IEEE P802.11
Wireless LANs

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| Proposed resolution for comments related to HE Operation element |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (33 CIDs): 3034, 5923, 5924, 8261, 3035, 4771, 7998, 9757, 9338, 3036, 3177, 4772, 5331, 5551, 6062, 7561, 8134, 8259, 8400, 8683, 9337, 9510, 9663, 9845, 5214, 5909, 6437, 6439, 6441, 6442, 6443, 6447, 4775

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.***

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| **CID** | **Section** | **Pg / Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 3034 | 9.4.2.219 | P91L8 | MaxBSSID Indicator field is 1 octet in length and is only useful (i.e., valid) if the AP is part of a Multiple BSSID Set. Make MaxBSSID Indication separate (optional) field. Add a bit sub-field to HE Parameters to indicates if the AP is part of a Multiple BSSID set. | Add a new bit field in HE Operation Parameters call Multiple BSSID AP. Move MaxBSSID Indication sub-field out of HE Operation Parameter field and make it a separate (optional) field. MaxBSSID Indicator field is present in HE Operation element only when Multiple BSSID AP bit in HE Parameters field is 1. In addition, the value of Tx BSSID Indicator is ignored if the Multiple BSSID AP bit value is 0. | AcceptedAdded a bit (Multiple BSSID AP) in HE Parameters to indicate if the AP is part of a multiple BSSID set. Moved the 1-octet MaxBSSID indicator field out of HE Parameters. The value of Multiple BSSID AP bit in HE Parameter indicates if TxBSSID Indicator bit is meaningful or reserved and whether the (new) MaxBSSID Indicator field is carried in the element.Please see document 11-17/0135r1 |
| 5923 | 9.4.2.219 | P92L11 | The definition of MaxBSSID indicator is not clear. Should properly reference to 9.4.2.46 and clearly provide HE AP behavior exceptions.There could also be multiple Multiple BSSID elements from multiple APs or the HE AP has its own Multiple BSSID element. | Clarify the defintion of MaxBSSID idicator and how to set it up when there are multiple sources of Multiple BSSID elements. | RevisedAgree in principle with the comment.MaxBSSID Indicator is now a separate field which is present only if the AP belongs to a multiple BSSID set. In a multiple BSSID set, there is only one AP (referred to as Transmitted BSSID) that sends Beacons, Probe Response, (Re-)Association Response frames with Multiple BSSID element.Please see document 11-17/0135r1 |
| 5924 | 9.4.2.219 | P92L14 | The non-zero value here is the same as the MaxBSSID from the Multiple BSSID element? The setting of a non-zero value here contradicts the value setting of MaxBSSID indicator defined in line 11 in the same paragraph. | Clarify if any non-zero value can be set or the non-zero value needs to be set as the same as the MaxBSSID indicator. | RevisedAgree with the comment.MaxBSSID Indicator is now a separate field which is present only if the AP belongs to a multiple BSSID set. When present, the value will be same as MaxBSSID Indicator carried in Multiple BSSID element.Please see document 11-17/0135r1 |
| 8261 | 9.4.2.219 | P92L15 | An AP corresponding to neither a nontransmitted BSSID nor a transmitted BSSID sets both MaxBSSID Indicatorand Tx BSSID Indicator to 0. Does this AP correspond to a AP with no support of multi-BSS feature, or is there any other case ? It would be nice to clarify this point in the text. | as per comment | RevisedAgree with the comment.Added a bit (Multiple BSSID AP) in HE Parameters to indicate if the AP is part of a multiple BSSID set. TxBSSID Indicator bit is meaningful only when AP belongs to a multiple BSSID set (i.e., Multiple BSSID AP bit is set to 1).Please see document 11-17/0135r1 |
| 3035 | 9.4.2.219 | P91L1 | VHT Operation Information field is useful only when operating in 5GHz. Make the 3-octet VHT Operation Information field option and add a bit in the HE Parameters to indicate the presence of VHT Operation Information field | As in comment | AcceptedIn order to avoid ambiguity regarding which VHT Operation info a non-AP HE STA should follow, added a bit in HE Parameters to indicate if VHT Operation Information field is carried in this element. AP sets this to 0 when operating in 2.4G or if the frame is carrying VHT Operation element.Please see document 11-17/0135r1 |
| 4771 | 9.4.2.219 | P91L4 | The operation of HE STAs is not controlled by the presence of the VHT Operation element because the HE Operation IE has the VHT Operation Information field. Remove the occurrence of VHT Operation element from this sentence.Also specify the meaning of the VHT Operation Information field when sent in 2.4Gigs. | As in comment. | RevisedAgree with the comment.Please see resolution for CID 3035Please see document 11-17/0135r1 |
