IEEE P802.11  
Wireless LANs

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| SA1 Reporting CID Resolutions | | | | |
| Date: 2024-07-14 | | | | |
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Abstract

This submission addresses the following SA1 CIDs: 6058 6061 6178 6198.

Revision history:

R0 – Initial version

R1 – Included offline feedback on text modifications for CIDs 6058 and 6061.

– Include modifications to text moved from section 9 to 11 to make normative.

| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| --- | --- | --- | --- | --- | --- |
| 6058 | 11.55.1.5.4 | 163.44 | Since how to assign indices to RF chains or  antenna elements is implementation dependent, the Q matrix doesn't have to be an identity matrix. 802.11az had a similar statement about the Q matrix, which was carried into REVme drafts including REVme D5.0. During the SA ballot for REVme D5.0, "an identify matrix" has been changed to "a permutation matrix". Please refer to 11-24/0033r9, 11-21/0727r34 and 11-24/0698r4 (Or REVme\_D6.0 when it becomes available). | "Change this paragraph to ""When transmitting HE/EHT-STFs and HE/EHT-LTFs in SI2SR, SR2SI, or SR2SR NDP, if N\_STS = T\_TX, the spatial mapping matrix, Q matrix, shall be a permutation matrix with N\_TX rows and N\_TX columns. If N\_STS < T\_TX, Q shall be P D where P is a permutation matrix with N\_TX rows and N\_TX columns and D is a matrix with N\_TX rows and N\_STS columns where the first N\_STS rows make up an identity matrix and the remaining rows make up a zero matrix.""  With the description above, NOTE 3 should also be properly stated or simply be deleted." | Revised  Incorporate changes specified in 24/1111r0 (<https://mentor.ieee.org/802.11/dcn/24/11-24-1111-01-00bf-SA1_reporting_cid_resolution.docx>). |
| 6061 | 11.55.1.5.4 | 163.44 | Since assigning spatial stream indices to RF chains/antenna elements is implementation dependent, the Q matrix does not have to be an Identity matrix. Requiring the Q matrix to be a permutation matrix of size N\_TX x N\_TX (elements restricted to 0 or 1) should be sufficient. On the other hand, neither "RF chain/antenna element selection matrix" nor "RF chain/antenna element swapping" is defined anywhere in the 11bf draft or in the baseline spec. | Revise this paragraph and Note 3 to replace identity matrix with permutation matrix. A contribution is to be submitted by the commenter to provide proposed text changes. Note that a revision based a similar concept was adopted recently for the relevant 11az text in REVme D5.0. | Revised  Incorporate changes specified in 24/1111r0 (<https://mentor.ieee.org/802.11/dcn/24/11-24-1111-01-00bf-SA1_reporting_cid_resolution.docx>). |

**Notes:**

* The P802.11bf text cited by CID 6058 and 6061 was originally taken from the latest P802.11az draft.

**Summary of cited references:**

[11-21-0727r34](https://mentor.ieee.org/802.11/dcn/21/11-21-0727-34-000m-revme-phy-comments.xls) (https://mentor.ieee.org/802.11/dcn/21/11-21-0727-34-000m-revme-phy-comments.xls):

* Document contains P802.11 REVme PHY comments.
* Relevant are: 7016, 7017, 7018, and 7020, with resolution described in document 11-24-0698r4.
* Motion to approve relevant resolutions run as “PHY Motion 6”.

[11-24-0033r9](https://mentor.ieee.org/802.11/dcn/24/11-24-0033-09-000m-revme-motions.pptx) (https://mentor.ieee.org/802.11/dcn/24/11-24-0033-09-000m-revme-motions.pptx):

* Document contains motion deck for P802.11REVme comment resolutions.
* Motion 157 covers “PHY Motion 6” which was approved by unanimous consent (2024-05-16).

[11-24-0698r4](https://mentor.ieee.org/802.11/dcn/24/11-24-0698-04-000m-spatial-mapping-for-he-ranging.docx) (https://mentor.ieee.org/802.11/dcn/24/11-24-0698-04-000m-spatial-mapping-for-he-ranging.docx):

* Relevant text changes are as follows:

For the HE-STF and HE-LTF fields, if *NSTS* = *NTX*, the spatial mapping matrix *Q* shall be a permutation matrix with *NTX* rows and *NTX* columns; if *NSTS* < *NTX*, *Q* shall be *P* × *D* where *P* is a permutation matrix with *NTX* rows and *NTX* columns and *D* is a matrix with *NTX* rows and *NSTS* columns where the first *NSTS* rows make up an identity matrix and the remaining rows make up a zero matrix.

