IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to BSS Color |
| Date: March 15, 2020 |
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 Abstract

This submission proposes resolutions for following (18) CIDs received for TGax SA Ballot 1:

24144, 24147, 24555, 24556, 24310, 24442, 24242, 24243, 24244, 24245, 24516, 24515, 24246, 24247, 24248, 24249, 24250, 24514

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on offline feedback
* Rev 2: Updates made based on feedback received when the doc was presented during 3/19/20 TGax telco
	+ CID 24249 deferred to have further discussions with Matt, Yongho, Liwen, and Mark R.
	+ Updates based on offline feedback from Yongho are highlighted.
		- Delete last sentence added to the 2nd paragraph in 26.17.3.2.
			* The case is covered in 26.11.4
		- Bug fix in 2nd paragraph of 26.11.4
			* The change fixes a bug: “HE BSS” should be changed to “BSS” for considering the TDLS case in the legacy BSS.
* Rev 3: Updated resolution for CIDs 24248, 24249 and 24250 based on offline discussions.
	+ Several updates throughout the doc based on feedback from Mark Rison.

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** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 24144 | Lalam, Massinissa | 205.45 | 9.4.2.248 | "The BSS Color Disabled subfield is set to 1 to temporarily disable the use of" .. Without notion of what is the maximum duration an AP can disable BSS color, the word "temporary" has no normative meaning. Remove it from the sentence and if you want to say that an HE BSS should try to advertise a BSS color as much as possible, put it as a NOTE. | As in comment | **Revised**Agree with the comment. The term temporarily is removed from the paragraph. Further the reference to the clause that provides normative behavior for disabling color is updated. Also fixed a couple of references.**TGax editor, please make changes as shown in doc 11-20-316r3 tagged as 24144** |
| 24147 | Lalam, Massinissa | 464.16 | 26.17.3.3 | "An HE STA that transmits an HE Operation element and that decides to temporarily disable .." Remove the word temporarily if no maximum time during which a BSS can disable BSS coloring is defined in the standard. | As in comment | **Revised**Agree with the comment. The term temporarily is removed from the paragraph. A NOTE is added to recommend that BSS color should be disabled for a short period of time so that the STAs in the BSS can benefit from the feature. Further deleted the last sentence of the last paragraph of 26.17.3.4 which was repeating the same behavior.**TGax editor, please make changes as shown in doc 11-20-316r3 tagged as 24147** |
| 24555 | Asterjadhi, Alfred | 429.52 | 26.11.4 | "If all the recipient STAs are members of the HE STA's HE BSS"... How does the AP know that all the recipients are members when the frame is broadcast? Please clarify. | As in comment. | **Rejected**Since an AP constructs the PPDU and the contents carried in the PPDU, it is expected to have knowledge about the intended recipients STAs for that PPDU. For example, a broadcast RU may carry Multi-STA BA for associated STAs or could carry a TF with RUs for associated STAs. |
| 24556 | Asterjadhi, Alfred | 429.57 | 26.11.4 | The HE MU PPDU has multiple RUs and each can be addressed to different STAS with memberships from multiple BSSs of a multiple BSS set. In all of these cases the BSS color is set to the same value, that of the main BSS. Hence, it should not be set to 0. | As in comment. | **Rejected**Since an AP constructs the PPDU and the contents carried in the PPDU, it is expected to have knowledge about the intended recipients STA(s) for that PPDU. For example, a broadcast RU may carry a frame which is of interest to unassociated STAs (e.g., FILS Discovery frame or Multi-STA BA for unassociated STAs). |
| 24310 | RISON, Mark | 430.31 | 26.11.4 | "An HE STA that received an HE SU PPDU, HE ER SU PPDU or HE MU PPDU with the RXVECTOR parameter BSS\_COLOR equal to 0 shall not discard the HE PPDU." -- it might discard it for other reasons | Change to "An HE STA that receives an HE SU PPDU, HE ER SU PPDU or HE MU PPDU with the RXVECTORparameter BSS\_COLOR equal to 0 shall not discard the HE PPDU on that basis." | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24442 | RISON, Mark | 430.43 | 26.11.4 | "If the value of TXVECTOR parameter PARTIAL\_AID [5:8] for VHT PPDUs transmitted from an HE AP to all associated VHT and HE STAs with the TXVECTOR parameter GROUP\_ID equal to 63" -- a VHT PPDU can't be transmitted to something that is not a VHT STA anyway, and the wording is confusing anyway because GROUP\_ID 63 means to a single STA so can't be for transmission "to all associated [...] STAs" | Change to "If the value of TXVECTOR parameter PARTIAL\_AID [5:8] for VHT PPDUs with the TXVECTOR parameter GROUP\_ID equal to 63 transmitted by an HE AP to any associated STA" | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24242 | Seok, Yongho | 463.41 | 26.17.3.1 | "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..."I interpreted this sentence to that an AP is transmitting a PPDU in a direct path. But it is wrong.For avoding ambiguity, change to "When a non-AP HE STA is associated with an HE AP, the non-AP HE STA transmitting an HE PPDU in a direct path to a TDLS peer STA shall set..." | As in the comment. | **Revised**The paragraph is moved to 26.17.3.2 which discusses initial color section. The 1st sentence in the 3rd paragraph in 26.17.3.1 are modified to clarify that it is the non-AP STA in a TDLS link that is transmitting the HE Op element and setting the BSS color in its HE PPDU. A new sentence is added at the end of the paragraph to specify that the HE PPDUs from HE non-AP STA to its TDLS peer will use the BSS color it advertises in HE Operation element.Bug fix in 26.11.4 based on feedback from Yongho.