IEEE P802.11
Wireless LANs

|  |
| --- |
| CR for Spatial reuse |
| Date: 2019-03-12 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Laurent Cariou |  |  |  | laurent.cariou@intel.com |

Abstract

This document provides CR for CIDs:.

20337, 20338, 20569, 20615, 20669, 20677, 20948, 21038, 21060, 21094, 21095, 21483, 21484, 21485

1. **Introduction**

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. The introduction and the explanation of the proposed changes are 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** | **Commenter** | **Clause Number(C)** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 20337 | kaiying Lv | 26.10.2.3 | 395.37 | There is no definition of the dot11SRGAPBSSColorBitmap and dot11SRGAPBSSIDBitmap. | Define dot11SRGAPBSSColorBitmap and dot11SRGAPBSSIDBitmap. | Revised – Agree with the commenter. Add a definition for it in section Annex C. Apply the changes marked with CID 20337 in doc 19/0416r1. |
| 20338 | kaiying Lv | 26.10.2.4 | 397.15 | There is no definition of the dot11NonSRGAPOBSSPDMaxOffset | Define dot11NonSRGAPOBSSPDMaxOffset. | Revised – Agree with the commenter. Add a definition for it in section Annex C. Apply the changes marked with CID 20338 in doc 19/0416r1. |
| 20569 | Mark RISON | 26.10.2.2 | 394.12 | "NDP" should always be qualified as "sounding" or "feedback", for HE -- what is the intent at 394.12? Ditto with "NDP Announcement" | Change to "An NDP (including a HE sounding NDP or HE TB feedback NDP)"; also at 394.61. Change "HE NDP PPDU" to "HE sounding NDP or HE TB feedback NDP" at 409.16, 409.28. At 409.45 change " unless the HE PPDU contains an NDP," to " unless the HE PPDU is an HE sounding NDP or HE TB feedback NDP, or contains" and delete "is" in "is a frame" later in the sentence. CHange "an NDP" to "an HE sounding NDP or HE TB feedback NDP" at 718.32, 718.47. Insert "VHT/HE" before "NDP Announcement" at 239.62, 394.11, 394.60, 409.32, 409.33, 409.45, 409.46. Change "NDP feedback report response"/"NDP feedback report poll response" to "HE TB feedback NDP" in 9.3.1.22.9 (3x), 25.5.6.2 (3x). Change " NDP feedback report response" to " responses" and " The NDP feedback report response" to "The response" in 26.5.6.1. Change " NDP feedback report " to " the NDP feedback report procedure " in 25.5.6.2, 26.5.6.3.1. Change "NDP feedback report support subfield" to "NDP Feedback Report Support subfield" in 25.5.6.2. Change "NDP feedback parameter values." to "NDP feedback report parameter values." at 348.62. Change " NDP Feedback Report operation" and "procedure of NDP Feedback report" to " the NDP feedback report procedure" in 26.5.6.3.1. Change "NDP Feedback Report response" to "NDP feedback report response" in 26.5.6.5 (2x) | Revised – this term was used to encompass all NDP frames, it is proposed to be changed to non-HE NDP in this sentence as the exception for HE NDP is already defined thanks to the SPATIAL\_REUSE Rx vector. Apply the changes marked as CID20569 in doc416r0. |
| 20615 | Mark RISON | 26.10.3.1 | 401.51 | "An AP sending a Trigger frame may set the SR field in the Common Info field of the Trigger frame to SRP\_-DISALLOW or, if permitted, to SRP\_ AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED" -- it's not clear who/what gives the permission | Delete ", if permitted," from the cited text at the referenced location | Revised – the rules to set the field to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED are defined in 26.11.6. Add a reference to this subclause in the commented sentence. Apply the changes marked as CID20615 in doc 19/0416r1. |
| 20669 | Mark RISON | 26.10.2.1 | 393.34 | "A STA may operate using one of the two modes, neither mode, or both modes simul-taneously." -- which modes are these? Are they the "types" of OBSS PD in the same para? Or is this a misplaced line and refers to OBSS PD and SRP modes in the previous subclause? | Move the cited sentence to the end of 26.10.1 | Revised – agree with the commenter. This actually refers to the types previously introduces so the term Modes should be replaced by types. Apply the changes marked with CID20669 in doc 19/0416r1. |
| 20677 | Mark RISON | 26.10.2.1 | 393.24 | It was pointed out that in 26.10.2.1, the third sentence incorrectly refers to the first type of OBSS PD-based spatial reuse, which was described in the previous sentence. So instead of "26.10.2.2 (General operation with non-SRG OBSS PD level)" it should refer to "26.10.2.3 General operation with SRG OBSS PD level". For avoidance of doubt, it is only the \*second\* reference to the former section within the paragraph that needs changing. | As it says in the comment | Reject – this change has been corrected in draft 4.0. |
