Gain field is an unsigned integer containing the beam gain in units of 0.5 dB, where 0 dBi is represented by a value of 0.

Polarization field is set to 0 if the Polarization Sensing Supported field within the DMG Sensing Capabilities field (see 9.4.2.334) is set to 0. This field is set to 1 if the beam contained in this Beam Descriptor field is Horizontally Polarized, set to 2 if the beam contained in this Beam Descriptor field is Vertically Polarized, set to 3 if the beam contained in this Beam Descriptor field is Left Hand Circularly Polarized, and set to 4 if the beam contained in this Beam Descriptor field is Right Hand Circularly Polarized. Values 5, 6, and 7 are reserved.

9.4.2.336 DMG Sensing Short Capabilities element

The DMG Sensing Short Capabilities element contains fields that are used to advertise optional DMG sensing capabilities. The DMG Sensing Short Capabilities element is defined in Figure 9-1074cc.

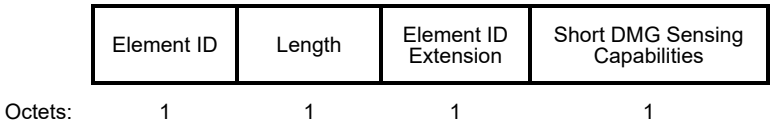

Figure 9-1074cc—DMG Sensing Short Capabilities element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The Short DMG Sensing Capabilities field is defined in Figure 9-1074cd.

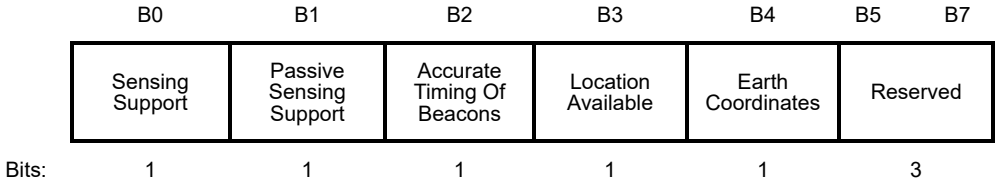

Figure 9-1074cd—Short DMG Sensing Capabilities field format

The Sensing Support field indicates support for any type of DMG sensing (except DMG passive sensing) as described in 11.55.3.

The Passive Sensing Support field indicates support for DMG passive sensing as described in 11.55.3.9.

The Accurate Timing Of Beacons field indicates that the time interval between beacons is sample accurate.

The Location Available field indicates that the STA is able to provide its location.

The Earth Coordinates field specifies the coordinates used for azimuth and elevation. If the Earth Coordinates field is set to 1, earth coordinates (azimuth 0 is north, elevation 0 is horizon) are used. If the Earth Coordinates field is set to 0, an arbitrary STA's coordinates are used.

9.4.2.337 DMG Sensing Measurement Session element

The DMG Sensing Measurement Session element carries information needed for a DMG sensing measurement exchange of a DMG sensing measurement session. The format of the DMG Sensing Measurement Session element is defined in Figure 9-1074ce.

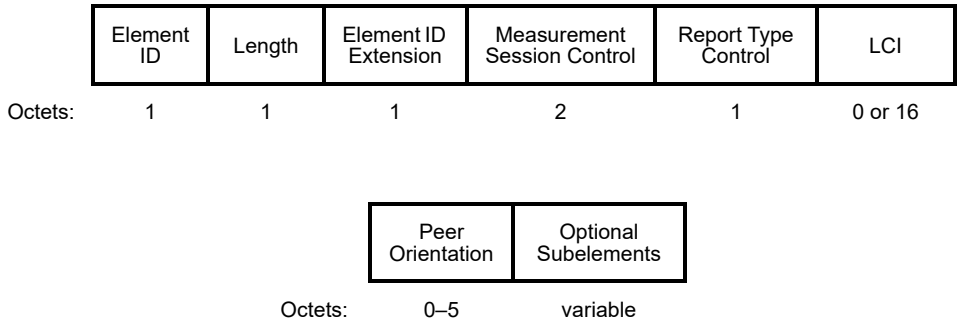

Figure 9-1074ce—DMG Sensing Measurement Session element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The Measurement Session Control field is defined in Figure 9-1074cf.

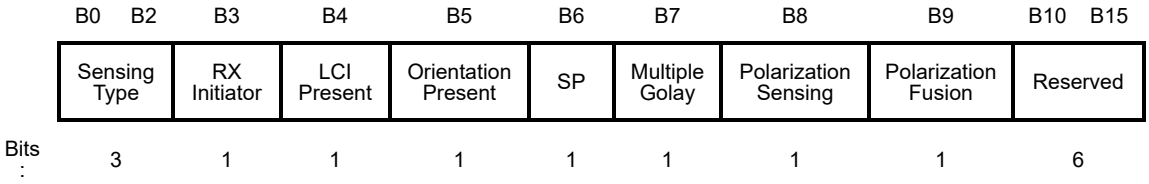

Figure 9-1074cf—Measurement Session Control field format

The Sensing Type field is defined in Table 9-417ac.

Table 9-417ac—Sensing Type field definition

Value	Description
0	Coordinated Monostatic
1	Coordinated Bistatic
2	Bistatic

Table 9-417ac—Sensing Type field definition *(continued)*

Value	Description
3	Multistatic
4–7	Reserved

The RX Initiator field is set to 1 if the sensing initiator is the sensing receiver in coordinated bistatic or bistatic sensing, and to 0 if the sensing initiator is the sensing transmitter in coordinated bistatic or bistatic sensing. This field is reserved if the Sensing Type field is not set to 1 (coordinated bistatic) or 2 (bistatic).

The LCI Present field is set to 1 if the LCI field is present in the DMG Sensing Measurement Session element. It is set to 0 otherwise.

The Orientation Present field is set to 1 if the Peer Orientation is present in the DMG Sensing Measurement Session element. It is set to 0 otherwise.

The SP field is set to 1 to indicate that the Extended Schedule element is in use. It is set to 0 otherwise.

If present in a DMG Sensing Measurement Request frame, the Multiple Golay field is set to 1 to indicate a request by the sensing initiator to use different Golay sequences in the TRN fields of PPDUs sent in different DMG sensing measurement exchanges.

The Polarization Sensing field is set to 1 to indicate the performing of polarization sensing by sensing responders if the Sensing Type field is set to Coordinated Monostatic. It is set to 0 otherwise. The Polarization Sensing subfield is reserved for other sensing types.

The Polarization Fusion subfield is set to 1 to indicate the report of fused polarization sensing results by the sensing responder in a DMG Sensing Measurement Report frame, this field is set to 0 to indicate the separate report of different polarization sensing results by sensing responder in DMG Sensing Measurement Report frame. This subfield is reserved if polarization is not used in the DMG sensing.

The Report Type Control field is defined in Figure 9-1074cg, and is used to indicate which type of report the sensing initiator expects from the sensing responder.

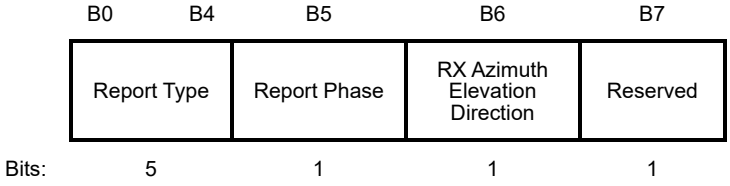

Figure 9-1074cg—Report Type Control field format

The Report Type field is defined in Table 9-417ad.

Table 9-417ad—Report Type field definition

Value	Description
0	No report
1	CSI
2	DMG Sensing Image Direction
3	DMG Sensing Image Range-Doppler
4	DMG Sensing Image Range-Direction
5	DMG Sensing Image Doppler-Direction
6	DMG Sensing Image Range-Doppler Direction
7	Target
8–31	Reserved

The Report Phase field indicates that the sensing initiator requests phase information to be included in the report if the Report Type is DMG Sensing Image (2, 3, 4, 5, or 6). The Report Phase field is reserved if the Report Type field is not equal to 2, 3, 4, 5, or 6.

The RX Azimuth Elevation Direction field indicates that the sensing initiator requests receive direction information to be reported in azimuth/elevation format rather in receive beam index format if the report includes direction reporting.

The LCI field is defined in 9.4.2.20.10.

The Peer Orientation field is defined in Figure 9-1074ch.

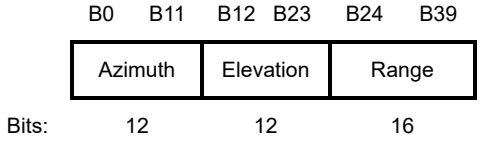

Figure 9-1074ch—Peer Orientation field format

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

The Elevation field contains the elevation orientation of the addressed STA as measured by the transmitting STA in units of (180/4096)° with values from –2048 to 2047.

The Range field contains the range from the transmitting STA to the addressed STA as measured by the addressed STA in units of millimeters.

The Optional Subelements field contains 0 or more subelements. The subelement format and ordering of subelements are defined in 9.4.3. The Subelement ID field values for the defined subelements are defined in Table 9-417ae.

Table 9-417ae—Subelements of DMG Sensing Measurement Session definition

Subelement ID	Subelement Name	Extensible
1	TX Beam List	Yes
2	RX Beam List	Yes
3	DMG Sensing Scheduling	Yes
4	Burst Response Delay	Yes
5	DMG SBP Specific	Yes
6–255	Reserved	No

If the sensing initiator is a DMG AP or DMG PCP, and if the DMG Sensing Measurement Request frame is transmitted to satisfy a DMG SBP request, it also includes a DMG SBP Specific subelement in the DMG Sensing Measurement Request frame to describe the set of parameters associated with the DMG SBP request. The format of the DMG SBP Specific subelement is as shown in Figure 9-1074ci.

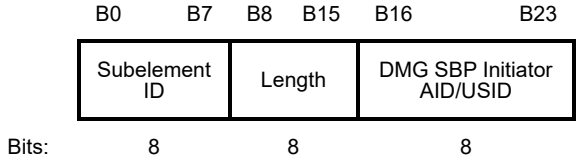

Figure 9-1074ci—DMG SBP Specific subelement format

The DMG SBP Initiator AID/USID field indicates either the AID or the USID for the DMG SBP initiator that triggers the DMG AP or DMG PCP to transmit the associated DMG Sensing Measurement Request frame to satisfy the DMG SBP request from the DMG SBP initiator.

9.4.2.337.1 TX Beam List subelement

The TX Beam List subelement contains a list of transmit beam indices. The beam indices are indices into the Beam Descriptors List field sent within the DMG Sensing Beam Descriptor element (see 9.4.2.335) with the TX Flag field set to 1. The TX Beam List subelement is defined in Figure 9-1074cj.

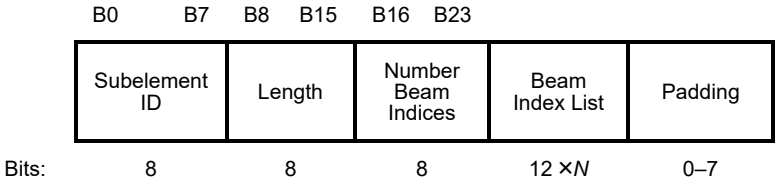

Figure 9-1074cj—TX Beam List subelement format

If the Report Type field is 3, 5, 6, or 7 (that is, values indicating Doppler measurement) and the DMG Sensing Scheduling subelement is present in DMG Sensing Session element, the Number Beam Indices field is equal to the Number TX Beams Per Exchange field within the DMG Sensing Scheduling subelement.

9.4.2.337.2 RX Beam List subelement

The RX Beam List subelement contains a list of receive beam indices. The beam indices are indices into the Beam Descriptors List field sent within the DMG Sensing Beam Descriptor element (see 9.4.2.335) with the TX Flag field set to 0. The RX Beam List subelement is defined in Figure 9-1074ck.

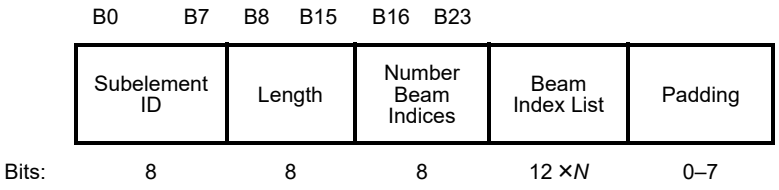

Figure 9-1074ck—RX Beam List subelement format

9.4.2.337.3 DMG Sensing Scheduling subelement

The DMG Sensing Scheduling subelement contains scheduling information for the measurement defined in the sensing measurement session. The DMG Sensing Scheduling subelement is defined in Figure 9-1074cl.

	Subelement ID	Length	Start Of Burst	Inter-burst Interval	Intra-burst Interval	Number TX Beams Per Exchange	Repeat Per Exchange	Number Bursts	Number Of Exchanges Per Burst
Octets:	1	1	4	2	1	1	1	1	1

Figure 9-1074cl—DMG Sensing Scheduling subelement format

The Start Of Burst field contains the time for the start of the first burst in units of microseconds. A value of 0 indicates that the time for the start of the first burst is unspecified.

The Interburst Interval field contains the time between the start of successive bursts. This field is in units of microseconds. A value of 0 indicates that the time between the start of successive bursts is unspecified.

The Intraburst Interval field contains the time between the start of successive DMG sensing measurement exchanges in a burst. This field is in units of microseconds. A value of 0 indicates that the time between the start of successive DMG sensing measurement exchanges in a burst is unspecified.

If the Sensing Type field is set to Coordinated Monostatic in the Measurement Session Control field (see Figure 9-1074cf), the following apply:

— If the SP field in the Measurement Session Control field is set to 1, the Number TX Beams Per Exchange field contain the maximum number of TX beams to be used in one DMG sensing measurement exchange. If the SP field in the Measurement Session Control field is set to 0, the

Number TX Beams Per Exchange field contain the number of TX beams to be used in the first DMG sensing measurement exchange. The use of this field is described in 11.55.3.6.

— If the SP field in the Measurement Session Control field is set to 1, the Repeat Per Exchange field indicates the maximum number of times to repeat the transmission in one DMG sensing measurement exchange. If the SP field in the Measurement Session Control field is set to 0, the Repeat Per Exchange field indicates the number of times to repeat the transmission in the first DMG sensing measurement exchange.

If the Sensing Type field is not set to Coordinated Monostatic in the Measurement Session Control field (see Figure 9-1074cf), the following apply:

— The Number TX Beams Per Exchange field contain the number of TX beams to be used in one DMG sensing measurement exchange. The use of this field is described in 11.55.3.6.

— The Repeat Per Exchange field indicates the number of times to repeat the transmission.

The Number Bursts field contains the number of times to repeat the burst. A value of 0 indicates repeat until tear down.

The Number Of Exchanges Per Burst field contains the number of times to repeat the DMG sensing measurement exchanges during one burst. A value of 0 indicates that the number of DMG sensing measurement exchanges per burst is unspecified.

9.4.2.337.4 Burst Response Delay subelement

The format of the Burst Response Delay subelement is defined in Figure 9-1074cm.

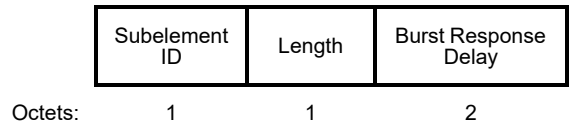

Figure 9-1074cm—Burst Response Delay subelement format

The Burst Response Delay field of the Burst Response Delay subelement contains the maximum time in milliseconds after the end of the last PPDU in the burst it takes the sensing responder to generate the report on the sensing measurements in the burst.

9.4.2.338 DMG Sensing Image Range Axis LUT element

The DMG Sensing Image Range Axis LUT element carries the LUT for the Range Axis used in DMG Sensing Image Report Data subelement (see 9.4.2.341.3). The format of the DMG Sensing Image Range Axis LUT element is defined in Figure 9-1074cn.

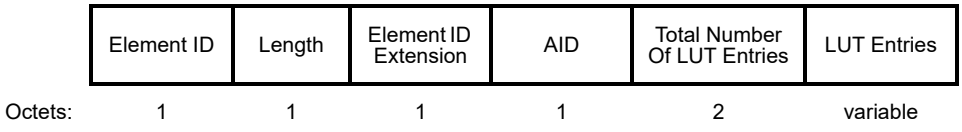

Figure 9-1074cn—DMG Sensing Image Range Axis LUT element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The AID field uniquely identifies the sensing responder to whom the DMG Sensing Image Range Axis LUT element belongs.

The Total Number Of LUT Entries field contains the total number of LUT entries that the sender STA sends in one or multiple DMG Sensing Image Range Axis LUT elements.

The LUT Entries field contains the range values for each entry. Each value is 16 bits representing the range in units of millimeters.

9.4.2.339 DMG Sensing Image Doppler Axis LUT element

The DMG Sensing Image Doppler Axis LUT element carries the LUT for the Doppler Axis used in DMG Sensing Image Report Data element (see Figure 9-1074cx). The format of the DMG Sensing Image Doppler Axis LUT element is defined in Figure 9-1074co.

	Element ID	Length	Element ID Extension	AID	Total Number Of LUT Entries	LUT Entries
Octets:	1	1	1	1	2	variable

Figure 9-1074co—DMG Sensing Image Doppler Axis LUT element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The AID field uniquely identifies the sensing responder to whom the DMG Sensing Image Doppler Axis LUT element belongs.

The Total Number Of LUT Entries field contains the total number of LUT entries that the sender STA sends in one or multiple DMG Sensing Image Doppler Axis LUT elements.

The LUT Entries field contains the Doppler values for each entry. Each value is 16 bits representing the Doppler in units of 1 mm/s.

9.4.2.340 DMG Sensing Report Control element

The structure of the DMG Sensing Report Control element is shown in Figure 9-1074cp.

	Element ID	Length	Element ID Extension	AID	Report Control
Octets:	1	1	1	1	6

Figure 9-1074cp—DMG Sensing Report Control element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The AID field uniquely identifies the sensing responder to whom the DMG Sensing Report Control element belongs.

The Report Control field is defined in Figure 9-1074cq.

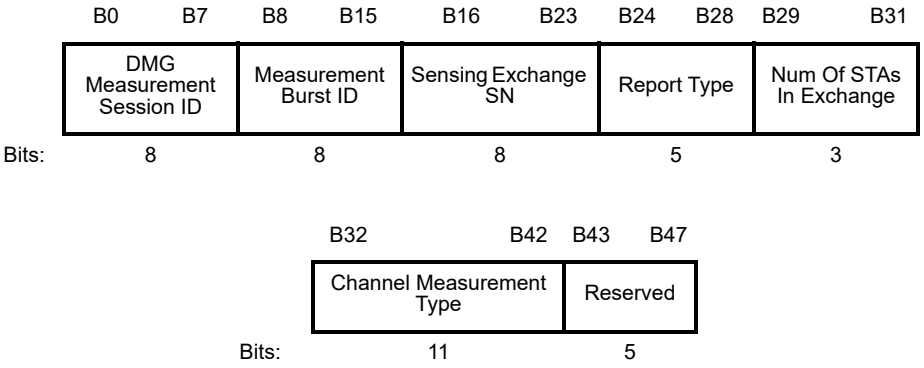

Figure 9-1074cq—Report Control field format

The DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN fields identify the sensing measurement and the DMG sensing measurement exchange.

The Report Type field is set to one of the values described in Table 9-417ad.

The Channel Measurement Type field is defined in Figure 9-1074cr.

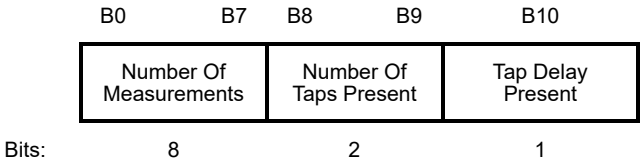

Figure 9-1074cr—Channel Measurement Type field format

The fields of the Channel Measurement Type field are defined in Table 9-294.

9.4.2.341 DMG Sensing Report element

9.4.2.341.1 General

The DMG Sensing Report element contains information needed for a DMG sensing measurement report (see 11.55.3.7). The format of the DMG Sensing Report element is defined in Figure 9-1074cs.

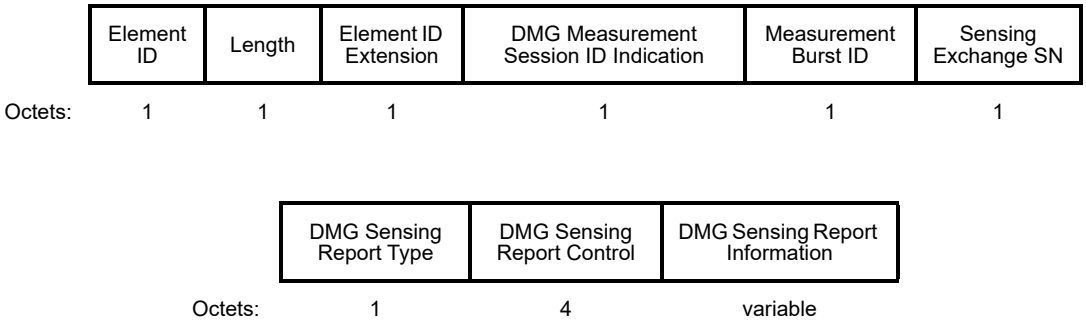

Figure 9-1074cs—DMG Sensing Report element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN fields identify the DMG sensing measurement session, DMG sensing burst, and the DMG sensing measurement exchange, respectively.

The Measurement Burst ID and Sensing Exchange SN values reported are of the last used Measurement Burst ID and Sensing Exchange SN to compute the report.

The Sensing Exchange SN field is reserved if the DMG Sensing Report Type field is set to 3, 5, 6, or 7.

The DMG Sensing Report Type field is set to one of the values described in Table 9-417ad.

The DMG Sensing Report Control field is defined in Figure 9-1074ct.

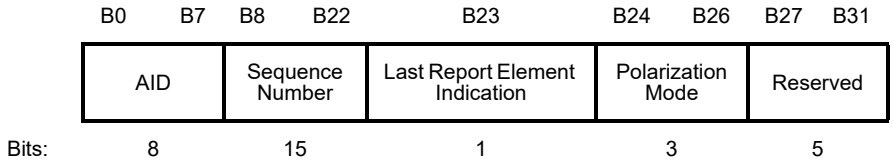

Figure 9-1074ct—DMG Sensing Report Control field format

The AID field uniquely identifies the sensing responder to which the DMG sensing measurement report belongs.

The Sequence Number field contains the sequence number of the DMG Sensing Report element. The first Sequence Number is 0 and it is incremented for every DMG Sensing Report element sent that has the same AID, DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN.

The Last Report Element Indication field is set to 1 in the last DMG Sensing Report element sent that has the same AID, DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN.

The Polarization Mode field indicates the polarization mode information of the sensing results contained in the DMG Sensing Report element. Possible values for this subfield are defined in Table 9-417af.

Table 9-417af—Polarization Mode field definition

Value	Description
0	No polarization information
1	Horizontally polarized for linear polarization, left hand circularly polarized-left hand circularly polarized for circular polarization
2	Horizontally polarized-vertically polarized for linear polarization, left hand circularly polarized-right hand circularly polarized for circular polarization
3	Vertically polarized-vertically polarized for linear polarization, right hand circularly polarized-right hand circularly polarized for circular polarization
4	Vertically polarized-horizontally polarized for linear polarization, right hand circularly polarized-left hand circularly polarized for circular polarization
5	Fused result
6–7	Reserved

The Polarization Mode field is set to 0 to indicate that the sensing results contained in the DMG Sensing Report element has no polarization information. For linear polarization, this subfield is set to 1, 2, 3 or 4 to indicate that sensing results contained in the DMG Sensing Report element were obtained by transmitting with horizontal polarization and receiving with horizontal polarization, transmitting with horizontal polarization and receiving with vertical polarization, transmitting with vertical polarization and receiving with vertical polarization, or transmitting with vertical polarization and receiving with horizontal polarization, respectively. For circular polarization, this field is set to 1, 2, 3 or 4 for different transmitting and receiving circular polarization combinations. This field is set to 5 to indicate the sensing results contained in the DMG Sensing Report element is the fused result based on different polarization results.

The DMG Sensing Report Information field contains one or more subelements. The subelements that might be included are: DMG Sensing Report Header subelement (9.4.2.341.2), DMG Sensing Image Report Data subelement (9.4.2.341.3), and DMG Sensing Targets Report Data subelement (9.4.2.341.4).

The DMG Sensing Report subelement ID field values for the defined subelements are shown in Table 9-417ag.

Table 9-417ag—Optional Subelement IDs for DMG Sensing Report

Subelement ID	Name
0	DMG Sensing Report Header
1	DMG Sensing Image Report Data
2	DMG Sensing Targets Report Data
3–255	Reserved

The DMG Sensing Report Header subelement contains sensing receiver location information. The DMG Sensing Report Header subelement field format is defined in 9.4.2.341.2.

The DMG Sensing Image Report Data subelement contains measurements reported. The DMG Sensing Image Report Data subelement field format is defined in 9.4.2.341.3. Multiple DMG Sensing Image Report Data subelements may be present in a DMG Sensing Report element if the sensing image report information is longer than 255 octets.

The DMG Sensing Targets Report Data subelement contains the reported targets. The DMG Sensing Targets Report Data subelement field format is defined in 9.4.2.341.4. Multiple DMG Sensing Targets Report Data subelements may be present in a DMG Sensing Report element if the sensing targets report information is longer than 255 octets.

A DMG Sensing Measurement Report frame (9.6.21.10) includes one or more DMG Sensing Report elements.

9.4.2.341.2 DMG Sensing Report Header subelement

The DMG Sensing Report Header subelement carries a description of a DMG Sensing Image Report Data subelement. The format of the DMG Sensing Report Header subelement is defined in Figure 9-1074cu.

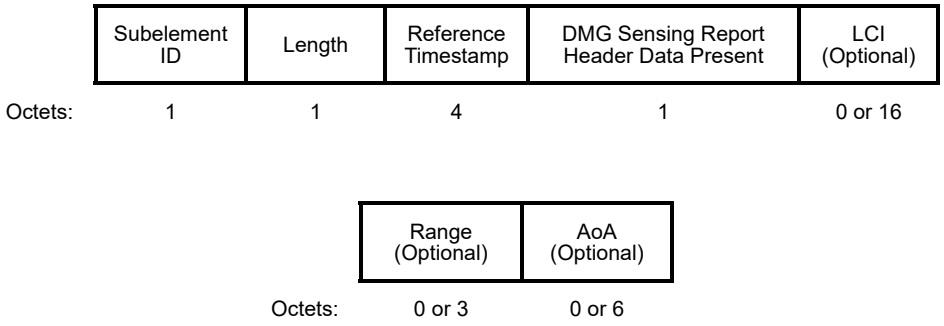

Figure 9-1074cu—DMG Sensing Report Header element format

The Subelement ID field is defined in Table 9-417ag.

The Length field is defined in 9.4.3.

The Reference Timestamp field contains the lower 4 octets of the TSF timer value sampled at the PHY-RXSTART.indication of the first PPDU in the last DMG sensing measurement exchange included in the report.

The DMG Sensing Report Header Data Present field is as shown in Figure 9-1074cv.

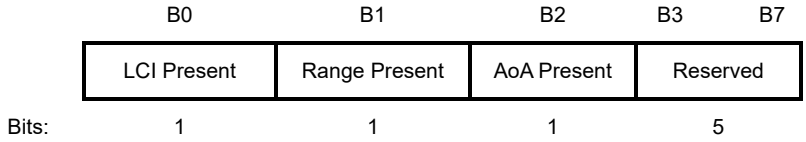

Figure 9-1074cv—DMG Sensing Report Header Data Present field format

The LCI Present field is set to 1 to indicate that the LCI field is present in the DMG Sensing Report Header subelement; it is set to 0 otherwise.

The Range Present field is set to 1 to indicate that the Range field is present in the DMG Sensing Report Header subelement; it is set to 0 otherwise.

The AoA Present field is set to 1 to indicate that the AoA field is present in the DMG Sensing Report Header subelement; it is set to 0 otherwise.

The LCI field is defined in Figure 9-303.

The Range field is defined in Figure 9-1074cw.

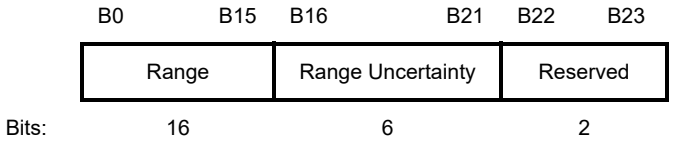

Figure 9-1074cw—Range field format

The Range field indicates the range of the sensing receiver relative to the sensing transmitter in units of millimeters.

The Range Uncertainty field contains the range estimated uncertainty using the following equation:

$$\text{Range Uncertainty} = \text{round}(4 \cdot \log 2(u))$$

where u is the range estimated uncertainty in units of millimeters.

The AoA field indicates an AoA measurement result done by the sensing receiver relative to the sensing transmitter. The AoA field is defined in Figure 9-1041. The Best AWV ID field in AOA Results field is reserved.

9.4.2.341.3 DMG Sensing Image Report Data subelement

The DMG Sensing Image Report Data subelement contains DMG sensing image report results. This element follows DMG Sensing Report Header subelement. The format of the DMG Sensing Image Report Data subelement is defined in Figure 9-1074cx.

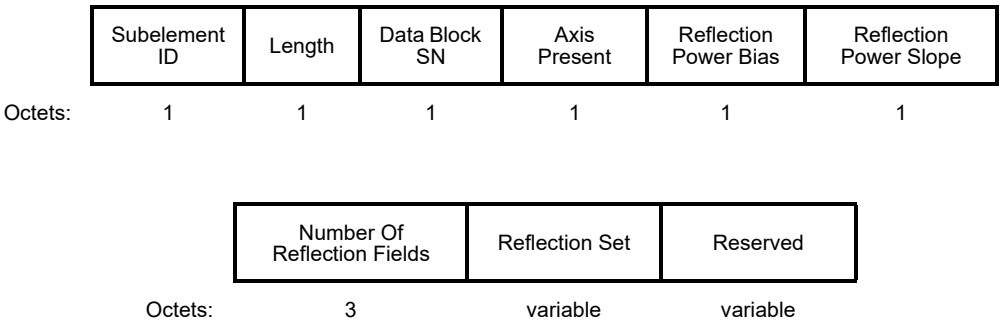

Figure 9-1074cx—DMG Sensing Image Report Data element format

The Subelement ID field is defined in Table 9-417ag.

The Length field is defined in 9.4.3.

The Data Block SN field contains the sequence number of the DMG Sensing Image Report Data subelement belonging to the same DMG sensing image report.

The Axis Present field is defined in Figure 9-1074cy.

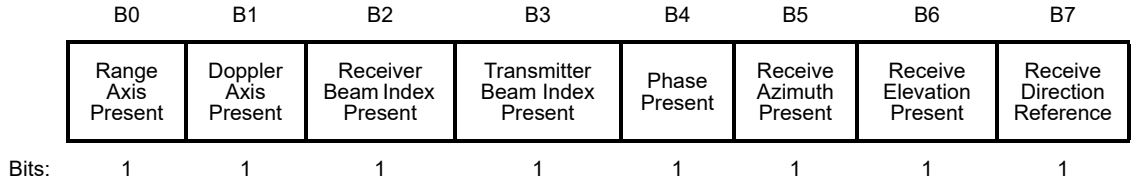

Figure 9-1074cy—Axis Present field format

The Range Axis Present field is set to 1 to indicate the presence of Range Axis Index field in the Reflection Set field. It is set to 0 otherwise.

The Doppler Axis Present field is set to 1 to indicate the presence of Doppler Axis Index field in the Reflection Set field. It is set to 0 otherwise.

The Receiver Beam Index Present field is set to 1 to indicate the presence of Receiver Beam Index field in the Reflection Set field. It is set to 0 otherwise.

The Transmitter Beam Index Present field is set to 1 to indicate the presence of Transmitter Beam Index field in the Reflection Set field. It is set to 0 otherwise.

The Phase Present field is set to 1 to indicate the presence of Phase Value field in the Reflection Set field. It is set to 0 otherwise.

The Receive Azimuth Present field is set to 1 to indicate the presence of receive azimuth angles in the Reflection subelements. It is set to 0 otherwise.

The Receive Elevation Present field is set to 1 to indicate the presence of receive elevation angles in the Reflection subelements. It is set to 0 otherwise.

If either the Receive Azimuth Present field or the Receive Elevation Present field is set to 1, the Receiver Beam Index Present field is set to 0. If the Receiver Beam Index Present field is set to 1, both the Receive Azimuth Present field and the Receive Elevation Present field are set to 0.

If either the Receive Azimuth Present field or the Receive Elevation Present field is set to 1, the Receive Direction Reference is set to 1 to indicate that the azimuth and elevation axis are in earth coordinates. Otherwise, they are in an arbitrary STA coordinate system. If the Receiver Beam Index Present field is set to 1, this field is reserved.

The Reflection Power Bias field contains the bias value to compute the reflection power. The value is in unit of 1 dBm representing the negated value. The bias represented is in the range 0 dBm to –255 dBm, represented by value 0 to 255 in the field.

The Reflection Power Slope field contains the slope value to compute the reflection power. The value is in units of 1/256 dBm representing the factor for the reported values.

The Number Of Reflection Fields field contains the number of Reflection fields present in the Reflection Set field.

The Reflection Set field contains multiple Reflection fields. All Reflection fields within a Reflection Set field have the same format, which is derived from the Axis Present field. There are 4 format options for 2 axes (Figure 9-1074cz), 3 axes (Figure 9-1074da), 4 axes (Figure 9-1074db), and 5 axes (Figure 9-1074dc). The number of bits allocated for each axis is fixed and given by the axis type.

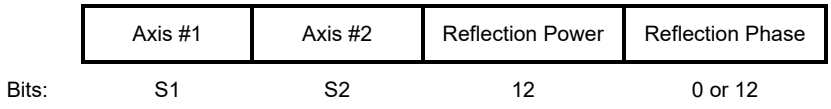

Figure 9-1074cz—Reflection field format for 2 axes

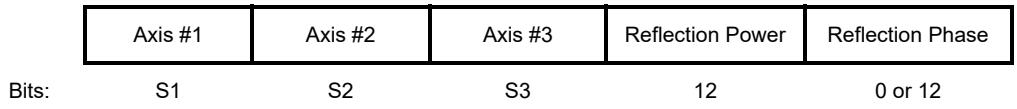

Figure 9-1074da—Reflection field format for 3 axes

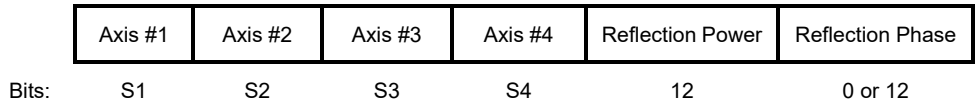

Figure 9-1074db—Reflection field format for 4 axes

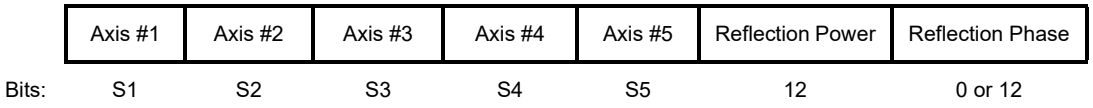

Figure 9-1074dc—Reflection field format for 5 axes

The order of the axis and the number of bits (S1, S2, S3, S4, S5) in Figure 9-1074cz, Figure 9-1074da, Figure 9-1074db and Figure 9-1074dc is according to Table 9-417ah and the selected axis in Axis Present field.

Table 9-417ah—Order of the axis and allocated bits in a Reflection field

Axis	Allocated Bits (S1, S2, S3, S4, S5)
Range	16
Doppler	10
Receiver Beam Index	12
Transmitter Beam Index	12
Receive Azimuth	12
Receive Elevation	12

If azimuth and elevation are part of the report, the 5 axes are: Range, Doppler, Transmit Beam Index, Receive Azimuth, and Receive Elevation.

The Axis #1, #2, #3, #4, and #5 fields in the Reflection field represents the index of the axis according to the values defined in Table 9-417ah.

The Reflection Power field in the Reflection field represents the reflection received power in units of dBm. The actual reflection received power value is given by the following equation:

$$\text{Reflection Received Power [dBm]} = (-\text{Reflection Power Bias}) + (\text{Reflection Power}) \times (\text{Reflection Power Slope} / 256)$$

where the Reflection Power Bias and Reflection Power Slope are the values in the DMG Sensing Image Report Data element.

The Reflection Phase field in the Reflection field is present if the Phase Present field within the Axis Present field is equal to 1. The Reflection Phase field in the Reflection field represents the reflection received phase in units of $(360/4096)°$.

In monostatic sensing the Receiver Beam Index axis represents the Beam Index used by the STA to transmit and receive, and the Transmitter Beam Index axis is not present. The Receiver Beam Index is an index into the DMG Sensing Beam Descriptor element (see 9.4.2.335).

9.4.2.341.4 DMG Sensing Targets Report Data subelement

The DMG Sensing Targets Report Data subelement contains DMG sensing targets report results. This element follows DMG Sensing Report Header subelement. The format of the DMG Sensing Targets Report Data subelement is defined in Figure 9-1074dd.

	Subelement ID	Length	Data Block SN	Axis Present	Number Of Targets	Target Parameters	Reserved
Octets:	1	1	1	1	1	variable	variable

Figure 9-1074dd—DMG Sensing Target Report Data subelement format

The Subelement ID field is defined in Table 9-417ag.

The Length field is defined in 9.4.3.

The Data Block SN field contains the sequence number of this DMG Sensing Target Report Data element belonging to the same DMG sensing target report.

The Axis Present field is as shown in Figure 9-1074de.

	B0	B1	B2	B3	B4
	Range Axis Present	Azimuth Axis Present	Elevation Axis Present	Radial Velocity Axis Present	Azimuth Velocity Axis Present
Bits:	1	1	1	1	1

	B5	B6	B7
	Elevation Velocity Axis Present	Reserved	
Bits:	1	2	

Figure 9-1074de—Axis Present field format

The Range Axis Present field is set to 1 to indicate the presence of Range Axis Index field in the Target field. It is set to 0 otherwise.

The Azimuth Axis Present field is set to 1 to indicate the presence of Azimuth Axis Index field in the Target field. It is set to 0 otherwise.

The Elevation Axis Present field is set to 1 to indicate the presence of Elevation Axis Index field in the Target field. It is set to 0 otherwise.

The Radial velocity Axis Present field is set to 1 to indicate the presence of Radial Velocity Axis Index field in the Target field. It is set to 0 otherwise.

The Azimuth velocity Axis Present field is set to 1 to indicate the presence of Azimuth Velocity Axis Index field in the Target field. It is set to 0 otherwise.

The Elevation velocity Axis Present field is set to 1 to indicate the presence of Elevation Velocity Axis Index field in the Target field. It is set to 0 otherwise.

The Number Of Targets field contains the number of Target fields that are reported in the following Target Parameters field.

The Target Parameters field contains one or multiple Target fields as defined in Figure 9-1074df.

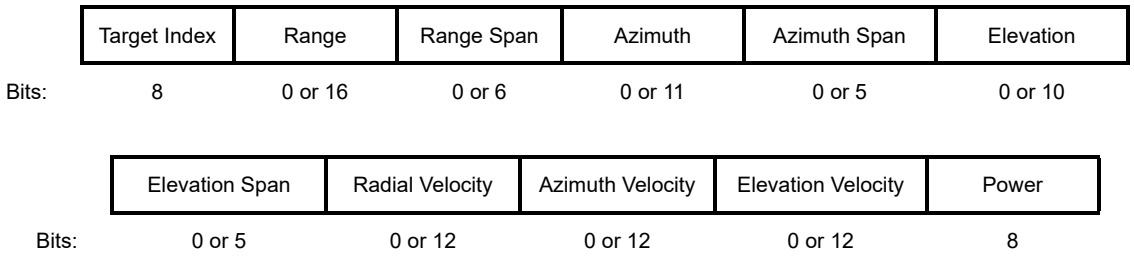

Figure 9-1074df—Target Parameters field format

The Target Index field indicates the ID of the target. The sensing receiver may allocate a nonzero value to each detected target and use the same value in different reports. A Target Index field value of 0 is used if the sensing receiver does not allocate a persistent number to each target.

The Range field indicates the range of the target relative to the sensing receiver in units of millimeters. This field is present if Range Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Range Span field indicates the range span (size) of the target relative to the sensing receiver, using the following equation:

$$\text{Range Span} = \min(\text{round}(4 \cdot \log2(u)), 63)$$

where u is the range span in units of millimeters. The minimum value of u is 1 millimeter.

This field is present if Range Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Azimuth field indicates the azimuth of the target relative to the sensing receiver in units of $(360/2048)°$. This field is present if Azimuth Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Azimuth Span field indicates the azimuth span (size) of the target relative to the sensing receiver, using the following equation:

$$\text{Azimuth Span} = \min(\max(\text{round}(3 \cdot \log2(u \cdot 2048/360)), 0), 31)$$

where u is the azimuth span in units of $(360/2048)°$.

This field is present if Azimuth Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Elevation field indicates the elevation of the target relative to the sensing receiver in units of $(360/2048)°$. This field is present if Elevation Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Elevation Span field indicates the elevation span (size) of the target relative to the sensing receiver, using the following equation:

$$\text{Elevation Span} = \min(\max(\text{round}(3 \cdot \log2(u \cdot 2048/360)), 0), 31)$$

where u is the elevation span in units of $(360/2048)°$.

This field is present if Elevation Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Radial Velocity field indicates the radial velocity of the target relative to the sensing receiver in units of 1 mm/s. This field is present if Radial velocity Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Azimuth Velocity field indicates the azimuth velocity of the target relative to the sensing receiver in units of $((360/2048)°)/s$. This field is present if Azimuth Velocity Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Elevation Velocity field indicates the elevation velocity of the target relative to the sensing receiver in units of $((360/2048)°)/s$. This field is present if Elevation Velocity Axis Present field is set to 1 in Axis Present field, and not present otherwise.

The Power field is an unsigned integer indicating the received power from the target, in 1 dB units relative to –255 dBm.

9.4.2.342 BRP Sensing element

The BRP Sensing element is defined in Figure 9-1074dg.

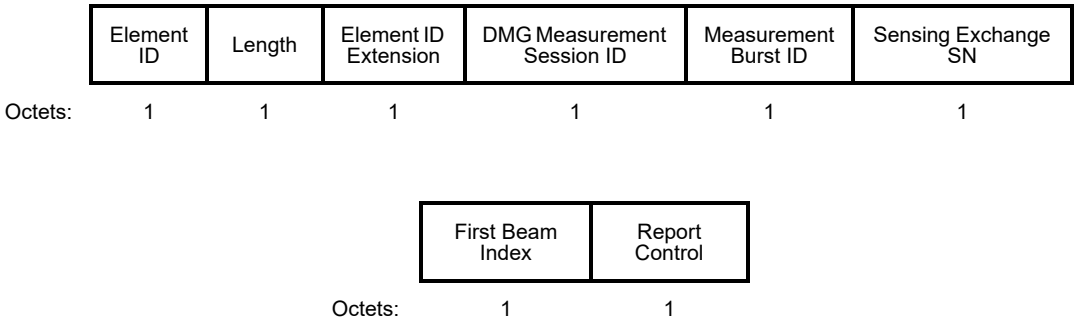

Figure 9-1074dg—BRP Sensing element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN fields identify the DMG sensing measurement session, the DMG sensing burst, and the DMG sensing measurement exchange, respectively.

The First Beam Index field is an index into the TX beam list within the DMG Sensing Measurement Session element that indicates the first beam to be used in the transmission of the TRN field of the PPDU that carries the BRP frame as defined in the TX beam list in the DMG Sensing Measurement Session element (see 9.4.2.337).

The Report Control field is defined in Figure 9-1074dh.

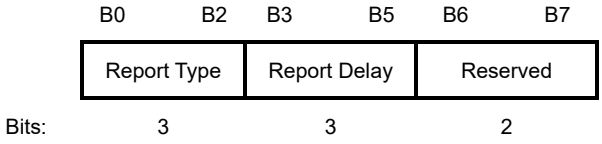

Figure 9-1074dh—Report Control field format

The Report Type field is defined in Table 9-417ad.

The Report Delay field is defined in Table 9-417ai.

Table 9-417ai—Report Delay field definition

Value	Interpretation
0	No report in the DMG sensing measurement exchange
1	Report in this frame covering measurements in this DMG sensing measurement exchange
2	Report in this frame covering measurements in the previous DMG sensing measurement exchange
3	Report in this frame covering measurements in this burst
4	Report in this frame covering measurements in the previous burst
5–7	Reserved

9.4.2.343 DMG Passive Sensing Beacon element

The DMG Passive Sensing Beacon element contains an optional LCI and the number of sectors to be described in adjoining DMG Beacon Sector Descriptor elements. The DMG Passive Sensing Beacon element is defined in Figure 9-1074di.

