IEEE P802.11  
Wireless LANs

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| LB204 Comment Resolutions for CIDs Regarding FILS Discovery frames | | | | |
| Date: 2015-01-05 | | | | |
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Abstract

This document provides proposed text changes to the draft as a result for comment resolutions for CIDs 6057, 6000, 6588, 6127, 6128, 6584, 6113, 6128, 6156, 6591, 6919, 6959. These comments address clauses 6, 8 and 10, and in particular sections regarding the FILS Discovery frame. The baseline for this comment resolution document is 802.11ai Draft 3.1.

**Red Lined Text Changes for the Proposed Resolutions:**

**CID 6057, 6000, 6588, 6127, 6584, 6113, 6128, 6156, 6591, 6919, 6959**

**Instructions for Editor: please modify the text of 6.3.3.3.2, 8.6.8.38, and 10.45.2 with the following changes:**

* Semantics of the service primitive

The BSSDescriptionFromFDSet parameter is present if dot11FILSActivated is true[CID 2258]. Each BSSDescriptionFromFD[CID 3018, 13/1042r1] consists of the following elements:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Type | Valid range | Description | IBSS adoption [CID 2643] |
| BSSID | MAC address | N/A | The BSSID of the found BSS. | Do not adopt |
| SSID/Short SSID | The SSID as defined in the  SSID element or the Short SSID as defined in the Reduced Neighbor Report Element[REVmc] | As defined in the  SSID element in the Reduced Neighbor Report Element | The SSID or the Short SSID of the found BSS. | Do not adopt |
| FD Capability | [editor]As defined in  8.6.8.38 ( FILS Discovery frame format) [CID 5052] | As defined in  8.6.8.38 ( FILS Discovery frame format) | The parameter indicates which optional parameters are present in BSSDescriptionFromFD. The parameter is present if any of the following optional parameters are present in the BSSDescriptionFromFD.[CID 2259, 2644] [CID 4918] | Do not adopt |
| Access Network Options | [editor]As defined in 8.4.2.91 Access Network Options | As defined in 8.4.2.91 Access Network Options | The advertised access network options of the BSS. This parameter is optional. | Do not adopt |
| AP-CSN  [CID 4217] | Integer | 0 - 255 | The value of the Configuration SequenceNumber in the found BSS. This parameter is optional. | Do not adopt |
| AP’s next TBTT Offset | Integer | As defined in  8.6.8.38 ( FILS Discovery frame format) | The information of next Target Beacon Transmission Time of the found BSS. | Do not adopt |
| Reduced Neighbor Report  [CID 6880]  [CID 5133] | [editor]As defined in  8.4.2.169 ( Reduced Neighbor Report element) | As defined in  8.4.2.169 ( Reduced Neighbor Report element) | The Next TBTT information of neighbor BSS(s) of the found BSS. This parameter is optional. | Do not adopt |
| Primary Channel | Integer | 0-255 | The Primary Channel of the advertised BSS. The Primary Channel is only defined within the indicated Operating Class as shown in Annex E. [14/0765r7, CID 4633][CID 6291] | Do not adopt |
| RSNE | RSN element | As defined in  8.4.2.24 ( RSNE) | The information for robust security network. This parameter is optional. [CID 2645] | Do not adopt |
| FILS Indication | As defined in  8.4.2.179 ( FILS Indication element) [editor] | As defined in  8.4.2.179 ( FILS Indication element) [CID 3096] | The information related to FILS authentication and upper layer set up capabilities of the found AP.[CID 2815, 2183][CIDs 3097, 2646] | Do not adopt |
| Channel Center Frequency Segment 1 | Integer | 1-255 | The channel frequency index of the 80 MHz channel of frequency segment 1 when the BSS operates on an 80+80 operating channel width. This parameter is optional. | Do not adopt |

[Editorial to follow style of REVmc]

* FILS Discovery frame format

The FILS Discovery frame uses Public Action frame format. The format of its Action field is shown in Table 8-308a (FILS Discovery frame format).

