IEEE P802.11
Wireless LANs

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| HE MCS and NSS Comment resolutions |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (28 CIDs):

* 4769, 4770, 4932, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Fixed some typos (not worthy of highlighting).
* Rev 2: Incorporated suggestions received during the presentation. Changes highlighted in blue. Text in red is pending.
* Rev 3: Fixing the bug for the text in red (which remains unchanged).
* Rev 4: replaced “<” with “<=” which is the correct bound.

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.***

# PARS I

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 4769 | Alfred Asterjadhi | 86.48 | m and n are not defined. Define them and on what values combos they depend on. | As in comment. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.This new signaling removes the m and n fixing the issue.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 4769. |
| 4770 | Alfred Asterjadhi | 88.34 | How do you indicate support for NSS = 8 with this encoding? | If the NSS indicates the number of NSS as an unsigned integer then there is no value for NSS =8. Please clarify. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.This new signaling also fixes the indication of NSS =8.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 4770. |
| 4932 | Brian Hart | 86.37 | Maximum thruput per area is achieved at a middling MCS - not too low (sets NAV too far away) and not too high (area that must be suppressed in order to achieve an adequate SINR for MCS10/11 is inefficiently high). But the HE Operation/HE Capability signalling does not permit 64QAM MCSs to be deleted | Use the Reserved values to lower the max MCS to 4/5/6 as an AP's policy choice for the BSS for high density deployments | Rejected –The HE Capabilities indicates the MCSs that are supported by the STA and the STA decides which ones to use when transmitting to the AP. Reducing the MCS level to a low value would increase the TX time for the same amount of payload defeating the purpose of this amendment. |
| 5519 | Graham Smith | 86.53 | "indicates the highest NSS value minus 1, supported by the STA" Comma usage seems wrong, either delete it or add another after "value". | Delete comma in cited text. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5519. |
| 5520 | Graham Smith | 86.60 | "Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfield". Where is this "Channel Bandwidth Set" field? A search in this documment finds 4 occurances of the same sentence but I can't find a Figure or Table with it in. Add further information as to where this field is, in all four locations | Add information as to the whereabouts of the the Channel Bandwidth Set field at P86L60, P86L63, P87L34, P87L37. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.Fixed the inconsistency of the naming, namely referring to the Channel Width Set field of the HE Caps. TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5520. |
| 5525 | Graham Smith | 86.34 | I am wondering if it is possible to make this Tx Rx HE MCS Support field more complicated? We indicate the highest NSS and MCS, and then indicate, via the bitmaps, the BWs supported. Then we add the Tx and Rx NSS Descriptors. But, the bitmap indicates if Descriptor fields are present, so it is not possible to simply indicate the highest NSS and MCS and BW supported, we have to then add the Descriptors. The description seems to say that the descriptors can be omitted but not if the BW bitmaps can be. So many things come to mind. Should we not indicate which fields are optional for a start, and then get the text to be clear. | Indicate which fields are optional in FIG 9-589cm. Then make clear how the bit maps are used if the 'Descriptor" fields are not present. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5525. |
| 5526 | Graham Smith | 86.53 | P86 Lines 53 - 65. It looks as though this para is supposed to be summary but it fails miserably. It jumps striaght to the Descriptor description without making it clear what the Bitmaps do. It is unclear how the BWs are supported. It talks about a Channel Bandwidth Set which I can't find. The combination of bitmap and Descriptors seems to be a catch-all to allow any and every combination of BW, MCS and NSS - do we really want to do this? Do we really expect a mixture of BW and NSS for example? I can accept that the MCS may vary for a higher BW, say, but do we expect the number of SS to change? I have problems with this...maybe the description is not clear, maybe we need a table to provide examples? Maybe this summary should not be here and maybe should be at the end of the clause. | Move summary, if that's what it is meant to be (not sure as it seems to be repeated on next page,(but that's another comment) to after the individual field descriptions, and provide examples on how it is used. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 8679. |
