IEEE P802.11  
Wireless LANs

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| --- | --- | --- | --- | --- |
| LB200 Proposed Resolutions for Subclause 9.46 SST | | | | |
| Date: 2013-12-24 | | | | |
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Abstract

Addressing almost all CIDs from LB200 which relate to subclause 9.46 and its sole subclause 9.46.1

**Revision Notes:**

R2:

added DEFVAL { false } to the MIB variable dot11SelectiveSubchannelTransmissionPermitted

Changed MIB group of MIB variable dot11SelectiveSubchannelTransmissionPermitted from dot11S1Gentry to dot11S1GStationConfigEntry

R1: per comments during review

R0: initial revision

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 TGah Draft. This introduction is not part of the adopted material.

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

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

**CID LIST:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1051 | Adrian Stephens | 194.30 | 9.46.1 | 9.46 introduces a number of new frame exchange sequences. Some help to understand these would be welcome. | Provide figures showing examples of the different types of operation provided by this feature. | Revise - TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID1051 |
| 1052 | Adrian Stephens | 194.40 | 9.46.1 | "T(S)BTT" - define this terminology somewhere | as in comment | Revise – generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID1052 |
| 1053 | Adrian Stephens | 194.51 | 9.46.1 | "An S1G AP that wishes to indicate to SST STAs the expectation of the transmission of frames by the AP within a beacon interval" --- anthropomorthism run riot. Now APs aparently have wishes and expectations. | Reword to avoid these terms. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1053 – just as an aside to the commenter, it should be noted that while one battle might have been won in this instance, there are 16 interesting occurrences of “wish” and 19 of “desire” and 7 of “want” in the baseline – maybe the 802.11 Editorial Style Guide should be updated to mention anthropomorphism, not that anyone ever reads that document, but hey! Soldier on! |
| 1054 | Adrian Stephens | 194.56 | 9.46.1 | "indicating the expected start times and channels of the transmissions in the Channel Activity Schedule field of the element." -- passive voice considered dangerous. Expected by whom? | Identify the subject of "expected" | Revise - replace “expected” with “estimated”, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID1054 |
| 1055 | Adrian Stephens | 195.06 | 9.46.1 | "as described in 8.4.2.170l." The cited reference doesn't apply to the entire sentence (i.e. "may include"). | Delete cited text and insert "(see 8.4.2.170l)" after "element". | Accept - TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID1055 |
| 1258 | Adrian Stephens | 194.30 | 9.46.1 | Remove this heading. without 9.46.2 it serves no purpose | As in comment | Accept - TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID1258 |
| 1356 | Ahmadreza Hedayat | 194.40 | 9.46 | This paragraph can be made clearer if the lengthy examples in the paranthesis are either rephrased or moved to the end of the paragraph. Ditto P194L58 to P195L2. | As in the comment | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1356 |
| 1357 | Ahmadreza Hedayat | 194.28 | 9.46 | The SST feature introduced in 11ah (from 12/1338r0) seem to be purely based on selective channel fading arguments. The authors of 12/1338r0 do mention the chance of increasing number of hidden nodes, however the subject is not treated well enough. SST increases the chance of hidden nodes multifold, and yet there is not MAC simulation in this document to evaluate the overall benefit of this feature. | Make an effort to justify the usefulness of this feature with a PHY/MAC simulation. | Reject - Hidden nodes are already possible under a multitude of conditions and scenarios within the current standard, and many mechanisms exist to deal with the hidden node problem when it does arise; These same mechanisms can be applied in the case of SST. The author does not provide any evidence for the claim that the chance of a hidden node is increased multifold by the SST mechanism and the author fails to note that SST behavior is controlled by the AP. |
| 1529 | amin jafarian | 194.28 | 9.46.1 | How does a STA that sends an NDP PS-Poll in the primary channel indicate its new temporary primary channel? Also it need to be clear which of the channel(s) in the Bitmap is (are) the primary channel(s). And if multiple primaries are possible at a given start time how to deal with hidden channel problem is not clear. What about PS-Poll frames? | As in comment | Revise - partially agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1529 - further details on the response of the task group to the commenter are as follows: The identification of the selected subchannel is stated in the draft as follows: “The transmission of frames on an allowed subchannel by an SST STA is an implicit indication to the AP as to the subchannel selection made by the SST STA. An SST STA may queue for transmission, a QoS NULL frame addressed to the AP for this purpose.” - Hidden node problems can be dealt with in a similar manner as is done with today’s standard. On the final question, it is not clear what the question is regarding PS-Poll frames. |
| 1530 | amin jafarian | 194.28 | 9.46.1 | Currently an AP that operates in a 1 or 2MHz BSS (e.g., in Japan, EU) cannot use SST procedure because the SST is binded to the BSS Operation Channel Width. In order to allow SST in these scenarios it is needed to define an SST Operation Channel Width which is not limited to the BSS Operation Channel Width. | Enable SST operation in 1 or 2MHz BSS. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1530 |
