IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DMG-MAC-CID-Resolution-I | | | | |
| Date: 2018-06-18 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Assaf Kasher | Qualcomm |  |  | akasher@qti.qualcomm.com |
|  |  |  |  |  |

Abstract

This document proposes resultion to some MAC CIDs.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1317 | 1225.48 | 9.4.2.135 | It is not clear what 'strongest tap measured' means in table 9-256. Is it the strongest tap of the same TRN unit, or the strongest tap of all TRN units?    "Unless all in-phase and quadrature component values are reported as zero, they are scaled such that the two most significant bits for at least one of the component values equal 01 or 10 (binary)."  Should this requirement applies to all taps, or just the 'strongest tap measured' and other taps scaled accrodingly? | revise the description/meaning |

Proposal: **Revised**

Discussion:

The intent is that the strongest tap will be the strongest over all measured, otherwise relative power differences cannot be determined by the receiver of this field.

***Editor: Change P1226L1-10 as follows:***

Each channel measurement contains *Ntaps* channel impulse taps. The channel impulse response reported for all *Nmeas* measurements correspond to a common set of relative tap delays. If the Tap Delay subfield is not present, then the *Ntaps* channel taps is interpreted as contiguous time samples, separated by Tc. The delay values in the Tap Delay subfield, when present, correspond to the strongest taps and are unsigned integers, in increments of Tc, starting from 0. Each channel tap is reported as an in-phase and quadrature component pair, with each component value represented as a twos complement number between –128 and 127. Unless all in-phase and quadrature component values are reported as zero, they are scaled such that the two most significant bits for at least one of the component values equal 01 or 10 (binary). The same scale applies to all measurements over all TRN subfields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1315 | 1371.60 | 9.5.4 | The L-RX subfield description can be reworded to use the trem TRN unit instead of TRN-R subfileds x4 | change to :"If the MID-REQ subfield is set to 0, the L-RX subfield indicates the number of TRN-R units requested by the transmitting STA as part of beam refinement. Possible values range from 0 to 16. Other values are reserved. If the subfield is set to 0, the transmitting STA does not need receive training as part of beam refinement..If the MID-REQ subfield is set to 1, the L-RX subfield indicates the number of TRN-R units that the STA uses during the MID phase for each tx sector/awv" |

Proposed Resolution: **Revised**

***Editor: Modify the paragraph starting P1371L59 as follows:***

If the MID-REQ subfield is set to 0, the L-RX subfield indicates the ~~compressed~~ number of TRN~~-R~~ ~~subfields~~ units requested by the transmitting STA for RX training as part of beam refinement. To obtain the number of TRN-R subfields, the value of the L-RX subfield is multiplied by 4. Possible values range from 0 to 16~~, corresponding to 0 to 64 TRN-R fields~~. Other values are reserved. If the subfield is set to 0, the transmitting STA does not need receive training as part of beam refinement. If the MID-REQ subfield is set to 1, the L-RX subfield indicates the ~~compressed~~ number of ~~AWV settings that the~~ TRN units the STA uses during the MID phase for each TX sector/AWV. ~~To obtain the number of AWVs that is used, the value of the L-RX subfield is multiplied by 4.~~

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1256 | 1606.48 | 10.3.4 |  |  | DMG STA's CCA requirement is very vague. I could not find clear requirement for receiver for the CS, particularly AWV related operation.  In clause 10.3.1, there is a paragraph stating "... , a DMG STA can configure its receive antenna to a quasi-omni pattern ... ", which does not specify requirement for the receiver or AWV. (This is not a normative behavior specified by "shall" language)  In clause 10.3.4.2, there is a paragraph stating "A DMG STA ... may configure its receiving antenna array to a quasi-omni antenna pattern ... " , which does not specify requirement. In the same subclause, there is a note stating "NOTE--The steady state of the antenna configuration might depend on the actual applications in which a DMG STA is involved. For example, a DMG STA that expects transactions with several STAs during a CBAP configures the receiving antenna to a quasi-omni pattern to be ready to receive transmission from any of the STAs. A DMG STA that expects transactions with a single STA (e.g., AP or PCP) might keep its receiving antenna directed to the peer STA.", which gives some idea but again does not specify requirements. In the same subclause, there is a paragraph stating "A DMG STA ... should configure its receiving antenna array to be directed ...", which does not specify requirement again.  In clause 10.3.4.3, there are paragraphs showing example DMG STA CCA operations among STAs using Figure 10-18 and Figure 10-19. However, this subclause does not specify requirement how DMG STA controls AWV.  In clause 10.37.5, there is a paragraph stating "Within a CBAP a STA with multiple DMG antennas should use only one DMG antenna in its frame transmission, CCA and frame reception...", which does not specify requirement. | Please specify DMG STA's CCA requirement with "shall" language. Lack of clear requirement for CS could result in selfish STA deployment, wich could be harmful. |

Proposed Resolution: **Reject**

**Reject Reason:**

The second paragraph in 10.3.4.2 applies to DMG STA – a DMG STA may transmit if the medium is idle and the backoff counter expired. The AWV setting of the receive antenna while sensing the medium is intentionally kept in a non-binding (no “shall”) language. This is because even the term quasi-omni is fairly vauge and defining the relation between RX pattern and TX pattern in any directional mode is very problematic. Considering this, it will be very hard to test whether a device complies with AWV specific sensing requirements. This is the reason the “should” language is used.