| 20948 | Mark RISON | 26.10.3.2 | 402.17 | Re CID 16157: this change omits the L-SIG field, which sounds as if it would be included in the "legacy portion" referred to in D3.0. Also why "or"? | Change "which is measured from the L-STF, L-LTF and L-SIG fields" | Reject – throughput the SR subclauses, the received power is indicated to be measured on L-STF and L-LTF, omitting L-SIG, as STF and LTF can be boosted. |
| 21038 | Massinissa Lalam | 26.10 | 392.55 | I made a comment (#16411) that class B devices should not be allowed to perform spatial reuse operation due to their wear accuracy. A revision was presented in this direction in 1866r0 but was then rejected in 1866r1 based on discussion that never occurs (well as the commentor I was not involved). I still don't think class B devices should be allowed to transmit over existing communications when the requirements on their mesurements accuracy are this loose. It makes the feature unusable (and thus disabled by default) in practice when you do not control the type of STAs you have in your neighbourhood. | Add following note at end of subclause 26.10.1: "Class B device as defined in 27.3.14.3 (Pre correction accuracy requirements) shall not operate with the procedures defined in this subclause. (#16411)" | Revised – agree with the commenter and with commenter for CID 21060 regarding the justifications. Class B devices should indeed not be allowed to operate with spatial reuse. Apply the changes marked as CID21038 and 21060 in doc 19/0416r1 to forbid Class B devices from using spatial reuse. |
| 21060 | Matthew Fischer | 26.1 | 392.60 | Class B STA self-awareness with respect to TX and RX power is tolerant of relatively large errors such that the Spatial Reuse functions have the potential to operate at such STAs with the equivalent of random decisions, given the operating range of the SR mechanisms in dB compared to the allowed combined TX and RX Class B error ranges. As such, Class B STA should be prohibited from employing SR. | Prohibit Class B STA from employing Spatial Reuse. | Revised – agree with the commenter and with commenter for CID 21038 regarding the justifications. Class B devices should indeed not be allowed to operate with spatial reuse. Apply the changes marked as CID21038 and 21060 in doc 19/0416r1 to forbid Class B devices from using spatial reuse. |
| 21094 | Matthew Fischer | 26.10.1 | 393.18 | Shouldn't the requirement of a STA to respond be dependent on its signaling of support of RM? | Change "A non-AP HE STA that performs spatial reuse operation shall" to "A non-AP HE STA that performs spatial reuse operation and that has dot11RadioMeasurementActivated set to true shall" | Revised – the statement mentions that the STA shall support some procedure in section 11.11, and shall therefore have the RM capability set to 1. Apply the changes marked as CID21094 in doc 19/0416r1. |
| 21095 | Matthew Fischer | 26.10.2.2 | 393.62 | To correctly account for the precedence of SR operations in the case of a STA employing both SRG and non-SRG OBSS PD, there needs to be another condition added here. | Add the condition "-If the STA is also operating with an SRG OBSS PD, then the received PPDU is not an SRG PPDU." It might be possible to shorten this to: "The received PPDU is not an SRG PPDU." if the determination of what is an SRG PPDU is modified to include the fact that the STA performing the determination is actively performing the SRG OBSS PD SR procedure. i.e. if you also make a change to include such a condition in the subclause 26.2.3 SRG PPDU identification | Reject – even if the PPDU is an SRG PPDU, the STA may use Non SRG OBSS\_PD. There is definitely benefits from using SRG instead of Non SRG, but there is no need to force a STA to use SRG instead of Non SRG. |
| 21483 | Xiaofei Wang | 26.10.2.2 | 394.26 | It should be clearly defined what "SR\_Delay" means. Without a definition, the whole concept as well as the SR operation is difficult to understand. | please clearly define what "SR\_Delay" means in SR operations | Revised – agree with the commenter. Add a note to clarify the SR\_DELAY concept. Apply the changes marked as CID21483 in doc 19/0416r1. |
| 21484 | Xiaofei Wang | 26.10.2.2. | 394.34 | It should be clearly defined what "SR\_Restricted" means. Without a definition, the whole concept as well as the SR operation is difficult to understand. | please clearly define what "SR\_Restricted" means in SR operations | Revised – agree with the commenter. Add a note to clarify the SR\_RESTRICTED concept. Apply the changes marked as CID21484 in doc 19/0416r1. |
| 21485 | Xiaofei Wang | 26.10.2.2 | 394.26 | The names "SR\_Delay" and "SR\_Restricted" and "SR\_Disallowed" seem not to follow the same naming convention. Please define these terms in the same naming convention. | suggest to change the term "SR\_DELAY" to "SR\_DELAYED" | Revised – agree with the commenter. Change SR\_DELAY to SR\_DELAYED throughout the entire spec. Apply the changes marked as CID21485 in doc 19/0416r1. |