| 1531 | amin jafarian | 194.40 | 9.46.1 | Do all the beacons sent in parallel or in series contain the same information i.e., same SST element? It seems that if the beacons are sent in series the SST element included may contain information only for the channel where that particular beacon is sent. | clarify whether beacons sent at T(S)BTT have same content. | Revise - TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID1531 |
| 1532 | amin jafarian | 194.40 | 9.46.1 | Not clear whether there is an impact on non-SST devices operation when the AP implements SST | Clarify whether SST impacts non-SST STAs behavior. | Revise - the primary channel does not move, so the non-SST STAs obey the rules found in 10.47.1, which this document updates for completeness. TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1532 |
| 1533 | amin jafarian | 194.50 | 9.46.1 | Second sentence is too long. Also it is not clear what "wishes" means from a device point of view. | Replace second sentence with: "An S1G AP indicates to SST STAs that it may transmit sounding frames within the beacon interval by including an SST element in the (Short) Beacon that immediately precedes the beacon interval. The SST element indicates the expected start times and the channels where these sounding frames may be transmitted, in the Channel Activity Schedule field of the SST element. These sounding frames can be used to estimate the channel parameters that may be used as input to an operating channel selection algorithm by the SST STAs." | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1533 |
| 1534 | amin jafarian | 195.30 | 9.46.1 | Sounding frames are sent with a PIFS separation. What is the AP's behavior when the channel is busy during PIFS? | Some more clarification is needed w.r.t sounding for SST. | Revise - resolution provides clarity, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1534 |
| 1535 | amin jafarian | 195.50 | 9.46.1 | TBTT should be T(S)BTT | As in comment. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 1535 |
| 2028 | Hyoungjin Kwon | 224.37 | 9.46.1 | Define what the NDP packet for SST sounding is. S1G NDP is recommeded because SST STA can consider subchannel selection as well as antenna selection. | Define S1G NDP as packet for SST sounding | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2028 |
| 2147 | kaiying Lv | 195.44 | 9.46 Subchannel Selective Transmission (SST) | The whole paragraph is confusing on using "local (short) Beacon", "local Beacon", "(short) Beacon", "T(S)BTT" and "TBTT" | Modify the paragraph with consistent statement | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2147 |
| 2577 | Mitsuru Iwaoka | 195.61 | 9.46.1 | The 3rd last paragraph of 9.46.1 specifies as an SST STA that has selected a channel of operation that is not the primary channel for the BSS shall operate on the selected channel as though the channel is the primary channel of the BSS. This specification may cause different non-AP STAs select different primary channels in the SST duration., and may transmit UL PPDU concurrently. For example, in a 4MHz BSS, if AP includes an SST element in a Beacon with the Maximum Transmission Width = 2MHz and the Channel Activity Bitmap = "11000000", one non-AP STA may select lowest operating channel of BSS as primary channel, and another non-AP STA may select highest operating channel of BSS as primary channel. These two non-AP STAs can start UL transmission in the same time. The AP may not be able to receive these concurrently received PPDUs. If the AP can receive these two PPDUs, the AP cannot send immediate ACK to the STA which send the shorter PPDU, while the AP is receiving another PPDU. It is necessary to specify only one primary channel is active in SST. | 1) Modify the 8.4.2.170l (Subchannel Selective Transmission element) as following:  a) Replace "Channel Activity Bitmap" in Figure 8-401dk (Page 109, Line 35) and Figure 8-401dl (Page 110, Line 47) by two 4bit width subfields "Active Subchannel Offset" and "Temporary Primary Channel".  b) Replace the 5th paragraph (Page 109, Line 48) by a following text: --- The Active Subchannel Offset subfield indicates the offset of the lowest numbered channel on which transmission activity is expected or permitted at a given time in MHz, from the lowest numbered operating channel of the BSS. The set of channels on which transmission activity is expected or permitted at a given time includes channels corresponds to Maximum permitted PPDU bandwidth.  The Temporary Primary Channel subfield indicates the offset of the temporary primary channel used at a given time in MHz, from the lowest numbered operating channel of the BSS. ---   c) Replace the 4th last paragraph (Page 110, Line 59) by following text: --- The Active Subchannel Offset subfield indicates the offset of the lowest numbered channel on which an SST sounding transmission activity is performed at a given time in MHz, from the lowest numbered operating channel of the BSS. The set of channels on which an SST sounding transmission activity is performed at a given time includes channels corresponds to Maximum permitted PPDU bandwidth.  The Temporary Primary Channel subfield indicates the offset of the temporary primary channel used at a given time in MHz, from the lowest numbered operating channel of the BSS. ---   d) Replace "Channel Activity Bitmap" by "Active Subchannel Offset, Temporary Primary Channel, ".  2) Modify the 9.46.1 according to the modification of 8.4.2.170l. Details are TBD.  [Note] This proposed change may conflict with other comments to 8.4.2.170b and 8.4.2.170j. | Reject - the behavior described is identical to any existing hidden node scenario, where two STAs can start their transmissions to the AP at the same time. In the case when one STA is closer electromagnetically to the AP, the AP is likely to receive the UL transmission from that STA. There might or might not be errors in the reception. The SST procedure does not create a new problem. If an AP wishes to reduce the probability of occurrence of an SST-based hidden node issue, the AP is free to set only one bit in the bitmap at a time. |