| 5527 | Graham Smith | 86.58 | "The Highest NSS Supported M1 subfield indicates the highest NSS value minus 1, supported by the STA that transmitted this subfield. The Highest NSS Supported M1 value is applicable to both transmissions and receptions but does not necessarily apply to all combinations of PPDU bandwidth and MCS. The PPDU bandwidth and MCS values that do not support the NSS value indicated in this subfield are described in the Tx MCS NSS Descriptors and Rx MCS NSS Descriptors subfields, if present." This trhe third sentence concerns the last fields and should be associated with those fields. Delete from end of second sentence to end of para. | Delete from end of second sentence to end of para. This description should be moved to after the Descriptor description. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5527. |
| 5528 | Graham Smith | 87.30 | "The PPDU bandwidth and NSS values that do not support the MCS value indicated in this subfield are described in the Tx MCS NSS Descriptors and Rx MCS NSS Descriptors subfields, if present. If no Tx MCS NSS Descriptors subfield is present, then the STA supports transmission of all combinations of PPDU bandwidth identified by the Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfields. If no Rx MCS NSS Descriptors subfield is present, then the STA supports reception of all combinations of PPDU bandwidth identified by the Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfields." This para is describing the Highest MCS supported. Leave it at that. We should describe the fields in order, not suddenly jump to the last ones. Delete. | Delete cited text and/or move this text to the end after the description for the Descriptors. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5528. |
| 5529 | Graham Smith | 87.56 | "If all of the bits of the Tx BW Bitmap subfield and all of the bits of the Rx BW Bitmap subfield are zero, then none of the subfields of the Tx Rx HE MCS Support field beyond Highest MCS Supported need to be present." If the bits are zero then that implies that the fields are present. Therefore the RX and Tx bitmaps have to be present? In addition the field is then only 6 bits. It looks as though the bit fields always have to be there. | Change cited text as follows: "If all of the bits of the Tx BW Bitmap subfield and all of the bits of the Rx BW Bitmap subfield are zero, then the Tx MCS NSS Descriptors and Rx MCS NSS Descriptor sub fields are not present." | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5529. |
| 5530 | Graham Smith | 87.59 | "If either the Tx BW Bitmap subfield or the Rx BW Bitmap subfield has at least one bit set to 1, then both the Tx BW Bitmap subfield and the Rx BW Bitmap subfield are present, even if one of these subfields has the value of all zeros." The bit fields always need to be there based upon previous description (and comment). Simply delete this | Delete cited text. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5530. |
| 5531 | Graham Smith | 88.18 | Fiigure 9-589cn. Why 4 bits for the MCS? The Highest MCS only needed 3 (0 to 7). If you add another bit you will need to add a table explaining how the bits are used. Suggest MCS sub field is cut to 3 bits, then add in the text that the coding is as per Table 9-262ab. | MCS sub field cut to 3 bits, then add in the text that the coding is as per Table 9-262ab. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.Used 3 bits for the MCS fields as suggested.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5531. |
| 5532 | Graham Smith | 87.64 | "Each Tx MCS NSS Descriptor indicates the value of the highest supported NSS for the indicated MCS for a specific bandwidth of operation" seems straightforward. We have a bit map telling us that this is the highest MCS and NSS supported for this BW. So what is the next text trying to say? "...and for all MCS that are higher than the indicated MCS up to but not including the next MCS in the set for this bandwidth"? Each Tx MCS NSS Descriptor indicates the value of the highest supported NSS for the indicated MCS for a specific bandwidth of operation How can we have an MCS that is higher but not including the next above the MCS to this one that is indicated as the highest? Sorry does not make any sense - is this the highest MCS or not? Either delete the second part of the text or dscribe better what you are trying to convey. | Either delete the second part of the cited text or describe better what you are trying to convey. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5532. |