No beamforming is applied. If *NSTS* = *NTX*, the spatial mapping matrix *Q* is a permutation matrix with *NTX* rows and *NTX* columns. If *NSTS* < *NTX*, *Q* is *P* × *D* where *P* is a permutation matrix with *NTX* rows and *NTX* columns and *D* is a matrix with *NTX* rows and *NSTS* columns where the first *NSTS* rows make up an identity matrix and the remaining rows make up a zero matrix.

. If *NSTS* = *NTX*, the spatial mapping matrix *Q* is a permutation matrix with *NTX* rows and *NTX* columns. If *NSTS* < *NTX*, *Q* is *P* × *D* where *P* is a permutation matrix with *NTX* rows and *NTX* columns and *D* is a matrix with *NTX* rows and *NSTS* columns where the first *NSTS* rows make up an identity matrix and the remaining rows make up a zero matrix.

* Final text taken from P802.11REVme D6.0 (P4397.1-6)

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Description automatically generated

***TGbf Editor: Modify P163.44 to P165.34 in D4.0 as follows:***

The spatial mapping matrix Q for the HE-STF, HE-LTF, EHT-STF and EHT-LTF in an SI2SR, SR2SI, or SR2SR NDP shall be:

* If NSTS = NTX, a permutation matrix with NTX rows and NTX columns.
* If NSTS < NTX, a P × D matrix where P is a permutation matrix with NTX rows and NTX columns and D is a matrix with NTX rows and NSTS columns where the first NSTS rows make up an identity matrix and the remaining rows make up a zero matrix.

In both NSTS = NTX and NSTS < NTX cases, the spatial stream to physical antenna port mapping shall be the same for all SI2SR, SR2SI, and SR2SR NDP transmissions within a sensing measurement session.

| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
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| 6178 | 9.4.1.78.2 | 52.42 | Subclause 9.4.1.78.2 (CSI encoding and decoding) does not describe the frame format, but the procedures for encoding and decoding CSI. | As 9.4.1.78.2 describes procedures for ecoding and decoding CSI, the subclause should be moved to a subclause of 11.55.1.5.4 (Common rules). | Revised  Incorporate changes specified in 24/1111r0 (<https://mentor.ieee.org/802.11/dcn/24/11-24-1111-01-00bf-SA1_reporting_cid_resolution.docx>). |

**Notes:**

* Agree in principle with commentor as section 9 typically describes frame formats and not procedures.
* The CSI Report field (9.4.1.25), Noncompressed Beamforming Report field (9.4.1.26), and Compressed Beamforming Report field (9.4.1.27) descriptions in IEEE P802.11REVme D6.0 refer to appropriate sections in the PHY subclauses for similar encoding rules.
  + The CSI Report field refers to section 19.3.12.3.2 (CSI matrices feedback)
  + The Noncompressed Beamforming Report field refers to section 19.3.12.3.5 (V matrix coding (noncompressed beamforming))
  + The Compressed Beamforming report field refers to section 19.3.12.3.6 (Compressed beamforming feedback matrix)
* The difference between generating the beamform report vs the sensing report is the RX vector provides the already formatted outputs (see CHAN\_MAT and CHAN\_MAT\_TYPE) to build the beamform report, but an additional conversion from the CSI\_ESTIMATE RX vector is required to build the sensing report.
* Since this conversion is related to the MLME Sensing procedure, placing it as a subclause under 11.55.1.5.4 (Common rules) seems reasonable.
* Further, the rules for generating segmented sensing measurement reports (11.55.1.5.3.4) appears incorrectly placed as a subclause of the Non-TB sensing measurement exchange (11.55.1.5.3).
  + Section 11.55.1.5.3.4 should also be placed as a subclause under 11.55.1.5.4 (Common rules).

***TGbf Editor:***

***Move clause 9.4.1.78.2 (CSI encoding and decoding) and corresponding 3 subclauses:***

***9.4.1.78.2.1 (General),***

***9.4.1.78.2.2 (CSI encoding procedure),***

***9.4.1.78.2.3 (CSI decoding procedure)***

***To a subclause under 11.55.1.5.4.***

***TGbf Editor:***

***Move subclause 11.55.1.5.3.4 (Rules for generating segmented sensing measurement reports)***

***To a subclause under 11.55.1.5.4.***

***TGbf Editor: Modify relocated text under CSI encoding and decoding heading as follows:***

**11.55.1.5.4.x CSI encoding and decoding**

**11.55.1.5.4.x.1 General**

Subclause 11.55.1.5.4.x.2 (CSI encoding procedure) describes the encoding of the measured CSI that shall be used to scale and quantize the CSI\_ESTIMATE RXVECTOR for inclusion in the Sensing Measurement Report field. Subclause 11.55.1.5.4.x.3 (CSI decoding procedure) describes the decoding of the scaled and quantized CSI that is received in the Sensing Measurement Report field.

