IEEE P802.11
Wireless LANs

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| BSS Basic HE-MCS per Bandwidth |
| Date: 2017-08-02 |
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Abstract

Proposed language to address the question of BSS Basic HE-MCS per Bandwidth.

There are a couple of choices:

1. Do NOT allow an HE AP to specify any BW requirement for any STA wishing to join the BSS
2. Allow an HE AP to specify BW requirements for HE STA wishing to join the BSS, but not for non-HE STA wishing to join the BSS
3. Allow an HE AP to specify BW requirements for any/all STA wishing to join the BSS

Details of the proposed solutions are in the body of this document.

Changes are referenced to TGax D1.4.

**REVISION NOTES:**

**R0**:

initial

**END OF REVISION NOTES**

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:**

In the May 2017 meeting, 11-171052r4 was adopted. That document made changes to the HE Capabilities and HE Operation elements. After those changes are actioned in the TGax draft, the HE Operations element will have a Basic MCS NSS set definition that uses the same format as the HE Capabilities Supported MCS and NSS set field definition. But there will be a question, which is – what is the bandwidth requirement for joining the BSS?

The answer to this question is a bit unclear.

There are at least two choices as to how to answer the question:

1. Do NOT allow an HE AP to specify any BW requirement for any STA wishing to join the BSS
	1. This choice still needs some clarifying language, specifically:
		1. It is possible for a STA to advertise BW-dependent MCS support values in the HE Cap IE
		2. For example, if a STA supports the Basic HE MCS set for 80 MHz, but does not support it for 160 MHz, then can the STA join?
		3. The answer might be simply, that there is no explicit answer, and the STA can take a chance, and find out the answer in the form of an ACCEPT or REJECT of its association request
		4. The other choice is to make something explicit in the amdenment
2. Allow an HE AP to specify BW requirements for STAs wishing to join the BSS
	1. I.e. give the AP the ability to include per-BW BSS Basic HE MCS values inside of the HE Op IE
		1. Allow optional inclusion of two additional copies of the HE MCS NSS field, one for 160 and one for 80+80
		2. Have an option to indicate that the 160 and 80+80 values are identical to the 80 MHz values to reduce overhead
		3. Note that these values are invisible to non-HE STAs because they are located inside of the HE Op IE
			1. Non-HE STA will not see the BW restriction and try to join
			2. AP can use BSS membership selector to prohibit non-HE STA from joining
			3. AP can selectively refuse membership based on observed STA Capabilities

For background, readers should familiarize themselves with:

**27.15.4.1 Rx Supported HE-MCS and NSS Set**

In particular, note that the following language is already part of the TGax draft, regarding STA capabilities:

*Otherwise, if the Max HE-MCS For n SS subfield (n = NSS) in each Rx HE-MCS Map For b sub-field for b  { 80 MHz, 160 MHz, 80+80 MHz} indicates support, then the <HE-MCS, NSS> tuple* ***at that bandwidth*** *is supported by the first STA on receive as defined in 9.4.2.237.4 (Supported HE-MCS And NSS Set field(#5518))(#3526, #3354, #3461, #3775, #3858, #4301).(#4769)*

*An HE STA shall not, unless explicitly stated otherwise, transmit a HE PPDU unless the <HE-MCS, NSS> tuple and bandwidth used are in the Rx supported HE-MCS and NSS set(#Ed) of the receiving STA(s).*

Note that because the HE Capabilities information for supported HE MCS is clearly provided with bandwidth dependency, it is important that the operational information is made clear about bandwidth choices when selecting option 1 as a solution. I.e. if solution 1 is to be adopted, then it needs to be made clear in the amendment that the basic HE-MCS, NSS set only applies to <=80 MHz operation, and not for other bandwidths.

**Proposed Changes to TGax D1.4, Choice 1:**

**9.4.2.238 HE Operation element**

***TGax editor: change the text shown:***

(#4775)(#6437)(#6439)(#6452)(#6458)(#9673)(#9562, #9563)The Basic HE MCS And NSS Set field indicates the HE-MCSs for each number of spatial streams in HE PPDUs that are supported by all HE STAs in the BSS (including IBSS and MBSS) for <= 80 MHz operation. The Basic HE-MCS And NSS Set field is defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field).(#4769)

***TGax editor: modify the text as shown:***

**10.3 DCF**

**10.3.1 General**

All VHT STAs that are members of a BSS are able to receive and transmit using all of the <VHT-MCS, NSS> tuples in the basic VHT-MCS and NSS set (see 11.40.7) except as constrained by the rules of 10.7.12.

