IEEE P802.11
Wireless LANs

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| Proposed resolution to CID 41,42,44,84, 98, 111, 151 and 168 in LB217 |
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 Abstract

This document proposes resolutions to x CIDs on TGaj D1.0: 41,42,44,84, 98, 111, 151 and 168.

**Revision History**

R0: Initial version.

**Technical comments:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 41 |  |  |  | T | I am uploading comments from Bob Heile as part of the 802.19 vote on the CA document. |  |  |

Discussion: Not an effective comment.

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| 42 |  |  |  | T | The first paragraph of section 2 includes the following:"As 802.11ad has already addressed the co-existence with 802.15.3c [4] [5], therefore 802.11aj enables the co-existence with 802.15.3c accordingly."I'm not sure if this sentence is referring to the channelization, the DBC mechanism, or both. The logic used is one of "Since 11ad coexists with 15.3c, then 11aj must also coexist with 15.3c." but this only holds true to the extent that 11aj behaves like 11ad. To what degree is that true? If there are behaviors that are different, further evidence is required for those behaviors that they also coexist. | Clarify the sentence, particularly what it is referring to. Describe and differences in behavior between 11aj and 11ad. If there are differences in behavior, provide evidence for those behaviors that they also coexist |  |

Proposed resolution: **Revised**

***Change the first paragraph of section 2 as follows:***

“When an 802.11aj STA (CDMG STA) operates on 2.16 GHz channel in the 60 GHz frequency band, to enhance coexistence, it keeps the same 2.16 GHz channel spacing with the same common channelization as what is defined in Clause 20 for 802.11ad [4]. A CDMG STA uses the DMG PHY defined in 802.11ad when operating on 2.16 GHz channel. As 802.11ad has already addressed the co-existence with 802.15.3c [4] [5], therefore an 802.11aj STA using the same DMG PHY enables the co-existence with the 802.15.3c devices accordingly.

When an 802.11aj STA operates on a 1.08 GHz channel in the 60 GHz frequency band, to enhance coexistence, according to the DBC mechanism (see 9.41a) defined in 802.11aj, the CDMG STA follows the same procedure defined in 802.11ad when establishing a CDMG BSS. A CDMG AP or PCP operating on a 1.08GHz channel shall

* schedule a DMG beacon header interval (BHI) on the 2.16 GHz channel
* transmit DMG Beacon frames both on 2.16 GHz and 1.08 GHz channels
* schedule DTI on a 2.16 GHz channel and/or a 1.08 GHz channel when operating a CDMG BSS

A CDMG AP or PCP operating on a 1.08 GHz channel may use the EDMG AP or PCP clustering mechanism to mitigate Inter-BSS interference.

CDMG STAs operating on a 1.08 GHz channel shall transmit RTS / DMG CTS / DMG DTS frames for each TXOP on both the 1.08 GHz and 2.16 GHz channels.

Therefore other mmWave devices operating on the 2.16 GHz channel can detect the DMG Beacon frame and a CDMG STA can detect a transmission from a device of other mmWave devices at least in a period of beacon interval. ”

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| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 44 |  |  |  | T | Section 3 claims that the preamble design promotes coexistence. Is this actually referring to the CSMA or listen before talk mechanism? I'm not sure how the preamble actually helps that much without CSMA to go with it. | Please clarify. |  |

Proposed resolution: **Revised.**

The intention of the section 3 is not to refer to the CSMA or listen before talk mechanism. It is referring as follows: both 802.15.3c and 802.11ad use repetitions of the same sized Golay codes and same SC chip rate in preamble respectively. While 802.11aj uses the same preamble with 802.11ad when operating on a 2.16 GHz channel during at least a period of beacon interval. 802.11aj also mandates the RTS/CTS for a TXOP on the 2.16GHz channel. Therefore 11aj/11ad/15.3c can detect one another by using simple correlators. 802.11aj follows the same channel access rule as 802.11ad including CSMA and listen before talk mechanisms.

***Change the first paragraph of section 3 as follows:***

“When 802.11aj operates on a 2.16 GHz channel in the Chinese 60 GHz frequency band, it uses exactly the same preamble design as 802.11ad [1] [4]. This enables the co-existence with 802.11ad. While 802.11ad uses repetitions of the same sized Golay codes and SC chip rate as 802.15.3c in preamble respectively. The same preamble design therefore enables simple correlators to significantly enhance detection of one another between 802.11ad/802.11aj and 802.15.3c.”

