IEEE P802.11  
Wireless LANs

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| MAC support for preamble puncture mode | | | | |
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Abstract

This submission proposes text changes to MAC section to support HE MU PPDU in preamble puncture mode:

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: reflect comments from Po-Kai, Reza, Yongho and Alfred

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.***

**Discussion:** Refer to IEEE 802.11-16/1382r0

**9.2.4.6.4 A-Control**

**9.2.4.6.4.1 General**

**TGax Editor: *change Table 9-18a as follows:***

**Table 9-18a—Control ID subfield values**

|  |  |  |  |
| --- | --- | --- | --- |
| **Control ID value** | **Meaning** | **Length of the Control Information subfield (bits)** | **Content of the Control Information subfield** |
| 0 | UL MU response scheduling | 26 | See 9.2.4.6.4.2 (UL MU response scheduling) |
| 1 | Operating Mode | 16 | See 9.2.4.6.4.3 (Operating Mode(#2209)) |
| 2 | HE link adaptation | TBD | See 9.2.4.6.4.4 (HE link adaptation) |
| 3 | Buffer Status Report (BSR) | 26 | See 9.2.4.6.5 (Buffer Status Report (BSR)) |
| 4 | UL Power Headroom | 8 | See 9.2.4.6.5 (Buffer Status Report (BSR)) |
| 5 | Bandwidth Query Report (BQR) | 10 | See 9.2.4.6.4.7(Bandwidth Query Report (BQR)) |
| ~~5~~6-15 | Reserved |  |  |

**TGax Editor: *add the following paragraph after 9.2.4.6.4.6 as follows:***

**9.2.4.6.4.7 Bandwidth Query Report (BQR)**

The Control Information subfield, when the Control ID subfield is 5, contains the Bandwidth Query Report used for Bandwidth Query report operation to assist HE DL MU transmission (see 25.5.1.3 (Bandwidth Query report operation for HE DL MU).

|  |  |  |
| --- | --- | --- |
|  | B0 B7 | B8 B9 |
|  | Available Channel BitMap | Reserved |
| Bits: | 8 | 2 |

**Figure 9-15h—Control Information subfield format when the Control ID subfield is 5**

Bandwidth Query Report used for bandwidth query report operation to assist DL HE MU transmission (see 25.5.1.3. (Bandwidth query report operation).

**Table 9-xx—Available Channel Bit-Map field**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
| 20MHz | set to 1 if the channel is available, set to 0 otherwise | Set to 0 | Set to 0 | Set to 0 | Set to 0 | Set to 0 | Set to 0 | Set to 0 |
| 40MHz | set to 1 if the 20MHz covering tone [-244:-3] is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [3:244] is available and is set to 0 otherwise | Set to 0 | Set to 0 | Set to 0 | Set to 0 | Set to 0 | Set to 0 |
| 80MHz | set to 1 if the 20MHz channel covering tone [-500:-259] is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [-258:-17] is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [17:258] is available and set to 0 otherwise | is set to 1 if the 20MHz channel covering tone [259:500] is available and set to 0 otherwise | Set to 0 | Set to 0 | Set to 0 | Set to 0 |
| 80+80MHz or 160MHz | set to 1 if the 20MHz channel covering tone [-500:-259] of primary 80 MHz channel is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [-258:-17] of primary 80 MHz channel is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [17:258] of primary 80 MHz channel is available and set to 0 otherwise | is set to 1 if the 20MHz channel covering tone [259:500] of primary 80 MHz channel is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [-500:-259] of secondary 80 MHz channel is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [-258:-17] of secondary 80 MHz channel is available and set to 0 otherwise | set to 1 if the 20MHz channel covering tone [17:258] of secondary 80 MHz channel is available and set to 0 otherwise | is set to 1 if the 20MHz channel covering tone [259:500] of secondary 80 MHz channel is available and set to 0 otherwise |

The 4 LSBs (B0-B3) of the Available Channel Bit Map subfield indicates the channel availability of the primary 80MHz channel.

For 20MHz operation, B0 is set to 1 if the channel is available and is set to 0 otherwise.

For 40MHz operation, B0 is set to 1 if the 20MHz covering tone [-244:-3] is available and is set to 0 otherwise. B1 is set to 1 if the 20MHz channel covering tone [3:244] is available and is set to 0 otherwise.

For 80MHz, 80+80MHz and 160MHz operation, B0 is set to 1 if the 20MHz channel covering tone [-500:-259] is available and is set to 0 otherwise, B1 is set to 1 if the 20MHz channel covering tone [-258:-17] is available and is set to 0 otherwise, B2 is set to 1 if the 20MHz channel covering tone [17:258] is available and is set to 0 otherwise, B3 is set to 1 if the 20MHz channel covering tone [259:500] is available and is set to 0 otherwise.

The next 4 LSBs (B4-B7) of the Available Channel Bit Map subfield indicates the channel availability of the secondary 80MHz channel for 160MHz and 80+80MHz operation.

B4 is set to 1 if the 20MHz channel covering tone [-500:-259] is available and is set to 0 otherwise, B5 is set to 1 if the 20MHz channel covering tone [-258:-17] is available and is set to 0 otherwise, B6 is set to 1 if the 20MHz channel covering tone [17:258] is available and is set to 0 otherwise, B7 is set to 1 if the 20MHz channel covering tone [259:500] is available and is set to 0 otherwise.

