IEEE P802.11
Wireless LANs

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| CR for 27.9 spatial reuse |
| Date: 2017-02-28 |
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Abstract

This document provides CR for CIDs related to OBSS\_PD SR.

* 3078, 3079, 3080, 3081, 3082, 4261 ,4926, 5088, 5200, 5201, 5202, 5203, 5209, 5480, 5481, 5483, 5486, 5487, 5488 ,5490, 5491, 5492, 5493, 5575, 5576, 5681, 5864, 6018, 6021, 6022, 6024, 6026 ,6027, 6028, 6054, 6150, 6153, 6759, 6761, 6762, 6765, 6766, 6767, 7121, 7126, 7172, 7173, 7229, 7230, 7405, 7610, 7911, 8072, 8074, 8088, 8101, 8102, 8103, 8230, 8236, 8237, 8562, 8721, 8723, 9232, 9233, 9459, 9460, 9461, 9539, 9601, 9603, 9728, 9761, 9762, 9940, 9941, 9942, 9943, 9945, 10018, 10020, 10021, 10022, 10023, 10024, 10025, 10026, 10027, 10028, 10033, 10034, 10079, 10282, 10411, 5739, 5939, 6170, 7910, 8105, 9542, 9607, 9608, 9954
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.***

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| **CID** | **Clause Number** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 3078 | 27.9.2.2 | 191.60 | Add the ability for AP to set the OBSS PD Min and Max for managed APs | As in the comment | Revised – agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 3079 | 27.9.2.2 | 191.60 | Add the ability for AP to disable OBSS PD based reuse | As in the comment | Revised – agree with the commenter. The changes defined in doc 267r5, 947r21 and 748r1 resolve this comment. |
| 3080 | 27.9.2.2 | 191.60 | Add a mechanism for a STA to disable OBSS STAs from applying OBSS PD based reuse on top of the PPDU that it is sending. | As in the comment | Revised – agree with the commenter. The changes defined in doc 748r1 resolve this comment. |
| 3081 | 27.9.2.2 | 192.16 | Define the rules for OBSS PD based transmissions on secondary channels. It is miissing in the current draft | As in the comment | Revised – CCA section 28.3.17.6.4 already takes into account OBSS\_PDlevel in the secondary channel. |
| 3082 | 27.9.2.2 | 192.16 | Define the interaction between OBSS PD based reuse and SRP based reuse. It is missing in the current draft. | As in the comment | Revised - agree with the commenter. The changes defined in doc 1471r21 resolve this comment. |
| 4261 | 27.9.2.2 | 192.01 | The note reference to the antenna connector connection to section 3.1. is ambigous. Clause 3.1 doesn't exist. | Add definition for antenna connector in 3.4 Definitions, acronyms, and abbreviations | Rejected – Clause 3.1 exists and defines the antenna connector concept. |
| 4926 | 27.9.2.1 | 190.21 | This CCARESET is trying to say "don't let this PPDU cause CCA to report busy to the MAC". And a reset stops the reporting it cold. But if the PHY is oding mid PPDU detrection (e..g cyclic extension autocorr) then the PPDU can still be detected after the CCARESET | Add a new parameter to CCARESET. Call it "isResetDueToInterBssPpdu" or similar. This will signify: 1) if the PHY does intra PPDU detection, (say cyclic extension autocorrelation or DSSS spreading sequence xcorr), then don't retrigger on something with the same characteristics after a CCARESET until the end of the PPDU. And 2) the parameter will also indicate that CCA issues an IDLE indication immediately after a CCARESET primitive if isResetDueToInterBssPpdu is included and true. | Rejected – the PHY entity may not be able to differenciate if CCA.indication equal to busy is triggered because of a new PPDU or because of a mid-packet detection of the current PPDU, so this modification should not be made. |
| 5088 | 27.9 | 190.01 | The section: "27.9 Spatial reuse operation" does not take antenna and beam-forming in consideration, which is an overlook in my opinion. | There should be a constraint put in place on antenna configuration and beam-forming for spatial reuse.In the most conservative case the same antenna configuration used for reception should be used for Tx.If beam-forming or non-omni antenna is used, the maximum power needs to be scaled down by antenna gain. | Rejected – the comment is understandable. However, it is also true today for the regular CCA mechanism. As OBSS\_PD SR intends to be as simple as possible, this imprecision can be ignored. |
| 5200 | 27.9.1 | 190.12 | There is no definition for "SR PPDU" | define SR PPDU | Revised – agree in principle with the commenter. SR PPDU is defined in 1471r21 for SRP-based SR. For further clarification, remove any mention of SR PPDU for OBSS\_PD-based SR operation. Make the propose changes as in 941r0. |
| 5201 | 27.9.2.1 | 190.24 | The language here uses "Inter-BSS PPDU", but in 27.2.1 the language uses "Inter-BSS frame". Is there an implied difference? Or are we using different terminology for the same thing? | unify terminology | Revised – agree with the commenter. Propose a small modification of section 27.2.1 to clarify that a PPDU carrying an inter-BSS frame is an inter-BSS PPDU. Make the changes as in doc 941r0. |
| 5202 | 27.9.2.1 | 190.50 | "SR Backoff procedure for SR delayed case." This supposed sentence doesn't make any sense, but perhaps it was meant to be a section heading? Need to fix this. | as in comment | Revised – agree with the commenter. This was deleted and clarified by previous contribution doc 267r5 and 947r21.  |
| 5203 | 27.9.2.2 | 191.07 | I do not see how "OBSS\_PD\_min" and "OBSS\_PD\_max" are set. I interpret this as that the non-AP STAs may set them to whatever they please. To properly manage the interference environment, the AP must have control over the OBSS\_PD\_min and max level the non-AP STAs use. | Define a protocol whereby the AP can dictate the OBSS\_PD\_min level that is used by the non-AP STAs. Included in this must be the ability to disable SR, by setting OBSS\_PD\_min and OBSS\_PD\_max both to -82dBm.And define that OBSS\_PD\_min and OBSS\_PD\_max are set by the non-AP STAs to the default values only in the absense of direction from the AP. | Revised – agree with the commenter. The changes defined in doc 267r5, 947r21 and 748r1 resolve this comment. |
| 5209 | 27.9.2.2 | 192.20 | Define UL TB PPDU | as in comment | Revised – agree with the commenter. The changes defined in doc 267r5, 947r21 and 748r1 resolve this comment by modifying UL TB PPDU by HE trigger-based PPDU. |
| 5480 | 27.9.1 | 190.06 | "The objective of the HE spatial reuse operation ..." 'The' HE spatial reuse scheme indicates ther is one scheme, not true. | Delete 'the' from cited text | Revised – agree with the commenter. Remove “the” and include a sentence that clarifies that there are 2 independent SR mechanisms. Make the changes as in the proposed changes in doc 941r0. |
| 5481 | 27.9.1 | 190.06 | The objective of the HE spatial reuse operation is to improve the system level performance, the utilization of medium resources and power saving in dense deployment scenarios by early identification of signals from overlapping basic service sets (OBSSs) and interference management." This does not mention the basic idea in that spatial reuse allows channels to be reused more often in dense deployments. | Replace cited text with "The objective of HE spatial reuse operation is to allow channels to be reused more often across a dense deployment." | Revised – agree with the commenter. Make the changes as in doc 941r0. |
| 5483 | 27.9.2 | 190.19 | " If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by an RXSTART.indication due to a PPDU reception then the STA's MAC sublayer may a) issue a PHYCCARESET. request primitive and b) not update its NAV timers based on frames carried in the PPDU if all the following conditions are met:" So it first says BUSY, then checks it is from an OBSS, then checks the RSSI to see if below the OBSS\_PD, then it can reset the CCA and not update NAV. This is the complication for only looking at OBSS. The only possible reason for restricting this to OBSS is that all the other STAs in the same network are further away than OBSS STAs. It is pretty difficult to see a set up where setting a CCA value for OBSS\_PD would be such that the same value excluded STAs in the wanted network. On top of that, the mere fact of having to go through all the rules to ensure that it is in fact an inter BSS packet, one does ask whay is the difference in simply setting a CCA value? But OK, "The TG voted for it" so maybe we are stuck with it, but please let's not promote this. | The OBSS\_PD scheme should be dropped. There is no reason to set a threshold only fopr OBSS. | Rejected – the concept is to apply spatial reuse only when the receiver PPDU is classified as inter-BSS, instead of applying it blindly on any PPDUs.  |
| 5486 | 27.9.2.1 | 190.50 | "SR Backoff procedure for SR delayed case". Thius looks like it was meant as a heading but as SR delayed is not defined none of this makes sense. | Delete lines 50 - 57 | Revised –This was clarified by previous contributions. Doc 267r5 and 947r21 resolve this comment. |
| 5487 | 27.9.2.2 | 191.03 | "Adjusting the OBSS\_PD level and transmit power can improve the system level performance and the utilization of the spectrum." A bold statement, partially true but not telling the whole story. Do we need the publicity? Delete | Delete cited text | Revised – clarify that the objective is to allow the medium to be reused more often between OBSSs. Make the changes as in doc 941r0.  |
| 5488 | 27.9.2.2 | 191.05 | "..an HE STA is allowed to adjust the OBSS\_PD level in conjunction with its transmit power based on the following adjustment rule:" "Is allowed to", this reads as a "may" so use the correct term so no confusion. | Replace "is allowed to" with "may" | Revised – agree with the commenter. Make the changes as in doc 941r0. |
| 5490 | 27.9.2.2 | 191.39 | "The OBSS\_PDlevel". We need to add "value of" | "The value of the OBSS\_Pdlevel" | Revised – agree with the comment. Make the changes as in doc 941r0. |
| 5491 | 27.9.2.2 | 191.39 | "The OBSS\_PDlevel is applicable to the start of a 20 MHz PPDU received on the primary 20 MHz channel". This plus the following sentences are a very long winded way of trying to say that the CCA level is adjusted with bandwidth. Simply state that if the bandwidth fiffers from 20MHz the value is increased by 10 log (Bandwidth/20MHz) | Replace L39-49 with "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)" | Revised – agree with the comment. Make the changes as in doc 941r0. |
| 5492 | 27.9.2.2 | 191.07 | In the formula the underscaore has gone missing for the OBSS\_PD max and min so as to agree with the figure. | Insert underscores for the OBSSPDmax and OBSSPDmin | Revised – agree with the commenter. The changes defined in doc 267r5, 947r21 resolve this comment. |
