IEEE P802.11  
Wireless LANs

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | LB233 CR Spatial Reuse | | | | | | Date: 2018-08-06 | | | | | | Author(s): | | | | | | Name | Affiliation | Address | Phone | email | | Matthew Fischer | Broadcom |  |  | [Matthew.fischer@broadcom.com](mailto:Matthew.fischer@broadcom.com) | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |

Abstract

This document discusses resolutions to CIDs from WG LB 233 of TGax D3.0 related to the Spatial Reuse features of the TGax draft.

The CID list is:

15646, 15704, 15705, 15706, 15707, 15708, 15747, 15748, 15749, 15750, 15751, 15783, 15796, 15797, 15798, 15817, 15909, 15910, 16157, 16279, 16519, 16603, 16937, 17020, 17021, 17022, 17045, 17078, 17080, 17081, 17082, 17083

Proposed changes in this document are with reference to TGax D3.1.

**REVISION NOTES:**

**R0**:

Initial

**R1**:

CID 16535 reassigned and therefore removed from this document – it had been resolved to adjust the names of the values of the SRP field of SIGA so that two values would have more common naming – i.e. changing PROHIBITED to DISALLOWED – CID now resolved by 11-18-1495

CID 16759, 16760 removed from this document, reassigned to Laurent and 11-18-1495

CID 16411 removed from this document, reassigned to Laurent and 11-18-1495

CID 15707 added to this document

CID 16157 resolution modified – the changes related to this CID and CID 15706 and 15707 are modified in this revision to NOT use the RSSI\_LEGACY parameter, which was removed from the text because it is a relative measure and not an absolute power value

27.9.2.4 – add more differentiation between AP and non-AP STA

MIB – add two MIB variables for AP Max and Min offset values for SRG OBSS PD values

CID 15704 added and associated changes in 27.9.2.3 which set some basic rules for SRG set determination

**R2**:

CID 15817 – changed from reject to revise, added some rules for an AP to set SRG bitmaps

CID 15909 – changed resolution and proposed change – the problem is actually that the VHT MU PPDU is not allowed to carry the value indicated in the paragraph, so the condition is invalid

CID 16935, 16936 moved to 11-18-1495

CID 15706 – change to 27.9.2.2 – 3 dB decrease in measured RSSI only applies to LSTF and LLTF, not to LSIG – so LSIG is removed from one sentence – note that LSIG for the HE ER SU PPDU where there is no 3 dB reduction needed is covered by the default statements in the previous paragraph

**R3**:

CID 15707 – changed proposed text – removed L-SIG as a field that can be used to measure receive power level in several places – while the field might be used for this purpose, it is natural to use the LSTF and/or LLTF because of the structure and purpose of these fields – removal of LSIG allows a singular statement of adjustment by 3 dB for the HE ER SU PPDU case, thereby making the language less complex

CID 15796 – found another FTM instance that needed to be stricken

Updated doc references

**END OF REVISION NOTES**

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 TGmd Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGmd Editor: Editing instructions preceded by “TGmd Editor” are instructions to the TGmd editor to modify existing material in the TGmd draft. As a result of adopting the changes, the TGmd editor will execute the instructions rather than copy them to the TGmd Draft.***

**CIDs**

Spatial Reuse CIDs.

