IEEE P802.11  
Wireless LANs

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | SRP-Based SR for HE Trigger-based PPDU – 27.9.3 | | | | | | Date: 2016-10-06 | | | | | | Author(s): | | | | | | Name | Affiliation | Address | Phone | email | | Matthew Fischer | Broadcom |  |  | [Matthew.fischer@broadcom.com](mailto:Matthew.fischer@broadcom.com) | | James Wang | Mediatek |  |  | [James.wang@mediatek.com](mailto:James.wang@mediatek.com) | | Yongho Soek | Newracom |  |  | [Yongo.seok@newracom.com](mailto:Yongo.seok@newracom.com) | | Ron Porat | Broadcom |  |  | [Ron.porat@broadcom.com](mailto:Ron.porat@broadcom.com) | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |

Abstract

This submission proposes resolutions for comment CID 944 related to TGax D0.1.:

NOTE- The proposed changes on this document are based on TGax Draft 0.5.

**REVISION NOTES:**

R0: initial

**R1:**

27.9.3

TSRP\_PPDU does not contain a common info field, reworded to reference HE PHY Header RXVECTOR field

SRP decision window is no longer applicable for DSRP\_PPDU

**27.9.3.4 SRP\_PPDU-based spatial reuse backoff procedure**

Added “plus interference”

25.12a TXVECTOR parameter SPATIAL\_REUSE

Added a definition for “Required SNR for the MCS to be used” which includes a “should”

**R2:**

Made header numbering consistent

27.9.3.1 DSRP

Changed the ignore condition to only if the color matches and the rxstart occurred within the timeout window

27.9.3.2 TSRP

Qualified the condition of a frame preceding the TSRP with a color match

Added the case when the preceding frame does not match the color of the TSRP

Use the review tab and change to “final showing markup” to see all changes

**R3:**

**27.9.3.4 SRP\_PPDU-based spatial reuse backoff procedure**

Time limit should be earliest, not shortest of durations

**25.12a TXVECTOR parameter SPATIAL\_REUSE**

Allow SR\_DISALLOW in any ppdu

**R4:**

ADD CID 64 and 2911

**R5:**

**27.9.3.3 SRP\_PPDU-based spatial reuse backoff procedure**

Expand the TX Power restriction for TX Power to ALL PPDUs transmitted during the SRP opportunity. For example, a CTS or BA or other response PPDU.

**25.12a TXVECTOR parameter SPATIAL\_REUSE**

Remove the last sentence regarding a requirement to set SRP to SR\_DISALLOW – it applied to HE SU and HE ER PPDU which are not included in SRP operation

**R6:**

**25.12a TXVECTOR parameter SPATIAL\_REUSE**

Fixed this subclause to correctly refer to Trigger-based PPDU and to state that transmitters of Trigger-based PPDUs fill in SRP field of SIGA by using Trigger Common info SR field information

Modified condition for non-trigger PPDU TXVEC SR parameter value setting

**R7:**

**Fix resolution box document references – they had said 1476r4 – now updated to 1476r7**

Fix CID number of first CID – it was 944, it is now 994

**R8:**

Add SRP types:

ULSRP\_PPDU = Uplink SRP PPDU and associated opportunity description

DLSRP\_PPDU = Downlink SRP PPDU and associated opportunity description – SRP opportunity limited to use by an AP

Update text to D1.0

Add A-control for SRP condition indication – i.e. “this is an SR PPDU so you need to check SRP before you can send your acknowledgement” - plus associated rules for the recipient of such a PPDU, plus an HE Cap bit to indicate that a STA supports this functionality and therefore is a suitable candidate for reception of an SR PPDU

Add language to 27.9.3.5 SRP\_PPDU-based spatial reuse backoff procedure

Add new subclause 27.9.4 which clarifies the intereaction of SRP and OBSS\_PD

**R9:**

27.9.2.1 – the text that was shown here is deleted (not all of this subclause was deleted, but only two paragraphs of the subclause) – this subclause refers to OBSS\_PD operation, and therefore, should not mention the SRP parameter value in a received PPDU – that is SRP operation. Similar language to that which is now deleted does exist in 27.9.3, but not exactly similar, since some of the language in the stricken 27.9.2.1 was simply incorrect.