| 2578 | Mitsuru Iwaoka | 195.58 | 9.46.1 | The 4th last paragraph of 9.46.1 says that an SST STA which selected its best channel(s) may report its selection to the AP on the primary channel of the BSS. Though, there is no method defined other than TWT request. | Define an S1G Subchannel Feedback frame as the S1G Action frame, and define the procedure to feedback subchannel selection. Details are TBD. | Revise - the text does describes a method for communicating this information already but an explicit mechanism is added as an option, but using a different method than the commenter proposed - see NDP-PS-Poll and UDI field changes. TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2578 |
| 2588 | Mitsuru Iwaoka | 194.28 | 9.46 | The current draft specifies three methods of SST, including SST element in a Beacon, including a Channel Indication subfield in a RPS element, and including a TWT Channels subfield in a TWT element. It is better to define a new field format in 8.4.1 which is commonly used in the SST element, the RPS element, and the TWT element. | 1) Insert a new subclause 8.4.1.55 (Subchannel Indication field), and specify the Subchannel Indication field which includes following fields: --- Actoive Subchannel Offset: 4 bits Primary Channel Offset: 4 bits UL Activity : 1 bit DL Activity : 1 bit Maximum Transmission Width : 2 bits --- (Note: The definitions of Actoive Subchannel Offset subfield and Primary Channel Offset subfield are proposed in another comment for 9.46.1)  2) Modify the 8.4.2.170b (RPS element), 8.4.2.170j (TWT element), 8.4.2.170l (Subchannel Selective Transmission element), and 9.46 to use Subchannel Indication field.  Details are TBD. | Revise - see 11-14-0485r0. |
| 2764 | SHOUKANG ZHENG | 195.28 | 9.46.1 | Need to clarify e.g. "the SST sounding sequence within the Sounding RAW comprises a series of PIFS-separated NDP frames (e.g., NDP CTS frames), " | Please clarify | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2764 |
| 2785 | Shusaku Shimada | 194.40 | 9.46.1 | T(S)BTT should be changed to "TBTT or TSBTT", and TSBTT should be listed in 3.3 Abbreviations and acronyms and defined clearly. | Change "T(S)BTT" to "TBTT or TSBTT" | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2785 |
| 2918 | Young Hoon Kwon | 195.32 | 9.46.1 | It is not clear "Non-AP STAs" that are prohibited from transmitting is limited to those STAs within the BSS. It needs further clarification. | As mentioned in the Comment. | Revise - generally agree with commenter tha the text is vague, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2918 which delete the text in question. |
| 2919 | Young Hoon Kwon | 195.44 | 9.46.1 | It is not clear if an SST STA can select more than one channels, which are not adjacent to each other, from the allowed operating channels of the BSS. It needs further clarification. | As mentioned in the Comment. | Reject - the text is clear. There is no qualifier for “one or more channels” and therefore adjacency is not restricted. |
| 2525 | Minho Cheong | 194.00 | 9.46 | It is needed to define the detailed SIG format of NDP packets for sounding for SST operation | Describe in detail how to report the selected best sub-channel to AP | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2525 |
| 2526 | Minho Cheong | 194.00 | 9.46 | It is needed to define a very short effcient packet to report the selected sub-channel to AP when SST operation. It may be better if we can protect those packets in a RAW (report RAW). | Define a very short effcient packet to report the selected sub-channel to AP when SST operation. Protect those packets in a new type of RAW (report RAW). | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2526 |
| 2533 | Minho Cheong | 194.00 | 9.46 | It is uncertain whether possible to transmit on 4/8MHz channels which consists only secondary sub-channels and not aligned to the normal primary/secondary channel grid | Define channel setting (primary/secondary) rule for the frequency resource to which SST is applied | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-0610r1 found under all headings which include CID 2533 |
| 2049 | Jae Seung Lee | 196.15 | 9.47 | There may be STAs that do not check beacons and do not support RAW or TWT. Such STAs do not know which subchannel is being used for transmission during a specific RAW under SST operation. If the AP is transmitting in the non-primary channel in the specific RAW duration, the STAs cannot find the AP. It may keep transmit/retransmit to the AP and cannot get any responses from it. A mechansim to prevent access by STAs that do not support RAW or TWT during SST operation should be added. | Add a mechansim to prevent access by STAs that do not support RAW or TWT during SST operation. | Reject - a STA that chooses to forgo the reception of beacons has accepted the tradeoff of being unaware of RAW and other dynamic information within the beacon that might help to reduce the probability of interference with scheduled operations in the BSS. |
| 2964 | Zhongding Lei | 194.00 | 9.46 | As SST sounding can be over multiple beacon intervals, SST operation may be extended beyond one beacon interval. | Increase time span of SST operation. | See separate submission - this comment is not addressed by this document. |