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| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 84 | 25 | 164 | 2 | G | We now have DMG, CDMG and QMG. Can these three be combined? I see a large amount of copy and paste (redundancy) across the three. If not combined, add some text near the top of 802.11 explaining all the many PHYs we now have and which frequency bands they operate in. | Combine the similar text in clause 20, 25, and 26 into a single clause, and move the frequency-specific details into new subclauses. |  |

Proposed resolution: **Revised.**

A CDMG STA is a DMG STA that, in addition to features supported as a DMG STA, supports DMG features identified in Clause 8, Clause 9, Clause 10, Clause 26 (QMG PHY specification) (operating on a 1.08 GHz bandwidth channel). A QMG STA, which operates in around 45GHz frequency band, is newly defined 802.11 spec. It supports QMG features identified in Clause 8, Clause 9, Clause 10, Clause 26 (QMG PHY specification) (operating on a 540 MHz or 1.08 GHz bandwidth channel). Although the CDMG STAs and QMG STAs support some existing features and mechanisms defined for HT/VHT/DMG STAs, they are different especially in PHY layer. So it is better to define each PHY specification in separate clause to make it more clear for people when reading the spec what features a CDMG STA or QMG STA supports. While in order to reduce redundancy, propose to remove the duplicated descriptions that already exist in 802.11 spec from 11aj D1.0 and refer to the existing txt as much as possible. We can see that some duplicated txt will be removed from 11aj D1.0 according to the resolutions to some CIDs in 11-16/0321r2, 11-16-0324r3, Also in clause 25 the same descriptions that as the same as defined in 11ad refer to the corresponding subclause in clause 21.

In REVmc 4.2, the operating frequency bands for HT STA and VHT STA are described in 4.3.11 (High throughput (HT) STA) and 4.3.12 (Very high throughput (VHT) STA) respectively. Similarly, propose to change the definition of CDMG STA as follows in 4.3.23 (CDMG STA) to describe the operating band for a CDMG STA. The operating bands for a QMG STA already exist in 4.3.24 (QMG STA) in 11aj D1.0.

***Example Changes:***

“**4.3.23 CDMG STA**

~~The IEEE 802.11 CDMG 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 CDMG STA is a DMG STA that supports CDMG features operating in Chinese 60GHz frequency band when dot11CDMGOptionImplemented is true. In addition to DMG features, a CDMG STA supports CDMG features as identified in Clause 9 (MAC sublayer functional description), Clause 10 (MLME) and Clause 25 (China Directional Multi-Gigabit (CDMG) PHY specification)….”

“**4.3.24 QMG STA**

The IEEE Std 802.11 QMG STA operates in 42.3 GHz to 47.3 GHz or 47.2 GHz to 48.4 GHz frequency bands.

…”

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| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 98 | 6.3 | 6 | 13 | T | There are no rate set (operational, basic, or supported) in the MLME primitives. | Update the DMG (or other rate set primitive fields) to advertise the rate set use for communications over an 11aj link. |  |

**Proposed resolution: Reject**

A CDMG STA is defined as a DMG STA with additional features and a QMG STA is defined as a non-DMG STA in 11aj. Therefore the CDMG STA and QMG STA can use the existing definition of BSSBasicRateSet, OperationalRateSet and SupportedRates parameters defined for the DMG STA and non-DMG STA respectively to advertise the rate set used for communications over an 11aj link.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** | **IBSS adoption** |
| BSSBasicRateSet  | Set of integers | 1–127 inclusive (for each integer in the set) | **Non-DMG BSS:** The set of data rates that all STAs in the BSS are able to use for communication. All STAs in the BSS are able to receive and transmit at each of the data rates listed in the set.**DMG BSS:** Empty. | Adopt |
| OperationalRateSet | Set of integers | 1–127 inclusive (for each integer in the set) | **Non-DMG BSS:** The set of data rates that the peer STA is able to use for communication within the BSS. The peer STA is able to receive at each of the data rates listed in the set. This set is a superset of the rates contained in the BSSBasicRateSet parameter. **DMG BSS:** The set of MCS indexes that the peer STA uses for communication within the BSS. | Do not adopt |

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| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 151 | 25.3.6.1 | 174 | 32 | E | The figure is copied from the corresponding figure in DMG, but without changing the parameters to CDMG (e.g. STF is not 2176 Tc) | Update the figure according to CDMG parameters and frame format. |  |

Proposed resolution: **Revised.**

This is a copy and paste error when the 11aj D1.0 was created. Also the reputation of Ga128 in SC mode preamble and Gb128 in control mode preamble shall be as the same as those defined in 11ad.

