IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CC28-XDMGz-Comment-Resolution | | | | |
| Date: 2018-09-17 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Assaf Kasher | Qualcomm |  |  | akasher@qti.qualcomm.com |
|  |  |  |  |  |

Abstract

This document proposes resolution to mostly DMG/EDMG related CIDs of CC28. Resolution and page and line references are based on D0.41

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 86 | 28.00 | 16 | 9.4.2.127.7 | "TRN field sent by the receiver STA" - what receiver | replace by "TRN field sent by the peer STA" |

Proposed Resolution: **Revised**

***TGaz Editor: Modify the text P24L24-26 as follows:***

A DMG/EDMG STA sets the AOD Channel Measurement Feedback subfield to 1 to indicate the ability to send a Channel Measurement Feedback element based on measurement on a TRN field sent by the peer RSTA, for the purpose of AOD estimation.

***TGaz Editor: Modify the text in P63L25-27:***

In a Direction Measurement FTM pair that agreed on I2R AOD, the ISTA shall add a TRN field to the Ack frames in the exchanges specified by the Direction Measurement Density by setting the TRN\_LEN to a non-zero value and PACKET\_TYPE to 1. The RSTA shall set the Best AWV Id field in the Fine Timing Measurement frames sent to the ISTA following these Ack frames to the AWV Id or the Best Sector Index of the TRN field (if the ACK was an EDMG/DMG PPDU respectively). If the RSTA has set the AOD Channel Measurement Feedback subfield to 1 in the DMG Direction Measurement Capabilities field, it shall also append a Channel Measurement Feedback element to the Fine Timing Measurement frames sent to the ISTA following the reception of the Ack frames with PACKET-TYPE equal to TRN-T-PACKET or EDMG-PACKET-TYPE equal to EDMG-TRN-T-PACKET and TRN-LEN greater than 0 or EDMG-TRN-LEN greater than 0.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 232 | 29.00 | 9.4.2.166 | "The DMG Direction Measurement Parameters subelement is included in the initial FTM request to describe the requested set of parameters that the initiator proposes to use and in the initial FTM frame from the responder when either STA is a non-EDMG STA. " -- only included if both STAs are DMG STAs | As it says in the comment |
| 233 | 29.00 | 9.4.2.166 | "The DMG Direction Measurement Parameters subelement is included in the initial FTM request to describe the requested set of parameters that the initiator proposes to use and in the initial FTM frame from the responder when either STA is a non-EDMG STA. " -- this is not backward-compatible with existing DMG STAs, which will not include this | As it says in the comment |
| 235 | 30.00 | 9.4.2.166 | It seems guaranteed to cause trouble to have fields in different orders for DMG and EDMG | Swap R2I AOA Request and I2R AOA Request in Figure 9-4.f |
| 236 | 30.00 | 9.4.2.166 | It would be better to make the field positions the same for DMG and EDMG | Put Direction Measurement Density before L-RX and then say that L-RX's top two bits are unused for DMG, then have a single figure |

Proposed Resolution: **Revised**

**Disucssion:**

It is better to unite the subelements for DMG and EDMG to reduce the confusion. Their separation was not necessary in the first place.

***TGaz Editor: Modify the text in 9.4.2.166 (starting P28L28) as follows:***

Table 9.4.a -- Optional Subelement IDs for Fine Timing Measurement Parameters

|  |  |  |
| --- | --- | --- |
| Subelement ID | Name | Extensible |
| 0 | DMG Direction Measurement Parameters | Yes |
| 1-220 | Reserved |  |
| 221 | Vendor Specific |  |
| 222-255 | Reserved |  |

The DMG Direction Measurement Parameters subelement is optionaly included in the initial FTM request

frame from the ISTA and in the initial Fine Timing Measurement frame from the RSTA when both STAs are mutually direction measurement capable (see 11.22.6.3.4). The DMG Direction Measurement Parameters subelement has the structure shown in Figure 9-4.b1.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Subelement ID | Length | DMG Direction Measurement Parameters |
| octets: | 1 | 1 | 1 |

Figure 9-4.b1 - DMG Direction Measurement Parameters subelement format

The format of the DMG Direction Measurement Parameters field is shown in Figure 9-4.c (DMG Direction Measurement Parameters field format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 B121 | B12 B14 | B15 |
|  | R2I AOA Request | I2R AOA Request | R2I AOD Request | I2R AOD Request | L-RX | Direction Measurement Density | Reserved |
| bits: | 1 | 1 | 1 | 1 | 8 | 3 | 1 |

Figure 9-4.c - DMG Direction Measurement Parameters field format

A value of 1 in the I2R AOA Request subfield indicates a request for FTM initiator to FTM responder Angle of Arrival measurement.