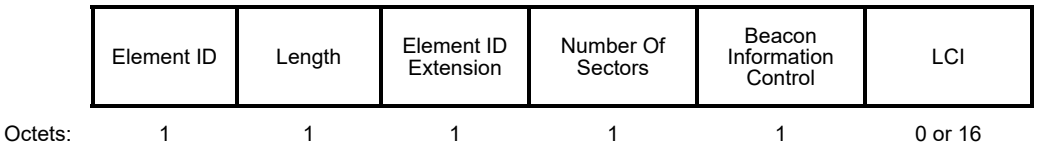

Figure 9-1074di—DMG Passive Sensing Beacon element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The Number Of Sectors field contains the number of sector descriptors in the attached DMG Beacon Sector Descriptor element. It is equal to the number of sectors used in the BTI.

The Beacon Information Control field is defined in Figure 9-1074dj.

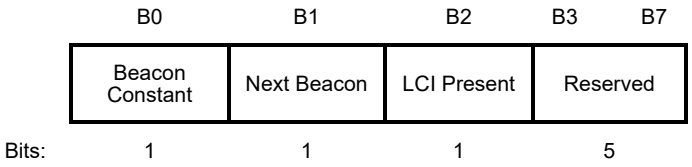

Figure 9-1074dj—Beacon Information Control field format

The Beacon Constant field is set to 1 to indicate that the AP uses the same set of sectors in all BTIs. It is set to 0 otherwise.

The Next Beacon field is set to 1 to indicate that the Beacon Sector Descriptors describe the next BTI, it is set to 0 if they describe the previous BTI. It is reserved if the Beacon Constant field is set to 1.

The LCI Present field is set to 1 to indicate that LCI field is present in the DMG Passive Sensing Beacon element. It is set to 0 otherwise.

The LCI field is defined in 9.4.2.20.10.

9.4.2.344 DMG Beacon Sector Descriptor element

The DMG Beacon Sector Descriptor element contains a set of sector descriptors for DMG passive sensing. The DMG Beacon Sector Descriptor element is defined in Figure 9-1074dk.

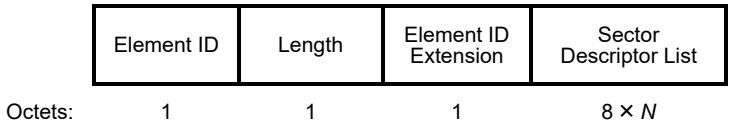

Figure 9-1074dk—DMG Beacon Sector Descriptor element format

In Figure 9-1074dk, *N* is equal to the number of sectors defined within the DMG Passive Sensing Beacon element (see 9.4.2.343).

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The Sector Descriptor List field contains *N* Sector Descriptor fields. The Sector Descriptor field is defined in Figure 9-1074dl.

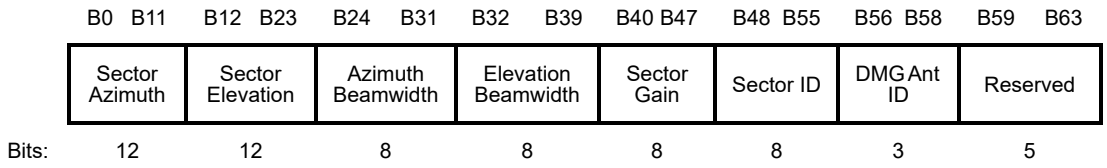

Figure 9-1074dl—Sector Descriptor field format

The Sector Azimuth and Sector Elevation fields contain the direction of the beam in azimuth and elevation, respectively. The Sector Azimuth field is specified in units of $(360/4096)°$ and takes values from 0 to 4095. The Sector Elevation field is encoded as a 2s complement number taking values from –2048 to 2047 in units of $(180/4096)°$.

The Azimuth Beamwidth and Elevation Beamwidth fields contain the beacon beam 3 dB bandwidth in azimuth and elevation respectively in units of $(180/256)°$.

The Sector Gain field indicates the antenna gain of the sector. It has value of 0 to 255 with 0.5 dB resolution.

The Sector ID field is equal to the Sector ID used in the beacon using the azimuth and elevation as described.

The DMG Ant ID field is equal to the DMG Ant ID used in the beacon using the azimuth and elevation as described.

9.4.2.345 DMG Sensing Measurement Exchange Duration element

The format of the DMG Sensing Measurement Exchange Duration element is defined in Figure 9-1074dm.

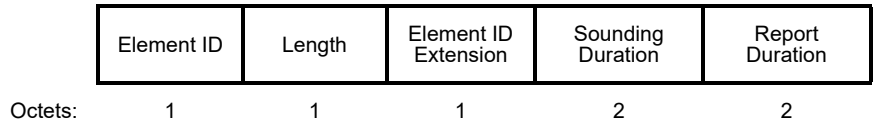

Figure 9-1074dm—DMG Sensing Measurement Exchange Duration element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

If the SP field in the DMG Sensing Measurement Request frame is set to 1, the Sounding Duration field contains the maximum duration of the sounding phase among all DMG sensing measurement exchanges with

the same DMG Measurement Session ID. If the SP field in the DMG Sensing Measurement Request frame is set to 0, the Sounding Duration field contains the duration of the sounding phase in the first DMG sensing measurement exchange. The value of the Sounding Duration field is equal to the sum of the sounding PPDUs and SBIFS between them. The sounding PPDUs are DMG monostatic sensing PPDUs. This field is in the unit of microsecond.

If the SP field in the DMG Sensing Measurement Request frame is set to 1, the Report Duration field contains the maximum duration of the DMG Sensing Measurement Report frame transmitted by the sensing responder among all DMG sensing measurement exchanges belonging to the same DMG Measurement Session ID. If the SP field in the DMG Sensing Measurement Request frame is set to 0, the Report Duration field contains the duration of the DMG Sensing Measurement Report frame transmitted by the sensing responder in the first DMG sensing measurement exchange. This field is in the unit of microsecond. A value of 0 indicates that the sensing responder does not transmit any report frame.

9.4.2.346 DMG SBP Parameters element

The DMG SBP Parameters element indicates operational parameters associated with a requested DMG SBP procedure. The format of the DMG SBP Parameters element is defined in Figure 9-1074dn.

	Element ID	Length	Element ID Extension	DMG SBP Parameters Control	Sensing Responder Addresses	Sensing Responder IDs
Octets:	1	1	1	2	0 or $n \times 6$	0 or variable

Figure 9-1074dn—DMG SBP Parameters element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1.

The format of the DMG SBP Parameters field is defined in Figure 9-1074do.

	B0	B1	B2 B5	B6	B7 B10
	DMG SBP Request	Sensing Responder	DMG Number Of Sensing Responders	DMG Mandatory Number Of Responders	DMG Number Of Preferred Responders
Bits:	1	1	4	1	4

	B11	B12	B13 B15
	DMG Preferred Responder List	DMG Mandatory Preferred Responder	Reserved
Bits:	1	1	3

Figure 9-1074do—DMG SBP Parameters Control field format

The DMG SBP Request field is set to 1 to indicate that the DMG SBP Parameters element is delivered by the DMG SBP Request frame. It is set to 0 to indicate that the DMG SBP Parameters element is delivered by the DMG SBP Response frame or the DMG SBP Termination frame.

The Sensing Responder field is set to 1 to indicate that the SBP initiator requests to participate as a sensing responder in the DMG sensing procedure initiated by the SBP responder in response to the DMG SBP request. The Sensing Responder field is set to 0 to indicate that the SBP initiator requests to not participate in the DMG sensing procedure initiated by the SBP responder in response to the DMG SBP request. The field is reserved if the DMG SBP Request field is set to 0.

If the DMG SBP Request field is set to 1, the value of the DMG Number Of Sensing Responders field indicates the number of sensing responders requested for participation in the DMG sensing procedure initiated by the SBP responder in response to the DMG SBP request. If the Sensing Responder field is set to 1, the value indicated in the Number Of Sensing Responders field includes the SBP initiator.

If the DMG SBP Request field is set to 0, the value of the DMG Number Of Sensing Responders field indicates the actual number of sensing responders ready to participate in the DMG SBP procedure.

The DMG Mandatory Number Of Responders field indicates whether the requested number of sensing responders indicated in the DMG Number Of Sensing Responders field is interpreted as a mandatory requirement by the SBP responder. A value of 0 indicates that the requested number of sensing responders is a maximum number, and the SBP initiator accepts measurements taken with a smaller number of sensing responders. A value of 1 indicates that the requested number of sensing responders is a mandatory requirement.

If the Mandatory Preferred Responder field is set to 1, the Number Of Sensing Responders and Mandatory Number Of Responders fields are reserved.

If the DMG SBP Request field is set to 1, the value of the DMG Number Of Preferred Responders field indicates the number of sensing responders with the known Sensing Responder Addresses to participate in the DMG sensing procedure initiated by the SBP responder in response to the DMG SBP request. If the Sensing Responder field is set to 1, the value indicated in the DMG Number Of Preferred Responders field includes the SBP initiator.

If the DMG SBP Request field is set to 0, the value of the DMG Number Of Preferred Responders field indicates the actual number of sensing responders with the known Sensing Responder Addresses ready to participate in the DMG SBP procedure.

If the DMG SBP Request field is set to 1, the DMG Preferred Responder List field is set to 1 to indicate that the Sensing Responder Addresses field is present, and it includes the MAC addresses of the sensing responders requested by the sensing initiator to be included in the DMG sensing procedure in response to the DMG SBP request (n is equal to the value in the DMG Number Of Sensing Responders field). Otherwise, the DMG Preferred Responder List field is set to 0, and the Sensing Responder Addresses field is not present.

If the DMG SBP Request field is set to 0, the presence of the Sensing Responder Addresses and the Sensing Responder IDs fields are defined in 9.6.21.13 and 9.6.21.15.

If the Sensing Responder and the DMG Preferred Responder List fields are both set to 1, the MAC address of the SBP initiator is included in the Sensing Responder Addresses field.

The DMG Mandatory Preferred Responder field is reserved if the DMG Preferred Responder List field is 0. If the DMG Preferred Responder List field is equal to 1, the DMG Mandatory Preferred Responder field indicates whether the set of preferred sensing responders is interpreted as mandatory by the SBP responder. A value of 1 indicates that the SBP responder is requested to only include DMG STAs listed in the Sensing Responder Addresses field within the DMG SBP Request frame in the DMG sensing procedure used to satisfy the DMG SBP request. A value of 0 indicates that the SBP responder may include DMG STAs that are not listed in the Sensing Responder Addresses field within the DMG SBP Request frame in the DMG sensing procedure in response to the DMG SBP request.

If the Sensing Responder Addresses field is present, it contains the list of MAC addresses. The MAC addresses are of the sensing responders that the SBP initiator requires to participate in the DMG sensing procedure.

If the Sensing Responder IDs field is present, it contains the list of the AID of the sensing responders participating in the DMG SBP procedure. The field might be present if the DMG SBP Request field is set to 0, and the DMG Preferred Responder List field is set to 1. Otherwise, the field is not present.

The AIDs are present in the same order as the related MAC addresses in the Sensing Responder Addresses field (n is equal to the value in the DMG Number Of Sensing Responders field).

9.5 Fields used in Management and Extension frame bodies and Control frames

9.5.4 BRP Request field

Change Figure 9-1168 as follows:

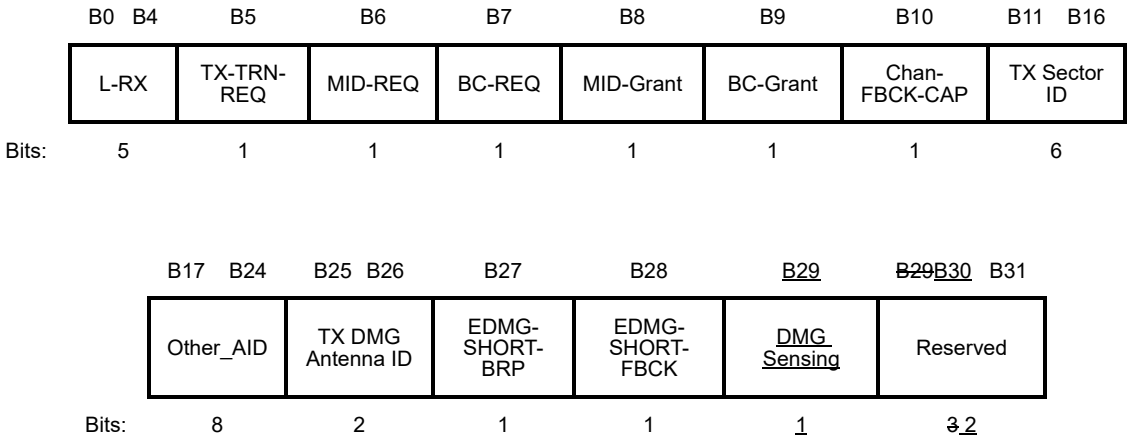

Figure 9-1168—BRP Request field format

Insert the following new paragraph at the end of 9.5.4:

The DMG Sensing field is set to 1 to indicate that the PPDU that carries the BRP frame is used in a DMG sensing procedure (see 11.55.3) and is not used for beamforming training.

9.6 Action frame format details

9.6.7 Public Action frame details

9.6.7.1 Public Action field

Insert the following rows in Table 9-471:

Table 9-471—Public Action field values

Public Action field value	Description
54	Sensing Measurement Termination
55	Sensing Measurement Query
56	SBP Request
57	SBP Response
58	SBP Termination
61	Sensing Measurement Request
62	Sensing Measurement Response
63	Sensing Measurement Report

Insert the following subclauses at the end of 9.6.7:

9.6.7.56 (Protected) Sensing Measurement Request frame format

The (Protected) Sensing Measurement Request frame is transmitted by a sensing initiator to request a sensing measurement session. The format of the (Protected) Sensing Measurement Request frame Action field is defined in Figure 9-1258a.

	Category	Public Action/ Protected Dual Of Public Action	Dialog Token	Sensing Comeback Info	Measurement Session ID Indication	Sensing Measurement Parameters element
Octets:	1	1	1	1	1	0 or variable

Figure 9-1258a—(Protected) Sensing Measurement Request frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

The Dialog Token field is defined in 9.4.1.12.

The Sensing Comeback Info field is formatted as shown in Figure 9-1258b.

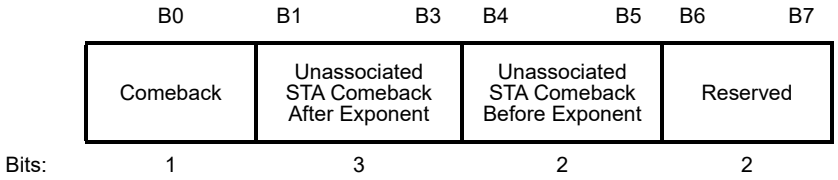

Figure 9-1258b—Sensing Comeback Info field format

The Comeback field is set to 1 in a (Protected) Sensing Measurement Request frame addressed to an unassociated non-AP STA by an AP to indicate that the AP is not currently able to perform a new sensing measurement session with this non-AP STA. Otherwise, the Comeback field is set to 0.

The Unassociated STA Comeback After Exponent field contains an unsigned integer. It is encoded according to the conventions in 9.2.2. The Unassociated STA Comeback After Exponent value is equal to $2^{(\text{Comeback After Exponent} + 4)}$ ms (giving it a value from 16 ms to 2048 ms). It is a time after which the unassociated non-AP STA is expected to transmit a Sensing Measurement Query frame to the AP (see 11.55.1.4). The Unassociated STA Comeback After Exponent field is reserved if the Comeback field is set to 0.

The Unassociated STA Comeback Before Exponent field contains an unsigned integer. It is encoded according to the conventions in 9.2.2. The Unassociated STA Comeback Before value is equal to $2^{(\text{Comeback Before Exponent} + 12)}$ ms (giving it a value from 4096 ms to 32768 ms). It is a time before which the unassociated non-AP STA is expected to transmit a Sensing Measurement Query frame to the AP (see 11.55.1.4). The Unassociated STA Comeback Before Exponent field is reserved if the Comeback field is set to 0.

The Measurement Session ID Indication field is defined in Figure 9-1258c. The Measurement Session ID field indicates a Measurement Session ID that identifies assigned operational parameters in the Sensing Measurement Parameters element to be used in the corresponding sensing measurement exchanges. The Measurement Session ID Indication field is reserved if the Comeback field of the Sensing Comeback Info field is set to 1 in a (Protected) Sensing Measurement Request frame addressed to an unassociated non-AP STA by an AP.

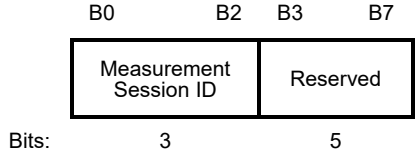

Figure 9-1258c—Measurement Session ID Indication field format

The Sensing Measurement Parameters element is defined in 9.4.2.331. The Sensing Measurement Parameters Element is not present if the Comeback field of the Sensing Comeback Info field is set to 1 in a (Protected) Sensing Measurement Request frame addressed to an unassociated non-AP STA by an AP.

9.6.7.57 (Protected) Sensing Measurement Response frame format

The (Protected) Sensing Measurement Response frame is sent by a sensing responder in response to a (Protected) Sensing Measurement Request frame. The format of the (Protected) Sensing Measurement Response frame Action field is defined in Figure 9-1258d.

	Category	Public Action/ Protected Dual Of Public Action	Dialog Token	Measurement Session ID Indication	Status Code	Decline Duration Indication	Sensing Measurement Parameters element
Octets:	1	1	1	1	2	1	0 or variable

Figure 9-1258d—(Protected) Sensing Measurement Response frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

The Dialog Token field is defined in 9.4.1.12 and set to the value in the corresponding Sensing Measurement Request frame.

The Measurement Session ID Indication field is shown in Figure 9-1258c and it is set to the same value in the corresponding Sensing Measurement Request frame.

The Status Code field is defined in 9.4.1.9. The Status Code SUCCESS, REQUEST_DECLINED, and REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS are used in the frame.

The Status Code is set to 0 (SUCCESS) to indicate that the sensing measurement session is established.

The Status Code is set to 37 (REQUEST_DECLINED) to indicate the request has been declined and does not send a new Sensing Measurement Request frame for Decline Duration seconds. The sensing measurement session is not established.

The Status Code is set to 144 (REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS) to indicate the request has been rejected and suggested parameters are provided. The sensing measurement session is not established.

The Decline Duration Indication field indicates a time duration within which the sensing initiator is requested not to send a new Sensing Measurement Request frame after its request has been declined. The Decline Duration Indication field is present in the Sensing Measurement Response frame with Status Code set to REQUEST_DECLINED. This field is reserved otherwise. The Decline Duration Indication field is defined in Figure 9-1258e. The Decline Duration field contains a duration in units of seconds.

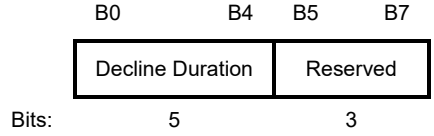

Figure 9-1258e—Decline Duration Indication field format

The Sensing Measurement Parameters element is defined in 9.4.2.331. It is present if the Status Code field is set to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS. Otherwise, it is not present.

9.6.7.58 Sensing Measurement Report frame format

The Sensing Measurement Report frame is an Action No Ack of category Public transmitted to provide sensing measurement result(s). The format of the Sensing Measurement Report frame Action field is defined in Figure 9-1258f.

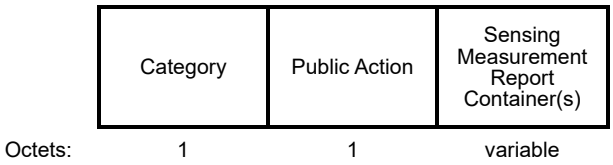

Figure 9-1258f—Sensing Measurement Report frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action field is defined in 9.6.7.1.

The Sensing Measurement Report Container field is defined in 9.4.1.81.

9.6.7.59 (Protected) Sensing Measurement Termination frame format

The (Protected) Sensing Measurement Termination frame is an Action or an Action No Ack frame used to terminate sensing measurement session(s). The format of the (Protected) Sensing Measurement Termination frame Action field is defined in Figure 9-1258g.

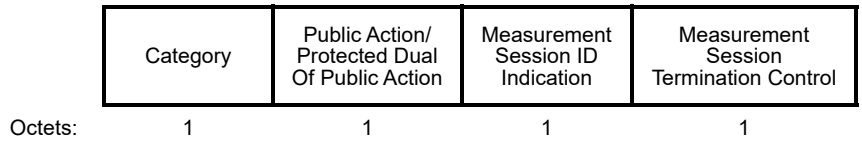

Figure 9-1258g—(Protected) Sensing Measurement Termination frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

NOTE—If an AP sends a (Protected) Sensing Measurement Termination frame to terminate a sensing measurement session initiated by a non-AP STA during a non-TB sensing measurement exchange, the (Protected) Sensing Measurement Termination frame is an Action No Ack frame.

The Measurement Session ID Indication field combined with the Measurement Session Termination Control field indicates the identifier(s) of the sensing measurement session(s) to be terminated. The Measurement Session ID Indication field is defined in Figure 9-1258c. The format of the Measurement Session Termination Control field is shown in Figure 9-1258h.

The Terminate All TB Measurement Sessions field is set to 1 to indicate that the STA requests to terminate all sensing measurement sessions established in the TB case. The Terminate All TB Measurement Sessions field is set to 0 to indicate that the STA does not request to terminate all the sensing measurement sessions established in the TB case. If the Terminate All TB Measurement Sessions field is set to 1, the TB/Non-TB Measurement Session Type field and the Measurement Session ID Indication field are reserved.

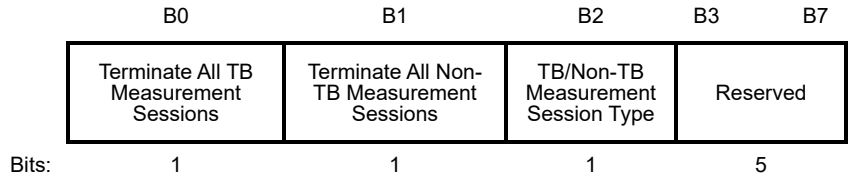

Figure 9-1258h—Measurement Session Termination Control field format

The Terminate All Non-TB Measurement Sessions field is set to 1 to indicate that the STA requests to terminate all sensing measurement sessions established in the non-TB case. The Terminate All Non-TB Measurement Sessions field is set to 0 to indicate that the STA does not request to terminate all the sensing measurement sessions established in the Non-TB case. If the Terminate All Non-TB Measurement Sessions field is set to 1, the TB/Non-TB Measurement Session Type field and the Measurement Session ID Indication field are reserved.

If the Terminate All TB Measurement Sessions field and the Terminate All Non-TB Measurement Sessions field are both set to 0, the TB/Non-TB Measurement Session Type field indicates the Measurement Session ID contained in the Measurement Session ID Indication field is assigned to TB or non-TB case. The TB/ Non-TB Measurement Session Type field is set to 0 to indicate that the Measurement Session ID contained in Measurement Session ID Indication field is assigned by an AP for the TB sensing measurement exchange; and set to 1 to indicate the Measurement Session ID contained in Measurement Session ID Indication field is assigned by a non-AP STA for the non-TB sensing measurement exchange.

9.6.7.60 (Protected) Sensing Measurement Query frame format

The (Protected) Sensing Measurement Query frame is transmitted by an unassociated non-AP STA to inform its capabilities and presence to the AP to perform sensing. The format of the (Protected) Sensing Measurement Query frame Action field is defined in Figure 9-1258i.

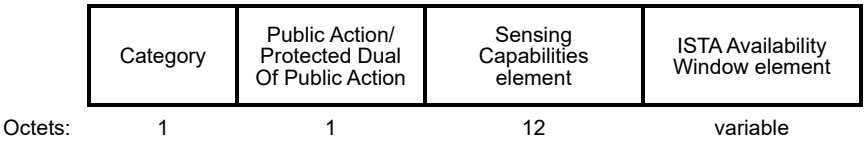

Figure 9-1258i—(Protected) Sensing Measurement Query frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

The Sensing Capabilities element is described in 9.4.2.332.

The ISTA Availability Window element is described in 9.4.2.298.

9.6.7.61 (Protected) SBP Request frame format

The (Protected) SBP Request frame allows a non-AP STA to request an SBP procedure (11.55.2). The format of the (Protected) SBP Request frame Action field is defined in Figure 9-1258j.

The Category field is defined in 9.4.1.11.

	Category	Public Action/ Protected Dual Of Public Action	Dialog Token	SBP Parameters element	Sensing Measurement Parameters element	ISTA Availability Window element
Octets:	1	1	1	variable	variable	variable

Figure 9-1258j—(Protected) SBP Request frame Action field format

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

The Dialog Token field is defined in 9.4.1.12.

The SBP Parameters element is defined in 9.4.2.333.

The Sensing Measurement Parameters element is defined in 9.4.2.331.

The ISTA Availability Window element is defined in 9.4.2.298.

9.6.7.62 (Protected) SBP Response frame format

The (Protected) SBP Response frame is transmitted by an AP to accept or reject a request for an SBP procedure (11.55.2). The format of the (Protected) SBP Response frame Action field is defined in Figure 9-1258k.

	Category	Public Action/ Protected Dual Of Public Action	Dialog Token	Status Code	Measurement Session ID Indication	SBP Initiator AID/USID
Octets:	1	1	1	2	1	2

	Decline Duration Indication	SBP Parameters element	Sensing Measurement Parameters element	RSTA Availability Window element
Octets:	1	0 or variable	0 or variable	0 or variable

Figure 9-1258k—(Protected) SBP Response frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

The Dialog Token field is set to the same value as the Dialog Token field of the corresponding SBP Request frame.

The Status Code field is defined in 9.4.1.9. If the AP accepts the request, the Status Code field is set to SUCCESS (see 9.4.1.9). Otherwise, if the AP rejects the request, the Status Code field is set to either REQUEST_DECLINED or REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS (see 9.4.1.9).

If the Status Code field is equal to SUCCESS, the Measurement Session ID Indication field is defined in Figure 9-1258c and is set to the Measurement Session ID value corresponding to the sensing measurement

session initiated by the AP that accepts the corresponding SBP request. If the Status Code field is not equal to SUCCESS, the Measurement Session ID Indication is reserved.

The SBP Initiator AID/USID field is defined in 9.4.1.8. If the Status Code field is equal to SUCCESS and if the requesting non-AP STA is associated with the AP, the SBP Initiator AID/USID field is set to the requesting non-AP STA's AID. If the Status Initiator AID/USID field is set to the requesting non-AP STA's USID. If the Status Code field is not equal to SUCCESS, the SBP Initiator AID/USID field is reserved.

The Decline Duration Indication field is shown in Figure 9-1258e and it indicates a time duration within which the SBP Initiator is requested not to send a new SBP Request frame after its request has been declined. This field is present in the SBP Response frame with the Status Code set to REQUEST_DECLINED and is reserved otherwise. The Decline Duration field contains a duration in units of seconds.

The SBP Parameters element is present if the Status Code field is equal to SUCCESS or REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS. Otherwise, the SBP Parameters element is not present. The SBP Parameters element is defined in 9.4.2.333.

The Sensing Measurement Parameters element is present if the Status Code field is equal to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS. Otherwise, the Sensing Measurement Parameters element is not present. The Sensing Measurement Parameters element is defined in 9.4.2.331.

The RSTA Availability Window element is defined in 9.4.2.299. It is present in an SBP Response frame if the Status Code is equal to SUCCESS, might be present if the Status Code is equal to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, and it is not present otherwise.

9.6.7.63 (Protected) SBP Termination frame format

The (Protected) SBP Termination frame allows either an SBP initiator or an SBP responder to terminate an SBP procedure. The format of the (Protected) SBP Termination frame Action field is defined in Figure 9-1258l.

	Category	Public Action/ Protected Dual Of Public Action	Measurement Session ID Indication	SBP Termination Control	SBP Parameters element
Octets:	1	1	1	1	0 or variable

Figure 9-1258l—(Protected) SBP Termination frame Action field format

The Category field is defined in 9.4.1.11.

The Public Action/Protected Dual Of Public Action field is defined in 9.6.7.1 and 9.6.10.

The Measurement Session ID Indication field is set to the Measurement Session ID value corresponding to the sensing measurement session that was initiated by the SBP procedure, which is intended to be terminated. The Measurement Session ID Indication field is defined in Figure 9-1258c.

The Measurement Session ID Indication field is reserved if the Terminate All SBP Procedures field is equal to 1.

The format of the SBP Termination Control field is defined in Figure 9-1258m.

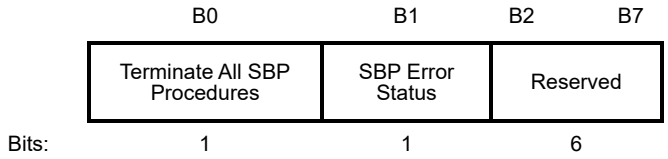

Figure 9-1258m—SBP Termination Control field format

The Terminate All SBP Procedures field is set to 1 to indicate that the STA requests to terminate all established SBP procedures between the SBP initiator and the SBP responder. Otherwise, it is set to 0. If the Terminate All SBP Procedures field is set to 1, then the Measurement Session ID Indication field is reserved.

The SBP Error Status field is set to 1 to indicate that the SBP procedure is terminated due to SBP error conditions; otherwise, it is set to 0. The SBP Error Status field is reserved if the Terminate All SBP Procedures field is equal to 1.

The SBP Parameters element is defined in 9.4.2.333. The SBP Parameters element is present if the SBP Error Status field is set to 1; otherwise, it is not present.

9.6.10 Protected Dual Of Public Action frames

Insert the following rows in Table 9-516:

Table 9-516—Public Action field values defined for Protected Dual of Public Action frames

Public Action field value	Description	Defined in
35	Protected Sensing Measurement Request	9.6.7.56
36	Protected Sensing Measurement Response	9.6.7.57
37	Protected Sensing Measurement Termination	9.6.7.59
38	Protected Sensing Measurement Query	9.6.7.60
39	Protected SBP Request	9.6.7.61
40	Protected SBP Response	9.6.7.62
41	Protected SBP Termination	9.6.7.63

9.6.19 DMG Action frame details

9.6.19.1 DMG Action field

Insert the following rows in Table 9-568:

Table 9-568—DMG Action field values

DMG Action field values	Meaning
24	Protected DMG Sensing Measurement Request
25	Protected DMG Sensing Measurement Response
26	Protected DMG SBP Request
27	Protected DMG SBP Response
28	Protected DMG SBP Report
29	Protected DMG SBP Termination

Insert the following subclauses at the end of 9.6.19:

9.6.19.24 Protected DMG Sensing Measurement Request frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.19.1.

The format of the frame after the action field is identical to the format of the DMG Sensing Measurement Request frame (9.6.21.8).

9.6.19.25 Protected DMG Sensing Measurement Response frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.19.1.

The format of the frame after the action field is identical to the format of the DMG Sensing Measurement Response frame (9.6.21.9).

9.6.19.26 Protected DMG SBP Request frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.19.1.

The format of the frame after the action field is identical to the format of the DMG SBP Request frame (9.6.21.12).

9.6.19.27 Protected DMG SBP Response frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.19.1.

The format of the frame after the action field is identical to the format of the DMG SBP Response frame (9.6.21.13).

9.6.19.28 Protected DMG SBP Report frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.19.1.

The format of the frame after the action field is identical to the format of the DMG SBP Report frame (9.6.21.14).

9.6.21 Unprotected DMG Action frame details

9.6.21.1 Unprotected DMG Action field

Insert the following rows in Table 9-597:

Table 9-597—Unprotected DMG Action field values

Unprotected DMG Action field values	Meaning
6	DMG Sensing Measurement Request
7	DMG Sensing Measurement Response
8	DMG Sensing Measurement Report
9	DMG Sensing Measurement Termination
10	DMG SBP Request
11	DMG SBP Response
12	DMG SBP Report
13	DMG SBP Termination

9.6.21.2 Announce frame format

Insert the following rows in Table 9-598:

Table 9-598—Announce frame Action field format

Order	Information	Notes
43	DMG Sensing Capabilities	The element is defined in 9.4.2.334 and is optionally present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
44	DMG Sensing Beam Descriptor	The element is defined in 9.4.2.335 and is optionally present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.
45	DMG Sensing Short Capabilities	The element is defined in 9.4.2.336 and is present if dot11DMGSensingMsmtImplemented is true. Otherwise, the element is not present.

9.6.21.3 BRP frame format

Insert the following rows in Table 9-599:

Table 9-599—BRP frame Action field format

Order	Information
12	BRP Sensing element
13	DMG Sensing Report Control element
14	DMG Sensing Report element

Insert the following new paragraph at the end of 9.6.21.3:

The BRP Sensing element is defined in 9.4.2.342. The BRP Sensing element is present in the frame if the DMG Sensing field within the BRP Request field is equal to 1. The DMG Sensing Report Control element is defined in 9.4.2.340. The DMG Sensing Report element is defined in 9.4.2.341.

Insert the following subclauses at the end of 9.6.21:

9.6.21.8 DMG Sensing Measurement Request frame format

The DMG Sensing Measurement Request frame is an Action frame. It is transmitted by a sensing initiator to request a DMG sensing measurement session. The format of the DMG Sensing Measurement Request frame Action field is defined in Table 9-604a.

Table 9-604a—DMG Sensing Measurement Request frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	Dialog Token
4	DMG Measurement Session ID Indication
5	DMG Sensing Measurement Session element

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The Dialog Token field is defined in 9.4.1.12 and it is set by the requesting STA.

The DMG Measurement Session ID Identification field indicates a DMG Measurement Session ID that identifies assigned operational parameters in the DMG Sensing Measurement Session element to be used in the corresponding DMG sensing measurement exchanges as shown in Figure 9-1312a.

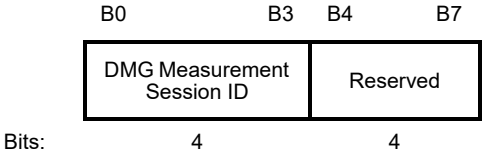

Figure 9-1312a—DMG Measurement Session Indication ID field format

The DMG Sensing Measurement Session element is defined in 9.4.2.337.

9.6.21.9 DMG Sensing Measurement Response frame format

The DMG Sensing Measurement Response frame is an Action frame. It is transmitted by a sensing responder in response to a DMG Sensing Measurement Request frame. The format of the DMG Sensing Measurement Response frame Action field is defined in Table 9-604b.

Table 9-604b—DMG Sensing Measurement Response frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	Dialog Token
4	DMG Measurement Session ID Indication
5	Status Code
6	Decline Duration Indication field
7	DMG Sensing Measurement Session element
8	DMG Sensing Image Range Axis LUT
9	DMG Sensing Image Doppler Axis LUT
10	DMG Sensing Measurement Exchange Duration element

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The Dialog Token field is defined in 9.4.1.12 and is set to the value in the corresponding DMG Sensing Measurement Request frame.

The DMG Measurement Session ID Indication field in the DMG Sensing Measurement Response frame is shown in Figure 9-1312a and is set to the value in the corresponding DMG Sensing Measurement Request frame.

The Status Code is defined in 9.4.1.19. The Status Codes SUCCESS, REQUEST_DECLINED, and REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS are used in the frame.

The Decline Duration Indication field is shown in Figure 9-1258e and it indicates a time duration within which the sensing initiator is requested not to send a new DMG Sensing Measurement Request frame after its request has been declined. This field is present in the DMG Sensing Measurement Response frame with the Status Code set to REQUEST_DECLINED and is reserved otherwise. The Decline Duration field contains a duration in units of seconds.

The DMG Sensing Measurement Session element is defined in 9.4.2.337. It is present in the Sensing Measurement Response frame if the Status Code is set to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS. Otherwise, it is not present in the DMG Sensing Measurement Response frame.

The DMG Sensing Image Range Axis LUT element is defined in 9.4.2.338.

The DMG Sensing Image Doppler Axis LUT element is defined in 9.4.2.339.

The DMG Sensing Measurement Exchange Duration element is defined in 9.4.2.345. It is optionally present in the Sensing Measurement Response frame if the Sensing Type field is set to Coordinated Monostatic in the Measurement Session Control field (see Figure 9-1074cf) and if the Status Code is set to SUCCESS. Otherwise, it is not present in the DMG Sensing Measurement Response frame.

9.6.21.10 DMG Sensing Measurement Report frame format

The DMG Sensing Measurement Report frame is an Action frame. The format of the DMG Sensing Measurement Report frame Action field is defined in Table 9-604c.

Table 9-604c—DMG Sensing Measurement Report frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	Dialog Token
4	DMG Sensing Report Control element
5	DMG Sensing Report element or one or more Channel Measurement Feedback elements

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The Dialog Token field is defined in 9.4.1.12 and set by the requesting STA.

The DMG Sensing Report Control element is defined in 9.4.2.340.

The DMG Sensing Report element is defined in 9.4.2.341.

The Channel Measurement Feedback element is defined in 9.4.2.135. The DMG Sensing Measurement Report frame (see 9.6.21.10) contains more than one Channel Measurement Feedback element if the measurement information exceeds 255 octets (see 9.6.21.3).

If the Report Type field within the Report Control field in the DMG Sensing Report Control element is set to 1, the Channel Measurement Feedback element(s) is present in the DMG Sensing Measurement Report frame.

If the Report Type field within the Report Control field in the DMG Sensing Report Control element is set to a value between 2 and 7, the DMG Sensing Report element is present in the DMG Sensing Measurement Report frame.

9.6.21.11 DMG Sensing Measurement Termination frame format

The DMG Sensing Measurement Termination frame is an Action frame. The format of the DMG Sensing Measurement Termination Action field is defined in Table 9-604d.

Table 9-604d—DMG Sensing Measurement Termination frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	DMG Measurement Session ID Indication
4	DMG Sensing Measurement Termination Control

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The DMG Measurement Session ID Indication field indicates the DMG sensing measurement session to be terminated. The format of the field is shown in Figure 9-1312a.

The DMG Sensing Measurement Termination Control field indicates the sensing measurement session(s) to be terminated. The format of the DMG Sensing Measurement Termination Control field is shown in Figure 9-1312b.

The Terminate All Coordinated Monostatic Sessions field is set to 1 to indicate that the STA requests to terminate all established sensing measurement sessions of the sensing type Coordinated Monostatic; otherwise, it is set to 0.

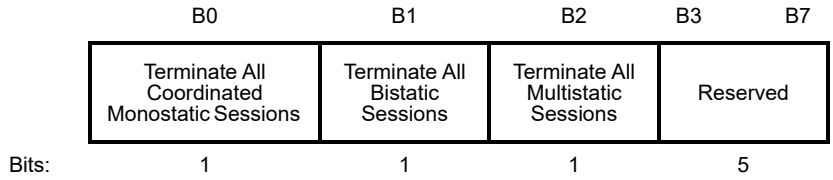

Figure 9-1312b—DMG Sensing Measurement Termination Control field format

The Terminate All Bistatic Sessions field is set to 1 to indicate that the STA requests to terminate all established sensing measurement sessions of the sensing type Bistatic Or Coordinated Bistatic; otherwise, it is set to 0.

The Terminate All Multistatic Sessions field is set to 1 to indicate that the STA requests to terminate all established sensing measurement sessions of the sensing type Multistatic; otherwise, it is set to 0.

If the DMG sensing measurement session indicated in the DMG Measurement Session ID Indication field belongs to the sensing type whose field Termination all is set to 1, the DMG Measurement Session ID Indication field is ignored.

9.6.21.12 DMG SBP Request frame format

The DMG SBP Request frame is an Action frame. It is transmitted by an SBP initiator to an SBP responder to request a DMG SBP procedure. The format of the DMG SBP Request frame Action field is defined in Table 9-604e.

Table 9-604e—DMG SBP Request frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	Dialog Token
4	DMG Sensing Measurement Session element
5	DMG SBP Parameters element

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The Dialog Token field is defined in 9.4.1.12 and set by the requesting STA.

The DMG Sensing Measurement Session element is defined in 9.4.2.337. The Report Type field in the DMG Sensing Measurement Session element is set to one of the following types: DMG Sensing Image Direction, DMG Sensing Image Range-Doppler, DMG Sensing Image Range-Direction, DMG Sensing Image Doppler-Direction, DMG Sensing Image Range-Doppler Direction, or Target.

The DMG SBP Parameters element is defined in 9.4.2.346.

9.6.21.13 DMG SBP Response frame format

The DMG SBP Response frame is an Action frame. It is transmitted by a sensing responder in response to a DMG SBP Request frame. The format of the DMG SBP Response frame Action field is defined in Table 9-604f.

Table 9-604f—DMG SBP Response frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	Dialog Token
4	DMG Measurement Session ID Indication
5	Status Code
6	Decline Duration Indication
7	DMG SBP Parameters element
8	DMG Sensing Measurement Session element
9	DMG Sensing Image Range Axis LUT
10	DMG Sensing Image Doppler Axis LUT

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The Dialog Token field is defined in 9.4.1.12 and it is set to the value in the corresponding DMG Sensing Measurement Request frame.

The DMG Measurement Session ID Indication field in the DMG Sensing Measurement Response frame is shown in Figure 9-1312a and is set to the value allocated for the DMG SBP procedure.

The Status Code is defined in 9.4.1.19. The Status Code SUCCESS, REQUEST_DECLINED, and REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS are used in the frame.

The Decline Duration Indication field is shown in Figure 9-1258e and it indicates a time duration within which the SBP initiator is requested not to send a new DMG SBP Request frame after its request has been declined. This field is present in the DMG SBP Response frame with the Status Code set to REQUEST_DECLINED and is reserved otherwise. The Decline Duration field contains a duration in units of seconds.

The DMG SBP Parameters element is defined in 9.4.2.346. If the element is present in the DMG SBP Response frame, the DMG SBP Request field is set to 0. The fields Sensing Responder, DMG Mandatory Number Of Responders, DMG Preferred Responder List, and DMG Mandatory Preferred Responder are set equal to the fields indicated in the DMG SBP Parameters element of the DMG SBP Request frame that triggered the response.

The DMG SBP Parameters element is present in the DMG SBP Response frame if the Status Code is set to SUCCESS, and one of the two combinations of the DMG Preferred Responder List and the DMG

Mandatory Number Of Responders fields set to (1,0) and (0,0) is applied. Otherwise, the DMG SBP Parameters element is not present in the frame with the Status Code set to SUCCESS.

— If the DMG Preferred Responder List field and DMG Mandatory Preferred Responder field are set to 1, the following applies to the respective fields and fields: the DMG Number Of Preferred Responders field is equal to the same field in the DMG SBP Request frame that triggered the response; the Sensing Responder Addresses and the Sensing Responder IDs fields are present in the element and n is identical to the DMG Number Of Preferred Responders field.

— If the DMG Preferred Responder List field is set to 1, and the DMG Mandatory Preferred Responder field is set to 0, the following applies to the respective fields and fields: the DMG Number Of Preferred Responders field indicates the actual number (n) of sensing responders with the known MAC addresses ready to participate in the DMG SBP procedure; the Sensing Responder Addresses field and the Sensing Responder IDs field both of size n, are present in the element. The number n is less than or equal to the value in the DMG Number Of Preferred Responders field of the DMG SBP Parameters element in the DMG SBP Request frame that triggered the response.

— If the DMG Mandatory Number Of Responders field is set to 0, the DMG Number Of Sensing Responders field indicates the number of the sensing responders assigned to satisfy the DMG SBP request. The number is less than or equal to the value in the DMG Number Of Sensing Responders field of the DMG SBP Parameters element of the DMG SBP Request frame that triggered the response.

At least one of the DMG SBP Parameters element and the DMG Sensing Measurement Session element are present in the DMG SBP Response frame if the Status Code is set to the REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS.

In the DMG SBP Parameters element, if present in the DMG SBP Response frame, the following conditions apply:

— If the DMG Mandatory Preferred Responder field is set to 1, the DMG Number Of Preferred Responders field contains the actual number of the sensing responders to which the DMG Measurement Session ID is assigned, and the Sensing Responder Addresses field contains the addresses. The Sensing Responder IDs field is not present.

— If the DMG Mandatory Number Of Responders field is set to 1, the DMG Number Of Sensing Responders field contains the actual number of the sensing responders to which the DMG Measurement Session ID is assigned.

— The DMG SBP Parameters element is defined in 9.4.2.346.

The DMG Sensing Measurement Session element is defined in 9.4.2.337.

The DMG Sensing Image Range Axis LUT element is defined in 9.4.2.338. It is present in the DMG SBP Response frame if the Status Code is set to SUCCESS. Multiple DMG Sensing Image Range Axis LUT elements, corresponding to different STAs participating in the associated DMG sensing measurement, may be present. If the Status Code is not set to SUCCESS, the element is not present.

The DMG Sensing Image Doppler Axis LUT element is defined in 9.4.2.339. It is present in the DMG SBP Response frame if the Status Code is set to SUCCESS. Multiple DMG Sensing Image Doppler Axis LUT elements, corresponding to different STAs participating in the associated DMG sensing measurement, may be present. If the Status Code is not set to SUCCESS, the element is not present.

9.6.21.14 DMG SBP Report frame format

The DMG SBP Report frame is an Action frame. The format of the DMG SBP Report frame Action field is defined in Table 9-604g.

