
IEEE P802.11
Wireless LANs

**Proposed resolution for comments related to
Section 27.11.4 (BSS Color)**

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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (14 CIDs):
3084, 3085, 3086, 5387, 7166, 6786, 6779, 6777, 6781, 3088, 9458, 10299, 3087, 5476.

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.

CID	Section	Pg / Ln	Comment	Proposed Change	Resolution
3084	27.11.4	196: 39	Add section reference to setting NAV	Update sentence as follows: "the channel access rules as described in 27.9 (Spatial reuse operation) or reduce power consumption as described in 27.14.1 (Intra-PPDU power save for HE non-AP STAs) or set the NAV as described in 27.2.2 (Updating two NAVs)."	Revised Agree with the comment Added text indicating that NAV would be updated TGax editor please make the changes as shown in 11-17/0134r10
3085	27.11.4	196: 43	Mention that BSS Color is a 6-bit value	Edit sentence as follows: "An HE STA transmitting an HE Operation element shall select a value in the range 1 to 63 to include in the 6-bit BSS Color subfield of the HE Operation element ..."	Reject This sentence was updated by document 11-17/0045r6 and appears in D1.1. Since both BSS Color subfield in HE Operation element and New BSS Color subfield of BSS Color change Announcement element have a length of 6-bits, such clarification is not required.
5387	27.11.4	196: 44	A BSS may change its BSS Color (Subclause 27.16.2 Selecting and advertising new BSS Color) during the operation.	The BSS shall maintain the single value of the BSS Color subfield of the HE Operation element for the lifetime of the BSS or until the BSS changes the BSS Color to the new value.	Accepted Added text as suggested by the commenter. TGax editor please make the changes as shown in 11-17/0134r10
3086	27.11.4	196: 43	Since BSS Color can change when AP determines a prolonged color collision, remove text that states that BSS Color is maintained for the lifetime of the BSS	Remove follow from the sentence: " and shall maintain that single value of the BSS Color subfield for the lifetime of the BSS"	Revised Agree with the comment – added text to capture the BSS Color change case. See resolution for CID 5387. TGax editor please make the changes as shown in 11-17/0134r10
6786	27.16.2	206: 25	"An HE AP may choose to change the BSS Color under certain conditions". That's not what was said back on page 196 (lines 43-44), where HE STAs had to use the same BSS Color for the lifetime of the BSS. The reader shouldn't have to flip backwards and forwards through the specification to see if apparently definitive requirements are countermanded by statements far away.	Reconcile the two statements at issue. For example, add some "Except when ..." qualifier to the earlier statement.	Revised Agree with the comment – added text to capture the color change case. See resolution for CID 5387. TGax editor please make the changes as shown in 11-17/0134r10
6779	27.11.4	197: 19	An "HE non-AP STA should use [...] instead of the BSS_COLOR". Wait a moment, didn't we read just on the preceding page that an HE STA "shall maintain that single value of the BSS Color subfield for the lifetime of the BSS" (P196 LL43-44)? So already the text is contradicting itself. This needs to be resolved.	Reconcile the two statements at issue. For example, add some "Except when ..." qualifier to the earlier statement.	Revised Agree with the comment – added text to capture the color change case. See resolution for CID 5387. TGax editor please make the changes as shown in 11-17/0134r10