|  |  |  |
| --- | --- | --- |
| * FILS Discovery frame format | | |
| Order | Information | Notes |
| 1 | Category [14/1107r3] |  |
| 2 | Public Action [14/1107r3] |  |
| 3 | FILS Discovery Information field | [CID 4617] |
| 4 | Reduced Neighbor Report element [CID 5133] | Reduced Neighbor Report element is optionally present. |
| 5 | FILS Indication element | The FILS Indication element is optionally present. |
| 6 | Vendor Specific element | One or more Vendor Specific elements are optionally present. |

[14/1107r3] [CID 6333]

The FILS Discovery Information field is shown in Figure 8-662a (FILS Discovery Information field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | |  |
|  | FILS Discovery Frame  Control | SSID/ Short SSID [Motion 122] | AP’s Next TBTT Offset (ANTO)   [Motion 122] | FD Capability (optional) | | Operating Class  (optional) |
| Octets: | 2 | 1-32 | 1 | 0 or 2 | | 0 or 1 |
|  |  |  |  |  | |  |
| [CIDs 4031, 4055, 4616, 4250] | AP Configuration Sequence Number (APCSN) (optional) | Access Network Options (ANO) (optional) | Primary Channel (optional) | | Channel Center Frequency Segment 1 (optional) | RSN Information  (optional) |
| Octets: | 0 or 1 | 0 or 1 | 0 or 1 | 0 or 1 | | 0 or 4 |
| * FILS Discovery Information field format [14/0412r3][CIDs 4804, 4617 | | | | | | | |



[14/0412r3]

[14/0412r3]

The format of the 2-octet FILS Discovery Frame Control field is shown in  8-662b (FILS Discovery Frame Control field format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B4 | | | | B5 | B6 | B7 |
|  | SSID Length | | | | Capability Presence Indicator | Short SSID Indicator | AP-CSN Presence Indicator |
| Bits: | 5 | | |  | 1 | 1 | 1 |
|  |  |  |  |  |  |  |  |
| [CID 4585] | B8 | B9 | B10 | B11[13/1043r1] | B12 B15 | | |
|  | ANO Presence Indicator | CCFS-1 Presence Indicator [13/1534r0] | Primary Channel Presence Indicator | RSN Info Presence Indicator | Reserved (4 bits) | | |
| Bits: | 1 | 1 | 1 | 1 | 4 | | |
| * FILS Discovery Frame Control field format | | | | | | | |

The SSID Length subfield of the FILS Discovery Frame Control Field indicates the length, in octets, of the SSID/Short SSID field in the FILS Discovery frame. The value of this field is equal to the length of the SSID/Short SSID field in octets minus 1. [13/1339r1][CID 4162, 4163, 4164] When the Short SSID Indicator subfield is equal to 1, the value of the SSID Length subfield is equal to 3 (the length of the Short SSID in octets minus 1).

A value of 1 for the Capability Presence Indicator subfield indicates that the FD Capability field is present in the FILS Discovery frame. A value of 0 indicates that the FD capability field is not present in the FILS Discovery frame. [13/1339r1][14/0412r3][CIDs 4056, 4641, 4166, 4165, 4645, 4648, 4646, 4651, 4647, 4644, 4650, 4649] [14/1107r3]

A value of 1 for the Short SSID Indicator subfield indicates that a Short SSID is contained in the SSID/Short SSID field of the FILS Discovery frame. A value of 0 indicates that a SSID is contained in the SSID/Short SSID field of the FILS Discovery frame.

A value of 1 for the AP-CSN Presence Indicator subfield indicates that the AP-CSN field is present in the FILS Discovery frame. A value of 0 indicates that the AP-CSN field is not present in the FILS Discovery frame. [13/1339r1][14/0412r3][14/1107r3]

A value of 1 for the ANO Presence Indicator subfield indicates that the ANO field is present in the FILS Discovery frame. A value of 0 indicates that the ANO field is not present in the FILS Discovery frame. [13/1339r1][14/0412r3][14/1107r3]

A value of 1 for the CCFS-1 (channel center frequency segment 1) Presence Indicator subfield indicates that the 1-octet Channel Center Frequency Segment 1 field is present in the FILS Discovery frame. A value of 0 indicates that Channel Center Frequency Segment 1 is not present. [13/1534r0][14/0412r3][CID 4167][14/1107r3]