**R10:**

27.9.3 – added SR\_DELAY into a few term definitions – see next change for explanation

27.11.6 – added: An HE STA that transmits a PPDU that contains a Trigger MPDU should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY. – note that the effect of using the value SR\_DELAY is to communicate to a receiver that the MPDU inside of the PPDU contains a trigger which then contains a common info field which contains explicit SRP parameter values for the upcoming trigger-based PPDU that follows this PPDU. By using SR\_DELAY, the trigger transmitter can help to avoid having a trigger PPDU being discarded due to OBSS PD which would then jeopardize the reception of the following trigger-based PPDU(s)

28.3.10.7.2 – HE SIGA parameter table entry – modified SR\_DELAY language as per above comment

28.3.10.7.2 – HE SIGA supplemental table of SRP parameter values – changed RESERVED value 15 to be SR\_DELAY

27.9.4 – adjusted the language to include SR\_DELAY and fixed an error in the last paragraph

Various cleanup, e.g. bad references to 25. Instead of 27., 2.a and 2.b swapped, extra mention of common info field in TSRP\_PPDU case

27.9.3.3 ULSRP\_PPDU – allow use of minimum receiver sensitivity if no beacon record exists

**R11:**

27.11.6 – added the following sentence:

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

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

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

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A motion [SR Motion 8, May 2016, DCN11-16-699r0] related to SRP-based SR Operation for HE trigger-Based PPDU is not fully defined.

SR Motion 8 [May 2016, DCN11-16-699r0]

* Add the following 4 bit SR field (in SIG A) for HE Trigger-Based PPDU
* One TBD value for SR Disallow Flag, (under TBD restrictions)
* One TBD value is reserved
* Remaining 14 values for SRP
  + SRP = TX PWRAP + Acceptable Receiver Interference LevelAP
  + SR STA shall back-off its TX power based on
  + TX PWRSR STA < SRP –RSSItrigger frame@SR STA”

This document intends to provide clarification and definition of the SRP-based SR operation for HE trigger-Based PPDU.

***TGax editor: insert a new subclause 27.9.3 SRP-based spatial reuse operation and the associated text as follows:***

**27.9.3 SRP-based spatial reuse operation**

SRP-based SR Opportunities are identified from the value of the RXVECTOR parameter SPATIAL\_REUSE and/or the contents of a Trigger MPDU. An HE STA is allowed to 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 SR\_DISALLOW, 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 (Table 9-262aa).

A DSRP\_PPDU is a PPDU that contains a valid Trigger MPDU and that has a value other than SR\_DISALLOW in the Common Info Field SPATIAL\_REUSE. (Delayed SRP PPDU).

A TSRP\_PPDU is a PPDU that is an HE Trigger based PPDU and that has a value other than SR\_DISALLOW or SR\_DELAY in the RXVECTOR parameter SPATIAL\_REUSE. (Trigger-based SRP PPDU).

An ULSRP\_PPDU is a PPDU that is an HE SU PPDU or HE MU PPDU with the UL/DL field in SIGA equal to 1 (UL direction) and that has a value other than SR\_DISALLOW in the RXVECTOR parameter SPATIAL\_REUSE. (UpLink SRP PPDU)

A DLSRP\_PPDU is a DL HE SU PPDU or DL HE MU PPDU with the UL/DL field of SIGA equal to 0 and that has a value other than SR\_DISALLOW or SR\_DELAY in the RXVECTOR parameter SPATIAL\_REUSE. (DownLink SRP PPDU)

Note – A PPDU containing a Trigger MPDU can be both a DSRP\_PPDU and a DLSRP\_PPDU.