7166	27.11.4	196: 43	When BSS Color collision happens, an HE AP may switch the BSS Color to a new one.	Please change the text as follows: "shall maintain that single value of the BSS Color subfield until the HE STA transmitting an HE operation element switches to a new BSS Color"	Revised Agree with the comment – added text to capture the color change case. See resolution for CID 5387. TGax editor please make the changes as shown in 11-17/0134r10
6777	27.11.4	197: 9	Unnecessary variant used for defined term: "BSS color". The term is "BSS Color".	Change to "BSS Color".	Reject 802.11 style discourages unnecessary capitalization -- see 2.7 in 09/1034r11. The term BSS color should not be capitalized. Capitalization is used for frame or field names.
6781	27.11.4	197: 27	Unnecessary variant used for defined term: "BSS color". The term is "BSS Color".	Change to "BSS Color".	Revised Text is updated to refer to RXVECTOR Parameter BSS_COLOR TGax editor please make the changes as shown in 11-17/0134r10
3088	27.11.4	197: 8	A non-AP STA may determine BSS Color overlap with a neighboring (OBSS) AP. In such cases, the non-AP STA needs a mechanism to report a color collision to its associated AP.	Define a mechanism where a non-AP STA can autonomously report a color collision to its associated AP.	Revised Added mechanism to enable a non-AP STA to autonomously report Color collision to its associated AP. TGax editor please make the changes as shown in 11-17/0134r10
9458	27.16.2	206: 24	It may be possible that an OBSS using the same BSS Color may be only visible to STAs, but may or may not be visible to the AP. A mechanism is needed for a STA to report a visible OBSS with the same BSS Color to its AP. The AP may then make decisions whether to change the BSS Color.	Provide a mechanism for STAs to report to AP an OBSS that is visible to the STAs that uses the same BSS Color as the AP that the STAs are associated with.	Revised Added mechanism to enable a non-AP STA to autonomously report Color collision to its associated AP. TGax editor please make the changes as shown in 11-17/0134r10
10299	27.16.2	206: 28	The algorithm to choose a new BSS Color is beyond the scope of this standard, but it is beneficial to define frames and procedure to gather color information.	Add texts as follows. "An HE non-AP STA may report the information of BSS color in the PPDU's it received before the association via the BSS Color Statistics Report element(TBD) in Probe Request or (Re)Association Request frames."	Revised Agree with the comment that there should be a mechanism for non-AP STA to report the OBSS colors that it sees in its neighborhood. However, this can be done post association and can leverage existing framework without needing to define a new element. TGax editor please make the changes as shown in 11-17/0134r10
3087	27.11.4	196.49	Need to capture the case where the received frame came from an unassociated STA with color value 0	Add text to clarify that this applies only when the received BSS Color value is non-zero	Revised This CID was resolved in doc 11-17/0045r6 when it expanded this paragraph to clearly mention each case (including unassociated STA). Note: doc 11-17/0045r6 was approved in CR Motion 146.
5476	27.11.4	196.49	"An HE STA receiving an HE Operation element shall set the TXVECTOR parameter BSS_COLOR..." Color should be optional at least.	"An HE STA receiving an HE Operation element may set the TXVECTOR parameter BSS_COLOR..."	Revised The text referenced by this CID has been updated in doc 11-17/0045r6. The revised text clarifies the conditions under which the responding STA sets the BSS_COLOR value to the one indicated in the peer STA's HE Op. In addition, BSS Color is not an optional feature. Please see resolution for CID 5475 in doc 11-17/0045r6 for additional details. Note: doc 11-17/0045r6 was approved during IEEE Jan 2017 in CR Motion 146.

27.11.4 BSS_COLOR

TGax Editor: Please modify the 1st and 2nd paragraphs (pg 203 line 26 in D1.1) in this section as follows:

The BSS Color is an identifier of the BSS and is used to assist a receiving STA in identifying the BSS from which a PPDU originates so that the STA can use the channel access rules as described in 27.9 (Spatial reuse operation) or reduce power consumption as described in 27.14.1 (Intra-PPDU power save for non-AP HE STAs) or update the NAV as described in 27.2.2 (Updating two NAVs) [CID 3084].

An HE STA transmitting an HE Operation element or a BSS Color Change Announcement element, except when the HE STA is a non-AP STA associated with an HE AP, shall select a value in the range 1 to 63 to include in either the BSS Color subfield of the HE Operation element or the New BSS Color subfield of the BSS Color Change Announcement element respectively that it transmits and shall maintain that single value of the BSS Color subfield for the lifetime of the BSS. BSS or until the BSS changes the BSS Color to the new value as described in 27.16.2.1 [CID 3086, 5387, 6786, 6779, 7166] An non-AP HE STA associated with an HE AP that is transmitting an HE PPDU in a direct path to a DLS or 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.

TGax Editor: Please modify the 9th and 10th paragraphs (pg 204 line 13 in D1.1) in this section as follows:

All APs that are members of a ~~Multiple~~ multiple BSSID Set ~~set~~ element shall use the same BSS color.