**Discussion**

**Propsed changes**

**CID 1052, 2785**

Note that a different CID proposes to add TSBTT to subclause 3.3, this proposed resolution adds T(S)TBTT, which is a distinct definition from TSBTT.

***TGah editor: add another definition to subclause 3.3 Abbrevications and acronyms of TGah D1.1as shown:***

3.3 Abbreviations and acronyms

T(S)BTT TBTT or TSBTT

**CID 1530**

* **General**

**Instructions to TGah Editor*: Insert the following row in Table 8-55:***

|  |  |  |  |
| --- | --- | --- | --- |
| * **Element IDs (continued)** | | | |
| **Element** | **Element ID** | **Length of indicated element (in octets)** | **Extensible** |
| Group ID List | <ANA> | 0-255 | Yes |
| S1G Operation(#863,866) | <ANA> | TBD |  |
| SST Operation | <ANA> | 4 | No |

**Instructions to TGah Editor*: Insert the following subclause immediately after 8.4.2.170w:***

**8.4.2.170y SST Operation element**

The Subchannel Selective Transmission (SST) Operation element is shown in Figure 8-401ed (SST Operation element format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 B7 | B8 B15 | B16 B23 | B24 B26 | B27 | B28 B31 |
|  | Element ID | Length | SST Enabled Channel Bitmap | Primary Channel Offset | SST Channel Unit | Reserved |
| Bits: | 8 | 8 | 8 | 3 | 1 | 4 |
| **Figure 8-401ed – SST Operation element format** | | | | | | |

The Element ID and Length fields are defined in 8.4.2.1 (General).

The SST Enabled Channel Bitmap field is 8 bits in length and contains a bitmap indicating which channels are enabled for SST operation. Each bit in the bitmap corresponds to one channel of width equal to the value of SST Channel Unit field, with the least significant bit corresponding to the lowest numbered subchannel in the SST Enabled Channel Bitmap. The channel number of each of the channels in the SST Enabled Channel Bitmap is equal to PCN minus PCO plus POS, where PCN is the value of the Primary Channel Number subfield in the most recently transmitted S1G Operation element, PCO is the value of the Primary Channel Offset field and POS is the position of the channel in the bitmap. A value of 1 in a bit position in the bitmap indicates that the subchannel is enabled for SST operation but transmissions from SST STAs in that subchannel are allowed subject to the rules defined in 9.46 (Subchannel Selective Transmission (SST)). More than one bit in the bitmap can be set to 1.

NOTE - transmissions need to comply with the channelization for the regulatory domain of operation.

The Primary Channel Offset field is 3 bits in length and indicates the relative position of the primary channel with respect to the lowest numbered channel in the SST Enabled Channel Bitmap field. For example, a value of the Primary Channel Offset equal to 2 indicates that the primary channel is the third subchannel in the SST Enabled Channel Bitmap.