| 5533 | Graham Smith | 88.01 | "MCS values that are lower than the lowest specified MCS within a set of Tx MCS NSS Descriptor fields implicitly support transmission of PPDUs using the highest NSS value indicated in the Highest NSS Supported subfield." Confused by the use of "set of" Tx MCS NSS Descriptor fields. A set would indicate all, up to 5, of the sub fields. So do we look through all the fields (up to five I guess), find the lowest MCS, and assume that for all BW MCSs below this use the highest NSS? This seems pretty confusing and I don't understand if this is really practical. Do we think that devices will support different NSSs for a set BW as the MCS changes? Surely we want the device to simply indicate for each BW, the max NSS and MCS and leave it at that? | Delete cited text or explain better what is intended. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5533. |
| 5534 | Graham Smith | 88.06 | "Each Rx MCS NSS Descriptor indicates the value of the highest supported NSS for the indicated MCS for a specific bandwidth of operation" seems straightforward. We have a bit map telling us that this is the highest MCS and NSS supported for this BW. So what is the next text trying to say? "...and for all MCS that are higher than the indicated MCS up to but not including the next MCS in the set for this bandwidth"? Each Rx MCS NSS Descriptor indicates the value of the highest supported NSS for the indicated MCS for a specific bandwidth of operation How can we have an MCS that is higher but not including the next above the MCS to this one that is indicated as the highest? Sorry does not make any sense - is this the highest MCS or not? Either delete the second part of the text or dscribe better what you are trying to convey. | Either delete the second part of the cited text or describe better what you are trying to convey. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5534. |
| 5535 | Graham Smith | 88.08 | "MCS values that are lower than the lowest specified MCS within a set of Rx MCS NSS Descriptor fields implicitly support transmission of PPDUs using the highest NSS value indicated in the Highest NSS Supported subfield." Confused by the use of "set of" Rx MCS NSS Descriptor fields. A set would indicate all, up to 5, of the sub fields. So do we look through all the fields (up to five I guess), find the lowest MCS, and assume that for all BW MCSs below this use the highest NSS? This seems pretty confusing and I don't understand if this is really practical. Do we think that devices will support different NSSs for a set BW as the MCS changes? Surely we want the device to simply indicate for each BW, the max NSS and MCS and leave it at that? | Delete cited text or explain better what is intended. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5535. |
| 5536 | Graham Smith | 88.27 | "The MCS subfield of the Tx MCS NSS Descriptor and Rx MCS NSS Descriptor subfields indicates an MCS value encoded as an unsigned integer." Why be different than the Table 9-262ab? MCS0-7 are mandatory? Just use 3 bits and be consistent. | Change cited text to "The MCS subfield of the Tx MCS NSS Descriptor and Rx MCS NSS Descriptor subfields indicates an MCS value encoded as per Table 9-262ab". Also change Fig 9-589cn accordingly. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5536. |
| 5537 | Graham Smith | 88.37 | Why do we need this final 'last' bit? If the bit map works, it is clear which is the last one. Get rid of this and simply have 2 reserved bits (MCS should be 3 bits) | Delete text from P88 Lines 37 to 40. Change Fig 9-589cn such that MCS is 3 bits and Last MCS NSS is replaced with "Reserved" (2 bits) | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.This “last bit” removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5537. |
| 5790 | Hongyuan Zhang | 86.42 | In 11n, all BW modes (20 and 40MHz) have the same MCS and Nss capabilities; in 11ac all BW modes within {20, 40, 80}MHz have ths same MCS and Nss capabilities, while 160/80+80MHz may define a different Nss capability; now in 11ax it seems that the presence of "Tx MCS Nss Descriptions" and "Rx MCS NSS Descriptions" fields allow any BW modes to define a different Max Nss and Max MCS capabilities, and different Nss may defined different max MCS too. Do we really need this level of flexibility? For example, for a 80MHz capable device it seems very natrual that the same number of Nss should be supported for 20, 40 and 80MHz modes because almost all the necessary hardware are already physically present. This unnecessary flexibility makes the AP rate control much more complex than the previous generations. | Consolidate the MCS/Nss capabilities, make them common for 20/40/80MHz like in 11ac. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5790. |
| 5920 | James Yee | 86.44 | In Figure 9-589cm, there is no defintion of m and n in the text that follows. | Add explanation of n and m in Figure 9-589cm to the text of section 9.4.2.218.4 | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.The fields governed by m and n are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 5920. |
| 7560 | Liwen Chu | 86.60 | This is no such thing of Channel Bandwidth Set field | Use the defined field. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.Fixed the name of the field as well, namely known as Channel Width Set.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 7560. |
