IEEE P802.11
Wireless LANs

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| Proposed resolution for comments related to Section 27.16.2 |
| Date: 2017-03-03 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (11 CIDs):

6787, 7131, 10300, 10301, 4910, 4911, 6789, 8356, 4909, 9703, 4908

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** | **Section** | **Pg / Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 6787 | 27.16.2 | 206.27 | "one other OBSS AP in the neighborhood that uses the same color as the BSS Color of its BSS". Sorry, this is quite muddled. Defined terms need to be capitalized; otherwise they retain their everyday meaning. So "color", lower case, is an actual color of the rainbow. The color of the AP depends on how it is painted. The BSS doesn't have a color. The draft uses colloquial shortcuts that aren't even short: why not simply say "one other OBSS AP in the neighborhood that uses that same BSS Color"? | Change to "one other OBSS AP in the neighborhood that uses the same BSS Color". | RevisedAgree with the comment. D1.1 updated the text in this sentence. The modifications simplified the sentence and addressed the issues pointed out by this comment. No further changes are proposed. |
| 7131 | 27.16.2 | 206.31 | It is necessary to clarify whether the New BSS color or Color Switch Countdown time may be changed during the advertisement of BSS Color Change Announcement. | Clarify | RevisedAgree with the comment.Added text to suggest that the AP shall not change the BSS Color change TBTT or the value of the New BSS Color subfield that it advertises.TGax editor please make changes as shown in 11-17/0138r0 |
| 10300 | 27.16.2 | 206.32 | P92L19 defines the rule to set the BSS Color Disable subfield to 1 at detecting BSS Color overlapping. The whole operation of BSS Color change should be described here including BSS Color Disable subfield setting. | Add texts as follows after "(Re)Association Response frames.".The AP shall set the BSS Color Disable subfield to 1. | RevisedAgree with the comment. Added text that says an HE AP shall set the BSS Color Disabled bit to 1 in HE Operation element that it transmits while it is advertising the BSS Color change announcements.TGax editor please make changes as shown in 11-17/0138r0 |
| 10301 | 27.16.2 | 206.43 | The surrounding STAs not associating the BSS under spatial reuse operation with intra/inter-BSS frame identification could lose opportunity of spatial reuse during the time leading up to the BSS color change TBTT. | Add texts as follows."an HE AP shall set the existing BSS Color in BSS Color field in HE-SIG-A." | RevisedAgree with the comment.Added text to indicate that the TXVECTOR parameter BSS\_COLOR of an HE PPDU shall carry the current BSS Color value.TGax editor please make changes as shown in 11-17/0138r0 |
| 4910 | 27.16.2 | 206.22 | Since clients might sleep for say 2 sec between beacon reading times, then a color change may take multiples of that before it can happen, which is uselessly slow for a mobile AP, such as one mounted on a bus. | This BSS Color feature is grossly under-engineered for mobile devices and real-world issues. Re-analyze considering what can go wrong instead of what can go right. Fix the various instabilities arising from BSS Color, especially with mobile APs. BTW, a looming change in BSS Color doesn't even change the Check Beacon field in the TIM frame, which shows how little thought has been put into this feature | RevisedAgree with the comment. Added a new entry to the ‘events’ list to trigger an increment of the value of the Check Beacon field in the TIM frame.TGax editor please make changes as shown in 11-17/0138r0 |
| 4911 | 27.16.2 | 206.22 | Due to the dangerous power of a BSS Color change frame in the hands of a script kiddie, there should (must!) be protected dual of this frame | This BSS Color feature is grossly under-engineered for mobile devices and real-world issues. Re-analyze considering what can go wrong instead of what can go right. Fix the various instabilities arising from BSS Color, especially with mobile APs | RevisedAgree with the comment.Defined a variant of HE Action frame which is protected. Changed the frame type of BSS Color Change Announcement frame from HE Action to Protected HE Action.TGax editor please make changes as shown in 11-17/0138r0 |
| 6789 | 27.16.2 | 206.51 | Unnecessary variant used for defined term: "BSS color". The term is "BSS Color". | Change to "BSS Color". | Reject802.11 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. |
| 8356 | 27.16.2 | 206.35 | The transition period after the AP transmits an announcement frame for BSS color change until the new BSS color takes effect could be very long, especially for STAs that are in sleep mode and STAs that are in the process of joining the existing BSS. Need to devise a scheme to minimize the potential problems that may arise during the long transitional time to handle newly associated STAs that are just associated with the AP using the existing BSS color. | What suggested here is just a temporary solution. A more detailed procedure should be developed to alleviate the problems mentioned. Modify the paragraph on line 43-45 as follows: "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 with an indication that this BSS color is to be changed at the BSS color TBTT" | RejectThe spec text specifies that an HE AP shall advertise BSS Color Change Announcement element via Beacon, Probe Response, (Re-)Association Response frames. Therefore, a STA that is newly associated with the AP or about to associate with the AP will get to know about the upcoming BSS Color change event (the announcement includes the new BSS Color and the TBTT when the change would occur). This is no different from many other features that are already defined in the standard (e.g., Channel Switch Announcement). |