An SRP\_PPDU is a PPDU that is at least one of a DSRP\_PPDU, TSRP\_PPDU, ULSRP\_PPDU or DLSRP\_PPDU.

An SR\_PPDU is a PPDU transmitted during an SRP Opportunity by an HE STA when SRP conditions for SRP-based spatial reuse operation are satisfied.

The SRP Decision Window is a period of time that has a duration equal to aSIFSTime + aRxPHYStartDelay + (2 x aSlotTime) and that ends at the time of receipt of the PHY-RXSTART.indication of an TSRP\_PPDU, ULSRP\_PPDU or DLSRP\_PPDU.

An AP sending a trigger frame may set the SR field in the Common Info field of the trigger frame to SR\_DISALLOW to forbid OBSS STAs from performing SRP-based SR transmission during the ensuing uplink SRP\_PPDU duration.

**27.9.3.1 DSRP\_PPDU-based spatial reuse initiation**

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

1. 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 detection)
2. An SR\_PPDU is queued for transmission and the intended transmit power of the SR\_PPDU, after normalization to 20MHz bandwidth (i.e., the transmit power in dBm minus the value, in dB of the intended transmit bandwidth divided by 20MHz), is below the value of SRP minus RPL, where SRP is the value obtained from Table 26-19 (Spatial Reuse subfield encoding) based on the value of the Spatial Reuse information of the common info field of the Trigger MPDU of the DSRP\_PPDU and the value of RPL is the received power level of the legacy portion of the DSRP\_PPDU, normalized to 20MHz 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 MPDU DUR field value. See Figure 25 – srp1 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 trigger-based PPDU(s) that are triggered by the Trigger MPDU of the DSRP\_PPDU and that occurs within aSIFSTime + aRxPHYStartDelay + 2 x aSlotTime of the end of the last symbol on the air of the PPDU that contained the Trigger MPDU, 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 trigger-based PPDU that is triggered by the Trigger MPDU of the DSRP\_PPDU.

Duration from Common Info field

DSRP\_PPDU

HE Trigger-based PPDU

**Figure 25 – srp1 – DSRP\_PPDU Spatial Reuse**

**27.9.3.2 TSRP\_PPDU-based spatial reuse initiation**

An HE STA identifies a TSRP\_PPDU SRP Opportunity when the following three conditions are met:

1. The STA receives a PHY-RXSTART.indication corresponding to the reception of a TSRP\_PPDU that is identified as an Inter-BSS PPDU (see 27.2.1 Intra-BSS and inter-BSS frame detection)
2. Condition a or b is met:
   1. There was no PHY-CCA.indication transition from BUSY to IDLE within the SRP Decision Window corresponding to the TSRP\_PPDU
   2. At least one PHY-CCA.indication transition from BUSY to IDLE occurred within the SRP Decision Window corresponding to the TSRP\_PPDU and the RXVECTOR parameter BSS\_COLOR of the preceding PPDU that caused the BUSY to IDLE transition is the same as the RXVECTOR parameter BSS\_COLOR of the TSRP\_PPDU and the direction of the preceding PPDU is the opposite of the direction of the TSRP\_PPDU
3. An SR\_PPDU is queued for transmission and the intended transmit power of the SR\_PPDU, after normalization to 20MHz bandwidth (i.e., the transmit power in dBm minus the value, in dB of the intended transmit bandwidth divided by 20MHz), is below the value of SRP minus RPL, where SRP is the value obtained from Table 26-19 (Spatial Reuse subfield encoding) based on the value of the Spatial Reuse parameter of the RXVECTOR of the TSRP\_PPDU and the value of RPL is:
   1. equal to the minimum receiver sensitivity of the STA, normalized to 20MHz if condition 2.a. is true
   2. the received power level of the PPDU that preceded the TSRP\_PPDU as identified in condition 2.b., normalized to 20 MHz if condition 2.b. above is true

A STA that identifies an SRP Opportunity due to the receipt of a TSRP\_PPDU may issue a PHYCCARESET.request primitive at the time of the receipt of the PHY-RXSTART.indication and if condition 2.a. is true, follows the normal NAV update procedure with TXOP\_DURATION parameter information from the received RXVECTOR, if any. If condition 2.b is true, the STA may eschew the NAV update operations normally executed based on the receipt of the RXVECTOR parameter TXOP\_DURATION and the MPDU DUR field value. A STA that identifies an SRP Opportunity due to the receipt of a TSRP\_PPDU shall not transmit an SR PPDU that terminates beyond the duration indicated in the L-SIG length field of the TSRP\_PPDU.

