IEEE P802.11
Wireless LANs

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| Specification Framework for TGbf |
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Abstract

This document provides the framework from which the draft TGbf amendment will be developed. The document provides an outline of each the functional blocks that will be a part of the final amendment. The document is intended to reflect the working consensus of the group on the broad outline for the draft specification. As such it is expected to begin with minimal detail reflecting agreement on specific techniques and highlighting areas on which agreement is still required. It may also begin with an incomplete feature list with additional features added as they are justified. The document will evolve over time until it includes sufficient detail on all the functional blocks and their inter-dependencies so that work can begin on the draft amendment itself.

# Revision history

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| **Revision** | **Date** | **Changes** |
| 0 | March 19, 2021 | Initial draft version. Includes motions up to and including the 802.11 March 2021 plenary meeting. |
| 1 | April 28, 2021 | Includes feedback received on r0 of the document, as well as motions accepted after the March 2021 plenary meeting and before the May 2021 interim meeting. |
| 2 | July 20, 2021 | Includes motions accepted during and after the May 2021 interim up to and including the July 2021 plenary. |

# Definitions, acronyms, and abbreviations (Clause 3, [1])

## Definitions

## Abbreviations and acronyms

|  |  |
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| SENS | WLAN Sensing |
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# General description (Clause 4, [1])

[Editor’s note: 4.3 Components of the IEEE 802.11 architecture, 4.3.19 Wireless network management]

# Layer management (Clause 6, [1])

[Editor’s note: 6.3 MLME SAP interface]

# PHY service specification (Clause 8, [1])

# Frame formats (Clause 9, [1])

[Editor’s note: 9.3 Format of individual frame types]

[Editor’s note: 9.4 Management and extension frame body components]

[Editor’s note: 9.6 Action frame format details]

(Motion 21, 21/0908r2) A Sensing Measurement Report frame, which allows a sensing receiver to report sensing measurements, is defined. This frame contains at least the following two fields:

* Measurement report control field: Contains information necessary to interpret the measurement report field.
* Measurement report field: Carries CSI measurements obtained by a sensing receiver.

# MAC sublayer functional description (Clause 10, [1])

# MLME (Clause 11, [1])

[Editor’s note: 11.21 Wireless network management procedures]

## 7.1 WLAN sensing (SENS) procedure

### 7.1.1 Overview

A sensing procedure allows a STA to perform WLAN sensing and obtain measurement results. A sensing session is an instance of a sensing procedure with associated operational parameters of that instance (Motion 8, 20/1849r4).

A sensing initiator is a STA that initiates a WLAN sensing session. A sensing responder is a STA that participates in a WLAN sensing session initiated by a sensing initiator. A sensing transmitter is a STA that transmits PPDUs used for sensing measurements in a sensing session. A sensing receiver is a STA that receives PPDUs sent by a sensing transmitter and performs sensing measurements in a sensing session (Motion 9, 20/1849r4).

A STA can assume multiple roles in one sensing session (Motion 9, 20/1849r4). In a sensing session, a sensing initiator might be a sensing transmitter, a sensing receiver, both or neither (Motion 10c, 21/0147r3).

A sensing session is pairwise and is identified by MAC addresses and/or associated AID/UID (Motion 23, 21/0644r4).

More than one sensing responder may participate in the measurement phase and reporting phase (Motion 16, 20/0145r5).

A sensing initiator may maintain multiple sensing sessions (Motion 23, 21/0644r4).

A sensing session is composed of one or more of the following phases: setup phase, measurement phase, reporting phase, and termination phase (Motion 15, 20/1851r4).

A sensing session may be comprised of multiple burst instances (Motion 14, 21/0145r4).

### 7.1.2 Setup phase

In the setup phase of a sensing session, a sensing session is established, and operational parameters associated with the sensing session are determined and may be exchanged between STAs (Motion 15, 20/1851r4).

An optional negotiation process in the sensing setup phase is defined that allows for a sensing initiator and a sensing responder to exchange and agree on operational parameters associated with a sensing session (Motion 17, 20/0370r1; Motion 23, 21/0644r4).

The Measurement Setup ID may be used to identify attributes of the sensing measurement instances (Motion 24, 21/0644r4).

The type of measurement result reported in a sensing session shall be decided by its initiator (Motion 13, 21/0147r3).

More than one type of sensing measurement results may be defined (Motion 12, 21/0147r3).

### 7.1.3 Measurement phase

In the measurement phase of a sensing session, sensing measurements are performed (Motion 15, 20/1851r4).

NDP can be used for the channel measurement (e.g. CSI) between sensing transmitter and sensing receiver(s) in sub-7 GHz bands. NDP format for sensing is TBD (Motion 22, 21/1015r1).

The Measurement Instance ID may be used to identify the sensing measurement instance that utilizes attributes of the same Measurement Setup ID (Motion 24, 21/0644r4).

The Dialog Token field may be a possibility to contain both the Measurement Setup ID and the Measurement Instance ID (Motion 24, 21/0644r4).

### 7.1.4 Reporting phase

In the reporting phase of a sensing session, sensing measurement results are reported (Motion 15, 20/1851r4).

Results of measurement performed in a sensing session should be obtained by or reported to its initiator (Motion 11, 21/0147r3).

Transmission of the Sensing Measurement Report frame is initiated by an MLME primitive. Both immediate and delayed reporting are acceptable (Motion 21, 21/0908r2).

### 7.1.5 Termination phase

In the termination phase of a sensing session, STAs stop performing measurements and terminate the sensing session (Motion 15, 20/1851r4).

### 7.1.6 Threshold-based measurement and reporting

(Motion 18, 21/0351r5) An optional threshold-based measurement and reporting procedure is defined in which

* The difference between the current measured CSI and the previous measured CSI is quantified. The difference is referred to as CSI variation.
* A threshold value to be used by the sensing receiver in the threshold-based procedure is defined.
* By comparing the CSI variation with the threshold, the sensing receiver can send a feedback resulting from the large CSI variation to the sensing transmitter.
* Whether the threshold is predefined, or defined by the sensing receiver, transmitter, initiator or responder is TBD.
* The threshold-based procedure is not always required (Procedure A in 21/0351r5 is not always required).

# PHY (sub-7 GHz)

CSI (that is, the channel measured during the training symbols of a received PPDU) is a type of sensing measurement result for sub-7 GHz WLAN sensing (Motion 20, 21/0908r2).

To enable sub-7 GHz WLAN sensing, an RXVECTOR parameter CSI\_ESTIMATE is defined that contains the channel measured during the training symbols of the received PPDU. The format of CSI\_ESTIMATE is the same one used in the measurement report field within the Sensing Measurement Report frame. The format of CSI\_ESTIMATE is TBD (Motion 21, 21/0908r2).

## 8.1 HT PHY specification (Clause 19, [1])

### 8.1.1 HT PHY service interface

## 8.2 VHT PHY specification (Clause 21, [1])

### 8.2.1 VHT PHY service interface

## 8.3 HE PHY specification (Clause 27, [2])

### 8.3.1 HE PHY service interface

## 8.4 EHT PHY specification (Clause 36, [3])

### 8.4.1 EHT PHY service interface

# PHY (60 GHz)

## 9.1 DMG PHY specification (Clause 20, [1])

## 9.2 EDMG PHY specification (Clause 28, [4])

# References

[1] Draft IEEE P802.11-REVme/D0.0

[2] Draft IEEE P802.11ax/D8.0

[3] Draft IEEE P802.11be/D0.4

[4] Draft IEEE P802.11ay/D7.0