### IEEE P802.11 Wireless LANs

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| **REVmd Assorted Comment Resolutions** | | | | |
| Date: 2018-09-09 | | | | |
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Abstract

This document contains proposed resolutions for several REVmd comments (18):

1. 1267, 1263, 1143, 1142, 1128, 1126, 1124, 1123, 1122, 1110
2. 1090, 1088, 1432, 1438, 1439, 1583, 1117, 1108

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| **CID** | **Commenter** | **Clause**  **Page**  **Line** | **Comment** | **Proposed Change** | **Proposed Change** |
| 1267 | Joseph Levy | 11.23.6.5  2143  20 | Calling a S1G 2, 4, 8, or 16 MHz off-channel TDLS direct link a "wide bandwidth off-channel direct link" seems a bit confusing.  I understand the need to allow for an off-channel direct link for S1G STAs, but shouldn't it be called something else.  Also the way the feature is implemented in the section 11.23.6.5 seems very awkward.  It would be better to add a new set of clauses for the "S1G off-channel direct link", which duplicate 11.23.6.5 with the S1G changes.  This would also eliminate the need to keep switching between VHT and S1G requirements. | Remove the (11ah) additions to 11.23.6.5 which added S1G to the wide bandwidth off-channel direct link and add a new section "11.23.6.6 Setting up a S1G off-channel direct link" with the S1G requirements. | Rejected - the wideband aspect is relative to the bandwidth of the base channel, and a wideband direct link is always wider than the base channel. The S1G modifications appear to have been added in a fairly natural way, so there would be no need to restructure the clause. |
| 1263 | Xiaofei Wang | 10.50.2  1921  25 | The reachable address update procedure may create an error in the following situation:  1. STA1 who is originally associated with relay AP1, moves to relay AP2, under the same root AP, without perfroming disassociation with relay AP1  2. relay AP2 performs reachable address update to the root AP based on condition 1) in L23  3. Before the max idle period expiry of STA1 in relay AP1, another STA2 associates with relay AP1  4. relay AP1 sends reachable address update frame containing "current list" STA1 and STA2 to root AP based on condition 1) in L23, overwriting the correct forwarding entry for STA1 in root AP  5. Later traffic to STA1 is forwarded to relay AP1, causing relay AP1 disassociation of STA1, which triggers another reachable address update frame sent to root AP, based on condition 2) in L23. This completely removes STA1 from root AP's "current list" of reachbale addresses | A potential solution may be:  An S1G relay STA shall send a Reachable Address Update frame that contains the modifications of reachable addresses to the AP to which it is associated when one of the following conditions occurs:  1)A new non-AP STA associates with the S1G relay AP of the relay  2)A non-AP STA is disassociated or deauthenticated from the S1G relay AP of the S1G relay  3)A Reachable Address Update frame is received at the S1G relay AP of the S1G relay    For condition 1) and 2), the reachable address update frame only contains the newly associated/disassocated STA addresses    For condition 3), the relay AP ignores/removes an address from the reachable address element with add/remove subfield set to 0,  from the received reachable address update frame, if the current forwarding relay for the address is not the same as the the STA sending the reachable address update frame to the relay AP | Revised - implement changes in https://mentor.ieee.org/802.11/dcn/18/11-18-1968-0x-000m-comment-resolution-for-cid-1263.docx, which clarify that the Reachable Address Update frame represents changes in the set of reachable addresses.  (separate motion) |
| 1143 | Robert Stacey | 9.9.1  1550  35 | There are 8 NDP CMAC control frames and 2 NDP CMAC management frames. Surely there is a general frame format -- an architecture -- behind this menagerie. | Define a general MAC frame format for CMAC frames. It looks like there might be two basic types: a 24-bit frame and a 36-bit frame (distinguished by the PPDU fomat that carrier them). Define a general MAC frame format for each -- this may just be a Frame Tpe field and Frame Body field. Define the Frame body for each of the individual frames (no need to show the Frame Type field for each since this is common to all) | Revised -  In Table 9-502 (NDP CMAC frame Type field values), delete all occurrences of "(control frame)" and "(management frame)".  In Table 9-502 (NDP CMAC frame Type field values), merge the two entries for Value 0 into a single Entry Value 0 with Meaning "NDP CTS or NDP CF-End" and See subclause "9.9.2.1 (NDP CTS), 9.9.2.2 (NDP CF-End)".  Merge 9.9.2 (NDP control frame details) and 9.9.3 (NDP management frame details) into a single clause 9.9.2 named "NDP CMAC frame details". (Remove heading 9.9.3 (NDP management frame details), renumber 9.9.3.x to 9.9.2.y, rename 9.9.2 (NDP control frame details) to 9.9.2 (NDP CMAC frame details).)  1634.50 change "NDP Control frame" to "NDP CMAC frame that is not an NDP Probe Request frame".  3133.29 change "Control NDP frame" to "NDP CMAC frame".  3153.30 change "Control NDP frame" to "NDP CMAC frame". |