Note – When condition 2.b is true, the receiving STA is able to receive PHY header information from both downlink and uplink transmitters in the TXOP and therefore, NAV protection is not necessary.

Note – The RXVECTOR TXOP\_DURATION NAV update is performed at time that corresponds to the end of the duration indicated in the L-SIG length field of the received TSRP\_PPDU.

Duration from LSIG

TSRP\_PPDU (HE trigger based PPDU)

**Idle**

Figure 25-srp2 – Condition 2.a TSRP\_PPDU with preceding IDLE

**27.9.3.3 ULSRP\_PPDU-based spatial reuse initiation**

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

1. The STA receives a PHY-RXSTART.indication corresponding to the reception of a ULSRP\_PPDU that is identified as an Inter-BSS PPDU (see 27.2.1 Intra-BSS and inter-BSS frame detection)
2. An SR\_PPDU is queued for transmission and the intended transmit power of the SR\_PPDU, after normalization to 20MHz bandwidth (i.e., the transmit power in dBm minus the value, in dB of the intended transmit bandwidth divided by 20MHz), is below the value of SRP minus RPL, where SRP is the value obtained from Table 26-19 (Spatial Reuse subfield encoding) based on the value of the Spatial Reuse parameter of the RXVECTOR of the ULSRP\_PPDU, and the value of RPL is the highest received power level of all beacons received within the previous 100ms with the same color as the color indicated in the ULSRP\_PPDU or equal to the minimum receiver sensitivity of the STA, normalized to 20MHz if there is no recorded beacon reception information or there is no color match in the recorded beacon information.

**27.9.3.4 DLSRP\_PPDU-based spatial reuse initiation**

Only an AP can identify an SRP Opprtunity based on the reception of a DLSRP\_PPDU.

An HE AP identifies a DLSRP\_PPDU SRP Opportunity when the following three conditions are met:

1. The AP receives a PHY-RXSTART.indication corresponding to the reception of a DLSRP\_PPDU that is identified as an Inter-BSS PPDU (see 27.2.1 Intra-BSS and inter-BSS frame detection)
2. The NAV timer of the AP is zero or is being ignored for an SRP Opportunity, prior to the start of the TXOP containing the PHY-RXSTART.indication of the DLSRP\_PPDU.
3. An SR\_PPDU is queued for transmission and the intended transmit power of the SR\_PPDU, after normalization to 20MHz bandwidth (i.e., the transmit power in dBm minus the value, in dB of the intended transmit bandwidth divided by 20MHz), is below the value of SRP minus RPL, where SRP is the value obtained from Table 26-19 (Spatial Reuse subfield encoding) based on the value of the Spatial Reuse parameter of the RXVECTOR of the DLSRP\_PPDU and the value of RPL is the highest received power level of the legacy portion of all non-Intra-BSS PPDUs of the same BSS color of the DLSRP\_PPDU and that were received during the previous 500 ms of STA wake state operation, where the wake state operation may be discontiguous in time

An AP that identifies an SRP Opportunity due to the receipt of a DLSRP\_PPDU may issue a PHYCCARESET.request primitive at time of the receipt of the PHY-RXSTART.indication and for the duration indicated in the L-SIG field of the received HE SRP\_PPDU PHY header may ignore its NAV timer when determining the medium condition.

