IEEE P802.11
Wireless LANs

|  |
| --- |
| LB230 CR 20MHz only STA on Secondary Channel  |
| Date: 2018-03-05 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Yongho Seok | MediaTek Inc. | 2840 Junction Ave, San Jose, CA 95134 |  | yongho.seok@mediatek.com  |
| Chao-Chun Wang | MediaTek Inc. |  |  |  |
| James Yee  | MediaTek Inc. |  |  |  |
| Guoqing Li | Apple |  |  | Guoqing\_li@apple.com  |

Abstract

This submission proposes resolutions of comments received from TGax LB230.

(The proposed change is based on TGax Draft 2.2.)

* CIDs: 14339, 11834, 11837, 14005 (4 CID)

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

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

| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| --- | --- | --- | --- | --- | --- |
| 14339 | 366.19 | 28.3.3.5 20 | limiting 20MHz only STA on the primary 20MHz may cause the poor network performance. Enable 20MHz only STA on secondary channel. | as in the comment | Revised- Agree in principle. The baseline TWT mechanism defined in 802.11ah already supports a secondary channel operation of a non-AP STA. Also, since 802.11ax supports the TWT mechanism, we can enable a 20MHz-only non-AP HE STA on a secondary channel with a minimal change. TGax editor makes changes as shown in the as specified in 11-18/0107r3.  |
| 11834 | 270.30 | 27.7.1 | The spec should allow the TWT channel to be negotiated between AP and the STA | The spec should allow the TWT channel to be negotiated between AP and the STA | Revised- Agree in principle. By allowing the TWT channel to be negotiated between an AP and a STA, we can enable a 20MHz-only non-AP HE STA on a secondary channel with a minimal change. Please refer a benefit of a 20MHz-only non-AP HE STA on a secondary channel from 11-18/369r3 document. TGax editor makes changes as shown in the as specified in 11-18/0107r3. |
| 11837 | 131.39 | 9.4.2.00 | Different channels should be allowed to maximize the utlization of the medium and reducing the power consumption for the STAs | Remove the contstraint that HE STA cannot use TWT channel field | Revised- Agree in principle. By allowing the TWT channel to be negotiated between an AP and a STA, we can enable a 20MHz-only non-AP HE STA on a secondary channel with a minimal change. Please refer a benefit of a 20MHz-only non-AP HE STA on a secondary channel from 11-17/369r3 document. TGax editor makes changes as shown in the as specified in 11-18/0107r3. |
| 14005 | 28.1.1 | 330.25 | 20 MHz-only non-AP HE STA operates in the Primary 20 MHz channel | Change "in 40 MHz channel width" to "in the Primary 20 MHz channel within 40 MHz channel width" at P330L25. Change "in 160 MHz and 80+80 MHz channel widths" to "in the Primary 20 Mhz channel within 160 and 80+80 MHz channel widths" at P330L29. | Revised- As a resolution of CID 14339, 11834, 11837, the HE Subchannel Selective Transmission operation is proposed in an optional mode of the 20 MHz-only non-AP HE STA. So, now 20 MHz-only non-AP HE STA is not restricted on the primary 20 MHz channel. But, because the default operation of the 20 MHz-only non-AP HE STA uses the primary 20 MHz channel, adding the clarification text proposed by a commenter makes sense. TGax editor makes changes as shown in the as specified in 11-18/0107r3. |

**Discussion:**

The below is a summary of the proposed operation.

1. 20MHz-only non-AP HE STA enables the PS mode together with enabling operation in the non-primary20
	1. In this case, the STA goes to the negotiated non-primary20, and repeats the following
		1. Wakes up at the beginning of TWT SP in the non-primary20
		2. Transmits (in the non-primary20) only if it receives a Trigger frame with appropriate RU allocation
		3. No EDCA based transmission anywhere (not in primary20, not in non-primary20) during the TWT SP
		4. Goes back to sleep at the end of TWT SP
	2. Note:  Periodically (based on DTIM mode), the STA will have to switch back to Primary20 to listen to DTIM Beacon at the TBTT
		1. It is the APs responsibility to ensure that the TBTT and TWT SP do not overlap, and that there is sufficient time between TBTT and TWT SP such that the STA can perform channel switch between the primary20 and non-primary20
	3. In this case, the STA will not be listening to any packets in the non-primary20 outside of the TWT SP, hence it is not required to set the NAV in the non-primary20
2. 20MHz-only non-AP HE STA does NOT enable the PS mode when operating in the non-primary20
	1. In this case, the STA repeats the following
		1. At the beginning of TWT SP (well, sometime before it since it takes time to switch channel), the STA switches channel from Primary20 to non-primary20
		2. Transmits (in the non-primary20) only if it receives a Trigger frame with appropriate allocation
		3. No EDCA based transmission anywhere (not in primary20, not in non-primary20) during the TWT SP
		4. At the end of TWT SP, the STA must perform channel switch to Primary20
	2. Note:  The AP should not transmit any packets to the STA while the STA is performing channel switch before and after the TWT SP
	3. In this case, the STA will not be capable of receiving any packets in the non-primary20 outside of the TWT SP, so cannot set the NAV in the non-primary20