| 4909 | 27.16.2 | 206.22 | Unless every associated STA guarantees to awaken and read the BSS Color Change Announcement element in the Beacon at some minimum interval, the AP has no safe way to set the Color Switch Countdown field in this element so all STAS receive it in time. Without this, a color change will create more problems than it solves. | This BSS Color feature is grossly under-engineered for mobile devices and real-world issues. Re-analyze considering what can go wrong instead of what can go right. Fix the various instabilities arising from BSS Color, especially with mobile APs | RejectThe BSS color change scheme is very similar to Channel Switch mechanism defined in the standard which faces the same challenge.We cannot guarantee that all the associated STAs will hear the advertisement. However, we can try to maximize the number of STA that heard the advertisement by taking into account their listen interval, power state etc. The AP is expected to have such knowledge about associated STAs. In addition, the AP is expected to advertises the upcoming change in Beacon, Probe Response, (Re)Association Response frames and in some cases via a separate action frame. Further, as a recommended by CID 4910, the TIM broadcast frame shall increment the Check Beacon field when BSS color change announcement is included in the beacon. Thus attempting to maximize the number of STAs that hear the announcement.Also note, the 2nd paragraph of this section specifies that AP shall advertise the color change announcement for a sufficient amount of time such that all the associated STAs have the opportunity to hear the advertisement.  |
| 9703 | 27.16.2 | 206.58 | "A HE non-AP STA in an infrastructure BSS shall not transmit the BSS Color Change Announcement element."In an TDLS/DLS, mesh cases, an HE non-AP STA should be allowed to transmit the BSS Color Change Announcement element.See the issue happened in an TDLS/DLS case.An HE non-AP STA1 has 1st TDLS connection with an HE non-AP STA2. And, the BSS Color of 1st TDLS connection is set to 1.Then, the HE non-AP STA1 has 2nd TDLS connection with an HE non-AP STA3. If the HE non-AP STA3 is a TDLS initiator STA, the HE non-AP STA1 can not know the BSS color of 2nd TDLS connection before receiving the TDLS confirm frame from the HE non-AP STA3. When the BSS color of 2nd TDLS connection is set to 2, the HE non-AP STA1 shall consider two BSS colors (1 and 2) as an intra-BSS color. It is very complicated scenario and current TGax draft does not handle this complicated issue.Simple solution is that all DLS/TDLS/Mes STAs use the pre-determined BSS color. But, the TGax group rejected this solution.Alternative solution is to just allow the BSS Color Change between two HE non-AP STAs (TDLS initiator STA and TDLS responder STA). | As per comment. | RejectAn HE non-AP STA in a (T)DLS connection when associated with an HE AP shall inherit the BSS Color of the associated AP. If the associated HE AP decided to change its BSS Color, the STAs switch to the new color at BSS Color change TBTT and the (T)DLS link uses the new BSS Color. If the non-AP HE STAs are associated with a legacy (i.e., non-HE) AP, then the initiator of the connection picks a random BSS color. The TDLS Setup Confirm frame carried HE Operation element which indicates the BSS color selected for the link. If there is need to change the BSS color (due to collision or some other reason), the device that detected the collision would tear down the link and initiate a new connection (picking a new BSS color in the process).In case of a mesh, each mesh STA beacons and is expected to catch the beacons of each neighboring peer mesh STA. As a result, each mesh STA can independently pick a non-overlapping BSS Color (depending on its local OBSS conditions). Each mesh STA can disassociate and establish new peering if it encounters BSS Color collision. Mesh Peering Open frame and Mesh Peering Confirm frames carry HE Operation element (see 9.6.16.2 & 9.6.16.3 of D1.0 spec). |
| 4908 | 27.16.2 | 206.22 | BSS color is defective with highly overlapped BSSs yet different colors. With mobile APs, ensuring highly overlapped BSSs always have the same color is infeasible | Define that non-fixed APs use BSS color = 0 (no color). This is a repeat of a D0.1 comment but was misunderstood during that CR. Being mroe specific, consider AP1 very near to AP2 and two STAs which are on either side of the APs: STA1 ---> AP1, AP2 <--- STA2. STA1 and STA2 want to transmit to AP1 and AP2 respectively. AP1 is a fixed AP, with a BSS color. AP2 is a mobile AP with an initially well-chosen (and different) BSS color who has now wandered very close to AP1. STA1 and STA2 hear each other at say -77 or -72 or -67 dBm. Roughly speaking, under the proportional rule, because STA1 and STA2 have different colors, they can both transmit as long as they drop their TX power by 5 or 10 or 15 dB, respectively. And if they do transmit, then their transmissions collide at AP1 and AP2 - badness. This mitigated by RTS/CTS, but no STA has ever had to transmit an RTS because the overheads are ugly - do we need to mandate that? What if AP1+STA1 are legacy devices whose RTS behavior cannot be changed? One theory is a) that all STAs always defers to transmissions from mobile BSSs, and APs/STAs within a mobile BSS always defer to transmissions from fixed BSSs (i.e. BSS Color is only a game played between APs/STAs within fixed BSSs; we use legacy CCA for mobile BSSs). Or b) mobile AP2 changes its color to AP1's color if it gets "close enough" (needs a definition). But if AP2 is on a train/bus/car, then AP2's BSS Color is thrashing all the time. c) Other?Put another way, this BSS Color feature is grossly under-engineered for mobile devices and real-world issues. Re-analyze considering what can go wrong instead of what can go right. Fix the various instabilities arising from BSS Color, especially with mobile APs | RejectIEEE 802.11 does not define a non-fixed or mobile AP. Therefore, the suggestion of using color 0 for non-fixed AP will not work. In addition, a BSS with color=0 is advantaged because no one else can perform SR on top of its PPDUs but it can perform SR on top of other BSSs |