**27.9.3.5 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), 27.9.3.2 (TSRP\_PPDU-based spatial reuse initiation), 27.9.3.3 (ULSRP\_PPDU-based spatial reuse initiation) or 27.9.3.4 (DLSRP\_PPDU-based spatial reuse initiation) above, 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 back-off 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).

**27.9.3.6 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 20MHz bandwidth for 20MHz, 40MHz, 80 MHz PPDU or in each 40MHz bandwidth for 80+80 or 160 MHz PPDU by selecting the row in Table 28-19 (Spatial Reuse subfield encoding) 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
  + The TXPWRAP is the transmit power in dBm at the output of the antenna connector normalized to 20MHz bandwidth (i.e., transmit power in dBm minus transmit bandwidth divided by 20MHz bandwidth in dB) of the AP sending the trigger frame.
  + Acceptable Receiver Interference LevelAP is a value in dBm normalized to a 20MHz bandwidth (i.e., minus transmit bandwidth divided by 20MHz bandwidth in dB) for each 20MHz transmit bandwidth for 20MHz, 40MHz, and 80MHz PPDU or in each of the 40MHz transmit bandwidths for an 80+80MHz 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 trigger-based 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 20MHz, 40MHz, 80 MHz PPDU or in each 40MHz bandwidth for 80+80 or 160 MHz PPDU to SR\_DISALLOW.

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 20MHz bandwidth for 20MHz, 40MHz, 80 MHz PPDU or in each 40MHz bandwidth for 80+80 or 160 MHz PPDU to SR\_DISALLOW.

**27.9.3.7 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.

**27.9.3.8 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 transmission.

***TGax editor: insert a new subclause 27.9.4 Interaction of OBSS\_PD and SRP-based spatial reuse and the associated text as follows:***

**27.9.4 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 SR\_DISALLOW 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 SR\_DISALLOW 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 SR\_DISALLOW in the Common Info Field SPATIAL\_REUSE of a Trigger MPDU 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 Trigger-based PPDU that is elicited by the Trigger MPDU.

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 SR\_DISALLOW or SR\_DELAY in the Common Info Field SPATIAL\_REUSE of a Trigger MPDU 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 Trigger-based PPDU that is elicited by the Trigger MPDU.

**9.3.1.23 Trigger Frame format**

***TGax editor: modify 9.3.1.23 Trigger Frame Figure 9-52d Common info field, by adding a 6-bit BSS Color field and 2 reserved bits, and add a sentence to the subclause providing a definition of the field as a reference to 9.4.2.219 HE Operation element:***

***TGax editor: modify 9.2.4.6.4.1 General as shown and change all references of the Reverse Direction Protocol A-Control field in the draft to Command Control Indication:***

**9.2.4.6.4.1 General**

|  |  |  |  |
| --- | --- | --- | --- |
| **Control ID value** | **Meaning** | **Length of the Control Information subfield (bits)** | **Content of the Control Information subfield** |
| 0 | UL MU response scheduling | 26 | See 9.2.4.6.4.2 (UL MU response scheduling) |
| 1 | Operating mode | 12 | See 9.2.4.6.4.3 (Operating Mode) |
| 2 | HE link adaptation | 16 | See 9.2.4.6.4.4 (HE link adaptation) |
| 3 | Buffer Status Report (BSR) | 26 | See 9.2.4.6.4.5 (Buffer Status Report) |
| 4 | UL Power Headroom | 8 | See 9.2.4.6.4.6 (UL power headroom) |
| 5 | Bandwidth Query Report (BQR) | 10 | See 9.2.4.6.4.7 (Bandwidth Query Report (BQR)) |
| 6 | Command Control Indication | 8 | See 9.2.4.6.4.8 (Command Control Indication) |
| 7-15 |  |  |  |

**9.2.4.6.4.2 UL MU response scheduling**

**9.2.4.6.4.8 Control Command Indication**

***TGax editor: change B2 “reserved” of Figure 9-15i Control Information subfield format when Control ID subfield value is 6 to “SR\_PPDU Indication” and modify the text of the subclause as shown:***

The Control Information subfield, when the Control ID subfield is 6, contains the Control Command Indication field. The format of the Control Command Indication field is shown in Figure 9-15i (Control Information subfield format when the Control ID subfield is 6)

The AC Constraint subfield of the RDP field indicates whether the mapped AC of an RD Data frame is constrained to a single AC, and is defined in Table 9-10 (AC Constraint subfield values), except that a value of 1 indicates that the response from an HE STA contains Data frames from the same AC or higher AC as defined in 10.28.4 (Rules for RD responder).