***Change the first paragraph in 25.3.6.1 General (Short Training field) as follows:***

The Short Training field is composed of 16 repetitions of sequences Ga128(n) of length 128 defined in 25.11 (Golay sequences), a single frequency sequence (SFS) of length 256 that used for IQ imbalance estimation, followed by a single sequence –Ga128(n). The SFS is defined as:

***Change Figure 25-4—SC and OFDM preambles as follows:***



**SC preamble**



Figure 25-4—SC and OFDM preambles

***Change the CDMG SC  as follows:***

***Change the first paragraph in 25.4.3.1.2 (Short Training field) as follows:***

The Short Training field is composed of 48 repetitions of sequences Gb128(n) of length 128, followed by a single -Gb128(n) sequence (for synchronization) and then a single -Ga128(n) sequence. The sequences Ga128(n) and Gb128(n) are defined in 21.11 (Golay sequences).

***Change the CDMG control mode as follows:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 168 | 25.9 | 196 | 47 | T | CDMG and DMG may operate in the same channel. It is not clear though on how the two coexists. For example, VHT receive procedure (REVmc D5.0 P2592, 21.3.20) clearly states that if a VHT receiver detects a NON\_HT PPDU, then it follows the RX state machine in Clause 17, etc. In case of CDMG, however, the receive procedure does not specify what a CDMG STA is supposed to do when detecting a DMG PPDU. | Specify that a CDMG STA shall follow the DMG receive procedure when a DMG PPDU is detected. |  |

Proposed resolution: **Revised.**

A CDMG STA follows the receive procedure of a DMG STA when operating on a 2.16 GHz channel.

***Insert the following paragraph as the first paragraph in 25.9:***

“**25.9 PHY receive procedure**

A CDMG STA shall follow the DMG receive procedure defined in clause 20.9 (PHY receive procedure) when a DMG PPDU is detected on a 2.16 GHz channel.”

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| --- | --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Type | Comment | Proposed Change | Remark |
| 111 |  | 284 |  | T | Status values in MIB are not defined | Replace TBD status values with O/M as needed |  |

Proposed resolution: **Revised.**

***Change the table in B.4.3 as follows:***

**B.4.3 IUT configuration (continued)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Protocol capability | References | Status | Support |
| … | … | … | … | … |
| \*CF33 | CDMG STA |  | O.5 | Yes, No  |
| \*CF34 | 45MG STA |  | O.5 | Yes, No  |

Discussion:

***Insert the following subclause, B.4.27 to B.4.27.2, after B.4.26:***

* **CDMG features**
* **CDMG MAC features**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Protocol capability | References | Status | Support |
|  | Are the following MAC protocol features supported? |  |  |  |
| CDMG-M0 | DMG MAC features | B.4.24.1(DMG MAC features) | CF33:M |  |
| CDMG-M1 | CDMG capabilities signaling |  |  |  |
| CDMG-M1.1 | CDMG Capabilities element | 8.4.2.172 (CDMG Capabilities element) | CF33:M | Yes, No, N/A |
| CDMG-M1.2 | Signalling of STA capabilities in Probe Request, (Re)Association Request frames | 8.3.3.5 (Association Request frame format), 8.3.3.7 (Reassociation Request frame format), 8.3.3.9 (Probe Request frame format), 8.4.2.172 (CDMG Capabilities element)) | (CF33 AND (CF2.1 OR CF2.2 OR CF2.4.2)):M | Yes, No, N/A |
| CDMG-M1.3 | Signalling of STA and BSS capabilities in DMG Beacon, Probe Response, (Re)Association Response frames | 8.3.3.6 (Association Response frame format), 8.3.3.8 (Reassociation Response frame format), 8.3.3.10 (Probe Response frame format), 8.3.4.2 (DMG Beacon)), 8.4.2.172 (CDMG Capabilities element) | TBD(CF25 AND (CF1 OR CF2.4.1)):M | Yes, No, N/A |
| CDMG-M2 | Dynamic bandwidth control | 8.3.4.2 (DMG Beacon), 9.41a (DBC mechanism for CDMG STAs)  | CF33:M | Yes, No, N/A |
| CDMG-M3 | Dynamic Channel Transfer | 10.47 (DCT Procedure), 8.6.8.36 (DCT Measurement Request frame)-8.6.8.39 (DCT Response frame), 6.3.116 (DCT procedure) | CF33:O | Yes, No, N/A |
| CDMG-M4 | Opportunistic transmissions  | 8.4.1.7 (Reason Code field), 8.4.2.174 (CDMG Extended Schedule element), 9.36.11 (Opportunistic transmission in alternative channel for CDMG STAs)  | CF33:O | Yes, No, N/A |
| CDMG-M5 | Selection of candidate SPs for spatial sharing | 8.4.2.175 (SSW Report element), 10.32.1 (General), AA.1 (Selection of candidate SPs for spatial sharing) | CF33:O | Yes, No, N/A |
| CDMG-M6 | CDMG AP or PCP clustering | 9.37a (CDMG AP or PCP clustering) | CF33:M | Yes, No, N/A |
| CDMG-M7 | CDMG protected period establishment and maintenance | 9.36.6.6.2a (CDMG protected period establishment and maintenance) | CF33:M | Yes, No, N/A |
| CDMG-M8 | Spatial sharing in a CDMG AP or PCP cluster | 9.37a.6 (Spatial sharing in a CDMG AP or PCP cluster) | CF33:M | Yes, No, N/A |
| CDMG-M9 | CDMG Enhanced Beam Tracking | 9.38.9 (CDMG enhanced beam tracking), Annex AA.3 (Beam tracking and switching for enhanced beam tracking mechanism) | CF33:O | Yes, No, N/A |
| CDMG-M10 | CDMG dynamic truncation of service period | 9.36.8.2 (CDMG dynamic truncation of service period) | CF33:M | Yes, No, N/A |
|  |  |  |  |  |