A value of 1 for the Primary Channel Presence Indicator subfield indicates that the Primary Channel field and the Operating Class field are present in the FILS Discovery frame. A value of 0 indicates that the Primary Channel field and the Operating Class field are not present in the FILS Discovery frame.[14/1107r3][13/1339r1][14/0412r3]

A value of 1 for the RSN Information Presence Indicator subfield indicates that the RSN information field is present in the FILS Discovery frame. A value of 0 indicates that the RSN information field is not present in the FILS Discovery frame. [13/1043r1][14/0412r3][14/1107r3]

The SSID/Short SSID field is variable length between 1 and 32 octets. When the value of the Short SSID Indicator subfield is equal to 1, the SSID/Short SSID field contains the 4-byte Short SSID (see 8.4.2.169 (Reduced Neighbor Report)). Otherwise, the SSID/Short SSID field contains the SSID, of which the length is specified by the 5-bit SSID Length field in the FILS Discovery frame Control of the FILS Discovery frame (see 8.4.2.2 (SSID element)).

The AP’s Next TBTT Offset (ANTO) field indicates the time offset in number of TUs, between the transmission of the FILS Discovery frame and the transmission of the next Beacon frame. [14/0412r3][CID 4621]

The FD Capability field contains the information that advertises the capabilities of the STA transmitting the FILS Discovery frame. Its length is 2 octets. Its presence is indicated by the 1-bit Capability Presence Indicator subfield in the FILS Discovery frame Control being equal to 1. The format of the FD Capability field is shown in Figure 8-662c (FD Capability field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 B4 | | | B5 B7 | | |
| [14/1270r0] | ESS | Privacy | BSS Operating Channel Width [14/0834r3] | | | Maximum Number of Spatial Streams [CID 4889] | | |
| Bits: | 1 | 1 |  | 3 | 3 | | | |
|  |  |  |  |  |  |  |  |  |
|  | B8 | B9 | B10 B12 | | | B13 B15 | | |
|  | Reserved | Multiple BSSIDs Presence Indicator | Maximum PHY Type [14/0834r3] | | | FILS Minimum Rate | | |
| Bits: | 1 | 1 | 3 | | | 3 | | |
| * FD Capability field format [CID 4618] | | | | | | | | |

[14/0412r3]

The subfields ESS and Privacy are interpreted as specified in 8.4.1.4 (Capability Information field). [13/1339r1]

[14/1270r0][Motion #136]The 3-bit BSS Operating Channel Width subfield indicates the BSS operating channel width of the transmitting AP, as defined in Table 8-308b (BSS Operating Channel Width).

|  |  |  |
| --- | --- | --- |
| * BSS Operating Channel Width [14/0834r3] | | |
| BSS Operating Channel Width Subfield (3 bits) | HR/DSSS, OFDM, ERP, HT or VHT BSS operating channel width | TVHT BSS operating channel width |
| 0 | 20 MHz or 22 MHz | TVHT\_W |
| 1 | 40 MHz | TVHT\_W+W |
| 2 | 80 MHz | TVHT\_2W |
| 3 | 160 MHz or 80+80 MHz | TVHT\_4W or TVHT\_2W+2W |
| 4 - 7 | Reserved | Reserved |

[14/0834r3][14/1270r0]

NOTE—FILS is only supported in non-DMG infrastructure BSS. FILS is not supported in IBSS, PBSS, or MBSS. [CIDs 4881, 4006][CID 6294]

The 3-bit Maximum Number of Spatial Streams subfield is coded per Table 8-308c (Maximum Number of Spatial Streams).

|  |  |
| --- | --- |
| * Maximum Number of Spatial Streams [14/0834r3] | |
| Nss Subfield (3 bits) | Maximum Number of Spatial Streams |
| 0 | 1 |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 5 to 8 |
| 5 - 7 | Reserved |

[CID 4889] [14/0834r3]

The Multiple BSSIDs Presence Indicator subfield is 1 bit in length and is set to 1 to indicate that the Multiple BSSID element is present in the Beacon frame. It is set to 0 to indicate that the Multiple BSSID element is not present in the Beacon frames.