The SST Channel Unit field is 1 bit in length and indicates the channel width unit of each SST channel. A value of 1 indicates that the channel width unit is 1 MHz and a value of 0 indicates that the channel width unit is 2 MHz.

The Reserved field is 4 bits in length.

**CID 1052, 1053, 1054, 1055, 1258, 1356, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 2028, 2147, 2764, 2785, 2578, 2918**

***TGah editor: modify subclause 9.46 Subchannel Selective Transmission (SST) of TGah D1.1as shown:***

9.47 Subchannel Selective Transmission (SST)

**~~9.46.1 Overview~~**

S1G STAs that are associated with an S1G AP transmit and receive on the channel or channels that are indicated by the AP as the allowed operating channels for the BSS in the most recently transmitted S1G Operation element except when the AP sets up an SST BSS, in which case, the SST STAs can operate on any channel that is indicated by the AP as the enabled SST operating channels for the SST BSS subject to the rules defined below.

An SST BSS is an S1G BSS for which the following conditions are satisfied:

1) The BSS operating channel width indicated in the Channel Width field of the S1G Operation Information element transmitted by the AP is less than or equal to 2 MHz.

2) The SST AP indicates that it enables SST operation by including the SST Operation element in the (Re-) Association Response frame sent to the non-AP STA.

3) The SST AP and the associated SST STAs shall align their TX LO center frequency with either:

a) 1MHz channelization boundary if the SST Channel Unit in the SST Operation element is equal to 1

b) 2MHz channelization boundary if the SST Channel Unit in the SST Operation element is equal to 0

An SST AP is an S1G AP with dot11SelectiveSubchannelTransmissionPermitted equal to true.

An SST AP that sets up an SST BSS shall include the SST Operation element in (Re-) Association Response frames sent during association. The S1G AP may include the SST Operation element in S1G Beacon frames. The SST AP indicates the set of enabled SST operating channels, the offset of the primary channel, and the channel width unit in the SST Operation element as described in 8.4.2.170y (SST Operation element). The set of enabled SST operating channels may include channels that are not in use by the BSS as specified by the SST Enabled Channel bitmap of the element. The SST AP that sets up an SST BSS shall choose the subset of allowed SST operating channels from the subset of enabled SST operating channels indicated in the SST Operation element. The set of enabled SST operating channels indicated by the AP is not static.

An SST STA is an S1G STA that is associated with an AP and that chooses a subset of the allowed operating channels for the SST on which to operate when SST operation is activated by the AP as indicated in the Subchannel Selective Transmission element. The set of allowed SST channels indicated by the AP is dynamic and may change every (short) becon interval.

At each T(S)BTT, an SST AP may send S1G Beacon frames on more than one channel from the set of allowed operating channels for the BSS either in parallel ~~(e.g. with a value of S1G\_DUP\_2M for the TXVECTOR parameter FORMAT and a value of CBW8 for the TXVECTOR parameter CH\_ BANDWIDTH in a BSS with an operating width of 8 MHz)~~ or in series ~~(e.g. sequential transmissions, each with a value of S1G\_DUP\_2M for the TXVECTOR parameter FORMAT and a value of CBW2 for the TXVECTOR parameter CH\_ BANDWIDTH and each transmitted on a different 2 MHz subchannel in a BSS with an 8 MHz operating width)~~ or a combination of the two. An example of Beacons sent in parallel is when one Beacon is transmitted with a value of S1G\_DUP\_2M for the TXVECTOR parameter FORMAT and a value of CBW8 for the TXVECTOR parameter CH\_ BANDWIDTH in a BSS with an operating width of 8 MHz. An example of Beacons sent in series is when several different Beacons are transmitted in sequence, each with a value of S1G\_DUP\_2M for the TXVECTOR parameter FORMAT and a value of CBW2 for the TXVECTOR parameter CH\_ BANDWIDTH and each transmitted on a different 2 MHz subchannel in a BSS with an 8 MHz operating width. When Beacons are transmited in series, all of the Beacons may be queued for transmission at T(S)BTT, but only one Beacon is transmited at a time. SIFS after any Beacon in the series is transmitted, another Beacon may be transmitted in the series, provided that normal medium access rules for the channel of transmission of the Beacon have been satisfied.

An SST AP ~~that wishes to allow SST operation within a beacon interva~~shall include the SST element in the S1G Beacon frame that immediately precedes ~~the~~a (short) beacon interval to allow SST operation within that (short) beacon interval (see figure 9-xxx ***Selective Subchannel Transmission channel transmission permission allocations from SST element***).