| 7998 | 9.4.2.219 | P93L10 | Is VHT Operation Information field necessary for HE AP operating in the 5 GHz band? Since an HE STA is also a VHT STA in the 5 GHz band, does it make sense to repeat these 3 bytes? Especially since it is more than likely that a VHT Operation Element will also be present in a 5 GHz AP for backward compatibility reason. The only interest seems to be in the 2,4 GHz band where VHT is not defined. | Consider deleting "VHT Operation Information" from the "HE Operation" element if the "VHT Operation" is also present in the frame carrying the "HE Operation" element. The sentence "The VHT Operation Information field is present in the HE Operation element only if no VHT Operation element is present in the same management frame carrying the HE Operation element." should be placed before "The structure of the VHT Operation Information field is defined in Figure 9-564 (VHT Operation Information field) and its subfields are defined in Table 9-252 (VHT Operation Information subfields)". Figure 9-589cq should also be changed with the size of VHT Operation Information being 0 or 3 octets instead of 3. | RevisedAgree with the comment.Please see resolution for CID 3035Please see document 11-17/0135r1 |
| 9757 | 9.4.2.219 | P93L10 | The addition of the VHT Operation Information field to the HE Operation element does not remove dependency from the VHT Operation element.If it is needed, the Basic VHT-MCS And NSS Set field also be added to the HE Operation element.Second comment is that it shall be placed as an optional field. When an HE AP supports both VHT STAs and HE STAs, it have to include an VHT Operation element. In such case, the addition of the VHT Operation Information field to the HE Operation element is just overhead.Third comment is that on 2.4GHz 80MHz operation is not allowed. Then, why do you think that the VHT Operation Information should be added to the HE Operation element? Are you considering the HE BSS consisting of only HE STAs?Please clarify above comments. | As per commnet. | RevisedAgree with the comment.Please see resolution for CID 3035Please see document 11-17/0135r1 |
| 9338 | 9.4.2.219 | P93L11 | It is better to define a channel width indication exclusive for HE STAs. There is a case when the AP wants to limit the channel width of the legacy STAs narrower than the HE STAs. This is because the HE STAs can coexist with the OBSS STAs in the secondary channels better than the legacy STAs. | Add "The content of the VHT Operation Information field in the HE Operation element may be different from the content notified in the VHT Operation element. The HE STAs follow the information specified in the VHT Operation Information field of the HE Operation element." after the sentence starting fom line 11 in page 93. | RevisedPlease see resolution for CID 3035Please see document 11-17/0135r1 |
| 3036 | 9.4.2.219 | P91L39 | Remove text that doesn’t apply anymore and is covered in the following paragraph | Remove paragraph starting on line 39. Paragraph starting on line 44 is correct and should be kept | AcceptedDeleted duplicate paragraph which was approved for removal in an earlier motion (CC23)Please see document 11-17/0135r1 |
| 3177 | 9.4.2.219 | P91L39 | Duplicated sentences in this paragraph and the next one. | Unify the two paragraphs or remove one. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 4772 | 9.4.2.219 | P91L39 | Duplicated (conflicting) definition of the BSS Color field. Remove the first occurrence. | As in comment. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 5331 | 9.4.2.219 | P91L39 | The two consequent sentences describe the same idea except for the "except" clause. | Join sentences describing the BSS Color field | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 5551 | 9.4.2.219 | P91L39 | "The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color for this BSS." Thie information in this sentence appears to be repeated in the next para. Suggest this is deleted and the second para edited to include the 'no color' rule. | Dlete cited text. Then edit next para to read as follows as follows: "The BSS Color field is an unsigned integer whose value is the BSS Color of the BSS corresponding to the AP, IBSS STA, mesh STA or TDLS STA that transmitted this element, except that a value of 0 in this field is used if there is no BSS color for this BSS, or one or more intended recipient STAs of an HE PPDU is not a member of a transmitting STA's BSS." | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 6062 | 9.4.2.219 | P91L39 | According to 27.11.4 BSS\_COLOR, BSS Color (0) indicates that one or more intended recipient STAs is not a member of a transmitting STA's BSS. Therefore, the indicated paragraph (p91, l39) should be deleted. | Delete the following paragraph:"The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color for this BSS." | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 7561 | 9.4.2.219 | P91L39 | This paragraph should be removed since the following paragraph replaces it. | As in comment | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 8134 | 9.4.2.219 | P91L39 | There are two differing descriptions of the meaning of the value 0 for BSS color - merge them or delete one or somehow reconcile them. | There are two differing descriptions of the meaning of the value 0 for BSS color - merge them or delete one or somehow reconcile them. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 8259 | 9.4.2.219 | P91L39 | In HE Operation element section, there are 2 different descriptions of BSS Color field. Clarification is needed. | as per comment | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 8400 | 9.4.2.219 | P91L39 | There are two paragraphs for the description of BSS Color field. | Merge these two paragraphs into one paragraph for the descriptions of AP. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 8683 | 9.4.2.219 | P91L39 | The "BSS Color" field has two definitions: lines 39-42 and lines 44-47. Which is correct? | Clarify | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 9337 | 9.4.2.219 | P91L39 | The content of the paragraph starting from line 39 is repeated in the next paragraph. The next paragraph also the other cases and should be kept. | Delete the paragraph starting from line 39 of page 91. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 9510 | 9.4.2.219 | P91L39 | "The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color forthis BSS.The BSS Color field is an unsigned integer whose value is the BSS Color of the BSS corresponding to the AP, IBSS STA, mesh STA or TDLS STA that transmitted this element, except that a value of 0 in this field isused if one or more intended recipient STAs of an HE PPDU is not a member of a transmitting STA's BSS."Similar sentences. These senetnces can be merged. | As in the comment. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 9663 | 9.4.2.219 | P91L39 | "The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color for this BSS."This paragraph has not been removed yet differently with the comment resolution document (11-16/0862r3) of CC23. | "The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color for this BSS."This paragraph has not been removed yet differently with the comment resolution document (11-16/0862r3) of CC23. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 9845 | 9.4.2.219 | P91L39 | Paragraph in line 39 - 42 needs to be deleted. | Delete the paragraph in line 39 - 42. | AcceptedPlease see document 11-17/0135r1 |
| 5909 | 9.4.2.219 |  | This paragraph starting with "The BSS Color field" is largely a repeat of the previous paragraph. Delete the previous paragraph and replace "is used" with "indicates that there is no BSS Color for this BSS and". | As suggested. | Revised - Please see resolution for CID 3036Please see document 11-17/0135r1 |
| 5214 | 27.11.4 | P196L63 | Regarding "BSS\_COLOR equal to 0 shall not discard the HE PPDU", there is nothing restricting APs from setting the BSS Color to 0. In 9.4.2.219, the value 0 is defined as "indicates that there is no BSS color for this BSS". Is the intention of this requirement to really not discard any SU PPDUs from APs with BSS Color set to 0? Or is the intention more limited to the previous paragraph where a SU PDDU is sent to a non-member and we set BSS\_COLOR to 0. | Clarify | Revised- The cited sentence (in 9.4.2.219) was approved for deletion in a previous motion of CC23. However for some unknown reason, the sentence is still present in the draft. The incorrect sentence is to be removed from section 9.4.2.219Please see document 11-17/0135r1 |
| 6437 | 9.4.2.219 | P91L40 | Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | RevisedParagraph was deleted per CID 3026Please see document 11-17/0135r1 |
| 6439 | 9.4.2.219 | P91L41 | Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | RevisedParagraph was deleted per CID 3026Please see document 11-17/0135r1 |
| 6441 | 9.4.2.219 | P92L3 | Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | AcceptedPlease see document 11-17/0135r1 |
| 6442 | 9.4.2.219 | P92L3 | (Second instance on same line:) Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | AcceptedPlease see document 11-17/0135r1 |
| 6443 | 9.4.2.219 | P92L4 | Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | AcceptedPlease see document 11-17/0135r1 |
| 6447 | 9.4.2.219 | P92L23 | Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | AcceptedPlease see document 11-17/0135r1 |
| 4775 | 9.4.2.219 | P92L28 | This paragraph describes normatvie behavior related to the non-AP STA and cannot be located in this subclause. Move the paragraph somewhere in subclause 27 (e.g., 27.11.4(BSS COLoR). | As in comment. | RevisedAgree with the comment. Section 27.11.4 already covers non-AP STA behavior. Deleted text from this section.Please see document 11-17/0135r1 |