A value of 1 in the R2I AOA Request subfield indicates a request for FTM responder to FTM initiator Angle of Arrival measurement.

A value of 1 in the I2R AOD Request subfield indicates a request for FTM initiator to FTM responder Angle of Departure measurement.

A value of 1 in the R2I AOD Request subfield indicates a request for FTM responder to FTM initiator Angle of Departure measurement.

The L-RX field indicates how many TRN-units are requested by the sender for Angle of Arrival measurements. The interpretation of this field is explained in 9.5.4 (BRP Request field). If either the initiator or the responder is a non-EDMG STA, the value of this field is limited to 32.

The Direction Measurement Density indicates how often in a burst a direction measurement is performed. The interpretation of the values is defined in Table 9-4.d (Direction Measurement Density field interpretation)

Table 9-4.d Direction Measurement Density field interpretation

|  |  |
| --- | --- |
| Value | Interpretation |
| 0 | Only the first FTM measurement exchange in a burst is a direction measurement |
| 1 | Every measurement in a burst is a direction measurement |
| 2 | Every second measurement in a burst is a direction measurement |
| 3 | Every 4th measurement in a burst is a direction measurement |
| 4 | Every 8th measurement in a burst is a direction measurement |
| 5-7 | Reserved |



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 238 | 30.00 | 12 | 9.4.2.166 | What about non-single-carrier EDMG modes? | Add these to the table, or state that they cannot be used for 11az |

Proposed resolution: **Revised.**

**Discussion:**

The intent is that FTM exchanges are performed using SC mode. Since the frames are relatively short, we can limit the MCS to the mandatory MCS set.

###### *TGaz Editor: Add the following text at the end of “11.22.6.4.7.1 General”*

All frames transmitted during an FTM exchange by EDMG or non-EDMG STAs shall be carried in PPDUs in which the MCS is one of the mandatory MCSs of the SC mode.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 240 | 32.00 | 1 | 9.4.2.166 | "The Secure ToF Measurement field is set to 1 to enable a secure ToF measurement exchange between an ISTA and an RSTA. Otherwise the Secure ToF Measurement field is set to 0. " -- specify that it is not set to 1 unless both ISTA and RSTA have set Secure ToF Supported field to 1 | As it says in the comment |

Proposed Resolution: **Revised**

***TGaz Editor: Modify the text in the penultimate paragraph of 9.4.2.166 in D0.4:***

The Secure ToF Measurement field is set to 1 to enable a secure ToF measurement exchange between an ISTA and an RSTA. The secure ToF Measurement field may be set to 1 only if the Secure ToF Supported field was set to 1 in the initial Fine Timing Measurement Request and the initial Fine Timing Measurement frame. Otherwise the Secure ToF Measurement field is set to 0.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 239 | 31.00 | 11 | 9.4.2.166 | Huh? There are three reserved bits available | Don't add an Extension field. Make the two Secure ToF bits be B48/49 |

Proposed Resolution: **Revised**

**Disucussion:**

The intent was the reserve those bits for furture use in 11az. This future use has not materialized. The resolution proposed by the commenter will be followed.

***TGaz Editor: modify the text in P27L2-P28L16 as follows:***

***802.11 Editor: Update the Table 9-272 Format And Bandwidth field as follows: (REVmd 1.0, P1261, L60)***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 B6 | B7 | B8 B11 | B12 B15 | B16 B23 | B24 B39 | B40 |
|  | Status Indication | Value | Reserved | Number of Bursts Exponent | Burst Duration | Min Delta FTM | Partial TSF Timer | Partial TSF Timer No Preference |
| **Bits:** | 2 | 5 | 1 | 4 | 4 | 8 | 16 | 1 |
|  | B41 | B42 | B43 B47 | B48 | B49 | B50 B55 | B56 B71 |
|  | ASAP Capable | ASAP | FTMs per Burst | Secure ToF Measurement | Secure ToF Supported | Format and Bandwidth | Burst Period |
| **Bits:** | 1 | 1 | 5 | 1 | 1 | 6 | 16 |

Figure 9-606 -- Fine Timing Measurement Parameters field format



***Add the following paragraph to the end of 9.4.2.166 Fine Timing Measurement Parameters element (11md in D1.0)***

The Secure ToF Measurement field is set to 1 to enable a secure ToF measurement exchange between an ISTA and an RSTA. Otherwise the Secure ToF Measurement field is set to 0.

