IEEE P802.11
Wireless LANs

|  |
| --- |
| Resolutions to CID 1287, 1288, 1300 |
| Date: July 26, 2018 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| Jouni Malinen | Qualcomm Inc. |  |  | jouni@qca.qualcomm.com |
| Menzo Wentink | Qualcomm Inc. |  |  | mwentink@qti.qualcomm.com |
| Alfred Asterjadhi | Qualcomm Inc. |  |  | aasterja@qti.qualcomm.com |
| George Cherian | Qualcomm Inc. |  |  | gcherian@qti.qualcomm.com |

Abstract

This submission proposes resolutions for CIDs 1287, 1288 and 1300 received for TGm LB232

Revisions:

* Rev 0: Initial version of the document.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Pg / Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 1300 | Abhishek Patil | 857.34 | 9.4.1.25 | There are several sections of the spec that refer to portions of the MAC address (or BSSID) as MSB/LSB. This is confusing as MAC address/BSSID is a sequence of 48-bits. At times, the spec says I/G bit is the MSB in the address. This conflicts with the description in 802-2014 (clause 8 Fig 10) where it says I/G is bit 0 of the first octet. Please updates sections: 9.4.1.25 (P857L34), 9.4.2.21.10 (P996L29), 9.4.2.104 (P1183L1), 11.45.5.3 (P2305L20), 14.13.2.4.5 (P2612L1) and MIB references. | Please update the cited spec text to remove any references to MSB (or LSB) and instead use bit positions (e.g., MAC\_ADDR[0:47]) to describe (or operate on) the corresponding bits in the MAC address. | RevisedAgree with the comment.TGm editor please make changes as shown in doc 11-18/1350r0 |
| 1288 | Abhishek Patil | 1076.04 | 9.4.2.45 | Computing BSSID\_B involves an integer operation ("+I" and "modulo 2^n"). However, the description is in terms bit operations (... "and n LSBs equal to [(n LSBs of REF\_BSSID) +i] mod 2^n"). | Update the equation for derivation of BSSID(i) to include steps to convert the binary value to an integer and back to binary after the integer operations are performed | RevisedAgree with the comment.TGm editor please make changes as shown in doc 11-18/1350r0 |
| 1287 | Abhishek Patil | 1076.01 | 9.4.2.45 | The derivation of BSSID(i) makes references to MSB and LSB of a MAC address (BSSID). MAC address is a sequence of bits and it is confusing to refer to the bits in the address as MSB or LSB. It also conflicts with the description in clause 8 of 802-2014 spec (see Fig 10) which says that the I/G bit is bit 0 of the first octet. Per the derivation of BSSID(i), the BSSIDs in a multiple BSSID set would have the lower n-bits changing - this would mean the I/G bit is being affected - which is not the intention. Same comment for 11.10.14 | Please replace derivation of BSSID(i) so that it does not make reference to MSB/LSB and instead the operation is performed with respect to the bit positions (e.g., REF\_BSSID[(48-n) : 47]).Please make appropriate changes to section 11.10.14 (P2105L25) | RevisedAgree with the comment.TGm editor please make changes as shown in doc 11-18/1350r0 |

This document uses REVmd draft 1.2 as the baseline.

* Terminology for mathematical, logical, and bit operations[#1300,1288]

***TGm Editor: Please add the following mathematical operators at the end of this section:***

*dec*(A[b:c]) is the cast to decimal operator where bit *b* is scaled by 20 and bit *c* is scaled by 2*c-b*

*bin*[x, k] is the operator that casts decimal value *x* into *k* bits binary vector.

* Conventions[#1300]

***TGm Editor: Please add the following two new paragraphs (and figures) after the 3rd paragraph in this section (REVmd D1.2, P749L57):***

MAC addresses are assigned as ordered sequences of bits. The Individual/Group bit is always transferred first and is bit 0 of the first octet.

For certain operations (for example in 9.4.2.45 (Multiple BSSID element) and 12.7.1 (Key hierarchy)), the sequence of bits is represented such that the first octet contains bits 40-47, with bit 40 being the Individual/Group bit that is transferred first, bits 32-39 are the bits of the second octet, and so on, and bit 7 is the last transferred bit of the last octet. See Figure 9-0a (Representation of 48-bit MAC address with I/G bit 40).