The RDG/More PPDU subfield is defined in Table 9-11 (RDG/More PPDU subfield values).

The SR\_PPDU Indication subfield is defined in 9.2.4.6.4.2 (UL MU response scheduling).

**9.4.2.218.2 HE MAC Capabilities Information field**

***TGax editor: change one of the “reserved” bits of Figure 9-589ck HE MAC Capabilities Information field format to “SR Responder” and insert the following new row into the appropriate location within Table 9-262z Subfields of the HE MAC Capabilities Information field:***

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| SR Responder | Indicates support by the STA for the role of SR Responder. | Set to 1 if the STA supports the role of SR Responder.  Set to 0 otherwise. |

***TGax Editor: In TGa D1.0, modify subclause 27.9.2.1 General as shown:***

**27.9.2.1 General**

***TGax Editor: In TGa D1.0, modify subclause 27.11.6 SPATIAL\_REUSE 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).

An AP with dot11HESRPOptionImplemented set to true that transmits an HE ER PPDU should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DISALLOW.

A non-AP STA with dot11HESRPOptionImplemented set to true that transmits an HE SU PPDU, HE ER PPDU or HE MU PPDU should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DISALLOW.

An HE STA that transmits an HE Trigger-based PPDU determines the value of the TXVECTOR parameter SPATIAL\_REUSE according to 27.5.2.3 (STA behavior).

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 SR\_DISALLOW to forbid OBSS STAs from performing SRP-based SR transmission during the duration of the corresponding HE SU, HE ER, or HE MU PPDU.

An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DISALLOW for an NDP PPDU.

An HE STA shall set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DISALLOW for a PPDU containing an FTM or NDPA.

An HE STA that transmits a PPDU that contains a Trigger MPDU should set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DELAY.

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

An HE STA with dot11HESRPOptionImplemented set to false may set the TXVECTOR parameter SPATIAL\_REUSE to SR\_DISALLOW for any PPDU that is not an an HE Trigger-based PPDU or an NDP PPDU or a PPDU containing an FTM or NDPA.

An HE STA that has not set the value of the TXVECTOR parameter SPATIAL\_REUSE according to the rules listed above may set the parameter value to an integer in the range 1 to 14 as defined in Table 28-19 Spatial Reuse subfield encoding and the accompanying text of 28.3.10.7.2 (Content) and the SRP\_VALUE calculation:

An HE STA with dot11HESRPOptionImplemented set to true that transmits an HE PPDU may determine the value of the TXVECTOR parameter SPATIAL\_REUSE in each 20MHz bandwidth for 20MHz, 40MHz, 80 MHz PPDU or in each 40MHz bandwidth for 80+80 or 160 MHz PPDU by selecting the row in Table 28-19 (Spatial Reuse subfield encoding) 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\_VALUE as follows:

* SRP\_VALUE = TXPWRSTA + Acceptable Receiver Interference LevelSTA
* where
  + The TXPWRSTA is the transmit power in dBm at the output of the antenna connector normalized to 20MHz bandwidth (i.e., transmit power in dBm minus transmit bandwidth divided by 20MHz bandwidth in dB) of the AP sending the trigger frame.
  + Acceptable Receiver Interference LevelSTA is a value in dBm normalized to a 20MHz bandwidth (i.e., minus transmit bandwidth divided by 20MHz bandwidth in dB) for each 20MHz transmit bandwidth for 20MHz, 40MHz, and 80MHz PPDU or in each of the 40MHz transmit bandwidths for an 80+80MHz or 160 MHz PPDU and should be set to the ambient noise plus interference power level observed at the STA immediately prior to the transmission of the PPDU plus the SNR margin value which yields a 10% PER for the intended MCS(s) at the recipient, minus a safety margin value not to exceed 5 dB as determined by the STA.