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| --- | --- | --- | --- | --- | --- | --- |
| 15646 | GEORGE CHERIAN | 27.11.6 | 365.51 | Fix inconsistency between the following two sentences:  pp356LL51 "An AP with dot11HESRPOptionImplemented set to true that transmits an HE ER SU PPDU should set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_DISALLOW"  Vs  pp357LL16 "An HE AP that transmits an HE SU PPDU or an HE ER SU PPDU that contains a Trigger frame should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY." | As in the comment | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15646, which add a qualifier to the first citation that excludes triggers and the commenter to note that there is not an actual contradiction, as both statements are recommendations and not requirements. |
| 15705 | James June Wang | 27.9.3.2 | 348.20 | Does the statement means the restriction of TXOP limit related SR\_RESTRICTED in the above paragraph shall follow the conditions of 10.22.2.8 TXOP limits ? Please make the statement easier to read. "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 10.22.2.8 TXOP limits)" | Please clarify. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15705, which delete the note, as the note does not seem to add any useful information. |
| 15706 | James June Wang | 27.9.3.2 | 347.14 | Do we need "and captured in the RXVECTOR parameter RSSI\_LEGACY in the PHY-RXSTART.indication primitive" ? Reference to RSSI\_LEGACY does not appear in the 27.9.3.3 | Make it consistent with 27.9.3.3 | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15706, which update the text to explicitly use the returned value of RSSI\_LEGACY. |
| 15708 | James June Wang | 27.9.3.3 | 348.20 | Does the statement means the restriction of TXOP limit related SR\_RESTRICTED in the above paragraph shall follow the conditions of 10.22.2.8 TXOP limits ? Please make the statement easier to read. "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 10.22.2.8 TXOP limits)". | Please clarify. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15708, which delete the note, as the note does not seem to add any useful information. |
| 15747 | Jarkko Kneckt | 27.9.3.2 | 345.31 | Please clarify what is the legacy portion of SRP PPDU. | Please change the legacy portion of SRP PPDU to correct field name of the PPDU or the preamble. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15747, which changes the language to use the RXVECTOR parameter RSSI\_LEGACY. |
| 15748 | Jarkko Kneckt | 27.9.3.2 | 345.41 | The triggered transmission should start a SIFS from after the trigger frame. Why 2X aSlotTime is needed here? | Shorten or delete the 2 x a SlotTime. | Reject – the STA is only allowed to perform SR if the arriving frame is indeed, the expected HE TB PPDU, and in order to determine this, the receiver must decode the entire preamble and SIG field, which requires the aRxPHYStartDelay plus additional time to actually perform the decode operation. I.e. SIFS + aRxPHYStartDelay only accounts for the appearance of the SIG field, but does not allow any time for decoding of the SIG field, so additional time is needed to account for that operation. |
| 15749 | Jarkko Kneckt | 27.9.3.2 | 345.61 | The paragraph in lines 61 -65 is not clearly written. What is meant with:"In cases when condition 2) above is not met because there is no SR PPDU queued for transmission,". Clause 27.9.3.5 allows only SR PPDU transmission in a SRP opportunity, so why a case when SR PPDU is not available for transmission relevant? Please rewrite the paragraph more clearly and make sure that there is no contradiction with 27.9.3.5. | Clarify or delete the lines 61 -65. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15749, which deletes the paragraph because when condition 2 is not met for any reason, then the STA is not permitted to discontinue the reception or signal an idle medium condition, and therefore, no other reception should take place to which this STA will need to respond. |
| 15750 | Jarkko Kneckt | 27.9.3.2 | 345.48 | Figure 27-11 should also show SR PPDU. | Please add SR PPDU to the figure. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15750, which adds an SR PPDU and a BA and a PHY-CCARESET.request indication to the figure. |
| 15751 | Jarkko Kneckt | 27.9.3.6 | 347.20 | Double negation should be avoided. Please change to positive wording. | Change double negation to positive. | Reject – what looks like a simple change is complex because the statement is adding a restriction for existing behavior, where a response would be transmitted normally but only if certain conditions are met, e.g. the PPDU is addressesd to the STA, at least one MPDU is correctly received, etc. To change the language, for example, to “unless all outstanding” sort of makes the language sound like if this one condition in this location is met, then the other conditions found throughout the standard can be ignored, but this is not true. |
| 15783 | John Coffey | 27.9.3.3 | 346.06 | This section discusses continuing an existing backoff procedure even though another PPDU has been detected. By 'continuing' a backoff procedure, the STA (it seems) performs CCA in each new slot, including preamble detect. But the CCA requirements for preamble detect assume (for good reason) an 'otherwise idle' channel (that is, other than the new PPDU arriving), and that's important for the STA to be able to achieve the required 90% detection probability within aCCATime. What are the requirements for CCA when an existing backoff procedure is continued? I.e., though there may be an 'SRP opportunity', permitting the STA to 'eschew' updating the NAV, does that mean that the channel is considered to be 'otherwise idle' for purposes of CCA, or not? There are several possibilities, of which the proposed change is just one, but at the very least the spec needs to define something, and not leave implementers to guess. | Add after first sentence "For purposes of the countdown of an existing backoff procedure, the channel shall not be considered "otherwise idle" for the duration of the SRP opportunity"; for purposes of the countdown, the HE STA should detect the beginning of a PPDU at a received power level of -82dBm or greater within aCCATime with probability at least 90%." | Reject – if the ignored signal is anything above -82 dBm, then the detection of a signal at -82 dBm will be impossible, so the proposed requirement cannot be added. The group does not see the need for a performance requirement, as the receiver will naturally view any incoming signal with sufficient SINR, where the noise component of that SINR will include the signal that is being ignored, as decodable and will decode it. |