| 5493 | 27.9.2.2 | 191.10 | The figure and accompanying text breaks the terms used int eh formula. The figure needs to be moved down to come after present P192L2 and also the word 'where' needs to be inserted before TXPWRref. Maybe indent as well for clarity | edits as per comment | Revised – agree with the commenter. The changes defined in doc 267r5, 947r21 and 748r1 resolve this comment. |
| 5575 | 27.9.2.1 | 190.18 | There is no definition of OBSS\_PD. | Add "OBSS\_PD is the CCA sensitivity when a valid signal is received from an OBSS." | Revised – agree with the commenter. The changes defined in doc 267r5, 947r21 and 748r1 resolve this comment. |
| 5576 | 27.9.2.1 | 190.18 | In 802.11-2016 there is no reference at all to "PD". The term OBSS\_PD is unfortunate because it conveys the concept of 'power detect' when it is truly CS/CCA. A more correct term might be "OBSS\_CCA". | Replace "OBSS\_PD" with "OBSS\_CCA" | Rejected – changing the name would be confusing at this point. A definition has been added to clarify what OBSS\_PD means. |
| 5681 | 27.9.2.1 | 190.34 | why spatial reuse cannot be applied to group addressed public action frame? |  | Rejected – the commenter fails to identify an issue. It is not applied to those frames as they can have to be understood across OBSSs. |
| 5864 | 27.9.2.1 | 190.50 | The OBSS\_PD SR backoff procedure was passed as when the receiving STA validates the conditions for spatial reuse operation by using OBSS\_PD level, it shall invoke an SR backoff procedure by resuming the backoff counter countdown for the associated EDCAF. For clarification, an SRP-based SR backoff procedure should be defined.In the spec draft, SR backoff procedure is incomplete. Especially P190L50 says "SR Backoff procedure for SR delayed case". For clarification, the backoff procedures for SR delayed case and SR restricted case, respectively. | Define the SRP-based SR backoff procedure. | Revised – agree with the commenter. The changes defined in doc 1471r21 resolve this comment. |
| 6018 | 27.9.1 | 190.07 | It is unclear how the spatial reuse improves power saving? The spatial reuse may improve the transmission latency and system throughput in dense deployments. Perhaps as outcome of improved latency and throughput, the non-AP STA power efficiency is improved. | Please clarify how spatial reuse Improves non-AP STA power efficiency. | Revised – remove any mention to power saving to clarify. Make the changes as in 941r0. |
| 6021 | 27.9.2.1 | 190.36 | The sentence starting in line 36 seems to add a new condition that is not considered in the bulleted list in lines 23 -34. The new condition should be part of the bulleted list, not an exception to it. | Write the sentence as part of the bulleted list above. | Rejected – including SR\_delay and SR\_restricted would complixify the spec text instead of clarifying it. |
| 6022 | 27.9.2.1 | 190.39 | The condition in the lines 39 - 42 is difficult to read. There seems to be first one condition then description what is done if the condition is fulfilled and then again some more conditions. Write first all conditions and then the performed operation, if the conditions are met. | Mnodify the sentence. Write all conditions first and then the operation if the conditions are fulfilled. Please ensure that all opeation alternatives are wirtten to the normative text. | Rejected – the changes wouldn’t improve the clarity of the spec text. |
| 6024 | 27.9.2.1 | 190.59 | The lines 59 - 62 seems to relate to operation is allowed if the conditions in lines 20 - 34 are met. The statement in the lines 59 - 62 should be moved as next text after the conditions to ensure correct understanding of the operation. | Move the sentences in lines 59 - 62 to follow the conditions introduced in the lines 20 - 34. | Revised – lines 59-62 were removed in docs 267r5 and 947r21.  |
| 6026 | 27.9.2.1 | 190.26 | The use of the spatial reuse parameter in the RXVECTOR should be clarified or at least there should be a reference to its operation rules. | Please clarify how RXVECTOR parameter are used. | Revised – the different options for using spatial reuse RxVector were clarified in doc 267r5 and 947r21. |
| 6027 | 27.9.2.1 | 190.19 | Can a PHY-CCA.indication indicate something else than BUSY followed by the RXSTART.indication? If the PHY-CCA Indication can have other value in this case, then it should be clarified how the STA operates in these situations. If the PHY-CCA cannot have other value, then the condition is not needed. | Please clarify the question in the comment. | Rejected – the spec text respects the steps in time for the reception of a PPDU. |
| 6028 | 27.9.2.2 | 191.03 | What is system level performance? | Please clarify. Perhaps it relates to throughput, non-AP STA power consumption and latency. | Rejected – the commenter failed in identifying an issue. |
| 6054 | 27.9.2 | 190.15 | Currently, Spatial reuse is adopted for OBSS packets. In enterprise network, the SR considering ESS is more useful than considering BSS. As proposed in 947r18, AP should be able to send the BSSs list belonging to an ESS/a Group and in that case SR should be considered in the other BSSs except for the BSSs list sent by the AP | As proposed in 947r18, includes the BSSs list belonging to a ESS in a Beacon and add the related operation in the specs | Revised – agree with the commenter. The changes defined in doc 267r5, and 947r21 resolve this comment. |
| 6150 |  | 190.50 | the SR backoff procedure for SR delayed case (described form line 50 ~57) is covered by SR backoff procedure specified from line 59 ~ 61. Because the PHYCCARESET.request primitive is already specified to be issued at the end of the PPDU in case of SR\_delayed ( form line 36 ~ 37), the STA may resume its backoff procedure when the STA'S MAC sublayer issues the PHYCCARESET.request primitive at the end of PPDU, following the specification of SR backoff procedure described from line 59 ~ 61. Suggest to merge SR delayed case backoff procedure and SR backoff procedure together as "If an HE STA's MAC sublayer issues a PHY-CCARESET.request primitive and not update its NAV timer asallowed above, the HE STA may resume its backoff procedure when the medium condition is IDLE asdefined in 10.22.2.2 (EDCA backoff procedure)."NOTE--The countdown of an existing backoff procedure is suspended until the medium condition is IDLE. | as the comment | Revised – The changes defined in doc 267r5, and 947r21 resolve this comment. |
| 6153 | 27.9.2.1 | 190.50 | the sentence is redudant or not complete | delete it or clarify | Revised - The changes defined in doc 267r5, and 947r21 resolve this comment. |
| 6759 | 27.9.1 | 190.07 | How do the spatial reuse modes help the goal of power saving, as is asserted here? Under legacy rules a STA simply evaluates the power of the incoming frame and if it exceeds the threshold, the STA stops there. The new rules involve various attempts to read further into the incoming frame to decide whether it's intra-BSS or inter-BSS, which has to consume more power, not less. It would be confusing and misleading to list power saving as an "objective" if no net power saving occurs. | Delete "and power saving". | Revised – agree with the commenter. Make the changes as in doc 941r0. |
| 6761 | 27.9.2.1 | 190.24 | "The received PPDU is an Inter-BSS PPDU" (as in 27.2.1). This excludes one of the main cases where spatial reuse might may some promise: an HE STA finishes transmitting and starts assessing the medium again, and finds that there are ongoing frames being transmitted. Perhaps the STA could conclude that these must be Inter-BSS (though that would require changes in 27.2.1, because it doesn't seem to be there now), but that would cause all Inter-BSS PPDUs to be subject to interference, and would vitiate the other conditions further below in this same section. However there is a way: there is already the concept of SR\_Delay in the draft, and (assuming that this isn't shorthand for SRP\_Delay, but instead a delay for all spatial reuse) the delay could be set to a uniform length that's long enough for reasonable PPDUs to finish. So: HE STA finishes its transmission, starts assessing medium, finds there are ongoing frames, DELAYS X-HUNDRED MICROSECONDS, then starts transmitting under spatial reuse rules. No need to read BSS Color, MAC address, or anything else: simply a power-based assessment of the incoming frame. All HE STAs know what X is, so have the option of fragmenting if interference becomes a problem, so the only constraint on X is that it should be long enough to allow legacy devices to operate reasonably: probably exceeding the lowest fragment size. | Rewrite the spatial reuse modes to eliminate the required classiifcation into Inter-BSS and Intra-BSS, and add a uniform delay before spatial reuse may take effect, this delay to exceed a reasonable fragment size for legacy devices. | Rejected – this would be a new spatial reuse mode. Unless the commenter brings a presentation to better present the need for another mode, this comment should be rejected. |
| 6762 | 27.9.2.1 | 190.36 | Almost the entire OBSS\_PD mode / SRP mode lacks basic protections to prevent matters from going disastrously wrong, as is all too possible. Unlike virtually any other mode, 'bad' OBSS\_PD decisions are not automatically self-righting (as too ambitious an MCS would be, for example) and do not have a natural limit to the damage that can be caused (as nnecessary use of RTS/CTS would be, for example). Worse, the effects of a 'bad' OBSS-PD decision will typically not be felt by the offending device, but instead by a victim device in a different BSS, with no messaging system provided to alert any devices in the system to the problem. This is likely to cause particularly severe problems for already deployed non-HE devices, which have been designed without taking into the account the possibility that 802.11 might later adopt such a scheme. However there is one small bright spot: the text at this location allows for a delay in the new proposed rules kicking in, but only for certain types of packet. The definition is too narrow, and broadening it would go a considerable distance towards making the mode a tolerable proposition. If there were a minimum substantial delay before the medium could be declared idle for \*all\* frames, then the worst case would be significantly less dire. Even legacy traffic might not suffer too much, since the idea of fragmenting to avoid interference has always been part of 802.11. If the minimum SR-delay is made longer than a reasonable minimum fragment size, then it starts to become minimally plausible that the mode might not be an unmitigated disaster. (Though some actual supporting experiments would still be necessary.) | Modify so that the medium cannot be declared idle until at least enough time has passed that a minimum length fragment can be transmitted and acknowledged. | Revised - . The changes defined in doc 267r5, 947r21 and 748r1 resolve this comment. |