Table 9-604g—DMG SBP Report frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	Dialog Token
4	DMG Sensing Report Control element
5	DMG Sensing Report element(s)

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The Dialog Token field is defined in 9.4.1.12 and set by the requesting STA.

The DMG Sensing Report Control element is defined in 9.4.2.340.

The DMG Sensing Report element is defined in 9.4.2.341. The DMG SBP report may contain DMG Sensing Report elements of multiple sensing responders participating in the SBP procedure.

9.6.21.15 DMG SBP Termination frame format

The DMG SBP Termination frame is an Action frame. The format of the DMG SBP Termination Action field is defined in Table 9-604h.

Table 9-604h—DMG SBP Termination frame Action field format

Order	Information
1	Category
2	Unprotected DMG Action
3	DMG Measurement Session ID Indication
4	DMG SBP Termination Control
5	DMG SBP Parameters element

The Category field is defined in 9.4.1.11.

The Unprotected DMG Action field is defined in 9.6.21.1.

The DMG Measurement Session ID field indicates the DMG sensing measurement session to be terminated. The format of the field is shown in Figure 9-1312a.

The DMG SBP Termination Control field indicates the sensing measurement session(s) to be terminated. The format of the DMG SBP Termination Control field is shown in Figure 9-1312c.

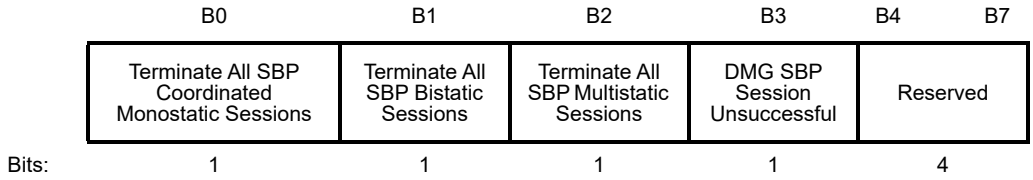

Figure 9-1312c—DMG SBP Termination Control field format

The Terminate All SBP Coordinated Monostatic Sessions field is set to 1 to indicate that the STA requests to terminate all sensing measurement sessions established in response to a DMG SBP procedure request of the sensing type coordinated monostatic; otherwise, it is set to 0.

The Terminate All SBP Bistatic Sessions field is set to 1 to indicate that the STA requests to terminate all sensing measurement sessions established in response to a DMG SBP procedure request of the sensing type Bistatic or Coordinated Bistatic; otherwise, it is set to 0.

The Terminate All SBP Multistatic Sessions field is set to 1 to indicate that the STA requests to terminate all sensing measurement sessions established in response to a DMG SBP procedure request of the sensing type Multistatic; otherwise, it is set to 0.

If the sensing measurement session indicated in the DMG Measurement Session ID field belongs to the sensing type whose field Termination all SBP is set to 1, the DMG Measurement Session ID field within the DMG Measurement Session ID Indication field is ignored.

If the DMG SBP Session Unsuccessful field is set to 1, the DMG SBP Parameters element is optionally present. Otherwise, it is not present.

The DMG SBP Parameters element is defined in 9.4.2.346. If the element is present in the DMG SBP Termination frame, the DMG SBP Request field is set to 0. The fields Sensing Responder, DMG Mandatory Number Of Responders, DMG Preferred Responder List, and DMG Mandatory Preferred Responder are set equal to the fields indicated in the DMG SBP Parameters element of the DMG SBP Request frame that initiated the SBP setup indicated with the DMG Measurement Session ID within the DMG Measurement Session ID Indication field.

If the DMG Mandatory Preferred Responder field is set to 1, the DMG Number Of Preferred Responders field contains the actual number of the sensing responders to which the DMG Measurement Session ID is assigned, and the Sensing Responder Addresses field contains the MAC addresses. The Sensing Responder IDs field is not present.

If the DMG Mandatory Number Of Responders field is set to 1, the DMG Number Of Sensing Responders field contains the actual number of the sensing responders to which the DMG Measurement Session ID is assigned.

Insert the following subclause at the end of 9.6:

9.6.39 Protected Sensing frame details

9.6.39.1 Protected Sensing Action field

A Protected Sensing Action field, in the one octet immediately after the Category field, differentiates the Protected Sensing frame formats. The Protected Sensing Action field values associated with each frame format within the Sensing category are defined in Table 9-658r.

Table 9-658r—Protected Sensing Action field values

Value	Meaning
0	Reserved
1	Protected Sensing Measurement Report
2	Protected Sensing Measurement Termination
3	Protected DMG Sensing Measurement Report
4	Protected DMG Sensing Measurement Termination
5	Protected DMG SBP Termination
6–255	Reserved

9.6.39.2 Protected Sensing Measurement Report frame format

The Category field is defined in 9.4.1.11.

The Action field is defined in 9.6.39.1.

The Protected Sensing Measurement Report frame is an Action No Ack frame of category Protected Sensing transmitted to provide sensing measurement results. The format of the frame after the Protected Sensing Action field is identical to the format of the Sensing Measurement Report Public Action frame (see 9.6.7.58).

9.6.39.3 Protected Sensing Measurement Termination frame format

The Category field is defined in 9.4.1.11.

The Action field is defined in 9.6.39.1.

The format of the frame after the action field is identical to the format of the Sensing Measurement Termination frame (see 9.6.7.59).

9.6.39.4 Protected DMG Sensing Measurement Report frame format

The Category field is defined in 9.4.1.11.

The Action field is defined in 9.6.39.1.

The Protected DMG Sensing Measurement Report frame is an Action frame of category Protected Sensing transmitted to provide DMG sensing measurements. The format of the frame after the action field is identical to the format of the DMG Sensing Measurement Report frame (see 9.6.21.10).

9.6.39.5 Protected DMG Sensing Measurement Termination frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.39.1.

The format of the frame after the action field is identical to the format of the DMG Sensing Measurement Termination frame (see 9.6.21.11).

9.6.39.6 Protected DMG SBP Termination frame format

The Category field is defined in 9.4.1.11.

The DMG Action field is defined in 9.6.39.1.

The format of the frame after the action field is identical to the format of the DMG SBP Termination frame (see 9.6.21.15).

11. MLME

11.3 STA authentication and association

11.3.3 Frame filtering based on STA state

Change item b) "Class 1a frames" as follows:

In an infrastructure BSS when a PTKSA has been established. ~~from PASN authentication exists.~~

1) Protected Fine Timing frames (9.6.34)
2) SA Query Request and SA Query Response frames sent to an individual address (11.13)
3) IRM Action frame (9.6.36)
4) Protected Sensing frames (9.6.39)
5) Protected Dual Of Public Action frame whose Public Action field value is one of the following: 51 (9.6.7.56), 52 (9.6.7.57), 54 (9.6.7.59), 55 (9.6.7.60), 56 (9.6.7.61), 57 (9.6.7.62), and 58 (9.6.7.63)
6) Protected DMG Action frames (9.6.19)

11.24 Quality-of-service Management frame (QMF)

11.24.1 General

11.24.1.2 Default QMF policy

Insert the following rows to Table 11-21 before the Vendor-Specific Protected row:

Table 11-21—Default QMF policy

Description	Management Frame Subtype value from Table 9-1	Category value from Table 9-81	Action field	QMF access category
Public Action-Sensing frame	1101	4	51–59	AC_VO
Protected Dual Of Public Action-Sensing frame	1101	9	51, 52, 54, 56–58	AC_VO
Protected Sensing frame	1101	38	1–4	AC_VO

Insert the following subclause at the end of Clause 11:

11.55 WLAN sensing

11.55.1 Sensing procedure

11.55.1.1 Overview

A sensing procedure includes sensing operations in which the sensing STAs exchange sensing capabilities, followed by a sensing initiator establishing one or more sensing measurement sessions with sensing responder(s), followed by one or more sensing measurement exchanges for each sensing measurement session, followed by sensing measurement session termination.

NOTE 1—A sensing initiator can manage multiple Measurement Session IDs to satisfy sensing applications.

Before initiating a sensing procedure, two sensing STAs shall exchange their sensing capabilities (see 11.55.1.3) to obtain the sensing capabilities of each other.

A sensing measurement session includes: sensing measurement session establishment (see 11.55.1.4), one or more sensing measurement exchanges using operational parameters agreed during the sensing measurement session establishment, and sensing measurement session termination. A sensing measurement exchange is a sequence of frame exchanges that results in the acquisition and/or reporting of sensing measurements (see 11.55.1.5). Two sensing measurement exchange variants are defined: Trigger-based (TB) sensing measurement exchange (see 11.55.1.5.2) and non-TB sensing measurement exchange (see 11.55.1.5.3). A sensing measurement session shall be active until either explicitly terminated in a sensing measurement session termination or implicitly terminated with the expiration of a sensing measurement session expiry timer (see 11.55.1.6).

NOTE 2—Although a sensing measurement session can be terminated without any measurement exchange performed due to any reason, the intention of establishing a sensing measurement session is to perform at least one exchange to get the measurement results.

A sensing initiator may participate in a sensing measurement exchange as a sensing transmitter, as a sensing receiver, as both a sensing transmitter and a sensing receiver, or as neither a sensing transmitter nor a sensing receiver. A sensing responder may participate in a sensing measurement exchange as a sensing transmitter, as a sensing receiver, or as both a sensing transmitter and a sensing receiver.

NOTE 3—A sensing initiator that does not act as a sensing transmitter or sensing receiver in a sensing measurement exchange might still obtain sensing measurement reports for that sensing measurement exchange.

As defined in 11.55.1.4, operational parameters associated with sensing measurement exchange(s) of a given Measurement Session ID are agreed upon when a sensing measurement session is established. Multiple sensing measurement sessions may be established between a sensing initiator and a sensing responder, which are assigned different Measurement Session IDs.

An example of a sensing procedure is provided in Annex AI.

In a sensing procedure initiated by an AP, an associated non-AP STA is identified by its AID and an unassociated non-AP STA is identified by its USID. The AID and USID assignment shall be non-conflicting and shall have the same size and range (as defined in 9.4.1.8).

NOTE 4—Prior to the transmission of a sensing measurement frame, including Sensing Measurement Request frame, Sensing Measurement Response frame, and Sensing Measurement Termination frame, by an AP to an associated non-AP STA in the EMLSR mode, the AP needs to transmit an initial control frame exchange (see 35.3.17).

NOTE 5—The transmission of an initial control frame is not required for an unassociated non-AP STA as only an associated non-AP STA can negotiate to be in the EMLSR mode.

11.55.1.2 Dependencies and timing related parameters

A STA that is an HE or EHT STA may support the sensing procedure. A STA that supports the sensing procedure is referred to as a sensing STA. A sensing STA has dot11SensingImplemented equal to true and shall set the Sensing field in the Extended Capabilities element to 1. A sensing STA shall support the sensing procedure as both a sensing initiator and a sensing responder.

A sensing STA shall support $N_g = 4$ and may support $N_g = 16$ in the Sensing Measurement Report frame that results from receiving an SI2SR NDP, SR2SI NDP, or SR2SR NDP with:

— Up to four spatial streams and a bandwidth of less than or equal to 320 MHz

— Five or more spatial streams and a bandwidth of less than or equal to 80 MHz

A sensing STA shall support $N_g = 8$ and may support $N_g = 16$ in the Sensing Measurement Report frame that results from receiving an SI2SR NDP, SR2SI NDP, or SR2SR NDP with five or more spatial streams and a bandwidth of greater than or equal to 160 MHz.

The measured RSSI for each receive chain in the Sensing Measurement Report frame shall be accurate to within ±5 dB (95% confidence interval) for values in the range –82 dBm to –20 dBm and shall be reported based on Table 9-129r.

NOTE—A similar accuracy is required for the beacon RSSI accuracy; see 11.43.

A sensing STA in which dot11APRequiresPMFActivated has the value Required (2) shall set the USNM-MFPR field of the RSNXE to 1. Otherwise, it shall set the USNM-MFPR field to 0.

A sensing STA in which dot11APRequiresPMFActivated has the value Required-X20M (1) shall set the USNM-MFPR-X20 field of the RSNXE to 1. Otherwise, it shall set the USNM-MFPR-X20 field to 0.

If an AP has set the USNM-MFPR field in the RSNXE to 1, an unassociated non-AP STA shall establish a PTKSA using PASN with that AP prior to initiating a sensing measurement session with that AP.

If the AP has set USNM-MFPR-X20 field in the RSNXE to 1, an unassociated non-AP STA shall establish a PTKSA with that AP prior to initiating a sensing measurement session with that AP unless the BW field in the Sensing Measurement Parameters element field in the Sensing Measurement Request frame sent by that non-AP STA indicates a 20 MHz bandwidth.

An AP shall discard Sensing Measurement Request frames, Sensing Measurement Query frames, and SBP Request frames from an unassociated non-AP STA if a PTKSA was required and the unassociated STA has not established a PTKSA to allow protection of all sensing and/or SBP management frames between the AP and the unassociated STA.

A sensing STA should use the timing related parameters defined in Table 11-33a.

Table 11-33a—Sensing procedure timing related parameters

Parameter	Value	Description
aSensingFrameExchangeExpiry	20 ms	The maximum time interval between the reception of a Sensing Measurement Request frame and the transmission of the corresponding Sensing Measurement Response frame, between the reception of a Sensing Measurement Query frame and the transmission of the corresponding Sensing Measurement Request frame, or between the reception of a Sensing Measurement Query frame and the transmission of the corresponding Sensing Measurement Termination frame. The transmitter of the Sensing Measurement Request frame or Sensing Measurement Query frame starts the corresponding timer when the frame is transmitted. The receiver of the Sensing Measurement Request frame or Sensing Measurement Query frame starts the corresponding timer when the frame is received.
aMeasurementSessionExpiry	Set to the value derived from the Measurement Session Expiry Exponent field of the Sensing Measurement Request frame that established the sensing measurement session.	The maximum duration for the established sensing measurement session.
aSensingComebackAfter	Set to the value derived from the Unassociated STA Comeback After Exponent field of the associated Sensing Measurement Request frame.	For an unassociated non-AP STA, the minimum time between the reception of a Sensing Measurement Request frame with Comeback field within the Sensing Comeback Info field equal to 1 and the transmission of the corresponding Sensing Measurement Query frame.
aSensingComebackBefore	Set to the value derived from the Unassociated STA Comeback Before Exponent field of the associated Sensing Measurement Request frame.	For an unassociated non-AP STA, the maximum time between the reception of a Sensing Measurement Request frame with the Comeback field within the Sensing Comeback Info field equal to 1 and the transmission of the corresponding Sensing Measurement Query frame.

11.55.1.3 Sensing capabilities exchange

A sensing STA shall include the Sensing Capabilities element (see 9.4.2.332) in a Probe Response frame, (Re)Association Response frame, (Re)Association Request frame, and Measurement Query frame. A sensing STA may include the Sensing Capabilities element (see 9.4.2.332) in a Probe Request frame.

A non-AP STA receives an AP's sensing capabilities (see 9.4.2.25 and 9.4.2.332) as part of an active or passive scanning procedure (see 11.1.4).

An AP may indicate the need for new sensing responders by setting the Responder Needed field in the Sensing Capabilities element within a Probe Response frame to 1.

NOTE 1—On receipt of a Probe Response frame with Responder Needed field equal to 1, an unassociated non-AP STA that intends to participate in a sensing procedure is expected to send a Sensing Measurement Query frame to the AP to solicit a Sensing Measurement Request frame. An associated non-AP STA ignores the Responder Needed field in a Probe Response frame.

NOTE 2—An unassociated non-AP STA might store an AP's sensing capabilities if at least one of the established sensing measurement sessions is active. Based on the AP's sensing capabilities, the unassociated non-AP STA might establish a sensing measurement session with the AP to perform non-TB sensing measurement exchanges.

A non-AP STA that has the 20 MHz Sensing Transmitter Only field in the Sensing Capabilities element equal to 1, shall set the BW field in the Sensing Capabilities element to 0.

An unassociated non-AP STA shall set the Poll Required field in the Sensing Capabilities element to 1 in any Sensing Measurement Query frame that it transmits.

When the Sensing Capabilities element is included in the (Re)Association Request frame, a non-AP STA shall set the Poll Required subfield in the Sensing Capabilities element to 1 if it intends to be polled in TB sensing measurement exchanges.

A non-AP STA shall include one ISTA Availability Window element in any Sensing Measurement Query frame indicating its availability for TB sensing measurement exchanges as well as a preferred periodicity. The periodicity of the sensing availability windows preferred by the STA is expressed in units of 10 TUs in the Count field in the ISTA Availability Information field of the ISTA Availability Window element. The value of the Count field in the ISTA Availability Information field of the ISTA Availability Window element shall be a multiple of the Beacon Interval of the recipient AP in units of 10 TUs.

11.55.1.4 Sensing measurement session

11.55.1.4.1 General

To establish a sensing measurement session, the SME of a sensing initiator shall issue an MLME-SENSMSMTSESSION.request primitive that results in the transmission of a Sensing Measurement Request frame from this sensing initiator to a sensing responder.

A sensing initiator shall not establish more concurrent sensing measurement sessions with a sensing responder than the value of the Max Supported Sessions field in the last Sensing Capabilities element received from the sensing responder.

NOTE 1—A sensing initiator does not initiate a sensing measurement session with a STA if the latest Sensing Capabilities element received from that STA sets the Max Supported Sessions field value to 0.

The Comeback field of the Sensing Comeback Info field within the Sensing Measurement Request frame shall be set to 0 if the frame is sent by an AP, is addressed to a non-AP STA, and includes a Sensing Measurement Parameters element (see 9.4.2.331).

The Comeback field of the Sensing Comeback Info field within the Sensing Measurement Request frame shall be set to 1 if the frame is sent by an AP, is addressed to an unassociated non-AP STA (see 11.55.1.4.2), and does not include a Sensing Measurement Parameters element (see 9.4.2.331).

NOTE 2—The Comeback field equal to 1 is only applicable for sensing measurement sessions with unassociated non-AP STAs (see 11.55.1.4.2).

The Comeback field of the Sensing Comeback Info field within the Sensing Measurement Request frame shall be reserved if the frame is sent by a non-AP STA.

Upon reception of a Sensing Measurement Request frame, the sensing responder shall validate the frame and issue an MLME-SENSMSMTSESSION.indication primitive. If the Comeback field of the Sensing Comeback Info field within the Sensing Measurement Request frame is set to 0, the SME of the sensing responder shall issue an MLME-SENSMSMTSESSION.response primitive to cause the transmission of a Sensing Measurement Response frame to the sensing initiator that transmitted the Sensing Measurement Request frame, according to the following rules:

— If the sensing responder accepts the requested sensing measurement session parameters in the received Sensing Measurement Request frame, it shall set the Status Code field to SUCCESS in the Sensing Measurement Response frame.

— If the sensing responder declines the requested sensing measurement session parameters in the received Sensing Measurement Request frame and provides its preferred sensing measurement parameters in the Sensing Measurement Response frame, it shall set the Status Code field to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS in the Sensing Measurement Response frame.

— If the sensing responder declines the requested sensing measurement session parameters in the received Sensing Measurement Request frame without providing its preferred sensing measurement parameters in the Sensing Measurement Response frame, it shall set the Status Code field to REQUEST_DECLINED in the Sensing Measurement Response frame.

The sensing responder should transmit the Sensing Measurement Response frame within *aSensingFrameExchangeExpiry* (see Table 11-33a) timeout period in response to the Sensing Measurement Request frame. The sensing responder shall set the Measurement Session ID field in the Sensing Measurement Response frame to the value set in this field in the Sensing Measurement Request frame sent by the sensing initiator. Upon reception of a Sensing Measurement Response frame, the sensing initiator shall validate the frame and issue an MLME-SENSMSMTSESSION.confirm primitive. If the sensing initiator does not receive the Sensing Measurement Response frame within this timeout period, or if a Sensing Measurement Response frame is received with a Status Code other than SUCCESS, the sensing measurement session shall be considered unsuccessful.

If the sensing initiator receives a Sensing Measurement Response frame with a Status Code equal to SUCCESS after *aSensingFrameExchangeExpiry* timeout period of sending the corresponding Sensing Measurement Request frame, the sensing initiator should send a Sensing Measurement Termination frame with the Measurement Session ID carried in the received Sensing Measurement Response frame.

If the sensing responder receives a Sensing Measurement Request frame with a Measurement Session ID that corresponds to a measurement session that has not been terminated with the same sensing initiator, the sensing responder should not respond with a Sensing Measurement Response frame.

The Measurement Session ID shall be assigned by a sensing initiator to a sensing responder during the establishment of a sensing measurement session. The same Measurement Session ID may be assigned to different sensing responders. The <sensing initiator’s MAC address, Measurement Session ID> tuple should be used to uniquely identify the corresponding sensing measurement session.

During a sensing measurement session, the sensing initiator shall assign the role(s) of a sensing responder as one of the following (see 9.4.2.331):

— Sensing receiver

— Sensing transmitter

— Sensing transmitter and sensing receiver

The sensing initiator shall not set both the Sensing Transmitter field and the Sensing Receiver field within the Sensing Measurement Parameters element of a Sensing Measurement Request frame to 0.

If a sensing responder has set the 20 MHz Sensing Transmitter Only field in the Sensing Capabilities element equal to 1, then the sensing initiator shall assign the sensing responder to a sensing transmitter role only.

In both TB and non-TB sensing measurement exchanges, if a sensing initiator assigns in a Sensing Measurement Request frame the role of sensing receiver to the sensing responder and sets the Sensing Measurement Report Requested field to 1, the sensing responder shall send Sensing Measurement Report frames in sensing measurement exchanges that result from the sensing measurement session.

NOTE 3—If a sensing responder is not able to accept a request carried within a Sensing Measurement Request frame with the Sensing Measurement Report Requested field being 1, it can set the Status Code field to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS and set the Sensing Measurement Report Requested field of Sensing Measurement Parameters element to 0 in the Sensing Measurement Response frame.

In non-TB sensing measurement exchanges, if a sensing initiator assigns in a Sensing Measurement Request frame the role of sensing receiver to the sensing responder and sets the Sensing Measurement Report Requested field to 0, the sensing responder shall not send Sensing Measurement Report frames in sensing measurement exchanges that result from the sensing measurement session.

NOTE 4—Whether the sensing measurement report is requested or not, sensing measurements are available locally to the SME of the sensing receiver.

If a sensing initiator assigns in a Sensing Measurement Request frame only the role of sensing receiver to the sensing responder and sets the Sensing Measurement Report Requested field to 0, the sensing initiator shall also assign the sensing responder to be polled in the TB sensing measurement exchange by setting the Poll Assigned field in the TB Sensing Specific subelement of the Sensing Measurement Parameters element in the Sensing Measurement Request frame to 1.

Operational parameters defined in the Sensing Measurement Parameters field of the Sensing Measurement Parameters element, and in the TB Sensing Specific subelement or the Non-TB Sensing Specific subelement, in the establishment of a sensing measurement session corresponding to a Measurement Session ID shall be fixed until the session measurement session is terminated.

If the sensing initiator is an AP in which it assigns operational parameters to a sensing responder, it shall include a TB Sensing Specific subelement in the Sensing Measurement Parameters element in a Sensing Measurement Request frame and shall assign the following:

— The AID or USID in the AID/USID field.
— The Poll Assigned field set to 1 if the Poll Required field within the last Sensing Capabilities element received from the sensing responder is 1, or the AP requests the non-AP STA to be polled in the TB sensing measurement exchange.
— If the Sensing Receiver field or the Sensing Measurement Report Requested field of the Sensing Measurement Parameters is equal to 0, then the CSI Variation Threshold field shall be reserved. If the last Sensing Capabilities element received from the STA addressed by the AID/USID field has the Threshold-Based Reporting field equal to 1, and the sensing initiator requests to use threshold-based reporting (see 11.55.1.5.2.6.2) in the corresponding TB sensing measurement exchanges, then the CSI Variation Threshold field shall be set to a value in the range 0 to 10 to indicate the CSI variation threshold (see Table 9-417z). Otherwise, the CSI Variation Threshold field shall be set to 15 to indicate basic reporting (see 11.55.1.5.2.6.1) is used in the corresponding TB sensing measurement exchanges.
— The SR2SR field may be set to 1 only if the SR2SR subfield in the last Sensing Capabilities element received from the sensing responder is 1.

— The RSTA Availability Information field in the RSTA Availability Window element contains exactly one Availability Window Information field. The Availability Window Broadcast Format subfield in the Header subfield in the RSTA Availability Information field in this RSTA Availability Window element shall be set to 0 (see 9.4.2.299). The assigned availability window for the unassociated sensing responder shall overlap with a 10 TU interval signaled by the ISTA Availability Window element in the Sensing Measurement Query frame.

If the sensing responder is an associated non-AP STA, and it is not available in the sensing availability window provided by the AP, the sensing responder shall set the Status Code field to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS and include a TB Sensing Specific subelement in the Sensing Measurement Response frame. The TB Sensing Specific subelement shall include an ISTA Availability Window element (see 9.4.2.298).

Figure 11-108a, Figure 11-108b, and Figure 11-108c together show an example of how an AP (sensing initiator) assigns an availability window from the received Availability Window element of a non-AP STA (sensing responder).

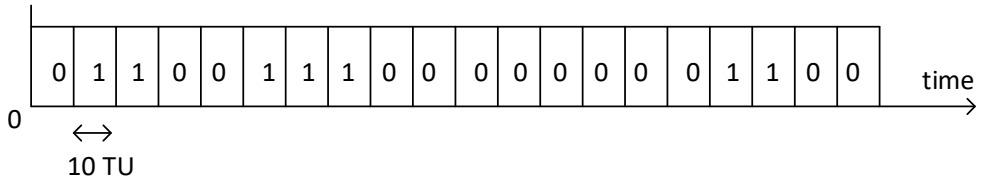

Figure 11-108a—Example of a bitmap with 200 TU periodicity signaled in the ISTA Availability Window element by a non-AP STA

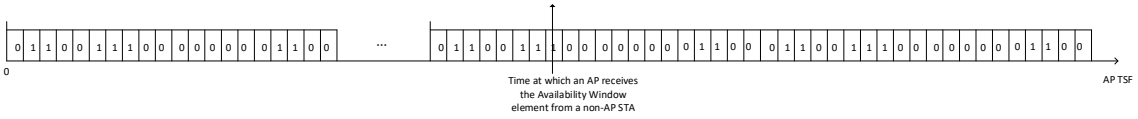

Figure 11-108b—Example of mapping of a non-AP STA's availability bitmap to an AP's TSF

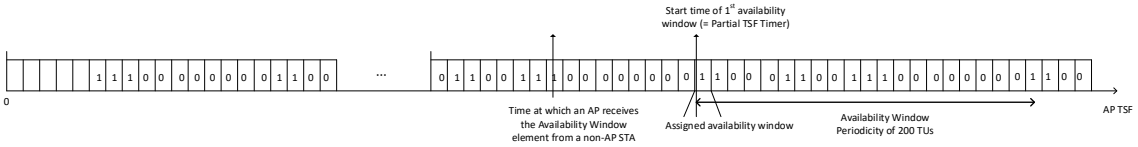

Figure 11-108c—Example of how an AP assigns an Availability Window to a non-AP STA

If the sensing initiator is a non-AP STA, it shall include a Non-TB Sensing Specific subelement as part of the Sensing Measurement Parameters element in a Sensing Measurement Request frame and shall assign a value in the Min Measurement Interval field that is not lower than the value of the Min Measurement Interval field within the Sensing field in the last Sensing Capabilities element or in the Non-TB Sensing Specific subelement in the last Sensing Measurement Parameters element received from the sensing responder.

If a Sensing Measurement Parameters element is included in the Sensing Measurement Request frame, the sensing initiator shall assign the following parameters in the Sensing Measurement Parameters field after accounting for the sensing capabilities of the sensing responder as indicated in the last received Sensing Capabilities element from that STA:

— The requested bandwidth to be used in the transmission of SI2SR NDPs, SR2SI NDPs, and SR2SR NDPs. This value shall not be greater than the maximum bandwidth the sensing responder supports for sensing. This value is referred to as *aSensingBandwidth*.

— The requested number of LTF repetitions that the sensing responder transmits in an SR2SI NDP or SR2SR NDP that is an HE Ranging NDP, an HE TB Ranging NDP, an EHT Ranging NDP or an EHT TB Ranging NDP in the TX LTF Repetition field. This value shall not be greater than the maximum number of LTF repetitions that the sensing responder is capable of transmitting. This value is referred to as *aSensingSRTXRep*.

— The requested number of LTF repetitions that the sensing responder receives in an SI2SR NDP or SR2SR NDP that is an HE Ranging NDP or an EHT Ranging NDP in the RX LTF Repetition field. This value shall not be greater than the maximum number of LTF repetitions that the sensing responder is capable of receiving. This value is referred to as *aSensingSRRXRep*.

— The requested number of space-time streams the sensing responder receives in an SI2SR NDP or SR2SR NDP in the RX STS field. This value shall not be greater than the maximum number of space-time streams that the sensing responder is capable of receiving for all bandwidths smaller than or equal to the maximum bandwidth used in TB and non-TB sensing measurement exchanges. This value is referred to as *aSensingSRRXSTS*.

— The requested number of space-time streams the sensing responder transmits in an SR2SI NDP or SR2SR NDP in the TX STS field. This value shall not be greater than the maximum number of space-time streams that the sensing responder is capable of transmitting for all bandwidths smaller than or equal to the maximum bandwidth used in TB and non-TB sensing measurement exchanges. This value is referred to as *aSensingSRTXSTS*.

— The requested number of chains to be used in the reception of SI2SR NDPs and SR2SR NDPs by the sensing responder. This value shall not be greater than the maximum number of chains the sensing responder is capable of using in the reception of SI2SR NDPs and SR2SR NDPs.

— The subcarrier grouping to be used in a Sensing Measurement Report frame by sensing responder in the I_{N_g} field. This value shall be 16 if the I_{N_g} field is equal to 1, and shall be either 4 or 8 if the I_{N_g} field is equal to 0 (see 9.4.1.81.3).

NOTE 5—The terms “space-time stream” and “spatial stream” are equivalent in the sensing and SBP procedures because the NDPs used for sensing measurement do not employ STBC.

A Sensing Measurement Response frame in which the Status Code field is equal to SUCCESS shall not include a Sensing Measurement Parameters element.

Upon reception of a Sensing Measurement Response frame with the Status Code equal to REQUEST_DECLINED, the sensing initiator shall not transmit a new Sensing Measurement Request frame within the time indicated in the Decline Duration field to the same sensing responder from which the Sensing Measurement Response frame was received.

Following the successful establishment of a sensing measurement session between an AP and a non-AP STA, both STAs

— Shall start a sensing measurement session expiry timer;

— Shall set the sensing measurement session expiry timer to *aMeasurementSessionExpiry* (see Table 11-33a); and

— Shall reset the sensing measurement session expiry timer upon participating in TB and/or non-TB sensing measurement exchange(s).

A sensing measurement session established between an AP and a non-AP STA shall be terminated implicitly if the corresponding sensing measurement session expiry timer expires at either STA.

A typical state machine implementation of a sensing measurement session between an AP and a non-AP STA is provided in Figure 11-108d.

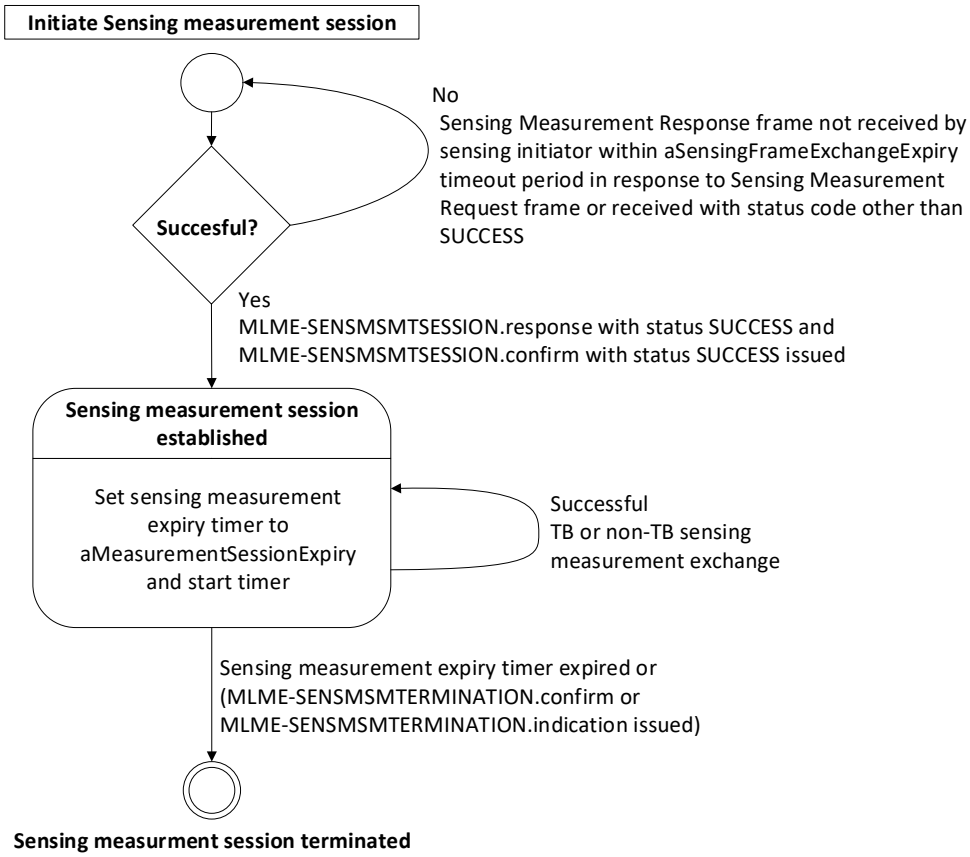

Figure 11-108d—Sensing measurement session state machine diagram

11.55.1.4.2 Sensing measurement session for unassociated STAs

An unassociated STA establishes a sensing measurement session for non-TB sensing measurement exchanges by transmitting a Sensing Measurement Request frame to the AP including a Non-TB Sensing Specific subelement (see Figure 9-1074bp) to set the parameters of the sensing measurement session.

To solicit a sensing measurement session initiation, the SME of an unassociated non-AP STA issues an MLME-SENSMSMTQUERY.request primitive that results in the transmission of a Sensing Measurement Query frame to the AP. Upon reception of a Sensing Measurement Query frame from an unassociated STA, the MLME of the AP shall issue an MLME-SENSMSMTQUERY.indication primitive. Upon receipt of the

MLME-SENSMSMTQUERY.indication primitive, the SME of the AP should issue an MLME-SENSMS-MTSESSION.request primitive to cause the transmission of a Sensing Measurement Request frame to the unassociated STA within a *aSensingFrameExchangeExpiry* (see Table 11-33a) timeout period to initiate a sensing measurement session. If the unassociated non-AP STA does not receive a Sensing Measurement Request frame from the AP within a *aSensingFrameExchangeExpiry* (see Table 11-33a) timeout period, then it shall consider the solicitation to the AP to initiate a sensing measurement session unsuccessful.

Upon reception of a Sensing Measurement Request frame with the Comeback field of the Sensing Comeback Info field equal to 1, an unassociated non-AP STA should transmit a Sensing Measurement Query frame to the AP after *aSensingComebackAfter* (see Table 11-33a) and before *aSensingComebackBefore* (see Table 11-33a) to solicit a Sensing Measurement Request frame from the AP. Both STAs start a corresponding unassociated STA comeback timer when the exchange of the Sensing Measurement Query frame and the Sensing Measurement Request frame with the Comeback field of the Sensing Comeback Info field equal to 1 completes. The unassociated STA comeback timer shall be set to *aSensingComebackBefore* (see Table 11-33a).

If the sensing responder is an unassociated non-AP STA, the sensing initiator shall assign the sensing responder to be polled in a TB sensing measurement exchange by setting the Poll Assigned field in the TB Sensing Specific subelement of the Sensing Measurement Parameters element in the Sensing Measurement Request frame to 1.

The USID is assigned to an unassociated non-AP STA by the AP during the establishment of a sensing measurement session in the case of a TB sensing measurement exchange and/or of an SBP procedure, whichever comes first. If an AP establishes multiple concurrent sensing measurement sessions with the same unassociated non-AP STA, or if an unassociated non-AP STA establishes multiple SBP procedures with the same AP, the AP shall assign the same USID value to the unassociated non-AP STA.

11.55.1.5 Sensing measurement exchange

11.55.1.5.1 General

In a sensing measurement exchange of a sensing procedure, sensing measurements are performed. A sensing measurement exchange has the following variants:

— Trigger-based (TB) sensing measurement exchange described in 11.55.1.5.2.
— Non-Trigger-based (Non-TB) sensing measurement exchange described in 11.55.1.5.3.

One or more sensing responders may participate in a TB sensing measurement exchange.

In case of MLO, the sensing measurement exchanges shall be per-link.

The Measurement Exchange ID shall be used to identify sensing measurement exchange(s) that have the sensing measurement session identified by the <Sensing Initiator’s MAC address, Measurement Session ID> tuple.

On receipt of an SI2SR NDP, SR2SI NDP, or SR2SR NDP, the sensing receiver’s MAC shall issue an MLME-SENSREPORT.indication primitive that includes sensing measurements obtained with the corresponding NDP, where the scaled and quantized CSI values within the Sensing Measurement Report field (see 9.4.1.81.4) shall be generated from the CSI_ESTIMATE RXVECTOR using the procedure described in 9.4.1.81.2.2.

NOTE 1—If the NDP is preceded by a Sensing NDP Announcement frame, the MLME-SENSREPORT.indication primitive also includes operational parameters carried in the Sensing NDP Announcement frame. If the NDP is triggered

by an SR2SI Sounding Trigger frame or SR2SR Sounding Trigger frame, the SENSREPORT.indication primitive also includes operational parameters carried in the SR2SI Sounding Trigger frame or SR2SR Sounding Trigger frame.

NOTE 2—No further Sensing Measurement Report frame is transmitted corresponding to a sensing measurement session that has either been explicitly or implicitly terminated. In the case where the Sensing Measurement Report frame corresponds to the previous TB or non-TB sensing measurement exchange, the sensing initiator does not transmit a Sensing Measurement Termination frame until all desired valid sensing measurement report(s) have been received.

NOTE 3—For an HE PPDU or an EHT PPDU addressed to an unassociated non-AP STA, the STA_ID in the preamble of the PPDU, if present, is set to the USID.

11.55.1.5.2 TB sensing measurement exchange

11.55.1.5.2.1 General

TB sensing measurement exchange is the trigger-based variant of a sensing measurement exchange. It is applicable to sensing measurement sessions in which an AP is the sensing initiator and one or more non-AP STAs are the sensing responders.

A TB sensing measurement exchange may include a polling phase (see 11.55.1.5.2.2), an NDPA sounding phase (see 11.55.1.5.2.3), a TF sounding phase (see 11.55.1.5.2.4 and 11.55.1.5.2.5), and a reporting phase (see 11.55.1.5.2.6).

A TB sensing measurement exchange shall not consist of

- A reporting phase alone;
- An NDPA sounding phase alone;
- A TF sounding phase of the SR2SR variant alone in which the sensing responder is a sensing receiver; or
- Only a polling phase and a reporting phase.

NOTE 1—To allow for an AP to determine whether a non-AP STA is present in a sensing availability window and manage the sensing measurement session expiry timer appropriately, TB sensing measurement exchange(s) that consist(s) of an NDPA sounding phase alone, or a TF sounding phase of the SR2SR variant alone in which the sensing responder is a sensing receiver, include(s) either a polling phase, a reporting phase, or both a polling phase and a reporting phase.

Figure 11-108e shows an example of a TB sensing measurement exchange that consists of a polling phase, an NDPA sounding phase, a TF sounding phase, and a reporting phase.

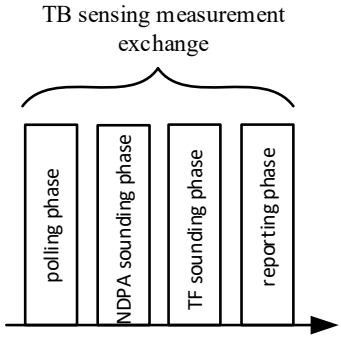

Figure 11-108e—TB sensing measurement exchange

If both polling phase and TF sounding phase are present and NDPA sounding phase is not present in a TB sensing measurement exchange, the TF sounding phase shall start a SIFS after the polling phase. If polling phase and NDPA sounding phase are present in a TB sensing measurement exchange, the NDPA sounding

phase shall start a SIFS after the polling phase. If both NDPA sounding phase and TF sounding phase are present in a TB sensing measurement exchange, the TF sounding phase shall start a SIFS after the NDPA sounding phase.

A sensing availability window is a period of time during which an AP and one or more STAs are assigned to participate in TB sensing measurement exchange(s). TB sensing measurement exchanges shall take place within a sensing availability window. Each sensing availability window may consist of one or more TXOPs, and each TXOP may consist of one or more TB sensing measurement exchanges.

At the beginning of each sensing availability window, the sensing initiator and sensing responder(s) shall only transmit frames corresponding to the sensing measurement exchange, i.e., polling, NDPA sounding, TF sounding, reporting, and SBP reporting and subsequently complete all sensing activities before channel becomes available for other activities.

The TF sounding phase has two variants: the SR2SI variant, as described in 11.55.1.5.2.4, and the SR2SR variant, as described in 11.55.1.5.2.5. A TF sounding phase may contain the SR2SI variant, the SR2SR variant, or both.

The reporting phase of a TB sensing measurement exchange has two variants: The basic reporting phase (see 11.55.1.5.2.6.1) and the threshold-based reporting phase (see 11.55.1.5.2.6.2).

NOTE 2—The reporting phase in Figure 11-108e can be either a basic reporting phase or a threshold-based reporting phase.

The SME of an AP shall issue an MLME-SENSTBMSMTRQ.request primitive to request a TB sensing measurement exchange to be performed with one or more non-AP STAs.

NOTE 3—The different phases present in a TB sensing measurement exchange and, if present, the variant used in the TF sounding phase are determined by MLME-SENSTBMSMTRQ.request primitive parameters.

Figure 11-108f shows an example of a TB sensing measurement exchange consisting of a polling phase, an NDPA sounding phase, a TF sounding phase, and a reporting phase. In the polling phase, the AP polls five STAs (i.e., STA1 to STA5) that are assigned to be polled, where STA1, STA2, and STA3 are sensing transmitters and STA4 and STA5 are sensing receivers. STA6 is a sensing responder and sensing receiver but is not assigned to be polled. Except for STA3, four STAs (i.e., STA1, STA2, STA4, and STA5) respond to the AP with a CTS-to-self frame, so both TF sounding phase and NDPA sounding phase are present. Since STA3 did not respond to the polling, it does not participate in the TB sensing measurement exchange. In the NDPA sounding phase, the AP sends a Sensing NDP Announcement frame to STA4, STA5, and STA6, and transmits an SI2SR NDP a SIFS after the Sensing NDP Announcement frame. In the TF sounding phase, the AP sends an SR2SI Sounding Trigger frame to STA1 and STA2 to solicit SR2SI NDP transmissions, which are multiplexed in the spatial domain. In the reporting phase, STA5 and STA6 send sensing measurement results to the AP. STA4 does not send sensing measurement results since it is not assigned to transmit a Sensing Measurement Report frame.

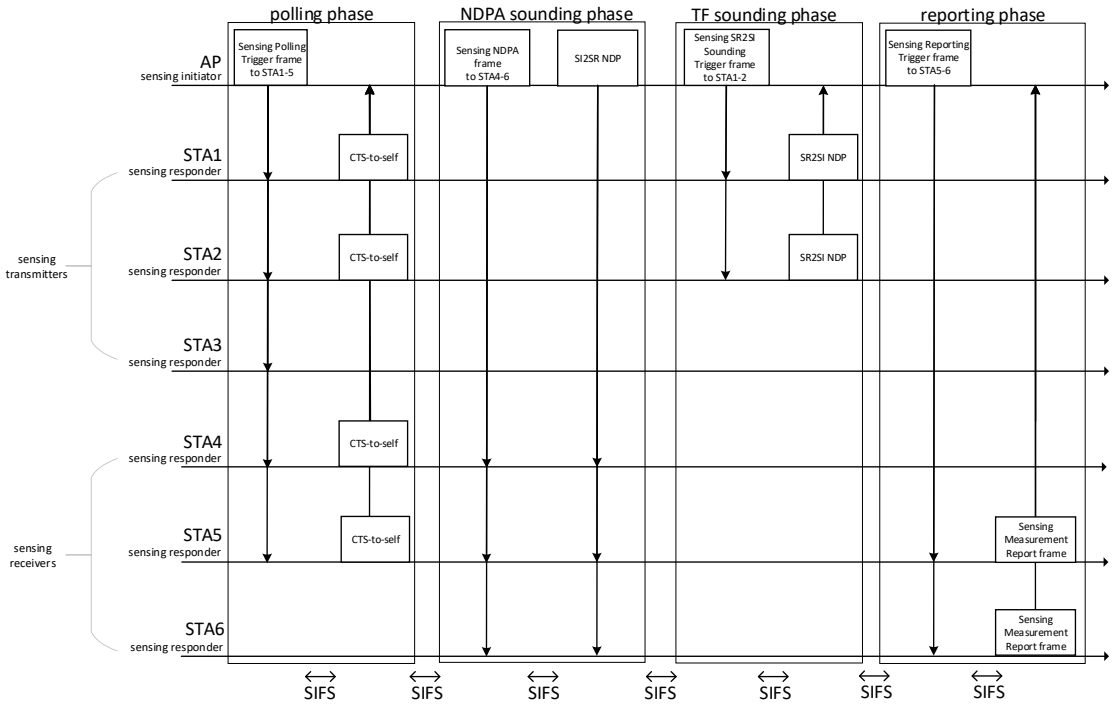

Figure 11-108f—Example of a TB sensing measurement exchange

The uplink power control, timing, and frequency synchronization requirements of unassociated STAs performing TB sensing measurement exchange shall follow the same rules as those of associated HE STAs, as described in 27.3.15, and of associated STAs, as described in 36.3.16.