| 1142 | Robert Stacey | 9.9  1550  10 | The (spec) architecture around NDP CMAC frames is misguided. NDP CMAC frames are another (MAC) frame format like the PV0 and PV1 formats. PV0 and PV1 frames go into an A-MPDU which becomes the PSDU  that is transferred to the PHY using the PHY SAP defined in Clause 8. Similarly,  NDP CMAC frames SHOULD become the PSDU that is trnasferred to the PHY using the PHY SAP. | Focus 9.9 on the frame formats. Remove references to figures and PPDU formats in Clause 23. Add a general statement: "NDP CMAC frames are carried in the S1G NDP PPDU". Remove the NDP\_CMAC\_FRAME\_BODY parameter from the TX/RXVECTOR. Add a description to 23.3.18 and 23.3.19 to descibe the mapping of the PSDU to and from the SIG field. | Rejected - insufficient detail. |
| 1128 | Robert Stacey | 9.8.1  1538  4 | Subclause 9.2.1 describes both PV0 and PV1 frames. 9.8.1 just repeats this for PV1 frames. | Remove 9.8.1 (including its content) | Rejected - 9.2.3 does not describe PV1 frames but refers to 9.8 for their definition. |
| 1126 | Robert Stacey | 9.4.1.48.2  889  54 | S1G band is not defined. Given the statement at P215L39 and the lack of global harminzation, it should probably be plural. | Define "S1G bands" as "Frequency bands below 1 GHz excluding the TV white space bands" or maybe "Frequency bands for which an S1G operating class is defined in Annex E." Replace "S1G band" with "S1G bands" throughout. | Revised - the S1G band may indeed have a different definition in different jurisdictions, but within a given S1G band the descriptions are correct.  In 3.2, add "S1G band Frequency band for which an S1G operating class is defined in Annex E."  879.30 change "non-S1G Band" to "a non-S1G band"  889.51 change "S1G Band" to "an S1G band"  889.54 add "an" before "S1G band"  1970.8 add "an" before "S1G band"  3168.51 add "an" before "S1G band"  3168.24 add "an" before "S1G band" |
| 1124 | Robert Stacey | 11.2.3.2  1969  52 | This seems to redefine "non-TIM STA". See P173L36. | Remove either this statement or the one at P173L36. | Rejected - The definition at 173.36 is a shorthand definition of a non-TIM STA. 11.2.3.2 provides the normative behavior. |
| 1123 | Robert Stacey | 11.2.3.2  1969  13 | It looks like paragraphs at L13, L19 and L32 describe a negotiation that establishes the type of PS mode used by the S1G non-AP STA. The sentence at L13 is thus inaccurate and the overall description could be better. Clarify if the procedure applies to both association and reassociation (some (Re) are missing). Define behavior for all possible cases: define what happens if the non-AP STA sends 0 and receives 1, and sends 1 and receives 0. | Change the sentence at L13 to read "An S1G non-AP STA determines the type of PS mode it uses (TIM mode or non-TIM mode) through the (Re)Association Request/(Re)Association Response frame exchange with the AP. The S1G non-AP STA may request operation in non-TIM mode by setting the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Request frame to 1. If the AP sets the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Response frame to 1 then the STA shall operate in the non-TIM mode following association. If the S1G non-AP STA sets the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Request frame to 0 or the S1G AP sets the Non-TIM Support field in the S1G Caapbilities element in the (Re)Association Response frame to 0, then the S1G non-AP STA shall operatin in the TIM mode following association. The S1G non-AP STA shall use the negotiated PS mode until either a new mode is negotiated through the PS mode switch (see ), a termporary PS mode switch has occured (see ) or the STA is disassociated. An S1G non-AP STA in non-TIM mode sets dot11NonTImModeActivated to true and sets it to false otherwise." And remove most of the other text. | Revised - agree with the comment. Make changes as shown in <this document> under CID 1123, which clean up this section based on the suggestions in the comment.  or  Rejected – the comment fails to specify specific editing instructions (specifically, “And remove most of the other text”). |