| 6765 | 27.9.2.1 | 190.60 | "the HE STA may resume its backoff procedure when the medium condition is IDLE". The timing involved is severely underdefined. In ordinary operation, a channel assessment is carried out at the beginning of a slot, and if the channel is idle, the backoff counter counts down before the end of the slot, thus preserving synchronization along slot boundaries. With the OBSS\_PD rules, the HE STA must perform all sorts of assessments of the incoming PPDU, extending well past the initial slot boundary and possibly / probably not ending near a slot boundary. When it finally declares the medium is idle and resumes backoff countdown, does it do so immediately or in synchronization with the original slot boundaries or in synchronization with the slot boundaries of the OBSS PPDU? This is not specified in the draft. | Specify it. | Revised – propose to define a new subsection to clarify that the existing backoff procedure resumes when CCAreset is sent. Make the changes as in doc 941r0. |
| 6766 | 27.9.2.1 | 190.60 | The issue of the timing of channel idle decisions psoses problems for fairness between HE devices. Compare two similarly situated HE STAs in the same BSS, STA A and STA B. Each sees an OBSS PPDU at essentialy the same power, but STA A makes the decision that the received frame is Inter-BSS marginally faster. Clearly STA A gains an advantage in medium access over STA B. By itself this might not necessarily be bad, if STA A does so by virtue of better processing. But as it is, it will be very difficult for an outsider to verify just how STA A has made its decision, since much depends in the received power levels at the STA's antenna connector, which will not be available to an outsider. Essentially STA A could deliver itself a meaningful and recurring advantage in channel access over STA B, perhaps by cutting a few non-observable corners. This is an undesirable state of affairs that could compromise the fairness of 802.11 networks. | Specify a standardized delay (number of slots) for the decision to be made. | Rejected – OBSS\_PD SR only talks about when to send the CCAreset (when the conditions are met). The backoff procedure that follows is unchanged. |
| 6767 | 27.9.2.2 | 191.03 | With the definitions in the rest of the draft, the sentence "Adjusting the OBSS\_PD level and transmit power can improve the system level performance and the utilization of the spectrum" is one-sided and incomplete. It would be at least equally true to say that adjusting the OBSS\_PD level and transmit power can degrade system level performance and utilization of the spectrum, perhaps disastrously so. if the subject is to be raised at all, then basic respect for truth and objectivity should demand a balanced discussion with ample warning of the potential negative effects, not a biased piece of advertising fluff. | Delete the sentence. | Revised – clarify the objective of SR is to allow the medium to be reused more often between OBSSs in dense deployment scenarios. Make the changes as defined in 941r0. |
| 7121 | 27.9.2.1 | 190.56 | It is unclear whether "SR Backoff procedure"(Line 50) and "existing backoff procedure"(Line 56) are the same or different procedures. | Clarify the procedures to avoid confusion. | Revised – propose to define a new subsection to clarify that the existing backoff procedure resumes when CCAreset is sent. Make the changes as in doc 941r0. |
| 7126 | 27.9.2.2 | 192.16 | "If a STA regards an inter-BSS PPDU as not having been received at all using a specific OBSS\_PDlevel,"The procedure is unclear. It seems that this means "a) issue a PHYCCARESET.request primitive and b) not update its NAV timers based on frames carried in the PPDU" in Page 190, Line20. | For example, "If a STA regards a PPDU as an inter-BSS PPDU by using a specific OBSS\_PDlevel and issues a PHYCCARESET.request primitive ...," | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 7172 | 27.9.2.1 | 190.37 | When OBSS\_PD based SR conditions are not met if the PPDU is HE SU PPDU or HE extended range SU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_Delay, the STA determines that the PPDU carries a trigger frame and may continue to receive the trigger frame and obtain the values of Spatial reuses fields of Common Info field in the trigger frame to determine whether SRP-based spatial reuse conditions are met or not. | Please clarify it | Revised - The changes defined in doc 1471r21 resolve this comment. |
| 7173 | 27.9.2.1 | 190.42 | When OBSS\_PD based SR conditions are not met if the PPDU is HE MU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_Restricted, the STA determines that the PPDU carries a trigger frame and may continue to receive the trigger frame and obtain the values of Spatial reuses fields of Common Info field in the trigger frame to determine whether SRP-based spatial reuse conditions are met or not. | Please clarify it | Revised - The changes defined in doc 1471r21 resolve this comment. |
| 7229 | 27.9 | 190.01 | Subclause 27.9 Spatial reuse operation requires more discussion and addition of appropriate mechanisms. The aim of 802.11ax is to get higher performance in dense environment. Obviously, OBSS management is a key element to meet the goal. We are adding more than billions of new pre-HE 802.11 devices to the market per year, and need more serious consideration how to cope with non-HE OBSS issues. Also, we see non 802.11 technology in 2.4 GHz, and will probably see non 802.11 technology in 5GHz bands at the time of HE STA launch. 802.11ax spatial reuse technology shall be able to handle non-HE and non-802.11 overlapping operations in efficient way, which are missing in the D1.0. | 1. Classify spatial reuse technologies into the following manner:(a) spatial reuse among non-802.11 networks, (b) spatial reuse among non-HE OBSSs, (c) spatial reuse among HE OBSSs.2. Define adaptive CCA-ED rules as a resolution to (a). Change primary channel ED threshold for CCA to be flexible, and change supplementary channel ED threshold (mid packet detect) for CCA to be flexible.3. Define adaptive CCA-SD rules as a resolution to (b). Change preamble detection threshold for CCA to be flexible as the currently defined minimal sensitivity is too sensitive for dense environment. Suggested text in 11-16/310r1 should be a good starting point for the rule.4. Refine color code based CCA rules as a resolution to (c). | Rejected – this would be a new spatial reuse mode. Unless the commenter brings a presentation to better present the need for another mode, this comment should be rejected. |
| 7230 | 27.9 | 190.01 | Transmit power control (TPC) works well to reduce OBSS interference, i.e., minimize interfere from an HE STA to others. Subclause 27.9.2.2 (Adjustment of OBSS\_PD and transmit power) describes how HE STA can increase OBSS\_PD level by decreasing its TX power. It is a nice incentive for STA to decrease its TX power. OBSS\_PD only works with HE STAs. However, it only works with legacy STAs with limited circumstances. This means STAs cannot truely enjoy effect of 802.11ax spatial reuse until legacy BSSs and STAs are wiped out from the market. There are very large number of legacy STA installed based, and we still see large number of legacy STA (even non-VHT STA) shipment to the market. | Add new subclause under 27.9 describing spatial reuse TPC rule following the spirit of linking CCA threshold (ED-based CCA and SD-based CCA) and transmission power, as spelled out for OBSS PD. | Rejected – this would be a new spatial reuse mode. Unless the commenter brings a presentation to better present the need for another mode, this comment should be rejected. |
| 7405 | 27.9.2.2 | 191.03 | Current OBSS\_PD mechanism only defines operation with default parameters. In managed environments, the spec should allow APs to configure more optimaly the parameters, having in mind that those parameters shall only be used by the STAs associated with the group of APs that apply those new parameters. | Add the mechanism to allow APs from an SR group to apply new OBSS\_Pdmin and max parameters, and the procedure so that those parameters can only be used if the received OBSS packet is from an OBSS that belongs to the same SR group. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 7610 | 27.9.2.1 | 190.51 | This is not a sentence. | Delete it. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 7911 |  |  | There is no definition of "SR\_Delay" (it can be any number from 1 to 15) | At 190.37 change "indicates SR\_Delay" to "does not indicate SR\_Disallowed" and at 274.12 change "Set to SR\_Delay" to "Set to a value other than SR\_Disallowed" | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 8072 | 27.9.2.2 | 191.00 | Shouldn't TXPWRref be dependent from the band (even the channel based on the local regulation)? please clarify if it is the case or not. | As in comment. | Rejected – TXPWRref is not band-dependent so we don’t need to specifically mention this in the spec. |
| 8074 | 27.9.2.2 | 192.19 | What is an "including UL TB PPDU" ? I think that "HE trigger-based PPDU" is what is meant. | As in comment. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 8088 | 27.9 | 190.01 | SRP is incomplete - backoff after meeting SRP conditions is not described - this is needed to avoid multiple STAs accepting an SRP condition and then all transmitting at the same time and creating a collision | Describe the backoff mechanism when SRP condition is met | Revised. Agree with the commenter. The changes defined in doc 1471r21 resolve this comment. |
| 8101 | 27.9.2 | 190.14 | OBSS PD effect on secondary channel level sensing has not been described - if the OBSS PD level changes, do the secondary channel thresholds also need to change? | Address the issue of non-primary sensing levels if the OBSS\_PD level changes - if there is no relationship with non-primary sensing levels, at least add a note indicating this so that it is explicitly stated somewhere. | Revised - CCA section 28.3.17.6.4 already takes into account OBSS\_PDlevel in the secondary channel. |