| 7993 | Massinissa Lalam | 87.56 | How can a STA know the size of the "Tx Rx HE MCS Support field" since Tx BW Bitmap and Rx BW Bitmap may not be present as they are "beyond Highest MCS Supported filed" in case all of their bits are equal to zero? Indeed, the sentence "If all of the bits of the Tx BW Bitmap subfield and all of the bits of the Rx BW Bitmap subfield are zero, then none of the subfields of the Tx Rx HE MCS Support field beyond Highest MCS Supported need to be present." implies that the Tx Rx HE MCS Support field can have a size as low as 6 bits. In my opinion the "Tx BW Bitmap" and "Rx BW bitmap" should always be present to maintain a minimum of a 2 bytes field (coherent with Figure 9-589cj), extended by one byte each time a bit is at 1 Tx BW Bitmap and Rx BW Bitmap. Therefore, the begining of the next subfield 'PPE Thresholds (optional)" can also be uniquely defined. | Please consider revision. For instance, replacing the whole paragraph with "If all of the bits of the Tx BW Bitmap subfield and all of the bits of the Rx BW Bitmap subfield are zero, then none of the subfields of the Tx Rx HE MCS Support field beyond Rx BW Bitmap are present." | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 8679. |
| 8678 | Sigurd Schelstraete | 86.44 | There is no reason to call the field "Highest NSS Supported M1". It's better and cleaner to call it "Highest NSS Supported" and clarify how this is encoded, as is done throughout the draft (see e.g. "NSTS Total For <=80 MHz", "Number Of Sounding Dimensions For <= 80 MHz", ... All of those fields are encoded as the number of streams minus 1, but that is not reflected in the field name) | See comment | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.The field is removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 8678. |
| 8679 | Sigurd Schelstraete | 87.56 | "If all of the bits of the Tx BW Bitmap subfield and all of the bits of the Rx BW Bitmap subfield are zero, then none of the subfields of the Tx Rx HE MCS Support field beyond Highest MCS Supported need to be present."This means that "Tx BW bitmap", "Rx BW bitmap", ... could be absent. That should be reflected in Figure 9-589cm. | Add "(if present)" for the fields that are not always included. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 8679. |
| 8680 | Sigurd Schelstraete | 88.30 | What is the encoding of NSS: #streams or #streams - 1. | Clarify | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.And clarified that NSS is equal to # as streams.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 6433. |
| 9303 | Tomoko Adachi | 86.34 | The HE Capabilities element is described that it includes the Tx Rx HE MCS NSS Support field in subclause 9.4.2.218.1, not Tx Rx HE MCS Support field. | Change the subclause title from "Tx Rx HE MCS Support field" to "Tx Rx HE MCS NSS Support field".Change "Tx Rx HE MCS Support field" to "Tx Rx HE MCS NSS Support field" in page 86 line 37.Change the caption of Figure 9-589cm from "Tx Rx HE MCS Support field format" to "Tx Rx HE MCS NSS Support field format".Change "Tx Rx HE MCS Support field" to "Tx Rx HE MCS NSS Support field" in page 87 line 58, in page 191 line 55, in page 191 line 59, in page 238 line 41, and in page 240 line 26. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.These two fields are removed so the issue is fixed.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 9303. |
| 6433 | John Coffey | 87.57 | The text provides a case in which certain subfields "do not need to be present". This seems to imply that the subfields could be present even though they do not need to be. Why allow an extra case? Is the assumption that subfields that do not need to be present will therefore not be present in different implementations? | Change "do not need to be present" to "are not present" (or shall not be present, or equivalent text). | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 6433. |
| 8348 | Peter Loc | 87.59 | Due to the lack of a length indication, the decoder does not know if Tx Rx HE MCS Support field does not contain the Tx and Rx bitmaps. It would be more deterministic if both Tx BW Bitmap subfield or the Rx BW Bitmap fields are always present in the Tx Rx HE MCS support field. | Replace the paragraph starting on line 56 with the following: "The Tx BW Bitmap and the Rx BW Bitmap are always present, even if one or both of these subfields has the value of all zeros. | Revised –Agree in principle with the comment. Proposed resolution is to simplify the signaling of the Tx Rx HE MCS Support subfield, make it compatible with the signaling of the Basic HE MCS and NSS Set of the HE Operation element and inline with the signaling for VHT STAs as suggested by CID 5790. We maintain the flexibility of signaling per bandwidth capability for up to 80 Mhz, 160 and 80+80 MHz.TGax editor to make the changes shown in 11-17/1052r4 under all headings that include CID 8348. |