| 15796 | Jonathan Segev | 27.11.6 | 357.00 | Section 27.11.6 SPATIAL\_REUSE describes a TXVector in the occurance its an FTM frame. Spatial reuse special consideration should not consider FTM frames as part of the Tx Vector because these are not measurement/sounding frames but are management frames used for negotiation. HE format for FTM can be used as part of negotiation but not beyond that, using HE format for FTM measurement is not backward compatible and will make existing devices non-standard compliant. "An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED for a PPDU containing an FTM or NDP Announcement frame and in any frame that is transmitted as a response to an FTM or NDP Announcement frame." P. 357, L.10-13 (D3.0). | Remove the special consideration (L.10-13) for SPATIAL\_REUSE of FTM negotiation frames as FTM frame used for negotiation does not require special consideration for spatial reuse, furthermore an FTM frame used for measurement cannot be transmitted in HE format: "An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED for a PPDU containing an FTM or NDP Announcement frame and in any frame that is transmitted as a response to an FTM or NDP Announcement frame." P. 357, L.10-13 (D3.0). | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. |
| 15797 | Jonathan Segev | 27.11.6 | 357.00 | Section 27.11.6 SPATIAL\_REUSE describes a TXVector in the occurance its an FTM frame. Spatial reuse special consideration should not consider FTM frames as part of the Tx Vector because these are not measurement/sounding frames but are management frames used for negotiation. Using HE format for FTM measurement frames will make 802.11-2016 STA none standard compliant. "An HE STA with dot11HESRPOptionImplemented set to false may set the TXVECTOR parameter SPATIAL\_ REUSE to SRP\_DISALLOW for any PPDU that is not an HE TB PPDU or an NDP PPDU or a PPDU containing an FTM or NDP Announcement frame and that is not a frame that is transmitted as a response to an FTM or NDP Announcement frame" P.357 L.36,37 | Remove the special consideration (L.10-13) for SPATIAL\_REUSE of FTM negotiation frames as FTM frame used for negotiation does not require special consideration for spatial reuse, furthermore an FTM frame used for measurement cannot be transmitted in HE format: "An HE STA with dot11HESRPOptionImplemented set to false may set the TXVECTOR parameter SPATIAL\_ REUSE to SRP\_DISALLOW for any PPDU that is not an HE TB PPDU or an NDP PPDU or a PPDU containing an FTM or NDP Announcement frame and that is not a frame that is transmitted as a response to an FTM or NDP Announcement frame" | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. Note that CID 15797 text changes are redundant to the text changes for CID 15796. |
| 15798 | Jonathan Segev | 27.11.6 | 357.00 | Using HE format for FTM measurement frames will make 802.11-2016 STAs implementing FTM non standard compliant, using HE format for FTM negotiation does not require special Spatial Reuse considerations "of any HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED, unless the HE PPDU contains an NDP, an FTM or an NDP Announcement frame or is a frame that is transmitted as a response to an FTM or NDP Announcement frame." P.357 L48,49 | of any HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED, unless the HE PPDU contains an NDP, an FTM or an NDP Announcement frame or is a frame that is transmitted as a response to an FTM or NDP Announcement frame." | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. Note that CID 15798 text changes are redundant to the text changes for CID 15796. |
| 15817 | Laurent Cariou | 27.2.3 | 255.05 | An HE AP may effectively use OBSSPDmin and max as it chooses with this paragraph. | There should be rules that regulate this or a procedure for the APs to define an SRG | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15817, commenter to note that there are restrictions with regards to BSS Color value 0. The BSS Color corresponding to the one used by the AP sending this element should also not be considered. This is defined in the 27.2.2, so no need to write something specific in this subclause. The changes add rules for AP setting BSS color map for itself and STAs. |
| 15909 | Liwen Chu | 27.2.3 | 255.29 | Change "RA" to "TA". | As in the comment | Revise - changes are redundant to those already made for CID 15760 - TGax editor to make no additional changes – commenter to note that RA is the correct field. See Table 10-12—Settings for the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID for VHT  STAs, where the Group\_ID value of 0 clearly denotes a PPDU that contains MPDUs that are addressed to an AP, making the RA the address of the AP, which is what the color refers to. |
| 15910 | Liwen Chu | 27.2.3 | 254.61 | The control frames transmitted by AP is missing from the subclause. Add the rules related to them. | As in the comment | Reject – the commenter appears to be referring to an attempt to classify control frames as SRG or not. Currently, the draft lets all such frames fall to the final paragraph, which declares them as not SRG PPDU. Any attempt to determine SRGness of a frame without SIG field information or a BSSID field would rely on just 6 bits of MAC address information to attempt to discern SRG from non-SRG. The hash collision probability is too great to permit this. |
| 16157 | Mark RISON | 27.9.3.2 | 345.31 | "legacy portion of the SRP PPDU" is not a defined concept | Define these portions as the L-STF, L-LTF and L-SIG fields | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 16157, which replaces the cited text with an approximation of what the commenter suggests. |
| 16279 | Mark RISON | 27.9.3.5 | 347.13 | "an A-Control field with the SR PPDU subfield set to 1" -- A-Control fields have Control subfields, not SR PPDU subfields | Refer to a subfield that exists | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 16279, which specifies that the SR PPDU subfield is in the CAS Control subfield. |
