

IEEE P802.11 Wireless LANs

Proposed Resolution for CID 72 (BSS Color Change Procedure)				
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Abstract

This submission proposes resolution for CID 72

Revision History:

Rev0: Initial version of the document

Rev1: Added discussion section

Rev2: added revision history, fixed typos

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	Pg / Ln	Comment	Proposed Change	Resolution
72	25.11	Unlike what is suggested here "An HE AP shall select a value in the range 1 to TBD to include in the BSS Color subfield of the HE Operation elements that it transmits and shall maintain that single value of the BSS Color subfield for the duration of the existence of the BSS.", it'd seem logical that an AP manages its Color value so that it reduces Color collision with other neighboring APs. Since some other STAs' behaviors depend on Color value it seems logical that an AP changes its Color value to avoid unintended behaviors from its associated STAs when there is a Color collision that at least the AP is aware of.	Allow an AP to change its Color value during the existence of the BSS.	Revised – Agree in principle with the comment. Please see contribution in document 11-16/1415r2 for more technical discussions. TGax editor please capture changes from this document (11-16/1415r2) for CID 72.

Discussion:

AP disables color (e.g., when color collision is detected) via a bit in HE Operation element (see doc 11-16/1413). However, it is not desired that AP disables color related features forever. Therefore, it is highly recommended that AP switches to a different color if color collision persists for a long time.

Color change procedure needs to be simple and well coordinate in order to ensure minimal service interruptions. STAs have different wake-up schedules. Different power save requirements, different listen interval etc. In addition, some STAs (TWT schedule STAs) may skip beacons and operate in TWT mode.

HE AP needs to ensure that all associated STAs are informed of the time when the color change is schedule to occur.

The proposed resolution defines a new element (BSS Color Change Announcement element) to carry color change announcement and the TBTT when the color change would occur. The mechanism is very similar to Channel Switch Announcement.

9.3.3 Management frames

9.3.3.1 Beacon frame format

TGax Editor: Insert the following new row (header row shown for convenience) into Table 9-27 (Beacon frame body):

Table 9-27—Beacon frame body

Order	Information	Notes
<ANA>	BSS Color Change Announcement	The BSS Color Change Announcement element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present.

9.3.3.6 Association Response frame format

TGax Editor: Insert the following new row (header row shown for convenience) into Table 9-30 (Association Response frame body):

Table 9-30—Association Response frame body

Order	Information	Notes
<ANA>	BSS Color Change Announcement	The BSS Color Change Announcement element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present.

9.3.3.8 Reassociation Response frame format

TGax Editor: Insert the following new row (header row shown for convenience) into Table 9-32 (Reassociation Response frame body):

Table 9-32—Reassociation Response frame body

Order	Information	Notes
<ANA>	BSS Color Change Announcement	The BSS Color Change Announcement element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present.

9.3.3.11 Probe Response frame format

TGax Editor: Insert the following new row (header row shown for convenience) into Table 9-34 (Probe Response frame body):

Table 9-34—Probe Response frame body

Order	Information	Notes
<ANA>	BSS Color Change Announcement	The BSS Color Change Announcement element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present.

9.6.28 HE Action frame details

9.6.28.1 HE Action field

TGax Editor: Modify Table 9-421z (HE Action field values) with the underline content as shown below:

Table 9-421z—HE Action field values

Value	Meaning
0	HE Compressed Beamforming And CQI
<u>1</u>	<u>HE BSS Color Change Announcement</u>
<u>2</u> -255	Reserved

TGax Editor: Insert the following new section at the end of section 9.6.28:

9.6.28.3 HE BSS Color Change Announcement frame format

The HE BSS Color Change Announcement frame is an Action or Action No ACK frame of category HE. The Action field of a HE BSS Color Change Announcement frame contains the information shown in Table 9-421xx (HE BSS Color Change Announcement frame Action field format).

Table 9-421xx HE BSS Color Change Announcement frame Action field format

Order	Information
1	Category
2	HE Action
3	BSS Color Change Announcement element

The Category field is defined in Table 9-47 (Category values).

The HE Action field is defined in Table 9-421z (HE Action field values).

The BSS Color Change Announcement element as defined in 9.4.2.22x is always present in the frame.

No Vendor-Specific elements are present in HE BSS Color Change Announcement frame.

TGax Editor: Insert the following new section at the end of section 9.4.2:

9.4.2.22x BSS Color Change Announcement element

The BSS Color Change Announcement element is used by an HE AP to advertise a BSS Color change and the value of the new BSS color. The format of the BSS Color Change Announcement element is shown in Figure 9-xxx (BSS Color Change Announcement element format).

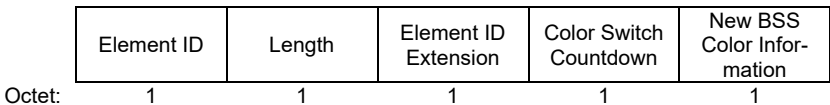


Figure Error! No text of specified style in document.-xxx – BSS Color Change Announcement element format

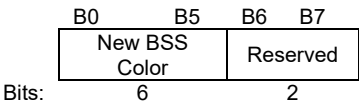


Figure Error! No text of specified style in document.-xxx – New BSS Color Information field format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The Color Switch Countdown field is set to the number of TBTTs that remain until the STA sending the BSS Color Change Announcement element switches to the new BSS Color. A value of 0 indicates that the switch occurs at the current TBTT if the element is carried in a Beacon frame or the next TBTT following the frame that carried the element if the frame is not a Beacon.

The format of the New BSS Color Information field is as defined in Figure 9-xxx (New BSS Color Information field format). The New BSS Color sub-field is set to the new BSS Color value that the HE AP intends to use starting from the TBTT at which the Color Switch Countdown reaches 0.

The BSS Color Change Announcement element can be included in HE BSS Color Change Announcement frame, Beacon, Probe Response, and (Re-)Association Response frames. The use of BSS Color Change Announcement elements and frames is described in 25.1a.1 (Selecting and advertising a new BSS Color).

TGax Editor: Insert the following new section at the end of section 25:

25.1a HE BSS Operation

25.1a.1 Selecting and advertising new BSS Color

An HE AP that sets up a BSS selects a BSS Color as defined in 25.11. An HE AP may choose to change the BSS Color under certain conditions such as when it detects that there is at least one other OBSS AP in the neighbourhood that uses the same color as the BSS Color of its BSS.

The algorithm to choose a new BSS Color is beyond the scope of this standard.

An HE AP shall announce its decision to change the BSS Color via the BSS Color Change Announcement element which is carried in the Beacon, Probe Response and (Re)Association Response frames. The AP may also advertise the BSS Color change event via the HE BSS Color Change Announcement frame. The BSS Color change announcement should be advertised for a period of time that is sufficient for all STAs in the BSS, including STAs in power save mode, to have the opportunity to receive at least one BSS Color Change Announcement element before the BSS Color change occurs.

BSS Color change TBTT is the one at which the Color Switch Countdown time has reached 0 and the BSS switches to the new color.

During the time leading up to the BSS Color change TBTT, an HE AP shall continue to advertise the existing BSS Color via the BSS Color subfield in HE Operation element.

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

- set the BSS Color Disable bit subfield value to 0 in HE Operation element
- start advertising the new BSS Color via BSS Color subfield in HE Operation element
- start using the new BSS Color

A HE non-AP STA that receives a BSS Color Change Announcement element shall start using the BSS Color specified in the received BSS Color Change Announcement element subsequent to the BSS Color change TBTT.

A HE non-AP STA in an infrastructure BSS shall not transmit the BSS Color Change Announcement element.