An unassociated non-AP STA as a sensing responder should synchronize to the AP's TSF timer using the Partial TSF field (see 11.55.1.5.2.3, 11.55.1.5.2.4, and/or 11.55.1.5.2.5) to ensure timing alignment with the sensing availability window.

NOTE 4—A non-AP STA as a sensing responder can also use AP's beacon to synchronize its clock to help ensure timing alignment with the sensing availability window.

To perform a TB sensing measurement exchange that includes at least one associated sensing responder in the EMLSR mode, the AP shall transmit an initial control frame (see 35.3.17) at the beginning of the TB sensing measurement exchange (see Figure 11-108g).

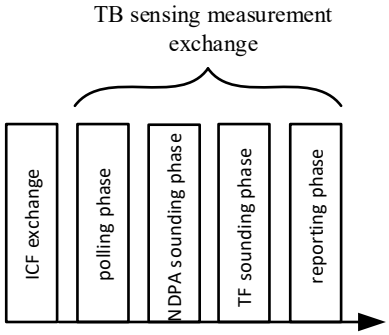

Figure 11-108g—TB sensing measurement exchange with an initial control frame

NOTE 5—AP can set the Polled Assigned field within the TB Sensing Specific subelement to 0 in the Sensing Measurement Request frame sent to an associated sensing responder in the EMLSR mode so that it avoids including the polling phase in the TB sensing measurement exchange as the BSRP Trigger frame used for an initial control frame exchange indicates the device availability. The MU RTS trigger frame as an initial control frame uses a broadcast address and seeks to obtain a non-HT duplicate CTS frame from all devices so that NAV can be set by the legacy devices as MAC protection, but it does not provide a mechanism to identify the device availability.

For a Sensing Trigger frame or a Sensing NDP Announcement frame transmitted in an HE PPDU or an EHT PPDU, the BSS_COLOR parameter shall be set to the value indicated in the BSS Color Information field of the Sensing Measurement Parameters element transmitted by the AP.

An unassociated non-AP STA acting as a sensing responder transmitting a Sensing Measurement Report frame in an HE PPDU or an EHT PPDU shall set the BSS_COLOR parameter to the value indicated in the BSS Color Information field of the Sensing Measurement Parameters element transmitted by the AP.

An AP shall follow the rules defined in 26.5.2 or 35.5.2 when transmitting Sensing Trigger frames. Additionally, the following rules apply:

— A Sensing Trigger frame shall be carried in an S-MPDU if the Sensing Trigger frame is carried in a VHT PPDU, HE PPDU, or EHT PPDU.

— An AP shall not transmit a Sensing Trigger frame or a Sensing NDP Announcement frame in a VHT MU PPDU, HE MU PPDU, or EHT MU PPDU that is not an EHT SU transmission.

11.55.1.5.2.2 Polling phase

In the polling phase, an AP sends a Sensing Polling Trigger frame to one or more STAs that are assigned to be polled in the TB sensing measurement exchange and expected to participate during the sensing availability window. The AP shall set the Polled Assigned field to 1 to request the non-AP STA to be polled in the TB sensing measurement exchange. Otherwise, it shall set the Poll Assigned field to 0.

The AP shall send a Sensing Polling Trigger frame to one or more STAs and shall allocate each RU indicated in the Polling Trigger frame to exactly one STA. Any STA addressed by a User Info field in a Sensing Polling Trigger frame that intends to participate in the TB sensing measurement exchange corresponding to any of the sensing measurement session(s) in the sensing availability window shall respond with a CTS-to-self frame in its designated RU allocation as identified in the Sensing Polling Trigger frame; otherwise, the STA shall not send a response to avoid unnecessary resource allocation and the AP shall not include the STA in this TB sensing measurement exchange. The CTS-to-self frame shall be sent in an S-MPDU within

its designated RU allocation as identified in the Sensing Polling Trigger frame and shall be within an HE TB PPDU if the corresponding User Info field variant is an HE variant, or within an EHT TB PPDU if the corresponding User Info field is an EHT variant.

If a TB sensing measurement exchange that starts with polling phase receives no CTS-to-self frame from any of the non-AP STAs, the AP shall not proceed with an NDPA sounding phase or a TF sounding phase if all STAs are assigned to be polled in the current sensing availability window. In this case, the AP may also start a new back off to access the channel and send another Sensing Polling Trigger frame.

An AP may set the Comeback field of the corresponding User Info field in the Sensing Polling Trigger frame in a TB sensing measurement exchange to 1 to request a sensing responder that is an unassociated non-AP STA to participate in another sensing measurement session as a sensing responder. After reception of a Sensing Polling Trigger frame with the Comeback field of the corresponding User Info field equal to 1, the unassociated non-AP STA should transmit a Sensing Measurement Query frame to the AP outside the sensing availability window associated with the corresponding Measurement Session ID.

To aid in synchronizing the TSF time of unassociated sensing responders, the AP maintains a trigger poll counter. Before transmitting a Sensing Polling Trigger frame, the AP shall increase the trigger poll counter by 1 modulo 8 and set the Token field of the Trigger Dependent Common Info field to the value of the trigger poll counter.

An AP shall begin a TB sensing measurement exchange with a polling phase if at least one STA is assigned to be polled. In a TB sensing measurement exchange with a polling phase, if an AP sends a Sensing Polling Trigger frame and receives a CTS-to-self frame from at least one STA, it shall proceed to the NDPA sounding and/or TF sounding phase a SIFS after the polling phase and if reporting is required, it shall proceed to the reporting phase a SIFS after the NDPA sounding and/or TF sounding phase.

If the AP does not poll all STAs assigned to be polled in the sensing availability window using a single Sensing Polling Trigger frame, the AP shall schedule one or more extra TB sensing measurement exchanges where each TB sensing measurement exchange begins with a polling phase within the same sensing availability window. The AP shall indicate the extra TB sensing measurement exchange by setting the More TF field in the Common Info field to 1 and the RA field to the broadcast address in the corresponding Sensing Trigger frames (i.e., Polling, SR2SI Sounding, SR2SR Sounding and Reporting) sent during this TB sensing measurement exchange. The extra TB sensing measurement exchange may occur in the same TXOP within the same sensing availability window (see Figure 11-108h) and, if it occurs in the same TXOP, it shall be a SIFS after the previous TB sensing measurement exchange. It may also occur in a separate TXOP within the same sensing availability window (see Figure 11-108i). If the AP sets the More TF field to 1 in the Sensing Trigger frame(s) of the preceding TB sensing measurement exchange, and if there are no additional TB sensing measurement exchanges within the same sensing availability window, the AP shall set the More TF field in the Common Info field to 0 and the RA field to the broadcast address in follow up Sensing Trigger frame(s) corresponding to the next TB sensing measurement exchange. Upon receipt of such a frame, a STA that has not been addressed by a User Info field in the Sensing Polling Trigger frame may enter doze state if no other condition requires this STA to remain awake.

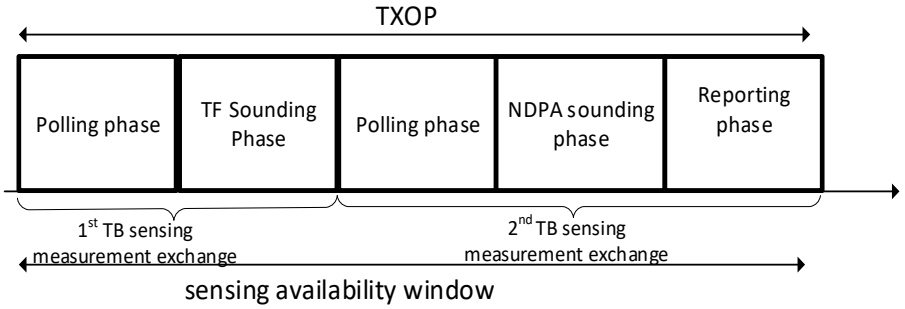

Figure 11-108h—Example of a sensing availability window with two TB sensing measurement exchanges within a single TXOP

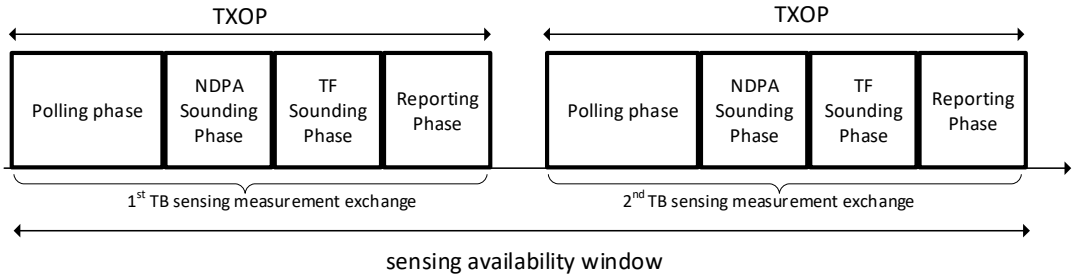

Figure 11-108i—Example of a sensing availability window with two TB sensing measurement exchanges in separate TXOPs

11.55.1.5.2.3 NDPA sounding phase

In the NDPA sounding phase, the AP, which is a sensing transmitter, transmits an SI2SR NDP on which one or more STAs perform sensing measurement. The NDPA sounding phase shall be present in a TB sensing measurement exchange if there exists at least one STA that is a sensing receiver in this NDPA sounding phase and that is not assigned to be polled or has responded in the polling phase. If the NDPA sounding phase is present in a TB sensing measurement exchange, and if the polling phase is also present, the NDPA sounding phase shall start a SIFS after the polling phase. If the NDPA sounding phase is present in a TB sensing measurement exchange, and if the polling phase is not present, the AP shall send the Sensing NDP Announcement frame as the first frame in this sensing measurement exchange.

The AP shall transmit a Sensing NDP Announcement frame to one or more STAs that are sensing receivers in this NDPA sounding phase and that are not assigned to be polled or have responded in the polling phase, followed after SIFS by an SI2SR NDP transmission. The STA Info fields within the Sensing NDP Announcement frame specify STAs that shall perform sensing measurements on the SI2SR NDP sent by the AP.

If the bandwidth of the PPDU carrying the Sensing NDP Announcement frame is less than or equal to 160 MHz, the format of the SI2SR NDP shall be an HE Ranging NDP, as described in 27.3.19.1.

If the bandwidth of the PPDU carrying the Sensing NDP Announcement frame is equal to 320 MHz, the format of SI2SR NDP shall be an EHT Ranging NDP, as described in 36.3.19a.1. The EHT LTF symbol shall use the 2x EHT-LTF with 1.6 μs GI.

The AP shall select a bandwidth value for the NDPA sounding phase that is less than or equal to the *aSensingBandwidth* corresponding to the Measurement Session ID included in this Sensing NDP Announcement frame for each of the STAs addressed in this phase. The AP shall set the TXVECTOR parameter CH_BANDWIDTH of both the PPDU carrying the Sensing NDP Announcement frame and the SI2SR NDP to the same value.

In the Sensing NDP Announcement frame, the AP shall set the values of the SI2SR NSTS field and the SI2SR Rep field within the STA Info fields corresponding to each of the STAs addressed by that frame to be less than or equal to *aSensingSRRXSTS* and *aSensingSRRXRep*, respectively. The combination of the values of the SI2SR NSTS and the SI2SR Rep shall not lead to a total number of LTFs transmitted as part of the HE Ranging NDP or the EHT Ranging NDP transmission that exceeds the total number of LTFs the corresponding STA is capable of receiving, as signaled in the Sensing Capabilities element.

A STA Info field with the AID11 field set to 2044 shall be present in a transmitted Sensing NDP Announcement frame as part of a TB sensing measurement exchange. When transmitting a Sensing NDP Announcement frame as part of a TB sensing measurement exchange beginning with a polling phase, the STA Info field with AID11 equal to 2044 shall be set as follows:

— The Partial TSF field is set to the AP's TSF[21:6] at the time of transmission of the preceding Sensing Polling Trigger frame. Specifically, the time of transmission is defined as when the first data symbol of the PSDU of the frame was transmitted to the PHY plus the AP's delays through its local PHY from the MAC-PHY interface to its interface with the WM.

— The Token field is set to the same trigger poll counter value as the Token field in the Trigger Dependent Common Info field of the Sensing Polling Trigger frame.

When transmitting a Sensing NDP Announcement frame as part of a TB sensing measurement exchange not beginning with a polling phase, the Partial TSF and Token fields of the STA Info field with AID11 equal to 2044 shall be reserved.

The AP maintains a sounding dialog token counter modulo 64 for each TB sensing measurement exchange corresponding to a Measurement Session ID. When transmitting a Sensing NDP Announcement frame to one or more non-AP STAs, the Sounding Dialog Token Number field in the Sounding Dialog field shall be set to the value of the corresponding counter representing the Measurement Exchange ID; after which the counter shall be incremented by 1.

11.55.1.5.2.4 TF sounding phase—SR2SI variant

In the SR2SI variant of a TF sounding phase, the AP solicits SR2SI NDP transmissions from one or more STAs, on which to perform sensing measurements. The SR2SI variant of a TF sounding phase shall be present in a TB sensing measurement exchange if there exists at least one STA that is a sensing transmitter to which the AP is the only sensing receiver in this TF sounding phase and that is not assigned to be polled or has responded in the polling phase.

The AP shall transmit an SR2SI Sounding Trigger frame to one or more STAs that are sensing transmitters in this TF sounding phase and that are not assigned to be polled or have responded in the polling phase to solicit SR2SI NDP transmission(s). The SR2SI Sounding Trigger frame shall allocate spatial resources for one or more SR2SI NDP transmissions. A sensing responder may be assigned to transmit an SR2SI NDP using more than one spatial stream. The SR2SI NDP shall be transmitted using uplink MU-MIMO if there are multiple sensing responders. Any STA addressed by a User Info field in an SR2SI Sounding Trigger frame shall transmit an SR2SI NDP a SIFS after receiving the SR2SI Sounding Trigger frame.

An AP may perform the frame exchange of transmitting an SR2SI Sounding Trigger frame and soliciting the SR2SI NDP transmission(s) multiple times during the TF sounding phase (see Figure 11-108j).

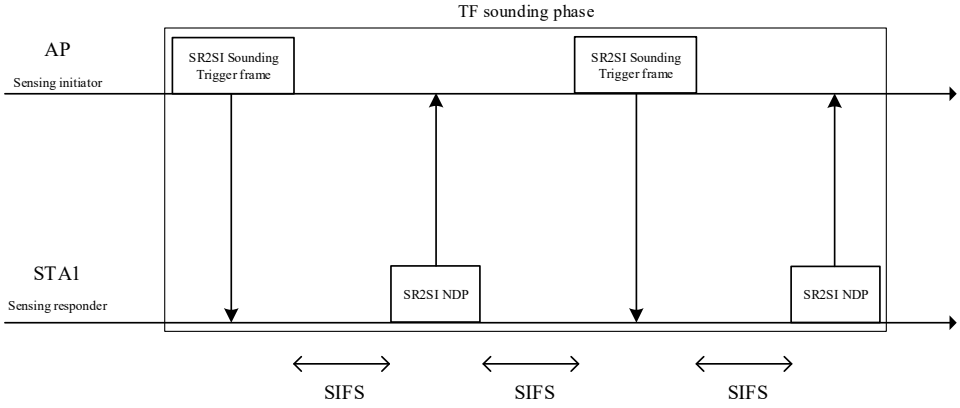

Figure 11-108j—Example of a TF sounding phase that contains multiple SR2SI Sounding Trigger frames

The format of the SR2SI NDP in the TF sounding phase of a TB sensing measurement exchange shall be an HE TB Ranging NDP if the SR2SI Sounding Trigger frame is soliciting an HE TB Ranging NDP, as described in 27.3.19.2. The format of the SR2SI NDP in the TF sounding phase of a TB sensing measurement exchange shall be an EHT TB Ranging NDP if the SR2SI Sounding Trigger frame is soliciting an EHT TB Ranging NDP, as described in 36.3.19a.2.

In the SR2SI Sounding Trigger frame, the AP shall set the SS Allocation/RA-RU Information field and the SR2SI Rep field of the User Info fields corresponding to each of the STAs triggered by the Trigger frame as follows:

— The number of spatial streams to be included in each SS Allocation/RA-RU Information field shall be less than or equal to *aSensingSRTXSTS* for the corresponding non-AP STA.

— All the SR2SI Rep fields in the User Info fields of the SR2SI Sounding Trigger frame shall be set to the same value. This value indicates the number of LTF repetitions in the SR2SI NDP and shall not exceed any of the *aSensingSRTXRep* for the corresponding non-AP STA(s) triggered by this Sensing Sounding Trigger frame.

— The product of the number of LTF repetitions, indicated in each of the SR2SI Rep fields of the User Info fields, and the number of LTF symbols, indicated in the Number Of HE-LTF Symbols And Midamble Periodicity field or the Number of HE/EHT-LTF Symbols field in the Common Info field, shall not exceed the total number of LTFs for the corresponding non-AP STA that it is capable of transmitting, as signaled in the Sensing Capabilities element.

The AP shall set the TXVECTOR parameter CH_BANDWIDTH of the SR2SI Sounding Trigger frame to a bandwidth that is less than or equal to the *aSensingBandwidth* of each of the STAs addressed in this Trigger frame and use the same value for the UL BW field of the Common Info field of the Trigger frame.

A User Info field with the AID12/USID12 field set to 2008 shall be present in all transmitted SR2SI Sounding Trigger frames as part of a TB sensing measurement exchange. When transmitting an SR2SI Sounding Trigger frame as part of a TB sensing measurement exchange beginning with a polling phase, the User Info field with AID12/USID12 equal to 2008 shall be set as follows:

— The Partial TSF field is set to the AP's TSF[21:6] at the time of transmission of the preceding Sensing Polling Trigger frame in that sensing measurement exchange. Specifically, the time of transmission is defined as when the first data symbol of the PSDU of the frame was transmitted to

the PHY plus the AP's delays through its local PHY from the MAC-PHY interface to its interface with the WM.

— The Token field is set to the same trigger poll counter value as the Token field in the Trigger Dependent Common Info field of the Sensing Polling Trigger frame.

When transmitting an SR2SI Sounding Trigger frame as part of a TB sensing measurement exchange not beginning with a polling phase, the Partial TSF and Token fields of the User Info field with AID12/USID12 equal to 2008 shall be reserved.

11.55.1.5.2.5 TF sounding phase—SR2SR variant

In the SR2SR variant of a TF sounding phase, the AP solicits SR2SR NDP transmissions from one non-AP STA, on which one or more non-AP STAs perform sensing measurements. The AP may transmit multiple times an SR2SR Sounding Trigger frame to solicit an SR2SR NDP during the SR2SR variant of a TF sounding phase.

The SR2SR variant of a TF sounding phase may be present in a TB sensing measurement exchange if there exists

— One non-AP STA that is a sensing transmitter in this SR2SR variant of the TF sounding phase and that is not assigned to be polled or has responded in the polling phase.

— At least one non-AP STA that is a sensing receiver in this SR2SR variant of the TF sounding phase and that is not assigned to be polled or has responded in the polling phase.

Implementation of the SR2SR variant of the TF sounding phase is optional. If supported, the AP shall transmit an SR2SR Sounding Trigger frame to one non-AP STA that is a sensing transmitter and one or more non-AP STAs that are sensing receivers, and are not assigned to be polled or have responded in the polling phase of the TB sensing measurement exchange to solicit SR2SR NDP transmission. The SR2SR Sounding Trigger frame shall allocate spatial resources for the SR2SR NDP transmission. The SR2SR NDP may be assigned to transmit with more than one spatial stream. The non-AP STA indicated as a sensing transmitter by a Transmitter User Info field in an SR2SR Sounding Trigger frame shall transmit an SR2SR NDP a SIFS after receiving the SR2SR Sounding Trigger frame. Any non-AP STA indicated as a sensing receiver by a Receiver User Info field in the SR2SR Sounding Trigger frame shall perform sensing measurement on the SR2SR NDP sent by the sensing transmitter (see Figure 11-108k).

NOTE—The AP can be one of the sensing receivers and perform sensing measurement on the SR2SR NDP.

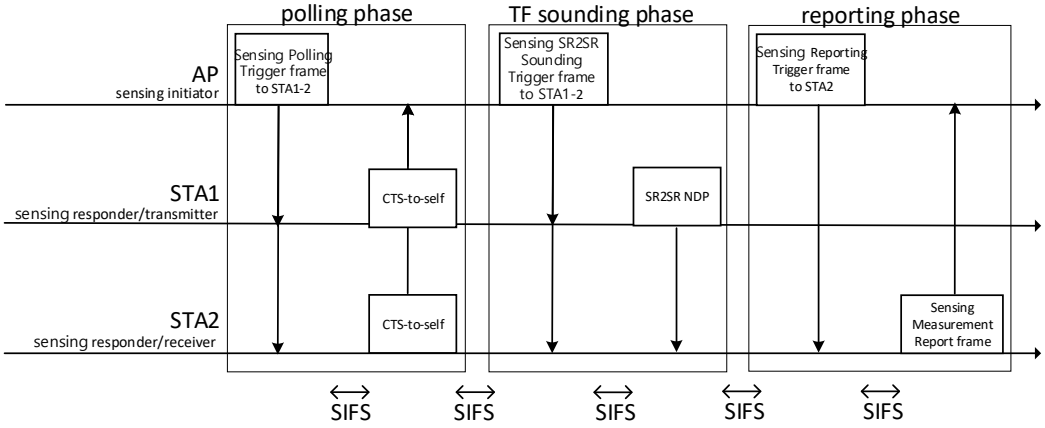

Figure 11-108k—Example of SR2SR variant of a TF sounding phase

The format of the SR2SR NDP in the TF sounding phase of a TB sensing measurement exchange shall be an HE Ranging NDP if the SR2SR Sounding Trigger frame is soliciting an HE Ranging NDP, as described in 27.3.19.1. The format of the SR2SR NDP in the TF sounding phase of a TB sensing measurement exchange shall be an EHT Ranging NDP if the SR2SR Sounding Trigger frame is soliciting an EHT Ranging NDP, as described in 36.3.19a.1.

The AP shall set the parameters of the SR2SR Sounding Trigger frame as follows:

— The number of spatial streams in the SS Allocation/RA-RU Information field within the Transmitter User Info field shall be less than or equal to *aSensingSRRXSTS* for the STA addressed by the AID12/USID12 field in each Receiver User Info field and shall be less than or equal to *aSensingSRTXSTS* for the STA addressed by the AID12/USID12 field within the Transmitter User Info field.

— The SR2SR Rep field in the Transmitter User Info field within the SR2SR Sounding Trigger frame shall be set to less than or equal to *aSensingSRRXRep*for the STA addressed by the AID12/USID12 field in each Receiver User Info field and shall be set to less than or equal to *aSensingSRTXRep* for the STA addressed by the AID12/USID12 field within the Transmitter User Info field.

— The product of the number of LTF repetitions, indicated in the SR2SR Rep field within the Transmitter User Info field, and the number of LTF symbols, indicated in the Number Of HE-LTF Symbols And Midamble Periodicity field or the Number Of HE/EHT-LTF Symbols field within the Common Info field, shall not exceed the total number of LTFs the STA addressed by the AID12/USID12 field in each Receiver User Info field is capable of receiving, as signaled in the Sensing Capabilities element, and shall not exceed the total number of LTFs the STA addressed by the AID12/USID12 field within the Transmitter User Info field is capable of transmitting, as signaled in the Sensing Capabilities element.

A User Info field with the AID12/USID12 field set to 2008 shall be present in all transmitted SR2SR Sounding Trigger frames as part of a TB sensing measurement exchange. When transmitting an SR2SR Sounding Trigger frame as part of the TB sensing measurement exchange beginning with a polling phase, the User Info field with AID12/USID12 equal to 2008 shall be set as follows:

— The Partial TSF field is set to the AP's TSF[21:6] at the time of transmission of the preceding Sensing Polling Trigger frame in that sensing measurement exchange. Specifically, the time of transmission is defined as when the first data symbol of the PSDU of said frame was transmitted to the PHY plus the AP's delays through its local PHY from the MAC-PHY interface to its interface with the WM.

— The Token field is set to the same trigger poll counter value as the Token field in the Trigger Dependent Common Info field of the Sensing Polling Trigger frame.

When transmitting an SR2SR Sounding Trigger frame as part of a TB sensing measurement exchange not beginning with a polling phase, the Partial TSF and Token fields of the User Info field with AID12/USID12 equal to 2008 shall be reserved.

An AP may transmit multiple SR2SR Sounding Trigger frames in a TF sounding phase.

When transmitting an SR2SR Sounding Trigger frame as part of the TB sensing measurement exchange, an AP shall include the corresponding Measurement Session ID and the Measurement Exchange ID fields in the Trigger Dependent Common Info field. The AP shall maintain a modulo 64 counter for each TB sensing measurement exchange corresponding to a Measurement Session ID. When transmitting a SR2SR Sounding Trigger frame to one or more non-AP STAs, the Measurement Exchange ID shall be the value of this modulo 64 counter; after which the counter shall be incremented by 1.

11.55.1.5.2.6 Reporting phase

If present, the reporting phase is the last phase of the TB sensing measurement exchange. The reporting phase may consist of the basic reporting phase (see 11.55.1.5.2.6.1), or the threshold-based reporting phase (see 11.55.1.5.2.6.2).

11.55.1.5.2.6.1 Basic reporting phase

For a sensing responder that is a sensing receiver, the basic reporting phase shall be present in a TB sensing measurement exchange if the Sensing Measurement Report Requested field within the Sensing Measurement Request frame is equal to 1.

In the basic reporting phase, the sensing initiator shall send a single Sensing Reporting Trigger frame allocating UL resources to one or more sensing receivers in order to obtain Sensing Measurement Report frame(s) containing sensing measurement results.

In TB sensing measurement exchanges, the sensing initiator shall not assign any UL resources to a sensing responder in a Sensing Reporting Trigger frame if the sensing initiator assigns in a Sensing Measurement Request frame the role of sensing receiver to the sensing responder and also sets the Sensing Measurement Report Requested field to 0.

To request that the sensing receiver transmits a Sensing Measurement Report frame, the SME of the sensing receiver uses the MLME-SENSREPORTRQ.request primitive. The sensing receiver shall transmit a Sensing Measurement Report frame carrying information supplied in the MLME-SENSREPORTRQ.request primitive corresponding to the Measurement Session ID indicated in the Sensing NDP Announcement frame or SR2SR Sounding Trigger frame previously received in the same sensing measurement exchange in response to the next Sensing Reporting Trigger frame that allocates resources for the sensing receiver. The SME of the sensing receiver shall provide a SensingMeasurementReportContainer parameter to the MLME-SENSREPORTRQ.request primitive that corresponds to either the current sensing measurement exchange or the previous sensing measurement exchange consistently throughout all TB sensing measurement exchanges with the same Measurement Session ID. In the latter case, in the first TB sensing measurement exchange for a given sensing measurement session, the sensing responder shall set the Invalid Indication field in the Sensing Measurement Report frame to 1.

11.55.1.5.2.6.2 Threshold-based reporting phase

Implementation of threshold-based reporting is optional. If implemented, for a sensing responder that is a sensing receiver, the threshold-based reporting shall be present in TB sensing measurement exchanges for the measurement session established with the CSI Variation Threshold field in the TB Sensing Specific subelement set to a value in the range 0 to 10 as part of the Sensing Measurement Request frame.

Threshold-based reporting allows the sensing initiator to find out the sensing responder(s) with their CSI variation values greater than or equal to the CSI variation threshold values assigned to them in the corresponding Sensing Measurement Request frame(s), and then allows the sensing initiator to transmit a Sensing Reporting Trigger frame to obtain the Sensing Measurement Report frame(s) containing the measurement result(s) from those sensing responder(s). This procedure enables the sensing initiator to get the feedback(s) only corresponding to large CSI variation(s) to reduce the overhead of regular feedback(s) in a basic reporting phase.

Threshold-based reporting phase includes a CSI variation reporting subphase and might additionally include a measurement reporting subphase. Only the sensing responders that report their CSI variation value greater

than or equal to their assigned CSI variation threshold may participate in the measurement reporting subphase.

The CSI variation value determined by a sensing responder indicates the quantified difference between the current measured CSI and the latest reported CSI at the sensing responder if the Sensing Measurement Report frame of the sensing responder sent in the CSI variation reporting subphase corresponds to the SI2SR NDP in the current sensing measurement exchange (Case A); and indicates the quantified difference between the measured CSI of the previous sensing measurement exchange and the latest reported CSI, if the Sensing Measurement Report frame of the sensing responder sent in the CSI variation reporting subphase corresponds to the SI2SR NDP in the previous sensing measurement exchange (Case B). In the threshold-based reporting, a sensing responder shall be either in Case A or in Case B consistently throughout all the subsequent TB sensing measurement exchanges corresponding to the same sensing measurement session. The Measurement Exchange IDs indicated by a responder in its Sensing Measurement Report frames in both the CSI variation reporting subphase and the measurement reporting subphase of the same sensing measurement exchange shall correspond to either the current sensing measurement exchange or the previous sensing measurement exchange, and shall be the same.

The quantization method of the CSI variation at the sensing responder is implementation specific, but the following apply:

— The CSI variation value shall be within the closed interval [0, 1].
— A larger CSI variation value shall reflect a larger difference between the measured CSI and the latest reported CSI.
— A CSI variation value equal to 0 should indicate that the CSI variation is smaller than an implementation dependent reference value.
— A CSI variation value equal to 1 should indicate that the CSI variation is larger than a second implementation dependent reference value.
— The above reference values should be the same in all sensing measurement exchanges of a sensing measurement session for a given sensing responder.

NOTE 1—The CSI variation value is a measure of the amplitude and phase variations of the channel between a sensing initiator and a sensing responder.

The CSI variation threshold for each sensing responder to be compared with the CSI variation value shall be transmitted to each sensing responder within a Sensing Measurement Request frame. Different sensing responders may have different threshold values set by the sensing initiator.

NOTE 2—The CSI variation threshold for each sensing responder to be compared with the CSI variation value is determined by the application at the sensing initiator.

If the CSI Variation Threshold field in the Sensing Measurement Request frame sent by the sensing initiator is equal to a value between 0 and 10, and the Status Code field in the corresponding Sensing Measurement Response frame sent by the sensing responder is equal to SUCCESS, the sensing initiator shall send a Sensing Threshold-Based Reporting Trigger frame in the CSI variation reporting subphase to the sensing responder(s) that supports threshold-based reporting to obtain a CSI variation feedback value(s). The sensing responder that supports threshold-based reporting shall send a Sensing Measurement Report frame containing the CSI variation feedback value a SIFS after receiving Sensing Threshold-Based Reporting Trigger frame in the assigned RU.

In the measurement reporting subphase, for all sensing responders for which the reported CSI variation feedback value was greater than or equal to the CSI variation threshold, the sensing initiator should transmit a Sensing Reporting Trigger frame assigning UL resources to the corresponding sensing responders a SIFS after the reception of the Sensing Measurement Report frame that included the CSI variation feedback;

otherwise, the sensing initiator shall not send a Sensing Reporting Trigger frame to the corresponding sensing responders.

NOTE 3—The value in the CSI Variation Threshold field can be used by the sensing responders to decide whether to clear the buffers if the measured CSI variation is less than the value in the CSI Variation Threshold field.

The sensing responder that provided the CSI variation feedback value greater than or equal to the threshold shall transmit a Sensing Measurement Report frame containing the measurement result to the sensing initiator in the assigned UL when triggered by a Sensing Reporting Trigger frame. The sensing responder not receiving the Sensing Reporting Trigger frame in the measurement reporting subphase shall not send a Sensing Measurement Report frame containing the measurement result to the sensing initiator.

An example of the threshold-based reporting phase is shown in Figure 11-108l.

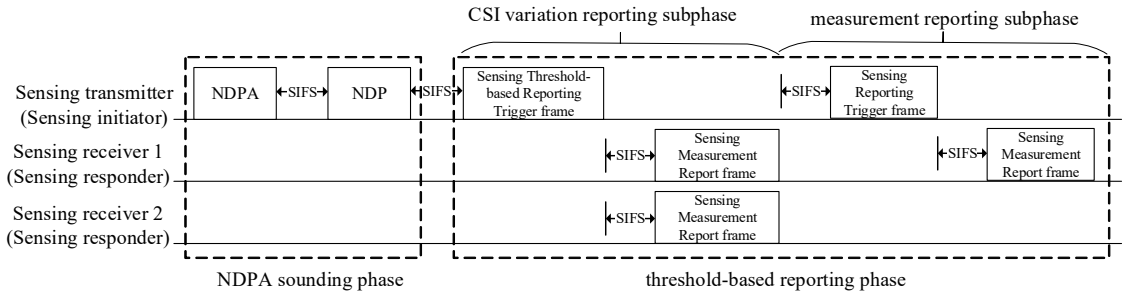

Figure 11-108l—Threshold-based reporting phase

11.55.1.5.3 Non-TB sensing measurement exchange

11.55.1.5.3.1 General

A non-TB sensing measurement exchange is the non-trigger-based variant of a sensing measurement exchange. It is applicable to sensing measurement sessions in which a non-AP STA is the sensing initiator, and an AP is the sensing responder. A non-AP STA acting as a sensing initiator shall participate in a non-TB sensing measurement exchange as a sensing transmitter, a sensing receiver, or both a sensing transmitter and a sensing receiver (see 11.55.1.1). Whenever the WM is available, the non-AP STA may initiate a non-TB sensing measurement exchange. The AP may limit the frequency with which the non-AP STA may initiate a non-TB sensing measurement exchange by conveying a minimum time interval between two consecutive non-TB sensing measurement exchanges in the Min Measurement Interval field in the Sensing field during the sensing capabilities exchange.

The SME of the non-AP STA shall issue an MLME-SENSNONTBMSMTRQ.request primitive to request a non-TB sensing measurement exchange to be performed with the intended AP. A non-TB sensing measurement exchange shall always include a measurement sounding phase (see 11.55.1.5.3.2). It shall also include a reporting phase if the Sensing Measurement Report Requested field within the Sensing Measurement Request frame that resulted in the non-TB sensing measurement exchange is equal to 1.

Figure 11-108m shows a non-TB sensing measurement exchange consisting of a measurement sounding phase and a reporting phase.

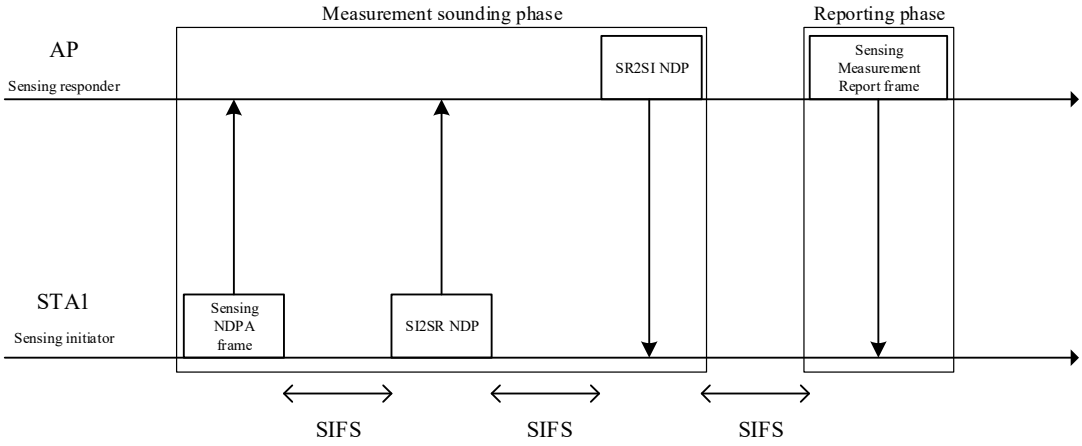

Figure 11-108m—A non-TB sensing measurement exchange consisting of a measurement sounding phase and a reporting phase

The non-AP STA shall set the Min Measurement Interval field in the Sensing Measurement Request frame taking into account the measurement exchange duration and the AP's capability indicated in the Min Measurement Interval field carried in the Sensing Capabilities element.

The non-AP STA shall not initiate a new non-TB sensing measurement exchange associated with the same sensing measurement session until the assigned minimum time interval between two consecutive non-TB sensing measurement exchanges has elapsed.

A sensing initiator shall not transmit a Sensing NDP Announcement frame in a VHT MU PPDU, HE MU PPDU, or EHT MU PPDU that is not an EHT SU transmission.

For a Sensing NDP Announcement frame transmitted in an HE PPDU or an EHT PPDU, the BSS_COLOR parameter shall be set to the value indicated in the BSS Color Information field of the Sensing Measurement Parameters element transmitted by the AP.

A sensing responder transmitting a Sensing Measurement Report frame to an unassociated non-AP STA acting as a sensing initiator in an HE PPDU or an EHT PPDU shall set the BSS_COLOR parameter to the value indicated in the BSS Color Information field of the Sensing Measurement Parameters element transmitted by the AP.

11.55.1.5.3.2 Measurement sounding phase

A non-AP STA shall initiate a non-TB sensing measurement exchange by transmitting a Sensing NDP Announcement frame addressed to the AP, followed by an SI2SR NDP after SIFS. The AP addressed by the Sensing NDP Announcement frame shall transmit an SR2SI NDP a SIFS after the SI2SR NDP.

The non-AP STA transmitting the SI2SR NDP shall set the TXVECTOR parameter CH_BANDWIDTH to the same value as the TXVECTOR parameter CH_BANDWIDTH in the preceding Sensing NDP Announcement frame. An AP transmitting an SR2SI NDP shall set the TXVECTOR parameter CH_BANDWIDTH to the bandwidth of the PPDU that carries the Sensing NDP Announcement frame and/or the SI2SR NDP; which are obtained from the RXVECTOR parameter CH_BANDWIDTH of the Sensing NDP Announcement frame or the SI2SR NDP, respectively. For the Sensing NDP Announcement frame, if not received in an HE/VHT/HT PPDU, the bandwidth is obtained from the RXVECTOR parameter

CH_BANDWIDTH_IN_NON_HT if the Sensing NDP Announcement frame is received in a non-HT duplicate PPDU, and is set to 20 MHz if the Sensing NDP Announcement frame is received in a non-HT PPDU. The allowed bandwidths for the Sensing NDP Announcement frames, SI2SR NDP, and SR2SI NDP, shall be less than or equal to *aSensingBandwidth*.

If the non-AP STA is only the sensing transmitter, the Sensing NDP Announcement frame should configure the SR2SI NDP to be transmitted with minimal length by setting both the SR2SI NSTS field and SR2SI Rep field to 0. If the non-AP STA is only the sensing receiver, the Sensing NDP Announcement frame should configure the SI2SR NDP to be transmitted with minimal length by setting both the SI2SR NSTS field and SI2SR Rep field to 0.

The format of both SI2SR NDP and SR2SI NDP shall be an HE Ranging NDP (see 27.3.19.1) or an EHT Ranging NDP (see 36.3.19a.1).

If the non-AP STA is a sensing transmitter, the STA shall set the SI2SR NSTS field and the SI2SR Rep field in the STA Info field within the Sensing NDP Announcement frame to be less than or equal to *aSensingSRRXSTS* and *aSensingSRRXRep*, respectively. If the non-AP STA is a sensing receiver, the STA shall set the SR2SI NSTS field and the SR2SI Rep field in the STA Info field within the Sensing NDP Announcement frame to be less than or equal to *aSensingSRTXSTS* and *aSensingSRTXRep*, respectively.

The non-AP STA maintains a sounding dialog token counter modulo 64 for each non-TB sensing measurement exchange. When transmitting a Sensing NDP Announcement frame to an AP corresponding to a Measurement Session ID, the Sounding Dialog Token Number field in the Sounding Dialog field shall be set to the value of the corresponding counter representing the Measurement Exchange ID; after which the counter shall be incremented by 1.

The non-AP STA may use any AC to transmit the Sensing NDP Announcement frame.

The Sensing NDP Announcement frame shall be transmitted by the non-AP STA and shall have the RA field set to the address of the AP and contain one STA Info field with the AID11 field set to 0. It shall include another STA Info field with AID11 field set to 2045, and the SI2SR NDP TX Power field shall be set to indicate the transmit power of the following SI2SR NDP. The SR2SI NDP RSSI Target field shall be set to the preferred receive power of the following SR2SI NDP or to a reserved value.

11.55.1.5.3.3 Reporting phase

The reporting phase shall be present if the Sensing Measurement Report Requested field within the Sensing Measurement Request frame that resulted in the non-TB sensing measurement exchange is equal to 1, and not present otherwise.

If the reporting phase is present, the AP shall send a Sensing Measurement Report frame to the non-AP STA SIFS after transmitting the SR2SI NDP (see Figure 11-108m).

The AP shall transmit a Sensing Measurement Report frame corresponding to the sensing measurement results of the SI2SR NDP for either the current non-TB sensing measurement exchange (see Figure 11-108n) or for the previous non-TB sensing measurement exchange (see Figure 11-108o) consistently throughout all the subsequent non-TB sensing measurement exchanges associated with the same sensing measurement session. In the latter case, in the first non-TB sensing measurement exchange for a given sensing measurement session, the AP shall set the Invalid Indication field in the Sensing Measurement Report frame to 1.

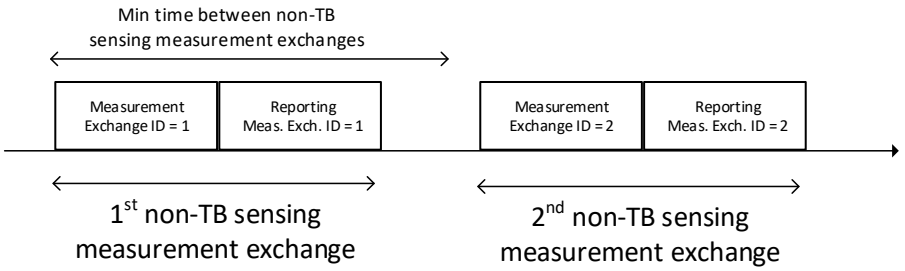

Figure 11-108n—Reported sensing measurement results correspond to current sensing measurement exchange

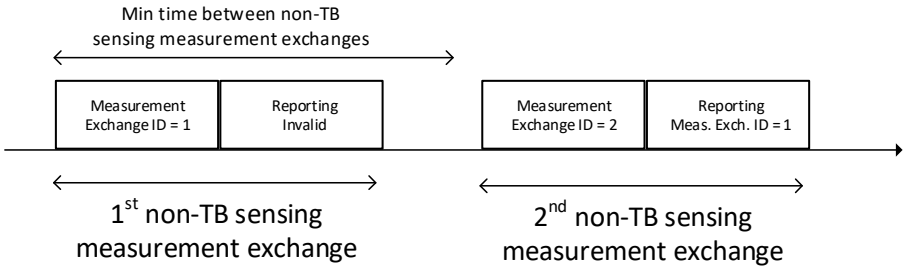

Figure 11-108o—Reported sensing measurement results correspond to previous sensing measurement exchange

11.55.1.5.4 Common rules

11.55.1.5.4.1 General

The sensing receiver shall use the same ordered set of RF chains and antenna elements without changing the order in the reception of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in all sensing measurement exchanges associated with the sensing measurement session. If the CSI measurement at a receive chain is invalid, then all CSI values associated with that chain shall be set to 0 in the MLME-SENSREPORT.indication primitive.

The sensing transmitter shall use the same ordered set of RF chains and antenna elements without changing the order for transmission of an SI2SR NDP, SR2SI NDP, or SR2SR NDP in all sensing measurement exchanges associated with that sensing measurement session. If any of the transmit chains is not available, the sensing transmitter shall not transmit the SI2SR NDP, SR2SI NDP, or SR2SR NDP for that sensing measurement exchange.

NOTE 1—The sensing transmitter needs to terminate the sensing measurement session if any of its transmit chains/antennas is no longer available for sensing measurements. If all transmit chains of the sensing transmitter are no longer available for sensing measurements, then the sensing measurement session is implicitly terminated.

NOTE 2—The sensing transmitter continues to use the same ordered set of chains/antennas with no antenna swapping even if it is included in the TF sounding phase with UL MU-MIMO transmission with different assigned SS allocation in different sensing measurement exchanges.