| 16519 | Oghenekome Oteri | 27.9.3.1 | 345.01 | "Trigger frame shall not set the SR field in the Common Info field of the Trigger frame to SR\_DELAY or SR\_RESTRICTED." However pg 357 line 15 says "An HE AP that transmits an HE SU PPDU or an HE ER SU PPDU that contains a Trigger frame should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY." the AP is transmitting Triggers in both cases but the SR\_DELAY behavior is different. | Please clarify behavior of AP with trigger frame or trigger frame like transmission. There may be some discrepancy for example with a NOTE and a justification. | Reject – the Common Info SR field is not used by third party recipients to determine whether SR during the trigger frame PPDU, but instead, this field is used by intended trigger recipients to determine what value to place into their HE TB PPDU SIG field’s SR subfields. |
| 16603 | Po-Kai Huang | 27.11.6 | 357.11 | For the FTM description in this section, the description suggests that we will have FTM carried in HE format, which will have the following issues. 1. It is not backward compatible with REVmc STAs (something which is contradicting to the TGaz PAR and CSD), Essentially it will create no 2. The longer symbol time of HE format is expected to increase medium usage, which is already a problem of REVmc FTM, 11az mitigate this by using NDP with shorter symbol time from data HE PPDU. REVmc FTM uses long management frames for sounding purposes. 3. There is no (range accuracy) performance advantage of using HE format (because REVmc FTM already supports all BWs), the performance is expected to somewhat degrade due to larger number of guard SC. 4. Developing a new FTM mode in 11ax is clearly conflicting to the 11ax and 11az charters - the work is already well in progress in 11az. The WG can decide to modify the 11ax PAR to include FTM, however till then, 11az should allow to continue its work without interference from other TG. 5. Developing an 11ax variant of FTM will create market confusion because 11az STAs are developing the HE support for FTM already well in progress. | Remove FTM description in this sectioin. Bring the discussion to 11az group to make sure that HE design can be harmonized without conflicting with 11az design. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. Note that CID 16603 text changes are redundant to the text changes for CID 15796. |
| 16937 | Xiaofei Wang | 27.2.3 | 255.38 | Not sure what function this following sentence serves "An HE AP that has not transmitted a Spatial Reuse Parameter Set element with a value of 1 in the SRG Information Present subfield may classify received PPDUs as SRG PPDUs using information that it has not transmitted." There is no normative behavior or interactions with other devices and seems to be only implementation, which should be removed | remove the sentence "An HE AP that has not transmitted a Spatial Reuse Parameter Set element with a value of 1 in the SRG Information Present subfield may classify received PPDUs as SRG PPDUs using information that it has not transmitted." | Reject – the sentence allows an AP to implement SRG SR without requiring its associated STAs to also implement SRG SR. Without this sentence, it is not clear if an AP would be allowed to do this. |
| 17020 | Yongho Seok | 27.11.6 | 357.12 | "An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED for a PPDU containing an FTM or NDP Announcement frame and in any frame that is transmitted as a response to an FTM or NDP Announcement frame." The Format And Bandwidth field (Table 9-272 (Format And Bandwidth field)) in the FTM Parameters element indicates the requested or allocated PPDU format and bandwidth that can be used by Fine Timing Measurement frames in an FTM session. Because Table 9-272 does not have the HE PPDU, the HE PPDU can't be used by Fine Timing Measurement frames in an FTM session. | Please remove the "an FTM or" from the cited sentence. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. Note that CID 17020 text changes are redundant to the text changes for CID 15796. |
| 17021 | Yongho Seok | 27.11.6 | 357.36 | "An HE STA with dot11HESRPOptionImplemented set to false may set the TXVECTOR parameter SPATIAL\_ REUSE to SRP\_DISALLOW for any PPDU that is not an HE TB PPDU or an NDP PPDU or a PPDU containing an FTM or NDP Announcement frame and that is not a frame that is transmitted as a response to an FTM or NDP Announcement frame." The Format And Bandwidth field (Table 9-272 (Format And Bandwidth field)) in the FTM Parameters element indicates the requested or allocated PPDU format and bandwidth that can be used by Fine Timing Measurement frames in an FTM session. Because Table 9-272 does not have the HE PPDU, the HE PPDU can't be used by Fine Timing Measurement frames in an FTM session. | Please remove the "an FTM or" from the cited sentence. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. Note that CID 17021 text changes are redundant to the text changes for CID 15796. |
| 17022 | Yongho Seok | 27.11.6 | 357.48 | "If the HESIGA\_Spatial\_reuse\_value15\_allowed subfield of the SR Control field of the most recently received Spatial Reuse Parameter Set element from its associated AP is equal to 0, or if STA has not received a Spatial Reuse Parameter Set element from its associated AP, the STA shall not set the TXVECTOR parameter SPATIAL\_REUSE of any HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED, unless the HE PPDU contains an NDP, an FTM or an NDP Announcement frame or is a frame that is transmitted as a response to an FTM or NDP Announcement frame." The Format And Bandwidth field (Table 9-272 (Format And Bandwidth field)) in the FTM Parameters element indicates the requested or allocated PPDU format and bandwidth that can be used by Fine Timing Measurement frames in an FTM session. Because Table 9-272 does not have the HE PPDU, the HE PPDU can't be used by Fine Timing Measurement frames in an FTM session. | Please remove the "an FTM" from the cited sentence. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15796, which removes the mention of the FTM frame, as appropriate. Note that CID 17022 text changes are redundant to the text changes for CID 15796. |
| 17045 | Yongho Seok | 27.2.3 | 255.26 | "A received PPDU that is a VHT MU PPDU with the RXVECTOR parameter GROUP\_ID equal to 0 is an SRG PPDU..." The GROUP\_ID parameter of a VHT MU PPDU can't be set to 0. Remove this paragraph. | As in comment. | Revise - changes are redundant to those already made for CID 15760 - TGax editor to make no additional changes. See Table 10-12—Settings for the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID for VHT  STAs, where the Group\_ID value of 0 clearly denotes a PPDU that contains MPDUs that are addressed to an AP, making the RA the address of the AP, which is what the color refers to. |