NOTE – In an SST BSS, the SST AP indicates the set of enabled SST operating channels in an SST Operation element and the subset of SST channels that SST STAs are allowed to access during a (short) beacon interval in the SST element. SST STAs are allowed to access an SST channel during a (short) beacon interval only if they have received an explicit indication by the SST AP via an SST element included in the S1G Beacon that precedes the (short) beacon interval.

An SST AP may include an SST element in transmitted S1G Beacon frames. An SST AP includes an SST element with the DL bit in the SST element set to 1 and estimated start times and SST channels for DL transmissions in the Channel Activity Schedule field to indicate the expected times for the transmission of DL frames. These frames can be used by the SST STAs to estimate the channel parameters which can be used as input to an algorithm for the selection of an operating channel.~~shall include the SST element in the (short) Beacon that immediately precedes the beacon interval, indicating the estimated expected start times and channels of the transmissions in the Channel Activity Schedule field of the element~~. The AP may transmit sounding frames to SST STAs for the purpose of estimating channel parameters. The AP may transmit sounding frames for SST STA channel estimation either in parallel ~~(e.g. with a value of S1G\_DUP\_2M for the TXVECTOR parameter FORMAT and a value of CBW8 for the TXVECTOR parameter CH\_ BANDWIDTH in a BSS with an operating width of 8 MHz)~~ or in series ~~(e.g. sequential transmissions, each with a value of S1G\_DUP\_2M for the TXVECTOR parameter FORMAT and a value of CBW2 for the TXVECTOR parameter CH\_BANDWIDTH and each transmitted on a different 2 MHz subchannel in a BSS with an 8 MHz operating width)~~ or a combination of the two.

An S1G AP may include a SST element (see 8.4.2.170l) in aS1G Beacon to indicate on which channels an SST STA is allowed to transmit within the BSS or SST BSS ~~as described in 8.4.2.170l~~.

An S1G AP may indicate on which SST channels it intends to transmit sounding and non-sounding frames following the transmission of an S1G Beacon frame by including a SST element in the S1G Beacon frame with a non-zero value in at least one Channel Activity bitmap subfield and a value of 1 in the corresponding DL Activity subfield. An SST STA may choose the best SST channel for transmissions based on its analysis of the sounding signals and received transmissions.

In an SST BSS, an SST STA shall not transmit in a channel that is not the primary channel of the BSS, for which the corresponding bit of the SST Channel Activity Bitmap is 0 in the most recently received SST element from its associated AP. An SST STA shall not transmit using a channel width that is greater than the value of the SST Channel Unit indicated in the most recently received SST Operation element from its associated AP.

When no SST Operation element has been received by an SST STA from its associated AP, the STA shall not transmit a frame with a BSSID that is equal to the BSSID of the BSS with which the STA is associated, in a channel of operation that is not a channel of operation of the BSS.

If the frames that are transmitted by an S1G AP in response to an announcement of transmission activity within a SST element are sounding frames, the S1G AP shall use the same value for the TXPWER\_LEVEL parameter of the TXVECTOR for each of the sounding frame transmissions associated with the SSTelement announcement. An S1G AP should transmit SST sounding frames at times and on SST channels indicated for downlink activity in SST elements that it transmits.

The AP may signal the presence of a RAW for the purpose of SST sounding for a group of STAs using a unified sounding RAW as indicated within a transmitted RPS information element. Such a Sounding RAW may be scheduled for periodic or non-periodic operation. An additional RAW may be scheduled after the Sounding RAW for the transmission of S1G NDP MAC frames (e.g., NDP PS-Poll) by SST STAs on their selected channel(s) for the purpose of communicating a selected subchannel to the AP. The AP is not required to use a RAW for SST sounding.

When the AP uses a RAW for SST sounding, the RAW Type is Sounding RAW and the RAW Type Options subfield is set to SST Sounding RAW in the RPS information element (See 8.4.2.170a (RPS element)) transmitted by the AP, the SST sounding sequence within the Sounding RAW comprises a series of ~~PIFS-separated~~ S1G NDP MAC frames (e.g., NDP CTS frames), each transmitted on one of the channels among those indicated by the Channel Indication field of the RAW, starting with lowest frequency channel and continuing in sequence with the next higher frequency channel if more than one channel is indicated. The RPS element for the SST sounding RAW specifies a start time, channel(s) and RAW duration for each RAW assignment. The AP shall not transmit any S1G NDP MAC frame on a channel within an SST sounding RAW before PIFS. If the AP does not observe an idle medium condition within one slottime after switching to a channel, then the AP shall not transmit an NDP, but shall wait for the duration of an NDP before switching to the next channel. This allows listening SST STAs to predict the timing of the sounding transmission for each channel. An AP may schedule multiple SST sounding RAWs to increase the probability that a sounding frame is transmitted on each SST channel. The amount of time allocated in the Sounding RAW for the channel switch operations performed by the AP is implementation dependent, and is calculated at the non-AP STA by subtracting the value N \* (PIFS + NDPTxTime) from the total RAW duration and dividing the result by N-1, where N is the number of channels to be sounded..~~but SST-capable devices may listen to the sounding sequence that is transmitted during the RAW.~~