The measured CSI for the  receive chain, the  transmit chain, and the  subcarrier is the complex value indicated by . The real part of the CSI is indicated by , and the imaginary part of the CSI is indicated by . The real and imaginary parts of the CSI are represented as 2s complement binary integers.

NOTE—Transmission constraints imposed on the Q matrix for the HE Ranging NDP (see 27.3.19.1 (HE Ranging NDP)), HE TB Ranging NDP (see 27.3.19.2 (HE TB Ranging NDP)), EHT Ranging NDP (see 36.3.19a.1 (EHT Ranging NDP)) and EHT TB Ranging NDP (see 36.3.4.2 (EHT TB Ranging NDP)) result in a one-to-one mapping of transmit antenna to space-time stream.

The encoded CSI is denoted as  and the decoded CSI is denoted as .

**11.55.1.5.4.x.2 CSI encoding procedure**

The number of receive chains is indicated by  and the number of transmit chains is indicated by .

* For a given tuple of receive and transmit chains, , the maximum of the absolute value of the real and imaginary parts of the CSI for all subcarriers shall be calculated using Equation (x1).
*  (x1)
* The number of subcarriers, , is specified in Table 9-129l (Number of subcarriers as a function of bandwidth, puncturing, and Ng). This calculation shall be performed for each tuple of receive and transmit chains, , with  and .
* For a given tuple of receive and transmit chains, , the positive scaling factor  (see 9.4.1.78.4 (Sensing Measurement Report field)) shall be selected to avoid overflow when scaling and quantizing the measured CSI using Equation (x2) and Equation (x3). The value of  maybe used in the selection of the  to avoid an overflow. The sensing receiver shall select the exact value of the scaling factor.

 (x2)



(x3)

* This calculation shall be performed for each tuple of receive and transmit chains, .
* Each real and imaginary part of the CSI shall be scaled and quantized to 8 bits using Equation (x2) and Equation (x3), respectively.

**11.55.1.5.4.x.3 CSI decoding procedure**

The received encoded CSI shall be decoded as follows:

* The received real and imaginary parts of the scaled and quantized CSI are decoded as a pair of 2s complement numbers and are combined to form the complex CSI, .
* Each CSI value is rescaled according to Equation (x4).

(x4)

| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
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| 6198 | 11.55.1.5.3.3 | 162.32 | Adding the text to descript how the last report of the last the sensing measurement exchange is transmitted if there has a invalid report after the first sensing measurement exchange. | as in comment | Revised  Incorporate changes specified in 24/1111r0 (<https://mentor.ieee.org/802.11/dcn/24/11-24-1111-01-00bf-SA1_reporting_cid_resolution.docx>). |

**Notes:**

* Existing protocol does not support delivery of final delayed measurement report after the Sensing measurement session has been terminated.
  + The current protocol does not support a flow where a Sensing Measurement Report frame is transmitted in response to a Sensing Measurement Termination frame.
* As a result, current description implies:
  + No further Sensing Measurement Report frames will be transmitted corresponding to a session that has been explicitally or implicitally terminated.
  + A sensing initiator should not initiate an explicit termination with a responder until all desired valid sensing measurement reports have been received.
* Since this behaviour is implied, adding a note can clarify the above two points.
  + Since this is common for both the basic reporting phase of the TB exchange and the reporting phase of the non-TB exchange, the note can be added to the General subclause (11.55.1.5.1) under the Sensing measurement exchange.

***TGbf Editor: Insert the following note in subclause 11.55.1.5.1 (General):***

NOTE – No further Sensing Measurement Report frame is transmitted corresponding to a sensing measurement session that has either been explicitaly or implicitialy terminated. In the case where the Sensing Measurement Report frame corresponds to the previous TB or non-TB sensing measurement exchange, the sensing initiator does not transmit a Sensing Measurement Termination frame until all desired valid sensing measurement report(s) have been received.

**SP:**

Do you support the resolution to CIDs 6058, 6061, 6178, and 6198 from 11-24/1111r0 and incorporating the changes into the latest TGbf draft?