| 17078 | Yoshio Urabe | 27.9.3.1 | 344.54 | "SRP-based SR opportunity" is not defined. | Replace with "SRP opportunity" or vice versa | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 17078, which use the phrase “SRP opportunity” as this appears in many other places. |
| 17080 | Yoshio Urabe | 3.2 | 39.18 | "SRP opportunity" is not defined. It is used many times in 27.9.3 as well. | Define "SRP opportunity" in Clause 3.2 as a time period with specific starting/ending point. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 17080, which add a definition for SRP opportunity to 3.2 |
| 17081 | Yoshio Urabe | 27.9.3.1 | 344.54 | The sentence "An HE STA may initiate an SR transmission during an SRP-based SR opportunity using an adjusted transmit power level (see 27.9.2.4 (Adjustment of OBSS PD and transmit power)) for the duration of an ongoing PPDU when certain conditions, designed to avoid interfering with the reception of the ongoing PPDU at the recipient are met." is not clear. The transmit power level according to 27.9.2.4 (OBSS PD-based) is not designed to avoid interfering with the reception of the ongoing PPDU at the recipient. | If the intention of the adjusted transmit power is the power according to SRP, remove "(see 27.9.2.4 ...)" and add "(27.9.3.2)" at the end of this sentence (after "are met"). Otherwise if both transmit power conditions of OBSS PD-based SR and SRP should be met at the same time in SRP opportunity, clarify the meaning. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 17081, which remove the reference to the adjustment of the transmit power level, noting to the commenter that the certain conditions being referred to here are the SRP conditions. |
| 17082 | Yoshio Urabe | 27.9.3.2 | 345.39 | "due to the receipt of a SRP PPDU" is not clear and it may be redundant. If it means that the receipt of a SRP PPDU is one of the conditions to identifying the SRP opportunity, it is always true for the (D)SRP-based SR because other type of SRP-based SR is not accepted. If it means that the SRP field of the Trigger frame in the SRP PPDU is used to identify the SRP opportunity, it should not be limited to the case. That is, even if RXVECTOR of the HE TB PPDU is used for determine the SRP value instead of the Trigger frame in the SRP PPDU, the STA may issue a PHY-CCARESET.request as well. There are two more "due to the receipt of a SRP PPDU" in the same paragraph (P345L35 and L45) and they seems to be redundant too. | Remove three "due to the receipt of a SRP PPDU" in the paragraph. | Accept |
| 17083 | Yoshio Urabe | 27.9.3.4 | 346.50 | The meaning of "Acceptable Receiver Interference Level\_AP" seems to be wrong. The sentence says, in short, Acceptable Receiver Interference Level = Recent (N+I) + Requred SNR (except the margin), which seems to be a required RSSI, not an acceptable interference level. It should be: (Acceptable Receiver Interference Level + Recent (N+I)) = Received Signal Power - Required SNR, where the sum in the left term is performed in true value, not in dB. This can be rewritten as: Acceptable Receiver Interference Level (dB) = 10\*log10(10^((Received Signal Power - Required SNR) / 10) - 10^((Recent (N+I) / 10)). The "Received Signal Power" above should be derived from UL Target RSSI for each user. So we should calculate Acceptable Receiver Interference Level for each user and select the minimum value among the users within the bandwidth corresponding to the SRP field. Instead of the precise calculation above, I prefer to ignore the ambient noise plus interference for simplicity, because the margin up to 5dB may handle the effect of the ambient noise and interference in most case. | Replace "should be set to the ambient noise plus interference power level observed at the AP immediately prior to the transmission of the Trigger frame plus the minimum SNR value that yields ... ensuing uplink HE TB PPDU, minus a safety margin value ..." with "should be set to the minimum value among the values of (the value of UL Target RSSI minus the minimum SNR value that yields ... ensuring uplink HE TB PPDU) for each User Info field assigned within the bandwidth corresponding to the SRP field of the Trigger frame, minus a safety margin value ...". | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 17083, which remove the noise plus interference term and substitute UL Target RSSI which should already have been calculated to account for the N+I term and changes plus to minus to get a noise limit, which might very well be equal to N+I, while leaving the safety margin adjustment in place. Note that the equation could just state that the Acceptable interference is N+I minus safety margin, but this does not account for a case when the AP might suggest a target RSSI that includes a safety margin already. |
| 15707 | James June Wang | 27.9.2.2 | 347.12 | There are three instances of spatial reuse based on received power level. 1. P347.12 "the received signal strength measured based on the non-HE portion of the HE PPDU preamble and captured in the RXVECTOR parameter RSSI\_LEGACY", 2.P348.2 "the received signal strength measured based on the non-HE portion of the HE PPDU preamble", 3. P354.14 "The value of RPL is the received power level of the legacy portion of the SRP PPDU". Use a consistent description/name for the received power level in three instances. | Use a consistent description/name for the received power level in three instances cited. | Revise – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15707, which create a consistent phrasing of the received power level measurement requirement. |
| 15704 |  | 9.4.2.241 | 180.33 | Is there any restrictions of AP setting BSS color map? For example, AP can set all BSS colors, excluding its own BSS color, in the bit map to 1, to include all OBSS to SRG. | Please clarify. | Revised – TGax editor to make changes as shown in 11-18/1410r3 that are marked with CID 15704, commenter to note that there are restrictions with regards to BSS Color value 0. The BSS Color corresponding to the one used by the AP sending this element should also not be considered. This is defined in the 27.2.2, so no need to write something specific in this subclause. The changes add rules for AP setting BSS color map for itself and STAs. |