Another issue is that adding “shall” language cannot be done in text that applies to devices already deployed in the field.

**Discussion:**

This CID was discussed in length in e-mail:

**Commenter**:

Thank you very much for sharing the background/context of the past 802.11ad work. It is very helpful for me.

I understand that the 802.11ad tried its best to avoid defining specific requirement on purpose.

However, to those who are not involved in the standard development in person, like me, it is a bit confusing. And, I would think it is probably better for 802.11 standard to be more explicit what is the intended behavior. If we leave too much flexibility to implementation, we might start to see dumb STA which does not capture the spirit and harm neighboring STAs while stating that the STA is 802.11 compliant and follows CCA rules.

Is it possible to change the normative behavior as follows? I know the wording requires refinement, but I hope you could see what I mean.

In subclause 10.3.4.2 Basic access, replace

“ A DMG STA operating under the DCF access method that does not operate in a TXOP exchange may configure its receiving antenna array to a quasi-omni antenna pattern to be ready to receive frames from any DMG STA.

NOTE—The steady state of the antenna configuration might depend on the actual applications in which a DMG STA is involved. For example, a DMG STA that expects transactions with several STAs during a CBAP configures the receiving antenna to a quasi-omni pattern to be ready to receive transmission from any of the STAs. A DMG STA that expects transactions with a single STA (e.g., AP or PCP) might keep its receiving antenna directed to the peer STA.

A DMG STA operating under the DCF access method that is participating in a TXOP exchange should configure its receiving antenna array to be directed toward the other transmitter involved in the TXOP.”

with

“ A DMG STA operating under the DCF access method that does not operate in a TXOP exchange shall configure its receiving antenna to one of the following states:

* The DMG STA configures its receiving antenna array to a quasi-omni antenna pattern
* The DMG STA configures its receiving antenna array directed to a peer STA that the STA is communicating with

NOTE—The steady state of the antenna configuration might depend on the actual applications in which a DMG STA is involved. For example, a DMG STA that expects transactions with several STAs during a CBAP configures the receiving antenna to a quasi-omni pattern to be ready to receive transmission from any of the STAs. A DMG STA that expects transactions with a single STA (e.g., AP or PCP) might keep its receiving antenna directed to the peer STA.

A DMG STA operating under the DCF access method that is participating in a TXOP exchange should configure its receiving antenna array to be directed toward the other transmitter involved in the TXOP.”

If more conditions are needed, it is possible to add more bullets to cover the missing conditions.

Please let me know what you think. Thanks again for your time to think about it.

**Response:**

The problem is with the “shall” statement and with clear definition of direction towards a STA.  I may be in a situation in which I am waiting for one of 2 devices to transmit to me, and therefore I will set my antennas to be able to provide high gain in 2 directions.  It also brings the question of how long a device has to be in an antenna setting to be able to access the channel (slot, random backoff, probe delay).

These are part of the reasons we are not supportive of using “shall” language in the DMG access rules.

**Commenter:**

Thank you very much for your further clarification. I understand that there are some other cases to be considered, i.e., direct antenna toward multiple STAs.

Then, can we specify as follows?

“ A DMG STA operating under the DCF access method that does not operate in a TXOP exchange shall configure its receiving antenna to one of the following states:

* The DMG STA configures its receiving antenna array to a quasi-omni antenna pattern
* The DMG STA configures its receiving antenna array directed to a peer STA or peer STAs that the STA is communicating with

NOTE—The steady state of the antenna configuration might depend on the actual applications in which a DMG STA is involved. For example, a DMG STA that expects transactions with several STAs during a CBAP configures the receiving antenna to a quasi-omni pattern to be ready to receive transmission from any of the STAs. A DMG STA that expects transactions with a single STA (e.g., AP or PCP) might keep its receiving antenna directed to the peer STA.

A DMG STA operating under the DCF access method that is participating in a TXOP exchange should configure its receiving antenna array to be directed toward the other transmitter involved in the TXOP.”

As for the question “how long a device has to be in an antenna setting to be able to access the channel”, I implicitly assumed that the STA performing CCA sets its receiving antenna to a particular pattern for entire CCA duration including AIFS + random backoff. Is there any issue for DMG STA to perform such CCA? If it is the common understanding and practice, we may want to describe it as a part of the standard as well.

The reason why I would like to see more clear requirement here is to assure reasonable coexistence among DMG STAs. As long as we use CBAP, CCA should be a substantial tool for DMG STAs to assure coexistence. The standard should define solid base rules.

There are 802.11 vs LTE-U/LAA (or NR-U) coex discussion in sub 6GHz. We may start to see similar discussion for 60GHz. It will be important even for 60GHz 802.11 devices to have solid LBT rules in order to justify efficient operation comparing with other radio access technologies.