The Secure ToF Supported field is set to 1 in the initial Fine Timing Measurement Request frame to indicate that an ISTA supports a secure ToF measurement exchange. Otherwise the Secure ToF Supported field is set to 0. The Secure ToF Supported field is reserved in the initial Fine Timing Measurement frame (see 11.22.6.3 (Fine timing measurement procedure negotiation)).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 334 | 52.00 | 9 | 11.22.6.3.4 | "a DMGz/EDMGz Specific Parameters subelement" -- no such subelement is defined | As it says in the comment (a few lines down it's an element -- make that consistent too) |
| 335 | 52.00 | 12 | 11.22.6.3.4 | "a DMGz/EDMGz/ Specific Parameters subelement" -- spurious / | Delete the last / |

Prosposed Resolution: Revised

***TGaz Editor: Modify the text in P48L11 as follows:***

initiator AOD measurement and responder AOD measurement, by including a DMG Direction Measurement Parameters subelement in the Fine Timing Measurement Parameters element transmitted in the FTM request frame. Valid combinations of AOA and AOD requests and the corresponding required

***TGaz Editor: Modify the text in P48L14 as follows:***

capabilities are shown in Table 6. The L-RX field in the DMG Direction Measurement Parameters subelement shall be set to the number of TRN units the ISTA needs for AOA estimation

***TGaz Editor: Modify the text in P48L22 as follows:***

Measurement frame with a Fine Timing Measurement Parameters element with a DMG Direction Measurement Parameters subelement. The requested AOA/AOD I2R/R2I parameters in the initial Fine Timing

***TGaz Editor: Modify the text in P44L35 as follows:***

element or a Ranging Parameters element. The FTM parameters element includes a Direction Measurement Parameters subelement if the Measurement Exchange (11.22.6.4 Measurement Exchange) is performed over a 60 GHz link. If a Ranging Parameters element is

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 479 | 37.00 |  | 9.4.2.252 | Azimuth AOA is currently only measured in earth coordinates, i.e., w.r.t. geographical north. Also Elevation AOA requires knowledge of absolute reference, e.g. horizon. Not all devices may have precise knowledge thereof, which holds especially for mobile STAs. | Allow alternative angular reference. Details TBD. |

Proposed Resolution: **Reject**

**Discussion**:

The purpose of the AOA measurements is to allow accurate positioning of the ISTA. If the RSTA does not provide the AOA in earth coordinates, the usage is not clear.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 480 | 37.00 | 24 | 9.4.2.252 | The AOA Azimuth subfield is not defined for non-AP STA | Please define |
| 481 | 37.00 | 27 | 9.4.2.252 | The AOA Elevation subfield is not defined for non-AP STA | Please define |

Proposed Resolution: **Revised.**

**Discussion:**

Under current protocols, the AOA result is meaningless (i.e. a STA will not find it useful) if it in relative coordinates. This is mainly because there is no protocol to send measurement results of other directions to other STAs, so the measurement cannot be combined with other results. Therefore, we propose to remove the restriction of AP only transmission.

***TGaz Editor: Modify the text in P32L22 as follows:***

The AOA is in earth coordinates (i.e. direction 0 is north).

***TGaz Editor: Modify the text in P32L24 as follows:***

The AOA is in earth coordinates (i.e. elevation 0 is horizon, values are in the range -90° to 90°). This field is coded as a two’s complement number.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 482 | 37.00 |  | 9.4.2.254 | Azimuth and Elevation subfields are both defined with equal width and resolution. As Elevation angles are defined in 0...180 degree, resolution can be increased by factor 2. Alternatively, Elevation subfield width can be reduced by 1 bit. | Increase elevation angle resolution to degree/8. |

Proposed Resolution: Revised

Discussion:

Rather than create non-uniformity in resolution, we agree to reduce the field size.

***TGaz Editor: Modify the table at P32L18 as follows:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 B10 | B11 B20 | B21 B27 | B28 B34 | B35 B45 | B46 B47 |
|  | AOA Azimuth | AOA Elevation | AOA Azimuth Accuracy | AOA Elevation Accuracy | Best AWV ID | Reserved |
| bits: | 11 | 10 | 7 | 7 | 11 | 2 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 523 | 28.00 | 24 | 9.4.2.166 | The optional subelements field is appended to the Fine Timing Measurement Parameters element. The Fine Timing Measurement Parameters element is defined as extensible in the Table 9-94--Element IDs. Seems that adding optional subelements should change setting of the Extensible column from "Yes" to "Subelements" | Propose changing setting of the Extensible column from "Yes" to "Subelements". It may require synchronization among all active TG to prevent error. |

