IEEE P802.11
Wireless LANs

|  |
| --- |
| Clarification of DMG, EDMG, and CDMG relationship |
| Date: 2020-03-24 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Solomon Trainin | Qualcomm |  |  | strainin@qti.qualcomm.com |
| Alecsander Eitan | Qualcomm |  |  | eitana@qti.qualcomm.com |
| Assaf Kasher | Qualcomm |  |  | akasher@qti.qualcomm.com |

Abstract

Clarification of DMG, EDMG, and CDMG relationship

1. **Result of the architecture investigation**

Figure 1 is a graphical interpretation in the Venn diagram of the relationship between DMG, CDMG, and EDMG. The DMG is the common part supported by the EDMG STA and the CDMG STA.



Figure 1

The CDMG does not include EDMG and the EDMG does not include the CDMG.

This case is different from the lower band, where each enhancement inherent earliest. VHT includes HT, and HE includes VHT, which includes HT (Figure 2)



Figure 2

1. **Observation of the potentially impacted terminology and recommendations**

DMG STA (BSS, Network) – scope is limited to STA that supports the PHY of the clause 20

Non-issue

EDMG STA – following the 4.3.30 definition, an STA that supports the PHY of the clauses 28 and 20. It is mentioned in other places as well. However, in many places it is used to specify behavior coupled with clause 28.

It is not really controversial and may stay as is.

The EDMG STA definition is repeated in 3.2 Definitions specific to IEEE Std 802.11

“enhanced directional multi-gigabit (EDMG) station (STA): A directional multi-gigabit (DMG) STA capable of transmitting and receiving EDMG physical layer (PHY) protocol data units (PPDUs).”

The definition contradicts with 4.3.30. There is no such definition of the HT STA, VHT STA and HE STA. No need for the definition since the 4.3.30 does this work.

**Suggest removing.**

EDMG STA PHY – is used consistently where both PHYs EDMG and DMG are referred together

Non-issue

EDMG PHY - is used in relation to the new PHY feature defined in the clause 28

Non-issue

EDMG (in general) – used as a qualifier of new defined features

“enhanced directional multi-gigabit (EDMG): Pertaining to an enhanced feature operation in directional multi-gigabit (DMG).”

Non-issue

non-DMG – used as a determination of anything that does not support 60GHz PHY.

Suggest modifying as it is done for non-HT, see below in references

**“non-directional multi-gigabit (non-DMG):** A modifier meaning not directional multi-gigabit (DMG), not enhanced directional multi-gigabit (EDMG), and not China directional multi-gigabit (CDMG)**”**

non-EDMG

The definition of non-EDMG is presented in **3.2 Definitions specific to IEEE Std 802.11.**

**“non-enhanced directional multi-gigabit (non-EDMG)**: A modifier meaning directional multi-gigabit (DMG) that is not EDMG.”

The notation (non-…) is used in the basic text and amendments even w/o definition. In the cases of Non-HT, non-VHT, and non-HE this modifier keeps anything that belongs to the former definitions (see Figure 2). For example, non-VHT means HT and below, non-HE means VHT and HT, and below HT.

The modifier non-EDMG is used to indicate definitions that are based on DMG (4.3.22 DMG STA) and include neither EDMG enhancement nor CDMG enhancement. It is not immediately clear (see Figure 1).

**Propose to clarify the definition:**

 **“non-enhanced directional multi-gigabit (non-EDMG)**: A modifier meaning directional multi-gigabit (DMG) and include neither EDMG enhancement nor CDMG enhancement..”

1. **Associated issues:**

 **“enhanced directional multi-gigabit (EDMG) aggregate physical layer (PHY) protocol data unit (A-PPDU)**: An A-PPDU where all constituent PPDUs are EDMG PPDUs.”
Wrong recursion. The A-PPDU is defined as one of the EDMG PPDU’s in **28.3.2.1 General.**

**Propose modify on P429L6**

**“…** included depending on whether the PPDU is an SU PPDU, an MU PPDU.”

**References**

**non-high-throughput (non-HT):** A modifier meaning not high throughput (HT), not very high throughput (VHT) and not high efficiency (HE).