* Selecting and advertising new BSS Color

TGax Editor: Please modify the 3rd and 4th paragraph (pg 213, line 58 in D1.1) in section as follows:

If the Color Switch Countdown field carried in BSS Color Change Announcement element has a value greater than 0, then at the next TBTT, its value is decremented by 1 until it reaches 0. BSS c~~C~~olor change TBTT is the one at which the Color Switch Countdown ~~time~~ field value has ~~reached~~ decremented to 0 ~~and the BSS switches to the new color~~. An HE AP shall not alter the BSS color change TBTT after it has begun advertising an upcoming BSS color change.[7131]

During the time leading up to the BSS c~~C~~olor change TBTT~~,~~:[7131, 10300, 10301]

* ~~an~~ An HE AP shall set the BSS Color Disabled subfield to 1 and shall continue to advertise the existing BSS c~~C~~olor ~~via~~ in the BSS Color subfield ~~in~~ of HE Operation element that it transmits.[10300]
* An HE AP shall not change the value it advertises in the New BSS Color subfield of the BSS Color Change Announcement element.[7131]
* An HE AP shall set the TXVECTOR parameter BSS\_COLOR of an HE PPDU to the existing BSS Color[10301]

At the BSS c~~C~~olor change TBTT, an HE AP shall:

* Set to 0 the BSS Color Disabled subfield ~~in~~ of the HE Operation element ~~to 0~~ that it transmits
* Start advertising the new BSS c~~C~~olor ~~via~~ in the BSS Color subfield ~~in~~ of the HE Operation element that it transmits
* Start using the new BSS color for all frames that it transmits after the TBTT
* TIM Broadcast

TGax Editor: Please modify this section (pg 147, line 31 in D1.1) as follows:

Change the 11th paragraph as follows:

The AP shall increase the value (modulo 256) of the Check Beacon field in the next transmitted TIM frame(s) when a critical update occurs to any of the elements inside the Beacon frame. The following events shall classify as a critical update:

* Inclusion of a Channel Switch Announcement element
* Inclusion of an Extended Channel Switch Announcement element
* Modification of the EDCA parameters element
* Inclusion of a Quiet element
* Modification of the DSSS Parameter Set
* Modification of the CF Parameter Set element
* Modification of the HT Operation element
* Inclusion of a Wide Bandwidth Channel Switch element
* Inclusion of a Channel Switch Wrapper element
* Inclusion of an Operating Mode Notification element
* Inclusion of a Quiet Channel element
* Modification of the VHT Operation element
* Modification of an HE Operation element
* Inclusion of a Broadcast TWT element

o) Inclusion of BSS Color Change Announcement element[4910]

Following changes are proposed to resolve CID 4911

* Management and Extension frame body components
* Fields that are not elements
* Action field

TGax Editor: Please add a new row to table 9-47 as follows:

Change Table 9-47 as follows (insert new row and updated reserved row):

|  |
| --- |
| * Category values
 |
| Code | Meaning | See subclause | Robust | Group addressed privacy  |
|  | ... |  |  |  |
| <ANA> | HE | 9.6.28 (HE Action frame details) | ~~No~~Yes | No |
| <ANA> | Unprotected HE | 9.6.28a (Unprotected HE Action frame details) | No | No |
| <ANA> | Quiet Time Period | 9.6.23a (Quiet Time Period Action frame details) | No | No |
| ~~21~~<ANA>–125 | Reserved | — | — | — |
|  | ... |  |  |  |

* HE Action frame details
* HE Action field

TGax Editor: Please modify table 9-421z (pg 106, line 13 in D1.1) as follows:

|  |
| --- |
| * HE Action field values
 |
| Value | Meaning |
| ~~0~~ | ~~HE Compressed Beamforming And CQI~~ |
| ~~1~~0 | HE BSS Color Change Announcement |
| ~~2-255~~1-255 | Reserved |

TGax Editor: Please add a new section as follows:

9.6.28a Unprotected HE Action frame detail

9.6.28a.1 Unprotected HE Action field

Unprotected HE Action frames are not encapsulated using mechanisms defined for robust Management frames. An Unprotected HE Action field, in the octet field immediately after the Category field, differentiates the formats. The Unprotected HE Action field values associated with each frame format is defined in Table 9-422aa (Unprotected HE Action field values).

|  |
| --- |
| Table 9-422aa – Unprotected HE Action field values  |
| Value | Meaning |
| 0 | HE Compressed Beamforming And CQI |
| 1-255 | Reserved |

TGax Editor: Please move contents of 9.6.28.2 to a new section 9.6.28a.2 and make the changes as follows:

* **HE Compressed Beamforming And CQI frame format**

The HE Compressed Beamforming And CQI frame is an Action No Ack frame of category Unprotected HE. The Action field of an HE Compressed Beamforming And CQI frame contains the information shown in Table 9-422ab (HE Compressed Beamforming And CQI frame Action field format).

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| --- |
| **Table 9-422ab – HE Compressed Beamforming And CQI frame Action field format** |
| **Order** | **Information** |
| 1 | Category |
| 2 | Unprotected HE Action |
| 3 | HE MIMO Control |
| 4 | HE Compressed Beamforming Report (see 9.4.1.63 (HE Compressed Beamforming Report field)) |
| 5 | HE MU Exclusive Beamforming Report (see 9.4.1.64 (HE MU Exclusive Beamforming Report field)) |
| 6 | HE CQI-only Report (see 9.4.1.65 (HE CQI-only Report field)) |

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

The Unprotected HE Action field is defined in Table 9-422aa (Unprotected HE Action field values).

The HE MIMO Control field is always present in the frame. The presence and contents of the HE Compressed Beamforming Report field, HE MU Exclusive Beamforming Report field and HE CQI-only Report field are dependent on the values of Feedback Type subfield of HE MIMO Control field.

No vendor-specific elements are present in HE Compressed Beamforming and CQI frame.

TGax Editor: Please modify table 9-421ab (pg 107, line 13 in D1.1) as follows:

|  |
| --- |
| * HE BSS Color Change Announcement frame Action field format
 |
| Order | Information |
| 1 | Category |
| 2 | HE Action |
| 3 | BSS Color Change Announcement element (see 9.4.2.222 (BSS Color Change Announcement element)) |