The sensing transmitter should use the same transmit power for transmitting an SI2SR NDP, SR2SI NDP, or SR2SR NDP to a given sensing receiver in all sensing measurement exchanges.

The bandwidth of PPDUs transmitted in a TB or non-TB sensing measurement exchange shall follow the rules of multiple frame transmission in an EDCA TXOP, see 10.23.2.8.

The spatial mapping matrix Q for the HE-STF, HE-LTF, EHT-STF and EHT-LTF in an SI2SR, SR2SI, or SR2SR NDP shall be:

— If $N_{STS} = N_{TX}$, a permutation matrix with N_{TX} rows and N_{TX} columns.
— If $N_{STS} < N_{TX}$, a matrix with N_{TX} rows and N_{STS} columns, in which N_{STS} rows make up a permutation matrix and the remaining rows make up a zero matrix.

In both $N_{STS} = N_{TX}$ and $N_{STS} < N_{TX}$ cases, the spatial stream to physical antenna port mapping in a STA shall be the same for all SI2SR, SR2SI, and SR2SR NDP transmissions within a sensing measurement session.

A sensing responder that is a sensing receiver shall include the Reference Timestamp field in the Sensing Measurement Report Control field and indicate its presence by setting the Timestamp Present field in the Presence and Control Bitmap field to 1 if the sensing initiator set the Report Timestamp field to 1 in the Sensing Measurement Request frame.

The TXVECTOR parameter SECURE_LTF_FLAG of a transmitted SI2SR NDP, SR2SI NDP, or SR2SR NDP shall be set to 0 (see 27.2.2 and 36.2.2).

When transmitting an SI2SR, SR2SI, or SR2SR NDP using the EHT Ranging NDP or EHT TB Ranging NDP, the sensing transmitter shall use the EHT puncturing pattern indicated in the Disabled Subchannel Bitmap subfield of the EHT Operation element that is one of the non-OFDMA puncturing patterns defined in Table 36-30 whose corresponding PPDU bandwidth value in the table is equal to the operating channel width of the BSS.

An AP acting as a sensing initiator shall limit each non-AP STA acting as a sensing receiver to participate either in a single NDP Announcement (NDPA) sounding phase or in a single SR2SR variant of a TF sounding phase during each sensing availability window of a given Measurement Session ID.

11.55.1.5.4.2 Rules for generating segmented sensing measurement reports

If the size of the measured CSI (see 9.4.1.81.4) exceeds *aSensingReportSegmentSize*, then the measured CSI shall be divided into a maximum of 32 successive segments.

aSensingReportSegmentSize shall be 3750 octets.

Each measured CSI segment shall be included in a separate Sensing Measurement Report Container field. The Sensing Measurement Report Control field shall be included in the Sensing Measurement Report Container field that carries the first measured CSI segment (e.g., the Sensing Measured Report Container field in which the First Report Segment field in the Segmentation Control field is 1 and the Invalid Indication field in the Segmentation Control field is 0). The Sensing Measurement Report Control field shall not be included in a Sensing Measurement Report Container field that does not carry the first measured CSI segment (e.g., all Sensing Measurement Report Container fields in which the First Report Segment field in the Segmentation Control field is equal to 0 or the Invalid Indication field in the Segmentation Control field is 1). Each measured CSI segment shall be of length equal to *aSensingReportSegmentSize*, except for the last segment which may be smaller.

Each measured CSI segment is identified by the value of the Remaining Report Segments field and the First Report Segment field in the Segmentation Control field. The other nonreserved fields of the Segmentation Control field shall be the same for all measured CSI segments. All measured CSI segments shall be sent in a single A-MPDU contained in a PPDU and shall be included in the A-MPDU in the descending order of the values of the Remaining Report Segments field.

11.55.1.5.5 Indication of receiver operating condition

The sensing receiver operating condition affects the accuracy of its CSI estimates. A sensing receiver that reports sensing measurement results should also report its operating condition in the form of either an operating point index or gain index in the Rx_OP_Gain_Index field within the Sensing Measurement Report field (see Table 9-129k), and set the value in the Rx_OP_Gain_Type field within the Sensing Measurement Report Control field (see Table 9-129h) accordingly. The Rx_OP_Gain_Type field value first selected by a sensing receiver and reported during a reporting phase shall remain consistent throughout all subsequent measurement reports associated with the same measurement session.

The sensing receiver shall set the Rx_OP_Gain_Type field to a value in the range 0 to 2 to indicate the format and contents of each Rx_OP_Gain_Index field (see 9.4.1.81.3 and 9.4.1.81.4). The value of 3 is reserved.

NOTE—A sensing receiver categorizes operating conditions such as receive signal strength level or gain settings, channel bandwidth, environment, and interference into operating points based on the severity of their nonlinear effects on CSI estimates, and then maps the operating points into Rx operating point indices. The metrics of nonlinear effects, operating point step size, the cap of operating point index value, and the underlying operating conditions the sensing receiver uses to categorize operating points and map Rx operating point indices are implementation dependent.

When a sensing receiver maps an Rx operating point index to a RX_OP_Gain_Index field value, the following apply:

— Each Rx_OP_Gain_Index field shall be set to a value in the range 0 to 255. A larger value shall indicate that the impact of the sensing receiver operating point on the corresponding CSI estimate is greater. In the case where the impact of the sensing receiver operating point is negligible on the corresponding CSI estimate, the Rx_OP_Gain_Index field value shall be set to 0.

— The value set in the Rx_OP_Gain_Index field may vary between sensing measurement exchanges belonging to the same sensing measurement session. A change in value indicates a change in the sensing receiver operating point, and thus a change in the impact on the corresponding CSI estimate.

— The same Rx_OP_Index field value may be reported for two sensing measurement exchanges with the same sensing measurement session. This indicates that the sensing receiver operating point is the same when CSI is estimated for each of these two sensing measurement exchanges. It further indicates that the impact of the sensing receiver operating point on the CSI for each of the two sensing measurement exchanges is the same.

If the RX_OP_Gain_Type field is 2, the RF/Analog Gain Index field within the RX_OP_Gain_Index field is defined as a mapping index of the analog domain gain, which mainly contains the gain of the AGC and other components. The Digital Gain Index field within the RX_OP_Gain_Index field is defined as a mapping index of the digital domain gain. When a sensing receiver maps an RF/analog gain index to an RF/Analog Gain Index field value and a digital gain index to a Digital Gain Index field value, the following shall apply:

— Each RF/Analog Gain Index field shall be set to a value in the range 0 to 63, such that they are monotonically increasing with respect to the RF/analog gain. Values 63 and 0 shall be used to indicate the maximum and minimum RF/analog gains, respectively, and the mapping of all other values is implementation specific.

— Each Digital Gain Index field shall be set to a value in the range 1 to 3, such that they are monotonically increasing with respect to digital gain. Values 3 and 1 shall be used to indicate the maximum

and minimum digital gains, respectively, and the mapping of all other values is implementation specific. If the digital gain is not available, the Digital Gain Index field shall be set to 0. In this case, the RF/Analog Gain Index field represents a mapping index of RF/analog gain or receiver gain.

11.55.1.6 Sensing measurement session termination

A sensing measurement session may be terminated either explicitly or implicitly. Under the explicit sensing measurement session termination, a STA uses the Sensing Measurement Termination frame for terminating a sensing measurement session. Under the implicit sensing measurement session termination, the sensing measurement session is terminated after the expiration of the sensing measurement session expiry timer.

Sensing measurement session(s) may be terminated explicitly at any time by either the sensing initiator or the sensing responder by transmitting an individually addressed Sensing Measurement Termination frame.

Upon reception of a Sensing Measurement Query frame from an unassociated STA, the AP may transmit a Sensing Measurement Termination frame to the unassociated STA within a *aSensingFrameExchangeExpiry* (see Table 11-33a) timeout period to terminate one or more sensing measurement session(s).

The explicit sensing measurement session termination is initiated by issuing an MLME-SENSMSMTTERMINATION.request primitive with the RA field set to the MAC address of the intended STA. The STA that initiates the termination of the sensing measurement session(s), shall issue an MLME-SENSMSMTTERMINATION.confirm primitive upon completion of the transmission of the Sensing Measurement Termination frame and terminate the indicated sensing measurement session(s). The STA that receives the Sensing Measurement Termination frame addressed to it, shall issue an MLME-SENSMSMTTERMINATION.indication primitive and shall terminate the indicated sensing measurement session(s).

NOTE 1—Sensing measurement session termination only applies to the sensing measurement session(s) between the peer STAs of the Sensing Measurement Termination frame exchange and not to the other sensing responders with the same Measurement Session ID.

If any of the BSS parameters has changed since the sensing measurement session was established that impacts the sensing session operation with the unassociated STA(s) [e.g., Transmit Power Envelop (TPE) and/or disabled subchannel bitmap] the AP shall send a Sensing Measurement Termination frame to explicitly terminate the sensing measurement session with the unassociated STA(s). The unassociated STA(s) shall not reestablish a new sensing measurement session prior to receiving a beacon frame from that AP.

For the implicit sensing measurement session termination of the sensing measurement session, the sensing initiator and the sensing responder shall use the sensing measurement session expiry timer. The sensing measurement session expiry timer maintains the measurement session identified with the Measurement Session ID between the sensing initiator and the sensing responder. The sensing measurement session expiry timer shall be set to *aMeasurementSessionExpiry* (see Table 11-33a) at

— The success of the procedure specified in 11.55.1.4
— The exchange is completed in the TB sensing measurement exchange (see 11.55.1.5.2)
— The exchange is completed in the non-TB sensing measurement exchange (see 11.55.1.5.3)

Upon expiry of the sensing measurement session expiry timer, the sensing initiator and sensing responder shall terminate the sensing measurement session and issue MLME-SENSMSMTTERMINATION.confirm primitives to their respective SMEs.

During the non-TB sensing measurement exchange, an AP as a sensing responder shall only transmit a Sensing Measurement Termination frame to an unassociated non-AP STA as a sensing initiator either in an

A-MPDU aggregated with the Sensing Measurement Report frame if required, or as an S-MPDU frame SIFS after the SR2SI NDP.

NOTE 2—If a sensing responder establishes multiple sensing measurement sessions with an AP and a sensing responder acts as a transmitter, participating only in the TF sounding phase with SR2SI variant in TB sensing measurement exchanges, after the corresponding TF sounding phase, all of the corresponding sensing measurement session expiry timers of multiple sensing measurement sessions are set to *aMeasurementSessionExpiry* (see Table 11-33a).

11.55.2 SBP procedure

11.55.2.1 General

SBP is a procedure that allows a non-AP STA to request an AP to perform sensing (see 11.55.1) on its behalf.

A STA in which both dot11SensingImplemented and dot11SBPImplemented are equal to true is defined as a STA that supports SBP and shall set the SBP field of the Extended Capabilities element to 1.

A non-AP STA may act as an SBP initiator if the SBP field of the Extended Capabilities element is equal to 1.

An AP may act as an SBP responder if the SBP field of the Extended Capabilities element is equal to 1.

NOTE 1—The non-AP STA that acts as an SBP initiator can be associated or unassociated with the AP that acts as an SBP responder.

NOTE 2—Sensing measurements provided in an SBP procedure are obtained using TB sensing measurement exchanges.

A STA that supports SBP should use the timing related parameters defined in Table 11-33b.

Table 11-33b—SBP procedure timing related parameters

Parameter	Value	Description
aSBPSetupExpiry	100 ms	The maximum time interval between the reception of an SBP Request frame and the transmission of the corresponding SBP Response frame.
aSBPProcedureExpiry	Set to the value derived from the SBP Procedure Expiry Exponent field within an SBP Request frame.	The time limit for which an SBP procedure remains active if no frames are exchanged between its SBP initiator and SBP responder.

NOTE 3—Prior to the transmission of an SBP frame, including SBP Response frame, Sensing Measurement Report frame, and SBP Termination frame, by an SBP responder to an associated SBP initiator in the EMLSR mode, the SBP responder needs to transmit an initial control frame exchange (see 35.3.17).

NOTE 4—The transmission of an initial control frame is not required for an unassociated non-AP STA as only the associated non-AP STA can negotiate to be in the EMLSR mode.

NOTE 5—For an HE PPDU or an EHT PPDU addressed to an unassociated non-AP STA, the STA_ID in the preamble of the PPDU, if present, is set to the USID.

11.55.2.2 Setup exchange

To establish an SBP procedure, the SME of an SBP initiator shall issue an MLME-SBP.request primitive that results in the transmission of an SBP Request frame to the intended SBP responder. The SBP Request frame shall include a SBP Parameters element and a Sensing Measurement Parameters element. The SBP Request frame may include a Sensing Responder Addresses field within the SBP Parameters element to indicate a set of preferred sensing responders.

The SBP procedure expiry timer value is included in the SBP Parameters element within the SBP Request frame (see 9.6.7.61). Upon expiry of the corresponding SBP procedure expiry timer, the SBP procedure shall be considered terminated (see 11.55.2.4).

If an SBP Request frame includes an SBP Procedure Expiry Exponent field and a Measurement Session Expiry Exponent field, the value indicated in the SBP Procedure Expiry Exponent field should be greater than the value indicated in the Measurement Session Expiry Exponent field.

On receiving an SBP Request frame, the SBP responder shall validate the frame and issue an MLME-SBP.indication primitive. If the SME of an SBP responder receives an MLME-SBP.indication primitive, it shall issue an MLME-SBP.response primitive that results in the transmission of an SBP Response frame to the SBP initiator within *aSBPSetupExpiry*. The Status Code field within the SBP Response frame should be set to SUCCESS to indicate that the SBP procedure request is accepted if the SBP responder is able to satisfy the SBP request with parameters indicated in the SBP Request frame. The Status Code field within the SBP Response frame shall be set to REQUEST_DECLINED or to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS to indicate that the SBP procedure request is rejected if the SBP responder is not able to satisfy the SBP request with parameters indicated in the SBP Request frame.

If the Status Code field within the SBP Response frame is equal to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, the SBP Response frame shall include an SBP Parameters element and a Sensing Measurement Parameters element that specify preferred SBP and sensing measurement session parameters, respectively.

If the Status Code field within the SBP Response frame is equal to SUCCESS, the SBP Response frame shall include a Measurement Session ID Indication field that specifies the Measurement Session ID assigned for the SBP setup exchange. In this case, the SBP Response frame shall not include a Sensing Measurement Parameters element and may include an SBP Parameters element.

If the Status Code field within the SBP Response frame is equal to SUCCESS, the SBP Response frame shall include an SBP initiator AID/USID field that specifies the AID/USID assigned to the SBP initiator.

If the Status Code field within the SBP Response frame is equal to REQUEST_DECLINED, the SBP Response frame shall not include a Sensing Measurement Parameters element nor an SBP Parameters element.

On receiving an SBP Response frame, the SBP initiator shall validate the SBP Response frame by ensuring its fields are valid and issue an MLME-SBP.confirm primitive. If the Status Code field within the received SBP Response frame is equal to REQUEST_DECLINED or REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, or if the SBP initiator does not receive an SBP Response frame with the Status Code field equal to SUCCESS within *aSBPSetupExpiry* of sending the corresponding SBP Request frame, the SBP procedure setup exchange shall be considered unsuccessful.

Upon reception of an SBP Response frame with the Status Code equal to REQUEST_DECLINED, the SBP initiator should not transmit a new SBP Request frame within the time indicated in the Decline Duration field.

The Sensing Measurement Parameters element within the Sensing Measurement Request frame sent by the SBP responder to initiate a sensing procedure used to satisfy an SBP request should take into account the Sensing Measurement Parameters element within the corresponding SBP Request frame. The Measurement Session ID Indication field within the Sensing Measurement Request frame sent by the SBP responder to initiate a sensing procedure used to satisfy an SBP request shall be identical to the Measurement Session ID Indication field within the corresponding SBP Response frame.

The SBP Request field within the SBP Parameters element within an SBP Request frame shall be set to 1. The SBP Request field within the SBP Parameters element within an SBP Response frame shall be set to 0. If present, the SBP Request subfield within the SBP Parameters element within an SBP Termination frame shall be set to 0.

The SBP responder shall set the Status Code field within the SBP Response frame to REQUEST_DECLINED if the Mandatory Number Of Responders field within the SBP Parameters element of the corresponding SBP Request frame is equal to 1 and the SBP responder is not able to satisfy the requested number of sensing responders indicated in the Number Of Sensing Responders field within the SBP Parameters element. If the Mandatory Number Of Responders field within the SBP Parameters element is equal to 0, the SBP responder should respond with an SBP Response frame with the Status Code field set to SUCCESS even if the requested number of sensing responders indicated in the Number Of Sensing Responders field within the SBP Parameters element cannot be satisfied.

If the Sensing Responder field within the SBP Parameters element of the corresponding SBP Request frame is equal to 0, the SBP responder shall not use a sensing procedure initiated with the issue of an MLME-SENSMSMTSESSION.request primitive that resulted in the transmission of a Sensing Measurement Request frame to the SBP initiator to satisfy the SBP request. Otherwise, if the Sensing Responder field is equal to 1, the SBP responder shall use a sensing procedure initiated with the issue of an MLME-SENSMS-MTSESSION.request primitive that results in the transmission of a Sensing Measurement Request frame to the SBP initiator to satisfy the SBP request.

NOTE 1—If an SBP initiator is also a sensing responder and a sensing receiver in the sensing procedure initiated by the SBP responder, the AP sets the Sensing Measurement Report Requested field to 0 in the Sensing Measurement Request frame transmitted to the SBP initiator.

If the Sensing Receiver field is reserved in the Sensing Measurement Parameters element included in the SBP Request frame, the Sensing Measurement Report Requested field in the Sensing Measurement Parameters element included in the same SBP Request frame is set to

- 1 to indicate that the SBP responder (i.e., AP) and all sensing responders with the sensing receiver role (i.e., value 01 or 11 in the Preferred Responder Role Bitmap in the SBP Parameters element) shall send the Sensing Measurement Report frames in sensing measurement exchanges that result from the sensing measurement session(s) initiated by the SBP responder.
- 0 to indicate that the SBP responder (i.e., AP) and all sensing responders with the sensing receiver role (i.e., value 01 or 11 in the Preferred Responder Role Bitmap in the SBP Parameters element) shall not send the Sensing Measurement Report frames in sensing measurement exchanges that result from the sensing measurement session(s) initiated by the SBP responder.

If the SBP initiator is unassociated with the SBP responder, the SBP responder shall set the Poll Assigned field in the SBP Parameters element in the SBP Response frame to 1 and poll the SBP initiator in the polling phase of TB sensing measurement exchanges (see 11.55.1.5.2) of the sensing procedure initiated by the SBP responder.

If the Preferred Responder List field within the SBP Parameters element of the corresponding SBP Request frame is equal to 0, the SBP responder may include any STA in the sensing procedure used to satisfy the SBP request that allows for measurements to be obtained with the operational parameters specified in the SBP Request frame.

If the SBP initiator requests for the threshold-based reporting, the CSI Variation Threshold field shall be set to a value in the range 0 to 10 to indicate the CSI variation threshold (see Table 9-417z). Otherwise, the CSI Variation Threshold field shall be set to 15 to indicate basic reporting is used in the corresponding TB sensing measurement exchanges.

If the Preferred Responder List field and the Mandatory Preferred Responder field within the SBP Parameters element of the SBP Request frame are both equal to 1, the intended sensing responder of the sensing procedure used by the SBP responder shall be equal to one of the MAC addresses listed in the Sensing Responder Addresses field within the corresponding SBP Request frame.

If the Preferred Responder List field and the Mandatory Preferred Responder field within the SBP Parameters element of the SBP Request frame are equal to 1 and 0, respectively, the SBP responder should use a sensing procedure initiated with the issue of an MLME-SENSMSMTSESSION.request primitive that results in the transmission of a Sensing Measurement Request frame to one or more sensing responders with MAC address(es) not equal to any of the MAC addresses listed in the Sensing Responder Addresses field within the corresponding SBP Request frame if a sensing procedure cannot be established with one or more STAs with MAC addresses listed in the Sensing Responder Addresses field.

If the Preferred Responder List field within the SBP Parameters element of the SBP Request frame is set to 1, the Number Of Preferred Responders field shall be set to the number of MAC addresses included in the Sensing Responder Addresses field.

The Preferred Responder List field within the SBP Parameters element of an SBP Response frame shall be set to 1 if:

— The Status Code field within the SBP Response frame is set to SUCCESS; and
— The Preferred Responder List field within the SBP Parameters element of the corresponding SBP Request frame is equal to 1.

Otherwise, the Preferred Responder List field within the SBP Parameters element of an SBP Response frame shall be set to 0.

If the Preferred Responder List field within the SBP Parameters element of the SBP Response frame is set to 0, neither the Sensing Responder Addresses field nor the Sensing Responder IDs field shall be included in the SBP Response frame. If the Preferred Responder List field within the SBP Parameters element of the SBP Response frame is set to 1, both Sensing Responder Addresses and Sensing Responder IDs fields shall be included in the SBP Response frame. In this case, the Number Of Preferred Responders field shall be equal to the number of MAC addresses within the Sensing Responder Addresses field and the number of AID/USIDs within the Sensing Responder IDs field.

If the Preferred Responder List field and Mandatory Preferred Responder field within the SBP Parameters element of the corresponding SBP Request frame are equal to 1 and 0, respectively, the MAC addresses within the Sensing Responder Addresses field of the SBP Response frame shall be a subset of the MAC addresses within the Sensing Responder Addresses field of the corresponding SBP Request frame.

If the Status Code field within the SBP Response frame is set to SUCCESS, the Number Of Sensing Responders field within the SBP Parameters element shall be set to the number of sensing responders used in the sensing procedure used by the SBP responder to satisfy the SBP request.

If the Status Code field within the SBP Response frame is set to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, the Number Of Sensing Responders field within the SBP Parameters element should indicate a suggested number of sensing responders.

NOTE 2—The method used by an SBP responder to select STAs to include in the sensing procedure used in response to an SBP Request frame in which the Preferred Responder List field within the SBP Parameters element is equal to 0 or in which the Preferred Responder List field and the Mandatory Preferred Responder field within the SBP Parameters element are equal to 1 and 0, respectively, is implementation dependent.

NOTE 3—Only TB sensing measurement exchanges (see 11.55.1.5.2) are used in sensing procedures initiated in response to an SBP request.

If the Preferred Responder Role Bitmap Present field within the SBP Parameters element of the SBP Request frame is equal to 1, both the Sensing Transmitter and the Sensing Receiver fields within the Sensing Measurement Parameters element of SBP Request frame shall be set to reserved.

If the Preferred Responder Role Bitmap Present field within the SBP Parameters element of the SBP Request frame is equal to 1 and if the Status Code field within the SBP Response frame is equal to SUCCESS, the SBP responder shall set the Sensing Transmitter and the Sensing Receiver fields in the Sensing Measurement Parameters element within the Sensing Measurement Request frame sent to initiate a sensing procedure to satisfy the SBP request according to the Preferred Responder Role Bitmap field within the SBP Parameters element of the corresponding SBP Request frame.

If the Preferred Responder Role Bitmap Present field within the SBP Parameters element of the SBP Request frame is equal to 0, the SBP initiator shall not set both the Sensing Transmitter field and the Sensing Receiver field within the Sensing Measurement Parameters element of the same SBP Request frame to 0.

If the Preferred Responder Role Bitmap Present field within the SBP Parameters element of the SBP Request frame is equal to 0 and if the Status Code field within the SBP Response frame is equal to SUCCESS, the SBP responder should set the Sensing Transmitter and the Sensing Receiver fields in the Sensing Measurement Parameters element within the Sensing Measurement Request frame sent to the sensing responder(s) to initiate a sensing procedure to satisfy the SBP request to the same values in the Sensing Measurement Parameters element of the corresponding SBP Request frame.

The Preferred Responder Role Bitmap Present field within the SBP Parameters element of the SBP Response frame or the SBP Termination frame shall be set to 0.

If the SR2SR Sounding Request field within the SBP Parameters element of the SBP Request frame is equal to 1, and if the Status Code field within the corresponding SBP Response frame is set to SUCCESS, the SBP responder shall initiate the SR2SR variant of the TF sounding phase with sensing responders that support SR2SR sounding (see 9.4.2.332) in the sensing procedure initiated by the SBP responder to satisfy the SBP request.

If the Preferred Responder Role Bitmap Present field within the SBP Parameters field of the SBP Request frame is equal to 0 and if the Status Code field within the SBP Response frame is equal to SUCCESS, the SBP responder should determine the sensing transmitter role and the sensing receiver role for the sensing responders that participate in the SR2SR variant of the TF sounding phase in the SBP procedure.

NOTE 4—The method used by the SBP responder to determine the sensing transmitter role and the sensing receiver role in the SR2SR variant of the TF sounding phase in the SBP procedure is implementation specific.

If the Preferred Responder Role Bitmap Present field within the SBP Parameters field of the SBP Request frame is equal to 1 and if the Status Code field within the SBP Response frame is equal to SUCCESS, the SBP responder should determine the sensing transmitter role and the sensing receiver role for the sensing responders that participate in the SR2SR variant of the TF sounding phase in the SBP procedure according

to the Sensing Responder Role Bitmap field within the SBP Parameters element of the corresponding SBP Request frame.

The SBP initiator shall include one ISTA Availability Window element in the SBP request frame to indicate its availability for obtaining the SBP report(s) when the SBP initiator does not request to be a sensing responder, for obtaining the SBP report(s) and the TB sensing measurement exchange(s) when the SBP initiator requests to be a sensing responder. The periodicity of the sensing availability windows requested by the SBP initiator is expressed in units of 10 TUs in the Count field in the ISTA Availability Information field of the ISTA Availability Window element. The value of the Count field in the ISTA Availability Information field of the ISTA Availability Window element shall be a multiple of the Beacon Interval of the SBP responder in units of 10 TUs. The requested sensing measurement periodicity shall be the same as the requested periodicity of the sensing availability windows.

An SBP responder that sends an SBP Response frame with Status Code SUCCESS shall include an RSTA Availability Window element in the SBP response frame. The RSTA Availability Information field in the RSTA Availability Window element shall contain exactly one Availability Window Information field. The Availability Window Information field represents the sensing availability window assigned by the SBP responder to the SBP initiator. The SBP responder shall set the Availability Window Broadcast Format field of the Header field in the RSTA Availability Information field of the RSTA Availability Window element to 0.

To satisfy an SBP request, the SBP responder shall initiate a new sensing procedure (see 11.55.1.4). The Sensing Measurement Request frame transmitted to a sensing responder used to satisfy an SBP request shall include an SBP Specific subelement containing the AID12/USID12 of the SBP initiator. The Measurement Session ID field in the Sensing Measurement Request frame(s) shall be the same as the Measurement Session ID sent in the SBP Response frame and shall be different than all the existing Measurement Session IDs used with corresponding sensing responder(s).

Figure 11-108p, Figure 11-108q, and Figure 11-108r together show an example of how an SBP responder assigns a sensing availability window from the received Availability Window element of the SBP initiator.

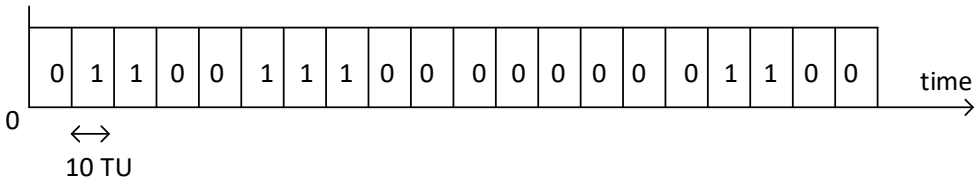

Figure 11-108p—Example of a bitmap with 200 TU periodicity signaled in the ISTA Availability Window element by an SBP initiator

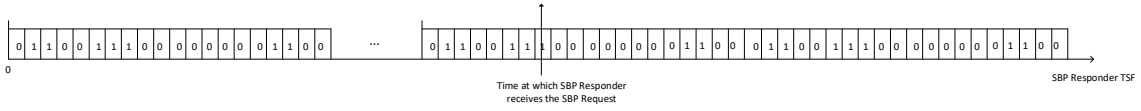

Figure 11-108q—Example of mapping of an SBP initiator's availability bitmap to an SBP responder's TSF

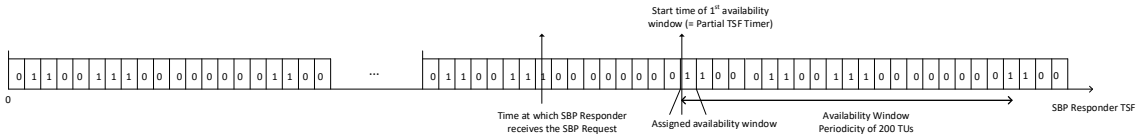

Figure 11-108r—Example of how an SBP responder assigns an Availability Window to an SBP initiator

An SBP responder shall reject a request from an SBP initiator by setting the Status Code field in the SBP Response frame to REQUEST_DECLINED or REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS if the SBP responder cannot assign the SBP initiator to a sensing availability window that overlaps with a 10 TUs interval in which the SBP initiator is available (as signaled by the ISTA Availability Window element in the SBP Request frame).

If the SBP responder rejects a request from an SBP initiator by setting the Status Code field in the SBP Response frame to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, the SBP responder may include an RSTA Availability Window element in the SBP Response frame. The RSTA Availability Information field in the RSTA Availability Window element shall contain one or more Availability Window Information fields. Each Availability Window Information field represents a sensing availability window that the SBP responder may assign to that SBP initiator if requested by the SBP initiator. The Availability Window Broadcast Format field of the Header field in the RSTA Availability Information field of the RSTA Availability Window element shall be set to 0.

If the Report Timestamp field within the received SBP Request frame is equal to 1, and if the Status Code field within the corresponding SBP Response frame is set to SUCCESS,

— If the SBP responder is the sensing transmitter, the SBP responder shall set the Report Timestamp field within the Sensing Measurement Request frame sent to the sensing responder(s) acting as the sensing receiver(s) to 1 to initiate a sensing procedure used to satisfy an SBP request.
— If the SBP responder is the sensing receiver, the SBP responder shall include the Reference Timestamp field in the Sensing Measurement Report Control field and indicate its presence by setting the Timestamp Present field in the Presence and Control Bitmap field to 1.

11.55.2.3 Reporting

Upon receipt of an MLME-SBPREPORT.request primitive, the SBP responder shall initiate the SBP reporting procedure by transmitting a Sensing Measurement Report frame to the SBP initiator indicated by the PeerSTAAddress parameter.

The SBP initiator shall be present in the sensing availability window assigned by the SBP responder if it intends to receive Sensing Measurement Report frames from the SBP responder obtained as a result of TB sensing measurement exchanges in the corresponding sensing availability window.

The SBP reporting procedure may commence a SIFS after the last phase of a TB sensing measurement exchange corresponding to the sensing measurement session initiated by the SBP responder, if the transmission of at least one Sensing Measurement Report frame does not exceed the acquired TXOP. If a longer transmission time is needed, then the approach of the SBP reporting allows the scheduling of one or more channel accesses within the assigned sensing availability window to complete the transmission. If the acquired TXOP consists of more than one TB sensing measurement exchange corresponding to the sensing measurement session initiated by the SBP responder, the SBP reporting procedure may commence a SIFS after the last phase of the last TB sensing measurement exchange in the TXOP corresponding to the sensing

measurement session initiated by the SBP responder. If the assigned sensing availability window consists of more than one TXOP, then the approach of the SBP reporting allows the scheduling of one or more channel accesses within the assigned sensing availability window to complete the transmission.

In the SBP reporting procedure, the SBP responder may transmit sequentially (i.e., a SIFS separated) multiple Sensing Measurement Report frames to the SBP initiator. A Sensing Measurement Report frame may include one or more Sensing Measurement Report Container fields to convey to the SBP initiator the sensing measurement reports of the corresponding sensing measurement exchange, each of the Sensing Measurement Report Container fields contains either a sensing measurement report generated by a sensing receiver corresponding to the sensing measurement exchange, or a segment of the measurement report generated by a sensing receiver corresponding to the sensing measurement exchange.

In the SBP reporting procedure, the SBP responder may transmit sequentially (i.e., a SIFS separated) one or more A-MPDUs, each carrying multiple Sensing Measurement Report frames.

11.55.2.4 Termination

An SBP procedure may be terminated by the SBP initiator by transmitting an SBP Termination frame at any time. An SBP procedure may be terminated by the SBP Responder by transmitting an SBP Termination frame at any time, if the SBP initiator is associated with the SBP responder. If the SBP responder intends to terminate an SBP procedure with an SBP initiator that is not associated with, the SBP responder should transmit an SBP Termination frame during the sensing availability window in which the SBP initiator is present.

If the SBP responder transmits an SBP Termination frame or receives an SBP Termination frame from the SBP initiator, or after the expiry of the SBP procedure expiry timer, the SBP responder should terminate corresponding sensing measurement session(s) with all the sensing responders, except for the SBP initiator if the SBP initiator is also a sensing responder, identified by the Measurement Session ID(s) associated with the sensing procedure(s) triggered by the terminated SBP procedure(s).

NOTE 1—If the SBP initiator is also a sensing responder for the sensing procedure used by the SBP responder to satisfy the SBP request, the termination of the SBP procedure automatically indicates the termination of the corresponding sensing measurement session between the SBP initiator (sensing responder of the sensing measurement session) and the SBP responder (sensing initiator of the sensing measurement session) for the sensing procedure used by the SBP responder to satisfy the SBP request.

If the SBP responder intends to terminate an SBP procedure due to unsuccessful or terminated sensing measurement sessions with the sensing responders, and if either the Mandatory Number Of Responders field or the Mandatory Preferred Responder field in the SBP Request frame that requested this SBP procedure is equal to 1, the SBP responder may set the SBP Error Status field to 1 and include the SBP Parameters element in the SBP Termination frame.

If any of the BSS parameters has changed since the SBP procedure was established with an unassociated STA acting as an SBP initiator (e.g., TPE and/or disabled subchannel bitmap) the SBP responder (i.e., AP) shall send SBP Termination frame to explicitly terminate the SBP procedure and correspondingly shall send Sensing Measurement Termination frame(s) to all sensing responders involved in this SBP procedure to explicitly terminate the sensing measurement session(s) (see 11.55.1.6). The unassociated STA acting as an SBP initiator shall not reestablish a new SBP procedure prior to receiving a beacon frame from that SBP responder (i.e., AP).

NOTE 2—In case the SBP initiator is also a sensing responder for this SBP setup then the SBP responder can transmit either a SBP Termination frame during the sensing availability window or a Sensing Measurement Termination frame outside of the sensing availability window, whichever occurs first.

If the SBP responder of an SBP request that has resulted in a received SBP Response frame with the Status Code field equal to SUCCESS is not able to satisfy required parameters specified in the corresponding SBP Request frame after the SBP Response frame was sent, it shall issue an MLME-SBPTERMINATION.request primitive that resulted in the transmission of an SBP Termination frame to the SBP initiator. The Measurement Session ID Indication field within the Sensing Measurement Termination frame sent by the SBP responder shall be identical to the Measurement Session ID Indication field within the corresponding SBP Response frame.

11.55.3 DMG sensing procedure

11.55.3.1 Overview

The DMG sensing types include monostatic sensing, bistatic sensing, multistatic sensing, coordinated monostatic sensing, coordinated bistatic sensing, and passive sensing.

In monostatic sensing, the sensing transmitter and the sensing receiver are the same STA.

In bistatic sensing, the sensing transmitter and the sensing receiver are two distinct STAs.

In multistatic sensing, the sensing transmitter and more than one sensing receivers are distinct STAs. For example, one sensing transmitter and two sensing receivers.

In passive sensing, the STA receives PPDUs transmitted by one or more STAs that are not necessarily intended for DMG sensing (such as DMG Beacon frames).

Coordinated monostatic sensing is an extension of monostatic sensing, by coordinating several monostatic sensing responders. In coordinated monostatic sensing, the transmissions by one or more devices that perform monostatic sensing are coordinated by a DMG AP or DMG PCP.

Coordinated bistatic sensing is an extension of bistatic sensing, by coordinating multiple sensing responders by one sensing initiator.

The DMG sensing procedure defines sensing operations between a single sensing initiator and one or more sensing responders. It comprises one or more of the following: DMG sensing capabilities exchange (11.55.3.3), DMG sensing measurement session (11.55.3.4), DMG sensing burst (11.55.3.5), DMG sensing measurement exchange (11.55.3.6), and DMG sensing measurement termination (11.55.3.8).

A DMG sensing procedure may be composed of multiple DMG sensing bursts that may be composed of multiple DMG sensing measurement exchanges.

NOTE—Measurements over a certain time period are required to compute the Doppler frequency shift. The occupancy time per channel access cannot exceed the TXOP limit. If a longer measurement time is needed, then the approach of the DMG sensing burst allows scheduling of the multiple channel accesses to collect measurements for the Doppler frequency shift computation.

A sensing responder may participate in several DMG sensing measurement sessions containing multiple and possibly overlapping DMG sensing bursts.

A sensing initiator may initiate several DMG sensing measurements containing multiple DMG sensing bursts with multiple and possibly overlapping sets of sensing responders.

A sensing initiator may instruct the sensing responder in the sensing receiver role or in the sensing receiver and sensing transmitter role to report at the DMG sensing measurement exchange, and/or it may instruct the sensing responder to accumulate the results and report once per DMG sensing burst.

Figure 11-108s illustrates a DMG sensing procedure with an AP performing DMG sensing measurements with three non-AP STAs, which are identified by their MAC addresses A, B, and C. The example starts with a DMG sensing capabilities exchange performed between the AP and STAs A, B, and C that establishes a sensing session identified by AID 1, AID 2, and AID 3, respectively.

DMG sensing measurement sessions are then performed, defining sets of operational parameters. The AP establishes with STA A and STA B a set of operational parameters that is assigned a DMG Measurement Session ID equal to 1, and it establishes with STA A and STA C another set that is assigned a DMG Measurement Session ID equal to 2. Operational parameters identified with the same DMG Measurement Session ID may be different among the involved STAs, except the intraburst and interburst intervals. These intervals (interburst and intraburst) for both STAs are equal as per the equal DMG Measurement Session ID.

After establishing the DMG sensing measurement session, DMG sensing measurement exchanges are performed. DMG sensing measurement exchanges are grouped into DMG sensing bursts. Each DMG sensing burst is identified by a Measurement Burst ID that is unique per DMG Measurement Session ID. Figure 11-108s presents two bursts (with Measurement Burst ID equal to 1 and Measurement Burst ID equal to 2) of the DMG Measurement Session ID equal to 1, and two bursts (with Measurement Burst ID equal to 1 and Measurement Burst ID equal to 2) of the DMG Measurement Session ID equal to 2.

Two DMG sensing bursts belonging to the DMG Measurement Session ID equal to 1 are performed with the intraburst interval equal to T1 and the interburst interval equal to T2. Another two DMG sensing bursts belonging to the DMG Measurement Session ID equal to 2 are performed with different burst parameters—an intraburst interval equal to T3 and an interburst interval equal to T4.

The Sensing Exchange SN uniquely identifies the DMG sensing measurement exchange per the Measurement Burst ID. There are 3 DMG sensing measurement exchanges in each burst, which have Sensing Exchange SNs equal to 1, 2, and 3.

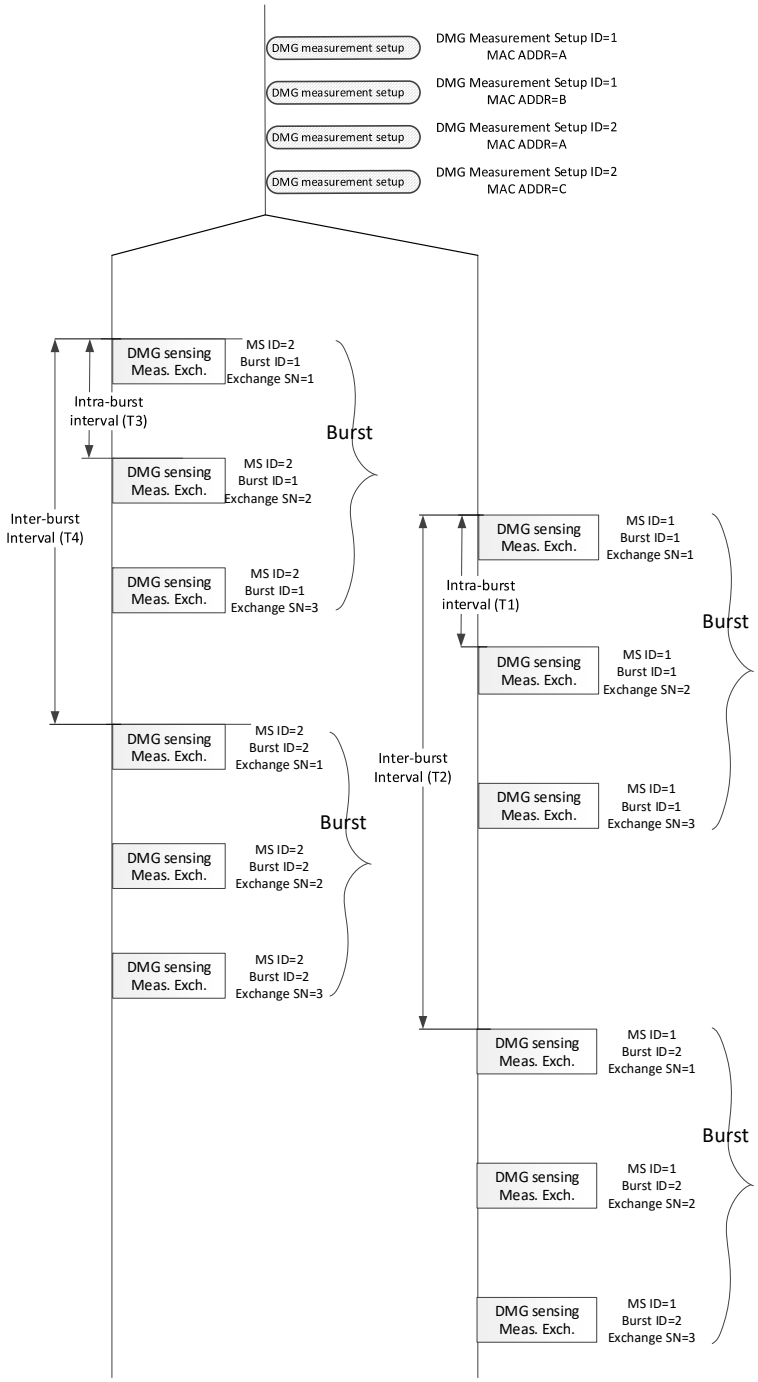

Figure 11-108s—DMG sensing procedure with three sensing responders

11.55.3.2 Dependencies and timing related parameters

Implementation of DMG sensing is optional for a DMG STA.

A DMG STA in which dot11DMGSensingMsmtImplemented is:

— False, shall set the Sensing support field of the Short DMG Sensing Capabilities field in the DMG Sensing Short Capabilities element to 0 (9.4.2.336).

— True, is defined as a STA that supports DMG sensing. The STA:

1) Shall set the Sensing support field of the Short DMG Sensing Capabilities field in the DMG Sensing Short Capabilities element to 1 (9.4.2.336).
2) Should use the timing related parameters defined in Table 11-33c.

Table 11-33c—DMG sensing procedure timing related parameters

Parameter	Value	Description
aDMGSensingProcedureExpiry	10 s	The time limit for which a DMG sensing measurement session remains active if no frames are exchanged between its sensing initiator and sensing responder.

11.55.3.3 DMG sensing capabilities exchange

DMG sensing capabilities include the types of DMG sensing and the roles the STA may assume for each of the supported DMG sensing types. The DMG Sensing Short Capabilities element (see 9.4.2.336) and the DMG Sensing Capabilities element (see 9.4.2.334) contain the sensing capabilities of a DMG STA.

A sensing capable DMG AP or DMG PCP shall convey the DMG Sensing Short Capabilities element in the DMG Beacon and Announce frames. A sensing capable DMG STA shall include the DMG Sensing Capabilities element (see 9.4.2.334) in probe and association frames.

DMG Sensing Beam Descriptor element (see 9.4.2.335) includes a set of descriptors of the beam patterns of a DMG STA. A sensing capable DMG AP or DMG PCP shall include the DMG Sensing Beam Descriptor element in at least one of DMG Beacon, Announce, Probe Response, and (Re)Association Response frames. A sensing capable DMG STA shall include the DMG Sensing Beam Descriptor element in at least one of Probe Request and (Re)Association Request frames.

A DMG sensing session is established when a DMG STA and a DMG AP or DMG PCP have completed an association.

The DMG AP or DMG PCP may set up the DMG sensing measurement with a non-AP and non-PCP DMG STA capable of one of the DMG sensing types.

The DMG AP or DMG PCP shall not initiate the DMG sensing measurement session with a non-AP and non-PCP DMG STA if the DMG STA is not capable of at least one of the DMG sensing types.