All HE STAs that are members of an HE BSS are able to receive and transmit using all of the <HE-MCS, NSS> tuples for <=80 MHz bandwidth as indicated in the basic HE-MCS And NSS Set field (see 27.16.1 (Basic HE BSS functionality)).

***TGax editor: modify the text as shown:***

**27.16.1 Basic HE BSS functionality**

An HE STA has dot11HEOptionImplemented equal to true.

A STA that is starting an HE BSS shall be able to receive and transmit at each of the <HE-MCS, NSS> tuple values for <=80 MHz bandwidth as indicated by the Basic HE-MCS And NSS Set field of the HE Operation parameter of the MLME-START.request primitive and shall be able to receive at each of the <HE-MCS, NSS> tuple values for <=80 MHz bandwidth as indicated by the Supported HE-MCS and NSS Set field of the HE Capabilities parameter of the MLME-START.request primitive. The basic HE-MCS and NSS set is the set of <HE-MCS, NSS> tuples for <=80 MHz bandwidth that are supported by all HE STAs that are members of an HE BSS. It is established by the STA that starts the HE BSS, indicated by the Basic HE-MCS And NSS Set field of the HE Operation parameter in the MLME-START.request primitive. Other HE STAs determine the basic HE-MCS and NSS set from the Basic HE-MCS And NSS Set field of the HE operation element in the BSSDescription derived through the scan mechanism (see 11.1.4.1 (General)).

An HE STA shall not attempt to join (MLME-JOIN.request primitive) a BSS unless it supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples for <=80 MHz in the basic HE-MCS and NSS set.

NOTE – An HE STA does not attempt to (re)associate with an HE AP unless the STA supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples for <=80 MHz in the basic HE-MCS and NSS set field in the HE Operation element transmitted by the AP because the MLME-JOIN.request primitive is a necessary precursor to (re)association.

**Proposed Changes to TGax D1.4, Choice 2:**

**9.4.2.238 HE Operation element**

***TGax editor: change Figure 9-589cq – HE Operation element format and change the text, as shown:***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | HE Operation Parameters | Basic HE MCS And NSS Set for <= 80 MHz Operation | Basic HE MCS And NSS Set for 160 MHz Operation | Basic HE MCS And NSS Set for 80+80 MHz Operation | VHT Operation Information | MaxBSSID Indicator |
| Bits: | 1 | 1 | 1 | 4 | 2 | 0 or 2 | 0 or 2 | 0 or 3 | 0 or 1 |

**Figure 9-589cq – HE Operation element format**

(#4775)(#6437)(#6439)(#6452)(#6458)(#9673)(#9562, #9563)The Basic HE MCS And NSS Set for <=80 MHz field indicates the HE-MCSs for each number of spatial streams in HE PPDUs that are supported by all HE STAs in the BSS (including IBSS and MBSS) for <= 80 MHz operation. The Basic HE MCS And NSS Set for 160 MHz field indicates the HE-MCSs for each number of spatial streams in HE PPDUs that are supported by all HE STAs in the BSS (including IBSS and MBSS) for 160 MHz operation. The Basic HE MCS And NSS Set for 80+80 MHz field indicates the HE-MCSs for each number of spatial streams in HE PPDUs that are supported by all HE STAs in the BSS (including IBSS and MBSS) for 80+80 MHz operation. Each of these fields is formatted identically to the the Basic HE-MCS And NSS Set field which is defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field).(#4769) The Basic HE MCS And NSS Set for 160 MHz field is present if the 160 MHz Basic MCS Set Present subfield is equal to 1; otherwise the field is not present. The Basic HE MCS And NSS Set for 80+80 MHz field is present if the 80+80 MHz Basic MCS Set Present subfield is equal to 1; otherwise the field is not present

***TGax editor: replace Figure 9-589cu – HE Operation Parameters field format with the new Figure shown:***

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|  | B0 B5 | B6 B8 | B9 | B10 B19 | B20 | B21 |
|  | BSS Color | Default PE Duration | TWT Required | HE Duration Based RTS Threshold | Partial BSS Color | VHT Operation Information Present |
| Bits: | 6 | 3 | 1 | 10 | 1 | 1 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B22 B23 | B24 | B25 | B26 | B27 | B28 | B29 | B30 | B31 |
|  | Reserved | 160 MHz Required | 160 MHz Basic MCS Set Present | 80+80 MHz Required | 80+80 MHz Basic MCS Set Present | Multiple BSSID AP | Tx BSSID Indicator | BSS Color Disabled | Reserved |
| Bits: | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

