IEEE P802.11  
Wireless LANs

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| **Resolutions to CIDs 2559 and 2560** |
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Abstract

This submission proposes a resolution for CIDs 2559 and 2560 (2 CIDs)

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 11md Draft. This introduction is not part of the adopted material.

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

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| **CID** | **Section#** | **Page#** | **L#** | **Comment** | **Proposed Change** | **Resolution** |
| 2559 | 8.3.5.14.2 | 770 | 9 | Should not return the RXVECTOR in the RXEND. Should just return the bits needed for radio measurement, since the rest has already been returned in the RXSTART, and returning it again is confusing. Also RSNI is missing | In the referenced subclause, change ", RXVECTOR" to ", RCPI, RSNI" and change the last para to "The RCPI and RSNI are included only when dot11RadioMeasurementActivated is true.". In Tables 15-2, 16-5, 17-2 delete the RCPI row and the NOTE. In Tables 18-3, 19-1, 20-1, 21-1, 22-1, 23-1, 24-1, 25-1 delete the RCPI row | **Rejected.**  As described in doc 19/xxxx<motionedRev>, RSNI is computed in the MLME using IPI reports made by the PHY, filtered by the MLME’s knowledge of virtual carrier sense. Therefore RSNI does not come from the PHY.  RXVECTOR is used to convey RCPI in the RXEND primitive since it is (usually) measured in the Data field. Although it is true that this instance of RXVECTOR contains parameters already sent in RXSTART, it is trivial to discard known duplicates and the choice of RXVECTOR has the advantage of interface consistency. |
| 2560 |  |  |  | Need to return RCPI and RSNI for radio measurement | In Figures 21-36, 23-33, 23-34, 23-35 change "Measure RCPI" to "Measure RCPI and RSNI". In Figure 20-18 change "Measure channel" to "Measure RCPI and RSNI". In Figure 25-38 change "Message RCPI" to "Measure RCPI and RSNI" and change the other two "Message"s to "Measure"s. In Figures 19-25, 19-26, 20-18 add an arrow up from the end of the "Data" box saying "Measure RCPI and RSNI" | **Revised.**  See changes under CID 2560 in  doc 19/xxxx<motionedRev> |

***Background for RSNI***

The 802.11k design is as follows:

* RCPI is measured during a PPDU and reported in RXVECTOR
* IPI (Idle Power Indicator) is measured “when the PHY is neither transmitting nor receiving …” (8.3.5.10.2 Semantics of the service primitive, etc) and reported by IPI-REPORT in the PHY-CCA.indication and PHY-CCARESET.indication primitives (Table 8-3)
* From 11.10.9.4 Noise Histogram report, IPI may be used to calculate ANPI, and then, with RCPI, may be used by the MLME to calculate RSNI (via the equation in 9.4.2.40 RSNI element):

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| “A STA shall include in the Noise Histogram report an average noise power indicator (ANPI) value representing the average noise plus interference power on the measured channel at the antenna connector during the measurement duration. **The STA may use Noise Histogram IPI density values to calculate ANPI.**  The IPI densities in the Noise Histogram report may be used to calculate an average noise power for the channel during the measurement duration. This calculated average IPI power value may be reported as the value for ANPI. Any equivalent method to measure ANPI may also be used. …  ANPI may be calculated over any period and for any received frame. **ANPI may be calculated in any period and at any time by filtering all PHY IPI values in a MAC filter to exclude IPI values received when NAV is nonzero.** These filtered IPI values represent idle channel noise and may be stored in a first-in-first-out (FIFO) buffer to facilitate ANPI calculation over a fixed number of IPI samples. **ANPI may be so calculated** upon receipt of any frame and **may be used with RCPI to calculate RSNI for any received frame**. Any equivalent method to measure ANPI may also be used to calculate RSNI for any received frame.” |

802.11k implemented the final averaging and filtering in the MLME because only the MAC/MLME knows virtual carrier sense.

Furthermore, recall that the PHY’s RX procedure and the RXVECTOR it returns is associated with receiving an actual PPDU. Noise is measured outside the transmission or reception of a PPDU, so it is not especially logical to report a noise measurement with a PHY primitive associated with a received PPDU. Furthermore, such a measurement cannot become an ANPI measurement nor a RSNI measurement unless the MAC/MLME is also pushing virtual carrier information down to the PHY beforehand (for which no primitive exists).

***Background for RCPI in RXVECTOR***

RCPI is measured during the “frame” in Clauses 15 and 16 and for the Data field in Clauses 17-25 except 20 and 25 of a PPDU (in the OFDM clauses).

However, for the mmWave PHYs (Clause 20 and 25), RCPI is measured during the preamble. This affects the proper placement of the arrows in the RX procedure figures.

As a corollary, RCPI in the RXVECTOR in the RXSTART.indication in Clauses 15-19 and 21-24 can only be populated with 255 (“Measurement not available”), hence the presence of RXVECTOR in RXEND. However, RCPI can be populated with a meaningful value in the RXSTART.indication in Clauses 20 and 24.

***Discussion on CID 2560***

With that background, reviewing the comment in detail:

*In Figures 21-36, 23-33, 23-34, 23-35 change "Measure RCPI" to "Measure RCPI and RSNI".*

Since RSNI is calculated by the MLME (from IPI measurements from the PHY), proposed change is rejected.