**TGax editor, please implement the change as shown in doc 11-20/0316r3 tagged 24242.** |
| 24243 | Seok, Yongho | 463.44 | 26.17.3.1 | "An HE STA associated with a non-HE AP that is the initiating STA of the TDLS link..."I interpreted this sentence to that an AP is the initiating STATE of the TDLS link. But it is wrong.For avoding ambiguity, change to "When a non-AP HE STA is associated with an HE AP, the non-AP HE STA transmitting an HE PPDU in a direct path to a TDLS peer STA shall set..." | As in the comment. | **Revised**The paragraph is moved to 26.17.3.2 which discusses initial color section. The 2nd sentences in the 3rd paragraph in 26.17.3.1 are modified to clarify that it is the non-AP STA in a TDLS link that is transmitting the HE Op element and setting the BSS color in its HE PPDU. A new sentence is added at the end of the paragraph to specify that the HE PPDUs from HE non-AP STA to its TDLS peer will use the BSS color it advertises in HE Operation element.**TGax editor, please implement the change as shown in doc 11-20/0316r3 tagged 24243.** |
| 24244 | Seok, Yongho | 463.56 | 26.17.3.1 | "...may disable BSS color by follow the procedure in..."Fix the typo: "by following". | As in the comment. | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24245 | Seok, Yongho | 463.60 | 26.17.3.1 | Combine the following two sentences:"A non-AP HE STA may following the procedure in 26.17.3.5 (Detecting and reporting BSS color collision) to determine and report a BSS color collision to the AP with which is associated.""An HE STA that transmits an HE Operation element may determine that a BSS color collision has occurred by following the procedure in 26.17.3.5 (Detecting and reporting BSS color collision)."as the following:"An HE STA may follow the procedure in 26.17.3.5 (Detecting and reporting BSS color collision) to determine and report a BSS color collision." | As in the comment. | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24516 | RISON, Mark | 464.19 | 26.17.3.3 | "An HE STA participating in an IBSS or a mesh BSS may temporarily disable the use of BSScolor if the HE STA determines that a BSS color collision has occurred (see 26.17.3.3 (Disabling BSScolor))." -- but 26.17.3.3 is about infrastructure BSSes (because of the references therein to APs). The resolution to CID 22407 claimed that "The 1st paragraph in 26.17.3.3 in generic and applies to any HE STA" but this is not correct, because that para talks of "its \*\*\*associated\*\*\* peer HE STAs" | Change "its associated peer HE STAs" to "other STAs in the BSS" | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24515 | RISON, Mark | 465.38 | 26.17.3.4 | "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." can be simplified to "A non-AP HE STA shall not transmit a BSS Color Change Announcement element." | As it says in the comment | **Revised**The two sentences are merged into a single sentence and moved to the first paragraph in the sub-clause. The spec text that says an HE AP can announcement a color change is moved to the first paragraph.**TGax editor, please make changes as shown in doc 11-20-316r3 tagged as 24515** |
| 24246 | Seok, Yongho | 465.54 | 26.17.3.5.1 | "An HE AP may determine that a BSS color collision has occurred if it receives frames on its primary channel from an OBSS STA containing the same BSS color..."Frames do not contain the BSS color. Change the frames to the HE PPDUs. | As in the comment. | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24247 | Seok, Yongho | 466.04 | 26.17.3.5.2 | "a frame...with the same color as it associated BSS."A frame does not contain the BSS color. Change to an HE PPDU. | As in the comment. | **Accepted****TGax editor, please implement the change as suggested by the comment.** |
| 24514 | RISON, Mark |  | 9.6.32.2 | CID 22404. If "An HE AP is allowed to send an individually addressed color change announcement frame to a particular STA. This would be the situation when that particular STA has missed a recent color change announcement and transmits a frame to the AP with the old color." this should be described | After the first para of the referenced subclause add "NOTE--An HE AP might send an HE BSS Color Change Announcement frame as an Action frame to a STA that appears to have missed a color change announcement and is transmitting with the old color." | **Accepted****TGax editor, please implement the change as suggested by the comment.** |

