**IEEE P802.11  
Wireless LANs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CC34 – TBD and CID Resolution for Restricted TWT Quiet Interval Usage** | | | | |
| **Date: 2021-04-28** | | | | |
| **Author(s):** | | | | |
| **Name** | **Affiliation** | **Address** | **Phone** | **email** |
| Chunyu Hu | Facebook | 1 Hacker Way  Menlo Park, CA 95034 |  | [chunyuhu07@gmail.com](mailto:chunyuhu07@gmail.com) |
| Payam Torab |  | [torab@ieee.org](mailto:torab@ieee.org) |
|  |  |  |
| Liwen Chu | NXP |  |  | [liwen.chu@nxp.com](mailto:liwen.chu@nxp.com) |
| Boyce Bo Yang | Huawei |  |  | yangbo59@huawei.com |
| Shawn Kim | WILUS |  |  | shawn.kim@wilusgroup.com |
| Yongho Seok | MediaTek |  |  | yongho.seok@gmail.com |
| Rojan Chitrakar | Panasonic |  |  | rojan.chitrakar@sg.panasonic.com |

**Abstract**

Proposed draft text for using Quiet element in support of restricted TWT operation, submitted as resolution to a TBD and a CID 2215. All proposed changes are relative to 11be Draft 0.4.

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2021-04-21 | 0 | Initial draft |
| 2021-04-26 | 1 | Optional CF-End to end quiet intervals, rTWT SP and quiet interval boundary alignment |
| 2021-05-01 | 2 | Address comments received, polish the wording on the quiet interval description, and some editorial changes. |

# Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 2215 |  |  | Quiet element is proposed for low latency traffic. However, this is not fair to legacy STAs since the EHT STAs can ignore the quiet element. | The methods to address the unfairness should be introduced | Revised  TGbe editor, please implement changes proposed in this doc 11-21/683, tagged as #2215. |

**Discussion:**

The comment refers to the Draft 0.4 text highlighted below,

**35.7.3 Restricted TWT service periods announcement**

If there is any restricted TWT agreement set up, the EHT AP shall announce the restricted TWT service period schedule information in the modified broadcast TWT element contained in transmitted Beacon, TBD(broadcast and/or individual) Probe response frames, (Re)Association frames, and other TBD frames as described in TBD.

In order to provide additional protection for restricted TWT service periods, subject to TBD rules, the EHT AP may announce quiet intervals by including Quiet elements in Management frames that it transmits, that overlap with restricted TWT service periods. Non-AP EHT STAs may ignore the quiet intervals that overlap with restricted TWT service periods following the rules below:

* Non-AP EHT STAs with dot11RestrictedTWTOptionImplemented set to true shall follow channel access rules as defined in 35.7.4 (Channel access rules for restricted TWT service periods).
* Non-AP EHT STAs with dot11RestrictedTWTOptionImplemented set to false may behave as if such overlapping quiet intervals do not exist.

The commentor is correct in that non-EHT STAs are not allowed to transmit during quiet intervals while EHT STAs (even those with dot11RestrictedTWTOptionImplemented set to false) are allowed to transmit. We define additional details for protection through overlapping quiet intervals to improve non-EHT STAs channel access.

***TGbe Editor: Editing instructions preceded by “TGbe Editor” are instructions to the TGbe editor to modify existing material in the TGbe draft. As a result of adopting the changes, the TGbe editor will execute the instructions rather than copy them to the TGbe Draft.***

### 9.3.3.2 Beacon frame format

***TGbe editor: Please modify the following row in Table 9-32:***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| 12 | Quiet | The Quiet element is optionally present if dot11SpectrumManagementRequired is true or dot11RadioMeasurementActivated is true or dot11RestrictedTWTOptionImplemented is true. |

### 9.3.3.2 Probe Response frame format

***TGbe editor: Please modify the following row in Table 9-39:***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| 11 | Quiet | The Quiet element is optionally present if dot11SpectrumManagementRequired is true or dot11RadioMeasurementActivated is true or dot11RestrictedTWTOptionImplemented is true. |

***TGbe editor: Please modify 9.4.2.22 (Quiet element) as follows:***

### 9.4.2.22 Quiet element

The Quiet element defines an interval during which no transmission occurs in the current channel. This interval might be used to assist in making channel measurements without interference from other STAs in the BSS, or to protect channel access during restricted TWT service periods (see 35.7.4.2 (Quieting STAs during restricted TWT service periods)). The format of the Quiet element is shown in Figure 9-284.