1. **Proposed changes**

***TGax editor: Change the term SR\_DELAY to the term SR\_DELAYED throughout the entire amendment. (#21485)***

***TGax editor: Change the following section 26.10 Spatial reuse operation as described below***

* Spatial reuse operation
* General

The objective of HE spatial reuse operation is to allow the medium to be reused more often between OBSSs in dense deployment scenarios by the early identification of signals from overlapping basic service sets (OBSSs) and interference management.

There are two independent spatial reuse modes: OBSS PD-based spatial reuse and SRP-based spatial reuse(#15654).

An HE AP participating in spatial reuse may request an associated non-AP HE STA to gather information regarding the neighborhood by sending a Beacon request (see 9.4.2.21.7 (Beacon request)) by following the procedure described in 11.11 (Radio measurement procedures). An HE AP shall not set a measurement mode in a Beacon request to an associated STA to a mode for which the STA has not explicitly indicated support via the RM Enabled Capabilities element (see 9.4.2.45 (RM Enabled Capabilities element)). An HE AP that sends a Beacon request for this purpose:

* May request that the non-AP HE STA gather information of BSSs matching a particular BSSID and/or SSID
* May request that the non-AP HE STA generate a report only for the channel the requesting AP is operating on or is considering switching to
* Shall request that the non-AP HE STA include the HE Operation element of neighboring HE APs in order to help determine the BSS Color information of the neighboring APs

(#15655)A non-AP HE STA that performs spatial reuse operation shall have dot11RadioMeasurementActivated set to true and shall respond to a Beacon request from its associated AP with a Beacon report as described in 11.11 (Radio measurement procedures). (#21094)

Class B device as defined in 27.3.14.3 (Pre correction accuracy requirements) shall not operate with the procedures defined in this subclause. (#21038, 21060)

* OBSS PD-based spatial reuse operation
* General

OBSS PD-based spatial reuse operation comprises two types of operation. The first type is defined in 26.10.2.2 (General operation with non-SRG OBSS PD level), and allows a STA, under specific conditions, to ignore an inter-BSS PPDU using a non-SRG OBSS PD level(#17012). The second type is defined in 26.10.2.3 (General operation with SRG OBSS PD level)(#16704) and allows a STA, under specific conditions, to ignore inter-BSS PPDUs that are identified as being SRG PPDUs, using an SRG OBSS PD level.(#15656, #17127) In addition to these differences between the two types, Non-SRG OBSS PD Min offset is fixed and defined in the specification while the SRG OBSS PD Min offset can be defined by the AP.(#15739, #15740) A STA may operate using one of the two types, neither type, or both types simultaneously. (#20669)(#15847)

* General operation with non-SRG OBSS PD level

If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by a PHY-RXSTART.indication due to a PPDU reception then the STA’s MAC sublayer may a) issue a PHY-CCARESET.request primitive before the end of the PPDU and not update its basic NAV timer based on the PPDU or may b) not update its basic NAV timer based on the PPDU if all the following conditions are met:

* The STA has not set the TXVECTOR parameter SPATIAL\_REUSE to the value SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED in any HE PPDU it has transmitted in the current beacon period and in the previous beacon period(#15741).
* The most recently received Spatial Reuse Parameter Set element from its associated AP had the Non-SRG OBSS PD SR Disallowed subfield equal to 0 or the non-AP STA has not received a Spatial Reuse Parameter Set element from its associated AP or the STA is an AP and its most recently transmitted Spatial Reuse Parameter Set element had the Non-SRG OBSS PD SR Disallowed subfield equal to 0 or the STA is an AP and has not transmitted a Spatial Reuse Parameter Set element.
* The received PPDU is an inter-BSS PPDU (see 26.2.2 (Intra-BSS and inter-BSS PPDU classification)) and the received PPDU is not a non-HT PPDU carrying a response frame (Ack, BlockAck or CTS frame), or the received PPDU contains a CTS and a PHY-CCA.indication transition from BUSY to IDLE occurred within the PIFS time immediately preceding the received CTS and that transition corresponded to the end of an inter-BSS PPDU that contained an RTS that was ignored following this procedure.
* The SPATIAL\_REUSE subfield in the HE-SIG-A (if present) of the received PPDU is not set to SRP\_ AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED.
* The received signal strength level, which is measured from the L-STF or L-LTF fields(#15706, #15707) of the PPDU and which is used to determine PHY-CCA.indication, is below the non-SRG OBSS PD level. The non-SRG OBSS PD level is defined in 26.10.2.4 (Adjustment of OBSS PD and transmit power). If the STA has dot11HESRPOptionImplemented set to true, it also follows the rules defined in 26.10.4 (Interaction of OBSS PD and SRP-based spatial reuse) to determine non-SRG OBSS PD level(#16510).
* The PPDU is not one of the following:
* A non-HE PPDU that carries a frame where the RA field is equal to the STA MAC address
* A non-HE PPDU that carries a Public Action frame(#17076)
* A non-HE PPDU that carries an NDP Announcement frame or FTM frame
* An non-HE NDP

Note – A STA can not perform SR over an HE NDP (see 26.11.6(SPATIAL\_REUSE)). (#20569)

If the inter-BSS frame is carried in an HE ER SU PPDU (where power of the L-STF/L-LTF symbols is boosted 3 dB), the received signal strength, which is measured from the L-STF or L-LTF fields of the PPDU and which is used to determine PHY-CCA.indication, shall be decreased by 3 dB to compensate for the power difference(#16025)(#15374).(#15706, #15707)

NOTE—In the case of a received CF-End frame that satisfies the conditions above, either the issuance of a PHY-CCARESET.request or the choice to not update the basic NAV timer both result in the NAV not being canceled as would normally occur following the successful reception of a CF-End frame.(#15763)

The PHY-CCARESET.request primitive shall be issued at the end of the PPDU if the PPDU is an HE SU PPDU or an HE ER SU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_DELAY.

NOTE 1 – A STA sets the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY in a PPDU if it allows OBSS\_PD-based spatial reuse operation, but only after the end of the PPDU. (#21483)

NOTE 2 —An AP can get protection equivalent to SR\_DELAY by transmitting the Trigger frame in a non-HT PPDU or HT PPDU with the TXVECTOR parameter AGGREGATION set to 0 instead of in a VHT PPDU.(#15375)

If the PHY-CCARESET.request primitive is issued before the end of the received PPDU, and a TXOP is initiated within the duration of the received PPDU, then the TXOP and the duration of the transmitted PPDU within that TXOP shall be limited to the duration of the received PPDU if the received PPDU is an HE MU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_RESTRICTED.

NOTE 3 – A STA sets the TXVECTOR parameter SPATIAL\_REUSE to SR\_RESTRICTED in a PPDU if it allows OBSS\_PD-based spatial reuse operation, but only before the end of the PPDU. (#21484)

(#15705, #15708)A STA that ignores a PPDU following the procedure described in this subclause is deemed to perform non-SRG OBSS PD-based spatial reuse.

* General operation with SRG OBSS PD level

If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by a PHY-RXSTART.indication due to a PPDU reception then the STA's MAC sublayer may a) issue a PHY-CCARESET.request primitive before the end of the PPDU and not update its basic NAV timer based on the PPDU or may b) not update its basic NAV timer based on the PPDU if all the following conditions are met:

* The received PPDU is an SRG PPDU (see 26.2.3 (SRG PPDU identification))
* The received signal strength level, which is measured from the L-STF or L-LTF fields(#15707) of the PPDU and which is used to determine PHY-CCA.indication, is below the SRG OBSS PD level. The SRG OBSS PD level is defined in 26.10.2.4 (Adjustment of OBSS PD and transmit power). If the STA has dot11HESRPOptionImplemented set to true, it also follows the rules defined in 26.10.4 (Interaction of OBSS PD and SRP-based spatial reuse) to determine SRG OBSS PD level.
* The PPDU is not one of the following:
* A non-HE PPDU that carries a frame where the RA field is equal to the STA MAC address
* A non-HE PPDU that carries a Public Action frame(#17076)
* A non-HE PPDU that carries an NDP Announcement frame or an FTM frame
* A non-HE NDP

Note – A STA can not perform SR over an HE NDP (see 26.11.6(SPATIAL\_REUSE)). (#20569)

If the inter-BSS frame is carried in an HE ER SU PPDU (where power of the L-STF/L-LTF symbols is boosted 3 dB), the received signal strength, which is measured from the L-STF or L-LTF fields of the PPDU and which is used to determine PHY-CCA.indication, shall be decreased by 3 dB to compensate for the power difference(#16025) when compared to the OBSS PD level.(#15707)

NOTE—In the case of a received CF-End frame that satisfies the conditions above, either the issuance of a PHY-CCARESET.request or the choice to not update the basic NAV timer both result in the NAV not being canceled as would normally occur following the successful reception of a CF-End frame.(#15764)

The PHY-CCARESET.request primitive shall be issued at the end of the PPDU if the PPDU is an HE SU PPDU or an HE ER SU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_DELAY.