~~An S1G AP may include a Subchannel Selective Transmission element in a (short) Beacon to indicate the a schedule of SST sounding and other transmissions schedule and transmit subsequent sounding signals (e.g., NDP frame) at a given time which can be used for sounding as described in 8.4.2.170l (Subchannel Selective Transmission element). An SST STA may choose the best subchannel for transmissions based on its analysis of the sounding signals and received transmissions.~~

When the AP uses a RAW for SST operation and the RAW is not a sounding RAW, then the RAW Type is Generic RAW and the Channel Indication Presence bit is set to 1 and the number of channels indicated in the Channel Indication in the RPS information element (See 8.4.2.170a (RPS element)) transmitted by the AP shall be one, unless there is only one STA assigned to each slot in the RAW defined by the RPS element. An AP shall not schedule any non-SST STA within a RAW that has a Channel Indication Presence bit equal to 1.

A local S1G Beacon is one that was ~~is~~ transmitted by the AP with which a STA is associated.

An SST STA may select one or more SST channels from the enabled SST operating channels as indicated in the SST Operation element transmitted by ~~BSS corresponding to~~ the SST AP with which it is associated. The SST STA may ~~and~~ operate on those SST channels for the (short) beacon interval following a T(S)BTT if a local S1G Beacon with an SST element indicating that the enabled SST channel(s) are ~~as~~ allowed for SST operation has been received by the SST STA during that (short) beacon interval. The STA shall not transmit frames on the indicated allowed SST channels with a bandwidth that is greater than the Maximum Transmission Width specified in the SST element. If no local S1G Beacon is received following a T(S)BTT, then no SST STA transmission is allowed during the (short) beacon interval that begins at that T(S)BTT. If an SST STA receives a local S1G Beacon which contains no SST element, the SST STA may transmit on the primary channel of the BSS a PPDU of width up to the BSS bandwidth indicated in the S1G Beacon frame during the (short) beacon interval that immediatelyfollows the reception of the S1G Beacon frame.

An SST STA that has selected an SST operating channel that is not the primary channel for the BSS shall operate on the selected channel as though the channel is the primary channel of the BSS, but only at the times allowed for operation on the selected channel as indicated in this subclause.

SST operating SST by sending an NDP PS-Poll frame, which includes the selected SST channel offset, in the UDI field The transmission of any frame on an allowed subchannel by an SST STA is an implicit indication to the AP as to the subchannel selection made by the SST STA. An SST STA may queue for transmission, a QoS NULL frame addressed to the AP for this purpose. To avoid ambiguity in which subchannel has been selected by the STA as its primary channel, the STA can send the frame using the minimum width channel for the band of operation.

An SST STA that has selected a subchannel for operation should operate on that subchannel during times indicated for permitted downlink and uplink operation according to the DL Activity and UL Activity fields and the Activity Start Time field in the SST element. An AP should transmit frames to SST STA on their selected subchannels.

An SST STA shall not transmit to the AP on an SST operating channel that is not indicated as allowed by the AP in the SST element or SST Operation element.

***TGah editor: change the 4th paragraph of subclause 9.21.5.1 General of TGah D1.3 as shown:***

9.21.5.1 General

~~But, a~~A STA ~~not within~~ that is not a member of the group indicated by the RAW Group subfield in the RAW Assignment field of the RPS element shall not access the WM in the indicated channels of the RPS element or in the BSS operating channel if there are no indicated channels for duration of the RAW ~~duration~~, except for a STA that is allowed not to check the beacon (e.g. non-TIM STA).)