**9.4.2.218.2 HE MAC Capabilities Information field**

**TGax Editor: *use one reserved bit (e.g. B32) as A-BQR support:***

**TGax Editor: *add one row in Table 9-262z as follows:***

**Table 9-262z—Subfields of the HE MAC Capabilities Information field**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| UL MU-MIMO | B1 of the UL MU MIMO subfield indicates the STA supports transmission of full bandwidth UL MUMIMO transmission. B2 of the UL MU MIMO subfield indicates the STA supports transmission of UL MU-MIMO transmission on an RU in an HE MU PPDU where the RU does not span the entire PPDU bandwidth.(# |  |
| A-BQR Support | Indicates support by an AP for receiving an (A-)MPDU that contains a BQR in the A-Control subfield and support by a non-AP STA for generating an (A-)MPDU that contains a BQR in the A-Control subfield. | If +HTC-HE Support is 1: Set to 1 if the STA supports the BQR A-Control field functionality. Set to 0 otherwise. Reserved if +HTC-HE Support is 0. |

**9.3.1.23 Trigger frame format**

**TGax Editor: *change Table 9-25a as follows:***

**Table 9-25a—Trigger Type subfield encoding**

|  |  |
| --- | --- |
| **Trigger Type field value** | **Description** |
| 0 | Basic Trigger |
| 1 | Beamforming Report Poll |
| 2 | MU-BAR |
| 3 | MU-RTS |
| 4 | Buffer Status Report Poll (BSRP) |
| 5 | Bandwidth Query Report Poll (BQRP) |
| ~~5~~6-16 | Reserved |

**TGax Editor: *Add the following paragraph after section 9.3.1.23.4:***

**9.3.1.23.5 Bandwidth Query variant**

The Bandwidth Query Report Poll (BQRP) variant Trigger frame format is as defined in Figure 9-52c (Trigger frame).

The Common Info field of the BQRP variant Trigger frame is defined in Figure 9-52d (Common Info field) and the Trigger Dependent Common Info field is not present.

The User Info field of the BQRP variant Trigger frame is defined in Figure 9-52e (User Info field) and the Trigger Dependent User Info field is not present.

The CS required subfield is set to 1.

**10.9 HT Control field operation**

**TGax Editor: *add the section highlighted in red in section 10.9 as follows:***

An HE variant HT Control field shall not be present in a frame addressed to a STA unless that STA declares support for +HTC-HE in the HE Capabilities Information field of its HE Capabilities element. The HE vari-ant HT Control field carried in the frame may contain a Control(#2495) subfield supported by the intended receiver that has:

* A value of 0 in the Control ID subfield when the transmitting STA expects an HE trigger-based PPDU(#Ed) that carries an immediate acknowledgement, as described in 25.5.2 (UL MU opera-tion)(#2315).
* A value of 1 in the Control ID subfield when the transmitting STA changes the receive operating mode(#2209), as described in 25.8 (Operating mode indication)(#2228).
* A value of 2 in the Control ID subfield when the transmitting STA follows the HE link adaptation procedure, as described in 10.31.4 (Link adaptation using the HE variant HT Control field).
* A value of 3 in the Control ID subfield when the transmitting STA follows the corresponding buffer status report procedure, as described in 25.5.2.5 (HE buffer status feedback operation for UL MU)(#824)
* A value of 4 in the Control ID subfield when the transmitting STA follows the UL MU operation procedure, as described in 26.3.13.2 (Power pre-correction).
* A value of 5 in the Control ID subfield when the transmitting STA follows the bandwidth query report procedure, as described in 25.5.1.2 (HE bandwidth query report operation for DL MU).

**TGax Editor: *add the following section after 25.5.1.2:***

**25.5.1.3 HE bandwidth query report operation for DL MU**

A non-AP STA with A-BQR Support subfield of its HE Capabilities element equal to 1 delivers bandwidth query reports (BQRs) to assist its AP in allocating DL MU and UL MU resources in an efficient way. The non-AP STA can either implicitly deliver BQRs in the BQR A-Control field of any frame transmitted to the AP (unsolicited BQR) or explicitly deliver BQRs in any frame sent to the AP in response to a BQRP variant Trigger frame (solicited BQR).

A non-AP STA reports its channel availability information (unsolicited BQR) to the AP to which it is associated using the BQR A-Control field of frames it transmits as defined below:

* The HE STA may report the channel availability information in the BQR A-Control subfield of frames it transmits if the AP has indicated its support in the A-BQR Support subfield of its HE Capabilities element; otherwise the STA shall not report the channel availability information in the BQR A-Control subfield.

A HE AP can solicit one or more HE non-AP STAs with A-BQR Support subfield of its HE Capabilities element equal to 1 for their BQR(s) by sending a BQRP variant Trigger frame (see 9.3.1.23 (Trigger frame format)). The non-AP STA with A-BQR Support subfield of its HE Capabilities element equal to 1 responds (solicited BQR) as defined below:

* The STA that receives a BQRP variant Trigger frame shall follow the rules defined in 25.5.2.3 (STA behavior) to generate the trigger-based PPDU when the Trigger frame contains the STA's AID in any of the Per User Info fields; otherwise the STA shall follow the rules defined in 25.5.2.6 (UL OFDMA-based random access) to gain access to a random RU and generate the Trigger-based PPDU when the Trigger frame contains one or more random RU(s).
* The STA shall include in the HE trigger-based PPDU one or more QoS Null frames containing the BQR A-Control field with the channel availability information of the STA when the AP has indicated its support in the A-BSR Support subfield of its HE Capabilities element. The HE STA shall not solicit an immediate response for the frames carried in the trigger-based PPDU (e.g., by setting the Ack Policy subfield of the frame to Normal Ack or Implicit BAR).