**TGm Editor: Visio file for Figure 9-0a: 11-18/1352**



Figure 9-0a – Representation of a 48-bit MAC address with I/G bit 40[#1300]

For computation of PARTIAL\_AID as described in 10.20 (Group ID and partial AID in VHT and CMMG PPDUs) and 10.22 (Group ID, partial AID, Uplink Indication, and COLOR in S1G PPDUs), the sequence of 48-bit is represented such that bit 0 is the Individual/Group bit and bit 47 is the last transmitted bit. This is illustrated in Figure 9-0b (Representation of 48-bit MAC address with I/G bit 0).

**TGm Editor: Visio file for Figure 9-0b: 11-18/1358**



Figure 9-0b – Representation of a 48-bit MAC address with I/G bit 0[#1300]

* PSMP STA Info field

***TGm Editor: Please make the changes as shown below to the 7th paragraph in this section (REVmd D1.2, P885L36):***

The PSMP Group Address ID (B21 to B63) subfield contains the 43 bits (MAC\_ADDR[0:42]) of a 48 bit MAC address. Use of this subfield is described in 10.30.2.8 (PSMP group addressed transmission rules). B63 contains the LSB of the group address.[#1300]

* Beacon Timing element

***TGm Editor: Please make the changes as shown below to the 8th paragraph in this section (REVmd D1.2, P1217L60):***

The Neighbor STA ID subfield is an unsigned integer that indicates the identification of the neighbor STA corresponding to this beacon timing information. When a mesh peering is established with this neighbor STA, the MSB of this field is set to 0, and the rest of this field is set to the 7 LSBs (AID[0:6]) of the AID value assigned to this neighbor mesh STA. When a mesh peering is not established with this neighbor STA, the MSB of this field is set to 1, and the rest of this field is set to the 7 bits of the last octet (MAC\_ADDR[0:6]) of the 48-bit MAC address of this neighbor STA.[#1300]

* Receiver’s procedure

***TGm Editor: Please make the changes as shown below to the 4th paragraph in this section (REVmd D1.2, P2744L58):***

A mesh STA can also check if its neighbor mesh STAs received its Beacon frame successfully by checking whether the Beacon Timing elements received from its neighbor mesh STAs contain beacon timing information of the mesh STA. When the Beacon Timing element is received from one of the peer mesh STAs, the mesh STA checks if the MSB of the Neighbor STA ID subfield is set to 0 and the rest of the field matches with the 7 LSBs (AID[0:6]) of the AID value assigned to the mesh STA through the mesh peering establishment. When the Beacon Timing element is received from a nonpeer mesh STA, the mesh STA checks if the MSB of the Neighbor STA ID subfield is set to 1 and the rest of the field matches with the 7 bits of the last octet (MAC\_ADDR[0:6]) of its own MAC address. If the matching is verified, the corresponding beacon timing information represents the correct beacon reception by the neighbor mesh STA.[#1300]

* Group ID and partial AID in VHT and CMMG PPDUs[#1300,1288]

***TGm Editor: Please make the changes to this section as shown below:***

The partial AID is a nonunique STA identifier defined in Table 10-12 (Settings for the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID for VHT STAs) and Table 10-13 (Settings for the TXVECTOR parameter PARTIAL\_AID for CMMG STAs) The partial AID is carried in the TXVECTOR parameter PARTIAL\_AID of a VHT SU PPDU or a CMMG PPDU and is limited to 9 bits.

, and subsequent discussion in this sectionthe 48-bit MAC address represented such that 202c-b See Figure 9-0b (Representation of 48-bit MAC address with I/G bit 0).

A STA transmitting a VHT SU PPDU carrying one or more group addressed MPDUs or transmitting a VHT NDP intended for multiple recipients shall set the TXVECTOR parameters GROUP\_ID to 63 and PARTIAL\_AID to 0. The intended recipient of a VHT NDP is defined in 10.37.6 (Transmission of a VHT NDP).

A STA transmitting a CMMG PPDU carrying one or more group addressed MPDUs shall set the TXVECTOR parameters PARTIAL\_AID to 0.