***TGah editor: modify subclause 10.47.1 Basic S1G BSS functionality of TGah D1.3 as shown:***

**10.47.1 Basic S1G BSS functionality**

An S1G STA that is a member of an S1G BSS with a 1 MHz, 2 MHz, 4 MHz, 8 MHz or 16 MHz operating channel width and 1 MHz primary channel width shall not transmit a 1 MHz S1G PPDU that does not use the primary 1 MHz channel of the BSS, except for a 1 MHz S1G PPDU transmission on an off-channel TDLS direct link as constrained by 10.22.6.4.2 (Basic wideband functionality) or a 1 MHz S1G PPDU transmission by an SST STA as constrained by 9.47 (Subchannel Selective Transmission (SST)).

An S1G STA that is a member of an S1G BSS with a 1 MHz, 2 MHz, 4 MHz, 8 MHz or 16 MHz operating channel width and 2 MHz primary channel width shall not transmit a 1 MHz S1G PPDU, except for a 1 MHz S1G PPDU transmission on an off-channel TDLS direct link or a 1 MHz S1G PPDU transmission by an SST STA as constrained by 9.47 (Subchannel Selective Transmission (SST)).

An S1G STA that is a member of an S1G BSS with a 2 MHz, 4 MHz, 8 MHz or 16 MHz operating channel width shall not transmit a 2 MHz S1G PPDU that does not use the primary 2 MHz channel of the BSS, except for a 2 MHz S1G PPDU transmission either on an off-channel TDLS direct link or a 2 MHz S1G PPDU transmission by an SST STA as constrained by 9.47 (Subchannel Selective Transmission (SST)).

An S1G STA that is a member of an S1G BSS with a 4 MHz, 8 MHz or 16 MHz operating channel width shall not transmit a 4 MHz S1G PPDU that does not use the primary 4 MHz channel of the BSS, except for a 4 MHz S1G PPDU transmission either on an off-channel TDLS direct link or by an SST STA as constrained by 9.47 (Subchannel Selective Transmission (SST)).

An S1G STA that is a member of an S1G BSS with an 8 MHz or 16 MHz operating channel width shall not transmit an 8 MHz S1G PPDU that does not use the primary 8 MHz channel of the BSS, except for an 8 MHz S1G PPDU transmission either on an off-channel TDLS direct link or on a permitted channel of the SST operation.

An S1G STA that is a member of an S1G BSS with a 16 MHz operating channel width shall not transmit a 16 MHz S1G PPDU that does not use the primary 8 MHz channel and the secondary 8 MHz channel of the BSS, except for a 16 MHz S1G PPDU transmission either on an off-channel TDLS direct link or by an SST STA as constrained by 9.47 (Subchannel Selective Transmission (SST)).

***TGah editor: Insert the following row in Beacon frame body, (Re-) Association Response frame body (Tables 8-24, 8-26 and Table 8-30):***

|  |  |  |
| --- | --- | --- |
| <XYZ> | SST Operation element | The SST Operation element is present if dot11SelectiveSubchannelTransmissionPermitted is true. |

***TGah editor: Change the following row inTable 8-45 (NDP MAC frame body for NDP PS-Poll (>=2MHz):***

|  |  |  |
| --- | --- | --- |
| UDI | 12 | The Uplink Data Indicator (UDI) subfield indicates if the STA has uplink data to transmit and is used by an SST STA to indicate its selected SST channel.  Set to 0: No uplink data  Set to 1: Uplink data present but estimated time for the transmission not determined.  Set from 2 to 9: Indicates the relative position of the selected SST channel with respect to the lowest numbered channel in the SST Enabled Channel Bitmap field of a received SST Operation element. For example, a value of the UDI equal to 2 indicates that the selected SST channel is the first channel in the SST Enabled Channel Bitmap.  Set to >9: Uplink data present and the estimated time required for the transmission of uplink data frames in unit of 40 usec excluding its reponse and applicable IFS durations. |

***TGah editor: add a new MIB variable to C.3 MIB Detail as shown:***

**C.3 MIB Detail**

dot11SelectiveSubchannelTransmissionPermitted OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

When this object is true, this indicates that Selective Subchannel Transmisison is permitted by this entity.

DEFVAL { false }

."

::= { dot11S1GStationConfigEntry <ANA> }

**CID 1051**

***TGah editor: add a new figure within subclause 9.46 Subchannel Selective Transmission (SST) as shown, labelling it as “Figure 9-xx Selective Subchannel Transmission channel transmission permission allocations from SST element.”:***

Ch 1

Beacon

Ch 2

Ch 4

Ch 3

TX Allowed on Ch 1

BSS Width

SST Width

TX Allowed on Ch 2

TX Allowed on Ch 3

TX Allowed on Ch 4

**References:**