| 8102 | 27.9.2.1 | 190.36 | The sentence here really does not provide any interesting functionality. At the end of the PPDU, the PHY is in a reset state anyway and the medium condition reverts to idle unless ED is active, which really does not matter in this case. | Provide additional text to justify the inclusion of this normative behavioral statement or delete it. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 8103 | 27.9.2 | 190.14 | There is no definitive statement regarding the priority of the SRP condition vs the OBSS\_PD condition | Add a normative behavioral statement that indicates that if a STA has enabled SRP and and SRP condition is in effect, then this overrides OBSS\_PD conditions. | Revised. Agree with the commenter. The changes defined in doc 1471r21 resolve this comment. |
| 8230 | 27.9.1 | 190.06 | what "system level performance" is? Is it delay, throughput or all performance metrics | it is better to delete these words and replace with something like "allows the concurrent use of the media by more than one STA". | Revised. Agree with the commenter. Make the proposed changes as in 941r0. |
| 8236 | 27.9.2.2 | 191.04 | system level performance again | as in previous comment | Revised. Agree with the commenter. Make the proposed changes as in 941r0. |
| 8237 | 27.9.2.2 | 191.07 | parameters incuded in the inequality and the Figure need to be defined | as in comment | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 8562 | 27.9.1 | 190.42 | The timing of PHYCCARESET.request primitive as well as the TXOP limitations if any is not clear in the case of spatial reuse during the reception of non-HE PPDU. | Clarify the he timing of PHYCCARESET.request primitive as well as the TXOP limitations if any in the case of spatial reuse during the reception of non-HE PPDU. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 8721 | 27.9.2.2 | 191.07 | Where are OBSSPDmin and OBSSPDmax defined? | Clarify | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 8723 | 27.9.2.2 | 192.01 | NOTE is not clear | Clarify NOTE | Revised – remove the NOTE as in the proposed changes in doc 941r0. |
| 9232 | 3.2 | 3.05 | The definition of SR should be included. | Add a definition of SR in clause 3.2. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 9233 | 3.2 | 3.05 | The definition of SRP-based SR should be included. | Add a definition of SRP-based SR in clause 3.2. | Revised. Agree with the commenter. The changes defined in doc 1471r21 resolve this comment. |
| 9459 | 27.9.2.1 | 190.19 | In the procedure stated for spatial reuse, a STA should not ignore any CTS frames, even if it is below OBSS\_PD. The OBSS STA may be at the edge of its BSS, and any transmissions may easily destroy its receptions from its AP, being either HE MU PPDU or HE/legacy SU PPDU. | revise the spatial reuse procedure, to at least obey CTS, which may be a part of MU-RTS/CTS exchange or RTS/CTS exchange. | Revised – The changes defined in doc 267r5 and 947r21 resolve this comment. Make the changes in 941r0 to simplify the current spec text. |
| 9460 | 27.9.2.1 | 190.50 | This sentence seems to be out of place; it may be a wrongly formatted title. | remove this sentence or provide the correct formatting. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 9461 | 27.9.2.1 | 190.36 | When should a STA issue a PHYCCARESET.request if the received PPDU is a legacy STA? The normative behavior seems to be lacking. | provide normative behavior on when the PHYCCARESET.request should be issued for legacy PPDUs. | Revised. Legacy PPDUs are handled in the classification of inter-BSS PPDUs. The changes defined in doc 267r5 and 947r21 resolve this comment. |
| 9539 | 27.9.2.1 | 190.55 | "NOTE--The countdown of an existing backoff procedure is suspended until the end of the PPDU carrying the SR delay entry since the medium is busy during the duration of the PPDU carrying the SR delay entry."This implies that there will be backoff counter for spatial reuse transmission. If it is true, it should be defined. | Define the backoff counter for SR transmission. | Revised – propose to define a new subsection to clarify that the existing backoff procedure resumes when CCAreset is sent. Make the changes as in doc 941r0. |
| 9601 | 27.9.2.1 | 190.19 | "If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by an RXSTART.indication due to a PPDU reception then the STA's MAC sublayer may a) issue a PHYCCARESET.request primitive and b) not update its NAV timers based on frames carried in the PPDU if all the following conditions are met:"If the STA newly receives an inter-BSS PPDU while decoding an intra-BSS PPDU (for example, as a capture effect), the OBSS\_PD-based spatial reuse operation shall not be allowed. | At the first paragraph of 27.9.2.1, replace"If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by an RXSTART.indication due to a PPDU reception"with"If a PHY-CCA.indication transition from IDLE to BUSY occures followed by an RXSTART.indication due to a PPDU reception..." | Rejected – the rules applies to each PPDU received and are self-contained. |
| 9603 | 27.9.2.2 | 192.20 | When an HE trigger-based PPDU is triggered by a Trigger frame having the CS Required subfield set to 0, an SR STA is not required to follow the SR\_maximum\_transmit\_power rule. | Change the following sentence"...for the transmissions of any PPDU (including UL TB PPDU)..."to"...for the transmissions of any PPDU (except when an HE trigger-based PPDU triggered by a Trigger frame having the CS Required subfield set to 0)..." | Revised – agree with the comment. Makes the changes as proposed in doc 941r0. |
| 9728 | 27.9.2.1 | 190.21 | "If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by an RXSTART.indication due to a PPDU reception then the STA's MAC sublayer may a) issue a PHY-CCARESET.request primitive and b) not update its NAV timers based on frames carried in the PPDU if all the following conditions are met:"The above rule is missing how long the STA's MAC sublayer can issue a PHY-CCARESET.request primitive, if the conditions are met.Change it as the following:"...may a) issue a PHY-CCARESET.request primitives before the end of the PPDU and..." | As per comment. | Revised – agree with the commenter. Make the changes as proposed in 941r0. |
| 9761 | 27.9.2.1 | 190.30 | Non-HT Public Action frame should be exempted from SR operation regardless with its RA because of the following reason.Even if an RA of a Public Action frame is an indivudual address other than the receiving STA, it may be intended to a STA in the BSS that the receiving STA belongs to. | Replace lines 30-33 with the following text:-- The PPDU is not a non-HT PPDU that carries a Public Action frame. | Revised – agree with the commenter. Make the changes as proposed in doc 941r0. |
| 9762 | 27.9.2.1 | 190.50 | The text in P190L50-54 is redundant because this condition and operation is covered by P190L36-37 and P190L56-57. | Remove lines 50-54.Move the NOTE in lines 56-57 after the next paragraph, that is, the end of the subclause 27.9.2.1. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this |
| 9940 | 27.9.2.1 | 190.50 | Is it a sub-cluase name? If this is an sub-clause name, make it as a sub-clause name. If not, delete this sentence. | As in the comment. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this |
| 9941 | 27.9.2.1 | 190.53 | In case of SR delay, as the PHYCCARESET.request primitive is issued at the end of the PPDU, it is quite straight-forward that a STA may resume its backoff procedure after the end of the PPDU if CCA is idle. This is also described in the last paragraph in page 190 again. Therefore, this sentence does not give any further information and is just redundant. It's better to delete this sentence. Same thing goes to following "NOTE". | As in the comment. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this |
| 9942 | 27.9.2.1 | 190.59 | To make the process clearer, it's better to mention one step further details. For example, when PHY sublayer receives a PHY-CCARESET.request frimitive and performs CCA, the PHY sublayer sends PHY-CCARESET.confirm primitive before sending PHY-CCA.indication primitive. | Modify the paragraphs to "If an HE STA's MAC sublayer issues a PHY-CCARESET.request primitive and not update its NAV timer as allowed above, the HE STA's PHY sublayer issues a PHY-CCARESET.confirm primitive and the HE STA may resume its backoff procedure when the medium condition is IDLE as defined in 10.22.2.2 (EDCA backoff procedure).". | Revised – propose to define a new subsection to clarify that the existing backoff procedure resumes when CCAreset is sent. Make the changes as in doc 941r0. |
| 9945 | 27.9.2.2 | 192.01 | the term "antenna connector" is used quite many times throughout the spec. without any confusion. Thus, this NOTE is meaningless. | Delete the sentence. | Revised – agree with the commenter. Remove the Note as in the proposed changes in doc 941r0. |
| 10018 | 27.9 | 190.01 | In dense environments, most preambles sent from OBSS STAs will not be decodable due to partially overlapping PPDUs. The spec should define a spatial reuse mechanism that is effective in dense environments. | Define an adjustable Energy Detection threshold proportional to the transmission power, similar to that of OBSS-PD. | Rejected – Current ED level is always higher than OBSS\_PD, so it wouldn’t make sense to make ED level proportional to the transmit power, as it would be disfavorable compared to legacy devices. |
| 10020 | 27.9.1 | 190.30 | "- A non-HT PPDU that carries an..." This implies that the non-HT PPDU need to be decoded up until the end of the PPDU to determine whether the PHYCCARESET.request can be issue. By that time the PPDU has already ended. | Replace bullet starting with "- The PPDU is not one of the following" with "The PPDU is not a non HT PPDU" | Rejected – The commenter failed to identify an issue. |
| 10021 | 27.9.1 | 190.36 | "The PHYCCARESET.request primitive shall be issued at the end of the PPDU..." This is normal behavior. If the PPDU also meets all the conditions mentioned in the list above (e.g. if the PPDU is a inter BSS PPDU) which rule take precedence? | Reformulate the bullets in lines 24-34 in page 190, so it includes the case of "SR\_Delay". | Rejected – SR\_delay is treated as an exception. It would make the spec less clear if we merge everything together. |