***TGax editor: change the sub-clause 27.7.2 as the following:***

**27.7.2 Individual TWT agreements**

**…**

— Shall set the TWT Channel subfield in the TWT element it transmits to 0 except when the HE STA sets dot11HESubchannelSelectiveTransmissionImplemented to true. In which case the TWT Channel field contains a bitmap indicating a secondary channel for the RU Allocation during a TWT SP (see 27.7.6 (HE Subchannel Selective Transmission operation)).

***TGax editor: change the sub-clause 9.4.2.200 as the following:***

**9.4.2.200 TWT element**

When transmitted by a TWT requesting STA that is ~~not~~ neither an S1G STA nor an HE STA with dot11HESubchannelSelectiveTransmissionImplemented equal to true, the TWT Channel field is reserved. When transmitted by a TWT requesting STA that is either an S1G STA or an HE STA with dot11HESubchannelSelectiveTransmissionImplemented equal to true, the TWT Channel field contains a bitmap indicating which channel the STA requests to use as a temporary primary channel during a TWT SP. When transmitted by a TWT responding STA that is either an S1G STA or an HE STA with dot11HESubchannelSelectiveTransmissionImplemented equal to true, the TWT Channel field contains a bitmap indi-cating which channel the TWT requesting STA is allowed to use as a temporary channel during the TWT SP. Each bit in the bitmap corresponds to one minimum width channel for the band in which the TWT responding STA's associated BSS is currently operating, with the least significant bit corresponding to the lowest numbered channel of the operating channels of the BSS. In an S1G BSS, T~~t~~he minimum width channel is equal to the SST Channel Unit field of the SST Operation element if such an element has been previously received or is equal to 1 MHz for a BSS with a BSS primary channel width of 1 MHz and 2 MHz for a BSS with a BSS primary channel width of 2 MHz if no such element has been previously received from the AP to which the SST STA is associated. In an HE BSS, the minimum width channel is equal to 20 MHz. A value of 1 in a bit position in the bitmap transmitted by a TWT requesting STA means that operation with that channel as the primary channel is requested during a TWT SP. A value of 1 in a bit position in the bitmap transmitted by a TWT responding STA means that operation with that channel as the primary channel is allowed during the TWT SP. In an HE BSS, only one bit of the bitmap can have a value of 1. The TWT Channel field is not present when the Broad-cast field has the value 1.

***TGax editor: change the sub-clause 10.45.1 as the following:***

**10.45.1 TWT Overview**

A TWT requesting STA indicates which single channel it desires to use as a temporary primary channel during a TWT SP by setting a single bit to 1 within the TWT Channel field of the TWT element, according to the mapping described for that field. A TWT responding STA indicates which single channel the TWT requesting STA is permitted to use as a temporary primary channel during a TWT SP by setting a single bit to 1 within the TWT Channel field of the TWT element, according to the mapping described for that field.

In an S1G BSS, d~~D~~uring a TWT SP, access to a channel that is not the primary channel of the BSS shall be performed according to the procedure described in 10.50 (Subchannel Selective Transmission (SST)(11ah)).

In an HE BSS, during a trigger-enabled TWT SP, access to a channel that is not the primary channel of the BSS shall be performed according to the procedure described in 27.7.6 (HE Subchannel Selective Transmission operation).

***TGax editor: insert a new subclause as follows:***

**27.7.6 HE Subchannel Selective Transmission operation**

A TWT requesting STA and a TWT responding STA may set up a TWT for enabling frame exchanges on a non-primary 20 MHz subchannel. In which case, the TWT requesting STA and the TWT responding STA follow the rules described in this subclause.

When an HE STA implements the HE Subchannel Selective Transmission operation described in this subclause, it shall set dot11HESubchannelSelectiveTransmissionImplemented to true.