To coordinate more than one sensing responder, the sensing initiator of a DMG sensing procedure shall be a DMG AP or DMG PCP.

The sensing initiator may be capable to take the roles of sensing transmitter, sensing receiver, both sensing transmitter and sensing receiver, or none of them.

A sensing responder may be capable of one or more of the following roles: Sensing receiver, sensing transmitter, and both sensing transmitter and sensing receiver.

A sensing initiator of the DMG sensing types:

— Monostatic or coordinated monostatic shall be capable to take the roles of both sensing transmitter and sensing receiver, or neither of them.
— Bistatic or coordinated bistatic shall be capable of the sensing transmitter role, the sensing receiver role, or both of them.
— Multistatic shall be capable of the sensing transmitter role.

A sensing responder of the DMG sensing types:

— Monostatic or coordinated monostatic shall be capable to take the roles of both sensing transmitter and sensing receiver.
— Bistatic or coordinated bistatic shall be capable of the sensing transmitter role, the sensing receiver role, or both of them.
— Multistatic shall be capable of the sensing receiver role.

The Beam Azimuth, Beam Elevation, Azimuth Beamwidth, and Elevation Beamwidth fields within the Beam Descriptor field shall be reported in earth coordinates if the Earth Coordinates field within the Short DMG Sensing Capabilities field is equal to 1, and in an arbitrary STA's coordinate system if the Earth Coordinates field is equal to 0.

11.55.3.4 DMG sensing measurement session

The DMG sensing measurement session is a procedure that allows a sensing initiator and a sensing responder to exchange and agree on operational parameters associated with DMG sensing bursts and DMG sensing measurement exchanges. Operational parameters may include intraburst and interburst schedule, number of DMG sensing measurement exchanges per burst, roles of sensing initiator and sensing responder, DMG sensing type, DMG sensing measurement report types, and other parameters. Operational parameters agreed between the sensing initiator and the sensing responder are assigned a DMG Measurement Session ID.

The sensing initiator and sensing responder may:

— Perform DMG beamforming training before the DMG sensing measurement session procedure.
— Perform an FTM procedure (see 11.21.6) to obtain the distance between them and their relative orientation prior to DMG sensing measurement session.

To establish a DMG sensing measurement session, the SME of a sensing initiator shall issue an MLME-DMG-SENSMSMTSESSION.request primitive that results in the transmission of a DMG Sensing Measurement Request frame to the sensing responder. The DMG Sensing Measurement Request frame shall contain a DMG Sensing Measurement Session element.

The sensing initiator shall set the:

— DMG Measurement Session ID field within the DMG Measurement Session ID Indication field of the DMG Sensing Measurement Request frame to a unique value identifying the measurement.
— Report Type field to the type of report to be used in the measurement if feedback is provided (see Table 9-417ad).

In the DMG Sensing Measurement Session element, the sensing initiator shall set the Sensing Type field to the sensing type to be used in the measurement. The sensing initiator shall not request a sensing type that the sensing responder has not indicated it is capable of, in the DMG Sensing Capabilities element (see 9.4.2.334). For a sensing type of bistatic, the RX Initiator field is set to 1 to indicate that the sensing initiator is the sensing receiver in the bistatic measurements. It is set to 0 if the sensing initiator is the sensing transmitter in the bistatic measurements.

If the sensing initiator has set the Report Type field to either DMG Sensing Image Range-Doppler, DMG Sensing Image Doppler-Direction, DMG Sensing Image Range-Doppler Direction or Target, the sensing initiator may set the Multiple Golay field to 1 to request measurement with different Golay sequences per each DMG sensing measurement exchange.

With the polarization information contained in the Beam Descriptor field of DMG Sensing Beam Descriptor element (see 9.4.2.335), the sensing initiator could request polarization sensing by setting the beam indices in the TX Beam List subelement and RX Beam List subelement to obtain the co-polarization (e.g., horizontally polarized-horizontally polarized and vertically polarized-vertically polarized when linear polarization is adopted) and cross-polarization (e.g., horizontally polarized-vertically polarized and vertically polarized-horizontally polarized when linear polarization is adopted) sensing results for the DMG sensing types—bistatic, coordinated bistatic, and multistatic. If the DMG sensing type is equal to coordinated monostatic, only the TX Beam List subelement is present in the DMG Sensing Measurement Session element (see 9.4.2.337). A sensing initiator could realize the polarization sensing, by setting the Polarization Sensing field in the Measurement Session Control field of the DMG Sensing Measurement Session element to 1, to indicate polarization sensing by the sensing responder(s) for all the beams indicated in the TX Beam List subelement.

During the measurement, the sensing initiator shall set the beam list in the following:

— TX Beam List subelement to the list of beams that are used by the sensing transmitter.

— RX Beam List subelement to the list of beams that are used by the sensing receiver.

Each beam index in the TX Beam List and RX Beam List subelements is an index of the beam descriptors the sensing transmitter and sensing receiver published in their DMG Sensing Beam Description elements for transmit and receive, respectively. If the Sensing Type field within the DMG Sensing Measurement Session element is equal to Coordinated Monostatic, the RX Beam List subelement is not present.

For coordinated monostatic sensing:

— If the sounding phase happens in parallel, the sensing initiator should assign the transmit beams to different sensing responders (e.g., to avoid interference across multiple sensing responders) by setting the TX Beam List subelement in the DMG Sensing Measurement Session element in the DMG Sensing Measurement Request frame.

— Any PPDU shall be constructed according to non-EDMG or EDMG PHY specifications. Sensing with a TRN field in a PPDU is an optional mode for the coordinated monostatic sensing.

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

The Azimuth and Elevation fields in the Peer Orientation field within the DMG Sensing Measurement Session element shall be reported in earth coordinates, if the Earth Coordinates field in the Short DMG Sensing Capabilities field sent by the sensing initiator is equal to 1, and in an arbitrary sensing initiator's coordinate system, if the Earth Coordinates field is equal to 0.

The sensing initiator may include a DMG Sensing Scheduling subelement in the Optional Subelements field within the DMG Sensing Measurement Request frame. If the SP field is equal to 0 in the Measurement Session Control field (Figure 9-1074cf), the DMG Sensing Scheduling subelement contains the scheduling of the measurement as proposed by the sensing initiator. The sensing initiator shall set the:

— Start Of Burst field to the time of the start of the burst in the unit of microseconds.

— Intraburst Interval field to the time between the start of successive DMG sensing measurement exchanges in a burst.

— Interburst Interval field to the time between the start of successive bursts.

— Number TX Beams Per Exchange field to the number of TX AWV patterns to be used in each DMG sensing measurement exchange.

— Repeat Per Exchange field to the number of times the sensing transmitter goes through the Number TX Beams Per Exchange within the DMG sensing measurement exchange (see 11.55.3.6.3).

If the SP field is equal to 1 in the Measurement Session Control field (Figure 9-1074cf), the DMG Sensing Scheduling subelement and the Extended Schedule element (9.4.2.130) contain the scheduling of the measurement as proposed by the sensing initiator. The AllocationType field in the Allocation field of the Extended Schedule element (Figure 9-639) shall be set to SP for DMG sensing. The Source AID field in the Allocation field of the Extended Schedule element shall be set to 0, indicating a DMG AP or DMG PCP as the sensing initiator. The Destination AID field in the Allocation field of the Extended Schedule element shall be set to the AID of the sensing responder scheduled by the sensing initiator to participate in the DMG sensing measurement exchanges during the airtime allocation.

The sensing initiator shall set the:

— Allocation Start For DMG Sensing field to the time of the start of the burst in the unit of microsecond. Every DMG sensing burst starts at

$$\text{TBTT offset} = \text{Allocation Start For DMG Sensing} - \left\lceil \frac{\text{Allocation Start For DMG Sensing}}{\text{BI}} \right\rceil \times \text{BI}.$$

— Distance Between DMG Sensing Bursts field to the number of beacon intervals between the start of successive bursts.

— Allocation Block Period field to the time measured in the number of beacon intervals between the start of successive DMG sensing measurement exchanges in the burst.

— Number Of Blocks field to the number of DMG sensing measurement exchanges in the burst.

— Allocation Block Duration field equal to the time allocated for a DMG sensing measurement exchange.

— Number TX Beams Per Exchange field to the number of TX AWV patterns to be used in each DMG sensing measurement exchange.

— Repeat Per Exchange field to the number of times the sensing transmitter goes through the Number TX Beams Per Exchange within the DMG sensing measurement exchange (see 11.55.3.6.3).

After receiving a DMG Sensing Measurement Request frame, the MLME of the sensing responder shall validate the frame and issue an MLME-DMG-SENSMSMTSESSION.indication primitive. Upon reception of an MLME-DMG-SENSMSMTSESSION.indication primitive, the SME of the sensing responder shall issue an MLME-DMG-SENSMSMTSESSION.response primitive that results in the transmission of a DMG Sensing Measurement Response frame to the sensing initiator that transmitted the DMG Sensing Measurement Request frame.

The sensing responder shall set the:

— DMG Measurement Session ID field in the DMG Sensing Measurement Response frame to the value set in this field in the DMG Sensing Measurement Request frame sent by the sensing initiator.

— Status Code field in the DMG Sensing Measurement Response frame to:

1) SUCCESS, if it accepts the DMG measurement session request.

2) REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, if it rejects the request but accepts the schedule that is included in the DMG Sensing Scheduling subelement included in the DMG Sensing Measurement Session element.

3) REQUEST_DECLINED if it rejects the request.

The sensing responder shall set the Sensing Type and RX Initiator fields to the same value that was in the DMG Sensing Measurement Session element within the DMG Sensing Measurement Request frame. If present:

— The Peer Orientation field contains the azimuth and elevation of the sensing initiator as measured by sensing responder.

— The LCI field contains the location of the sensing initiator.

The Azimuth and Elevation fields in the Peer Orientation field within the Measurement Session Control field shall be reported in earth coordinates, if the Earth Coordinates field in the Short DMG Sensing Capabilities field sent by the responder, is equal to 1, and in an arbitrary sensing responder coordinate system, if the Earth Coordinates field is equal to 0.

If the sensing initiator has set the Report Type field in the DMG Sensing Measurement Session element equal to the values 3, 5, 6, or 7 (that is, the values indicating Doppler reporting), the sensing responder shall include a Burst Response Delay subelement in the DMG Sensing Measurement Session element with the Burst Response Delay field set to the time in milliseconds it needs to calculate the response to the DMG sensing burst defined in the sensing initiator's DMG Sensing Measurement Session element.

If the sensing responder indicated REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, the DMG Sensing Scheduling subelement indicates the proposed schedule from the sensing responder.

Upon reception of a DMG Sensing Measurement Response frame with the Status Code equal to REQUEST_DECLINED, the sensing initiator should not transmit a new DMG Sensing Measurement Request frame within the time indicated in the Decline Duration field.

Upon reception of a DMG Sensing Measurement Response frame, the MLME of the sensing initiator shall validate the frame and issue an MLME-DMG-SENSMSMTSESSION.confirm primitive.

The sensing initiator requests a DMG sensing measurement session separately with each sensing responder. Operational parameters established upon session negotiation are identified by the DMG Measurement Session ID. The same DMG Measurement Session ID may be asserted to the agreement with different sensing responders if the sensing initiator schedules to address the sensing responders in the same DMG sensing measurement exchanges.

11.55.3.5 DMG sensing burst

A DMG sensing burst is a set of scheduled DMG sensing measurement exchanges so that the overall time that it takes to complete all DMG sensing measurement exchanges within each DMG sensing burst is less than the time difference between the start of consecutive DMG sensing bursts. One or more sensing responders may be scheduled for sensing within a DMG sensing burst.

To enable low velocity Doppler shift measurements, a set of repeated measurements over a long period may be needed. A DMG sensing burst enables such measurement.

The sensing initiator shall:

— Start the DMG sensing measurement exchanges organized in the measurement burst, if an MLME-DMG-SENSMSMTSTART.confirm primitive with the ResultCode equal to SUCCESS is received.

— Assign to each measurement burst a Measurement Burst ID. The Measurement Burst ID shall be unique within the range of the Measurement Burst ID field per a DMG Measurement Session ID (see 9.3.1.26.5).

— Each DMG sensing burst shall be composed of Number Of Exchanges Per Burst DMG sensing measurement exchanges. The beginning of each DMG sensing measurement exchange shall be separated from the beginning of the previous DMG sensing measurement exchange by an Intraburst Interval time.
— Address each sensing responder associated with the DMG Measurement Session ID at each DMG sensing measurement exchange of the burst. The sensing initiator shall access the medium to transmit a DMG Sensing Request frame or a BRP frame to each sensing responder at each DMG sensing measurement exchange in a burst. For each sensing responder, the time of the first access in a DMG sensing measurement exchange shall be separated by an Intraburst Interval time from the first access in the previous DMG sensing measurement exchange.
— Each DMG sensing measurement exchange in a burst is assigned a Sensing Exchange SN. The Sensing Exchange SN shall be unique per a Measurement Burst ID. The Sensing Exchange SN in a measurement burst shall increment sequentially. The first DMG sensing measurement exchange of the measurement burst shall have Sensing Exchange SN equal to 1.

The DMG Sensing Request frames sent to the different sensing responders in a DMG sensing measurement exchange shall be indicated with the same Measurement Burst ID, DMG Measurement Session ID, and Sensing Exchange SN.

If the value of the Report Type field in the DMG Measurement Session element (9.4.2.337) that is associated with the burst is equal to 3, 5, 6, or 7 (report types containing Doppler measurements) the sensing initiator shall follow the following rules:

— The DMG sensing measurement exchanges included in the measurement should not contain a reporting phase except for the first or last DMG sensing measurement exchange in a burst. The DMG sensing measurement exchange containing the reporting phase may require separate medium access. The value in the Number Of Exchanges Per Burst does not include the DMG sensing measurement exchange intended for the reporting.
— The values of the following fields in the DMG Sensing Request frame transmitted to the same sensing responder shall be the same among all DMG sensing exchanges belonging to the same Measurement Burst ID:
  — Sensing Type
  — First Beam Index
  — Num Of PPDUs In Exchange
  — RX TRN-Units Per Each TX TRN-Unit
  — EDMG TRN-Unit P
  — EDMG TRN-Unit N
  — TRN field Sequence Length
  — BW
  — Num Of Absent Exchanges

The number of STAs in a DMG sensing measurement exchange may vary among the DMG sensing exchanges belonging to the same Measurement Burst ID. In this case, STA ID, EDMG TRN Length and EDMG TRN-Unit M in different DMG sensing exchanges shall vary accordingly.

At the successful transmission of the DMG Sensing Measurement Response frame, the sensing responder that is part of the DMG measurement session of the burst shall be available at the medium on the DMG sensing measurement exchanges at the time scheduled by the sensing initiator (see 11.55.3.4).

During a DMG sensing burst, the sensing transmitter and the sensing responder shall follow the rules of the DMG sensing measurement exchanges of different DMG sensing types defined in the subclauses 11.55.3.6.2, 11.55.3.6.3, 11.55.3.6.4, and 11.55.3.6.5.

Figure 11-108t illustrates a DMG sensing burst when an AP performs a DMG sensing procedure with two non-AP STAs, which are identified by their MAC addresses A and B. The example starts with the establishment of a DMG sensing session between the AP and STAs A and B that is identified by AID 1 and AID 2, respectively.

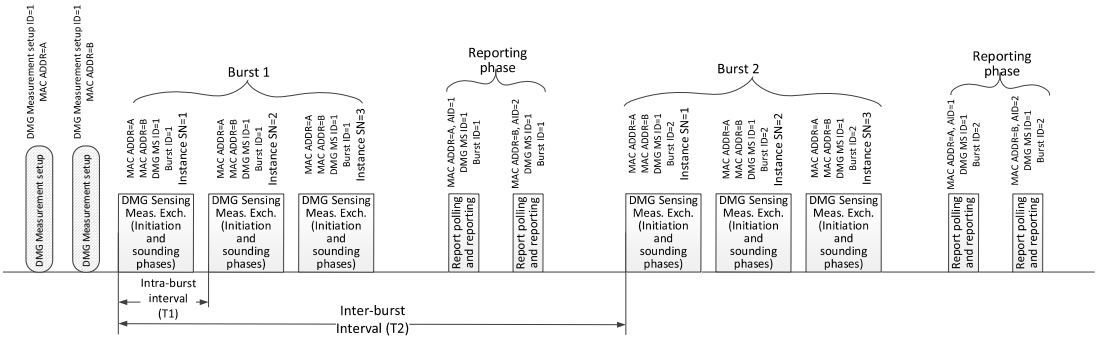

Figure 11-108t—Example of a DMG sensing burst

DMG sensing measurement session procedures are then performed, defining sets of operational parameters. The AP establishes a set, with STA A and STA B, that is assigned a DMG Measurement Session ID set to 1. Operational parameters identified with the same DMG Measurement Session ID may be different among the involved STAs, besides the intraburst and interburst intervals. The intervals (interburst and intraburst) for both STAs are equal as per the equal DMG Measurement Session ID.

After the DMG measurement session is established, DMG sensing measurement exchanges are performed. DMG sensing measurement exchanges are grouped in DMG sensing bursts. Each DMG sensing burst is identified by the Measurement Burst ID. It is unique per DMG Measurement Session ID. The figure presents two bursts (with Measurement Burst ID equal to 1, and Measurement Burst ID equal to 2 with a DMG Measurement Session ID equal to 1). Two DMG sensing bursts are performed with the intraburst interval equal to T1 and the interburst interval equal to T2.

The Sensing Exchange SNs uniquely identify the DMG sensing measurement exchange per the Measurement Burst ID. There are 3 DMG sensing measurement exchanges in each burst, which have Sensing Exchange SNs equal to 1, 2, and 3. The DMG sensing measurement exchanges include the initiation and sounding phases and do not include the reporting phase. DMG sensing results are aggregated and reported for each burst.

The report phase is delayed by the time it takes for the sensing responder to calculate the reported result. During the reporting phase, the AP separately polls the sensing responder and obtains the report. Each DMG sensing report is identified with the sensing responder's MAC Address and AID with the DMG Measurement Session ID and Measurement Burst ID.

The sensing initiator and sensing responder may perform an FTM procedure (see 11.21.6.4) to obtain the distance and relative orientation between the STAs for each DMG sensing burst.

11.55.3.6 DMG sensing measurement exchange

11.55.3.6.1 General

The SME of the sensing initiator shall initiate a DMG sensing measurement exchange by issuing an MLME-DMG-SENSMSMTSTART.request that shall include a list of peer STA addresses and parameters of the DMG Sensing Request frame for each of the STAs.

A DMG sensing measurement exchange:

— Is limited to one TXOP or SP. The SP shall be used if the SP field is equal to 1 in the Measurement Session Control field of the DMG Sensing Measurement Session element (9.4.2.337). Otherwise, the SP shall not be used.

— Belongs to one DMG Measurement Session ID.

— Includes the following phases: Initiation phase, sounding phase, and reporting phase. The sounding phase is mandatory; the initiation and reporting phases are optional.

— Is identified with the Sensing Exchange SN. The Sensing Exchange SN shall be sequential in increasing order. The Sensing Exchange SN shall be unique in range.

— May belong to a DMG sensing burst. The Sensing Exchange SN shall be unique per the Measurement Burst ID.

DMG sensing measurement exchanges of the DMG sensing types:

— Monostatic and bistatic may contain an initiation phase.

— Coordinated monostatic, coordinated bistatic, and multistatic shall contain an initiation phase.

The reporting phase is mandatory if the sensing responder is either in the sensing receiver role, or in the sensing transmitter and sensing receiver role.

The sensing initiator may update the transmit beams assigned to the sensing responder in DMG Sensing Measurement Request frame by setting the Updated TX Beam List field in the TDD Beamforming Information field in the DMG Sensing Request frame.

11.55.3.6.2 Coordinated monostatic DMG sensing measurement exchange

11.55.3.6.2.1 General

A coordinated monostatic DMG sensing measurement exchange is a DMG sensing measurement exchange of a DMG sensing procedure of sensing type coordinated monostatic. It can be performed in two modes: sequential and parallel. It includes an initiation phase, a sounding phase, and may include a reporting phase.

A coordinated monostatic DMG sensing measurement exchange is initiated by the sensing initiator with the transmission of a DMG Sensing Request frame(s) and the reception of DMG Sensing Response frame(s) from the sensing responders. It is then followed by the sounding phase in which DMG monostatic sensing PPDUs are transmitted and received by the sensing responder(s).

The measurement covers the number of transmit AWVs indicated by the Number TX Beams Per Exchange field within the DMG Sensing Scheduling subelement of the DMG Sensing Measurement Session element (see 9.4.2.337).

The sensing initiator shall determine the parameters of the DMG monostatic sensing PPDUs transmitted and received by the sensing responders in a way that is compatible with the sensing responders' capabilities and covers all the desired transmit beams indicated in TX Beam List subelement (see Figure 9-1074cj). The first beam used by the sensing responders to transmit and receive DMG monostatic sensing PPDUs in a DMG sensing measurement exchange is indicated by the First Beam Index field. The sensing responders shall cycle through the Number TX Beams Per Exchange beams to transmit and receive the DMG monostatic sensing PPDUs. If the Repeat Per Exchange field of the DMG Sensing Scheduling subelement (N_{RI}) is greater than 1, the sensing responder shall repeat the Number TX Beams Per Exchange Beams in each DMG sensing measurement exchange N_{RI} times.

If the Polarization Sensing field within the Measurement Session Control field in the DMG Sensing Measurement Session element is equal to 1, sensing responders shall transmit and receive DMG monostatic sensing PPDUs with different transmitting/receiving polarization combinations to receive co-polarization and cross-polarization sensing results for all the beams indicated in the TX Beam List subelement.

All the DMG monostatic sensing PPDUs transmitted and received by the sensing responders shall be separated by SBIFS. If a report is configured in the DMG sensing measurement exchange, the sensing responders shall report no longer than SIFS after their last DMG monostatic sensing PPDU or after the polling by the sensing initiator. The report may be based on Channel Measurement Feedback elements or DMG Sensing Report elements. The presence and type of the report is indicated by the Report Control field of the DMG Sensing Report Control element.

The number of sensing responders in each coordinated monostatic DMG sensing measurement exchange of the same DMG Measurement Session ID may be different.

11.55.3.6.2.2 Sequential coordinated monostatic DMG sensing measurement exchange

In a sequential coordinated monostatic DMG sensing measurement exchange, the following rules apply:

- The sensing initiator shall interact with each intended sensing responder one by one in order of the STA ID field of the DMG Sensing Request frame.
- For each sensing responder, the sequential coordinated monostatic DMG sensing measurement exchange shall include an initiation phase, a sounding phase, and a reporting phase.
  - In the initiation phase, the sensing initiator shall send a DMG Sensing Request frame to a sensing responder to request it to participate in the coordinated monostatic DMG sensing measurement exchange. The Monostatic Sounding Mode field within the TDD Beamforming Information field in the DMG Sensing Request frame shall be set to 1 to identify the sequential mode. The sensing responder shall not respond with the DMG Sensing Response frame to the sensing initiator later than a SIFS after the request.
  - In the sounding phase, the sensing responder shall transmit the first DMG monostatic sensing PPDU no later than a SIFS after the DMG Sensing Response frame. DMG monostatic sensing PPDUs transmitted by the same sensing responder shall be separated by a SBIFS. If the Sensing Exchange SN field of the TDD Beamforming Information field in the DMG Sensing Request frame is equal to 1, the DMG monostatic sensing PPDUs shall cover the number of transmitting AWV indicated by the Num Of TX Beams In Exchange field and the times of repetition indicated by the Repeat Per Exchange field in the DMG Sensing Scheduling subelement within the DMG Sensing Measurement Session element. The duration of the transmission of the DMG monostatic sensing PPDUs including the SBIFS shall be equal to the Sounding Duration field of the DMG Sensing Measurement Exchange Duration element delivered by the sensing responder within the DMG Sensing Measurement Response frame. If the Sensing Exchange SN field of the TDD Beamforming Information field within the DMG Sensing Request frame is equal to i ($i > 1$), the DMG monostatic sensing PPDUs shall cover the number of transmitting AWV indicated by the Num Of TX Beams In Exchange field and the times of repetition indicated by the Num Of Repeat In Exchange field in the TDD Beamforming Information field within the DMG Sensing Request frame with Sensing Exchange SN field is equal to $i - 1$. The duration of the transmission of the DMG monostatic sensing PPDUs including the SBIFS shall be equal to the Sounding Duration field of the DMG Sensing Response frame of the DMG Sensing Measurement Exchange with the Sensing Exchange SN field set to $i - 1$.
  - In the reporting phase, if the report is needed (see 9.4.2.337), the sensing responder shall send a DMG Sensing Measurement Report frame to the sensing initiator no later than a SIFS after the last DMG monostatic sensing PPDU. If the Sensing Exchange SN field of the TDD Beamforming Information field in the DMG Sensing Request frame is equal to 1, the duration of

the transmission of the DMG Sensing Measurement Report frame shall be equal to the Report Duration field of the DMG Sensing Measurement Exchange Duration element delivered by the sensing responder in the DMG Sensing Measurement Response frame. If the Sensing Exchange SN field of the TDD Beamforming Information field in the DMG Sensing Request frame is equal to i ($i > 1$), the duration of the transmission of the DMG Sensing Measurement Report frame shall be set to the Report Duration field of the DMG Sensing Response frame of the DMG sensing measurement exchange, when the Sensing Exchange SN field is equal to $i - 1$.

— The sensing initiator shall interact with the next sensing responder no later than a SIFS after the DMG Sensing Measurement Report frame of the current sensing responder.

The value of the Duration field of the first DMG Sensing Request frame in DMG sensing measurement exchange i shall be calculated by Equation (11-8a).

$$\text{Duration}^{(i)} = (N^{(i)} - 1) \times T_{REQ} + N^{(i)} \times T_{RSP} + (4N^{(i)} - 1) \times \text{SIFS} + \sum_{}^{N^{(i)}} (\text{Sounding Duration}_n^{(i-1)} + \text{Report Duration}_n^{(i-1)}) \quad \text{(11-8a)}$$

where

$N^{(i)}$ is the value of the Num Of STAs In Exchange field within the DMG Sensing Request frame in DMG sensing measurement exchange *i,*

T_{REQ} is the TXTIME of a DMG Sensing Request frame,

T_{RSP} is the TXTIME of a DMG Sensing Response frame,

$\text{Sounding Duration}_n^{(i-1)}$ is the value of the Sounding Duration field of the DMG Sensing Response frame delivered by the sensing responder n in DMG sensing measurement exchange $i - 1$ ($i > 1$). $\text{Sounding Duration}_n^{(0)}$ is the value of the first Sounding Duration field of the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frame delivered by sensing responder n, and

$\text{Report Duration}_n^{(i-1)}$ is the value of the Report Duration field of the DMG Sensing Response frame delivered by the sensing responder n in DMG sensing measurement exchange $i - 1$ ($i > 1$). $\text{Report Duration}_n^{(0)}$ is the value of the first Report Duration field of the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frame delivered by the sensing responder n.

The value of the Duration field of other frames in DMG sensing measurement exchange i shall be calculated as the subtraction of the duration of the frame and previous interframe space from the preceded value.

Figure 11-108u gives an example of two sequential coordinated monostatic DMG sensing measurement exchanges. The DMG AP or DMG PCP is the sensing initiator and the two non-AP STAs (STA A and STA B) are sensing responders. The SP is not used and the measurement results need to be reported. In the DMG sensing measurement session phase, STA A and STA B delivered the Sounding Duration 0a, Report Duration 0a, Sounding Duration 0b, and Report Duration 0b of the first DMG sensing measurement exchange to the sensing initiator by the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frame. In this example, the sensing initiator first interacts with STA A (STA ID equal to 0) and then with STA B (STA ID equal to 1) in each DMG sensing measurement exchange.

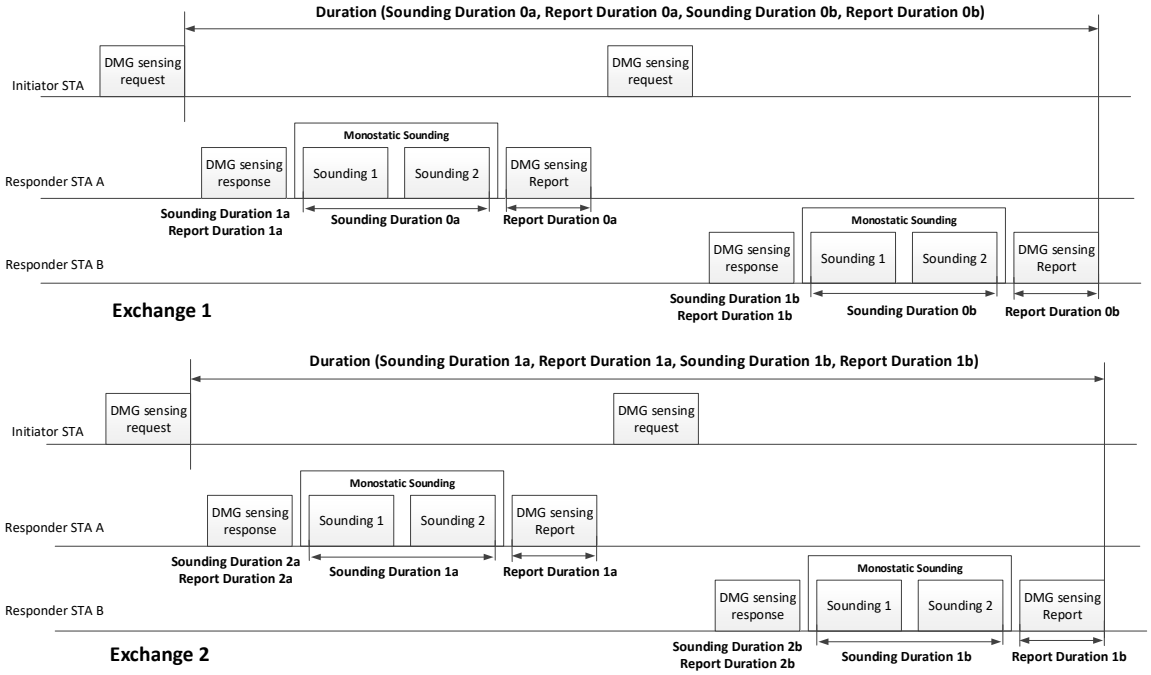

Figure 11-108u—Coordinated monostatic DMG sensing measurement exchanges, sequential sounding mode

In Exchange 1, in the initiation phase of STA A, the sensing initiator sends a DMG Sensing Request frame to STA A and receives a DMG Sensing Response frame from STA A. The DMG Sensing Request frame activates STA A to be ready to participate in the sounding and reporting phases. The DMG Sensing Response frame indicates to the sensing initiator the readiness of STA A and the Sounding Duration 1a and the Report Duration 1a of Exchange 2.

In the first DMG Sensing Request frame, the Monostatic Sounding Mode field is equal to 1 to indicate the sequential mode and the Duration field is set to the value according to Equation (11-8a). The calculation utilizes the Sounding Duration 0a, Report Duration 0a, Sounding Duration 0b, and Report Duration 0b fields delivered in the DMG Sensing Measurement Response frame.

In the following sounding phase of STA A, STA A transmits DMG monostatic sensing PPDUs and receives the reflected signal for sensing measurement. The duration of the transmission of the DMG monostatic sensing PPDUs including the SBIFS is equal to the Sounding Duration 0a. The measurement in the DMG monostatic sensing PPDU covers the number of transmit AWV indicated by the Number TX Beams Per Exchange field and the times of repetition indicated by the Repeat Per Exchange field within the DMG Sensing Scheduling subelement of the DMG Sensing Measurement Session element.

In the following reporting phase of STA A, STA A sends a DMG Sensing Measurement Report frame to the sensing initiator. The duration of the transmission of the DMG Sensing Measurement Report frame is equal to the Report Duration 0a. Then, the sensing initiator proceeds with the initiation phase, sounding phase, and reporting phase with STA B. In the initiation phase of STA B, the sensing initiator sends a DMG Sensing Measurement Request frame to STA B and receives a DMG Sensing Response frame from STA B. The DMG Sensing Response frame transmitted by STA B contains the Sounding Duration 1b and the Report Duration 1b of Exchange 2.

In the following sounding phase of STA B, STA B transmits DMG monostatic sensing PPDUs and receives the reflected signal for sensing measurement. The duration of the transmission of the DMG monostatic sensing PPDUs including the SBIFS is equal to the Sounding Duration 0b. In the following reporting phase of STA B, STA B sends a DMG Sensing Measurement Report frame with the report to the sensing initiator. The duration of the transmission of the DMG Sensing Measurement Report frame is equal to the Report Duration 0b.

In Exchange 2, the Duration field of the first DMG Sensing Request frame is set based on Equation (11-8a), which utilizes the Sounding Duration 1a, Report Duration 1a, Sounding Duration 1b, and Report Duration 1b fields delivered in the DMG Sensing Response frames in Exchange 1. The measurement in DMG monostatic sensing PPDUs covers the number of transmit AWV indicated by the Num Of TX Beams In Exchange field and the times of repetition indicated by the Num Of Repeat In Exchange field in the TDD Beamforming Information field of the DMG Sensing Request frame of the Exchange 1. The duration of the transmission of the DMG monostatic sensing PPDUs of STA A including the SBIFS is equal to the Sounding Duration 1a and the DMG monostatic sensing PPDUs of STA B including the SBIFS is equal to the Sounding Duration 1b. The duration of the transmission of the DMG Sensing Measurement Report frame of STA A is equal to the Report Duration 1a and the DMG Sensing Measurement Report frame of STA B is equal to the Report Duration 1b.

11.55.3.6.2.3 Parallel coordinated monostatic DMG sensing measurement exchange

In a parallel coordinated monostatic DMG sensing measurement exchange, the following rules apply:

— A parallel coordinated monostatic DMG sensing measurement exchange shall include an initiation phase, a sounding phase, and a reporting phase.

— In the initiation phase, the sensing initiator shall send a DMG Sensing Request frame to each intended sensing responder to request them to participate in the coordinated monostatic DMG sensing measurement exchange. The STA ID field of the DMG Sensing Measurement Request frame shall indicate the order of DMG Sensing Request frames and the Monostatic Sounding Mode field shall be set to 0 to identify the parallel sounding mode. Each sensing responder shall respond by sending a DMG Sensing Response frame a SIFS after the request. When the SP field in the DMG Sensing Measurement Request frame is equal to 1, if the sensing initiator does not receive a response within PIFS after a DMG Sensing Request frame, it shall send the next DMG Sensing Request frame, the duration of a DMG Sensing Response frame plus $2 \times \text{SIFS}$, after the DMG Sensing Request frame. When the SP field in the DMG Sensing Measurement Request frame is equal to 0, if the sensing initiator does not receive a response within PIFS after a DMG Sensing Request frame, it may transmit one or more additional PPDUs to keep the medium occupied till the time of the next DMG Sensing Request frame or the start of the monostatic sensing PPDU. These additional PPDUs shall be EDMG or DMG PPDUs constructed according to the EDMG or DMG PHY specification, and the TA field and RA field of the frame in the PPDU shall be set to the MAC address of the transmitting STA.

— The initiator shall randomize the value indicated in First Beam Index field in every DMG Sensing Request frame. The randomization algorithm is implementation specific.

— In the sounding phase, sensing responders shall start to send one or more DMG monostatic sensing PPDUs in parallel no later than a SIFS after the last DMG Sensing Response frame. DMG monostatic sensing PPDUs transmitted by each sensing responder shall be separated by a SBIFS. If the Sensing Exchange SN field of the TDD Beamforming Information field in the DMG Sensing Request frame is equal to 1, the DMG monostatic sensing PPDUs transmitted by each sensing responder shall cover the number of transmitting AWV indicated by the Number TX Beams Per Exchange field and the times of repetition indicated by the Repeat Per Exchange field within the DMG Sensing Scheduling subelement within the DMG Sensing Measurement Session element. The duration of the transmission of the DMG monostatic sensing PPDUs including the SBIFS shall be

equal to the Sounding Duration field within the DMG Sensing Measurement Exchange Duration element delivered by the sensing responder in the DMG Sensing Measurement Response frame. If the Sensing Exchange SN field of the TDD Beamforming Information field within the DMG Sensing Request frame is equal to i ($i > 1$), the DMG monostatic sensing PPDUs shall cover the number of transmitting AWV indicated by the Num Of TX Beams In Exchange field and the times of repetition indicated by the Num Of Repeat In Exchange field within the TDD Beamforming Information field of the DMG Sensing Request frame with Sensing Exchange SN field set to $i - 1$. The duration of the transmission of the DMG monostatic sensing PPDUs including the SBIFS shall be equal to the Sounding Duration field of the DMG Sensing Response frame of the DMG sensing measurement exchange with the Sensing Exchange SN field set to $i - 1$.

— In the reporting phase, if the reports are needed (see 9.4.2.337), the sensing initiator shall send a DMG Sensing Poll frame to each sensing responder for the report, in order of the STA ID field. Each sensing responder shall respond with a DMG Sensing Measurement Report frame to the sensing initiator, a SIFS after the DMG Sensing Poll frame. The sensing initiator shall send the first DMG Sensing Poll frame, the largest Sounding Duration plus a SIFS and a BRPIFS after the last DMG Sensing Response frame. If the Sensing Exchange SN field of the TDD Beamforming Information field in the DMG Sensing Request frame is equal to 1, the duration of the transmission of the DMG Sensing Measurement Report frame shall be equal to the Report Duration field of the DMG Sensing Measurement Exchange Duration element delivered by the sensing responder in the DMG Sensing Measurement Response frame. If the Sensing Exchange SN field of the TDD Beamforming Information field in the DMG Sensing Request frame is equal to i ($i > 1$), the duration of the transmission of the DMG Sensing Measurement Report frame shall be equal to the Report Duration field of the DMG Sensing Response frame of the DMG sensing measurement exchange with Sensing Exchange SN field to $i - 1$.

The value of the Duration field of the first DMG Sensing Request frame in DMG sensing measurement exchange i shall be calculated by the Equation (11-8b).

$$\text{Duration}^{(i)} = (N^{(i)} - 1) \times T_{REQ} + N^{(i)} \times T_{RSP} + N^{(i)} \times T_{POL} + (4N^{(i)} - 1) \times \text{SIFS} \quad \text{(11-8b)}$$

$$+ \text{BRPIFS} + \max_{1 \le n \le N^{i}} \text{Sounding Duration}_{n}^{(i-1)} + \sum^{N^{(i)}} \text{Report Duration}_{n}^{(i-1)}$$

where

$N^{(i)}$ is the value of the Num Of STAs In Exchange field within the DMG Sensing Request frame in DMG sensing measurement exchange i,

T_{REQ} is the TXTIME of a DMG Sensing Request frame,

T_{RSP} is the TXTIME of a DMG Sensing Response frame,

T_{POL} is the TXTIME of a DMG Sensing Poll frame,

$\text{Sounding Duration}_{n}^{(i-1)}$ is the value of the Sounding Duration field of the DMG Sensing Response frame delivered by the sensing responder n in DMG sensing measurement exchange $i - 1$ ($i > 1$). $\text{Sounding Duration}_{n}^{(0)}$ is the value of the first Sounding Duration field of the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frame delivered by the sensing responder n, and

$\text{Report Duration}_{n}^{(i-1)}$ is the value of the Report Duration field of the DMG Sensing Response frame delivered by the sensing responder n in DMG sensing measurement exchange $i - 1$ ($i > 1$).

$\text{Report Duration}_n^{(0)}$ is the value of the first Report Duration field of the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frame delivered by the sensing responder *n*.

The value of the Duration field of other frames in DMG sensing measurement exchange *i* shall be calculated as the subtraction of the duration of the frame and previous interframe space from the preceded value.

Figure 11-108v gives an example of two parallel coordinated monostatic DMG sensing measurement exchanges. The DMG AP or DMG PCP is the sensing initiator and the two non-AP STAs (STA A and STA B) are sensing responders. The SP is not used and the measurement results need to be reported. In the DMG sensing measurement session phase, STA A and STA B deliver the Sounding Duration 0a, Report Duration 0a, Sounding Duration 0b, and Report Duration 0b of the first DMG sensing measurement exchange to the sensing initiator by the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frames.

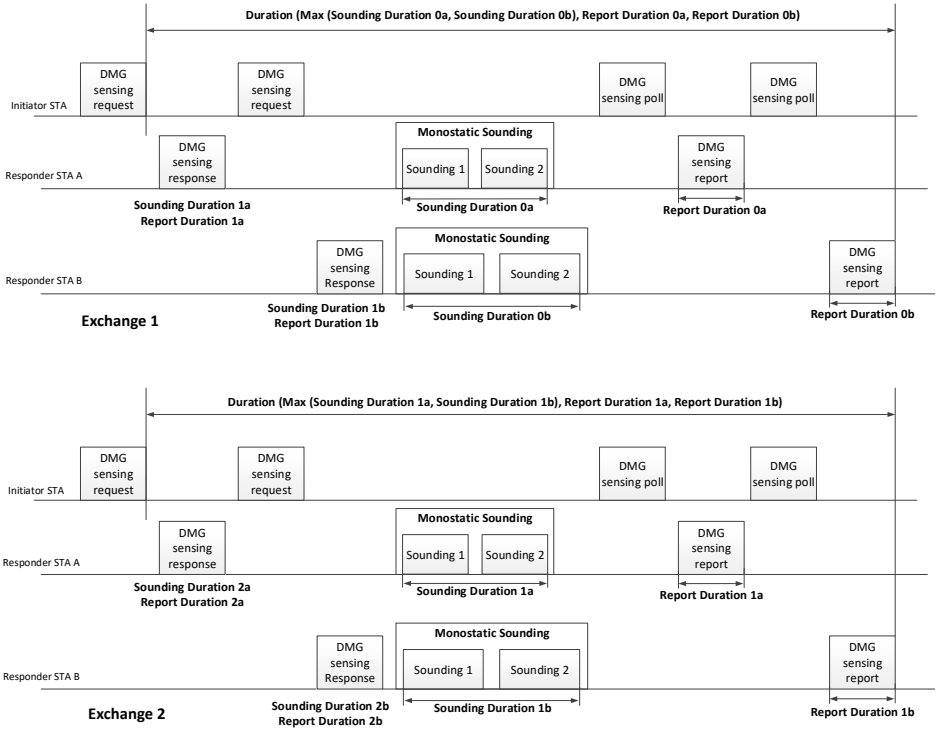

Figure 11-108v—Coordinated monostatic DMG sensing measurement exchanges, parallel sounding mode

In Exchange 1, in the initiation phase, the sensing initiator sends a DMG Sensing Request frame to STA A (STA ID equal to 0) and receives a DMG Sensing Response frame from STA A. Then the sensing initiator sends a DMG Sensing Request frame to STA B (STA ID equal to 1) and receives a DMG Sensing Response frame from STA B. The DMG Sensing Request frames activate STA A and STA B to be ready to participate in the sounding and reporting phases. The DMG Sensing Response frames indicate to the sensing initiator the readiness of STA A and STA B, and include the Sounding Duration 1a, Report Duration 1a, Sounding Duration 1b, and Report Duration 1b of the Exchange 2. Based on the STA ID field and the Num Of STAs In Exchange field within the received DMG Sensing Request frame, STA A infers that there is one remaining sensing responder to be initiated and estimates when the last DMG Sensing Response should end.

In the first DMG Sensing Request frame transmitted by the sensing initiator, the Duration field is set according to Equation (11-8b). The sensing initiator calculates the duration based on the Sounding Duration 0a, Report Duration 0a, Sounding Duration 0b, and Report Duration 0b fields delivered in the DMG Sensing Measurement Exchange Duration element within the DMG Sensing Measurement Response frames.

In the following sounding phase, STA A and STA B transmit DMG monostatic sensing PPDUs and receive the reflected signals in parallel. The duration of the transmission of the DMG monostatic sensing PPDUs of STA A including the SBIFS is equal to the Sounding Duration 0a. The duration of the transmission of the DMG monostatic sensing PPDUs of STA B including the SBIFS is equal to the Sounding Duration 0b. The measurement in DMG monostatic sensing PPDUs covers the number of transmit AWVs indicated by the Number TX Beams Per Exchange field and the times of repetition indicated by the Repeat Per Exchange field within the DMG Sensing Scheduling subelement of the DMG Sensing Measurement Session element.

The Sounding Duration of STA A and STA B may have different durations for different PPDU types or different Data Length. In the following reporting phase, after the largest Sounding Duration (Sounding Duration 0b) plus SIFS and BRPIFS from the end of the last DMG Sensing Response frame, the sensing initiator sends the first DMG Sensing Poll frame to STA A for the report and receives a DMG Sensing Measurement Report frame from STA A. Then the sensing initiator sends another DMG Sensing Poll frame to STA B for the report and receives a DMG Sensing Measurement Report frame from STA B. The duration of the transmission of the DMG Sensing Measurement Report frame of STA A is equal to the Report Duration 0a. The duration of the transmission of the DMG Sensing Measurement Report frame of STA B is equal to the Report Duration 0b.