**28.2.2 TXVECTOR and RXVECTOR parameters**

**TGax Editor: *Modify the row shown in Table 28-1 TXVECTOR and RXVECTOR parameters as shown, noting that the header row is shown for convenience only:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Condition** | **Value** | **TXVECTOR** | **RXVECTOR** |
| SPATIAL\_REUSE | FORMAT is HE\_SU, HE\_MU, HE\_EXT\_SU or HE\_TRIG | Indicates the spatial reuse parameter value. There is one value of the parameter present for each of an HE SU PPDU, HE extended range SU PPDU and HE MU PPDU. There are one to four values of the parameter present for an HE triggerbased PPDU, with the number of values depending on the bandwidth of the PPDU. See the Spatial Reuse field definition in 28.3.10.7.2 (Content).  See 27.5.2.3 (STA behaviour) and 27.11.6 (SPATIAL\_REUSE). | Y | Y |

**28.3.10.7.2 Content**

**TGax Editor: *Modify the row shown in Table 28-16 HE-SIG-A field of an HE SU PPDU and HE extended range SU PPDU as shown:***

**Table 28-16—HE-SIG-A field of an HE SU PPDU and HE extended range SU PPDU**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HE-SIG-A1 | B15-B18 | Spatial Reuse | 4 | Set to SR Disallow to disallow SRP-based spatial reuse (see 27.9.3 (SRP-based Spatial reuse operation) and 27.11.6 (SPATIAL\_REUSE)).  ~~NOTE—This part needs further development.~~  Set to value 1 to 14 corresponding to an SRP value (see Table 28-19 (Spatial Reuse subfield encoding)) to permit SRP-based SR operation.  Set to SR\_DELAY to indicate that the SR parameters are indicated in the common info field of Trigger MPDU(s) contained within the PPDU (see 27.9.2.1 (General) and 27.11a (TXVECTOR parameters SPATIAL\_REUSE for an HE PPDU)). |

**TGax Editor: *Modify the row shown in Table 28-17 HE-SIG-A field of an HE MU PPDU***

**Table 28-17—HE-SIG-A field of an HE MU PPDU**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HE-SIG-A1 | B11-B14 | Spatial Reuse | 4 | Set to SR Disallow to disallow SRP-based spatial reuse (see 27.9.3 (SRP-based Spatial reuse operation) and 27.11.6 (SPATIAL\_REUSE)).  ~~NOTE—This part needs further development.~~  Set to value 1 to 14 corresponding to SRP value (see Table 28-19 (Spatial Reuse subfield encoding)) to permit SRP-based SR operation.  Set to SR\_DELAY to indicate that the SR parameters are indicated in the common info field of Trigger MPDU(s) contained within the PPDU (see 27.9.2.1 (General) and 27.11a (TXVECTOR parameters SPATIAL\_REUSE for an HE PPDU)). |

**TGax Editor: *Modify the row shown in Table 28-19 Spatial Reuse subfield encoding:***

|  |  |
| --- | --- |
| **Value** | **Meaning** |
| 15 | SR\_DELAY |

**TGax Editor: *Add a new MIB variable in C.3 MIB Detail within the dot11HEStationConfigEntry group as shown:***

**C.3 MIB Detail**

dot11HESRPOptionImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable. Its value is determined by device capabilities.

This attribute, when true, indicates that the STA implementation is capable of transmitting Spatial Reuse Parameters in HE PPDUs. The capability is disabled, otherwise"

DEFVAL { false }

::= { dot11HEStationConfigEntry <XX>}

**End of proposed changes.**