An HE AP STA whose dot11HESubchannelSelectiveTransmissionImplemented is true shall set the HE Subchannel Selective Transmission Support field in the HE Capabilities element it transmits to 1. A 20MHz-only non-AP HE STA whose dot11HESubchannelSelectiveTransmissionImplemented is true shall set the HE Subchannel Selective Transmission Support field in the HE Capabilities element it transmits to 1. Otherwise, a non-AP HE STA shall set the HE Subchannel Selective Transmission Support field in the HE Capabilities element it transmits to 0.

A TWT requesting STA with dot11HESubchannelSelectiveTransmissionImplemented equal to true may set set one bit in the TWT Channel field of the TWT request frame to 1 to request a secondary channel that is permitted for the RU Allocation, when a TWT responding STA has set the HE Subchannel Selective Transmission Support field to 1 in the HE Capabilities element it transmits. The secondary channel requested in the TWT request frame shall not be outside of the BSS bandwidth.

After receiving the TWT request frame of which the TWT Channel field has a non-zero bit value, a TWT responding STA with dot11HESubchannelSelectiveTransmissionImplemented equal to true may set one bit in the TWT Channel field of the TWT response frame to 1 to indicate a secondary channel that is permitted for the RU Allocation. The secondary channel indicated in the TWT response frame shall not be outside of the BSS bandwidth.

During the negotiated trigger-enabled TWT SPs, an HE AP that is under the TWT agreement shall allocate an RU within a secondary channel specified in the TWT Channel field of the TWT response frame and follow the RU restriction rules defined in 28.3.3.6 (RU restrictions for 20 MHz operation), when allocating an RU in an HE MU PPDU or HE TB PPDU to a non-AP STA that is under the TWT agreement.

During the negotiated trigger-enabled TWT SPs, the non-AP STA that is under the TWT agreement shall move to a secondary channel specified in the TWT Channel field of the TWT response frame. The non-AP STA shall not access the medium on the secondary channel using a DCF and EDCAF. After moving into a new operation channel, the non-AP STA in order to transmit shall perform CCA until a frame is detected by which it can set its NAV, or until a period of time equal to the NAVSyncDelay has transpired, whichever is earlier. A STA that receives a PPDU on the secondary channel shall update its NAV according to 27.2.4 (Updating two NAVs).

The negotiated trigger-enabled TWT SPs shall not overlapp with the TBTTs at which the TWT responding STA schedules for transmission DTIM Beacon frames. The TWT responding STA shall ensure that all negotiated trigger-enabled TWT SPs that are overlapping in time use the same secondary channel.

An HE STA whose dot11HESubchannelSelectiveTransmissionImplemented is true may include a Channel Switch Timing element in (Re-)Association Request frames to indicate its channel switch time between the primary and secondary channel. The channel switch time informs the AP of the duration of time that the non-AP STA might not be available to receive frames before the TWT starting time and after the end of the trigger-enabled TWT SP.

NOTE- An HE STA in the PS mode is not required to move to a primary channel after the end of the trigger-enabled TWT SP.

***TGax editor: insert a new subclause as follows:***

**9.4.2.237.2 HE MAC Capabilities Information field**

***TGax editor: insert the following into Table 9-262z:***

|  |  |  |
| --- | --- | --- |
| HE Subchannel Selective Transmission Support | Indicates whether an HE STA supports an HE Subchannel Selective Transmission operation as described in 27.7.6 (HE Subchannel Selective Transmission operation). | Set to 1 if supported.Set to 0 otherwise. |

***TGax editor: insert the following into Figure 9-589ck:***

|  |  |
| --- | --- |
| B38 | B39 |
| A-MSDU In A-MPDU Support | ~~Reserved~~ HE Subchannel Selective Transmission Support |
| 1 | 1 |

***TGax editor: add the follow Channel Switch Timing element into Table 9-29 (Association Request frame body) and Table 9-31 (Reassociation Request frame body).***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| 43 | Channel Switch Timing | The Channel Switch Timing element is optionally present when dot11HESubchannelSelectiveTransmissionImplemented is true; otherwise it is not present. |

***TGax editor: change the sub-clause 9.4.2.63 as the following and makes the Switch Timeout field in Figure 9-377 (Channel Switch Timing element format) to an optional field:***

**9.4.2.63 Channel Switch Timing element**

The Switch Timeout field is set to a time in units of microseconds. The STA sending the Channel Switch Timing element waits for the first Data frame exchange on the off-channel for Switch Timeout microseconds before switching back to base channel. The time is measured from the end of the last symbol of the Ack frame that is transmitted in response to TDLS Channel Switch Response frame, as seen on the WM. When transmitted in (Re)Association Request frames by an HE STA, the Switch Timeout field is not present in the Channel Switch Timing element.

