IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to BSS Color – Part 1 |
| Date: March 10, 2019 |
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 Abstract

This submission proposes resolutions for comments received for TGax LB238 (9):

20061, 21489, 21490, 20063, 20064, 21491, 20084, 20930, 20931

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Additions based on feedback when the doc was presented 3/12/19 AM 2 highlighted in green

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** | **Commenter** | **Section** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 20061 | Abhishek Patil | 26.11.4 | 405 | 39 | The first two paragraphs don't belong here. This section describes TXVECTOR parameters. Move the two paragraphs to 26.17.3. | Create a new section under 26.17.3 to describe initial color selection. Add a reference to 26.17.3 in this subclause. Update any refences in the spec related to initial color selection to point to the new clause in 26.17.3 | **Revised**Agree with the comment.**TGax editor, please make changes as shown in 11-19/0395r1CID 20061** |
| 21490 | Xiaofei Wang | 26.11.4 | 405 | 45 | selection of color should be moved to section 26.17.3.1 which is named "selecting and advertising a new BSS color". This section is about how to set TXVECTOR values so selecting doesn't belong here | move the text on selecting a new BSS color to the appropriate section, which may be 26.17.3.1 | **Revised**Agree with the comment.**TGax editor, please make changes as shown in 11-19/0395r1CID 21490** |
| 21489 | Xiaofei Wang | 26.11.4 | 405 | 49 | The word "single" is unnecessary and should be removed. | remove "single" | **Revised**Agree with the comment.**TGax editor, please make changes as shown in 11-19/0395r1CID 21489** |
| 20063 | Abhishek Patil | 26.11.4 | 406 | 37 | This subclause describes the TXVECTOR Parameter BSS\_COLOR. The 3 paragraphs starting line 37 don't belong to this subclause. Same applies to the two paragraph starting line 57 | Move the paragraphs to 26.17.3 | **Revised**Agree with the comment.**TGax editor, please make changes as shown in 11-19/0395r1CID 20063** |
| 20064 | Abhishek Patil | 26.11.4 | 406 | 57 | Expand A1, A2 to Address 1, Address 2 fields | As in comment | **Revised**Agree with the comment.**TGax editor, please make changes as shown in 11-19/0395r1CID 20064** |
| 21491 | Xiaofei Wang | 26.17.3.1 | 434 | 40 | The sentence "The criteria for changing the BSS color and the method for selectinga new BSS color are beyond the scope of this standard." seems to conflict with the first sentence of this paragraph. If the method of selecting a new BSS color are beyond the scope of this standards, but at the same time a method for selecting a (presumely new) BSS color is defined in 26.11.4. Please either remove "method for selecting a new BSS color" are add more condition to this sentence. | as in comment | **Revised**Agree with the comment. The previous statement indicates that it is optional for an AP to change color. Therefore, it will up to the AP to determine when to switch color. Further, the AP may take into account OBSS color when determining the new color.**TGax editor, please make changes as shown in 11-19/0395r1CID 21491** |
| 20084 | Abhishek Patil | 26.17.3.1 | 435 | 31 | "such BSS" is ambiguous since the first sentence in the paragraph described non-AP STAs in an infrastructure BSS | Replace 'such' with 'IBSS or mesh' | **Revised**Agree with the comment.**TGax editor, please make changes as shown in 11-19/0395r1CID 20084** |
| 20930 | Mark RISON | 26.17.3.1 | 435 | 27 | "A non-AP HE STA in an infrastructure BSS shall not transmit the BSS Color Change Announcement ele-ment. An HE STA belonging to an IBSS or a mesh BSS shall not transmit a BSS Color Change Announce-ment element." is very long-winded | Change the cited text at the referenced location to "A non-AP STA shall not transmit a BSS Color Change Announcement element.". Delete "participating in such BSS " in the next sentence | **Reject**There is a different in behavior based on the type of BSS that the STA is participating in. A non-AP STA in infrastructure BSS cannot disable color or make a color change announcement. On the other hand, a STA belonging to an IBSS or mesh BSS can disable color. |
| 20931 | Mark RISON | 26.17.3.1 | 435 | 30 | "An HE STA participating in such BSS may temporarily disable the color if they determinethat a color collision has occurred (see 26.11.4 (BSS\_COLOR))." -- it's not clear how one "temporarily disables the color", nor whether this is referring to the AP or the non-AP STAs (surely a non-AP STA can't unilaterally ignore the BSS colour?) | Change the cited text at the referenced location to "An HE AP may temporarily disable the use of the BSS color if it determinesthat a color collision has occurred (see 26.11.4 (BSS\_COLOR))." | **Revised**Agree with the comment. The term ‘such BSS’ was causing an ambiguity. This text is revised to call out IBSS and mesh BSS.**TGax editor, please make changes as shown in 11-19/0395r1CID 20931** |