* HE Operation element

*TGax editor, please make changes to the following paragraphs in this sub-clause as showing below*

[24144] The BSS Color subfield 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 and is set as defined in 26.17.3 (BSS color).

The Partial BSS Color subfield is set to 1 to indicate that an AID assignment rule based on the BSS color as defined in 26.17.4 (AID assignment) is applied for the BSS. Otherwise, the Partial BSS Color subfield is set to 0.

The BSS Color Disabled subfield is set to 1 to disable the use of color for the BSS as described in 26.17.3.3 (Disabling BSS color); otherwise it is set to 0.

* General

*TGax editor, please move the 3rd paragraph in this sub-clause to clause 26.17.3.2 as shown below*

[24242, 24243]

* **Initial BSS color**

*TGax editor, please make changes to the following paragraph in this sub-clause as shown*

[24242, 24243]An HE AP starting an infrastructure BSS or an HE STA starting an IBSS or MBSS shall set the BSS Color subfield of the first HE Operation element it transmits to a value in the range 1 to 63 and shall maintain that value in subsequent HE Operation elements it transmits for the lifetime of the BSS or until the BSS color is changed as described in 26.17.3.4 (Selecting and advertising a new BSS color). When selecting a BSS color, the HE STA should consider the BSS colors in use by neighboring OBSSs.

[24242] that isand that is the initiating STA of a TDLS link the TDLSHE its associated[24243]non-AP that is and the ~~A non-AP STA shall set the BSS color in HE PPDU it transmits in direct path to its TDLS peer STA to the value it indicates in the HE Operation element it transmitted or the value it received in the HE Operation element from its TDLS peer STA.[24242, 24243]~~

* BSS\_COLOR

*TGax editor, please make changes to the 2nd paragraph in this sub-clause as shown*

[24242]An HE STA that transmitted an HE Operation element shall set the TXVECTOR parameter BSS\_COLOR as follows:

* For an HE SU PPDU, HE ER SU PPDU or DL HE MU PPDU, the parameter BSS\_COLOR is set to the value indicated in the BSS Color subfield of the HE Operation element if all the recipient STAs are members of the HE STA’s BSS or the PPDU carries at least one triggering frame.
* For an HE SU PPDU, HE ER SU PPDU or DL HE MU PPDU, the parameter BSS\_COLOR is set to 0 if the HE STA expects that at least one intended recipient STA is not a member of the HE STA’s BSS and the PPDU does not carry a triggering frame.
* Disabling BSS color

*TGax editor, please make changes to the following paragraph in this sub-clause as shown*

[24147]An HE STA that transmits an HE Operation element and that decides to disable the use of BSS color in the BSS to which it belongs, for example, after detecting a BSS color collision with an OBSS (see 26.17.3.5 (Detecting and reporting BSS color collision)), shall set the value of BSS Color Disabled subfield in the HE Operation element to 1 to inform its associated peer HE STAs that the BSS color is disabled; otherwise the HE STA shall set the BSS Color Disabled subfield to 0.

NOTE – It is recommended that an HE STA that transmits an HE Operation element does not disable the BSS color for an extended period of time, so that other HE STAs can benefit from features relying on BSS color.