A STA transmitting a VHT SU PPDU carrying one or more individually addressed MPDUs or a VHT NDP intended for a single recipient shall set the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID as shown in Table 10-12 (Settings for the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID for VHT STAs).

|  |
| --- |
| * **Settings for the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID for VHT STAs**
 |
| **Condition** | **GROUP\_ID** | **PARTIAL\_AID** |
| Addressed to AP | 0 | *dec*(BSSID[39:47]) |
| Addressed to Mesh STA | 0 | *dec*(RA[39:47]) |
| Sent by an AP and addressed to a STA associated with that AP orsent by a TDLS STA in a direct path to a TDLS peer STA | 63 | (AID + *dec*(BSSID[44:47] ⊕ BSSID[40:43]) x 25) mod 29 (10-12) |
|
| Otherwise (see NOTE) | 63 | 0 |
| NOTE—The last row covers the following cases:* A PPDU sent to an IBSS STA
* A PPDU sent by an AP to a non associated STA
* Any other condition not explicitly listed elsewhere in the table
 |

A STA transmitting a CMMG PPDU carrying one or more individually addressed MPDUs shall set the TXVECTOR parameter PARTIAL\_AID as shown in Table 10-13 (Settings for the TXVECTOR parameter PARTIAL\_AID for CMMG STAs).

|  |
| --- |
| * **Settings for the TXVECTOR parameter PARTIAL\_AID for CMMG STAs**
 |
| **Condition** | **PARTIAL\_AID** |
| A frame that is not a Control frame that is addressed to an AP. |  |
| A frame that is not a Control frame that is addressed to an AP. |  |
| A frame that is not a Control frame that is sent by an AP and addressed to a STA associated with that AP or sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA. |  (10-13) |
| Otherwise (see NOTE) | 0 |
| NOTE—The last row covers the following cases:* A PPDU sent to an IBSS STA
* A PPDU sent by an AP to a non associated STA
* Any other condition not explicitly listed elsewhere in the table
 |

A STA shall include the values computed in Table 10-12 (Settings for the TXVECTOR parameters GROUP\_ID and PARTIAL\_AID for VHT STAs) in the PHYCONFIG\_VECTOR parameters PARTIAL\_AID\_LIST\_GID00 and PARTIAL\_AID\_LIST\_GID63.

A STA that transmits a VHT or CMMG PPDU to a TDLS peer STA obtains the AID for the peer STA from the TDLS Setup Request or TDLS Setup Response frame.

An AP should not assign an AID to a STA that results in a 0 value PARTIAL\_AID (as computed using Equation (10-12)). A CMMG AP should not assign to a CMMG STA an AID that results in the PARTIAL\_AID value, as computed using Equation (10-13), being equal to either

0 or  or 

where OBSSID is the BSSID of a BSS that is not the BSS of which the AP is a member and for which the AP might be heard by the STA being assigned the AID.

A STA transmitting a VHT MU PPDU sets the TXVECTOR parameter GROUP\_ID as described in 21.3.11.4 (Group ID).

As an example of the GROUP\_ID and PARTIAL\_AID setting, consider the case of a BSS with BSSID 00-21-6A-AC-53-52[[1]](#footnote-1) that has as a member a non-AP STA assigned AID 5. In VHT PPDUs sent to an AP, the GROUP\_ID is set to 0 and the PARTIAL\_AID is set to 164. In VHT PPDUs sent by the AP to the non-AP STA associated with that AP, the GROUP\_ID is set to 63 and PARTIAL\_AID is set to 229.

As an example of the PARTIAL\_AID setting, consider the case of a BSS with BSSID 00-21-6A-AC-53-52 that has as a member a non-AP CMMG STA assigned AID 5. In CMMG PPDUs sent to an AP, the PARTIAL\_AID is set to 165. In CMMG PPDUs sent by the AP to the non-AP STA associated with that AP, the PARTIAL\_AID is set to 37.

NOTE 1—In the example above, BSSID[47:40] = 0x52, that is, BSSID[47] = 0, BSSID[46] = 1, BSSID[45] = 0, BSSID[44] = 1, etc.

NOTE 2—As described in IEEE Std 802-2001, the use of hyphens for the BSSID indicates hexadecimal representation rather than bit-reversed representation such that the leftmost octet in the representation is the first transmitted octet for 802.11. Using the BSSID vector numbering described above, the BSSID in IEEE Std 802-2001 hexadecimal representation is BSSID[7:0]-BSSID[15:8]- BSSID[23:16]-BSSID[31:24]- BSSID[39:32]-BSSID[47:40].