NOTE—An AP can get protection equivalent to SR\_DELAY by transmitting the Trigger frame in a non-HT PPDU or HT PPDU with the TXVECTOR parameter AGGREGATION set to 0 instead of in a VHT PPDU.(#15376)

If the PHY-CCARESET.request primitive is issued before the end of the received PPDU, and a TXOP is initiated within the duration of the received PPDU, then the TXOP and the duration of the transmitted PPDU within that TXOP shall be limited to the duration of the received PPDU if the received PPDU is an HE MU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_RESTRICTED.

NOTE—The restriction, in addition to the TXOP limit, of the PPDU duration within the TXOP is included in the above paragraph related to SR\_RESTRICTED as there are conditions where the TXOP limit can be exceeded (see 10.24.2.9 (TXOP limits)).

If an HE AP sends a Spatial Reuse Parameter Set element where the SRG Information Present field is set to 1, the BSS Color and Partial BSSID bitmap values shall be determined according to the following rules:

* If the most recent HE Operation element received by the AP from another AP has the BSS Color Disabled field equal to 1, then the AP shall set the BSS Color and/or Partial BSSID bits that correspond to that other AP to 0
* Else, if the AP is in the same ESS as another AP (i.e. with the same SSID, and connected by a DS), or is controlled by the same external management entity as another AP (irrespective of SSID), then the AP may set the BSS Color and/or Partial BSSID bits that correspond to that other AP to 1
* Else, the AP shall set the BSS Color and/or Partial BSSID bits to 0.

If an HE AP determines values for dot11SRGAPBSSColorBitmap and dot11SRGAPBSSIDBitmap (i.e., the SRG for the AP's own transmissions), then the values shall be determined according to the above rules.(#15704)(#15817)

* Adjustment of OBSS PD and transmit power

If(#15377) using OBSS PD-based spatial reuse, an HE STA shall maintain an OBSS PD level and may adjust this OBSS PD level in conjunction with its transmit power and this adjustment shall be made in accordance with Equation (26-5).(#16513, #16514)

*

The adjustment rule is illustrated in Figure 26-9 (Illustration of the adjustment rules for OBSS PD and TX\_PWR).

|  |
| --- |
|  |
| * Illustration of the adjustment rules for OBSS PD and TX\_PWR(#15744, #16758)(#15592)
 |

The value of the *OBSS\_PDlevel* is applicable to the start of a 20 MHz PPDU received on the primary 20 MHz channel. If the bandwidth of the received PPDU differs from 20 MHz, then the value of the *OBSS\_PDlevel* is increased by 10 log (bandwidth/20 MHz), using the bandwidth in MHz indicated by the value of RXVECTOR parameter CH\_BANDWIDTH or CH\_BANDWIDTH\_IN\_NON\_HT if(#15378) present.

*TX\_PWRref* = 21 dBm for non-AP STAs.

*TX\_PWRref* = 21 dBm for an AP with the Max HE-MCS For 3 SS subfield in the Tx HE-MCS Map  80 MHz subfield in the Supported HE-MCS and NSS Set field of its HE Capabilities element field set to 3.

*TX\_PWRref* = 25 dBm for an AP with the Max HE-MCS For 3 SS subfield in the Tx HE-MCS Map  80 MHz subfield in the Supported HE-MCS and NSS Set field of its HE Capabilities element field set to a value other than 3.(#16037, #16226, #16464)

*TX\_PWR* is the STA transmission power in dBm at the output of the antenna connector and is set following the rules in 11.8.6 (Transmit power selection) and, for transmission of HE TB PPDU, also following the rules in 27.3.14.2 (Power pre-correction).(#16512)

NOTE—The *TX\_PWRref* is 4 dB higher for APs with more than 2 spatial streams as those APs typically have higher transmit power than other devices, and as the OBSS\_PD procedure is based on a relative reduction of power.(#15657)

An AP may define SRG OBSS PD Min Offset and SRG OBSS PD Max Offset values that are used by its associated STAs (18/1495r6)to derive an SRG OBSS PD level for determining reception behavior for inter-BSS PPDUs that are determined to be SRG PPDUs. An AP may define a non-SRG OBSS PD Max Offset value that is used by its associated STAs (18/1495r6)to derive a non-SRG OBSS PD level for determining reception behavior for inter-BSS PPDUs that are not determined to be SRG PPDUs. The values of SRG OBSS PD Min Offset, SRG OBSS PD Max Offset and Non-SRG OBSS PD Max Offset are transmitted to associated STAs within the Spatial Reuse Parameter Set element.