**4.3.13 High-throughput (HT) STA *(all-inclusive)***

The IEEE 802.11 HT STA provides PHY and MAC features that can support a throughput of 100 Mb/s and

greater, as measured at the MAC data service access point (SAP). An HT STA supports HT features as

identified in Clause 10 (MAC sublayer functional description(#107)) and Clause 19 (High-throughput (HT)

PHY specification). An HT STA operating in the 5 GHz band supports transmission and reception of frames

that are compliant with mandatory PHY specifications as defined in Clause 17 (Orthogonal frequency

division multiplexing (OFDM) PHY specification). An HT STA operating in the 2.4 GHz band supports

transmission and reception of frames that are compliant with mandatory PHY specifications as defined in

Clause 16 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) and Clause 18

(Extended Rate PHY (ERP) specification).

**4.3.15 Very high throughput (VHT) STA *(all-inclusive, VHT is a superset of HT)***

A VHT STA is an HT STA that, in addition to features supported as an HT STA, supports VHT

features identified in Clause 9 (Frame formats), Clause 10 (MAC sublayer functional description(#107)),

Clause 11 (MLME), Clause 14 (MLME mesh procedures), Clause 17 (Orthogonal frequency division

multiplexing (OFDM) PHY specification), and Clause 21 (Very high throughput (VHT) PHY specification),

but operates only in the 5 GHz band in the cited text

**4.3.15a High efficiency (HE) STA *(all-inclusive, HE is a superset of VHT and HT)***

In the 5 to 7.125 GHz bands, the following apply:

— An HE STA is also a VHT STA if operating in the 5 GHz

In the 2.4 GHz band, the following apply:

— An HE STA is also an HT STA

The main PHY features in an HE STA that are not present in VHT STA or HT STA are the following:

**4.3.22 DMG STA *(no predecessor)***

The IEEE 802.11 DMG STA provides PHY and MAC features that can support a throughput of 1 Gb/s and

greater, as measured at the MAC data service access point (SAP). A DMG STA supports DMG features as

identified in Clause 10 (MAC sublayer functional description(#107)), Clause 11 (MLME), and Clause 20

(Directional multi-gigabit (DMG) PHY specification).

**4.3.26 CDMG STA(11aj) *(all-inclusive, CDMG is a superset of DMG)***

An IEEE 802.11 CDMG STA is a DMG STA that supports CDMG operation in the Chinese 60 GHz

frequency band, and has dot11CDMGOptionImplemented equal to true.(#4785) In addition to CDMG

features, a CDMG STA supports DMG features as described in 4.3.22 (DMG STA).

***The EDMG STA definition is almost compliant with others. It becomes fully compliant after one small change, see below. After the change the definition becomes all-inclusive, EDMG is a superset of DMG***

**4.3.30 EDMG STA**

The IEEE 802.11 enhanced directional multi-gigabit (EDMG) STA is a DMG STA that provides PHY and MAC features that can support a throughput of at least 20 Gb/s, as measured at the MAC data service access point (SAP). An EDMG STA supports DMG and EDMG features as identified in Clause 10, Clause 11, Clause 12, Clause 20 and Clause 28. An EDMG STA supports transmission and reception of frames that are compliant with PHY specifications as defined in Clause 20 and Clause 28.

The main features in an EDMG STA that are not present in a DMG STA are the following:…

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause Number(C)** | **Page(C)** | **Line(C)** | **Comment** | **Proposed Change** |
| 6216 | 3.2 | 22 | 36 | The definition of DMG A-PPDU and EDMG A-PPDU are very confusing. A DMG PPDU is defined as a clause 20 PPDU. Hence, a DMG A-PPDU is defined to cognatian only DMG PPDUs (which are non-EDMG PPDUs) and an EDMG A-PPDU to contain only EDMG PPDUs. But DMG is defined to include all operation in a frequency band with a channel greater than 45 GHz, hence both non-EDMG (clause 20) and EDMG (clause 28). To me this is inconsistant. | Fix the definitions to remove the inconsistancy and confusion. |