A STA transmitting a CMMG PPDU that is addressed to an AP shall set the TXVECTOR parameter UPLINK\_INDICATION to 1. The UPLINK\_INDICATION parameter shall be set to 0 for all other cases.

The TXVECTOR parameter COLOR is used to assist a receiving STA in identifying the BSS from which a reception originates so that the receiving STA might increase spatial reuse and reduce power consumption by terminating the reception process in the case when the reception is not from the BSS with which the STA is associated. A STA transmitting a CMMG PPDU that is addressed to an AP need not include the TXVECTOR parameter COLOR in the TXVECTOR. A STA transmitting a CMMG PPDU that is not an NDP frame and that is sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA shall set the TXVECTOR parameter COLOR to the value of the COLOR parameter, if present, from the RXVECTOR of the most recently received frame from its associated AP or from the DO of the IBSS of which it is a member that contained a COLOR parameter. An AP transmitting a CMMG PPDU shall set the TXVECTOR parameter COLOR to a value of its choosing within the range 0 to 7 and shall maintain that value for the duration of the existence of the BSS. The AP which is a member of a Multiple BSSID Set shall set the TXVECTOR parameter COLOR for each different BSSID(*i*) to a same value.

An AP shall include the value within the range 0 to 7 that it is using for the TXVECTOR parameter COLOR in the COLOR field of the CMMG Capabilities Info field of the CMMG Capabilities element in all frames that contain that element. The COLOR field of the CMMG Capabilities Info field of the CMMG Capabilities element in all frames transmitted from a non-AP STA is reserved.

* **Group ID, partial AID, Uplink Indication, and COLOR in S1G PPDUs**[#1300,1288]

***TGm Editor: Please make the changes to this section as shown below:***

The S1G partial AID is a nonunique identifier of an S1G STA as defined in Table 10-14 (Settings for the TXVECTOR parameter PARTIAL\_AID for NDP frames) and Table 10-15 (Settings for the TXVECTOR parameter PARTIAL\_AID for non-1 MHz PPDUs and non-NDP frames). The partial AID is carried in the TXVECTOR parameter PARTIAL\_AID of an S1G SU PPDU with the TXVECTOR parameter CH\_BANDWIDTH set to CBW2, CBW4, CBW8, or CBW16 and is limited to 9 bits.

T,T and subsequent discussion in this section

* the 48-bit MAC address represented such that See Figure 9-0b (Representation of 48-bit MAC address with I/G bit 40).

A STA transmitting an S1G PPDU carrying one or more group addressed MPDUs that share a single, common group AID value shall set the TXVECTOR parameter PARTIAL\_AID according to Table 10-14 (Settings for the TXVECTOR parameter PARTIAL\_AID for NDP frames) and Table 10-15 (Settings for the TXVECTOR parameter PARTIAL\_AID for non-1 MHz PPDUs and non-NDP frames). A STA transmitting an S1G PPDU carrying one or more group addressed MPDUs that do not share a common group AID and a common BSSID or that is transmitting an S1G NDP intended for multiple recipients shall set the TXVECTOR parameter PARTIAL\_AID to 0. The intended recipient of an S1G NDP is defined in 10.37.7 (Transmission of an S1G NDP).

A STA transmitting an S1G SU PPDU carrying one or more individually addressed MPDUs or an S1G NDP intended for a single recipient shall select any one of the AIDs assigned to the recipient and then set the TXVECTOR parameter PARTIAL\_AID as shown in Table 10-14 (Settings for the TXVECTOR parameter PARTIAL\_AID for NDP frames) and Table 10-15 (Settings for the TXVECTOR parameter PARTIAL\_AID for non-1 MHz PPDUs and non-NDP frames).