**Discussion:**

See CID list.

**Proposed changes to TGax D3.1:**

**3.2 Definitions specific to IEEE 802.11**

***TGax editor: insert a new definition in the appropriate location, as shown:***

**spatial reuse parameters (SRP) opportunity:** a spatial reuse opportunity that is established based on the value of the Spatial Reuse field of the HE-SIG-A field of an HE TB PPDU **(#17080)**

***TGax editor: modify the text as shown:***

**27.9.2.2 General operation with non-SRG OBSS PD level**

* The received signal strength level which is measured from the L-STF or L-LTF 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 27.9.2.4 (Adjustment of OBSS PD and transmit power). If the STA has dot11HESRPOptionImplemented set to true, it also follows the rules defined in 27.9.4 (Interaction of OBSS PD and SRP-based spatial reuse) to determine non-SRG OBSS PD level. **(#15706) (#15707)**
* 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 group addressed Public Action frame
  + A non-HE PPDU that carries an NDP Announcement frame frame **(#15796)**
  + An NDP

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 of the PPDU and which is used to determine PHY-CCA.indication shall be decreased by 3 dB to compensate for the power boost factor. **(#15706) (#15707)**

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—If an AP wants to get the protection equivalent to SR\_DELAY, when transmitting a Trigger frame in non-HE format, it might not transmit the Trigger frame in a VHT PPDU, but in a non-HT or in an HT PPDU with the TXVEC-TOR parameter AGGREGATION set to 0.

If the PHY-CCARESET.request primitive is issued before the end of the received PPDU, and a TXOP is ini-tiated 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.

**(#15705) (#15708)**

***TGax editor: modify the text as shown:***

**27.9.2.3 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 PHYRXSTART. 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 27.2.3 (SRG PPDU identification))

— The received signal strength level, which is measured from the L-STF or L-LTF 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 27.9.2.4 (Adjustment of OBSS PD and transmit power). If the STA has dot11HESRPOptionImplemented set to true, it also follows the rules defined in 27.9.4 (Interaction of OBSS PD and SRP-based spatial reuse) to determine SRG OBSS PD level. **(#15707)**

— 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 group addressed Public Action frame

• A non-HE PPDU that carries an NDP Announcement frame **(#15796)**

• An NDP If the inter-BSS

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 of the PPDU and which is used to determine PHY-CCA.indication shall be decreased by 3 dB to compensate for the power boost factor when compared to the OBSS PD level. **(#15707)**

***TGax editor: add the following text at the end of the subclause:***

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.

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

**27.9.2.4 Adjustment of OBSS PD and transmit power**

***TGax editor: modify the text as shown:***

Non-AP HE STAs shall maintain a SRG OBSS PD level, with its value selected by respecting the OBSS PD level condition in Equation (27-4) but with SRG OBSS PD Min and SRG OBSS PD Max in place of OBSS\_PDmin and OBSS\_PDmax, respectively, where SRG OBSS PD Min and SRG OBSS PD Max are determined according to Table 27-11 (Determining SRG OBSS PD Min and SRG OBSS PD Max values). **(#16936)**

An HE AP STA shall maintain a SRG OBSS PD level, with its value selected by respecting the OBSS PD level condition in Equation (27-4), but with dot11SRGAPOBSSPDMinOffset and dot11SRGAPOBSSPDMaxOffset in place of OBSS\_PDmin and OBSS\_PDmax, respectively. **(#16936)**

***TGax editor: modify the title of Table 27-11 – Determining SRG OBSS PD Min and SRG OBSS PD Max values, as shown:***

**Table 27-11—Determining SRG OBSS PD Min and SRG OBSS PD Max values for non-AP STAs (#16936)**

***TGax editor: insert the following as the new second to last paragraph of the subclause:***

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)**

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

**27.9.3 SRP-based spatial reuse operation**

**27.9.3.1 General**

***TGax editor: modify the text as shown:***

SRP-based SR opportunities are identified from the value of the RXVECTOR parameter SPATIAL\_REUSE and/or the contents of a Trigger frame. An HE STA may initiate an SR transmission during an SRP**(#17078)** opportunity **(#17081)**for the duration of an ongoing PPDU when certain conditions, designed to avoid interfering with the reception of the ongoing PPDU at the recipient, are met. If the RXVECTOR parameter SPATIAL\_ REUSE of the ongoing PPDU has the value SRP\_DISALLOW or SRP\_ AND\_NON\_SRG\_ OBSS\_PD\_PROHIBITED, no SRP-based SR transmission is allowed for the duration of that PPDU.

