IEEE P802.11
Wireless LANs

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| Proposed Resolution for CID 193 (BSS Color Disable Indication) |
| Date: 2016-11-09 |
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Abstract

This submission proposes resolution for CID 193

Revision History:

Rev0: Initial version of the document

Rev1, 2: Fixed author affiliation, fixed rev # in document header

Rev3: updated text to separate NAV setting and Intra-PPDU PS case based on feedback

Rev4: added discussion section

Rev5: changed PPDU power save to Intra-PPDU power save based on feedback

Rev6: revised based on received feedback (IEEE San Antonio, 11/8/16 AM2)

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** | **Pg / Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 193 | 25.11 | There may be cases where multiple APs have selected the same BSS Color as such a STA in rare occasions may happen to decide and go in doze state during the wrong PPDU. Enable the AP to turn off intra-PPDU PS based on BSS Color. | As in comment. | Revised.Please see contribution in document 11-16/1413r6TGax editor please capture changes from this document (11-16/1413r6) for CID 193. |

Discussion:

6-bits for BSS Color. Based on Birthday Paradox, in a dense environment, there is a high likelihood that 2 APs select the same color (for example, with only 8 APs in the neighborhood, there is a 50% change that 2 of them select the same color)

If BSS Color collision is not handled, it can cause:

* STAs to incorrectly set Intra-NAV values
* STAs to incorrectly enter power-save mode and missing frames from its AP

Therefore, it is critical for an HE APs to:

* Signal and inform associated STAs that there is BSS color overlap
* If needed, switch to a new color (see doc 11-16/1415)

The proposed resolution is to disable BSS Color when AP determines that there is a color collision.

The proposed text language is general so that it covers other situations such as an operator reorganizing a managed network.

**9.4.2.219 HE Operation element**

TGax Editor: *Please update this section with the underlined changes:*

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B5 | B6 B8 | B9 | B10 B19 | B20 | B21 | B22 B31 |
|  | BSS Color | Default PE Duration | TWT Required | HE Duration based RTS Threshold | Partial BSS Color | BSS Color Disabled | Reserved |
| Bits: | 6 | 3 | 1 | 10 | 1 | 1 | 10 |

Figure 9‑589cr - HE Operation Parameters field format

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 color for the BSS that it serves, for example, after detecting a BSS Color overlap in the neighborhood as described in 25.11.3 (BSS\_COLOR); otherwise the HE AP sets the BSS Color Disabled subfield to 0.

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 disables use of BSS Color parameter in Intra-PPDU power save and Intra BSS NAV logic that depend exclusively on BSS Color (see details in section 25.11.3). 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.

* Channel Access
* Intra-BSS and inter-BSS frame detection

TGax Editor: *Please add the underline text to this section:*

A frame received(#1577) by the STA is an intra-BSS frame if one of the following conditions is true:

* The RXVECTOR parameter BSS\_COLOR(#2435) in the received PPDU carrying the frame(#1577) is the same as the BSS color announced by the AP to which the STA is associated and BSS Color Disabled subfield has a value 0 in the most recently received HE Operation element from the AP to which the STA is associated.
* The RA field, TA field or BSSID field(#2438)(#2662) of the received(#1577) frame with the Individual/Group bit forced to the value 0(#447) is the same as the BSSID of AP to which the STA is associated(#608)
* The AP to which the STA is associated is a member of a Multiple BSSID Set with two or more members(#703)(#257)(#2332) and the RA field, TA field or BSSID field(#2438, #2662) of the received(#1577) frame with the Individual/Group bit forced to the value 0(#447) is same as the BSSID of any member of the Multiple BSSID Set
* The RXVECTOR parameter PARTIAL\_AID in the received VHT PPDU with the RXVECTOR parameter GROUP\_ID equal to 0 is the same as the BSSID[39:47] of the AP to which the STA is associated(#2437)
* The value of RXVECTOR parameter PARTIAL\_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP\_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1.(#705)(#2436)(MAC Motion #88)

A frame received by the STA is an inter-BSS frame if one of the following conditions is true(#62)(#2718):

* The RXVECTOR parameter BSS\_COLOR of the PPDU carrying the frame is not 0 and does not match the BSS color announced by the AP to which the STA is associated
* When the RXVECTOR parameter BSS\_COLOR of the PPDU carrying the frame is not present:
* The BSSID field of the received frame with Individual/Group bit forced to the value 0, if available, does not match the BSSID of AP to which the STA is associated
* If the BSSID field is not available, both the RA and TA fields exist, and none of the address fields of the received frame with Individual/Group bit forced to the value 0 match the BSSID of AP to which the STA is associated(#Ed)
* The AP to which the STA is associated is a member of a Multiple BSSID Set with two or more members and the BSSID field of the received frame with Individual/Group bit forced to the value 0, if available, does not match the BSSID of any member of the Multiple BSSID Set
* If the AP to which the STA is associated is a member of a Multiple BSSID Set with two or more members, the BSSID field is not available, both the RA and TA fields exist, and none of the address fields of the received frame with the Individual/Group bit forced to the value 0 match the BSSID of any member of the Multiple BSSID Set(#Ed)
* The RXVECTOR parameter PARTIAL\_AID of the received VHT PPDU frame with the RXVECTOR parameter GROUP\_ID equal to 0 is different from the BSSID[39:47] of the AP to which the STA is associated(#2439)
* The value of RXVECTOR parameter PARTIAL\_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP\_ID equal to 63 is different from the partial BSS color announced by the AP to which the STA is associated when the Partial BSS Color field in the most recently received HE Operation element is 1.(#705)(#2439)(MAC Motion #88)
* An HE AP receives either a VHT MU PPDU or an HE MU PPDU.(#2440)