|  |
| --- |
| * **Settings for the TXVECTOR parameter PARTIAL\_AID for NDP frames**
 |
| **Condition** | **PARTIAL\_AID** |
| A frame that is addressed to an AP or sent by an AP as a broadcast address | (*dec*(BSSID[39:47]))*mod*(291) + 1 |
| A frame that is sent by an AP and addressed to a STA associated with that AP or sent by a TDLS STA in a direct path to a TDLS peer STA, or to a group of STAs with a common group AID and a common BSSID | (AID[0:8] + 25 × *dec*(BSSID[44:47] BSSID[40:43]))*mod* 29*
 |
| Otherwise | 0 |

|  |
| --- |
| * **Settings for the TXVECTOR parameter PARTIAL\_AID for non-1 MHz PPDUs and non-NDP frames**
 |
| **Condition** | **PARTIAL\_AID** |
| A frame that is not a Control frame that is addressed to an AP | *dec*(BSSID[39:47])*mod*(291)) + 1 |
| A frame that is not a Control frame that is sent by an AP and addressed to a STA associated with that AP or is sent by a TDLS STA in a direct path to a TDLS peer STA or is sent to a group of STAs with a common group AID and a common BSSID | (AID[0:8] + 25 × *dec*(BSSID[44:47] BSSID[40:43]))*mod* 26*
 |
| Otherwise | 0 |

NOTE—In Table 10-14 (Settings for the TXVECTOR parameter PARTIAL\_AID for NDP frames) and Table 10-15 (Settings for the TXVECTOR parameter PARTIAL\_AID for non-1 MHz PPDUs and non-NDP frames) the last row includes the cases of a PPDU carrying MPDUs:

* sent by a STA that is a member of an IBSS to a STA or STAs that are members of an IBSS
* sent by an AP to a non associated STA
* any other condition not explicitly listed elsewhere in the table.

An S1G STA shall include the values computed in Table 10-14 (Settings for the TXVECTOR parameter PARTIAL\_AID for NDP frames) in the PHYCONFIG\_VECTOR parameter PARTIAL\_AID\_LIST\_GID00 and PARTIAL\_AID\_LIST\_GID63.

An S1G STA that transmits an S1G PPDU to a TDLS peer STA obtains the AID for the peer STA from TDLS Setup Request, or TDLS Setup Response frame.

An S1G AP should not assign to an S1G STA, an AID that results in the PARTIAL\_AID value, as computed using Equation (10-14) or Equation (10-15), being equal to either

0 or (*dec*(BSSID[39:47])*mod*(29 1)) + 1 or (*dec*(OBSSID[39:47])mod(29  1)) + 1

where OBSSID is the BSSID of a BSS that is not the BSS of which the AP is a member and for which the AP might be heard by the STA being assigned the AID.

An S1G STA transmitting an S1G MU PPDU sets the TXVECTOR parameter GROUP\_ID as described in 23.3.10.4 (Group ID).

As an example of the PARTIAL\_AID setting, consider the case of a BSS with BSSID 00-21-6A-AC-53-52 that has as a member a non-AP S1G STA assigned AID 5. In an NDP frame sent by the non-AP S1G STA to the S1G AP, the PARTIAL\_AID is equal to 165. In an NDP frame sent by the S1G AP to the non-AP S1G STA associated with that S1G AP, the PARTIAL\_AID is equal to 229. In a non-1 MHz S1G PPDU that is not an NDP frame and that is sent by the non-AP S1G STA to the S1G AP, the PARTIAL\_AID is set to 165. In a non-1 MHz S1G PPDU that is not an NDP frame that is sent by the S1G AP to the non-AP S1G STA associated with that S1G AP, the PARTIAL\_AID is set to 37.

NOTE 1—In the example above, BSSID[47:40] = 0x52, that is, BSSID[47] = 0, BSSID[46] = 1, BSSID[45] = 0, BSSID[44] = 1, etc.

NOTE 2—As described in IEEE Std 802-2001, the use of hyphens for the BSSID indicates hexadecimal representation rather than bit-reversed representation such that the leftmost octet in the representation is the first transmitted octet for IEEE Std 802.11. Using the BSSID vector numbering described above, the BSSID in IEEE Std 802-2001 hexadecimal representation is BSSID[7:0]-BSSID[15:8]- BSSID[23:16]-BSSID[31:24]- BSSID[39:32]-BSSID[47:40].

A STA transmitting an S1G PPDU that is not a 1 MHz PPDU and is not an NDP frame and that is addressed to an AP shall set the TXVECTOR parameter UPLINK\_INDICATION to 1. The UPLINK\_INDICATION parameter shall be set to 0 for all other cases. The TXVECTOR parameter UPLINK\_INDICATION is not present for 1 MHz frames and is not present for NDP frames.