***TGbe editor: Please modify 35.3.9.2 (Channel switching, enhanced channel switching, and channel quieting) as follows:***

### 35.3.9.2 Channel switching, enhanced channel switching, and channel quieting

If the Beacon frame or Probe Response frame transmitted by a first AP affiliated to an AP MLD, or transmitted by the transmitted BSSID in the same multiple BSSID set as the first AP if the first AP corresponds to a nontransmitted BSSID, any of the following elements is included for the first AP:

* Channel Switch Announcement element
* Enhanced Channel Switch Announcement element
* Max Channel Switch Time element
* Quiet element corresponding to quiet intervals other than quiet intervals scheduled to protect restricted TWT service periods (see 35.7.4.2 (Quieting STAs during restricted TWT service periods))
* Quiet Channel element

***TGbe editor: Please revise 35.7.3 (Restricted TWT service periods announcement) as follows, basically, remove the second paragraph:***

~~In order to provide additional protection for restricted TWT SPs, subject to TBD rules, the EHT AP may announce quiet intervals by including Quiet elements in MGMT frames that it transmits, that overlap with restricted TWT SPs. Non-AP EHT STAs may ignore the quiet intervals that overlap with restricted TWT SPs following the rules below:~~

* ~~Non-AP EHT STAs with dot11RestrictedTWTOptionImplemented set to true shall follow channel access rules as defined in 35.x.3.4 (Channel access rules for restricted TWT SPs).~~
* ~~Non-AP EHT STAs with dot11RestrictedTWTOptionImplemented set to false may behave as if such overlapping quiet intervals do not exist.~~

***TGbe editor: Please modify 35.7.4 (Channel access rules for restricted TWT service periods) as follows:***

### 35.7.4 Channel access rules for restricted TWT service periods

### 35.7.4.1 General

A non-AP EHT STA with dot11RestrictedTWTOptionImplemented set to true as a TXOP ~~owner~~ holder shall ensure the TXOP ends before the start of any restricted TWT service periods if the TXOP is obtained outside of a restricted TWT service period.

***TGbe editor: Please add the following new subclause (35.7.4.2):***

### 35.7.4.2 Quieting STAs during restricted TWT service periods (#2215)

In order to provide additional protection for restricted TWT service periods, an EHT AP with dot11RestrictedTWTOptionImplemented set to true may schedule a quiet interval that overlaps with any restricted TWT service period that has a duration of 1 TU or longer. Each such quiet interval, referred to as an overlapping quiet interval in this subclause, if scheduled, shall have a duration of 1 TU, and shall start at the same time as the corresponding restricted TWT service period.

Overlapping quiet intervals may be scheduled by including one or more Quiet elements in the Beacon and Probe Response frames that the EHT AP transmits. When the EHT AP is affiliated with an AP MLD operating on more than one link, the Quiet elements that correspond to overlapping quiet intervals on each link shall not be included in the Beacon frames that AP MLD transmits on its other links. See 35.3.9.2 (Channel switching, enhanced channel switching, and channel quieting).

NOTE—Unless specified otherwise (e.g., through the rules in this subclause), the channel access and transmission rules during quiet intervals are defined in 11.8.3 (Quieting channels for testing). AP can still use quiet intervals for channel testing and it’s under AP’s jurisdiction to schedule quiet intervals carefully to best serve various purposes.

If the AP terminates a restricted TWT SP (see 26.8.5 (Power save operation during TWT SPs)) before the end of the corresponding overlapping quiet interval, it may transmit a CF-End frame following the channel access rules in 35.7.4.1 (General).

A non-AP EHT STA may behave as if overlapping quiet intervals do not exist.