**Discussion: *None.***

* HE Capabilities element

**TGax Editor: *Change the figure below of this subclause as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | Element ID | Length | HE MAC Capabilities Information | HE PHY Capabilities Information | Supported HE-MCS and NSS Set | PPE Thresholds (optional) |
| Octets: | 1 | 1 | 5 | 9 | 4 or 8 or 12 | variable |
| * HE Capabilities element format
 |

**9.4.2.237.4 Supported HE-MCS and NSS Set field(#5518)**

**TGax Editor: *Delete all the current contents of this subclause and insert the following (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

The Supported HE-MCS and NSS Set field is used to convey the combinations of HE-MCSs and spatial streams that a STA supports for reception and the combinations that it supports for transmission(#6696)(#3385). The structure of the field is shown in Figure 9-589cm (Supported HE-MCS and NSS Set field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Rx HE-MCS MapFor <= 80 MHz  | (#5879) (#7576)Tx HE-MCS Map For <= 80 MHz | Rx HE-MCS Map For 160 MHz | (#5879) (#7576)Tx HE-MCS Map For 160 Mhz | Rx HE-MCS Map For 80+80 MHz | (#5879) (#7576)Tx HE-MCS Map For 80+80 Mhz |
| Octets: | 2 | 2 | 0 or 2 | 0 or 2 | 0 or 2 | 0 or 2 |
| Figure 9-589cm -- Supported HE-MCS and NSS Set field format(11ac)(#5960) |

The Supported HE-MCS and NSS Set field’s(#5960) subfields, and their presence, are defined in Table 9-262ab (Supported HE-MCS and NSS Set subfields).