An AP transmitting a Spatial Reuse Parameter Set element shall respect the following constraints:

* 82  82 + SRG OBSS PD Min Offset  62
* SRG OBSS PD Min Offset  SRG OBSS PD Max Offset
* 82 + SRG OBSS PD Max Offset  62
* 82 + Non-SRG OBSS PD Max Offset  62(#15710, #15711, $15712)

An HE STA shall maintain a non-SRG OBSS PD level, with its value selected by respecting the OBSS PD level condition in Equation (26-5) but with Non-SRG OBSS PD Min and Non-SRG OBSS PD Max in place of OBSS\_PDmin and OBSS\_PDmax, respectively. A non-AP STA shall determine Non-SRG OBSS PD Min and Non-SRG OBSS PD Max according to Table 26-10 (Non-SRG OBSS PD Min and Non-SRG OBSS PD Max values for non-AP STAs). An HE AP shall set Non-SRG OBSS PD Min to –82 dBm and Non-SRG OBSS PD Max to –82 dBm + dot11NonSRGAPOBSSPDMaxOffset.(#15713, #16936)

|  |
| --- |
| * Non-SRG OBSS PD Min and Non-SRG OBSS PD Max values for non-AP STAs
 |
| Non-SRG OBSS PD SR Disallowed field in Spatial Reuse Parameter Set element | Non-SRG Offset Present field in Spatial Reuse Parameter Set element | Value of Non-SRG OBSS PD Min (dBm)(#Ed) | Value of Non-SRG OBSS PD Max (dBm)(#Ed) |
| Not applicable if the Spatial Reuse Parameter Set element is not received | Not applicable if the Spatial Reuse Parameter Set element is not received | –82 | –62 |
| 0 | 0 | –82 | –62 |
| 0 | 1 | –82 | –82 + Non-SRG OBSS PD Max Offset |
| 1 | N/A | –82 | –82 |

An HE STA shall maintain an SRG OBSS PD level, with its value selected by respecting the OBSS PD level condition in Equation (26-5) but with SRG OBSS PD Min and SRG OBSS PD Max in place of OBSS\_PDmin and OBSS\_PDmax, respectively. A non-AP STA shall determine SRG OBSS PD Min and SRG OBSS PD Max to Table 26-11 (Determining SRG OBSS PD Min and SRG OBSS PD Max values). An HE AP shall set SRG OBSS PD Min to –82 + dot11SRGAPOBSSPDMinOffset dBm and SRG OBSS PD Max to –82 + dot11SRGAPOBSSPDMaxOffset dBm. An HE AP may transmit SRG OBSS PD Min and SRG OBSS PD Max offset values that are different from the ones that it uses.(#16936)

|  |
| --- |
| * Determining SRG OBSS PD Min and SRG OBSS PD Max values
 |
| SRG Information Present field in Spatial Reuse Parameter Set element | Value of SRG OBSS PD Min (dBm)(#Ed) | Value of SRG OBSS PD Max (dBm)(#Ed) |
| Not applicable if the Spatial Reuse Parameter Set element is not received | N/Asee NOTE | N/Asee NOTE |
| 0 | N/Asee NOTE | N/Asee NOTE |
| 1 | –82 + SRG OBSS PD Min Offset | –82 + SRG OBSS PD Max Offset |
| NOTE—If(#15379) SRG Information is not present, a STA cannot determine a PPDU to be SRG and so will not use SRG OBSS PD Min or SRG OBSS PD Max values. |

The Spatial Reuse Parameter Set element is optionally present in Beacons, Probe Responses and (Re)Association responses.

* OBSS PD SR transmit power restriction period

If a STA ignores an inter-BSS PPDU following the procedure in 26.10.2.3 (General operation with SRG OBSS PD level), using a chosen SRG OBSS PD level, or following the procedure in 26.10.2.2 (General operation with non-SRG OBSS PD level) using a chosen non-SRG OBSS PD level, then the STA shall start an OBSS PD SR transmit power restriction period. This OBSS PD SR transmit power restriction period shall be terminated at the end of the TXOP that the STA gains once its backoff reaches zero.