The TXVECTOR parameter COLOR is used to assist a receiving STA in identifying the BSS from which a received PPDU originates so that the receiving STA reduces intra-BSS collisions by reporting a busy medium regardless of the received power when COLOR indicates that the current PPDU might be intra-BSS and might reduce power consumption by terminating the reception process when the received PPDU could not be from the BSS with which the STA is associated. A STA transmitting an S1G PPDU that is not a 1 MHz PPDU and is not an NDP frame and that is addressed to an AP need not include the TXVECTOR parameter COLOR in the TXVECTOR. A STA transmitting an S1G PPDU that is not a 1 MHz PPDU and is not an NDP frame and that is sent by a TDLS STA in a direct path to a TDLS peer STA shall set the TXVECTOR parameter COLOR to the value of the COLOR parameter, if present, from the RXVECTOR of the most recently received frame from its associated AP or from the STA transmitting a beacon of the IBSS of which it is a member that contained a COLOR parameter. An AP transmitting an S1G PPDU that is not a 1 MHz PPDU and is not an NDP frame shall set the TXVECTOR parameter COLOR to a value of its choosing within the range 0 to 7 and shall maintain that value for the duration of the existence of the BSS. The AP which is a member of a Multiple BSSID Set shall set the TXVECTOR parameter COLOR for each different BSSID(*i*) to a same value.

An AP shall include the value within the range 0 to 7 that it is using for the TXVECTOR parameter COLOR in non-1 MHz, non-NDP frames in the COLOR field of the S1G Capabilities Information field of the S1G Capabilities element in all frames that contain that element. The COLOR field of the S1G Capabilities Information field of the S1G Capabilities element in all frames transmitted from a non-AP STA is reserved.

The partial BSSID is defined to be the PARTIAL\_AID of the address of the STA contained in the AP and is equal to

(*dec*(BSSID[39:47])*mod*(291)) + 1

* **Multiple BSSID set**

***TGm Editor: Please make the changes as shown below to the 1st paragraph in this section (REVmd D1.2, P2232L17):***

A multiple BSSID set is characterized as follows:

* All members of the set use a common operating class, channel, Channel Access Functions, and antenna connector.
* The set has a maximum range of 2n for at least one n, where 1  n  46.
* Members of the set have the same 48-n bits (BSSID[n:47]) in their BSSIDs.[#1300, 1287]
* All BSSIDs within the multiple BSSID set are assigned in a way that they are not available as MAC addresses for STAs using a different operating class, channel or antenna connector.
* LCI report (Location configuration information report)

***TGm Editor: Please make the changes as shown below to the 3rd paragraph below Figure 9-252 in this section (REVmd D1.2, P1031L27):***

The MaxBSSID Indicator field is as defined in 9.4.2.45 (Multiple BSSID element). When this field set to a nonzero value (n), it indicates the maximum possible number of BSSs, including the reference BSS, which share the same antenna connector and have the same 48–n bits (BSSID[n:47]) of the BSSIDs. When the BSSIDs of the co-located BSSs are configured at the reporting STA but not represented by the MaxBSSID Indicator field, the BSSID fields are present in the Co-located BSSID List subelement to provide an explicit list of such BSSID values.[#1300, 1287]

* Multiple BSSID element[#1300, 1288, 1287]

***TGm Editor: Please make the changes as shown below to the equation in the 3rd paragraph in this section (REVmd D1.2, P1110L64):***

BSSID(i) = BSSID\_A | BSSID\_B

where

BSSID\_A is (REF\_BSSID & ZERO[0:(n-1)])

BSSID\_B is (ZERO[n:47] & *bin*[(*dec*(REF\_BSSID[0:(n-1)])+i)mod 2n), n]

And

ZERO[b:c] denotes bits b to c inclusive of a 48-bit address set to 0

REF\_BSSID[b:c] denotes bits b to c inclusive of the REF\_BSSID address

1. As described in IEEE Std 802-2014, the use of hyphens for the BSSID indicates hexadecimal representation rather than bit-reversed representation. [↑](#footnote-ref-1)