|  |
| --- |
| Table 9-262ab -- Supported HE-MCS and NSS Set subfields  (11ac) |
| Subfield | Definition | Encoding |
| Rx HE-MCS Map For <= 80 MHz  | (#7684)(#7685)Indicates the maximum value of the RXVECTOR parameter MCS of a PPDU that can be received at all channel widths less than or equal to 80 MHz supported by this STA for each number of spatial streams.(#5960) | The format and encoding of this subfield are defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field) and the associated description.The Rx HE-MCS Map for 80 MHz is always present in the Supported HE-MCS and NSS Set field. |
| Tx HE-MCS Map For <= 80 MHz | (#7686)Indicates the maximum value of the TXVECTOR parameter MCS of a PPDU that can be transmitted at all channel widths less than or equal to 80 MHz supported by this STA for each number of spatial streams.(#7686)(#5960) | The format and encoding of this subfield are defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field) and the associated description.The Tx HE-MCS Map for 80 MHz is always present in the Supported HE-MCS and NSS Set field. |
| Rx HE-MCS Map For 160 MHz  | (#7684)(#7685)Indicates the maximum value of the RXVECTOR parameter MCS of a PPDU that can be received at 160 MHz channel width supported by this STA for each number of spatial streams.(#5960) | The format and encoding of this subfield are defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field) and the associated description.The Rx HE-MCS Map For 160 MHz subfield is present if B2 of the Channel Width Set subfield of the HE PHY Capabilities field is set to 1; otherwise, it is not present. |
| Tx HE-MCS Map For 160 MHz | (#7686)Indicates the maximum value of the TXVECTOR parameter MCS of a PPDU that can be transmitted at 160 MHz channel width supported by this STA for each number of spatial streams.(#7686)(#5960) | The format and encoding of this subfield are defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field) and the associated description.The Tx HE-MCS Map For 160 MHz subfield is present if B2 of the Channel Width Set subfield of the HE PHY Capabilities field is set to 1; otherwise, it is not present. |
| Rx HE-MCS Map For 80+80 MHz  | (#7684)(#7685)Indicates the maximum value of the RXVECTOR parameter MCS of a PPDU that can be received at 80+80 MHz channel width supported by this STA for each number of spatial streams.(#5960) | The format and encoding of this subfield are defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field) and the associated description.The Rx HE-MCS Map For 80+80 MHz subfield is present if B3 of the Channel Width Set subfield of the HE PHY Capabilities field is set to 1; otherwise, it is not present. |
| Tx HE-MCS Map For 80+80 MHz | (#7686)Indicates the maximum value of the TXVECTOR parameter MCS of a PPDU that can be transmitted at 80+80 MHz channel width supported by this STA for each number of spatial streams.(#7686)(#5960) | The format and encoding of this subfield are defined in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field) and the associated description.The Tx HE-MCS Map For 80+80 MHz subfield is present if B3 of the Channel Width Set subfield of the HE PHY Capabilities field is set to 1; otherwise, it is not present. |

Each Rx HE-MCS Map subfield and each Tx HE-MCS Map subfield have the structure shown in Figure 9-589cn (Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  B0 B1 | B2 B3 | B4 B5 | B6 B7 | B8 B9 | B10 B11 | B12 B13 | B14 B15 |
|  | Max HE-MCS For 1 SS | Max HE-MCS For 2 SS | Max HE-MCS For 3 SS | Max HE-MCS For 4 SS | Max HE-MCS For 5 SS | Max HE-MCS For 6 SS | Max HE-MCS For 7 SS | Max HE-MCS For 8 SS |
| Bits: | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Figure 9-589cn -- Rx HE-MCS Map and Tx HE-MCS Map subfields and Basic HE-MCS And NSS Set field(11ac)(#5392) |

The Max HE-MCS For *n* SS subfield (where *n* = 1, ..., 8) is encoded as follows:

* 0 indicates support for HE-MCS 0-7 for *n* spatial streams
* 1 indicates support for HE-MCS 0-9 for *n* spatial streams
* 2 indicates support for HE-MCS 0-11 for *n* spatial streams
* 3 indicates that *n* spatial streams is not supported for HE PPDUs

The maximum HE NSS in receive for a given MCS(#7687) is equal to the smaller of:(#5960)

* the maximum value of *n* for which the Max HE-MCS for *n* SS has a value that indicates support for that MCS (0, 1, or 2, for MCS 0-7, 1, or 2 for MCS 8-9, 2 for MCS 10-11)(#7687)
* the maximum supported NSS as indicated by the value of the Rx NSS field of the (#7688)Operating Mode Notification frame if(Ed) the value of Rx NSS Type is 0 or of the OM Control field

NOTE—A HE-MCS indicated as supported in the Rx HE-MCS Map fields for a particular number of spatial streams might not be valid at all bandwidths (see 28.5 (Parameters for HE-MCSs)) and might be affected by 27.15.4.3 (Additional rate selection constraints for HE PPDUs).(#5960)