* **BSS\_COLOR**

***TGax Editor: Please make the changes as shown below to this subclause***

[20061, 21490]

An HE STA that transmits HE Operation element shall select and advertise a BSS color as described in 26.17.3 (BSS color). An HE STA that transmitted an HE Operation element shall set the TXVECTOR parameter BSS\_COLOR of an HE SU PPDU, HE ER SU PPDU or DL HE MU PPDU to the value indicated in the BSS Color subfield of its HE Operation element unless(#15396) the HE STA transmits an HE SU PPDU or HE ER SU PPDU(#16769) for which one or more of the intended recipient STAs is not a member of the transmitting STA's HE BSS. In this case, the HE STA shall set the TXVECTOR parameter BSS\_COLOR of the PPDU(#16769, #Ed) to 0.

A non-AP HE STA that transmits an HE SU PPDU or HE ER SU PPDU to a STA that is not a member of the transmitting STA's HE BSS, shall set the TXVECTOR parameter BSS\_COLOR to 0.

The active BSS color is one of the following:

* The value of the BSS Color field in the most recently received HE Operation element if(#15397) an HE STA receives an HE Operation element from a peer HE STA.
* The value of the New BSS Color field in the most recently received BSS Color Change Announcement element if(#15398) an HE STA receives a BSS Color Change Announcement element from a peer HE STA and the BSS color change TBTT has passed (see 26.17.3.1 (Selecting and advertising a new BSS color)).(#17122)

An HE STA shall set the TXVECTOR parameter BSS\_COLOR for an HE SU PPDU, HE ER SU PPDU or UL HE MU PPDU that is addressed to a peer STA to the active BSS color value, if the HE STA has established any of the following:

* An association with the peer STA
* A TDLS link with the peer STA
* An IBSS membership with the peer STA

NOTE 1—A non-AP HE STA sets the TXVECTOR parameter BSS\_COLOR for an HE TB PPDU to the active color (see 26.5.3.3 (Non-AP STA behavior for UL MU operation)).(#17122)

NOTE 2—An HE mesh STA sets the TXVECTOR parameter BSS\_COLOR for an HE PPDU that it transmits to a peer HE mesh STA to the value in the BSS Color subfield of its transmitted HE Operation element.(#15108)

An HE STA that receives an HE PPDU with RXVECTOR parameter BSS\_COLOR with a value between 1 and 63 follows the spatial reuse rule described in 26.10 (Spatial reuse operation).

NOTE—An HE STA that received an HE PPDU with the RXVECTOR parameter BSS\_COLOR equal to 0 does not follow the spatial reuse rule described in 26.10 (Spatial reuse operation).

An HE STA that received an HE SU PPDU or an HE ER SU PPDU with the RXVECTOR parameter BSS\_COLOR equal to 0 shall not discard the HE PPDU.

[20063]

While the BSS Color Disabled subfield in HE Operation element is 1, an HE STA shall continue to advertise a nonzero value (same as before the color was disabled) in the BSS Color subfield of HE Operation element and in the TXVECTOR parameter BSS\_COLOR of an HE PPDU that it transmits.

NOTE—A non-AP HE STA sets the TXVECTOR parameter BSS\_COLOR of an HE PPDU that it transmits to the value advertised by the AP it intends to communicate with even if the AP has temporarily disabled BSS color.

[20063]

If(#15399) the value of TXVECTOR parameter PARTIAL\_AID [5:8] for VHT PPDUs transmitted by an HE AP with the TXVECTOR parameter GROUP\_ID equal to 63 is not consistent with the partial BSS color (i.e., *BCB*(0:3) described in 26.17.4 (AID assignment))(#16183) announced by the HE AP, then the HE AP shall set the Partial BSS Color field in the HE Operation element to 0. Otherwise, the HE AP may set the Partial BSS Color subfield in the HE Operation element to 1 (see 26.17.4 (AID assignment)).

* **BSS color**

***TGax Editor: Please add three new subclauses under 26.17.3 as shown below***

[20061, 21490, 20063]

**26.17.3.0a General**

All APs that are members of a multiple BSSID set or co-hosted BSSID(18/1814r2) set shall use the same BSS color.