Proposed Resolution: Accept

***TGaz Editor: add the following text at P22L5 (after 9.4.2.1 Generag):***

***Editor: Modify the line of the Fine Timing Measurement Parameters element in Table 9-87 (Element IDs (P912L60)):***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fine Timing Measurement Parameters  (see 9.4.2.166 (Fine Timing Measurement  Parameters element)) | 206 | N/A | Subelements | No |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 524 | 31.00 | 4 | 9.4.2.166 | It is not allowed to change size of the existent field. The Fine Timing Measurement Parameters element is extensible so adding new field is allowed. | Remove changes in the Fine Timing Measurement Parameters field format and add new field to the Fine Timing Measurement Parameters element. |

Proposed Resolution: **Revised**

**Discussion:**

The issue was resolved as part of the resolution to CID 239.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 536 | 30.00 | 12 | 9.4.2.166 | Table 9-272 (Format And Bandwidth field) needs VHTz and HEz PPDU format. | As in comment. |

Proposed Resolution: **Revised**

**Discussion:**

VHTz may use the codes allocated to VHT in the table. HE uses the same bandwidths, however the PHY format is different. The different between HE and HEz and VHT and VHTz is in the protocol, not the bandwidth and format used.

***TGaz Editor: replace the line indicating 17-30 with the following lines in the update to table 9-272 (Format and Bandwidth)***

|  |  |  |
| --- | --- | --- |
| 17 | HE | 20 |
| 18 | HE | 40 |
| 19 | HE | 80 |
| 20 | HE | 80+80 |
| 21 | HE (two separate RF LOs) | 160 |
| 22 | HE (single RF LO) | 160 |
| 23-30 | Reserved | Reserved |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 84 | 27.00 | 12 | 9.4.2.127.7 | Missing Editor Instruction: | Add: "Add the following subclause after 9.4.2.127.6" |

Proposed Resolution: **Revised**

***TGaz Editor: Modify the text in P24L2  
Add the following subclause after 9.4.2.127.6:***

***TGaz Editor: Modify the header and first line of 9.4.2.127.7:***

##### 9.4.2.127.7 DMG Direction Measurement Capabilities field

The DMG Direction Measurement Capabilities field advertises capabilities for performing direction

***TGaz Editor: Modify the caption to table 9-233a as follows:***

Table 9.233a - DMG Direction Measurement Capabilities field

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 230 | 27.00 | 16 | 9.4.2.127.7 | Bits should be numbered from 0, not 1 | As it says in the comment |
| 231 | 27.00 | 16 | 9.4.2.127.7 | Is the field called "AOD Feedback Best TRN subfield " or "AOD Feedback Best TRN"? If the former, should be "Subfield", if the latter, delete "subfield" | As it says in the comment |

Proposed Resolution: **accept**

***TGaz Editor: Modify table 9.233a as follows:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 | B5 | B6 B7 |
|  | AOA TX Capability | AOA RX Capability | AOD TX Capability | AOD RX Capability | AOD Feedback Best TRN Subfield | AOD Channel Measurement Feedback | Reserved |
| bits: | 1 | 1 | 1 | 1 | 1 | 1 | 2 |

***TGaz Editor: Modify table 2 (AOD results field)***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 B10 | B11 B21 | B22 B28 | B29 B35 | B36 B46 | B47 |
|  | AOA Azimuth | AOA Elevation | AOA Azimuth Accuracy | AOA Elevation Accuracy | Best AWV ID | Reserved |
| bits: | 11 | 11 | 7 | 7 | 11 | 4 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 85 | 28.00 | 13 | 9.4.2.127.7 | "TFN" -> "TRN" | Replace "TFN" by "TRN" |
| 471 | 28.00 | 3 | 9.4.2.127.7 | Typo: TFN--> TRN |  |

Proposed Resolution: **Accept**

***TGaz Editor: Modify P24L19 as follows:***

based on a TRN field attached to an Fine Timing Measurement frame and send a report.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 91 | 37.00 | 10 | 9.4.2.252 | editor instruction is wrong - Tgaz Editor instructions should be removed. The instruction to the (802.11) editor is missing | replace editor instruction with "Insert the following subclause after 9.4.2.251" |

Proposed Resoution: **Accept**

***TGaz Editor: Modify the text in P33L7:***

***Insert the following subclause after 9.4.2.251:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 92 | 37.00 | 30 | 9.4.2.252 | The "/" is extraneous | remove "/" |