The maximum HE NSS in transmit for a given MCS(#7687) is equal to the smaller of:(#5960)

* the maximum value of *n* for which the Max HE-MCS for *n* SS has a value that indicates support for that MCS (0, 1, or 2, for MCS 0-7, 1, or 2 for MCS 8-9, 2 for MCS 10-11)(#7687)
* the maximum supported NSTS as indicated by the value of the Tx NSTS field of (#7688)the OM Control field sent by a non-AP STA

NOTE—A HE-MCS indicated as supported in the Tx HE-MCS Map fields for a particular number of space time streams might not be valid at all bandwidths (see 28.5 (Parameters for HE-MCSs)) and might be affected by 27.15.4.3 (Additional rate selection constraints for HE PPDUs).(#5960)

* Parameters for HE-MCSs

**TGax Editor: *Change the paragraph below as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

Dual (#7501)carrier modulation (DCM) is an optional modulation scheme for any OFDMA and non OFDMA transmissions. DCM is only applied to MCS 0, MCS 1, MCS 3 and MCS 4. DCM is applied only with *NSS* = 1 or *NSS* = 2 (in the case of single user RU in an HE MU PPDU, *NSS,r,u* = 1 or *NSS,r,u* = 2). An HE STA shall support single spatial stream HE-MCSs within the range HE-MCS 0 to HE-MCS 7 for all channel widths for which it has indicated support regardless of the Tx or Rx Highest MCS Supported subfield(#9321) values in the Supported HE-MCS and NSS Set field. When more than one spatial stream is supported, the Tx or Rx Max HE MCS For *n* SS Supported subfield(#9321) values in the Supported HE-MCS and NSS Set field may result in a reduced HE-MCS range (cut-off) for *NSS* = 2, …, 8. Support for OFDMA 26-tone RU, 52-tone RU, 106-tone RU, 242-tone RU and 996-tone RU with *NSS* = 1 is mandatory. Support for non-OFDMA 20 MHz, 40 MHz, and 80 MHz with *NSS*= 1 is mandatory. Support for more than one spatial stream is optional in all cases. Support for OFDMA and non-OFDMA 160 MHz and 80+80 MHz with *NSS* = 1, …, 8 is optional.

* PPDU format, BW, MCS, NSS, and DCM selection rules
* MCS, NSS, BW and DCM selection

An HE STA that transmits an HE PPDU shall use an <HE-MCS, NSS> tuple supported by the receiver STA. An(#5517) <HE-MCS, NSS> tuple is supported if reported as such in the Supported HE-MCS and NSS Set field in the HE Capabilities element received from that STA. When the Supported HE-MCS and NSS set of the receiving STA or STAs is not known, the transmitting STA shall transmit using a <HE-MCS, NSS> tuple in the basic HE-MCS and NSS set if the basic HE MCS and NSS set is not empty, otherwise the transmitting STA shall transmit using a <HE MCS, NSS> tuple in the mandatory HE-MCS and NSS Set.(#7585) An HE STA is subject to all of the rules for HT STAs and VHT STAs that apply to its operating band (see 10.26 (Protection mechanisms)).(#5523, #7586)

* Rate selection constraints for HE STAs
* Rx Supported HE-MCS and NSS Set

**TGax Editor: *Change the paragraph below as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

The Rx Supported HE-MCS and NSS Set of a first HE STA is determined by a second HE STA for each <HE-MCS, NSS> tuple NSS = 1, …, 8 and bandwidth (<= 80 MHz, and 160 MHz or 80+80 MHz) from the Supported HE-MCS and NSS Set field of the HE Capabilities element(#7587) received from the first STA as follows:

* If support for the HE-MCS for NSS spatial streams at that bandwidth is mandatory (see 28.5 (Parameters for HE-MCSs)(#5111)), then the <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on receive.
* Otherwise, if the Max HE-MCS For n SS subfield (n = NSS) in each subfield Rx HE-MCS Map For *b* MHz, where *b* is <= 80, 160, 80+80 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).
* Otherwise, the <HE-MCS, NSS> tuple at that bandwidth is not supported by the first STA on receive.