A non-AP HE STA associated with an HE AP that is transmitting an HE PPDU in a direct path to a TDLS peer STA shall set the BSS Color subfield of the HE Operation element it transmits to the peer STA to the value indicated in the BSS Color subfield of the HE Operation element received from the HE AP. An HE STA associated with a non-HE AP the initiating STA shall use the same active BSS color for all its TDLS links.(#16932)

An HE STA that transmits an HE Operation element:

* Shall select an initial BSS color as described in 26.17.3.0b (Initial BSS color)
* May disable BSS color as described in 26.17.3.0c (Disabling BSS color)
* May determine color collision has occurred as described in 26.17.3.2 (Detecting and reporting BSS color collision)

An HE AP may select and advertise a new BSS color as described in 26.17.3.1 (Selecting and advertising a new BSS color)

A non-AP HE STA associated with an HE AP may determine and report a BSS color collision to its associated AP by following the procedure described in 26.17.3.2 (Detecting and reporting BSS color collision).

**26.17.3.0b Initial BSS color**

[21489]

**26.17.3.0c Disabling BSS color**

* [20064]ddress ddress
* [20064]ddress ddress
* **Selecting and advertising a new BSS color**

***TGax Editor: Please make the changes as shown below to this subclause***

An HE STA that transmits an HE Operation element shall select a BSS color as defined in 26.17.3.0b (Initial BSS color) for its BSS. An HE AP may change the color of its BSS under certain conditions such as when it detects an OBSS using the same color. [21491]or(see 26.17.3.2 (Detecting and reporting BSS color collision))

(#16467, #15123)An HE AP shall announce a pending BSS color change using the BSS Color Change Announcement element, which may be carried in the Beacon, Probe Response and (Re)Association Response frames transmitted by the AP. The HE AP may announce the pending BSS color change using the HE BSS Color Change Announcement frame. An HE AP should announce the pending BSS color change for a period of time that is sufficiently long for all STAs in the BSS, including STAs in PS mode, to have an opportunity to receive at least one frame carrying a(#15124) BSS Color Change Announcement element before the BSS color change.

If the Color Switch Countdown field in BSS Color Change Announcement element has a value greater than 0, then at the next TBTT the AP shall decrement the Color Switch Countdown field value by 1 until it reaches 0. BSS color change TBTT is the one at which the Color Switch Countdown field value has decremented to 0. An HE AP shall not alter the BSS color change TBTT after it has announced a pending BSS color change. An AP belonging to a co-hosted BSSID(18/1814r2) set (see 26.17.7 (Co-hosted BSSID set)) should select the value of Color Switch Countdown field such that the BSS color change TBTT interval between the BSSs in the set shall not be greater one beacon interval of the BSS with largest beacon interval in the set.

During the time leading up to the BSS color change TBTT:

* An HE AP shall set the BSS Color Disabled subfield to 1 and shall continue to advertise the existing BSS color via the BSS Color subfield in the HE Operation element.
* An HE AP shall not change the value it advertises in the New BSS Color subfield of the BSS Color Change Announcement element.
* An HE AP shall set the TXVECTOR parameter BSS\_COLOR of an HE PPDU to the existing BSS Color.

At the BSS color change TBTT, an HE AP shall:

* Set the BSS Color Disabled subfield in the HE Operation element that it transmits to 0 unless the HE AP belongs to a co-hosted BSSID(18/1814r2) set, in which case it shall continue to set the BSS Color Disabled subfield to 1 until all the BSSs in the co-hosted BSSID(18/1814r2) set have passed their respective BSS color change TBTT
* Start advertising the new BSS color in the BSS Color subfield in the HE Operation element
* Start using the new BSS color for all frames that it transmits after the TBTT

A co-hosted AP(18/1814r2) should not transmit an HE PPDU during the transition period until all the BSSs in the co-hosted(#Ed) set have completed their switch to the new color.

A non-AP HE STA that receives a BSS Color Change Announcement element from an AP shall use the value specified in the New BSS Color field of the element as the BSS color when communicating with that AP following the BSS Color change TBTT.

A non-AP HE STA in an infrastructure BSS shall not transmit the BSS Color Change Announcement element. An HE STA belonging to an IBSS or a mesh BSS shall not transmit a BSS Color Change Announcement element. An HE STA participating in [20084, 20931]IBSS or mesh BSS may temporarily disable the use of BSS color if they determine that a color collision has occurred (see 26.17.3.0c (Disabling BSS color)).

NOTE—The color change mechanism described in this subclause does not apply to an IBSS or a mesh BSS since these BSSs do not have a single coordinator.(#16467, #Ed)

* **Detecting and reporting BSS color collision**
* **General**

***TGax Editor: Please make the changes as shown below to this subclause***

An HE AP may determine that a BSS color collision has occurred if it receives frames on its primary channel(#16617) from an OBSS STA containing the same BSS color as the one it has selected for its BSS or if it receives autonomous BSS color collision report(s) from its associated STA(s). The HE AP shall set the BSS Color Disabled subfield to 1 in the HE Operation element that it transmits if the BSS color collision persists for a duration of at least dot11BSSColorCollisionAPPeriod.