In Exchange 2, the Duration field of the first DMG Sensing Request frame is calculated by Equation (11-8b) with the Sounding Duration 1a, Report Duration 1a, Sounding Duration 1b, and Report Duration 1b fields delivered within the DMG Sensing Response frames in Exchange 1. The measurement in DMG monostatic sensing PPDUs covers the number of transmit AWV indicated by the Num Of TX Beams In Exchange field and the times of repetition indicated by the Num Of Repeat In Exchange field within the TDD Beamforming Information field of the DMG Sensing Request frame of the Exchange 1.

The duration of the transmission of the DMG monostatic sensing PPDUs of STA A including the SBIFS is equal to the Sounding Duration 1a and the corresponding PPDUs of STA B including the SBIFS is equal to the Sounding Duration 1b.

The duration of the transmission of the DMG Sensing Measurement Report frame of STA A is equal to the Report Duration 1a and the corresponding frame of STA B is equal to the Report Duration 1b.

The sensing responder that receives the last DMG Sensing Request frame in order shall transmit monostatic sensing PPDU over the primary channel. The initiator shall first poll the sensing responder that receives the last DMG Sensing Request frame in order over the primary channel.

11.55.3.6.3 Bistatic DMG sensing measurement exchange

DMG sensing measurement exchanges where the Sensing Type field is bistatic are bistatic DMG sensing measurement exchanges. Only a single transmitting STA and a single receiving STA participate in a bistatic DMG sensing measurement exchange. The roles of the sensing initiator (sensing transmitter or sensing receiver) and sensing responder are set by the RX Initiator field of the Measurement Session Control field within the DMG Sensing Measurement Session element sent by the sensing initiator. These roles apply to all DMG sensing measurement exchanges of the same DMG measurement session.

A bistatic DMG sensing measurement exchange in which the sensing initiator is the sensing transmitter is composed of one or more BRP frames with a TRN field transmitted by the sensing initiator, followed after a

BRPIFS with a BRP frame from the sensing responder. The measurement covers the number of transmit AWV combinations indicated by the Number TX Beams Per Exchange field within the DMG Sensing Scheduling subelement of the DMG Sensing Measurement Session element (see 9.4.2.337).

The beams covered start from the first beam index specified in the BRP Sensing element and continue with beams in the Tx Beam List subelement. For each of these AWV combinations, all the AWV combinations indicated in RX Beam List subelement (see 9.4.2.337.2) of the sensing responder are covered.

The sensing initiator shall determine the format of the TRN field (by setting the TXVECTOR parameters TRN_SEQ_LENGTH, EDMG_TRN_LEN, RX_TRN_PER_TX_TRN, EDMG_TRN_P, EDMG_TRN_M, EDMG_TRN_N) in each of the transmitted BRP frames in a way that it is compatible with the sensing responder capabilities and covers all the desired TX and RX beams. For example, if the number of RX beams is small, BRP RX/TX PPDUs may be used. If the number of RX beams is large, a BRP RX PPDU may be used per each TX Beam. If there is a single RX beam, a BRP TX PPDU may be used, covering several TX beams.

If either the sensing initiator or sensing responder is a non-EDMG STA or if the sensing responder has the DMG TRN RX Only Capable field equal to 1 in the Beamforming Capability subelement of the EDMG Capabilities element (see 9.4.2.265), the sensing initiator shall use BRP-RX PPDUs, unless the number of RX beams is equal to 1 in which case BRP-TX PPDUs should be used. In each BRP frame, the First Beam Index field within the BRP Sensing element indicates the first beam that is used in the TRN field of the PPDU. The sensing initiator shall go through the number TX Beams Per Exchange TX beams. If the Repeat Per Exchange field of the DMG Sensing Scheduling subelement (N_{RI}) is greater than 1, the sensing initiator shall cover the number TX Beams Per Exchange TX Beams in the DMG sensing measurement exchange N_{RI} times, going to the first one after the last one. All BRP frames transmitted by the sensing initiator shall be separated by SIFS. Upon reception of a BRP frame with a TRN field, the MLME of the sensing responder shall issue an MLME-DMG-SENSMSMT.indication primitive that includes sensing measurements obtained with the beams in the TRN field of the received BRP frame. The SME of the sensing responder shall issue an MLME-DMG-SENSREPORT.request primitive to prepare a BRP frame with a report to be transmitted to the sensing initiator a BRPIFS after the received BRP frame. The report may be based on Channel Measurement Feedback elements or DMG Sensing Report elements. The presence and type of the report is indicated by the Report Control field within the DMG Sensing Report Control element (see 9.4.2.340). Upon reception of a BRP frame with a report, the MLME of the sensing initiator shall issue an MLME-DMG-SENSREPORT.indication primitive.

A bistatic DMG sensing measurement exchange in which the sensing initiator is the sensing receiver is composed of a BRP frame transmitted by the sensing initiator followed after a BRPIFS with one or more BRP frames with TRN field transmitted by the sensing responder. The first transmit beam to be used by the sensing responder is indicated by the First Beam Index field of the BRP Sensing element of the BRP frame sent by the sensing initiator. The sensing responder shall start transmitting using this beam indicating it in the same field in the first BRP frame it transmits. The sensing responder shall continue with the number of TX beams indicated in the Number TX Beams Per Exchange field in the DMG Sensing Scheduling subelement of the DMG Sensing Measurement Session element. For each beam, it shall allow the sensing initiator to cycle through all the beams indicated in its RX Beam List. The method allocating these transmit/receive beam combinations is the same as in a bistatic DMG sensing measurement exchange in which the sensing initiator is the sensing transmitter. All BRP frames transmitted by the sensing responder shall be separated by SIFS. Upon reception of a BRP frame with a TRN field, the MLME of the sensing initiator shall issue an MLME-DMG-SENSMSMT.indication primitive that includes sensing measurements obtained with the beams in the TRN field of the received BRP frame. There is no reporting in bistatic DMG sensing measurement exchanges in which the sensing initiator is the sensing receiver.

Figure 11-108w shows an example of a bistatic DMG sensing burst. The example shows three DMG sensing measurement exchanges within the burst identified by their Sensing Exchange SNs. In each DMG sensing measurement exchange the sensing initiator transmits a BRP frame within a BRP PPDU (with a TRN field). The sensing responder responds in each DMG sensing measurement exchange with a BRP frame. In this case the sensing responder is not ready with an immediate report, so in each DMG sensing measurement exchange after the first one the report is from the previous DMG sensing measurement exchange (Report Delay = 2). In the first DMG sensing measurement exchange, there is no report (Report Delay = 0).

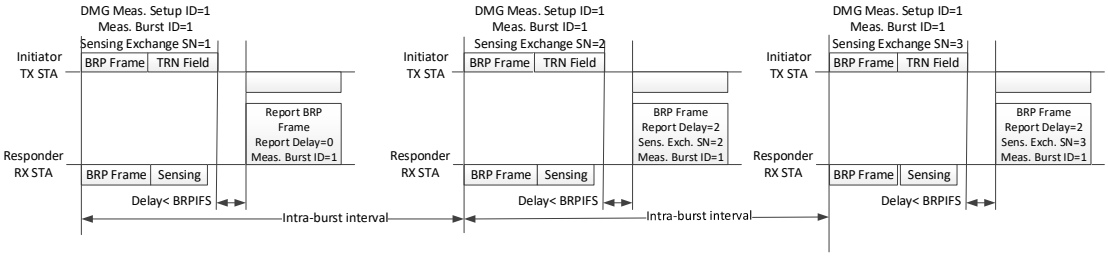

Figure 11-108w—Example of a bistatic DMG sensing measurement

11.55.3.6.4 Coordinated bistatic DMG sensing measurement exchange

A coordinated bistatic DMG sensing measurement exchange is a DMG sensing measurement exchange of a DMG sensing procedure of sensing type coordinated bistatic.

A coordinated bistatic DMG sensing measurement exchange is initiated by a set of bistatic DMG sensing measurement exchange requests answered by sensing responders. The initiation phase shall be followed by a sounding phase comprised of a set of bistatic DMG sensing measurement exchanges.

In the coordinated bistatic DMG sensing measurement exchange, the following rules apply:

— The number of sensing responders in each coordinated bistatic DMG sensing measurement exchange, of the same DMG Measurement Session ID, may be different.

— The sensing initiator shall send a DMG Sensing Request frame to each sensing responder it invites to participate in the DMG sensing measurement exchange.

— The sensing responder shall respond with a DMG Sensing Response frame to the sensing initiator a SIFS after receiving the DMG Sensing Request frame.

— The sensing responder that responded to the sensing initiator shall remain active to receive BRP PPDUs from the sensing initiator.

— The order of sounding is indicated in the STA ID field within the DMG Sensing Measurement Request frame.

— BRP frames transmitted in a coordinated bistatic DMG sensing measurement exchange shall have the DMG Sensing field in the BRP Request field set to 1. The Sensing Exchange SN in the BRP Sensing element in BRP frames transmitted as part of the DMG sensing measurement exchange shall have the same value as the Sensing Exchange SN transmitted by the sensing initiator in the DMG Sensing Request frame.

11.55.3.6.5 Multistatic EDMG sensing measurement exchange

A multistatic EDMG sensing measurement exchange is a DMG sensing measurement exchange of a DMG sensing procedure of sensing type multistatic.

11.55.3.6.5.1 Initiation

A multistatic EDMG sensing measurement exchange between a sensing initiator in the sensing transmitter role and two or more sensing responders is initiated by several DMG Sensing Request frames and DMG Sensing Response frames exchanges.

The sensing initiator initiates the multistatic EDMG sensing measurement exchange by sending DMG Sensing Request frames to each of the intended sensing responders. The DMG Measurement Session ID, Measurement Burst ID, and the Sensing Exchange SN fields shall have the same value in all DMG Sensing Request frames. The sensing initiator shall set the STA ID field to a value between 0 and 7 indicating the index of the sensing responder sync field in the sync field of the EDMG multistatic sensing PPDUs. EDMG multistatic sensing PPDUs shall be addressed to the sensing responder that has an STA ID equal to 0. The sensing initiator sets the First Beam Index field to a value that indicates the first beam that is used for transmission in the TRN field of the first EDMG multistatic sensing PPDU. The other beams used in the EDMG multistatic sensing PPDUs are the following beams in the TX Beam List subelement. The set of beams in the DMG sensing measurement exchange is repeated according to the Num Of Repeat In Exchange field.

The DMG Sensing Request frames shall be sent in the order of the STA ID value in the frame. Each frame shall be sent to the direction of the responder STA.

A STA that receives a DMG Sensing Request frame shall respond after SIFS with a DMG Sensing Response frame. The sensing responder shall remain active to receive all the EDMG multistatic sensing PPDUs in the multistatic EDMG sensing measurement exchange and poll frame.

The sensing initiator shall transmit a DMG Sensing Request frame to the next intended sensing responder SIFS after receiving the response from the previous sensing responder.

11.55.3.6.5.2 Sounding

The sensing initiator shall start the transmission of EDMG multistatic sensing PPDUs (see 28.9.5) a SIFS after receiving the response from the last sensing responder. The sensing initiator shall select the format of the TRN field (by setting the following TXVECTOR parameters: TRN_SEQ_LENGTH, EDMG_TRN_LEN, RX_TRN_PER_TX_TRN, EDMG_TRN_P, EDMG_TRN_M, and EDMG_TRN_N) in each of the transmitted EDMG multistatic sensing PPDUs, in a way that it is compatible with the sensing responders' capabilities and covers the desired transmit and receive beams. The selected TXVECTOR parameters shall match the values appearing in the corresponding fields of the DMG Sensing Request frames. The first EDMG multistatic sensing PPDU may be followed by up to three EDMG multistatic sensing PPDUs with the same parameters. All the EDMG multistatic sensing PPDUs in a multistatic EDMG sensing measurement exchange shall have the same PPDU length and TRN field format.

Upon receiving an EDMG multistatic sensing PPDU, the MLME of the sensing responder shall issue an MLME-DMG-SENSMSMT.indication primitive that includes sensing measurements obtained with the beams in the TRN field of the received EDMG multistatic sensing PPDU.

11.55.3.6.5.3 Reporting

The multistatic EDMG sensing measurement exchange may end with the sensing initiator polling each of the sensing responders for sensing measurement reports.

The SME of the sensing responder shall issue an MLME-DMG-SENSREPORT.request primitive to prepare a DMG Sensing Report frame to be transmitted to the sensing initiator.

The sensing initiator sends a DMG Sensing Poll frame to each of the sensing responders a SIFS after the transmission of the last PPDU. Each sensing responder responds a SIFS after receiving the DMG Sensing Poll frame with a DMG Sensing Report frame that includes a DMG Sensing Report Control element and either a DMG Sensing Report element or one or more Channel Measurement Feedback elements.

Upon reception of such a DMG Sensing Report frame, the MLME of the sensing initiator shall issue an MLME-DMG-SENSREPORT.indication primitive.

11.55.3.6.5.4 An example of a multistatic EDMG sensing measurement exchange

Figure 11-108x shows an example of an EDMG multistatic sensing measurement exchange. The EDMG sensing measurement exchange starts with the sensing initiator sending a DMG Sensing Request frame (denoted by RQ) to each of the sensing responders to initiate the DMG sensing measurement exchange and indicate the parameters that shall be used in the TRN fields of the EDMG multistatic sensing PPDUs in the DMG sensing measurement exchange. The sensing responders respond with DMG Sensing Response frames (denoted by RSP) indicating that they are ready to participate in the DMG sensing measurement exchange. After receiving the response from the last sensing responder, the sensing initiator sends an EDMG multistatic sensing PPDU. Sensing responder STA A uses Sync field 1 for synchronization and sensing responder STA B uses Sync field 2 for synchronization. They then use the TRN field for sensing. After the EDMG multistatic sensing PPDU transmission, the sensing initiator uses a DMG Sensing Poll frame (denoted by Report RQ) to solicit reports from the sensing responder.

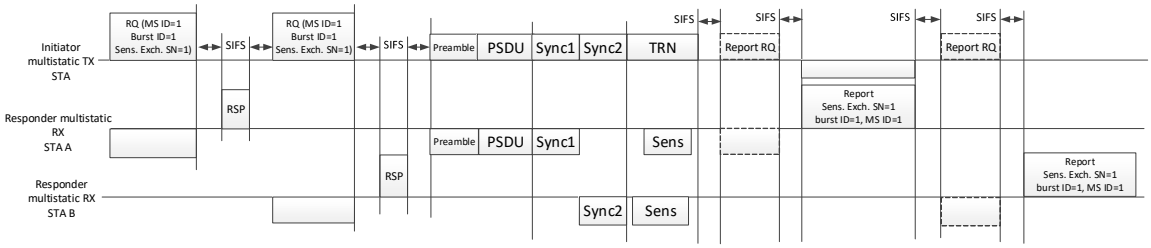

Figure 11-108x—Example of an EDMG multistatic sensing measurement exchange with two sensing responders

11.55.3.7 DMG sensing measurement reporting

There are seven types of report of DMG sensing as defined in Table 9-417ad.

If the sensing initiator requested Report Type values equal to 1, 2, or 4 (that is, report types that do not include Doppler) in the DMG Measurement Session frame, the sensing responders provide report in each DMG sensing measurement exchange, either through a DMG Sensing Report element or through Channel Measurement Feedback elements.

For the Channel Measurement Feedback elements, carried within a BRP frame, the measurements which the report is based upon are defined in the Report Delay field of the Report Control field of the BRP Sensing element (see 9.4.2.342). If the value of the field is 1, the report is based on a measurement in the current DMG sensing measurement exchange. If the value of the field is 2, the report is based on a measurement in the previous DMG sensing measurement exchange. The Report Delay field in the first DMG sensing measurement exchange of the burst can be set to 0, indicating no report in this DMG sensing measurement exchange, or 4, indicating report of measurements in the last DMG sensing measurement exchange of the previous burst.

For the DMG Sensing Report element or Channel Measurement Feedback elements carried within a DMG Sensing Report frame, the measurements on which the report is based are indicated by the fields DMG Measurement Session ID, Measurement Burst ID, and Sensing Exchange SN in the Report Control field of the DMG Sensing Report Control element (see 9.4.2.340).

For the DMG Sensing Report element or Channel Measurement Feedback elements carried within a DMG Sensing Report frame, the measurements correspond to either the current or the previous DMG sensing measurement exchange if the value in the Report Type field is 1, 2, or 4, or based on the previous or current burst if the value in the Report Type field is 3, 5, 6, or 7.

If the sensing initiator requested Report Type values equal to 3, 5, 6, or 7 (that is, report types that include Doppler), sensing responders provide a report for the whole burst at the end of the burst. The sensing initiator may use the DMG Sensing Poll frame to poll each of the sensing responders τ_R milliseconds after the end burst, where τ_R is the time specified in Burst Report Delay field in the Burst Response Delay subelement of the DMG Measurement Session element sent by each sensing responder. If the sensing responder specifies $\tau_R = 0$ or if the sensing initiator does not poll a sensing responder, the report shall be provided in the first DMG sensing measurement exchange of the next burst.

If the sensing initiator requested Report Type values equal to 2, 3, 4, 5, or 6 (that is, report types that include DMG Sensing Image) and the Report Phase field is equal to 1 within the Report Type Control field, the sensing responder shall include both the Reflection Power and Reflection Phase fields within the Reflection subelements; otherwise, the Reflection subelements shall include the Reflection Power field only.

If the Polarization Fusion field within the DMG Sensing Measurement Session element of the DMG Sensing Measurement Request frame (see 9.6.21.8) is equal to 0, the sensing responder shall report sensing results with different transmitting/receiving polarization combinations separately in the DMG Sensing Report element(s). During the DMG sensing measurement report, the Polarization Mode field within the DMG Sensing Report Control field indicates the polarization information (e.g., horizontally polarized-horizontally polarized, or horizontally polarized-vertically polarized) of the sensing result contained in the DMG Sensing Report element. If the Polarization Fusion field within the DMG Sensing Measurement Session element of the DMG Sensing Measurement Request frame is equal to 1, the sensing responder shall report fused sensing results in the DMG Sensing Report element(s). During the DMG sensing measurement report, the Polarization Mode field within the DMG Sensing Report Control field shall be set to 5 to indicate that the sensing result contained in the DMG Sensing Report element is fused, based on different polarizations results. The fusion method is implementation specific.

If the Report Type field of the Report Control field of a DMG Sensing Report Control element is set to 7 (Target) then the DMG Sensing Target Report Data subelements in the associated DMG Sensing Report Element contains Target Parameters field. Each Target Parameters field is associated with a Target and identified by the Target Index field. A Target Index is associated with measurements that the STA generating the report estimates that belong to a single object. If a STA estimates that a particular target is consistent in different reports (in different times, e.g., over different bursts), it may set the Target Index field to a consistent nonzero value.

11.55.3.8 DMG sensing measurement termination

After a DMG sensing measurement session is established (see 11.55.3.4), a DMG sensing measurement session is terminated either explicitly or implicitly. Under the explicit DMG sensing measurement termination, a DMG STA uses the DMG Sensing Measurement Termination frame (see 9.6.21.11) for the DMG sensing measurement session termination. Under the implicit sensing measurement session termination, the DMG sensing measurement session is terminated after the expiration of the DMG sensing procedure expiry timer.

A DMG sensing measurement session(s) may be terminated explicitly at any time by either the sensing initiator or the sensing responder by transmitting an individually addressed DMG Sensing Measurement Termination frame.

The explicit DMG sensing measurement session termination is initiated by issuing an MLME-DMG-SENSMSMTTERMINATION.request primitive. Upon reception of this primitive, the DMG STA shall initiate the termination of the sensing measurement session(s) by transmitting the DMG Sensing Measurement Termination frame with the RA field set to the MAC address indicated in the primitive. The MLME of a DMG STA that initiates the termination of the DMG sensing measurement session(s), shall issue an MLME-DMG-SENSMSMTTERMINATION.confirm primitive upon completion of the transmission of the DMG Sensing Measurement Termination frame and terminate the indicated DMG sensing measurement session(s). The MLME of a DMG STA that receives a DMG Sensing Measurement Termination frame addressed to it, shall issue an MLME-DMG-SENSMSMTTERMINATION.indication primitive and shall terminate the indicated DMG sensing measurement session(s).

For the implicit DMG sensing measurement session termination of a DMG sensing measurement session, the sensing initiator and the sensing responder shall use the DMG sensing procedure expiry timer. The DMG sensing procedure expiry timer maintains the DMG measurement session identified with the DMG Measurement Session ID between the sensing initiator and the sensing responder. The DMG sensing procedure expiry timer shall be set to *aDMGSensingProcedureExpiry* at

— The success of the procedure specified in 11.55.3.4;
— The exchange of DMG Sensing Request and DMG Sensing Response frames is completed in the coordinated DMG sensing measurement exchange (see 11.55.3.6.2, 11.55.3.6.4, and 11.55.3.6.5); or
— The exchange of the BRP frames is completed in the bistatic DMG sensing measurement exchange (see 11.55.3.6.3).

Upon expiry of the DMG sensing procedure expiry timer, the sensing initiator and sensing responder shall terminate the DMG sensing measurement session and issue an MLME-DMG-SENSMSMTTERMINATION.confirm primitive to the SME.

Once the DMG sensing measurement session between a sensing initiator and a sensing responder is terminated, the sensing responder shall not participate in any sensing measurement exchange associated with the corresponding DMG Measurement Session ID with the same sensing initiator.

11.55.3.9 DMG passive sensing

DMG passive sensing allows a STA to use DMG Beacon frame transmissions for sensing by enabling a STA to acquire information about the beacons direction and the location of the DMG AP or DMG PCP.

A DMG AP or DMG PCP advertises the capability to perform passive sensing in the DMG Sensing Short Capabilities element (see 9.4.2.336). The DMG AP or DMG PCP shall set the Sensing Support field of the Short DMG Sensing Capabilities field to 1 to indicate that it supports any type of sensing except DMG passive sensing. The DMG AP or DMG PCP shall set the Passive Sensing Support field to 1 if it supports DMG passive sensing. The DMG AP or DMG PCP shall set the Accurate Timing Of Beacons field to 1 if the SBIFS between beacon transmissions in the BTI is exactly aSBIFSTime $\pm T_c/2$ where T_c is defined in Table 20-4. The DMG AP or DMG PCP shall set the Location Available field to 1, if it can provide an LCI field in a DMG Passive Sensing Beacon element (see 9.4.2.343).

A STA requests information about a DMG Beacon frame transmission from a DMG AP or DMG PCP by sending an Information Request frame with the Element ID of the DMG Passive Sensing Beacon element in the Request Element field. The DMG AP or DMG PCP responds with an Information Response frame that

includes a DMG Passive Sensing Beacon element and one or more DMG Beacon Sector Descriptor elements (see 9.4.2.344). The Sector Azimuth, Sector Elevation, Azimuth Beamwidth, and Elevation Beamwidth fields in the Sector Descriptors field within the DMG Beacon Sector Descriptor element shall be reported in earth coordinates if the Earth Coordinates field within the Short DMG Sensing Capabilities field is equal to 1 and in an arbitrary STA's coordinate system if the Earth Coordinates field is equal to 0.

11.55.4 DMG SBP procedure

11.55.4.1 General

DMG SBP is the DMG variant of the SBP procedure. DMG SBP is a procedure that allows a non-AP and non-PCP STA to request a DMG AP or DMG PCP to perform DMG sensing (see 11.55.3) on its behalf.

Implementation of the DMG SBP procedure is optional for a DMG STA. A STA in which both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true is defined as a DMG STA that supports DMG SBP procedure.

A STA in which both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true shall set the DMG SBP field of the DMG Sensing Capabilities element to 1.

A STA in which dot11DMGSBPImplemented is false shall set the DMG SBP field of the DMG Sensing Capabilities element to 0.

A non-AP and non-PCP DMG STA may act as SBP initiator if both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true.

A DMG AP or DMG PCP may act as SBP responder if both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true.

The non-AP or non-PCP DMG STA that acts as an SBP initiator shall be associated with the DMG AP or DMG PCP that acts as an SBP responder before the DMG SBP setup exchange.

An SBP initiator shall not insert values other than 2, 3, 4, 5, 6, or 7 in the Report Type field of the DMG Sensing Measurement Session element (see 9.4.2.337).

A DMG SBP procedure expiry timer shall be present per each established DMG SBP setup exchange.

In the SBP initiator, the DMG SBP procedure expiry timer shall be set to *aDMGSBPProcedureExpiry* at the issue of the MLME-DMG-SBP.confirm primitive with the Status Code set to SUCCESS and the generation of the MLME-DMG-SBPREPORT.indication primitive.

In the SBP responder, the DMG SBP procedure expiry timer shall be set to *aDMGSBPProcedureExpiry* at the receipt of the MLME-DMG-SBP.response primitive with the Status Code set to SUCCESS and the receipt of the MLME-DMG-SBPREPORT.request primitive.

A DMG STA that supports the DMG SBP procedure should use the timing related parameters defined in Table 11-33d.

11.55.4.2 DMG SBP setup exchange

If both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true, to establish a DMG SBP procedure, the SME of a non-AP and non-PCP DMG STA (SBP initiator) shall issue an MLME-

Table 11-33d—DMG SBP procedure timing related parameters

Parameter	Value	Description
aDMGSBPSetupExpiry	200 ms	The maximum time interval between the reception of a DMG SBP Request frame and the transmission of the corresponding DMG SBP Response frame.
aDMGSBPProcedureExpiry	10 s	The time limit for which a DMG SBP procedure remains active if no frames are exchanged between its SBP initiator and SBP responder.

DMG-SBP.request primitive that results in the transmission of a DMG SBP Request frame to the intended SBP responder. The DMG SBP Request frame shall include valid parameters as defined in DMG Sensing Measurement Session and DMG SBP Parameters elements. The fields RX Initiator, LCI Present, and Orientation Present in the Measurement Session Control field of the DMG Sensing Measurement Session element are not in use and shall be set to reserved values.

The DMG SBP Parameters element within the DMG SBP Request frame may include a Sensing Responder Addresses field to indicate a set of preferred sensing responders.

On receiving a DMG SBP Request frame, if both dot11DMGSensingMsmtImplemented and dot11DMGSBPImplemented are true, the MLME of the SBP responder shall validate the frame and issue an MLME-DMG-SBP.indication primitive. If the SME of an SBP responder receives an MLME-DMG-SBP.indication primitive, it shall issue an MLME-DMG-SBP.response primitive that results in the transmission of a DMG SBP Response frame to the SBP initiator within *aDMGSBPSetupExpiry*. The Status Code field within the DMG SBP Response frame should be set to SUCCESS to indicate that the SBP procedure request is accepted if the SBP responder is able to satisfy the SBP request with parameters indicated in the DMG SBP Request frame. The Status Code field within the DMG SBP Response frame shall be set to REQUEST_DECLINED or to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS to indicate that the DMG SBP procedure request is rejected if the SBP responder is not able to satisfy the DMG SBP request with parameters indicated in the DMG SBP Request frame.

If the Status Code field within the DMG SBP Response frame is equal to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, the DMG SBP Response frame shall include a DMG SBP Parameters element and a DMG Sensing Measurement Session element that specify preferred SBP and DMG measurement session parameters, respectively.

If the Status Code field within the DMG SBP Response frame is equal to SUCCESS, the DMG SBP Response frame shall include a DMG Measurement Session ID field that specifies the DMG Measurement Session ID assigned for the DMG SBP setup exchange. In this case, the DMG SBP Response frame may also include a DMG SBP Parameters element.

On receiving a DMG SBP Response frame, the MLME of the SBP initiator shall validate the DMG SBP Response frame by ensuring its fields are valid and issue an MLME-DMG-SBP.confirm primitive. If the SBP initiator receives a DMG SBP Response frame with Status Code field equal to REQUEST_DECLINED or REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, or if it does not receive a DMG SBP Response frame with the Status Code field equal to SUCCESS within *aDMGSBPSetupExpiry* of sending the corresponding DMG SBP Request frame, the DMG SBP procedure setup exchange is defined to be unsuccessful.

Upon reception of a DMG SBP Response frame with the Status Code equal to REQUEST_DECLINED, the SBP initiator should not transmit a new DMG SBP Request frame within the time indicated in the Decline Duration field.

The DMG Sensing Measurement Session element within the DMG Sensing Measurement Request frame sent to initiate a DMG sensing procedure used to satisfy a DMG SBP request should take into account the DMG Sensing Measurement Session element within the corresponding DMG SBP Request frame. The DMG Measurement Session ID field within the DMG Sensing Measurement Request frame sent to initiate a DMG sensing procedure used to satisfy a DMG SBP request shall be identical to the DMG Measurement Session ID field within the corresponding DMG SBP Response frame.

The DMG SBP Request field within the DMG SBP Parameters element within a DMG SBP Request frame shall be set to 1. The DMG SBP Request field within the DMG SBP Parameters element within a DMG SBP Response frame shall be set to 0.

The SBP responder shall send a DMG SBP Response frame with the Status Code field set to REQUEST_-DECLINED if the DMG Mandatory Number Of Responders field within the DMG SBP Parameters element within the corresponding DMG SBP Request frame is set to 1 and the SBP responder is not able to satisfy the requested number of sensing responders indicated in the DMG Number Of Sensing Responders field within the DMG SBP Parameters element. If the DMG Mandatory Number Of Responders field within the DMG SBP Parameters element is set to 0, the SBP responder should send a DMG SBP Response frame with the Status Code field set to SUCCESS even if the requested number of sensing responders indicated in the DMG Number Of Sensing Responders field within the DMG SBP Parameters element cannot be satisfied.

If the Sensing Responder field within the DMG SBP Parameters element of the corresponding DMG SBP Request frame is equal to 0, the SBP responder shall not use a DMG sensing procedure initiated with the issue of an MLME-DMG-SENSMSMTSESSION.request primitive that resulted in the transmission of a DMG Sensing Measurement Request frame to the SBP initiator to satisfy the DMG SBP request. Otherwise, if the Sensing Responder field is equal to 1, the SBP responder shall use a DMG sensing procedure initiated with the issue of a MLME-DMG-SENSMSMTSESSION.request primitive with PeerSTAAddress parameter equal to the SBP initiator’s MAC address to satisfy the DMG SBP request.

If the DMG Preferred Responder List field within the DMG SBP Parameters element of the corresponding DMG SBP Request frame is equal to 0, the SBP responder may include any DMG STA in the DMG sensing procedure used to satisfy the DMG SBP request that allows for measurements to be obtained with the operational parameters specified in the DMG SBP Request frame.

If the DMG Preferred Responder List field and the DMG Mandatory Preferred Responder field within the DMG SBP Parameters element of the DMG SBP Request frame are both equal to 1, the intended sensing responder of the DMG sensing procedure used by the SBP responder shall be equal to one of the MAC addresses listed in the Sensing Responder Addresses field within the corresponding DMG SBP Request frame.

If the DMG Preferred Responder List field and the DMG Mandatory Preferred Responder field within the DMG SBP Parameters element of the DMG SBP Request frame are equal to 1 and 0, respectively, the SBP responder may use a DMG sensing procedure initiated with the issue of an MLME-DMG-SENSMSMTSES-SION.request primitive that resulted in the transmission of a DMG Sensing Measurement Request frame to a sensing responder with MAC address not equal to any of the MAC addresses listed in the Sensing Responder Addresses field within the corresponding DMG SBP Request frame if a DMG sensing procedure cannot be established with one or more STAs with MAC addresses listed in the Sensing Responder Addresses field.

If the DMG Preferred Responder List field within the DMG SBP Parameters element of the DMG SBP Request frame is equal to 1, the DMG Number Of Preferred Responders field shall be set to the number of MAC addresses included in the Sensing Responder Addresses field.

The DMG Preferred Responder List field within the DMG SBP Parameters element of a DMG SBP Response frame shall be set to 1 if:

— The Status Code field within the DMG SBP Response frame is set to SUCCESS; and

— The DMG Preferred Responder List field within the DMG SBP Parameters element of the corresponding DMG SBP Request frame is equal to 1.

Otherwise, the DMG Preferred Responder List field within the DMG SBP Parameters element of the DMG SBP Response frame shall be set to 0.

If the DMG Preferred Responder List field within the DMG SBP Parameters element of the DMG SBP Response frame is set to 0, neither the Sensing Responder Addresses nor the Sensing Responder IDs fields shall be included in the frame. If the DMG Preferred Responder List field within the DMG SBP Parameters element of the DMG SBP Response frame is set to 1, both the Sensing Responder Addresses field and the Sensing Responder IDs field shall be included in the frame. In this case, the DMG Number Of Preferred Responders field shall be equal to the number of MAC addresses within the Sensing Responder Addresses field and the number of AID within the Sensing Responder IDs field.

If the Status Code field within the DMG SBP Response frame is equal to SUCCESS, the DMG Number Of Sensing Responders field within the DMG SBP Parameters element shall be set to the number of sensing responders used in the DMG sensing procedure used by the SBP responder to satisfy the DMG SBP request.

If the Status Code field within the DMG SBP Response frame is equal to REJECTED_WITH_SUGGESTED_SENSING_PARAMETERS, the DMG Number Of Sensing Responders field within the DMG SBP Parameters element should indicate a suggested number of sensing responders.

NOTE—The method used by an SBP responder to select DMG STAs to include in the DMG sensing procedure used in response to a DMG SBP Request frame in which the DMG Preferred Responder List field within the DMG SBP Parameters element is equal to 0 or in which the DMG Preferred Responder List field and the DMG Mandatory Preferred Responder field within the DMG SBP Parameters element are set to 1 and 0, respectively, is implementation dependent.

If the SBP responder of a DMG SBP request that has resulted in DMG SBP Response frame being sent with the Status Code field equal to SUCCESS is not able to satisfy required parameters specified in the corresponding DMG SBP Request frame, it shall send a DMG SBP Termination frame to the SBP initiator by issuing an MLME-DMG-SBPTERMINATION.request primitive. The DMG Measurement Session ID field within the DMG SBP Termination frame sent by the SBP responder shall be identical to the DMG Measurement Session ID field within the corresponding DMG SBP Response frame.

To satisfy a DMG SBP request, the DMG SBP responder shall initiate a new DMG sensing procedure. The DMG Sensing Measurement Request frame transmitted to a sensing responder used to satisfy a DMG SBP request shall include a DMG SBP Specific subelement containing the AID/USID of the DMG SBP initiator. The DMG Measurement Session ID field in the DMG Sensing Measurement Request frame(s) shall be the same as the DMG Measurement Session ID sent in the DMG SBP Response frame and shall be different than all the existing DMG Measurement Session IDs used with corresponding sensing responder(s).

11.55.4.3 DMG SBP reporting

An SBP responder is a sensing initiator that provides service to the SBP initiator. The SME of the SBP responder (sensing initiator) collects DMG reports from the sensing responders associated with the DMG

Measurement Session ID set at the DMG SBP setup exchange. The reports are collected at the DMG sensing measurement exchange and/or at the burst, depending on the Report types.

The SME of the SBP responder issues an MLME-DMG-SBPREPORT.request primitive to deliver the DMG reports collected from sensing responders at the DMG sensing measurement exchange or burst to the SBP initiator.

Upon receipt of an MLME-DMG-SBPREPORT.request primitive, the SBP responder shall prepare DMG SBP Report frame(s) to be transmitted to the SBP initiator indicated by the PeerSTAAddress parameter of the primitive.

The DMG Sensing Scheduling subelement conveyed in the DMG SBP Response frame shall provide the schedule information at the DMG SBP setup exchange. The transmission of the DMG SBP Report frame(s) shall commence at the time scheduled for the delivery of the frames.

If the DMG reports are collected from sensing responders at DMG sensing measurement exchanges, the SBP responder should send DMG SBP Report frame(s) after the last phase of a DMG sensing measurement exchange. If the DMG reports are collected from sensing responders at bursts, the SBP responder should send DMG SBP Report frame(s) after the last phase of the last DMG sensing measurement exchange in a burst or after the last phase of the first DMG sensing measurement exchange in a burst.

At the time scheduled to deliver the DMG SBP Report frame(s), the SBP responder shall transmit all frames prepared for delivery at the preceding scheduled time.

11.55.4.4 DMG SBP termination

An SME of the SBP initiator and SBP responder may terminate the DMG SBP procedure by issuing the MLME-DMG-SBPTERMINATION.request primitive. The primitive initiates transmission of a DMG SBP Termination frame.

If the SBP responder intends to terminate a DMG SBP procedure due to unsuccessful or terminated DMG sensing measurement sessions with the sensing responders, and if either the DMG Mandatory Number Of Responders field or the DMG Mandatory Preferred Responder field in the DMG SBP Request frame that requested this DMG SBP procedure is set to 1, the SBP responder may set the DMG SBP Session Unsuccess field to 1 and include the DMG SBP Parameters element in the DMG SBP Termination frame.

An SBP responder may transmit the DMG SBP Termination frame to the SBP initiator at the time scheduled to send the DMG SBP Report frames.

An SBP initiator may transmit the DMG SBP Termination frame to the SBP responder at any media access allowed for its transmission.

An MLME-DMG-SBPTERMINATION.confirm primitive is delivered to the SME of the DMG STA that has sent the DMG SBP Termination frame.

An MLME-DMG-SBPTERMINATION.indication primitive is delivered to the SME of the DMG STA that received the DMG SBP Termination frame.

Delivery of the primitives shall terminate the DMG SBP Procedure(s) at the DMG STA as follows:

— If one of the fields (Terminate All SBP Coordinated Monostatic Sessions, Terminate All SBP Bistatic Sessions, and Terminate all SBP Multistatic Sessions) is set to 1, ignore the DMG Measurement Session ID field within the DMG Measurement Session ID Indication field.

—If the Terminate All SBP Coordinated Monostatic Sessions field is set to 1, then terminate all DMG SBP procedures using measurement sessions of the sensing type coordinated monostatic.

— If the Terminate All SBP Bistatic Sessions field is set to 1, then terminate all DMG SBP procedures using measurement sessions of the sensing type bistatic or coordinated bistatic.

— If the Terminate all SBP Multistatic Sessions field is set to 1, then terminate all DMG SBP procedures using measurement sessions of the sensing type multistatic.

— Otherwise, terminate the DMG SBP procedure identified with the DMG Measurement Session ID indicated in the DMG Measurement Session ID Indication field.

Issue of the primitives shall reset the DMG SBP procedure expiry timer to 0, respectively to the terminated DMG SBP procedure.

Upon expiry of the DMG SBP procedure expiry timer, the MLME of the SBP initiator or the SBP responder shall issue an MLME-DMG-SBPTERMINATION.confirm primitive to terminate the corresponding DMG SBP procedure.

If the SBP responder transmits a DMG SBP Termination frame or receives a DMG SBP Termination frame from the SBP initiator, or after the expiry of the DMG SBP procedure expiry timer, the SBP responder should terminate corresponding sensing measurement session(s) with all the sensing responders identified by the DMG Measurement Session ID(s) associated with the DMG sensing procedure(s) triggered by the terminated DMG SBP procedure(s).

12. Security

12.5 RSNA confidentiality and integrity protocols

12.5.2 CTR with CBC-MAC protocol (CCMP)

12.5.2.2 CCMP MPDU format

Replace Figure 12-15 with the following:

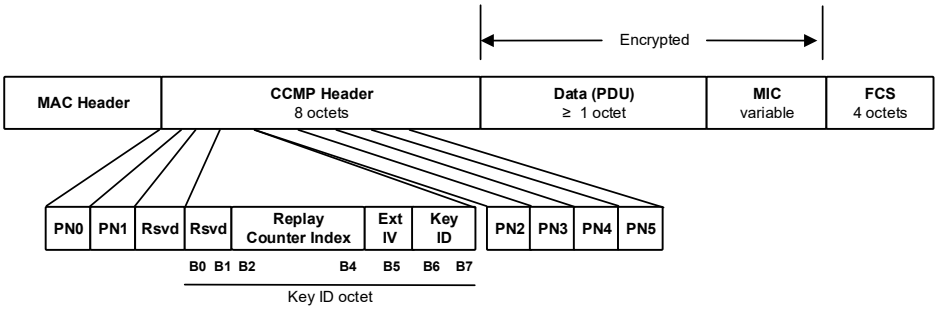

Figure 12-15—Expanded CCMP MPDU

Insert the following after the second paragraph below Figure 12-15 ("The third octet of the..."):

Bits 2–4 of the Key ID octet are for the Replay Counter Index subfield in a protected individually addressed Action frame that is a Protected Fine Timing frame or a Protected Sensing frame (see Table 9-81 and Table 12-2a). In other protected individually addressed frames, bits 2–4 are reserved.

Table 12-2a—Indication of Replay Counter Index subfield

B2 of Key ID octet	B3 of Key ID octet	B4 of Key ID octet	Indication in a protected individually addressed Action frame
0	0	0	Not a Protected Fine Timing frame nor a Protected Sensing frame
0	0	1	Protected Fine Timing frame
0	1	0	Protected Sensing frame
0	1	1	Reserved
1	0	0	Reserved
1	0	1	Reserved
1	1	0	Reserved
1	1	1	Reserved

Delete the fifth and sixth paragraphs below Figure 12-15 ("In a protected individually..." and "The remaining bits...").

12.5.2.4 CCMP decapsulation

12.5.2.4.4 PN and replay detection

Change items c) and d) as follows:

c) If management frame protection is negotiated, ~~the receiver shall set the MFPC bit on a given link to 1, it~~ the receiver shall maintain a single replay counter for received individually addressed robust PV0 Management frames ~~except Protected Fine Timing frames (see 9.6.34)~~ that are received with the To DS subfield equal to 0, except Protected Fine Timing frames (see 9.6.34) and Protected Sensing frames (see 9.6.39), and (S1G STA only) a single replay counter for received individually addressed robust PV1 Management frames ~~except Protected Fine Timing frames (see 9.6.34)~~.

NOTE 4—For Protected Fine Timing frames and Protected Sensing frames, PV1 Management frames are not applicable.

d) If dot11RSNAProtectedManagementFramesActivated is true and dot11QMFActivated is also true, the receiver shall maintain an additional replay counter for each ACI for received individually addressed robust PV0 Management frames ~~except Protected Fine Timing frames (see 9.6.34)~~ that are received with the To DS subfield equal to 1, except Protected Fine Timing frames (see 9.6.34) and Protected Sensing frames (see 9.6.39).

NOTE ~~4~~ 5—Separate replay counters for PV0 and PV1 Management frames allow for reordering between the two types. However, S1G STAs are required to use PV1 Management frames for individually addressed Action (and Action No Ack) frames when the peer is known to support them (see 10.57), so there is no issue with PV0 Action (and Action No Ack) frames. The other robust Management frames are Deauthentication and Disassociation frames, but reordering of a PV1 Action frame and a Deauthentication/Disassociation frame is not of much concern since the Action frame is not valid after deauthentication/disassociation.

NOTE ~~5~~ 6—QMF is not supported for PV1 Management frames (see 11.24.1.1).

Insert the following paragraph as item f) and modify the existing items f), g), h), i) into g), h), i), j):

f) If dot11RSNAProtectedManagementFramesActivated is true, the recipient shall maintain a separate replay counter for receiving individually addressed Protected Sensing frames (see 9.6.39) and shall use the PN from the received frame to detect replays.

Change item i) as follows:

i) If the receiver performs replay detection prior to decryption, then the receiver shall check that the replay counter used to detect replays is correct and discard the frame if incorrect. In particular, the separate replay counter for individually addressed Protected Fine Timing frames shall be used if ~~and only if~~ the ~~FTM~~ Replay Counter Index subfield of the CCMP Header (Figure 12-15) signals that the MPDU is a Protected Fine Timing frame; the separate replay counter for individually addressed Protected Fine Timing frames ~~it~~ shall not be used otherwise. The separate replay counter for individually addressed Protected Sensing frames shall be used if the Replay Counter Index subfield of the CCMP header (Figure 12-15) signals that the MPDU is a Protected Sensing frame; the separate replay counter for individually addressed Protected Sensing frames shall not be used otherwise.

12.5.4 GCM protocol (GCMP)

12.5.4.2 GCMP MPDU format

Replace Figure 12-28 with the following:

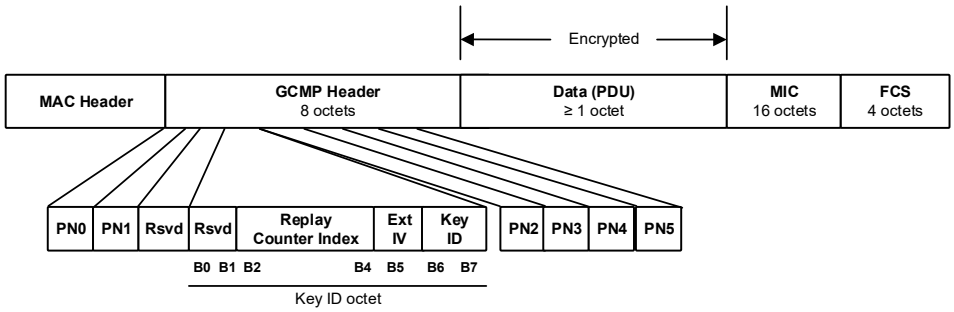

Figure 12-28—Expanded GCMP MPDU

Insert the following after the third paragraph below Figure 12-28 ("The third octet of the..."):

Bits 2–4 of the Key ID octet are for the Replay Counter Index subfield in a protected individually addressed Action frame that is a Protected Fine Timing frame or a Protected Sensing frame (see Table 9-81 and Table 12-2b). In other protected individually addressed frames, bits 2–4 are reserved.