TGax Editor: Please modify this section as follows:

* HE Operation element

The operation of HE STAs in an HE BSS is controlled by the HT Operation element, the VHT Operation element and the HE Operation element. The format of the HE Operation element is defined in Figure 9-589cq (HE Operation element format).

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|  |  |  |  |  |  |  |
|  | Element ID | Length | HE Operation Parameters | Basic HE MCS And NSS Set | VHT Operation Information | MaxBSSID Indicator[3034, 5923, 5924, 8261] |
| Octets: | 1 | 1 | 4 | 3 | 0 or 3[3035, 4771, 7998, 9757, 9338] | 0 or 1[3034, 5923, 5924, 8261] |
| * HE Operation element format
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The Element ID and Length fields are defined in 9.4.2.1 (General).

The format of the HE Operation Parameters field is defined in Figure 9-589cr (HE Operation Parameters field format).

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|  | B0 B5 | B6    B8 | B9 | B10  B19 | B20 | ~~B21    B28~~ | B21 | B22 B27 | B28 | B29 | B30 | B31 |
|  | BSS Color | Default PE Duration | TWT Required | HE Duration Based RTS Threshold | Partial BSS Color | ~~MaxBSSID Indicator~~ | VHT Operation Info Present[3035, 4771, 7998, 9757, 9338] | Reserved[3034, 3035, 4771, 7998, 9757, 9338] | Multiple BSSID AP[3034, 5923, 5924, 8261] | Tx BSSID Indicator | BSS Color Disabled | Dual Beacon |
| Bits: | 6 | 3 | 1 | 10 | 1 | ~~8~~ | 1 | 6 | 1 | 1 | 1 | 1 |
| * HE Operation Parameters field format
 |

~~The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color for this BSS.[~~3036, 3177, 4772, 5331, 5551, 6062, 7561, 8134, 8259, 8400, 8683, 9337, 9510, 9663, 9845, 5214, 5909, 6437, 6439]The BSS Color field is an unsigned integer whose value is the BSS Color of the BSS corresponding to the AP, IBSS STA, mesh STA or TDLS STA that transmitted this element, except that a value of 0 in this field is used if one or more intended recipient STAs of an HE PPDU is not a member of a transmitting STA's BSS.

The Default PE Duration subfield indicates the PE duration in units of 4 μs, for an HE trigger-based PPDU that is solicited with UL MU Response Scheduling in the A-Control subfield. Values 5-7 of the Default PE Duration subfield are reserved.

The TWT Required subfield is set to 1 to indicate that the AP requires the non-AP HE STAs to operate in the role of either TWT requesting STA, as described 27.7.2 (Individual TWT agreements), or TWT scheduled STA, as described in 27.7.3 (Broadcast TWT operation) and set to 0 otherwise.

The HE Duration Based RTS Threshold field enables an HE AP to manage RTS/CTS usage by HE non-AP STAs that are associated with it. The HE Duration Based RTS Threshold field contains the duration based RTS threshold in units of 32 s, which enables the use of RTS/CTS except for values 0 and 1023. The value 0 indicates that RTS/CTS must be used for all frame exchanges. The value 1023 indicates that HE duration-based RTS is disabled.

The Partial BSS Color field indicates whether or not the BSS applies an AID assignment rule using the partial BSS [6441]Color~~color~~ bits. If the Partial BSS Color field is set to 1, then the 4 least significant bits of BSS [6442]Color~~color~~ are used in AID assignment. If the Partial BSS Color field is set to 0, no partial BSS [6443]Color~~color~~ bits are used in the AID assignment.