| 10022 | 27.9.1 | 190.39 | "If the PHYCCARESET.request primitive is issued before the end of the PPDU,..." All PPDUs sent using the SR rule should be limited to within the OBSS PPDU, as the excess portion of the SR PPDU will be prone to interference. | Remove line 41 of page 190 that says "if the PPDU isHE MU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_Restricted." | Rejected – It is the STAs decision to excess the PPDU limit and suffer from interference or not excess and suffer from less interference. The spec does not need to specify that. |
| 10023 | 27.9.1 | 190.39 | "If the PHYCCARESET.request primitive is issued before the end of the PPDU,..." If it is allowed for the TXOP to go beyond the inter-BSS PPDU, it would be beneficial to limit the length of the first PPDU such that the start of the second PPDU starts after the end of the inter-BSS PPDU. This way the preamble of the second PPDU can be detected from third party. | Add rule as commented so preamble detection is still useful. | Rejected – it is not possible to change the length of the first PPDU when SR is being applied. |
| 10024 | 27.9.2.1 | 190.43 | In order to allow efficient use of SR resource, STA should be allowed to subtract the time it took to determine that the received PPDU is an inter-BSS PPDU from its BO timer. | Add "If the PHYCCARESET.request primitive is issued before the end of the PPDU, the Back off counter of the STA may be decremented by the time it took from the beginning of the PPDU until the PHYCCARESET.request primitive was issued" | Rejected – the comment is understandable. However, this mechanism should be kept as simple as possible.  |
| 10025 | 27.9.2.1 | 190.43 | The specification needs to define a way for a STA to detect other PPDUs after PHYCCARESET.request is issued before the end of the inter-BSS PPDU. | Define a threshold at which a STA's PHY will issue PHY-CCA.indication with a value equal to BUSY upon detection of energy above the threshold during the inter-BSS PPDU. The threshold shall be relative to the reception power of the inter-BSS PPDU. | Rejected – the intent is that the STA continues to monitor the medium and tries to detect incoming PPDUs at levels as low as the PD CCA threshold.  |
| 10026 | 27.9.2.1 | 190.50 | SR backoff procedure should be defined. | Add texts as follow.Before SR transmission, STA should wait for random time as special backoff. This random time should be determined by received interference level. | Rejected – for simplicity and fairness, we should not define a special backoff for SR, but reuse the existing backoff counter. |
| 10027 | 27.9.2.1 | 190.53 | "The STA may resume its backoff procedure..." This seems to be normal procedure after PHYCCARESET.request primitive is issued | Remove sentence and NOTE. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this |
| 10028 | 27.9.2.2 | 191.03 | When a HE STA lowers the transmission power based on OBSS-PD, the transmission may not be heard by another STA in the BSS, i.e. could be hidden within the BSS. Transmission of RTS could solve this problem. | Define a mechanism where the AP can request for the transmission of RTS if the transmission power of the STA is below a determined threshold. | Revised. Agree with the commenter. The OBSSPDmax can be changed by the AP to control how low the power can be changed. The changes defined in doc 267r5 and 947r21 resolve this |
| 10033 | 27.9.2.2 | 192.16 | If STA sets a low TXPWRmax after calculating with Equation (27-1), transmitted frame may not be receive at the receiver.STA should have information about link budget such as pathloss so that STA can judge if transmitted frame will be received successfully or not. | In HE SU PPDU, Acceptable Receiver Interference level of SRP in HE-SIG-A will be set as fixed value (such as -50dBm).STA that received HE SU PPDU frame can calculate pathloss by subtracting Acceptable Receiver Interference level as fixed value from SRP. | Rejected – this is true but left to the implementer. We don’t need normative text for this. |
| 10034 | 27.9.2.2 | 192.21 | "The STA may increase the OBSS\_PDlevel during the backoff procedure, its maximum transmit power beingadjusted as defined above." Incomplete sentence. | Correct sentence. | Revised. Agree with the commenter. The changes defined in doc 267r5 and 947r21 resolve this |
| 10079 | 27.9.2.1 | 190.59 | A PHY-CCARESET.request primitive needs to be acknowledged with a PHY-CCARESET.confirm primitive from the PHY.PHY-CCARESET.confirm primitive is issued by the PHY to the local MAC entity to confirm that the PHY has reset the CCA state machine when the PHY has received a PHY-CCARESET.request primitive. | As in the comment. | Revised – propose to define a new subsection to clarify that the existing backoff procedure resumes when CCAreset is sent. The confirmation from the PHY does not need to be described here. Make the changes as in doc 941r0. |
| 10282 | 27.9.2.1 | 190.50 | The rule to determine the length of PPDU transmitted under the OBSS\_PD based SR mechanism should be defined. If the length of the PPDU is over the end of the inter-BSS PPDU, it could be unintentional interference on other STAs. | Add "If the PHYCCARESET.request primitive is issued and the STA intends to transmit a PPDU with transmit power adjustment under the rule described in 27.9.2.2(Adjustment of OBSS\_PD and transmit power), the STA shall generate a PPDU of which the duration does not exceed the end of the Inter-BSS PPDU. | Rejected – It is the STAs decision to excess the PPDU limit and suffer from interference or not excess and suffer from less interference. The spec does not need to specify that. |
| 10411 |  | 86.18 | SRP-based SRSupport : no description in MAC | No description in MAC. | Revised - agree with the commenter. The changes defined in doc 1471r21 resolve this comment. |
| 5739 | 27.11.6 | 198.28 | For SU PPDU, can the spatial reuse be set to SR\_restricted? The allowed setting for SU PPDU vs. MU PPDU is not clear. | Clarify | Revised – Agree in principle with the commenter. Based on the presentation in 11-16/647r0, the SR\_RESTRICTED is not designed for HE SU PPDU. Corresponding texts have been added for clarification about the setting of SR\_DELAY and SR\_RESTRICTED for HE SU PPDU, HE ER SU PPDU, and HE MU PPDUTGax editor to make the changes shown in 11-17/0941r0 under all headings that include CID 5739. |
| 5939 | 27.11.6 | 198.34 | More information should be provided regarding the behavior of SR\_Restricted. | As suggested | Rejcted -The behavior of SR\_RESTRICTED has been described in 27.9.2.1. |
| 6170 | 27.11.6 | 198.24 | Are there only two options for SPATIAL\_REUSE? | Please clarify | Rejcted -The allowed setting for the spatial reuse field in HE SU PPDU, HE ER SU PPDU, and HE MU PPDU has been defined in Table 28-20—Spatial Reuse subfield encoding for an HE SU PPDU, HE ER SU PPDU, and HEMU PPDU. The allowed setting for the spatial reuse field in HE TB PPDU has been defined in Table 28-21—Spatial Reuse subfield encoding for an HE TB PPDU. |
| 7910 | 27.11.6 | 198.29 | "to SR\_Delay entry" -- it is not clear what is meant by setting to an entry | Change to "to a value other than SR\_Disallowed" | Rejcted -The behavior of SR\_DELAY has been described in 27.9.2.1. |
| 8105 | 27.11.6 | 198.34 | What is the meaning of SR\_RESTRICTED? The few references to this value do not make any sense. If the intent was to limit the SR transmission to the duration of the PPDU on top of which the SR transmission occurs, then there should be a general rule. | Remove SR\_RESTRICTED and add text that says: SRP transmissions are always restricted to the duration of the discarded/ignored PPDU and OBSS\_PD SR transmissions are not restricted in any way. | Rejcted -We clarify that SR\_RESTRICTED is not designed for SRP operation. For OBSS\_PD SR, the SR\_RESTRICTED is used to prevent spatial reuse transmission from disrupting response to Trigger frame. Details can be found in in 11-16/647r0. |
| 9542 | 27.11.6 | 198.22 | It should be stated that the criteria of setting the SPATIAL\_REUSE parameter in the TXVECTOR is out of the scope of this standard. | As in the comment. | Rejcted -Setting of the SPATIAL\_REUSE parameter is not out of the scope. The current texts in 27.11.6 SPATIAL\_REUSE describes the conditions of setting for various cases to make sure that spatial reuse can work properly. These texts shall not be deleted. |
| 9607 | 27.11.6 | 198.29 | If a Trigger frame having the CS Required subfield set to 0 is carried in an HE SU PPDU, the TXVECTOR parameter SPATIAL\_REUSE of the HE SU PPDU should not be SR\_Delay entry. | Change the second paragraphs 27.11.6 as the following:"...set the TXVECTOR parameter SPATIAL\_REUSE to SR\_Delay entry only if a Trigger frame having the CS Required subfield set to 1 is carried in the HE SU PPDU...". | Rejected – The current setting for SR\_DELAY and SR\_RESTRICTED is a recommendation when Trigger frame is carried. The implementer can do the choice based on their preference, and there is no need for adding further rule on top of the current rule. |
| 9608 | 27.11.6 | 198.33 | If a Trigger frame having the CS Required subfield set to 0 is carried in an HE MU PPDU, the TXVECTOR parameter SPATIAL\_REUSE of the HE SU PPDU should not be SR\_Restricted. | Change the second paragraphs 27.11.6 as the following:"...set the TXVECTOR parameter SPATIAL\_REUSE to SR\_Restricted entry only if a Trigger frame having the CS Required subfield set to 1 is carried in the HE MU PPDU...". | Rejected – The current setting for SR\_DELAY and SR\_RESTRICTED is a recommendation when Trigger frame is carried. The implementer can do the choice based on their preference, and there is no need for adding further rule on top of the current rule. |
| 9954 | 27.11.6 | 198.22 | There are 16 entries in SPATIAL\_REUSE parameter. However, only 1 entry (SR\_Delay or SR\_Restricted) in this sub-clause. And, there's no description for other entries throughout this draft spec. It needs further clarification on when to use and how to use other entries. | As in the comment. | Rejected – The allowed setting for the spatial reuse field in HE SU PPDU, HE ER SU PPDU, and HE MU PPDU has been defined in Table 28-20—Spatial Reuse subfield encoding for an HE SU PPDU, HE ER SU PPDU, and HEMU PPDU. The allowed setting for the spatial reuse field in HE TB PPDU has been defined in Table 28-21—Spatial Reuse subfield encoding for an HE TB PPDU.Description in 27.9 Spatial reuse operation and 27.11.6 also have been revised to clarify the operation.Hence, we believe that this comment has been addressed. |