| 1122 | Robert Stacey | 11.2.3.2  1969  7 | It is not clear what "during the whole operation time" means in this context. | Remove here and at L11 | Accepted. |
| 1110 | Robert Stacey | 10.35.5.1  1785  48 | There are a number of problems here. Prodiving the reader with editing instructions is inappropriate and uneccessary. Placing this in a subclause titled "VHT sounding protocol" makes it hard for the S1G STA implementor to find it.  Referencing a subclause from within the subclause creates an infinite loop causing the reader's brain to explode (a reader that carried out the instruction would replace "with "VHT" is replaced with "S1G"" with "with "S1G" is replaced with "S1G"" is replaced with "with "S1G" is replaced with "S1G""... bang). | Add a new subclause "10.35.6a S1G sounding protocol" with the statements: "The VHT sounding protocol defined in 10.35.5 applies to an S1G STA with the following exceptions: [bullet] The STA transmitting the steering matrix is called the S1G beamformer but otherwise performs the role of the VHT beamformer [bullet] The STA for which reception is optimized is called the S1G beamformee but otherwise performs with role of the VHT beamformee [bullet] The MIB objects dot11S1GSUBeamformerOptionImplemented, dot11S1GMUBeamformerOptionImplemented, ... apply instead of  dot11VHTSUBeamformerOptionImplemented, dot11VHTMUBeamformerOptionImplemented, ..., respectively. [bullet] The SU Beamformer Capable, MU Beamformer Capable, ... fields of the S1G Capabilties element apply instead of the SU Beamformer Capable, MU Beamformer Capable, ... fields of the VHT Capabilities element. [bullet] An S1G NDP is used instead of a VHT NDP" Also, move the statements at P1786L25 and L30 into this new subclause. | Revised - the approach taken for S1G is similar to the approach taken for TVHT: "See 21.1.3.1 (General) with “TVHT” replacing “VHT”.".  However, the S1G replacement instruction in the cited location is indeed recursive. In addition, clause 10.32 (Link adaptation) has a slightly different set of replacement instructions, with a notable difference that it introduces an S1G NDP Announcement frame. But an S1G NDP Annoucement frame is not defined, there is only the VHT NDP Announcement frame with slightly different contents when transmitted in an S1G PPDU.  A pragmatic way to resolve at least the technical issues is by excluding the S1G replacement instruction from the text affected by the instruction, and to revert all uses of S1G NDP Announcement frame to VHT NDP Announcement frame. As an alternative, it is possible to introduce S1G names for the VHT NDP Announcement frame, VHT MIMO Control field and the VHT Compressed Beamforming Report field. The latter approach is taken in this comment resolution.  Change as shown in <this document> under CID 1110. |
| 1090 | Robert Stacey | 9.8.3.1  1538  43 | There is a problem with the grammar here, but more significantly, the exception is not well described. | "The general form of the Frame Control field of the PV1 MAC header for all PV1 frames except the PV1 Probe Request frame, PV1 Resrouce Allocation frame, and PV1 Control frames is defined in Figure 9-881. The Frame Control fields for the PV1 Probe Response frame, Reseource Allocation frame and PV1 Control frames are defined in 9.8.5.3, 9.8.5.4, and 9.8.4 respectively." | Revised - agree with the comment. Make changes as shown in <this document> under CID 1090. |
| 1088 | Robert Stacey | 9.8.1  1538  12 | What is an IEEE 32-bit CRC? Is it different from a 32-bit CRC based on ITU-T V.42 [B54] (P725L31)? We either need a reference for IEEE 32-bit CRC or we need to align the two definitions here. | Either align the definitions or provide a reference for IEEE 32-bit CRC. | Revised -  725.31 change "a 32-bit CRC based on ITU-T V.42 [B54]" to "a 32-bit CRC based on ITU-T V.42 [B54] (see 9.2.4.8 (FCS Field))".  1538.12 change "an IEEE 32-bit CRC" to "a 32-bit CRC based on ITU-T V.42 [B54] (see 9.2.4.8 (FCS Field))". |
| 1432 | Mark Rison |  | A PS-Poll can be sent as a non-HT duplicate, so the reason given for rejection of CID 7382 on 802.11mc is invalid | Delete the note referred to in CID 7382 on 802.11REVmc | Rejected - insufficient detail. |