The 3-bit Maximum PHY Type subfield is defined as in Table 8-308d (Maximum PHY Type subfield).

|  |  |
| --- | --- |
| * Maximum PHY Type subfield [14/0834r3] | |
| Maximum PHY Type subfield (3 bits) | Maximum PHY Type [14/0834r3] |
| 0 | HR/DSSS (See Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification)) |
| 1 | ERP-OFDM (See Clause 18 (Orthogonal frequency division multiplexing (OFDM) PHY specification) and 19 (Extended Rate PHY (ERP) specification)) |
| 2 | HT (See Clause 20 (High Throughput (HT) PHY specification)) |
| 3 | VHT (See Clause 22 (Very High Throughput (VHT) PHY specification))  Or  TVHT (See Clause 23 (Television Very High Throughput (TVHT) PHY specification ))[CID 4027] |
| 4 - 7 | Reserved |

[14/0834r3]

The 3-bit FILS Minimum Rate subfield indicates the minimum rate to be used by the AP transmitting the FILS Discovery frame and by FILS STAs in subsequent transmissions between the AP and FILS STAs. [14/1107r3]Depending on the PHY Type of the received FILS Discovery frame sub, the FILS minimum rate is represented as a bit rate value or as an MCS value as shown in Table 8-308e (FILS Minimum Rate subfield). If an MCS value is provided, then the FILS Minimum Rate can be derived from the MCS value and the PHY Type in the FD Capability field.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| * FILS Minimum Rate subfield | | | | |
| FILS Minimum Rate subfield (3 bits) | FILS Minimum Rate / MCS | | | |
| If received FILS Discovery frame type is 0 (HR/DSSS) [14/0834r3] | If received FILS Discovery frame type is 1 (ERP-OFDM) | If received FILS Discovery frame type is 2 (HT) | If received FILS Discovery frame type is 3 (VHT or TVHT) |
| 0 | 1 Mbps | 6 Mbps | MCS 0 [CID 4888] | MCS 0 |
| 1 | 2 Mbps | 9 Mbps | MCS 1 | MCS 1 |
| 2 | 5.5 Mbps | 12 Mbps | MCS 2 | MCS 2 |
| 3 | 11 Mbps | 18 Mbps | MCS 3 | MCS 3 |
| 4 | Reserved | 24 Mbps | MCS 4 | MCS 4 |
| 5 - 7 | Reserved | Reserved | Reserved | Reserved |

[14/0834r3]

The Operating Class field is 1 octet in length. It specifies the operating class of the Primary Channel of the transmitting AP (see 8.4.1.36 (Operating Class)). [14/0412r3]

AP Configuration Sequence Number (AP-CSN) field format is defined in  8.4.2.178 (AP Configuration Sequence Number element). [14/0412r3][CIDs 4622, 4623, 4624 multiple places, , 4628, 4627, 4626, 4625]

Access Network Options (ANO) field format is specified in Figure 8-399 (Access Network Options field format) in 8.4.2.91 (Interworking element). [14/0412r3][CIDs 4026, 4624, , 4628, 4627, 4626, 4625]

Primary Channel field is present and set to the channel number of the primary channel (See 10.16.2 (Basic 20/40 MHz BSS functionality)) if the FILS Discovery frame is transmitted as a non-HT duplicate PPDU, otherwise the field is not present. [14/0412r3]

Channel Center Frequency Segment 1 field is present and set to the index of the channel center frequency of the frequency segment 1 for an 80+80 MHz VHT BSS, if the FILS Discovery frame is transmitted as a non-HT duplicate PPDUs at an 80+80 MHz channel bandwidth; otherwise the field is not present. [14/0412r3]

[14/0412r3][CIDs 4629, 4628, 4627, 4626, 4625]The FD RSN Information field contains the RSN information, including: RSN capability, an authentication suite selector, a pairwise cipher suite selector, a group data cipher suite selector, and a group management cipher suite selector. Its length is 4 bytes. Its format is defined in Figure 8-662d (Format of the FD RSN Information Field).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| [CID 4426] | B0 B15 | B16 B19 | B20 B23 | B24 B27 | B28 B31 |
|  | RSN Capability | Group Data Cipher Suite Selector | Group Mgmt Cipher Suite Selector | Pairwise Cipher Suite Selector | AKM Suite Selector |
| Bits: | 16 | 4 | 4 | 4 | 4 |
| * Format of the FD RSN Information Field [13/1043r1] | | | | | |