1. **Proposed changes**
* Intra-BSS and inter-BSS frame determination(#8111) (#5201)

***11ax Editor: Add the following text at the end of 27.2.1 Intra-BSS and inter-BSS frame determination:***

A PPDU carrying at least one inter-BSS frame is an inter-BSS PPDU.

A PPDU carrying at least one intra-BSS frame is an intra-BSS PPDU.

* Spatial reuse operation

***11ax Editor: Modify section 27.9 Spatial reuse operation as described as follows:***

* 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 early identification of signals from overlapping basic service sets (OBSSs) and interference management. (#5480, #5481, #5487, #6018)

There are two independent spatial reuse modes, one called OBSS\_PD-based spatial reuse and the other one called SRP-based spatial reuse. (#5480)

* OBSS\_PD-based spatial reuse operation
* General

If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by an 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 (#9728) and b) not update its NAV timers based on frames carried in 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(#6768)
* The received PPDU is:
* an Inter-BSS PPDU (see 27.2.1 (Intra-BSS and inter-BSS frame determination(#8111))) and the received PPDU is not a non-HT PPDU carrying a response frame (Ack, BlockAck or CTS frame),
* or 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(#6768)
* the RXVECTOR parameter RSSI\_LEGACY in the PHY-RXSTART.indication primitive, which defines the received power level measured from the legacy portion of the PPDU is below the Non-SRG OBSS\_PD level (defined in 27.9.2.2 (Adjustment of OBSS\_PD and transmit power)).
* The PPDU is not one of the following:
* (#9761)A non-HT PPDU that carries a Public Action frame
* A non-HT PPDU that carries an NDP Announcement frame(#8111) or an FTM frame
* An NDP.

A STA that takes actions (a) or (b) under the conditions of this previous paragraph is deemed to perform NON\_SRG-OBSS\_PD-based spatial reuse (see 27.11.6 (SPATIAL\_REUSE)).(#6768)

(#8111)If the PHY of a STA issues a PHY-CCA.indication with a value equal to BUSY followed by an RXSTART.indication due to a PPDU reception then the STA's MAC sublayer may a) issue a PHYCCARESET. request primitive before the end of the PPDU (#9728) and b) not update its NAV timers based on frames carried in the PPDU if all the following conditions are met:

* The received PPDU is an Inter-BSS PPDU (see 27.2.1 (Intra-BSS and inter-BSS frame determination(#8111)))
* The received PPDU is an SRG PPDU (see 27.2.2 (SRG and non-SRG frame determination(#8111))
* The most recently received Spatial Reuse Parameter Set element from the AP associated with the STA had the SRG Information Present subfield equal to 1 or the STA is an AP and its most recently transmitted Spatial Reuse Parameter Set element had the SRG Information Present subfield equal to 1
* The RXVECTOR parameter RSSI\_LEGACY in the PHY-RXSTART.indication primitive, which defines the received power level measured from the legacy portion of the PPDU is below the SRG OBSS\_PD level defined in 27.9.2.2 (Adjustment of OBSS\_PD and transmit power)
* The PPDU is not one of the following:
* (#9761)A non-HT PPDU that carries a Public Action frame
* A non-HT PPDU that carries an NDP Announcement frame or an FTM frame
* An NDP

(#8087)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 power measured based on the non-HE portion of the HE PPDU preamble(#3609) and captured in the RXVECTOR parameter RSSI\_LEGACY in the PHY-RXSTART.indication primitive shall be decreased by 3 dB to compensate for the power boost factor when compared to the OBSS PD level.(#8111)

The PHYCCARESET.request primitive shall be issued at the end of the PPDU if the PPDU is HE SU PPDU or HE extended range SU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_DELAY. (#doc 633r2)

If the PHYCCARESET.request primitive is issued before the end of the PPDU, and a TXOP is initiated within the duration of the PPDU, then the TXOP shall be limited to the duration of the PPDU if the PPDU is HE MU PPDU and the RXVECTOR parameter SPATIAL\_REUSE indicates SR\_RESTRICTED. (#doc 633r2)

* Adjustment of OBSS\_PD and transmit power

Adjusting the OBSS\_PD level and transmit power can improve the system level performance and the utilization of the spectrum. When using OBSS\_PD-based spatial reuse, an HE STA may adjust the OBSS\_PD level in conjunction with its transmit power and shall respect the condition defined in Equation (27-3).(#5489, #9315)

*

The adjustment rule is illustrated in Figure 27-9 (Illustration of the adjustment rules for OBSS\_PD and TX\_PWR).