***TGax editor: modify the text as shown:***

**27.9.3.2 SRP-based spatial reuse initiation**

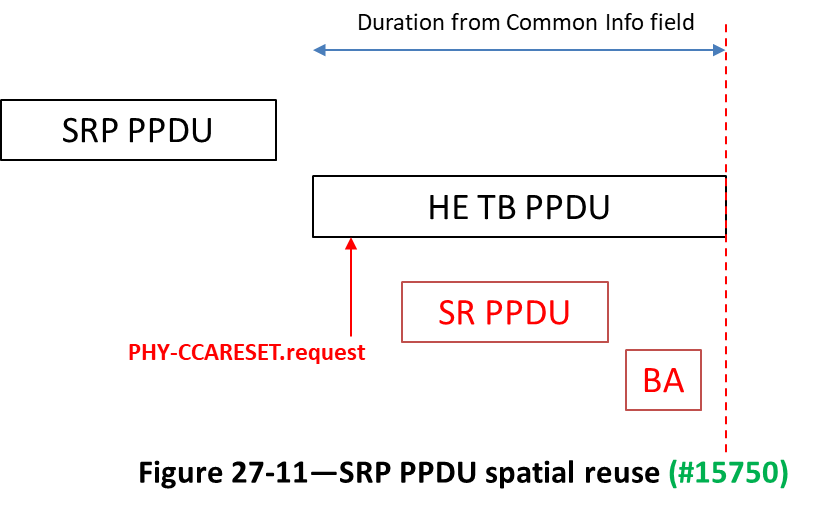
An HE STA identifies a SRP opportunity when the following two conditions are met: **(#17078)**

The value of RPL is the received power level which is measured from the L-STF, L-LTF or L-SIG of the SRP PPDU and which is used to determine PHY-CCA.indication, normalized to 20 MHz bandwidth. **(#15747) (#16157) (#15707)**

An HE STA that identifies an SRP opportunity may eschew the NAV update operations normally executed based on the receipt of the RXVECTOR parameter TXOP\_DURA-TION and the Trigger frame Duration field value. See Figure 27-11 (SRP PPDU spatial reuse). A STA that identifies an SRP opportunity may issue a PHY-CCARESET.request to ignore the associated HE TB PPDU(s) that are triggered by the Trigger frame of the SRP PPDU and that occurs within aSIFSTime + aRxPHYStartDelay + 2  aSlotTime of the end of the last symbol on the air of the PPDU that contained the Trigger frame, provided that the value of the RXVECTOR parameter BSS\_- COLOR of the HE TB PPDU matches the BSS color of the SRP PPDU. A STA that identifies an SRP opportunity shall not transmit an SR PPDU that terminates beyond the PPDU duration of the HE TB PPDU that is triggered by the Trigger frame of the SRP PPDU. **(#17082)**

**(#15749)**

***TGax editor: modify Figure 27-11 SRP PPDU spatial reuse by adding the elements in red as shown and a CID tag to the caption, as shown:***



**27.9.3.4 Spatial Reuse subfield of Trigger frame**

***TGax editor: modify the text as shown:***

Acceptable Receiver Interference LevelAP is a value in dBm normalized to a 20 MHz bandwidth (i.e., minus transmit bandwidth divided by 20 MHz bandwidth in dB) for each 20 MHz transmit bandwidth for 20 MHz, 40 MHz, and 80 MHz PPDU or in each of the 40 MHz transmit bandwidths for an 80+80 MHz or 160 MHz PPDU and should be set to the value of the UL Target RSSI indicated in the Trigger frame minus the minimum SNR value that yields <= 10% PER for the highest MCS of the ensuing uplink HE TB PPDU, minus a safety margin value not to exceed 5 dB as determined by the AP. **(#17083)**

***TGax editor: modify the text as shown:***

**27.9.3.5 SR PPDU transmission requirements**

An HE STA that identifies an SRP opportunity shall not transmit an MPDU during the SRP opportunity that elicits a response transmission from a STA from which it has not received an HE Capabilities element with the SRP Responder subfield equal to 1. An HE STA that identifies an SRP opportunity shall not transmit an MPDU that does not include an A-Control field CAS Control subfield with the SR PPDU subfield set to 1 and that solicits a response transmission during that SRP opportunity. **(#16279)**

***TGax editor: modify the text as shown:***

**27.11.6 SPATIAL\_REUSE**

The contents of the Spatial Reuse field are carried in the TXVECTOR parameter SPATIAL\_REUSE for an HE PPDU indicating spatial reuse information (See 27.9.3 (SRP-based spatial reuse operation)).

For a PPDU with a value of HE\_TB for the TXVECTOR parameter FORMAT, the SPATIAL\_REUSE parameter contains an array of four values. The first value in the array is the SPATIAL\_REUSE parameter that applies to the lowest frequency 20 MHz subband, the second value in the array applies to the second lowest frequency 20 MHz subband, the third value in the array applies to the third lowest frequency 20 MHz subband and the fourth value in the array applies to the highest frequency 20 MHz subband when the CH\_BANDWIDTH parameter has the value of CBW20, CBW40 or CBW80. The first value in the array applies to the lowest frequency 40 MHz subband, the second value in the array applies to the second lowest frequency 40 MHz subband, the third value in the array applies to the third lowest frequency 40 MHz sub-band and the fourth value in the array applies to the highest frequency 40 MHz subband when the CH\_BANDWIDTH parameter has the value of CBW160 or CBW80+80. When the SPATIAL\_REUSE parameter is an array, each value in the array shall individually conform to the rules in this subclause.