[13/1043r1]

The FD RSN information field contains a 2-octet RSN Capability subfield, as specified in Figure 8-217 (RSN Capabilities field format) in 8.4.2.24.4. (RSN capabilities).[13/1043r1]

The FD RSN information field also contains three 4-bit Cipher Suite Selectors, including one 4-bit Group Data Cipher Suite selector, one 4-bit Group Management Cipher Suite selector, and one 4-bit Pairwise Cipher Suite Selector. Each 4-bit Cipher Suite selector is a 4-bit code identifying a Cipher Suite Type as specified in Table 8-111 (Cipher suite selectors). The definition of the 4-bit Cipher Suite Selectors is shown in Table 8-308f (Cipher Suite Selector Definitions). [13/1043r1]

|  |  |
| --- | --- |
| * Cipher Suite Selector Definitions [13/1043r1] | |
| Cipher Suite Selector | Cipher Suite Type |
| 0 - 8 [CID 4885] | Cipher Suite Type 0 to 8, in Table 8-111 (Cipher suite selectors) |
| 9 - 13 | Reserved |
| 14 | Vendor Specific |
| 15 | No cipher suite selected [CID 4884] |

The RSN Information field contains one 4-bit AKM Suite Selector. A 4-bit Cipher Suite selector is a 4-bit code identifying a AKM Suite Type as specified in Table 8-113 (AKM suite selectors). The definition of the 4-bit AKM Suite Selectors is shown in Table 8-308g (AKM Suite Selector Definitions).

|  |  |
| --- | --- |
| * AKM Suite Selector Definitions [13/1043r1] | |
| AKM Suite Selector | AKM Suite Type |
| 0 [p14/1186r5 Motion #120] | Use AKM from RSN IE Beacon/Probe Response |
| 1[p14/1186r5 Motion #120] | Set AKM Suite to <ANA-1> of Table 8-139 (AKM suite selectors) |
| 2[p14/1186r5 Motion #120] | Set AKM Suite to <ANA-2> of Table 8-139 (AKM suite selectors) |
| 3[p14/1186r5 Motion #120] | Set AKM Suite to either <ANA-1> or <ANA-2> of Table 8-139 (AKM suite selectors) |
| 4 - 13 [p14/1186r5 Motion #120] | Reserved |
| 14 | Vendor Specific |
| 15 | no AKM suite selected |

[13/1043r1]

* FILS Discovery frame generation and usage [CID 4804, 4806]
* FILS Discovery frame transmission [14/1107r3]

AFILS AP supporting FILS Discovery may generate and transmit FILS Discovery frames. If the AP transmits the FILS Discovery frame in the 2.4 GHz or 5 GHz band, the FILS Discovery frame shall be transmitted at a data rate of 6 Mbps or higher, excluding all DSSS/CCK (Clause 17) data rates. [CID 6020] [ED: is there such a thing as a FILS AP that does **not** support FILS Discovery?]

NOTE—FILS is only supported in non-DMG infrastructure BSS. FILS is not supported in IBSS, PBSS, or MBSS. [CID 4798] [CID 4802][CID 6294]

An AP may transmit an FILS Discovery frame as a non-HT duplicate PPDU. When an FILS Discovery frame is transmitted as a non-HT duplicate PPDU, its primary channel shall be indicated by its Primary Channel field. [CID 4800]

If an AP transmits a FILS Discovery frame as a non-HT duplicate PPDU in an 80+80 MHz channel bandwidth, the Channel Center Frequency Segment 1 (CCFS-1) field shall be present in the FILS Discovery frame and shall be set to the channel center frequency of the frequency segment 1 for an 80+80 MHz VHT operating channel. [CIDs 4798, 4801][CID 6415]

An AP transmitting an FILS Discovery frame may transmit the FILS Discovery frame between Beacon frame instances. The interval between the transmission of a Beacon frame and a subsequent FILS Discovery frame shall be no less than the interval indicated in dot11FILSFDframeBeaconMinimumInterval. The transmission interval between any two transmitted FILS Discovery frames shall be no less than the interval indicated in dot11FILSFDframeBeaconMinimumInterval. [14/1107r3]

The transmitted FILS Discovery frame shall contain the FILS Discovery Information field.