* Selecting and advertising a new BSS color

*TGax editor, please split the first paragraph of this sub-clause and make changes to the first and second paragraph as shown*

[24515]An HE STA that transmits an HE Operation element shall select a BSS color as defined in 26.17.3.2 (Initial BSS color) for its BSS. An HE AP may change the BSS color under certain conditions, for example if it detects that an OBSS is using the same color. Ana

 A non-AP HE STA includes a STA participating in an IBSS or MBSS. M

When changing the BSS color, the HE AP should consider the BSS colors of OBSSs that the HE AP has identified by itself or via the autonomous collision reports received from associated non-AP HE STAs (see 26.17.3.5 (Detecting and reporting BSS color collision)).

The BSS Color Change Announcement element may be carried in the Beacon, Probe Response, (Re)Association Response, and HE BSS Color Change Announcement frames transmitted by the AP. An HE AP should announce an upcoming 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 BSS Color Change Announcement element before the BSS color change.

*TGax editor, please update the content of the last paragraph and following NOTE in this sub-clause as shown*

[24515][24147]

[24515]

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| **CID** | **Commenter** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 24248 | Seok, Yongho | 466.23 | 26.17.3.5.2 | "A non-AP HE STA that intends to autonomously report a BSS color collision to its associated HE AP shall do so by scheduling for transmission a BSS color collision Event Report frame every dot11BSSColorCollisionSTAPeriod..."So , do so what?Change to:"... shall schedule for transmission a BSS color collision Event Report frame..." | As in the comment. | **Revised**Agree with the commenter. The sentence is modified by the resolution to CID 24249 and includes the suggested fix.**TGax editor, please make changes as shown in doc 11-20-316r3 tagged as 24248** |
| 24249 | Seok, Yongho | 466.28 | 26.17.3.5.2 | "...if the non-AP STA has transmitted several such reports to its associated HE AP."Please clarify the "several".In a dictionary, "several" says more than two but not many. So, in here, the several means more than two reports? Then just change to "more than two reports".Otherwise, change to the NOTE. Concern is that current text is "shall" statement but the condition is ambigous. | As in the comment. | **Revised**Agree with the comment that the term ‘several’ creates an ambiguity as to how may such reports a non-AP STA is expected to send. Further, since it is left to implementation, an AP have no way to determine if the collision no longer exists or if the STA stopped sending since it reached it (implementation specific) max number.The resolution removes the condition that lets the STA pick any random number of reports. Instead a STA would report a collision as long as the collision exist and AP has not taken any corrective action (i.e., disabling the color or initiating a color change procedure). Further, the reporting frequency is increased to reduce the number of reports per STA and to spread the reports being generated by various STAs. This will result in better utilization of the medium.**TGax editor, please make changes as shown in doc 11-20-316r3 tagged as 24249** |
| 24250 | Seok, Yongho | 466.28 | 26.17.3.5.2 | "...dot11BSSColorCollisionSTAPeriod unless the BSS color collision no longer exists or if the associated HE AP has set the BSS Color Disabled bit to 1 in HE Operation element that it transmits or if the non-AP STA has transmitted several such reports to its associated HE AP."Remove "if" because "if" and "unless" are making a confuse. | As in the comment. | **Revised**The sentence is updated and split into several bullet to cover each condition separately.**TGax editor, please make changes as shown in doc 11-20-316r3 tagged as 24250** |

* Autonomous reporting of BSS color collision

*TGax editor, please make changes to the last paragraph in this sub-clause as shown*

[24248, 24249, 24250]A non-AP HE STA that autonomously reports a BSS color collision to its associated HE AP shall schedule for transmission a BSS color collision event report every dot11BSSColorCollisionSTAPeriod unless the BSS color collision no longer exists or the AP has set the BSS Color Disabled field to 1 in the HE Operation element that it transmits.

* MIB Detail

*TGax editor, please make the following changes to the cited entry this sub-clause as shown*

[24249]

dot11BSSColorCollisionAPPeriod OBJECT-TYPE

 SYNTAX Unsigned32 (5..120)

 UNITS "seconds"

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity.

 Changes take effect as soon as practical in the implementation.

 This attribute indicates the duration for which an HE AP waits before disabling BSS color when a color collision is detected."

 DEFVAL { 50 }

 ::= { dot11HEStationConfigEntry 13 }

dot11BSSColorCollisionSTAPeriod OBJECT-TYPE

 SYNTAX Unsigned32 (30..120)

 UNITS "seconds"

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity.

 Changes take effect as soon as practical in the implementation.

 This attribute indicates the interval between successive BSS color collision event reports sent by an non-AP HE STA."

 DEFVAL { 30 }

 ::= { dot11HEStationConfigEntry 14 }