| 1438 | Mark Rison | 3.2  161  21 | The definition of "base channel" is not clear. For example, in an 80 MHz BSS, with a STA that only supports 40 MHz but has sent an Notify Channel Width or Operating Mode Notification specifying 20 MHz, the "base channel" from that STA's perspective might be a 20, 40 or 80 MHz channel, depending on the intent | Change the definition at the referenced location to "Channel (including its current width) on which the tunneled direct-link setup (TDLS) peer station (STA) is associated with an access point (AP)."  In 11.21.1 after "The channel on which the AP operates is referred to as the base channel." add "However, when the STA is elsewhere in this specification referred to as switching back to the base channel, the STA may operate on a narrower channel." | Revised - the base channel is always a 20 MHz channel. This is specified in 11.21.1 (General), but indeed not very explicit from the definition of the base channel in 3.2.  Change as shown in <this document> under CID 1438. |
| 1439 | Mark Rison | 3.2  161  22 | The definition of "base channel" is not clear. The "base channel" varies when the STA's operating bandwidth changes (through Notify Channel Width or Operating Mode Notification) which leaves an issue with any existing TDLS link where one or the other device does not support "TDLS Wider Bandwidth" | In 11.21.1 after "The channel on which the AP operates is referred to as the base channel. " add "However, the base channel needs to take account of STAs that do not support the TDLS wider bandwidth mechanism." | Revised - the base channel is always a 20 MHz channel. This is specified in 11.21.1 (General), but indeed not very explicit from the definition of the base channel in 3.2.  Change as shown in <this document> under CID 1439. |
| 1583 | Mark Hamilton | 21.2.2  2901  50 | The USER\_POSITION array in Table 21-1 is very confusing. This is a "MU" entry, so there is one per user in an MU PPDU, indexed by 'u' (per the NOTE at the end). But, then what are these? And, the table row says they are specificied in ascending order. Of what, the values? So, this has to be 0,1,2,3 in order, always? What's the point, then? Something doesn't make sense. | Clarify how USER\_POSITION is different (or relates to) "u" which is already the index for a given user into array values that are "MU" in this table. | Revised - VHT DL MU-MIMO supports max. 4 users per transmissions. In order to identify which users are included in a particular DL MU-MIMO transmission, the AP sends the Group ID Management frame, which indicates the position of a user within each Group ID. For example, Group ID 12 may have STA1 in position 0, STA2 in position 1, STA3 in position 2 and STA4 in position 3. Then, when the VHT-SIG-A indicates Group ID = 12, STAs 1-4 know their user position to demodulate the packet (e.g. how to perform channel estimation to extract the correct spatial streams (potentially) addressed to it). However, there may be cases where even though a Group ID was assigned to 4 (or more) users, there is data for only, say, 3 users at the time of transmission. For example, continuing the case discussed above, AP finds that it has data for STA1, STA3 and STA4, but none for STA2. Then, the AP would be transmitting a VHT DL MU-MIMO packet using Group ID = 12, but with only 3 users. But the “user position” would be “0, 2, 3” (note that user position 1 is skipped). So, “u” would be 0, 1, 2 the PPDU, but “USER\_POSITION” would be 0, 2, 3.  Modify as shown under <this document> under CID 1583. |
| 1117 | Robert Stacey | 1296.48 | If a "non-TIM STA" is a temporary mode of operation (see definition at P173L36) and capabilities are presistent then how is this field to be interpreted? Also, the encoding does not match the description. | Change the definition to read "This bit indicates whether the STA supports the temporary PS Mode switch (see 10.44.2) while in non-TIM mode." Change the encoding to read "Set to 1 if supported." | Rejected - the cited location does not correspond to the comment and it is unclear which text the comment addresses. |
| 1108 | Robert Stacey | 4.3.14.1  215.64 | The statement "...if only 2 MHz channel width is supported" is not consistent with P215L48 "Mandatory support for 1 MHz and 2 MHz channel width" | Remove this statement and change the statement at P215L50 to "Mandatory support for the S1G\_1M and S1G\_SHORT PPDUs in all channel widths". Change the statement at L51 to "[bullet] Mandatory support for the S1G\_LONG PPDU in channel widths greater than 2 MHz [bullet] Optional support for the S1G\_LONG PPDU in 1 MHz and 2 MHz channel widths" | Revised - implement changes shown in <this document> under CID 1108, which are along the lines suggested in the comment. |