An AP may use the FILS Minimum Rate subfield in the FILS Discovery frame to indicate the minimum rate to be used by the AP and FILS STAs in subsequent transmissions between the AP and FILS STAs. [14/1107r3]

[all clause text replaced by 14/1107r3][13/1295r2 CIDs 2738, 2110, 2076, 3171][CID 3235][CID 4798] [CID 4345] [CIDs 3343, 2111, 2957, 3343][13/1295r2 CID 2856][CID 2131][13/1534r0][CIDs 4798, 4801] [13/1295r2 CID 2116][CID 6336]

[CID 3236][13/1295r2 CID 2940]~~The format of the FILS Discovery (FD) frame is defined in 8.5.8.35 (FILS Discovery frame format).~~[13/1295r2, CIDs 2374, 3172 ]

[13/1295r2][?][CID 2118][13/1295r2][CID 2078] [13/1295r2][CID 4874][CID 2045][13/1295r2][13/1295r2][13/1295r2][CID 2115][13/1295r2][ style guide][13/1295r2][CIDs 4347, 4370][13/1295r2][14/003r3][CID 4030]

* FILS Discovery frame reception [14/1107r3]

If a FILS STA has the ReportingOption in the MLME-SCAN.request primitive not equal to IMMEDIATE, then the STA shall follow the procedures indicated in 10.1.4.1 and not the procedures provided in this clause.

If an AP has indicated the FILS Minimum Rate in the FILS Minimum Rate subfield of a FILS Discovery frame, a scanning FILS STA that receives such an FILS Discovery frame shall use a data rate that is equal or higher than the indicated FILS Minimum Rate in subsequent transmissions between the AP and the FILS STA.

A scanning FILS STA that receives an FILS Discovery frame should compare the received SSID or Short SSID in the FILS Discovery frame with the SSID parameter or SSID list provided to the STA previously in a MLME-SCAN request primitive. If the STA has the ReportingOption in the MLME-SCAN.request primitive equal to IMMEDIATE and if the SSID in the FILS Discovery frame matches the SSID parameter or one of the SSIDs in the SSID list the STA shall issue an MLME-SCAN.confirm primitive with the information obtained from the received FILS Discovery frame immediately after the reception of the FILS Discovery frame, with the ResultCode equal to INTERMEDIATE\_SCAN\_RESULT. [CID 4368, 4346, 4029, 4808]

If the received FILS Discovery frame contains the AP-CSN subfield, as defined in 10.1.4.3.7 (BSS Configuration Parameter Set) and the non-AP STA maintains previously obtained BSS Configuration Parameter Sets, the non-AP STA shall use the received FD AP-CSN information as follows: [CIDs 6975, 6226]

If the received FILS Discovery frame contains the AP-CSN subfield as defined in 10.1.4.3.7 (BSS Configuration Parameter Set) and the non-AP STA maintains previously obtained BSS Configuration Parameter Sets, the non-AP STA shall use the received FD AP-CSN information as follows:

- The STA shall check if the BSSID in the received FILS Discovery frame is equal to a BSSID in the previously obtained BSS Configuration Parameter Sets; [CID 6975]

- The STA compares the AP-CSN value in the received FILS Discovery frame to the AP-CSN value associated with the BSSID in the BSS Configuration Parameter Sets; [CIDs 6975, 6021]

- If the values are equal, then the non-AP STA may use the information contained in the BSS Configuration Parameter Set to initiate one or more FILS procedures (as defined in 10.44.3, 10.44.4 and 10.44.5), without waiting for next Beacon frame or Probe Response frame; [CID 6975]

- If the non-AP STA has not successfully associated with an AP using the above procedures, it shall follow the procedures specified in 10.1.4.2 and 10.1.4.3. [CID 4809, 4812, 5015, 5016, 5126]

**References:**

1. **IEEE 802.11-14/1351r15, TGai LB204 comments on D3.0, Marc Emmelmann, November 2014**
2. **IEEE P802.11ai™/D3.1, November 2014**