An HE AP that decides to discontinue the use of the BSS color for the BSS that it serves, for example, after detecting a BSS color overlap with an OBSS (see 27.16.2.2) [3088, 9458, 10299], shall set the value of BSS Color Disabled subfield in the HE Operation element to 1 to inform associated STAs that the BSS Color is disabled; otherwise the AP shall set the BSS Color Disabled subfield to 0.

Following changes are proposed to resolve CIDs 3088, 9458, 10299

TGax Editor: Please update section title for 27.16.2 as shown below and move contents of 27.16.2 under a new sub-section 27.16.2.1 as follows:

27.16.2 ~~Selecting and advertising new~~ BSS Color

27.16.2.1 Selecting and advertising new BSS Color

TGax Editor: Please add a new section after 27.16.2.1 as follows:

27.16.2.2 Detecting and Reporting BSS Color Collision

An HE AP may determine that a BSS color collision has occurred if it receives frames 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. An HE AP that decides to change its BSS color may consider BSS color information of OBSS APs that it has gathered by itself and via the autonomous collision report(s) from associated STA(s) when selecting the value of its BSS color.

27.16.2.2.1 Autonomous Reporting of BSS Color Collision

A non-AP HE STA may autonomously report BSS color collision when it detects frames from OBSS STAs containing the same BSS color as the one advertised by the AP it is associated with. A STA whose dot11AutonomousBSSColorCollisionReportingImplemented is true shall support autonomous reporting of BSS color collision. When dot11AutonomousBSSColorCollisionReportingImplemented is true, dot11MultiBSSIDImplemented shall be equal to true.

Note – All APs that are members of a multiple BSSID set use the same BSS color (see 27.11.4 (BSS_COLOR)). A non-AP HE STA should filter such BSSs while determining if there is a BSS color collision.

The HE STA's autonomous report shall include BSS color information of all OBSSs that the STA is able to detect frames from in order to help its associated AP select a new non-overlapping BSS color when the AP decides to switch to a different BSS color.

A non-AP HE STA that is autonomously reporting a BSS color collision, shall transmit an Event Report frame (see 9.6.14.3 (Event Report frame format)) containing a single Event Report element (see 9.4.2.68 (Event Report element)). The Event Report element shall carry Event Token field value set to 0 (autonomous report) and Event Type field value set to 4 (BSS Color Collision). The Event Report Status field shall be set to 0 (Successful) and the Event Report field shall carry information about the BSS color used by OBSSs that the reporting STA is able to detect.

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 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.

Note – The maximum number of BSS color collision reports a non-AP STA transmits is out of scope of this standard.

4.3.18.8 Event reporting

TGax Editor: Please modify this section as follows:

Event requests enable a STA to request a non-AP STA to send particular real-time event reports. The types of events include transition, RSNA, WNM log, BSS Color Collision, and peer-to-peer link events. A transition event is transmitted after a non-AP STA successfully completes a BSS transition. Transition events are used to diagnose transition performance problems. An RSNA event report describes the type of Authentication used for the RSNA. RSNA events are used to diagnose security and authentication performance problems. A WNM log event report enables a non-AP STA to transmit a set of WNM log event messages to the requesting STA. WNM log event reports are used to access the contents of a STA's WNM log. A BSS color collision event report enables a non-AP HE STA to signal BSS color collision to its associated AP. A peer-to-peer link event report enables a non-AP STA to inform the requesting STA that a peer-to-peer link has been established. peer-to-peer link event reports are used to monitor the use of peer-to-peer links in the network.

9.4.2.67.1 Event Request definition

TGax Editor: Please modify Table 9-171 in this section as follows:

Table 9-171—Event Type field definitions for event requests and reports

Name	Event Type
Transition	0
RSNA	1
Peer-to-peer link	2
WNM log	3
BSS Color Collision	4
Reserved	4-2205-220
Vendor Specific	221
Reserved	222-255

9.4.2.68.1 Event Report Definition

TGax Editor: Please modify the 6th paragraph in this section as follows:

The Event TSF, UTC Offset, Event Time Error, and Event Report fields are present only when the Event Report Status field is 0 ([Successful](#)) and Event Type is not 4 ([BSS Color Collision](#)). [Event TSF and Event Report fields are present only when Event Status is 0 \(Successful\) and Event Type is 4 \(BSS Color Collision\).](#)

TGax Editor: Please modify the 10th paragraph in this section as follows:

The Event Report field contains the specification of a single event report, as described in 9.4.2.68.2 (Transition event report) to 9.4.2.68.5 (WNM log event report) [and 9.4.2.68.7 \(BSS Color Collision event report\)](#).