Changes with reference to REVmd draft 1.0.

**CID 1090**

Replace the first paragraph at 1539.43

The general format of the Frame Control field of the PV1 MAC header is shown in Figure 9-881 (Frame Control field(11ah)) except for the most significant octet of the Frame Control field of PV1 Probe Response frames (defined in 9.8.5.3 (PV1 Probe Response frame format)), Resource Allocation frames (defined in 9.8.5.4 (Resource Allocation frame format)), and PV1 Control frames (defined in 9.8.4 (PV1 Control frames)).

with

The Frame Control field of the PV1 MAC header for PV1 frames except the PV1 Probe Request frame, PV1 Resource Allocation frame, and PV1 Control frames, is defined in Figure 9-881 (Frame Control field).

The Frame Control field of the PV1 MAC header for the PV1 Probe Response frame, PV1 Resource Allocation frame and PV1 Control frames is defined in 9.8.5.3 (PV1 Probe Response frame format), 9.8.5.4 (Resource Allocation frame format), and 9.8.4 (PV1 Control frames), respectively.

**CID 1110**

At 1785.45 change as shown

For an S1G STA, the S1G sounding protocol is specified in 10.35.5 (VHT sounding protocol) with “VHT” replaced by “S1G”, except in this sentence.

At 784.1 change as shown

If the VHT NDP Announcement frame is transmitted in an S1G PPDU, the frame is referred to as an S1G NDP Announcement frame, and the format of the STA Info field is shown in Figure 9-56 (STA Info field in an S1G STA).

At 889.54 change as shown

In an S1G PPDU, the VHT Compressed Beamforming Report field is referred to as an S1G Compressed Beamforming Report field, and:

At 1517.42 add

When carried in an S1G PPDU, a VHT Compressed Beamforming frame is referred to as an S1G Compressed Beamforming frame, and a VHT MIMO Control field is referred to as an S1G MIMO Control field.

At 1517.42 add

When carried in an S1G PPDU, a VHT NDP Announcement frame is referred to as an S1G NDP Announcement frame.

**CID 1123**

At 1969.13 modify as shown

An S1G AP that sets the STA Type Support in transmitted S1G Capabilities elements to 0 or 1 shall set dot11NonTIMModeActivated to true and the Non-TIM Support field in the S1G Capabilities element to 1.

An S1G AP that sets the STA Type Support in transmitted S1G Capabilities elements to 2 may set dot11NonTIMModeActivated to false and the Non-TIM Support field in the S1G Capabilities element to 0.

An S1G AP that sets the STA Type Support in transmitted S1G Capabilities elements to 2 may set dot11NonTIMModeActivated to true and the Non-TIM Support field in the S1G Capabilities element to 1.

An S1G AP shall not set the Non-TIM Support field to 1 in response to a received Non-TIM Support field equal to 0.

An S1G AP that includes an AID Response element in a (Re)Association Response frame shall set the AID/Group AID field to the AID assigned to the (re)associating STA, the AID Switch Count field to 0, and the AID Response Interval field to the value of the Listen Interval field.

NOTE—The S1G AP can specify a listen interval that is different from the listen interval requested by the S1G non-AP STA in the (Re)Association Request frame if the AP can not buffer the S1G STA’s BUs for the requested listen interval.

An S1G non-AP STA requests the type of PS mode (TIM mode or non-TIM mode) through the (Re)Association Request frame transmitted to the S1G AP.

An S1G non-AP STA requests operation in non-TIM mode by setting the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Request frame to 1.

An S1G non-AP STA requests operation in TIM mode by setting the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Request frame to 0.

An S1G non-AP STA determines the type of PS mode (TIM mode or non-TIM mode) from the (Re)Association Response frame received from the S1G AP.

If an S1G AP sets the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Response frame to 1, then the S1G non-AP STA shall set dot11NonTIMModeActivated to true and operate in non-TIM mode following association, and is referred to as a non-TIM STA.

If an S1G AP sets the Non-TIM Support field in the S1G Capabilities element in the (Re)Association Response frame to 0, then the S1G non-AP STA shall set dot11NonTIMModeActivated to false and operate in TIM mode following association, and is referred to as a TIM STA.