Table 12-2b—Indication of Replay Counter Index subfield

B2 of Key ID octet	B3 of Key ID octet	B4 of Key ID octet	Indication in a protected individually addressed Action frame
0	0	0	Not a Protected Fine Timing frame nor a Protected Sensing frame
0	0	1	Protected Fine Timing frame
0	1	0	Protected Sensing frame
0	1	1	Reserved
1	0	0	Reserved
1	0	1	Reserved
1	1	0	Reserved
1	1	1	Reserved

Change the fourth paragraph below Figure 12-28 as follows:

Bits 6–7 of the Key ID octet are for the Key ID subfield. <u>The remaining bits of the Key ID octet are reserved.</u>

Delete the fifth paragraph below Figure 12-28 ("In a protected individually...").

12.5.4.4 GCMP decapsulation

12.5.4.4.4 PN and replay detection

Change items c) and d) as follows:

c) If management frame protection is negotiated, ~~the receiver shall set the MFPC bit on a given link to 1, it~~ the receiver shall maintain a single replay counter for received individually addressed robust PV0 Management frames ~~(except Protected Fine Timing frames (see 9.6.34)~~ that are received with the To DS subfield equal to 0, except Protected Fine Timing frames (see 9.6.34) and Protected Sensing frames (see 9.6.39) ~~and a single replay counter for received individually addressed robust PV1 Management frames except PV1 Protected Fine Timing frames (see 9.6.34)~~.

d) If dot11RSNAProtectedManagementFramesActivated is true and dot11QMFActivated is also true, the receiver shall maintain an additional replay counter for each ACI for received individually addressed robust Management frames ~~except Protected Fine Timing frames (see 9.6.34) and robust PV1 Management frames except Protected Fine Timing frames (see 9.6.34)~~ that are received with the To DS subfield equal to 1, except Protected Fine Timing frames (see 9.6.34) and Protected Sensing frames (see 9.6.39).

NOTE 3—PV1 frames are not supported with GCMP (see 12.5.4.1).

Insert the following paragraph as item f) and reletter the existing items f), g), h) to g), h), i):

f) If dot11RSNAProtectedManagementFramesActivated is true, the recipient shall maintain a separate replay counter for receiving individually addressed Protected Sensing frames (see 9.6.39) and shall use the PN from the received frame to detect replays.

Add the following item at the end of 12.5.4.4.4:

i) If the receiver performs replay detection prior to decryption, then the receiver shall check that the replay counter used to detect replays is correct and discard the frame if incorrect. In particular, the separate replay counter for individually addressed Protected Fine Timing frames shall be used if the Replay Counter Index subfield of the GCMP header (Figure 12-28) signals that the MPDU is a Protected Fine Timing frame; the separate replay counter for individually addressed Protected Fine Timing frames shall not be used otherwise. The separate replay counter for individually addressed Protected Sensing frames shall be used if the Replay Counter Index subfield of the GCMP header (Figure 12-28) signals that the MPDU is a Protected Sensing frame; the separate replay counter for individually addressed Protected Sensing frames shall not be used otherwise.

26. High-efficiency (HE) MAC specification

26.5 MU operation

26.5.2 UL MU operation

26.5.2.5 UL MU CS mechanism

Insert the following paragraph at the end of 26.5.2.5:

An AP that transmits a Sensing Trigger frame shall set the CS Required subfield to 1 unless one of the following conditions is met:

— The Sensing Trigger frame is of subvariant Sensing Polling, SR2SI Sounding, or SR2SR Sounding.

— The Sensing Trigger frame is of subvariant Sensing Reporting or Sensing Threshold-Based Reporting and the UL Length subfield in the Common Info field of the Trigger frame is less than or equal to 418.

27. High-efficiency (HE) PHY specification

27.2 HE PHY service interface

27.2.2 TXVECTOR and RXVECTOR parameters

Insert the following rows into Table 27-1:

Table 27-1—TXVECTOR and RXVECTOR parameters

Parameter	Condition	Value	TXVECTOR	RXVECTOR
CSI_ESTIMATE	FORMAT is either HE_SU or HE_TB, and PSDU_LENGTH is 0	Contains an array of CSI values based on the channel measured during the training symbols of the received HE Ranging NDP or HE TB Ranging NDP (see 9.4.1.81.2). The number of complex elements is $N_{RX} \times N_{TX} \times N_{SC}$, where N_{RX} is the number of receive chains, N_{TX} is the number of transmit chains, and N_{SC} is the total number of subcarriers (see Table 9-129l).	N	Y
	Otherwise	Not present.	N	N
RX_OP_Gain_Type	FORMAT is either HE_SU or HE_TB, and PSDU_LENGTH is 0	Indicates the type of values contained in Rx_OP_Gain_Index. Set to 0 to indicate neither Rx operating point index nor Rx gain index is contained in Rx_OP_Gain_Index. Set to 1 to indicate the Rx operating point index is contained in Rx_OP_Gain_Index. Set to 2 to indicate the Rx gain index is contained in Rx_OP_Gain_Index. The value of 3 is reserved. See Table 9-129h.	N	Y
	Otherwise	Not present.	N	N
RX_OP_Gain_Index	FORMAT is either HE_SU or HE_TB, and PSDU_LENGTH is 0	Contains N_{RX} values indicating Rx operating point index or Rx gain index associated with CSI measurement. See Table 9-129k.	N	Y
	Otherwise	Not present.	N	N

28. Enhanced directional multi-gigabit (EDMG) PHY specification

28.2 EDMG PHY service interface

28.2.2 TXVECTOR and RXVECTOR parameters

Insert the following rows in Table 28-1:

Table 28-1—TXVECTOR and RXVECTOR parameters

Parameter	Condition	Value	TXVECTOR	RXVECTOR
EDMG_MS_SENSING	FORMAT is EDMG, EDMG_MODULATION is EDMG_SC_MODE, NUM_USERS is 1, NUM_STS is 1	Set to 1 to indicate that the PPDU is an EDMG multistatic sensing PPDU. Set to 0 otherwise.	Y	N
	Otherwise	Not present	N	N
EDMG_MS_SENSING_N-STA	FORMAT is EDMG, EDMG_MS_SENSING is 1.	Set to the number of Sync subfields in this EDMG multistatic sensing PPDU.	Y	N
	Otherwise	Not present	N	N
EDMG_SENS_MULTIPLE_GO-LAY	FORMAT is EDMG, EDMG_MODULATION is EDMG_SC_MODE, NUM_USERS is 1, NUM_STS is 1	Set to 1 to indicate that the multiple Golay sequences option is used in this PPDU.	Y	Y
	Otherwise	Not present	N	N

Table 28-1—TXVECTOR and RXVECTOR parameters *(continued)*

Parameter	Condition	Value	TXVECTOR	RXVECTOR
EDMG_SENS_GOLAY_INDEX	EDMG_SENS_MULTIPLE_GOLAY is present and set to 1.	Set to an integer value between 1 and 8 to indicate the Golay sequence index to be used in the TRN field.	Y	Y
	Otherwise	Not present	N	N

28.3 Common parameters

28.3.3 EDMG preamble

28.3.3.3 EDMG portion of EDMG format preamble

28.3.3.3.2 EDMG-Header-A definition

28.3.3.3.2.3 Definition for EDMG SC mode and EDMG OFDM mode PPDUs

Replace the last row of Table 28-13 with the following rows:

Table 28-13—EDMG-MCS field definition if the Number of SS field is 0

Subfield	Number of bits	Start bit	Description
Multistatic Sensing	1	9	Corresponds to TXVECTOR parameter MG_MS_SENSING. Set to 1 to indicate that the PPDU is an EDMG multistatic sensing PPDU. Set to 0 otherwise.
Multistatic Sensing NSTA	3	10	Corresponds to TXVECTOR parameter EDMG_MS_SENSING_NSTA. Set to the number of Sync subfields in this EDMG multistatic sensing PPDU.
Sense Multiple Golay	1	13	Corresponds to TXVECTOR parameter EDMG_SENS_MULTIPLE_GOLAY. Set to 1 to indicate that the Golay sequences used in the TRN field are based on sequence index specified in the Sense Golay Index field.

Table 28-13—EDMG-MCS field definition if the Number of SS field is 0 *(continued)*

Subfield	Number of bits	Start bit	Description
Sense Golay Index	3	14	Corresponds to TXVECTOR parameter EDMG_SENS_GOLAY_INDEX. Indicates the index of the Golay sequences to be used in the TRN field.
Reserved	4	17	

28.9 EDMG beamforming

28.9.2 Beam refinement

28.9.2.2 EDMG BRP PPDU

28.9.2.2.6 TRN subfield definition for EDMG SC PPDUs and EDMG control mode PPDUs

Insert the following text as the fourth paragraph in 28.9.2.2.6 (before the paragraph that starts with "If the TRN_BL × N_{CB} length is equal to 64...")

If the EDMG_SENS_MULTIPLE_GOLAY TX_VECTOR parameter is equal to 1, the basic SC TRN sub-field waveform for the first and only transmit chain in time domain is defined as

$$r^{i_G}{}_{TRN\_BASIC}\left(q\frac{T_c}{N_{CB}}\right) = (Ga^{i_G}{}_{TRN\_BL\times N_{CB}}(q) - Gb^{i_G}{}_{TRN\_BL\times N_{CB}}(q - TRN\_BL \times N_{CB}) +$$
$$Ga^{i_G}{}_{TRN\_BL\times N_{CB}}(q - 2\times TRN\_BL \times N_{CB}) + Gb^{i_G}{}_{TRN\_BL\times N_{CB}}(q - 3\times TRN\_BL \times N_{CB}) +$$
$$Ga^{i_G}{}_{TRN\_BL\times N_{CB}}(q - 4\times TRN\_BL \times N_{CB}) - Gb^{i_G}{}_{TRN\_BL\times N_{CB}}(q - 5\times TRN\_BL \times N_{CB}))$$

where i_G is the value of the TX_VECTOR parameter EDMG_SENS_GOLAY_INDEX.

Insert the following subclauses at the end of 28.9:

28.9.4 EDMG multistatic sensing PPDU structure

28.9.4.1 General

EDMG multistatic sensing PPDUs are used for multistatic sensing. EDMG multistatic sensing is defined for single space-time stream ($i_{STS} = 1$) EDMG SC PPDUs only.

28.9.4.2 EDMG multistatic sensing PPDU structure

An EDMG multistatic sensing PPDU is an EDMG BRP PPDU in which a Sync field is inserted between the data field and the TRN field. The Sync field includes two or more Sync subfields and a Sync PAD subfield. The structure of an EDMG multistatic sensing PPDU is shown in Figure 28-48a.

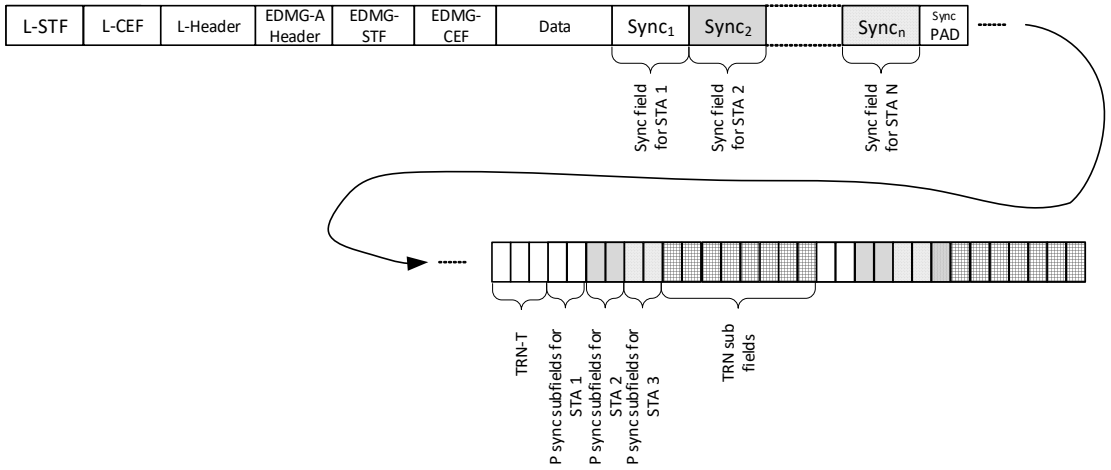

Figure 28-48a—EDMG multistatic sensing PPDU structure

An EDMG multistatic sensing PPDU enables sensing by N_{STA} STAs using the same PPDU, where N_{STA} is given by the Multistatic Sensing NSTA field within the EDMG-Header-A. If sensing is performed on a 4.32 GHz, 6.48 GHz, or 8.64 GHz channel, the Sync field and the TRN field in the EDMG multistatic sensing PPDU shall occupy 2, 3, or 4 contiguous 2.16 GHz channels, respectively.

NOTE—A STA that participates in a DMG sensing measurement exchange of the DMG sensing type multistatic as a sensing receiver may ignore all the PPDU fields preceding the Sync field and use its intended Sync subfield for synchronization.

28.9.4.3 EDMG multistatic sensing PPDU header fields

An EDMG multistatic sensing PPDU is indicated by setting the Multistatic Sensing field within the EDMG-Header-A to 1. The number of Sync fields in the PPDU is indicated by the Multistatic Sensing NSTA field within the EDMG-Header-A.

The PSDU Length field and the EDMG MCS field shall be set to values such that the duration of the Data field T_{DATA}, as interpreted from the EDMG-A header of the PPDU (see 28.12.3.3) by an EDMG STA unaware of the Multistatic Sensing field is equal to the duration of the Data field plus the duration of the Sync field (see 28.12.3.3) in the EDMG multistatic sensing PPDU.

The value set in the PSDU Length field is $PSDU\_LENGTH + SYNC\_LENGTH$, where $PSDU\_LENGTH$ is the length of PSDU data in octets and $SYNC\_LENGTH$ is the length of data in octets that can generate an integer number N_{blk_SYNC} of SC symbol blocks with the same length as the Sync field.

The number of codewords, N_{CW_SYNC}, corresponding to N_{blk_SYNC} SC symbol blocks is

$$N_{CW\_SYNC} = (512 - N_{GI}) \times N_{blk\_SYNC} \times N_{CBPS} \times N_{CB} / L_{CW}$$

where N_{GI}, N_{CBPS}, N_{CB}, and L_{CW} are the GI length, coded bit per modulation symbol, number of bounded channels, and codeword length, respectively.

$$SYNC\_LENGTH = N_{CW\_SYNC} \times (L_{CW}/\rho) \times (R/8)$$

where R is the code rate and ρ is the repetition factor.

The fields RX TRN-Units Per Each TX TRN-Unit, EDMG TRN-Unit P, EDMG TRN-Unit M, and EDMG TRN-Unit N are used in the same way as in an EDMG BRP frame (see 28.9.2.2.3). However, the $(N_{STA} - 1) \times P$ TRN subfields which are of the EDMG TRN-Unit M are used in a different way, as defined in 28.9.4.5, where N_{STA} and P have the values in the Multistatic Sensing NSTA and EDMG TRN-Unit P fields within the EDMG-Header-A, respectively. The EDMG TRN-Unit P and EDMG TRN-Unit M (M) fields are set so that $(N_{STA} - 1) \times P < M$.

The EDMG TRN Length field is used to indicate the length of the TRN field. The DMG TRN Length is set to the value used to describe the TRN field (number of TRN-Units).

The Beam Tracking Request field and the EDMG Beam Tracking Request field within the EDMG-Header-A of an EDMG multistatic sensing PPDU shall be set to 0.

Bits B37 and B46 of the L-Header shall be set to 1 to indicate an EDMG A-MPDU.

28.9.4.4 EDMG multistatic sensing PPDU Sync field

28.9.4.4.1 General

The EDMG multistatic sensing PPDU Sync field is composed of N_{Sync} Sync subfields followed by a Sync pad subfield.

28.9.4.4.2 Sync subfield definition

Each Sync subfield is composed of 18 Golay sequences. Sync subfields intended to be used by different STAs use different rows from the matrix $M(r, c)$ defined in Table 28-75a. The index r corresponds to the STA ID that each STA is assigned in the DMG Sensing Request frame at the beginning of the multistatic EDMG sensing measurement exchange.

Table 28-75a—Coefficient matrix for EDMG multistatic sensing Sync field

$M(:,0)$	$M(:,1)$	$M(:,2)$	$M(:,3)$	$M(:,4)$	$M(:,5)$	$M(:,6)$	$M(:,7)$
1	–1	1	–1	1	1	1	1
1	–1	1	–1	1	1	1	1
1	1	–1	–1	1	–1	–1	1
1	1	–1	–1	1	–1	–1	1
–1	1	–1	1	1	1	1	1
–1	1	–1	1	1	1	1	1
1	–1	–1	1	–1	–1	1	1
1	–1	–1	1	–1	–1	1	1

The structure of a Sync subfield is shown in Figure 28-48b and is defined in Equation (28-1a).

$$
\begin{aligned}
r_{Sync}\left(q\frac{T_c}{N_{CB}}\right) = & \sum_{k=0}^{7} -M(r,7)\times Gj^{p}{}_{TRN_{BL}\times N_{CB}}(q-(k\times TRN\_BL\times N_{CB})) \\
& + M(r,7)\times Gj^{p}{}_{TRN_{BL}\times N_{CB}}(q-(8\times TRN\_BL\times N_{CB})) \\
& + \sum_{k=0}^{3} M(r,2k)\times Gi^{p}{}_{TRN_{BL}\times N_{CB}}(q-((2k+9)\times TRN\_BL\times N_{CB})) \\
& + \sum_{k=0}^{3} M(r,2k+1)\times Gj^{p}{}_{TRN_{BL}\times N_{CB}}(q-((2k+10)\times TRN\_BL\times N_{CB})) \\
& + M(r,0)\times Gi^{p}{}_{TRN_{BL}\times N_{CB}}(q-(17\times TRN\_BL\times N_{CB}))
\end{aligned}
\tag{28-1a}
$$

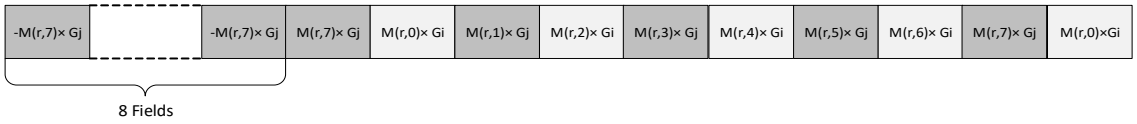

Figure 28-48b—Sync subfield structure

For $r = 1, 3, 5,$ and 7, p is set to 7; and for $r = 2, 4, 6,$ and 8, p is set to 8. For $r = 1, 2, 3,$ and 4, $G_j = G_b$ and $G_i = G_a$; and for $r = 5, 6, 7,$ and 8, $G_j = G_a$ and $G_i = G_b$.

The pairs of Golay complementary sequences $(Ga^{p}_{128}, Gb^{p}_{128})$, $(Ga^{p}_{256}, Gb^{p}_{256})$, $(Ga^{p}_{384}, Gb^{p}_{384})$, $(Ga^{p}_{512}, Gb^{p}_{512})$, $(Ga^{p}_{768}, Gb^{p}_{768})$, and $(Ga^{p}_{1024}, Gb^{p}_{1024})$ are defined in 28.10.

The k^{th} Sync subfield is transmitted using an AWV optimized for reception by the k^{th} STA.

28.9.4.4.3 Sync pad definition

The Sync pad subfield is composed of N_{pad} $Ga^{7}{}_{TRN\_BL\times N_{CB}}$ sequences such that $N_{blk\_SYNC} = TRN\_BL\times(N_{pad}+N_{STA}\times L_{SYNC})/512$ is the smallest integer resulting in an integer value of $SYNC\_LENGTH$ in octets (see 28.9.4.3). L_{SYNC} is equal to 18.

28.9.4.5 TRN field for EDMG multistatic sensing PPDU

The TRN field of an EDMG multistatic sensing PPDU is identical to the TRN field of an EDMG BRP-TX or BRP-RX/TX PPDU, as defined in 28.9.2.2.5, with the exception that instead of P TRN subfields transmitted with the AWV used to transmit the data field of the PPDU, we have $N_{STA}\times P$ TRN subfields in which the k^{th} set of P TRN subfields are transmitted with an AWV used to transmit the k^{th} Sync subfield. $M-((N_{STA}-1)\times P)$ TRN subfields are transmitted using AWV selected by the sensing transmitter to represent its TX beams.

28.9.5 DMG monostatic sensing PPDU

As described in Annex AB, any DMG PPDU or EDMG PPDU may be used for monostatic sensing.

This subclause proposes wider constraints on the waveform used in the TRN field of PPDU used for monostatic sensing.

Any waveform may be used in the TRN field of a DMG monostatic sensing PPDU if the following constraints are met:

a) The length of the waveform shall be equal or shorter than the length of a TRN field declared in the Header field or EDMG-Header-A field.

b) The power of the waveform shall be less than or equal to the power of a TRN field averaged over each $128 \times T_c$ period.

c) The spectral density of the waveform, averaged over 10 MHz bandwidth, shall be less than or equal to the spectral density of a TRN field.

d) The waveform shall comply with the same transmit mask (or be lower) as the mask complied by the preamble and data fields of the PPDU (see 20.3.2 and 28.3.5).

e) The waveform does not contain more than 6 consecutive sequences Ga_{128}^{1} and no more than 6 consecutive sequences Gb_{128}^{1}.

EDMG PPDUs may be used in the parallel mode of coordinated DMG monostatic sensing. The TRN field of EDMG SC PPDUs (see 28.9.2.2.6) may be used as the waveforms of the TRN field of a coordinated DMG monostatic sensing PPDU. Each responder in the parallel mode of coordinated DMG monostatic sensing may be assigned with a unique TRN subfield waveform for EDMG SC PPDUs.

28.12 EDMG PLME

28.12.3 TXTIME calculation

28.12.3.3 TXTIME calculation for EDMG SC mode

Insert the following paragraph between the first ($T_{Data} = (N_{BLKS} \times 512 + N_{GI}) \times$ aDMGChipTimeDuration μs) and second ("If the NUM_USERS parameter is equal to 1, the CH_BANDWIDTH parameter...") paragraphs of 28.12.3.3:

If EDMG_MS_SENSING is equal to 1, $T_{Data} = (N_{BLKS} \times 512 + N_{GI}) \times$ aDMGChipTimeDuration $+ (N_{STA} \times L_{SYNC} + N_{pad}) \times T_{Golay}$, where N_{STA} is the value of EDMG_MS_SENSING_NSTA, $T_{Golay} = 128 \times$ aDMGChipTimeDuration, and N_{pad} and L_{SYNC} are defined in 28.9.4.4.3.

35. Extremely high throughput (EHT) MAC specification

35.3 Multi-link operation (MLO)

35.3.14 MLD individually addressed Management frame delivery

35.3.14.1 General

Insert the following text at the end of the first paragraph of 35.3.14.1:

— Public Action Sensing Measurement Report frame

— Protected Sensing Measurement Report frame

36. Extremely high throughput (EHT) PHY specification

36.2 EHT PHY service interface

36.2.2 TXVECTOR and RXVECTOR parameters

Insert the following rows into Table 36-1:

Table 36-1—TXVECTOR and RXVECTOR parameters

Parameter	Condition	Value	TXVECTOR	RXVECTOR
CSI_ESTIMATE	FORMAT is EHT_MU, PSDU_LENGTH is 0, and CH_BANDWIDTH is either CBW320-1 or CBW320-2	Contains an array of CSI values based on the channel measured during the training symbols of the received EHT Ranging NDP or EHT TB Ranging NDP (see 9.4.1.81.2). The number of complex elements is $N_{RX} \times N_{TX} \times N_{SC}$, where N_{RX} is the number of receive chains, N_{TX} is the number of transmit chains, and N_{SC} is the total number of subcarriers (see Table 9-129l).	N	Y
	Otherwise	Not present.	N	N
RX_OP_Gain_Type	FORMAT is EHT_MU, PSDU_LENGTH is 0, and CH_BANDWIDTH is either CBW320-1 or CBW320-2	Indicates the type of values contained in Rx_OP_Gain_Index. Set to 0 to indicate neither Rx operating point index nor Rx gain index is contained in Rx_OP_Gain_Index. Set to 1 to indicate the Rx operating point index is contained in Rx_OP_Gain_Index. Set to 2 to indicate the Rx gain index is contained in Rx_OP_Gain_Index. The value of 3 is reserved. See Table 9-129h.	N	Y
	Otherwise	Not present.	N	N
RX_OP_Gain_Index	FORMAT is EHT_MU, PSDU_LENGTH is 0, and CH_BANDWIDTH is either CBW320-1 or CBW320-2	Contains N_{RX} values indicating Rx operating point index or Rx gain index associated with CSI measurement. See Table 9-129k.	N	Y
	Otherwise	Not present.	N	N

Annex B

(normative)

Protocol Implementation Conformance Statement (PICS) proforma

B.2 Abbreviations and special symbols

B.2.2 General abbreviations for Item and Support columns

Insert the following abbreviations (maintaining alphabetical order):

WS Wireless sensing

B.4 PICS proforma—IEEE Std 802.11-2024

B.4.3 IUT configuration

Insert the following rows at the end of the table:

Item	IUT configuration	References	Status	Support
*CFSSTA	Sensing STA	11.55.1.2	CFHE: O CFEHT: O	Yes ☐ No ☐
*CFDSSTA	DMG sensing STA	11.55.3.2	CFDMG: O	Yes ☐ No ☐
*CFDSPASS	DMG passive sensing STA	11.55.3.9	CFDMG: O	Yes ☐ No ☐

B.4.4 MAC protocol

B.4.4.1 MAC protocol capabilities

Insert the following rows at the end of the table (maintaining item order):

Item	Protocol capabilities	References	Status	Support
	Are the following MAC protocol capabilities supported?			
…	…	…	…	…
PC50	Support for the role of sensing initiator in a sensing procedure	11.55.1	CFSSTA: M	Yes ☐ No ☐
PC51	Support for the role of sensing responder in a sensing procedure	11.55.1	CFSSTA: M	Yes ☐ No ☐

Item	Protocol capabilities	References	Status	Support
*PC52	Support for the SR2SR variant of a TF sounding phase	11.55.1.5.2.5	CFSSTA: O	Yes ☐ No ☐
*PC53	Support for threshold-based reporting phase	11.55.1.5.2.6.2	CFSSTA: O	Yes ☐ No ☐
PC54	Support for sensing measurement session termination	11.55.1.6	CFSSTA: M	Yes ☐ No ☐
*PC55	Support for the role of SBP initiator in an SBP procedure	11.55.2	CFSSTA: O	Yes ☐ No ☐
*PC56	Support for the role of SBP responder in an SBP procedure	11.55.2	CFSSTA: O	Yes ☐ No ☐
PC57	Support for the role of sensing initiator in a DMG sensing procedure	11.55.3	CFDSSTA: M	Yes ☐ No ☐
PC58	Support for the role of sensing responder in a DMG sensing procedure	11.55.3	CFDSSTA: M	Yes ☐ No ☐
*PC59	Support for coordinated monostatic DMG sensing	11.55.3.6.2	(CFDSSTA AND NOT (PC60 OR PC62)): M (CFDSSTA AND (PC60 OR PC62)): O	Yes ☐ No ☐
*PC60	Support for bistatic DMG sensing	11.55.3.6.3	(CFDSSTA AND NOT (PC59 OR PC62)): M (CFDSSTA AND (PC59 OR PC62)): O	Yes ☐ No ☐
PC60.1	Support for bistatic DMG sensing as a sensing transmitter	11.55.3.6.3	(PC60 AND NOT PC60.2): M (PC60 AND PC60.2): O	Yes ☐ No ☐
PC60.2	Support for bistatic DMG sensing as a sensing receiver	11.55.3.6.3	(PC60 AND NOT PC60.1): M (PC60 AND PC60.1): O	Yes ☐ No ☐
*PC61	Support for coordinated bistatic DMG sensing	11.55.3.6.4	(CFDSSTA AND PC60): O	Yes ☐ No ☐
*PC61.1	Support for coordinated bistatic DMG sensing as a sensing transmitter	11.55.3.6.4	(PC61 AND NOT PC61.2): M (PC61 AND PC61.2): O	Yes ☐ No ☐
*PC61.2	Support for coordinated bistatic DMG sensing as a sensing receiver	11.55.3.6.4	(PC61 AND NOT PC61.1): M (PC61 AND PC61.1): O	Yes ☐ No ☐

Item	Protocol capabilities	References	Status	Support
*PC62	Support for EDMG multistatic sensing	11.55.3.6.5	(CFDSSTA AND NOT (PC59 OR PC60): M (CFDSSTA AND (PC59 OR PC60): O	Yes ☐ No ☐
PC63	Support for DMG sensing measurement termination	11.55.3.8	CFDSSTA: M	Yes ☐ No ☐
PC64	Support for DMG passive sensing	11.55.3.9	CFDSPASS: M	Yes ☐ No ☐
*PC65	Support for the role of SBP initiator in a DMG SBP procedure	11.55.4	CFDSSTA: O	Yes ☐ No ☐
*PC66	Support for the role of SBP responder in a DMG SBP procedure	11.55.4	CFDSSTA: O	Yes ☐ No ☐

B.4.4.2 MAC frames

Insert the following rows at the end of the table (maintaining item order):

Item	MAC frame	References	Status	Support
	Is transmission of the following MAC frames supported?	Clause 9		
…	…	…	…	…
FT78	(Protected) Sensing Measurement Request frame	9.6.7.56	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FT79	(Protected) Sensing Measurement Response frame	9.6.7.57	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FT80	Sensing Measurement Report frame	9.6.7.58	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FT81	(Protected) Sensing Measurement Termination frame	9.6.7.59	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FT82	(Protected) Sensing Measurement Query frame	9.6.7.60	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FT83	(Protected) SBP Request frame	9.6.7.61	PC55: M	Yes ☐ No ☐ N/A ☐
FT84	(Protected) SBP Response frame	9.6.7.62	PC56: M	Yes ☐ No ☐ N/A ☐
FT85	(Protected) SBP Termination frame	9.6.7.63	(PC55 OR PC56): M	Yes ☐ No ☐ N/A ☐
FT86	DMG Sensing Measurement Request frame	9.6.21.8	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FT87	DMG Sensing Measurement Response frame	9.6.21.9	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FT88	DMG Sensing Measurement Report frame	9.6.21.10	CFDSSTA: M	Yes ☐ No ☐ N/A ☐

Item	MAC frame	References	Status	Support
FT89	DMG Sensing Measurement Termination frame	9.6.21.11	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FT90	DMG SBP Request frame	9.6.21.12	PC65: M	Yes ☐ No ☐ N/A ☐
FT91	DMG SBP Response frame	9.6.21.13	PC66: M	Yes ☐ No ☐ N/A ☐
FT92	DMG SBP Report frame	9.6.21.14	PC66: M	Yes ☐ No ☐ N/A ☐
FT93	DMG SBP Termination frame	9.6.21.15	(PC65 OR PC66): M	Yes ☐ No ☐ N/A ☐
FT94	DMG Sensing Request frame	9.3.1.26	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FT95	DMG Sensing Response frame	9.3.1.26	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FT96	DMG Sensing Poll frame	9.3.1.26	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
…	…	…	…	…
	Is reception of the following MAC frames supported?	Clause 9		
…	…	…	…	…
FR79	(Protected) Sensing Measurement Request frame	9.6.7.56	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FR80	(Protected) Sensing Measurement Response frame	9.6.7.57	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FR81	Sensing Measurement Report frame	9.6.7.58	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FR82	(Protected) Sensing Measurement Termination frame	9.6.7.59	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FR83	(Protected) Sensing Measurement Query frame	9.6.7.60	CFSSTA: M	Yes ☐ No ☐ N/A ☐
FR84	(Protected) SBP Request frame	9.6.7.61	PC56: M	Yes ☐ No ☐ N/A ☐
FR85	(Protected) SBP Response frame	9.6.7.62	PC55: M	Yes ☐ No ☐ N/A ☐
FR86	(Protected) SBP Termination frame	9.6.7.63	(PC55 OR PC56): M	Yes ☐ No ☐ N/A ☐
FR87	DMG Sensing Measurement Request frame	9.6.21.8	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FR88	DMG Sensing Measurement Response frame	9.6.21.9	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FR89	DMG Sensing Measurement Report frame	9.6.21.10	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FR90	DMG Sensing Measurement Termination frame	9.6.21.11	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FR91	DMG SBP Request frame	9.6.21.12	PC66: M	Yes ☐ No ☐ N/A ☐
FR92	DMG SBP Response frame	9.6.21.13	PC65: M	Yes ☐ No ☐ N/A ☐

Item	MAC frame	References	Status	Support
FR93	DMG SBP Report frame	9.6.21.14	(PC65 OR PC66): M	Yes ☐ No ☐ N/A ☐
FR94	DMG SBP Termination frame	9.6.21.15	(PC65 OR PC66): M	Yes ☐ No ☐ N/A ☐
FR95	DMG Sensing Request frame	9.3.1.26	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FR96	DMG Sensing Response frame	9.3.1.26	CFDSSTA: M	Yes ☐ No ☐ N/A ☐
FR97	DMG Sensing Poll frame	9.3.1.26	CFDSSTA: M	Yes ☐ No ☐ N/A ☐

Insert the following new subclause at the end of subclause B.4:

B.4.41 Wireless sensing (WS) features

B.4.41.1 WS MAC features

Item	Protocol capability	References	Status	Support
	Are the following MAC protocol features supported?			
WS1	TB sensing	11.55.1.5.2	CFSSTA: M	Yes ☐ No ☐ N/A ☐
WS2	non-TB sensing	11.55.1.5.3	CFSSTA: M	Yes ☐ No ☐ N/A ☐
WS3	SR2SR sensing	11.55.1.5.2.5	PC52: M	Yes ☐ No ☐ N/A ☐
*WS4	Sensing reporting	11.55.1.5.2.6	CFSSTA: M	Yes ☐ No ☐ N/A ☐
WS5	Basic sensing reporting	11.55.1.5.2.6.1	WS4: M	Yes ☐ No ☐ N/A ☐
WS6	Threshold-based reporting	11.55.1.5.2.6.2	PC53: M	Yes ☐ No ☐ N/A ☐
WS7	Sensing measurement session termination	11.55.1.6	CFSSTA: M	Yes ☐ No ☐ N/A ☐
*WS8	SBP	11.55.2	CFSSTA: O	Yes ☐ No ☐ N/A ☐
WS9	SBP Reporting	11.55.2.3	WS8: M	Yes ☐ No ☐ N/A ☐
WS10	SBP Termination	11.55.2.4	WS8: M	Yes ☐ No ☐ N/A ☐
WS11	DMG passive sensing	11.55.3.9	CFDSPASS: O	Yes ☐ No ☐ N/A ☐
WS12	Sequential coordinated monostatic DMG sensing	11.55.3.6.2.2	CFDSSTA: O	Yes ☐ No ☐ N/A ☐
WS13	Parallel coordinated monostatic DMG sensing	11.55.3.6.2.3	PC59: M	Yes ☐ No ☐ N/A ☐
WS14	Bistatic DMG sensing	11.55.3.6.3	PC60: M	Yes ☐ No ☐ N/A ☐
WS15	Coordinated bistatic DMG sensing	11.55.3.6.4	PC61: M	Yes ☐ No ☐ N/A ☐

Item	Protocol capability	References	Status	Support
WS16	Multistatic EDMG sensing	11.55.3.6.5	PC62: M	Yes ☐ No ☐ N/A ☐
WS17	DMG SBP	11.55.4	(PC65 OR PC66):M	Yes ☐ No ☐ N/A ☐

B.4.41.2 WS PHY features

Item	Protocol capability	References	Status	Support
	Are the following PHY protocol features supported?			
WSP1	EDMG multistatic sensing PPDU	28.9.4	CFDSSTA: O	Yes ☐ No ☐ N/A ☐

Annex C

(normative)

ASN.1 encoding of the MAC and PHY MIB

C.3 MIB Detail

Change the comment list following the dot11smt definition as follows (not all lines shown):

```
-- ****************************************************************
-- * Major sections
-- ****************************************************************

--  Station ManagemenT (SMT) Attributes
    --  DEFINED AS "The SMT object class provides the necessary support
    --  at the station to manage the processes in the station such that
    --  the station may work cooperatively as a part of an IEEE 802.11
    --  network."

   dot11smt OBJECT IDENTIFIER ::= { ieee802dot11 1 }
   --  dot11smt GROUPS
   --  ...
   --  dot11EHTStationConfigTable                    ::= ( dot11smt 46 )
   --  dot11EHTPPEThresholdsMappingsTable            ::= ( dot11smt 47 )
   --  dot11EBCSTrafficStreamTable                   ::= ( dot11smt 48 )
   --  dot11SENSStationConfigTable                   ::= ( dot11smt 49 )
```

Insert the following at the end of the dot11StationConfig TABLE:

```
-- ****************************************************************
-- * dot11SENSStationConfigTable TABLE
-- ****************************************************************
dot11SENSStationConfigTable OBJECT-TYPE
   SYNTAX SEQUENCE OF Dot11SENSStationConfigEntry
   MAX-ACCESS not-accessible
   STATUS current
   DESCRIPTION
      "Station Configuration attributes. In tabular form to allow for multiple
      instances on an agent."
   ::= { dot11smt 49 }

dot11SENSStationConfigEntry OBJECT-TYPE
   SYNTAX Dot11SENSStationConfigEntry
   MAX-ACCESS not-accessible
   STATUS current
   DESCRIPTION
      "An entry (conceptual row) in the dot11SENSStationConfig Table.
      ifIndex - Each IEEE 802.11 interface is represented by an ifEntry. Inter-
      face tables in this MIB module are indexed by ifIndex."
   INDEX { ifIndex }
   ::= { dot11SENSStationConfigTable 1 }

Dot11SENSStationConfigEntry::= SEQUENCE
   {
      dot11SensingImplemented,                          TruthValue
      dot11SBPImplemented,                              TruthValue
```

```
        dot11DMGSensingMsmtImplemented,                    TruthValue
        dot11DMGSBPImplemented,                            TruthValue
        dot11APRequiresPMFActivated,                       Integer
    }

dot11SensingImplemented OBJECT-TYPE
    SYNTAX TruthValue
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This is a capability variable. Its value is determined by device capabil-
        ities.

        This attribute, when true, indicates that the STA is a sensing STA. This
        attribute, when false, indicates the STA is not a sensing STA. The default
        value of this attribute is false."
    DEFVAL { false }
    ::= { dot11SENSStationConfigEntry 1 }

dot11SBPImplemented OBJECT-TYPE
    SYNTAX TruthValue
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This is a capability variable. Its value is determined by device capabil-
        ities.

        This attribute, when true, indicates that the STA supports SBP. This
        attribute, when false, indicates the STA does not support SBP. The default
        value of this attribute is false."
    DEFVAL { false }
    ::= { dot11SENSStationConfigEntry 2 }

dot11DMGSensingMsmtImplemented OBJECT-TYPE
    SYNTAX TruthValue
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This is a capability variable. Its value is determined by device capabil-
        ities.

        This attribute, when true, indicates that the STA supports DMG sensing.
        This attribute, when false, indicates the STA does not support DMG sens-
        ing. The default value of this attribute is false."
    DEFVAL { false }
    ::= { dot11SENSStationConfigEntry 3 }

dot11DMGSBPImplemented OBJECT-TYPE
    SYNTAX TruthValue
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This is a capability variable. Its value is determined by device capabil-
        ities.

        This attribute, when true, indicates that the STA supports DMG SBP. This
        attribute, when false, indicates the STA does not support DMG SBP. The
        default value of this attribute is false."
    DEFVAL { false }
    ::= { dot11SENSStationConfigEntry 4 }

dot11APRequiresPMFActivated OBJECT-TYPE
```

```
SYNTAX INTEGER {inactive (0), requiredX20M (1), required (2)}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
   "This is a control variable.
   It is written by an external management entity or the SME.
   Changes take effect at the next occurrence of an MLME-START.request or
   MLME-JOIN.request primitive.
   The attribute applies only to preassociation sensing behavior.
   If set to required (2), indicates that the station requires management
   frame protection for all sensing frames exchanged during the sensing capa-
   bility exchange (see 11.55.1.3), establishment of a sensing measurement
   session (see 11.55.1.4), setup exchange of an SBP procedure (see
   11.55.2.2) and sensing measurement reporting (see 11.55.1.5.2.6.1,
   11.55.1.5.2.6.2, 11.55.1.5.3.3 and 11.55.2.3).
   If set to requiredX20M (1), indicates that the station management frame
   protection for all sensing frames exchanged during the sensing capability
   exchange (see 11.55.1.3), establishment of a sensing measurement session
   (see 11.55.1.4), setup exchange of an SBP procedure (see 11.55.2.2) and
   sensing measurement reporting (see 11.55.1.5.2.6.1, 11.55.1.5.2.6.2,
   11.55.1.5.3.3, and 11.55.2.3) except those using a 20 MHz bandwidth for
   measurements.
   Otherwise, if set to inactive (0), indicates that management frame protec-
   tion during sensing capability exchange, establishment of a sensing mea-
   surement session, setup exchange of an SBP procedure, and sensing
   measurement reporting is not required."
DEFVAL { inactive }
::= { dot11SENSStationConfigEntry 5 }
```

Insert the following new annex after Annex AH:

Annex AI

(informative)

Sensing procedure example

Figure AI-1 illustrates an example of a sensing procedure where an AP performs sensing as a sensing initiator with three non-AP STAs (sensing responders) referred to as STA A, STA B, and STA C, which have MAC addresses A, B, and C, and identifiers AID 1, USID 2, and AID 3, respectively.

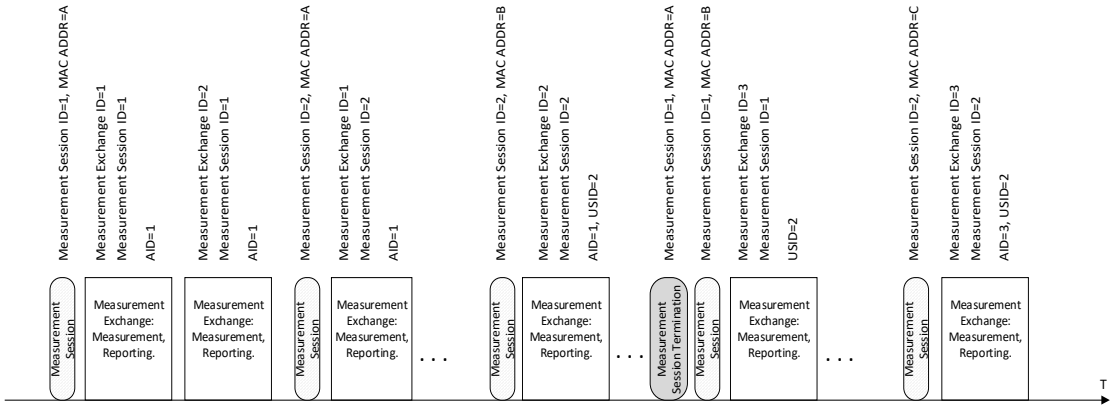

Figure AI-1—Example of a sensing procedure

The example starts with the establishment of a sensing measurement session between the AP and STA A (AID 1), which defines a first set of operational parameters that is assigned a Measurement Session ID of 1. The concept of Measurement Session ID is defined in 11.55.1.4. After the sensing measurement session is established, sensing measurement exchanges are performed based on the defined operational parameters (Measurement Session ID equal to 1). Each sensing measurement exchange is assigned a Measurement Exchange ID (see 11.55.1.5). After some time, a second sensing measurement session is established between the AP and STA A, which defines a second set of operational parameters that is assigned a Measurement Session ID of 2. After the second sensing measurement session is established, subsequent sensing measurement exchanges may be performed based on either the first (Measurement Session ID equal to 1) or second (Measurement Session ID equal to 2) set of operational parameters. A sensing measurement session may be explicitly terminated with a sensing measurement session termination. In the example, the sensing measurement session between the AP and STA A with Measurement Session ID equal to 1 is terminated.

Also in Figure AI-1, a sensing measurement session between the AP and STA B is established that defines a set of operational parameters identical to the one corresponding to Measurement Session ID equal to 2 established between the AP and STA A. Therefore, the AP also assigns a Measurement Session ID equal to 2 to this new sensing measurement session. Subsequent sensing measurement exchanges associated with Measurement Session ID equal to 2 may thus include STA A, STA B, or both STA A and STA B. Each sensing measurement exchange may have one-to-many (including one-to-one) announcement and/or triggering, and may have either one-to-many or many-to-one (including one-to-one) sounding. After a sensing measurement session is terminated for all STAs that use the corresponding Measurement Session ID, the Measurement Session ID becomes available for reuse if a new sensing measurement session is established, potentially with a different set of operational parameters.

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