An AP with dot11HESRPOptionImplemented set to true that transmits an HE ER SU PPDU that does not contain a Trigger frame **(#15646)**should set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_DISALLOW.

A non-AP STA with dot11HESRPOptionImplemented set to true that transmits an HE SU PPDU, HE ER SU PPDU or HE MU PPDU may set the TXVECTOR parameter SPATIAL\_REUSE, when permitted by other conditions, to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED when the HESIGA\_Spa-tial\_reuse\_value15\_allowed subfield of the SR Control field of the most recently received Spatial Reuse Parameter Set element from its associated AP is equal to 1. Otherwise, the non-AP STA shall set it to SRP\_- DISALLOW

An HE STA that transmits an HE TB PPDU determines the value of the TXVECTOR parameter SPA-TIAL\_REUSE according to 27.5.3.3 (STA behavior for UL MU operation).

An HE AP with dot11HESRPOptionImplemented set to true may set the TXVECTOR parameter SPATIAL\_ REUSE of an MSDU, A-MPDU or MMPDU to the value SRP\_DISALLOW to forbid OBSS STAs from performing SRP-based SR transmission during the duration of the corresponding HE SU PPDU, HE ER SU PPDU, or HE MU PPDU.

An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED for an NDP PPDU.

An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED for a PPDU containing an NDP Announcement frame and in any frame that is transmitted as a response to an NDP Announcement frame. **(#15796)**

An HE AP that transmits an HE SU PPDU or an HE ER SU PPDU that contains a Trigger frame should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY.

An HE STA that transmits an HE SU PPDU or HE ER SU PPDU shall not set the TXVECTOR parameter SPATIAL\_REUSE to SR\_RESTRICTED.

An HE AP that transmits an HE MU PPDU that contains a Trigger frame should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_RESTRICTED.

An HE STA that transmits an HE MU PPDU shall not set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY.

An HE STA that transmits a PPDU that does not contain a Trigger frame shall not set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY or SR\_RESTRICTED.

An HE STA with dot11HESRPOptionImplemented set to false may set the TXVECTOR parameter SPATIAL\_ REUSE to SRP\_DISALLOW for any PPDU that is not an HE TB PPDU or an NDP PPDU or a PPDU containing an NDP Announcement frame and that is not a frame that is transmitted as a response to an NDP Announcement frame. **(#15796)**

A non-AP HE STA may set the TXVECTOR parameter SPATIAL\_REUSE of an HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED if the HESIGA\_Spatial\_reuse\_value15\_allowed subfield of the SR Control field of the most recently received Spatial Reuse Parameter Set element from its associated AP is equal to 1. If the HESIGA\_Spatial\_reuse\_value15\_allowed subfield of the SR Control field of the most recently received Spatial Reuse Parameter Set element from its associated AP is equal to 0, or if STA has not received a Spatial Reuse Parameter Set element from its associated AP, the STA shall not set the TXVECTOR parameter SPATIAL\_REUSE of any HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_ PROHIBITED, unless the HE PPDU contains an NDP, an NDP Announcement frame or is a frame that is transmitted as a response to an NDP Announcement frame. **(#15796)**

An AP HE STA may set the TXVECTOR parameter SPATIAL\_REUSE of an HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED if the HESIGA\_Spatial\_reuse\_value15\_allowed subfield of the SR Control field of the most recently transmitted Spatial Reuse Parameter Set element is equal to 1. If the HESIGA\_Spatial\_reuse\_value15\_allowed subfield of the SR Control field of the most recently transmitted Spatial Reuse Parameter Set element is equal to 0, or if AP has not transmitted a Spatial Reuse Parameter Set element, the AP shall not set the TXVECTOR parameter SPATIAL\_REUSE of any HE PPDU to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED.

A STA shall set the TXVECTOR parameter SPATIAL\_REUSE of an HE PPDU to SRP\_DISALLOW or, if permitted, to SRP\_AND\_NON\_SRG\_OBSS\_PD\_PROHIBITED as per the other rules in this subclause, if the STA is a non-AP HE STA and the SRP Disallowed subfield of the SR Control field of the most recently received Spatial Reuse Parameter Set element from its associated AP is equal to 1.

dot11SRGAPOBSSPDMinOffset and dot11SRGAPOBSSPDMaxOffset

**TGax Editor: *Add two new MIB variables in C.3 MIB Detail within the dot11StationConfigEntry group as shown:***

**C.3 MIB Detail**

dot11SRGAPOBSSPDMinOffset 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 SRG OBSS PD Min Offset for an AP."

DEFVAL { 0 }

::= { dot11StationConfigEntry <XX>}

dot11SRGAPOBSSPDMaxOffset 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 SRG OBSS PD Max Offset for an AP."

DEFVAL { 0 }

::= { dot11StationConfigEntry <XX>}