***TGax editor: change the sub-clause 28.1.1 as the following:***

**28.1.1 Introduction to the HE PHY**

A non-AP HE STA shall support the following features:

…

— A 20 MHz operating non-AP HE STA shall support 26-, 52-, and 106-tone RU sizes ~~and~~ on locations allowed in 28.3.3.6 (RU restrictions for 20MHz operation) in the primary 20 MHz channel within (#14005) 40 MHz and the primary 20 MHz channel within (#14005) 80 MHz channel widths in the 5 GHz band (transmit and receive)

A non-AP HE STA may support the following:

…

— For a 20 MHz-only non-AP HE STA, 26-, 52-, 106-, and 242-tone RU sizes ~~and~~ on locations allowed in 28.3.3.6 (RU restrictions for 20MHz operation) in the primary 20 MHz channel within (#14005) 40 MHz channel width in the 2.4 GHz band when the 20 MHz-only non-AP HE STA does not support the HE Subchannel Selective Transmission operation as described in 27.7.6 (HE Subchannel Selective Transmission operation). (#11834, 11837)

— For a 20 MHz-only non-AP HE STA, 26-, 52-, 106-, and 242-tone RU sizes on locations allowed in 28.3.3.6 (RU restrictions for 20MHz operation) in any 20 MHz channel within 40 MHz channel width in the 2.4 GHz band when the 20 MHz-only non-AP HE STA supports the HE Subchannel Selective Transmission operation as described in 27.7.6 (HE Subchannel Selective Transmission operation). (#11834, 11837)

— For a 20 MHz-only non-AP HE STA, 26-, 52-, 106-, and 242-tone RU sizes on locations allowed in 28.3.3.6 (RU restrictions for 20MHz operation) in any 20 MHz channel within 40 MHz, 80MHz, 160 MHz, and 80+80 MHz channel widths in the 5 GHz band when the 20 MHz-only non-AP HE STA supports the HE Subchannel Selective Transmission operation as described in 27.7.6 (HE Subchannel Selective Transmission operation). (#11834, 11837)

— For a 20 MHz operating non-AP HE STA, 26-, 52-, 106-, and 242-tone RU sizes ~~and~~ on locations allowed in 28.3.3.6 (RU restrictions for 20MHz operation) in the primary 20 MHz channel within (#14005) 160 MHz and 80+80 MHz channel widths in the 5 GHz band.

***TGax editor: change the sub-clause 28.3.2.8 as the following:***

**28.3.2.8 RU restrictions for 20 MHz operation**

The center 26-tone RU in ~~the primary~~ any 20 MHz channel shall not be assigned to a 20 MHz operating non-AP STA when ~~20 MHz operating non-AP HE STAs are~~ it is a recipient~~s~~ of a 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz HE MU PPDU.

***TGax editor: change the sub-clause 28.3.3.5 as the following:***

**28.3.3.5 20 MHz operating non-AP HE STAs**

A 20 MHz operating non-AP HE STA shall operate in the primary 20 MHz channel except when the 20 MHz operating non-AP HE STA is a 20 MHz-only non-AP HE STA whose dot11HESubchannelSelectiveTransmissionImplemented is equal to true. In such case, the 20 MHz-only non-AP HE STA can operate in any 20 MHz channel within the BSS bandwidth according to the procedure described in 27.7.6 (HE Subchannel Selective Transmission operation).

**Annex C (normative)**

**ASN.1 encoding of the MAC and PHY MIB**

**C.3 MIB Detail**

***TGax editor: change Annex C as the following:***

Dot11HEStationConfigEntry ::=

SEQUENCE {

 …

 dot11PartialBSSColorImplemented TruthValue

 dot11HESubchannelSelectiveTransmissionImplemented TruthValue

 }

dot11PartialBSSColorImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the partial BSS color (see

27.16.3 (AID assignment)) is implemented. The capability is disabled otherwise."

DEFVAL { false }

::= { dot11HEStationConfigEntry 22}

dot11HESubchannelSelectiveTransmissionImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that a HE Subchannel Selective Transmission operation (see 27.7.6 (HE Subchannel Selective Transmission operation)) is implemented. The capability is disabled otherwise."

DEFVAL { false }

::= { dot11HEStationConfigEntry 23}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \* End of dot11HEStationConfigTable TABLE

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

dot11HEComplianceGroup OBJECT-GROUP

OBJECTS {

 …

dot11PartialBSSColorImplemented,
dot11HESubchannelSelectiveTransmissionImplemented }

STATUS current

DESCRIPTION

"Attributes that configure the HE Group for IEEE 802.11."

::= { dot11Groups 100 }