*In Figure 20-18 change "Measure channel" to "Measure RCPI and RSNI".*

Since TRN field is for measuring the channel during the TRN not RCPI, proposed change is rejected (but see below).

*In Figure 25-38 change “Message RCPI” to “Measure RCPI and RSNI”*

Since RSNI is calculated by the MLME (from IPI measurements from the PHY), proposed RSNI change is rejected. But the arrow is associated with the Data field which is too late, which needs fixing.

*… and change the other two “Message”s to “Measure”s.*

Agree that all *three* “Messages” should be changed to “Measures”

*In Figures 19-25, 19-26, … add an arrow up from the end of the "Data" box saying "Measure RCPI and RSNI"*

Agree that we need the arrow for RCPI (but not for RSNI)

*In Figures … 20-18 add an arrow up from the end of the "Data" box saying "Measure RCPI and RSNI"*

Agree that we need the arrow for RCPI (but not RSNI), but at the end of the preamble.

***Discussion on CID 2559***

The commenter is correct that the parameters in the RXVECTOR sent in the RXEND.indication, except for RCPI, are duplicative. Although it may be true for some that “returning it again is confusing”, there is no error here, and discarding duplicated parameters is a trivial exercise in any implementation. Resing RXVECTOR does have the advantage of interface consistency. Two different changes could be made here, or no change at all, so propose a strawpoll.

Option A: Status quo

* No change to RXVECTOR in RXEND (i.e. interface consistency).
* Can resolve this today

Option B: For the RXEND primitive, change the RXVECTOR parameter to RCPI

* Table 8-3: delete PHY-RXEND.indication in RXVECTOR row
* Table 8-3: insert new row, “RCPI / PHY-RXEND.indication / Clauses 15-19 and 21-24: 0-255; clauses 20 and 25: not present
* For each clause of Clauses 15-19 and 21-24, delete RCPI from the (TXVECTOR/)RXVECTOR table
* For Table 21-3, Mapping of VHT PHY parameters for NON\_HT operation, delete the RCPI row
* This option destroys some familiar text, and this interface parameter is “hidden” in clause 8 rather than appearing in each PHY clause.

Option C: Add a new parameter RXENDVECTOR to the RXEND primitive, and make RPCI a parameter of RXENDVECTOR

* Table 8-3: delete PHY-RXEND.indication in RXVECTOR row
* Table 8-3: insert new row, “RXENDVECTOR / PHY-RXEND.indication / A set of parameters
* For each clause of Clauses 15-19 and 21-24, move RCPI row from (TXVECTOR/)RXVECTOR table into a new table in a new subsection <clause#>.2.<end+1> RXENDVECTOR parameters, with some intro language
* For Table 21-3, Mapping of VHT PHY parameters for NON\_HT operation, for the RCPI row, change “RXVECTOR” to “RXENDVECTOR”
* For each clause of Clauses 20 and 25, create a new (empty) table in a new subsection <clause#>.2.<end+1> RXENDVECTOR parameters, with some intro language.

Option D: Add new parameter RXENDVECTOR to the RXEND primitive, and make both RXERROR and RPCI as parameters of RXENDVECTOR

* <Similar changes as option C plus a few more to move RXERROR around.>

***Sidebar***

Meanwhile I see some confusion between PPDUs and frames/MPDUs. I do some light clean-up below.

Also “ANPI may be calculated over any period and for any received frame. ANPI may be calculated in any period and at any time by filtering all PHY IPI values in a MAC filter to exclude IPI values received when NAV is nonzero.” Has some duplication (over any period / in any period) and some erroneous language (“ANPI may be calculated for any received frame” yet ANPI is calculate outside frames). Therefore do some clean up below.

***TG editor, change, under CID 2560, according to the following instructions***

In Figure 25-38 change change the three "Message"s to "Measure"s. Delete the “Measure RCPI” at the end of the Data field and change the “Measure RSSI” at the end of the preamble (the end of the “SIG” box) to “Measure RSSI and RCPI”.

In Figure 20-18 add an arrow up from the end of the preamble (the “Header” box) saying "Measure RCPI"

In Figures 19-25, 19-26 add an arrow up from the end of the "Data" box saying "Measure RCPI"

***TG editor: change, under CID 2560, as shown by Word Track changes:***

**8.3.5.10.2 Semantics of the service primitive**

The primitive provides the following parameter:

PHY-CCARESET.request(

IPI-STATE

)

The IPI-STATE parameter is present if dot11RadioMeasurementActivated is true. The IPI-STATE parameter can be one of two values: IPI-ON or IPI-OFF. The parameter value is IPI-ON when the MAC sublayer is requesting the PHY entity to report IPI values when the PHY is neither receiving nor transmitting a PPDU.

11.10.9.4 Noise Histogram report

ANPI may be calculated in any period and at any time by filtering all PHY IPI values in a MAC filter to exclude IPI values received when NAV is nonzero. These filtered IPI values represent idle channel noise and may be stored in a first-in-first-out (FIFO) buffer to facilitate ANPI calculation over a fixed number of IPI samples. ANPI may be so calculated upon receipt of any frame and may be used with RCPI to calculate RSNI for any received frame. Any equivalent method to measure ANPI may also be used to calculate RSNI for any received frame. (#2560)