**Figure 9-589cu – HE Operation Parameters field format**

***TGax editor: insert the following text in an appropriate location within the subclause 9.4.2.238 HE Operation element:***

The 160 MHz Required subfield indicates if support of 160 MHz operation is required to join the BSS that is the source of this element. A value of 1 indicates that support of 160 MHz operation is required to join the BSS. A value of 0 indicates that support of 160 MHz operation is not required to join the BSS.

The 160 MHz Basic MCS Set Present subfield indicates if the Basic HE MCS And NSS Set for 160 MHz Operation subfield is present in the element. A value of 1 indicates that the field is present. A value of 0 indicates that the field is not present. If the field has the value 0 and the 160 MHz Required subfield has the value 1, then the Basic HE MCS And NSS Set for 160 MHz Operation is identical to the Basic HE MCS And NSS Set for <=80 MHz Operation.

The 80+80 MHz Required subfield indicates if support of 80+80 MHz operation is required to join the BSS that is the source of this element. A value of 1 indicates that support of 80+80 MHz operation is required to join the BSS. A value of 0 indicates that support of 80+80 MHz operation is not required to join the BSS.

The 80+80 MHz Basic MCS Set Present subfield indicates if the Basic HE MCS And NSS Set for 80+80 MHz Operation subfield is present in the element. A value of 1 indicates that the field is present. A value of 0 indicates that the field is not present. If the field has the value 0 and the 80+80 MHz Required subfield has the value 1, then the Basic HE MCS And NSS Set for 80+80 MHz Operation is identical to the Basic HE MCS And NSS Set for <=80 MHz Operation.

***TGax editor: modify the text as shown:***

**10.3 DCF**

**10.3.1 General**

All VHT STAs that are members of a BSS are able to receive and transmit using all of the <VHT-MCS, NSS> tuples in the basic VHT-MCS and NSS set (see 11.40.7) except as constrained by the rules of 10.7.12.

All HE STAs that are members of an HE BSS are able to receive and transmit using all of the <HE-MCS, NSS> tuples for <=80 MHz bandwidth and for each additional required bandwidth indicated in the basic HE-MCS And NSS Set fields (see 27.16.1 (Basic HE BSS functionality)).

***TGax editor: modify the text as shown:***

**27.16.1 Basic HE BSS functionality**

An HE STA has dot11HEOptionImplemented equal to true.

A STA that is starting an HE BSS shall be able to receive and transmit at each of the <HE-MCS, NSS> tuple values for <=80 MHz bandwidth and for each additional required bandwidth as indicated by the Basic HE-MCS And NSS Set fields of the HE Operation parameter of the MLME-START.request primitive and shall be able to receive at each of the <HE-MCS, NSS> tuple values for <=80 MHz bandwidth and for each additional required bandwidth as indicated by the Supported HE-MCS and NSS Set field of the HE Capabilities parameter of the MLME-START.request primitive. The basic HE-MCS and NSS set is the set of <HE-MCS, NSS> tuples for <=80 MHz bandwidth and for each additional required bandwidth that are supported by all HE STAs that are members of an HE BSS. It is established by the STA that starts the HE BSS, indicated by the Basic HE-MCS And NSS Set fields of the HE Operation parameter in the MLME-START.request primitive. Other HE STAs determine the basic HE-MCS and NSS set from the Basic HE-MCS And NSS Set fields of the HE operation element in the BSSDescription derived through the scan mechanism (see 11.1.4.1 (General)).

An HE STA shall not attempt to join (MLME-JOIN.request primitive) a BSS unless it supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples for all required bandwidths in the basic HE-MCS and NSS set.

NOTE – An HE STA does not attempt to (re)associate with an HE AP unless the STA supports (i.e., is able to both transmit and receive using) all of the <HE-MCS, NSS> tuples for all required bandwidths in the basic HE-MCS and NSS set field in the HE Operation element transmitted by the AP because the MLME-JOIN.request primitive is a necessary precursor to (re)association.

**End of proposed changes.**