VHT Operation Info Present bit indicates whether or not the 3 octet VHT Operation Information field is carried in the HE Operation element. A bit value of 1 indicates the field is present; otherwise the field is not present in the element. An HE AP shall set the bit to 0 when operating in 2.4GHz or when the frame containing this element carries VHT Operation element. [3035, 4771, 7998, 9757, 9338]

Multiple BSSID AP bit indicates whether or not the AP transmitting this element belongs to a Multiple BSSID set. A value of 1 indicates the AP belongs to Multiple BSSID set, otherwise the value is set to 0. A non-AP STA transmitting this element shall set the value of this bit to 0. [3034, 5923, 5924, 8261]

An HE AP corresponds to a nontransmitted BSSID if the AP's BSSID can be derived from Multiple BSSID element present in the Beacon or Probe Response frame transmitted by another AP (i.e., the AP identified by the Transmitted BSSID). The Tx BSSID Indicator indicates whether an HE AP corresponds to transmitted BSSID. [3034]~~The definition of MaxBSSID Indicator is same as the MaxBSSID Indicator in Multiple BSSID element.~~ An HE AP corresponding to a nontransmitted BSSID sets Tx BSSID Indicator to 0. An HE AP corresponding to a transmitted BSSID sets Tx BSSID Indicator to 1. [3034, 5923, 5924, 8261]~~An HE AP corresponding to Nontransmitted BSSID or a transmitted BSSID sets the MaxBSSID Indicator field to non-zero value.An AP corresponding to neither a nontransmitted BSSID nor a transmitted BSSID sets both MaxBSSID Indicator and Tx BSSID Indicator to 0.~~ TxBSSID Indicator bit field is reserved when Multiple BSSID AP bit is set to 0. [3034, 5923, 5924, 8261]

The BSS Color Disabled subfield indicates whether the transmitting AP recommends the associated STAs to disable the use of BSS Color parameter when making decisions related to Intra-PPDU power save and setting Intra BSS NAV. An HE AP sets the BSS Color Disabled subfield to 1 if the HE AP decides to disable the use of the BSS [6447]Color~~color~~ for the BSS that it serves, for example, after detecting a BSS Color overlap in the neighborhood as described in 27.11.4 (BSS\_COLOR); otherwise the HE AP sets the BSS Color Disabled subfield to 0.

[4775]~~If a HE non-AP STA receives from associated AP a BSS Color Disabled subfield value equal to 1 in the HE Operation element the HE non-AP STA should not exclusively use BSS Color parameter in making decision related to Intra-PPDU power save and for setting Intra BSS NAV. Instead, the non-AP STA should use the MAC header to make such decisions (see 27.11.4 (BSS\_COLOR)). HE non-AP STA may (re)enable BSS Color related features once it receives from the associated AP a BSS Color Disabled subfield equal to 0 in an HE Operation element.~~

The Dual Beacon subfield indicates whether the HE AP transmits beacons using two PHY formats, one in a non-HE format and other in an HE\_EXT\_SU PHY format. The Dual Beacon subfield also indicates the TBTT offset of Beacon frame in HE extended range SU PPDU in 11.1.3.10 (Beacon generation in an HE BSS). The subfield is set to 0, if the HE AP transmits beacons in one PHY format. The subfield is set to 1 if the HE AP transmits beacons in an HE extended range SU PPDU and a non-HE PPDU.

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 a bitmap of size 24 bits. Each 3 bit pair in the bitmap indicates the supported HE-MCS set for NSS from 1 to 8. The Basic HE-MCS And NSS Set field is defined in Figure 9-589cs (Basic HE-MCS And NSS Set field format).

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|  | B0         B2 | B3         B5 | B6         B8 | B9        B11 | B12     B14 | B15     B17 | B18     B20 | B21      B23 |
|  | 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: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| * Basic HE-MCS And NSS Set field format
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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 0-8 for *n* spatial streams
* 2 indicates support for HE-MCS 0-9 for *n* spatial streams
* 3 indicates support for HE-MCS 0-10 for *n* spatial streams
* 4 indicates support for HE-MCS 0-11 for *n* spatial streams
* 5-7 are reserved

The structure of the VHT Operation Information field is defined in Figure 9-564 (VHT Operation Information field) and its subfields are defined in Table 9-252 (VHT Operation Information subfields). This 3-octet field is present when VHT Operation Info Present bit field is set to 1; else the field is not carried in the element. [3035, 4771, 7998, 9757, 9338]

[3034, 5923, 5924, 8261]The definition of MaxBSSID Indicator is same as the MaxBSSID Indicator in Multiple BSSID element (see section 9.4.2.46). An HE AP belonging to Multiple BSSID set includes this 1-octet field in the element. The field is not present if the Multiple BSSID AP bit is set to 0 in HE Parameters field.