If a STA starts an OBSS PD SR transmit power restriction period with a chosen non-SRG OBSS PD level, the STA’s transmit power as measured at the output of the antenna connector shall be equal or lower than the *TX\_PWRmax*, calculated with this chosen non-SRG OBSS PD level with Equation (26-6), with the appropriate non-SRG parameters according to Table 26-10 (Non-SRG OBSS PD Min and Non-SRG OBSS PD Max values for non-AP STAs), for the transmissions of any PPDU that is not carrying a frame that is allowed to be sent without regard to the busy/idle state of the medium until the end of the OBSS PD SR transmit power restriction period.(18/1866r5)

If a STA starts an OBSS PD SR transmit power restriction period with a chosen SRG OBSS PD level, the STA’s transmit power as measured at the output of the antenna connector, shall be equal or lower than the *TX\_PWRmax*, calculated with this chosen SRG OBSS PD level with Equation (26-6), with the appropriate SRG parameters according to Table 26-11 (Determining SRG OBSS PD Min and SRG OBSS PD Max values), for the transmissions of any PPDU that is not carrying a response frame that is allowed to be sent without regard to the busy/idle state of the medium until the end of the OBSS PD SR transmit power restriction period.(18/1866r5)

NOTE—Examples of frames that are transmitted without regard to the busy/idle state of the medium include but are not limited to a frame contained in an HE TB PPDU that is a response to a Trigger frame with the CS Required subfield set to 0 and an Ack or Block Ack frame sent as an immediate response.

A STA may have multiple ongoing OBSS PD SR transmit power restriction periods that overlap in time.(#15746)

NOTE 1—The STA’s transmit power is always equal or lower than the minimum *TX\_PWRmax* among all *TX\_PWRmax* from ongoing OBSS PD SR transmit power restriction periods.

*

NOTE 2—Equation (26-6) is equivalent to the condition defined in Equation (26-5). The STA can derive *OBSS\_PDlevel* from its transmit power or can derive *TX\_PWRmax* from *OBSS\_PDlevel*.(#16516)

NOTE 3—Anytime, even if *TX\_PWRmax* is unconstrained, the STA has to respect the transmit power restrictions defined in 11.8.6 (Transmit power selection).

An example of OBSS PD SR operation is shown in Figure 26-10 (Example of OBSS PD SR operation).

|  |
| --- |
|  |
| * Example of OBSS PD SR operation
 |

In this example:

* STA SR S2 receives the PPDU from S1 and, if(#15382) it classifies it as inter-BSS PPDU, ignores it using OBSS PD-based spatial reuse with non-SRG OBSS PD, starts the OBSS PD SR transmit power restriction period 1 with TX\_PWRmax 1 and decrements its backoff counter until the reception of the PPDU from D1.
* If(#15382) it classifies the PPDU from D1 as inter-BSS PPDU, it ignores it if it chooses to do so(#15715) using OBSS PD-based spatial reuse with non-SRG OBSS PD, starts the OBSS PD SR transmit power restriction period 2 with TX\_PWRmax 2 and decrements its backoff counter until the reception of the PPDU from S1''.
* It defers during the TxOP S1'' set by the intra-BSS PPDU from S1'' which belongs to its own BSS. At the end of the TxOP S1'', it resumes its backoff decrement until the reception of the PPDU from S1'.
* If(#15383) it classifies the PPDU from S1' as SRG PPDU, it ignores it if it chooses to do so(#15715) using OBSS PD-based spatial reuse with SRG OBSS PD, starts the OBSS PD SR transmit power restriction period 3 with TX\_PWRmax 3 and decrements its backoff counter until it reaches zero, as it does not receive the PPDU from D1'.
* It starts transmitting a PPDU with a TX\_PWRmax equal to min(TX\_PWRmax 1, TX\_PWRmax 2, TX\_PWRmax 3) and respect this transmit power restriction until the end of the SR TXOP.
* OBSS PD-based spatial reuse backoff procedure

If an HE STA ignores an inter-BSS PPDU following the procedure in 26.10.2.2 (General operation with non-SRG OBSS PD level), the HE STA may resume EDCAF procedures after the PHY-CCARESET.request primitive is sent, provided that the medium condition is not otherwise indicated as BUSY.