**Response:**

Hi Kaz, I also agree with Assaf. Receive patterns the STA can assume is endless; it could put some gain toward the STAs it is talking to, could direct the gain toward a subset with different gains based on distance, could be omni, or any combination.

Better coexistence does not have to be achieved through forcing a receive pattern. We have regulatory rules to limit transmit power based on antenna gain, and to limit CCA threshold (energy detect) based on transmit power. IEEE can adopt similar approach but that needs a lot more study.

**Commenter**

Thank you for sharing your thoughts.

I understand that the receive patterns that STA can assume is endless. I do not intend to specify what the beam pattern should be in precise manner. However, there should be a little better way to specify how it should be done.

We sometimes argue what the CCA threshold should be, i.e., -68dBm for PD / -48dBm for ED, or raise the threshold. We know that CCA threshold could make impact to the system level performance. Then, why do we allow any kind of antenna gain/pattern for the CCA?

The current standard language allows any dumb implementation for CCA w.r.t. AWV, meaning that it is possible to implement extremely selfish STA while claiming that it follows CCA rules. This is my concern.

“Better coexistence does not have to be achieved through forcing a receive pattern. We have regulatory rules to limit transmit power based on antenna gain, and to limit CCA threshold (energy detect) based on transmit power. IEEE can adopt similar approach but that needs a lot more study.”

It would be nice if we can study on this part a little more in IEEE. I hope receive antenna gain/pattern should be also considered when we discuss CCA threshold for DMG STA.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1025 | 1864.50 | 10.39.6.4.41 | TRN-T fields used in place of TRN-T subfields - this is incorrect (and different from the usual case of this problem) | repalce "TRN-T fields" with "TRN-T subfiels" do this in other places in the draft - a submission will be provided |

Proposed Resolution: **Revised**

**Disucssion**

I am also proposing to change the incorrect usages of TRN-R fields and TRN fields

***Editor: Modify P1224L4 as follows:***

the STA has measured on the TRN-T subfields of the BRP packet that contained the Channel Measurement

***Editor: Modify Table-255 (channel MEasruemet Feedback) by replacing every “TRN-T field” with “TRN-T subfield”***

***Editor: Modify P1864L50-51 as follows:***

header, the Packet Type and the Training Length fields are set to indicate the number of AGC and TRN-T subfields appended to the packet.

***Editor: Modify P1865L1 as follows:***

If a STA requests transmit beam refinement training, but does not send TRN-T subfields, the responding STA

***Editor: Modify P1865L4 as follows:***

field to 0. The requesting STA shall then transmit a BRP packet with TRN-T subfields. The responding STA

***Editor: Modify P1868L44 as follows:***

when the beam tracking initiator requests TRN-T subfields.

***Editor: Modify Figure 10-82 (Example of beam tracking procedure with initiator requesting TRN-T)***

***Editor: Modify P1215L25-26 as follows:***

The BS-FBCK field indicates the index of the TRN-T subfield that was received with the best quality in the last received BRP-TX PPDU, where the first TRN-T subfield in the PPDU is defined as having an index equal to 1.

***Editor: Modify P2888L37 as follows***

each of the TRN-T subfields ~~repetition~~ (except for those using the CE AWV configuration). The beam

***Editor: Modify P1371L63 as follows:***

corresponding to 0 to 64 TRN-R subfields. Other values are reserved. If the subfield is set to 0, the transmitting

***Editor: Modify P1847L19 as follows:***

set to indicate the number of TRN-R subfields the initiator requests for use in the BRP transaction

***Editor: Modify P1847L25-26 as follows:***

with a BRP frame with the MID-REQ field set to 0 and the L-RX field set to indicate the number of TRN-R subfields the responder requests for use in the BRP transaction.

***Editor: Modify P1860L23-26 as follows:***

the responder sending a BRP frame with TRN-R subfields (as requested in the BRP setup subphase). This packet may be transmitted using a wide pattern, approaching an omni transmit

***Editor: Modify P1860L41 as follows:***

pattern, or using a sector antenna pattern. The receiver may use the TRN-R subfields for receive training.

***Editor: Modify P1864L42 as follows:***

respond with a BRP packet (20.9.2.2 (Beam refinement)) including as many TRN-R subfields as indicated in

***Editor: Modify P1867L17 as follows:***

A STA that has requested beam refinement receive training shall, except when receiving TRN-R subfields, set

***Editor: Modify P1867L36 as follows:***

In a BRP-RX packet, all TRN-R subfields shall be transmitted using the same TX AWV configuration as the

***Editor: Modify P1867L41 as follows:***

0, in which case the TRN-R fields subshall be transmitted using the best known TX AWV configuration for

***Editor: Modify P1868L42 as follows:***

sequence when the beam tracking initiator requests TRN-R subfields, while Figure 10-82 (Example of beam

***Editor: in figure 10-81 (Example of beam tracking procedure with initiator requesting TRN-R) replace “TRN-R fields” with TNR-R subfields”***

***Editor: Modify P1867L59 as follows:***

BEAM\_TRACKING\_REQUEST to Beam Tracking Requested, TRN-LEN to the number of requested TRN subfields

**References:**