If the received frame satisfies both intra-BSS and inter-BSS conditions, the decision made by using the MAC address takes precedence over the decision made by using the RXVECTOR parameter BSS\_COLOR (#640)(#2661)(#776).

If the received frame does not satisfy any of the intra-BSS and inter-BSS conditions, then the frame cannot be determined as intra-BSS or inter-BSS frame(#62).

If the BSS Color Disabled subfield has a value 1 in the most recently received HE Operation element from the AP to which the STA is associated, the decision to classify a received frame as intra-BSS or inter-BSS is made by using the MAC address in the received frame instead of using the RXVECTOR parameter BSS\_COLOR.

## 25.11 TXVECTOR parameters STA\_ID\_LIST, UPLINK\_FLAG and BSS\_COLOR for an HE PPDU

### 25.11.3 BSS\_COLOR

TGax Editor: *Please add the underline at the end of this section:*

An 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 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.

If the most recently received HE Operation element from the AP to which it is associated contained a value of 1 in the BSS Color Disabled subfield then:

* A HE non-AP STA should use the A1, A2 and Duration/ID fields of the MPDUs contained in the received PPDUs instead of the BSS\_COLOR and TXOP\_Duration field in the HE SIG A field to determine whether the STA should update the Intra-BSS NAV.
* A HE non-AP STA should use the A1, A2 of the MPDUs contained in the received PPDUs instead of the BSS\_COLOR and STA\_ID\_LIST field in the HE SIG A field to determine whether the STA may go to doze state for the duration of that PPDU (see 25.2.1 (Intra-BSS and inter-BSS frame detection), 25.2.2 (Updating two NAVs), and 25.15.1 (Intra-PPDU power save for HE non-AP STAs)).

The HE non-AP STA may use the BSS COLOR if the most recently received HE Operation element from the AP to which it is associated contained a value of 0 in the BSS Color Disabled subfield.

* Power management
* Intra-PPDU power save for HE non-AP STAs

TGax Editor: *Please add the underline text to this section:*

An HE non-AP STA (#1598)has dot11IntraPPDUPowerSaveOptionActivated equal to true operates in intra-PPDU power save mode.

An HE non-AP STA that is in intra-PPDU power save mode may enter the doze state until the end of a PPDU currently being received(#2848) when one of the following conditions is met:

* The PPDU is an HE MU PPDU where the RXVECTOR parameter BSS\_COLOR is the BSS color of the BSS with which the STA is associated and BSS Color Disabled subfield has a value 0 in the most recently received HE Operation element from the AP to which the STA is associated and the RXVECTOR parameter UL\_FLAG is 0 and the RXVECTOR parameter STA\_ID\_LIST does not include the identifier of the STA or the broadcast identifier(s) intended for the STA.(#Ed)
* The PPDU is an HE MU PPDU, HE SU PPDU or HE extended range SU PPDU and one of the following conditions are true:(#Ed)
* The RXVECTOR parameter BSS\_COLOR is the BSS color of the BSS with which the STA is associated and BSS Color Disabled subfield has a value 0 in the most recently received HE Operation element from the AP to which the STA is associated and the RXVECTOR parameter UL\_FLAG is 1
* The RXVECTOR parameter BSS\_COLOR is the BSS color of the BSS with which the STA is associated, the RXVECTOR parameter UL\_FLAG is 0 and a PHY-RXEND.indication(UnsupportedRate) primitive was received(#194)
* The PPDU is an HE trigger-based PPDU where the RXVECTOR parameter BSS\_COLOR is the BSS color of the BSS with which the STA is associated and BSS Color Disabled subfield has a value 0 in the most recently received HE Operation element from the AP to which the STA is associated. (#1599)
* The PPDU is a VHT PPDU where(#782) the RXVECTOR parameter PARTIAL\_AID is the BSSID[39:47] of the BSS with which the STA is associated and the RXVECTOR parameter GROUP\_ID is 0.(#Ed)
* The PPDU is a PPDU with(#782):
* An A-MPDU including TA or RA equal to either the BSSID of the BSS with which the STA is associated or the BSSID of any BSS of a multiple BSSID set that the STA's associated BSS belongs to and,(MAC Motion #93)
* The RA is not the(#Ed) MAC address of the STA

An HE STA that is in intra-PPDU power save mode and has entered doze state shall continue to operate its NAV timers(#2850) and consider the medium busy during doze state and shall transition into awake state at the end of the PPDU.

NOTE—The STA can contend for access to the medium immediately on the expiry of the NAV timers(#2851).(#1600)