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|  |
| * Illustration of the adjustment rules for OBSS\_PD and TX\_PWR
 |

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). (#5490, 5491)

*TXPWRref* = 21 dBm for non-AP STAs.

*TXPWRref* = 21 dBm for an AP with the Highest NSS Supported M1 subfield in the Supported HE-MCS and NSS Set field(#5518) of its HE Capabilities element field equal to or less than 1.

*TXPWRref* = 25 dBm for an AP with the Highest NSS Supported M1 subfield in the Supported HE-MCS and NSS Set field(#5518) of its HE Capabilities element field equal to or greater than 2.

(#5494)*TXPWR* is the STA transmission power in dBm at the antenna connector.

 (#5494)(#8111)An AP may define SRG OBSS PD Min Offset and SRG OBSS PD Max Offset values that are used by its associated STAs and by the AP 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 and by the AP 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 dBm  82 + SRG OBSS PD Min Offset dBm  62dBm(#5205, #8073, #5484)
* SRG OBSS PD Min Offset  SRG OBSS PD Max Offset
* SRG OBSS PD Max Offset + 82 dBm  62 dBm
* Non-SRG OBSS PD Max Offset  SRG OBSS PD Max Offset
* Non-SRG OBSS PD Max Offset + 82 dBm  62 dBm

HE STAs shall maintain a Non-SRG OBSS\_PD level, with its value selected by respecting the OBSS\_PD level condition in Equation (27-3) but with Non-SRG OBSS PD Min and Non-SRG OBSS PD Max in place of OBSS\_PDmin and OBSS\_PDmax, respectively, where Non-SRG OBSS PD Min and Non-SRG OBSS PD Max are determined according to Table 27-2 (Determining Non-SRG OBSS PD Min and Non-SRG OBSS PD Max values).

|  |
| --- |
| * Determining Non-SRG OBSS PD Min and Non-SRG OBSS PD Max values
 |
| OBSS\_PD SR Disallowed | Non-SRG Offset Present | Value of Non-SRG OBSS PD Min | Value of Non-SRG OBSS PD Max |
| Spatial Reuse Parameter Set element not received | Spatial Reuse Parameter Set element not received | 82 | 62 |
| 0 | 0 | 82 | 62 |
| 0 | 1 | 82 | 82 + Non-SRG OBSS PD Max Offset |
| 1 | Don’t care | 82 | -82 |

(#3198, #3199, #3200, #9944)

HE STAs shall maintain a SRG OBSS\_PD level, with its value selected by respecting the OBSS\_PD level condition in Equation (27-3) 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 27-3 (Determining SRG OBSS PD Min and SRG OBSS PD Max values).

|  |
| --- |
| * Determining SRG OBSS PD Min and SRG OBSS PD Max values
 |
| SRG Information Present | Value of SRG OBSS PD Min | Value of SRG OBSS PD Max |
| Spatial Reuse Parameter Set element 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—When 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. |

STAs which receive a Spatial Reuse Parameter Set information element from their associated AP that has a value of 1 in the SRP Disallowed subfield shall not perform SRP-based SR transmissions.

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

* OBSS\_PD SR transmit power restriction period

(#5494, #5500, #5503, #7406, #8104, #9947, #7125, #3197, #5689, #9541, #6025)If a STA ignores an inter-BSS PPDU following the procedure in 27.9.2.1 (General), using a chosen SRG OBSS\_PD level, or a chosen non-SRG OBSS\_PD level 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 power as measured at the output of the antenna connector, shall be equal or lower than the *TXPWRmax*, calculated with this chosen non-SRG OBSS\_PD level with Equation (27-4), with the appropriate non-SRG parameters according to Table 27-2 (Determining Non-SRG OBSS PD Min and Non-SRG OBSS PD Max values), for the transmissions of any PPDU (including HE Trigger-Based PPDU, except when the HE trigger-based PPDU is triggered by a Trigger frame having the CS Required subfield set to 0) until the end of the OBSS\_PD SR transmit power restriction period. If a STA starts an OBSS\_PD SR transmit power restriction period with a chosen SRG OBSS\_PD level, the STA’s power as measured at the output of the antenna connector, shall be equal or lower than the *TXPWRmax*, calculated with this chosen SRG OBSS\_PD level with Equation (27-4), with the appropriate SRG parameters according to Table 27-3 (Determining SRG OBSS PD Min and SRG OBSS PD Max values), for the transmissions of any PPDU (including HE Trigger-Based PPDU) until the end of the OBSS\_PD SR transmit power restriction period.(#5870)

Multiple ongoing OBSS\_PD SR transmit power restriction periods may overlap in time.

NOTE 1—The STA can increase but not decrease the chosen SRG OBSS\_PD level or non-SRG OBSS\_PD level during an OBSS\_PD SR transmit power restriction period.

NOTE 2—The STA’s power is always equal or lower than the minimum *TXPWRmax* among all *TXPWRmax* from ongoing OBSS\_PD SR transmit power restriction periods.

*

(#5207, #5496, #9315, #9946)NOTE 1—Equation (27-4) is equivalent to the condition defined in Equation (27-3).

NOTE 2—Anytime, even if *TXPWRmax* is unconstrained, the STA has to respect the transmit power restrictions defined by 11.8.6 Transmit power selection.

An example of OBSS\_PD SR operation is shown in Figure 27-10 (Example of OBSS\_PD SR operation).

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|  |
| * Example of OBSS\_PD SR operation
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* OBSS\_PD-based spatial reuse backoff procedure (#9942, #9539, #7121)

If an HE STA ignores an inter-BSS PPDU following the procedure in 27.9.2.1, the HE STA may continue the countdown of an existing backoff procedure right after the PHY-CCARESET.request primitive is sent, provided that the medium condition is not otherwise indicated as BUSY.

~~27.9.2.5 Transmission of a PPDU with OBSS\_PD-based spatial reuse(#8111)~~

~~Provided that other conditions are fulfilled to allow the transmission of a PPDU with OBSS\_PD-based spatial reuse procedure, a STA may transmit the PPDU only if one of the following conditions is met:~~

* ~~The medium was idle for PIFS preceding the received OBSS PPDU that was discarded based on~~ *~~OBSS\_PD~~~~level~~*~~.~~
* ~~A PHY-CCA.indication transition from BUSY to IDLE occurred within the PIFS time immediately preceding the received OBSS PPDU and the transition corresponded to the end of a PPDU that did not contain a CTS.~~
* ~~A PHY-CCA.indication transition from BUSY to IDLE occurred within the PIFS time immediately preceding the received OBSS PPDU and the transition corresponded to the end of a PPDU that contained 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 a PPDU that contained an RTS.~~
* SRP-based spatial reuse operation

(#6178, #5043, #5873, #5940, #7117, #7174, #5385, #9508, #10040, #10039, #10080, #8094, #5504, #6845, #6115, #6127, #6143, #6142, #6842, #6843, #4997, #9462, #9180, #9183, #9209, #10412, #10413, #10414, #10415, #10406, #10305, #8568, #8914, #8909)

.3SRP-based spatial (#5200)

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-based SR opportunity using an adjusted transmit power level 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. When the RXVECTOR parameter SPATIAL\_REUSE of the ongoing PPDU has the value SRP\_DISALLOW(#6768), no SRP-based SR transmission is allowed for the duration of that PPDU.

An HE-STA supporting SRP-based SR operation indicates support for SRP-based SR operation by setting the SRP-based SR Support subfield to 1 in the HE PHY Capabilities Information field of the HE Capabilities element (see Table 9-262aa (Subfields of the HE PHY Capabilities Information field)).

An AP sending a Trigger frame may set the SR field in the Common Info field of the Trigger frame to SRP\_DISALLOW(#6768) to forbid OBSS STAs from performing SRP-based SR transmission during the ensuing uplink SRP\_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.