The <HE-MCS, NSS> tuples excluded by 27.15.4.3 (Additional rate selection constraints for HE PPDUs) can also be eliminated from the Rx Supported HE-MCS and NSS Set.

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 of the receiving STA(s).

* Tx Supported HE-MCS and NSS Set

**TGax Editor: *Change the paragraph below as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

The Tx Supported HE-MCS and NSS Set of a first HE STA is determined by a second STA for each <HE-MCS, NSS> tuple NSS = 1, …, 8 and bandwidth (<= 80 MHz, and 160 MHz or 80+80 MHz) from the Supported HE-MCS and NSS Set field received from the first STA as follows:

* If support for the <HE-MCS, NSS> tuple at that bandwidth is mandatory (see 28.5 (Parameters for HE-MCSs)), then the <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on transmit.
* Otherwise, if the Max HE-MCS For *n* SS subfield (*n* = NSS) in each subfield Tx HE-MCS Map For *b* MHz, where *b* is <= 80, 160, 80+80 indicates support, then
* The <HE-MCS, NSS> tuple at that bandwidth is supported by the first STA on transmit as defined in 9.4.2.237.4 (Supported HE-MCS and NSS Set field(#5518)).
* Otherwise, the <HE-MCS, NSS> tuple at that bandwidth is not supported by the first STA on transmit.
* HE BSS operation
* Basic HE BSS functionality

A STA that is starting an HE BSS shall be able to receive and transmit at each of the <HE-MCS, NSS> tuple values 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 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 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 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 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.

**TGax Editor: *Change the paragraph below as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

At a minimum, an HE STA sets the Rx MCS Bitmask of the Supported MCS Set field of its HT Capabilities element according to the setting of each subfield Rx HE-MCS Map For *b* MHz, *b* = 80, 160, 80+80, of the Supported HE-MCS and NSS Set field of its HE Capabilities element as follows: for each subfield Max HE-MCS For *n* SS, 1 <= *n* <= 4, of each subfield Rx HE-MCS Map For *b* MHz, where *b* is <= 80, 160, 80+80, with a value other than 3 (no support for that number of spatial streams), the STA shall indicate support for MCSs 8(*n*– 1) to 8(*n*– 1) + 7 in the Rx MCS Bitmask, where *n* is the number of spatial streams, except for those MCSs marked as unsupported as described in 27.15.4.3 (Additional rate selection constraints for HE PPDUs).

The setting of the Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields is shown in Table 11-25 (Setting of Channel Center Frequency Segment 0, Channel Center Frequency Segment 1 and Channel Center Frequency Segment 2 subfields), except that the Max NSS support is provided by the HE STA in frames that contain an HE Capabilities element (see 9.4.2.237 (HE Capabilities element)) and an Operating Mode field (see 9.2.4.6.4.3 (Operating Mode) and 9.4.1.53 (Operating Mode field)), wherein in the table the Max NSS support refers to the HE Max NSS support instead of the VHT Max NSS support for an HE STA.

**TGax Editor: *Change the paragraph below as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

An HE STA shall not transmit to a second HE STA using a bandwidth that is not indicated as supported in the Channel Width Set subfield in the HE Capabilities element received from that HE STA.

* HE Operation element

**TGax Editor: *Change the paragraphs below as follows (#CID 4769, 4770, 5519, 5520, 5525, 5526, 5527, 5528, 5529, 5530, 5531, 5532, 5533, 5534, 5535, 5536, 5537, 5790, 5920, 7560, 7993, 8678, 8679, 8680, 9303, 6433, 8348):***

(#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).The Basic HE-MCS And NSS Set field is defined in Figure 9-589cn (Basic HE-MCS And NSS Set field format).

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