***TGax editor: Modify the following subclause 26.10.3.1 General as follows: (#20615)***

**26.10.3 SRP-based spatial reuse operation**

**26.10.3.1 General**

[…]

An AP sending a Trigger frame may set the SR field in the Common Info field of the Trigger frame to SRP\_- DISALLOW or, if permitted by the rules defined in 26.11.6 (SPATIAL\_REUSE), to SRP\_ AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED to disallow OBSS STAs from performing SRP-based SR transmission during the ensuing uplink PPDU duration. An AP sending a Trigger frame shall not set the SR field in the Common Info field of the Trigger frame to SR\_DELAY or SR\_RESTRICTED. (#20615)

***TGax editor: Modify the following MIB variable in section Annex C as follows: (#20337)***

Dot11HEStationConfigEntry ::=

 SEQUENCE {

 dot11HEULMUResponseSchedulingOptionImplemented TruthValue,

 dot11ULMUMIMOOptionImplemented TruthValue,

 dot11OFDMARandomAccessOptionImplemented TruthValue,

 dot11HEControlFieldOptionImplemented TruthValue,

 dot11OMIOptionImplemented TruthValue,

 dot11HEMCSFeedbackOptionImplemented INTEGER,

 dot11HEDynamicFragmentationLevel INTEGER,

 dot11AMPDUwithMultipleTIDOptionImplemented TruthValue,

 dot11MPDUAskedforAckInMultiTIDAMPDU TruthValue,

 dot11TXOPDurationRTSThreshold Unsigned32,

 dot11PPEThresholdsRequired TruthValue,

 dot11IntraPPDUPowerSaveOptionActivated TruthValue,

 dot11AMSDUFragmentationOptionImplemented TruthValue,

 dot11BSSColorCollisionAPPeriod Unsigned32,

 dot11BSSColorCollisionSTAPeriod Unsigned32,

 dot11AutonomousBSSColorCollisionReportingImplemented TruthValue,

 dot11HESRPOptionImplemented TruthValue,

 dot11HEBSRControlImplemented TruthValue,

 dot11HEUPHControlActivated TruthValue,

 dot11HEBQRControlImplemented TruthValue,

 dot11HECASControlImplemented TruthValue,

 dot11PartialBSSColorImplemented TruthValue,

 dot11ObssNbRuToleranceTime Unsigned32,

 dot11HESubchannelSelectiveTransmissionImplemented TruthValue,

 dot11SRResponderOptionImplemented TruthValue,

 dot11AutonomousBSSColorInUseReportingImplemented TruthValue,

 dot11ShortSSIDListImplemented TruthValue,

 dot11ColocatedRNRImplemented(#15651) TruthValue,

 dot11SRGAPOBSSPDMinOffset Integer,

 dot11SRGAPOBSSPDMaxOffset Integer,

 dot11SRGAPBSSColorBitmap OCTET STRING (SIZE(8)),

 dot11SRGAPBSSIDBitmap OCTET STRING (SIZE(8)),

 dot11NonSRGAPOBSSPDMaxOffset Integer,

 dot11HTVHTTriggerOptionImplemented TruthValue(#Ed)

 }

***TGax editor: Add the following text in section Annex C as follows after the variable*** ***dot11SRGAPOBSSPDMaxOffset : (#20337, #20338)***

dot11SRGAPBSSColorBitmap OBJECT-TYPE(#16936)

 SYNTAX OCTET STRING (SIZE(8))

 MAX-ACCESS read-only

 STATUS current

 DESCRIPTION

 "This is a control variable.

 This variable is a 64 bit bitmap that indicates which BSS color values are used by members of the SRG of which the AP is a member.

 It is written by an external management entity.

 Changes take effect as soon as practical in the implementation.

 This attribute indicates the SRG BSS Color Bitmap for an AP."

::= { dot11HEStationConfigEntry xx}

dot11SRGAPBSSIDBitmap OBJECT-TYPE(#16936)

 SYNTAX OCTET STRING (SIZE(8))

 MAX-ACCESS read-only

 STATUS current

 DESCRIPTION

 "This is a control variable.

 This variable is a 64 bit bitmap that indicates which Partial BSSID values are used by members of the SRG of which the AP is a member.

 It is written by an external management entity.

 Changes take effect as soon as practical in the implementation.

 This attribute indicates the SRG BSSID Bitmap for an AP."

::= { dot11HEStationConfigEntry xx}

dot11NonSRGAPOBSSPDMaxOffset OBJECT-TYPE(#16936)

 SYNTAX Integer

 UNITS "dBm"

 MAX-ACCESS read-only

 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 Non SRG OBSS PD Max Offset for an AP."

 DEFVAL { 0 }

::= { dot11HEStationConfigEntry xx}