* DSRP\_PPDU-based spatial reuse initiation

An HE STA identifies a DSRP\_PPDU SRP opportunity when the following two conditions are met:

* The STA receives a PHY-RXSTART.indication corresponding to the reception of a DSRP\_PPDU that is identified as an Inter-BSS PPDU (see 27.2.1 (Intra-BSS and inter-BSS frame determination(#8111)))
* An SR\_PPDU is queued for transmission and the intended transmit power of the SR\_PPDU, after normalization to 20 MHz bandwidth (i.e., the transmit power in dBm minus the value, in dB of the intended transmit bandwidth divided by 20 MHz), is below the value of SRP minus RPL, where SRP is the value obtained from Table 28-20 (Spatial Reuse subfield encoding for an HE SU PPDU, HE ER SU PPDU, and HE MU PPDU) based on at least one of:
* The value of the Spatial Reuse information of the common info field of the Trigger frame of the DSRP\_PPDU and the value of RPL is the received power level of the legacy portion of the DSRP\_PPDU, normalized to 20 MHz bandwidth
* The value of the Spatial Reuse information of the SIGA SRP field of the HE TB PPDU that follows the DSRP\_PPDU and the value of RPL is the received power level of the legacy portion of the DSRP\_PPDU, normalized to 20 MHz bandwidth

A STA that identifies an SRP opportunity due to the receipt of a DSRP\_PPDU may eschew the NAV update operations normally executed based on the receipt of the RXVECTOR parameter TXOP\_DURATION and the Trigger frame DUR field value. See Figure 27-11 (DSRP\_PPDU spatial reuse). A STA that identifies an SRP opportunity due to the receipt of a DSRP\_PPDU may ignore the PHY-RXSTART.indication and the associated HE TB PPDU(s) that are triggered by the Trigger frame of the DSRP\_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 RXVECTOR BSS\_COLOR matches the BSS color of the DSRP\_PPDU. A STA that identifies an SRP opportunity due to the receipt of a DSRP\_PPDU 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 DSRP\_PPDU.

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|  |
| * DSRP\_PPDU spatial reuse
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* SRP\_PPDU-based spatial reuse backoff procedure

If an HE STA identifies an SRP opportunity as allowed in 27.9.3.1 (DSRP\_PPDU-based spatial reuse initiation), the HE STA may continue the countdown of an existing backoff procedure provided that the medium condition is not otherwise indicated as BUSY. If the HE STA receives another SRP\_PPDU during the back-off procedure, it shall suspend its back-off and subsequently, if an SRP opportunity is identified based on the new SRP\_PPDU, the STA may resume its backoff procedure. The TXOP that the HE STA gains once its backoff reaches zero shall not extend beyond the SRP opportunity endpoint which is the earliest ending of all of the durations of all of the SRP\_PPDUs that were used to confirm the SRP opportunity and all of the durations indicated in the Common Info fields of Trigger frames within all DSRP\_PPDUs that were used to confirm the SRP opportunity.

If the HE-STA is already executing its backoff procedure employing *OBSS\_PDlevel* as a threshold for determination of an IDLE medium condition prior to the reception of an SRP\_PPDU, the intended transmit power of the next SR\_PPDU in the transmission queue as measured at the output of the antenna connector shall be equal to or lower than the TXPWRmax, calculated with this specific *OBSS\_PDlevel* using Equation (25-1).

After a STA has identified the start of an SRP Opportunity, and until the SRP Opportunity Endpoint is reached, the transmission of any PPDU by the STA shall be limited by the transmit power restrictions identified in 27.9.3 (SRP-based spatial reuse operation).

* Spatial Reuse field of Trigger frame

An AP with dot11HESRPOptionImplemented set to true that transmits a Trigger frame may determine the value of the Spatial Reuse field value of the Common Info field of the Trigger frame in each 20 MHz bandwidth for 20 MHz, 40 MHz, 80 MHz PPDU or in each 40 MHz bandwidth for 80+80 or 160 MHz PPDU by selecting the row in Table 28-20 (Spatial Reuse subfield encoding for an HE SU PPDU, HE ER SU PPDU, and HE MU PPDU) that has a numerical value in the column labeled "Meaning" that is the highest value that is equal to or below the value of the computed MAC parameter SRP\_INPUT as follows:

* SRP\_INPUT = *TXPWRAP* + Acceptable Receiver Interference LevelAP

where

*TXPWRAP* is the transmit power in dBm at the output of the antenna connector normalized to 20 MHz bandwidth (i.e., transmit power in dBm minus transmit bandwidth divided by 20 MHz bandwidth in dB) of the AP sending the Trigger frame.

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 ambient noise plus interference power level observed at the AP immediately prior to the transmission of the trigger frame plus the SNR margin value which yields a 10% PER for all of the intended MCS(s) in the ensuing uplink HE TB PPDU, minus a safety margin value not to exceed 5 dB as determined by the AP.

An AP with dot11HESRPOptionImplemented set to true that transmits a trigger frame may set the value of the Spatial Reuse field value of the Common Info field of the trigger frame in each 20MHz bandwidth for 20 MHz, 40 MHz, 80 MHz PPDU or in each 40 MHz bandwidth for 80+80 or 160 MHz PPDU to SRP\_DISALLOW(#6768).

An AP with dot11HESRPOptionImplemented set to false that transmits a trigger frame shall set the value of the Spatial Reuse field value of the Common Info field of the trigger frame in each 20 MHz bandwidth for 20 MHz, 40 MHz, 80 MHz PPDU or in each 40 MHz bandwidth for 80+80 or 160 MHz PPDU to SRP\_DISALLOW(#6768).

* SR\_PPDU transmission requirements

An HE STA that identifies an SRP opportunity shall not transmit a PPDU during the SRP opportunity that elicits a response transmission from a STA from which it has not received an HE Capabilities element with the SR Responder field equal to 1. An HE STA that identifies an SRP opportunity and transmits a PPDU that elicits a response transmission during that SRP opportunity shall include an A-Control field with the SR\_PPDU Indication subfield value set to 1 in each MPDU of the PPDU that it transmits that contains an A-Control field.(#8087, #8091, #8092)

* SR\_PPDU reception and response transmission requirements

An HE STA that receives a PPDU which contains at least one MPDU with an SR\_PPDU Indication subfield value equal to 1 shall not transmit a response PPDU elicited by the received PPDU if all outstanding SRP and OBSS\_PD transmit power requirements are not met by the response transmission.(#8087, #8091, #8092)

* Interaction of OBSS\_PD and SRP-based spatial reuse

An HE STA with dot11HESRPOptionImplemented set to true that receives a PPDU that is identified as an inter-BSS PPDU with a value other than SRP\_DISALLOW(#6768) for the RXVECTOR parameter SPATIAL\_REUSE and fails to identify an SRP Opportunity based on the receipt of the PPDU shall use a value of 82 dBm/20 MHz or lower for the *OBSS\_PDlevel* as it applies to this PPDU.

An HE STA with dot11HESRPOptionImplemented set to true that receives a PPDU that is identified as an inter-BSS PPDU with a value other than SRP\_DISALLOW(#6768) or SR\_DELAY for the RXVECTOR parameter SPATIAL\_REUSE and identifies an SRP opportunity based on the receipt of the PPDU may use a value of positive infinity or lower for the *OBSS\_PDlevel* as it applies to this PPDU and may use a value equal to the receive power of this PPDU plus 1 dB for the ED level for the duration of this PPDU.

An HE STA with dot11HESRPOptionImplemented set to true that receives a PPDU that is identified as an inter-BSS PPDU with a value other than SRP\_DISALLOW(#6768) in the Common Info Field SPATIAL\_REUSE of a Trigger frame and fails to identify an SRP opportunity based on the receipt of the PPDU shall use a value of 82 dBm/20 MHz or lower for the *OBSS\_PDlevel* as it applies to the HE TB PPDU that is elicited by the Trigger frame.

An HE STA with dot11HESRPOptionImplemented set to true that receives a PPDU that is identified as an Inter-BSS PPDU with a value other than SRP\_DISALLOW(#6768) or SR\_DELAY in the Common Info Field SPATIAL\_REUSE of a Trigger frame and identifies an SRP opportunity based on the receipt of the PPDU may use a value of positive infinity or lower for the *OBSS\_PDlevel* as it applies to the HE TB PPDU that is elicited by the Trigger frame.

An HE STA with dot11HESRPOptionImplemented set to true that receives a PPDU that is identified as an inter-BSS PPDU with a value equal to SR\_DELAY for the RXVECTOR parameter SPATIAL\_REUSE shall use a value of negative infinity for the *OBSS\_PDlevel* as it applies to this PPDU and shall use a value equal to the receive power of this PPDU minus 1 dB for the ED level for the duration of this PPDU.

***11ax Editor: Modify section 27.11.6 SPATIAL\_REUSE as described as follows:***

**27.11.6 SPATIAL\_REUSE**

….. (existing texts)

An HE STA 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. (#5739)

An HE STA that transmits an HE MU PPDU that contains a Trigger frame should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_RESTRICTED. (#5739)

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. (#5739)

An HE STA that transmits an HE MU PPDU shall not set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY. (#5739)

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.

….. (existing texts)