* **CDMG PHY features**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Protocol capability | References | Status | Support |
|  | Are the following PHY protocol features supported? |  |  |  |
| CDMG-M0 | DMG PHY features | B.4.24.2 (DMG PHY features) | CF33:M |  |
| CDMG-P1 | PHY operating modes |  |  |  |
| CDMG-P1.1 | Operation according to Clause 25 (China directional multi-gigabit (CDMG) PHY specification) | 25 (China directional multi-gigabit (DMG) PHY specification) | CF33:M |  |
| CDMG-P2 | CDMG PHY frame format  |  |  |  |
| CDMG-P2.1 | CDMG control mode format | 25.4 (CDMG control mode) | CF33:M | Yes, No, N/A |
| CDMG-P2.2 | CDMG SC mode format | 25.6 (CDMG SC mode) | CF33:M | Yes, No, N/A |
| CDMG-P | CDMG MCS 17-28 of OFDM mode | 25.5 (CDMG  | TBD | Yes, No, N/A |
| CDMG-P2.3 | CDMG low-power SC mode format | 25.7 (CDMG low-power SC mode) | CF33:O | Yes, No, N/A |
| CDMG-P2.4 | Modulation and coding schemes (MCS) |  |  |  |
| CDMG-P2.4.1 |  MCS 0 of CDMG control mode |  | DMG-P2.1:M | Yes, No, N/A |
| CDMG-P2.4.2 | MCS 1-16 of CDMG SC mode |  |  |  |
| CDMG-P2.4.2.1 | MCS 1-9 |  | CDMG-P2.2:M | Yes, No, N/A |
| CDMG-P2.4.2.2 | MCS 10-16 |  | CDMG-P2.2:O | Yes, No, N/A |
| CDMG-P2.4.3 | MCS 29-35 of CDMG low-power SC mode |  | CDMG-P2.3:M | Yes, No, N/A |
| CDMG-P2 |  Common preamble format | 25.3 (Common parameters) | CF33:M | Yes, No, N/A |
| CDMG-P3 | Enhanced mobile device support Mode | 25.6 (CDMG SC mode) | CF33:M | Yes, No, N/A |
| … | … | … | … | … |

* **QMG features**
* **QMG MAC feature**
* **45MG PHY features**

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| Item | Protocol capability | References | Status | Support |
|  | Are the following PHY protocol features supported? |  |  |  |
| 45MG-P1 | 45MG modulation and coding schemes (45MG MCS) |  |  |  |
| 45MG-P1.1 | 45MG MCS 0 of control mode | 26.4 (45MG control mode) | 45MG-P1.1: M | Yes, No, N/A |
| 45MG-P1.2 | 45MG MCS 1-8 of SC mode | 26.5 (45MG SC mode) | 45MG-P1.2: M | Yes, No, N/A |
| 45MG-P1.3 | 45MG MCS 9-16 of SCOFDM mode | 26.6 (45MG OFDM mode) | 45MG-P1.3: M | Yes, No, N/A |
| … | … | … | … | … |