Proposed Resolution: **reject**

Discussion: The problem does not exist in D0.41

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 93 | 38.00 | 5 | 9.4.2.253 | editor instruction is wrong - Tgaz Editor instructions should be removed. The instruction to the (802.11) editor is missing | replace editor instruction with "Insert the following subclause after 9.4.2.252" |

Proposed Resolution: **Accept**

***TGaz Editor: Modify the text in P34L6:***

***Add the following subclause after 9.4.2.252***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 316 | 52.00 | 6 | 11.22.6.3.4 | "one of the first 4 subfields of this field" is too brittle to be spec language | Refer to the fields explicitly |
| 335 | 52.00 | 12 | 11.22.6.3.4 | "a DMGz/EDMGz/ Specific Parameters subelement" -- spurious / | Delete the last / |

Proposed Resolution: **Revised**

***TGaz Editor: Modify P48L6-14 as follows:***

A pair of ISTA and RSTA are defined to be mutually direction measurement capable if both the ISTA and the RSTA indicated support for DMGz/EDMGz direction measurement by including the DMG Direction Measurement Capabilities field in the DMG Capabilities element, and by the ISTA setting at least one of the first 4 subfields (AOA TX Capability, AOA RX Capability, AOD TX Capability, AOD RX Capability) of this field to 1 and the RSTA setting one the corresponding subfields (AOA RX Capability, AOA TX Capability, AOD RX Capability, AOD TX Capability) of this field to 1.

A DMGz/EDMGz ISTA may request that FTM exchanges will include direction measurement if the ISTA and RSTA are mutually direction measurement capable.

A DMGz/EDMGz ISTA may request initiator AOA measurement, responder AOA measurement, initiator AOD measurement and responder AOD measurement, by including a DMG Direction Measurement Parameters subelement in the Fine Timing Measurement Parameters element transmitted in the FTM request frame. Valid combinations of AOA and AOD requests and the corresponding required capabilities are shown in Table 6. The L-RX field in the DMG Direction Measurement Parameters subelement shall be set to the number of TRN units the ISTA needs for AOA estimation in case R2I AOA was requested, otherwise it shall be set to 0.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 337 | 52.00 | 27 | 11.22.6.3.4 | Spurious article | Delete "the" in "in the Table" (also at 51.29) |

Proposed Resolution: **Accept**

***TGaz Editor: Modify P48L28 as follows:***

Measurement frame shall be compatible with the corresponding AOA/AOD TX/RX capabilities as shown in Table 6.

***TGaz Editor: Modify P48L3 as follows:***

EDMGz ranging protocol as described in Subclause 11.22.6.5a (Secure EDMG Measurement Exchange Protocol).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 333 | 52.00 | 19 | 11.22.6.3.4 | Space (non-break) needed between number and unit | As it says in the comment |

Proposed Resolution: **Accept**

***TGaz Editor: Modify P48L21 as follows:***

The RSTA should respond within 10 ms from the initial FTM request with an initial Fine Timing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 314 | 48.00 | 11.22.6.2 | "one of the first 4 subfields of this field" is too brittle to be spec language | Refer to the fields explicitly |
| 315 | 48.00 | 11.22.6.2 | "one of the first 4 subfields of this field" is too brittle to be spec language | Refer to the fields explicitly |
| 317 | 48.00 | 11.22.6.2 | Two things look suspect with e). It's for the same case as d). The subfield referred to does not exist | Refer to the EDMG Ranging Supported subfield, and merge with d) |

Proposed Resolution: Revised

***TGaz Editor: Modify P43L6-14 as follows:***

1. DMGz Ranging, it shall set the DMG Range Measurement field of the Extended Capabilities element to 1. Otherwise it shall set the Multi User Range Measurement field of the Extended Capabilities element to 0. A STA that additionally supports Direction Measurement shall include a DMG Direction Measurement Capabilities field in the DMG Capabilities element and set at least one of the first 4 subfields (AOA TX Capability, AOA RX Capability, AOD TX Capability, AOD RX Capability) of this field to 1
2. eDMGz Ranging, it shall set the EDMG Range Measurement field of the Extended Capabilities element to 1. Otherwise it shall set the Multi User Range Measurement field of the Extended Capabilities element to 0. A STA that additionally supports Direction Measurement shall include a DMG Direction Measurement Capabilities field in the DMG Capabilities element and set at least one of the first 4 subfields (AOA TX Capability, AOA RX Capability, AOD TX Capability, AOD RX Capability) of this field to 1.

**References:**