TGax Editor: Please add a new section as follows:

[9.4.2.68.7 BSS Color Collision event report](#)

[Event Report field is 8-octets in length with each bit representing a BSS color value. A value of 1 at a bit position indicates that the BSS color value corresponding to that position is in use by OBSS as detected by the reporting non-AP HE STA.](#)

11.24.2.1 Event request and event report

TGax Editor: Please modify the 1st paragraph in this section as follows:

The Event Request and Event Report frames enable network real-time diagnostics. A STA whose dot11EventsActivated is true shall support event requests and reports and shall set to 1 the Event field of the Extended Capabilities elements that it transmits. If dot11EventsActivated is true and the Event Type is not BSS Color Collision, a STA shall log all Transition, RSNA, peer-to-peer, and WNM log events, including the corresponding TSF, UTC Offset and Event Time Error.

TGax Editor: Please add a new paragraph after the 1st paragraph in this section as follows:

A STA whose dot11AutonomousBSSColorCollisionReportingImplemented is true shall set the Event field of the Extended Capabilities elements that it transmits to 1.

TGax Editor: Please add a new section after 11.24.2.6 as follows:

11.24.2.7 BSS Color Collision event

The BSS color collision event report enables a non-AP HE STA to inform its associated AP whether a BSS color collision has occurred. The report carries information about the BSS color used by OBSSs that the reporting STA is able to detect.

C.3 MIB Detail

TGax Editor: Please make the following additions to this section:

```
Dot11HEStationConfigEntry ::=
    SEQUENCE {
        dot11HEULMUResponseSchedulingOptionImplemented    TruthValue,
        dot11ULMUMIMOOptionImplemented                    TruthValue,
        dot11OFDMARandomAccessOptionImplemented            TruthValue,
        dot11HEControlFieldOptionImplemented                TruthValue,
        dot11OMIOptionImplemented                          TruthValue,
        dot11HEMCSFeedbackOptionImplemented                 TruthValue,
        dot11HEDynamicFragmentationImplemented              TruthValue,
        dot11AMPDUwithMultipleTIDOptionImplemented          TruthValue,
        dot11MPDUAskedforAckInMultiTIDAMPDU                 TruthValue,
        dot11DurationRTSThreshold                          Unsigned32,
        dot11PPEThresholdsRequired                          TruthValue,
        dot11IntraPDUPowerSaveOptionActivated               TruthValue,
        dot11AMSDUFragmentationOptionImplemented            TruthValue,
        dot11BSSColorCollisionAPPeriod                     Unsigned32,
        dot11BSSColorCollisionSTAPeriod                     Unsigned32,
        dot11AutonomousBSSColorCollisionReportingImplemented TruthValue
    }
```

dot11BSSColorCollisionAPPeriod OBJECT-TYPE

SYNTAX Unsigned32 (50..255)

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The attribute indicates the duration for which an HE AP shall wait before disabling BSS color. The minimum value of this variable is 50."
DEFVAL { 50 }
::= { dot11HEStationConfigEntry 14}

dot11BSSColorCollisionSTAPeriod OBJECT-TYPE

SYNTAX Unsigned32 (5..10)
UNITS "seconds"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The attribute indicates the interval between successive BSS color collision reports. The maximum value of this variable is 10."
DEFVAL { 5 }
::= { dot11HEStationConfigEntry 15}

dot11AutonomousBSSColorCollisionReportingImplemented OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This is a capability variable.
Its value is determined by device capabilities.
This attribute, when true, indicates that autonomously detecting and reporting of BSS color collision is implemented."
DEFVAL { false }
::= { dot11HEStationConfigEntry 16}