An S1G non-AP STA shall operate in the negotiated PS mode during association unless a PS mode switch is negotiated as described in 10.20 (S1G dynamic AID assignment operation) or a temporary PS mode switch has occurred as described in 10.44.2 (Rescheduling of awake/doze cycle). The STA shall update the value of the ListenInterval parameter it uses in invocations of primitives with the value of the AID Response Interval field in the AID Response element of the (Re)Association Response frame.

A TIM STA listens to selected Beacon frames (based upon the ListenInterval parameter of the MLME-ASSOCIATE.request or MLME-REASSOCIATE.request primitive) and sends PS-Poll frames to the AP if the TIM element in the most recent Beacon frame indicates an individually addressed BU is buffered for that STA.

A non-TIM STA shall transmit at least one PS-Poll or trigger frame that is individually addressed to the associated AP every listen interval and might not listen to selected S1G Beacon frames (based upon the ListenInterval parameter of the MLME-ASSOCIATE.request or MLME-REASSOCIATE.request primitive) unless it follows the TWT or NDP Paging procedure.

A non-TIM STA may send (NDP) PS-Poll frames to an S1G AP regardless of whether individually addressed buffered BUs have been indicated by the S1G AP.

(11ah)non-traffic indication map (non-TIM) mode: A sub 1 GHz (S1G) non-access point (non-AP) station (STA) power save mode in which an S1G non-AP STA (Ed)needs not listen for traffic indication map (TIM) Beacon frames but transmits at least one PS-Poll or trigger frame to the associated AP every listen interval.

(11ah)non-traffic indication map (non-TIM) station (STA): A sub 1 GHz (S1G) non-access point (non-AP) station (STA) that has entered the non-TIM mode.

CID 1583

2901.50 change the USER\_POSITION row of Table 21-1—TXVECTOR and RXVECTOR parameters as shown.

|  |
| --- |
| ~~Index for user in MU transmission.~~ User position in MU transmission using the group ID GROUP\_ID.  Integer: range 0-3.    NOTE—The entries in the USER\_POSITION array are in ascending order. |

CID 1438, 1439

change as shown:

161.23

**base channel:** Primary channel of the basic service set (BSS) of the access point (AP) with which the tunneled direct-link setup (TDLS) peer station (STA) is associated.

176.59

**primary 20 MHz channel:** In a 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz very high throughput (VHT) basic service set (BSS), the 20 MHz channel that is used to transmit 20 MHz physical layer (PHY) protocol data units (PPDUs). In a VHT BSS, the primary 20 MHz channel is also the primary channel. In an HT or VHT BSS, the primary 20 MHz channel is also the primary channel.

1033.38

The TDLS Wider Bandwidth subfield indicates whether the STA supports a wider bandwidth than the BSS bandwidth for a TDLS direct link with a primary channel equal to the base channel. The field is set to 1 to indicate that the STA supports a wider bandwidth and to 0 to indicate that the STA does not support a wider bandwidth. A 160 MHz bandwidth is defined to be identical to an 80+80 MHz bandwidth (i.e., one is not wider than the other).

2134.59

The primary channel on which the AP operates is referred to as the base channel and a TDLS STA that operates on this channel is referred to as on the base channel. If the direct link is switched to a channel that is not the base channel, then this channel is referred to as the off-channel, and a TDLS STA that operates on this channel is referred to as off-channel.

CID 1108

215.47 change as shown

The main PHY features in an S1G STA are the following:

— Mandatory support for 1 MHz and 2 MHz channel width

— Mandatory support for S1G\_1M PPDU

— Mandatory support for S1G\_SHORT PPDU

— Mandatory support for S1G\_LONG PPDU if ≥ 4 MHz channel width is supported

— Mandatory support for detection and decode of SIG-A field of the S1G\_LONG preamble

— Mandatory support for single spatial stream S1G-MCS 0 to S1G-MCS 2 and S1G-MCS 10 (for 1 MHz PPDU only)

— Mandatory support for single spatial stream S1G-MCS 3 to S1G-MCS 7 for an S1G AP

— Mandatory support for binary convolutional coding

— Mandatory support for normal guard interval

— Mandatory support for fixed pilots

— Optional support for 2, 3 and 4 spatial streams (transmit and receive)

— Optional support for S1G\_LONG PPDU if ≥ 4 MHz channel width is not supported