IEEE P802.11
Wireless LANs

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| LB272-CID-1376 resolution |
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Abstract

This document proposes resolution to LB272 CID 1376

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| --- | --- | --- | --- | --- | --- |
| 1376 | 9.4.2.329.3 | 133.24 | Using receive beam Index as a receiver direction result is very limiting. A receiver can achieve much higher accuracy using interpolation or super resolution. | submission will be provided |   Revise: TGbf editor: make changes specified in <https://mentor.ieee.org/802.11/dcn/23/11-23-1003-00-00bf-lb272-misc-comments-set-2.docx> |

Discussion:

Given a receive array with *N* antennas, a receiver can perform *N* measurement (per a Transmit configuration), each with a different weight vector $w\_{n}$**.** For a specific reflection from a direction $θ$, the output of the correlator at the delay *t* of the reflection is $y\_{n}=w\_{n}^{T}a\left(θ\right)p\_{t}$. Where $a\left(θ\right)$ is the array steering vector for direction $θ$ and $p\_{t}$ is the power and the phase of the reflection in direction. Combining the results from *N* measurements, we get that $y=W^{T}a\left(θ\right)p\_{t}$, so that $a\left(θ\right)p\_{t}=\left(W^{T}\right)^{-1}y$**.** The given $a\left(θ\right)$, $θ$ can be estimated accurately given the array response for theta, especially when the array has a uniform shape.

***TGbf Editor Modify figure 9-1002cd – Axis Present field format:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
|  | Range Axis Present | Doppler Axis present | Receiver Beam Index Present | Transmitter Beam Index Present | Phase Present | Receive Azimuth Present | Receive Elevation Present | Receive Direction Reference |
| bits: | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

***TGbf Editor: Add the following text in P95L34 (D1.1):***

The Receive Azimuth Present field indicates the presence of receive azimuth angles in the Reflection subelements.

The Receive Elevation Present field indicates the presence of receive azimuth angles in the Reflection subelements.

When either the Receive Azimuth Present field or the Receive Elevation Present field is set to 1, the Receiver Beam Index Present field is set to 0. When the Receiver Beam Index Present field is set to 1, both the Receive Azimuth Present field and the Receive Elevation Present field are set to 0.

When either the Receive Azimuth Present field or the Receive Elevation Present field is set to 1 the Receive Direction Reference is set to 1 to indicate that the azimuth and elevation axis are in earth coordinates. Otherwise, they are in an arbitrary STA coordinate system. When the Receiver Beam Index Present field is set to 1, this is field is reserved.

***TGbf Editor: Change the text in P96L1-7 (D1.1) as follows:***

The Reflection Fields field contains multiple Reflection fields. All Reflection fields within a Reflection Fields field have the same format, which can be derived from the Axis Present field. There are 4 format options: for 2 axes (Figure 9-1002cg (Reflection field format for 2 axes)), 3 axes (Figure 9-1002ch (Reflection field format for 3 axes)), 4 axes (Figure 9-1002ci (Reflection field format for 4 axes)) and 5 axes (Figure 9-1002cj (Reflection field format for 5 axes)).

The number of bits allocated for each axis is fixed and given by the axis type. The order of the axis in this field is given in Table 9-401y (Order of the axis and allocated bits in a Reflection field).

The azimuth axis is given in units of (360/4096)°. The elevation axis is given in units of (180/4096) °.

***TGbf Editor: Add the following figure after figure 9-1002ci***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Axis #1 | Axis #2 | Axis #3 | Axis #4 | Axis #5 | Reflection Power | Reflection Phase |
| bits: | S1 | S2 | S3 | S4 | S5 | 12 | 0 or 12 |

**Figure 9-1002cj** - **Reflection field format for 4 axes**

***TGbf Editor: change Table 9-401y—Order of the axis and allocated bits in a Reflection field as follows:***

|  |  |
| --- | --- |
| **Axis**  | **Allocation (S1, S2, S3, S4, S5)** |
| Range | 16 |
| Doppler | 10 |
| Receiver Beam Index | 12 |
| Transmitter Beam Index | 12 |
| Receive Azimuth | 12 |
| Receive Elevation | 12 |

Note: When azimuth and elevation are part of the report, the 5 axes are: Range, Doppler, Transmit Beam Index, Receive Azimuth and Receive Elevation.

**SP:** do you agree to the resolution of CIDs: The list of CIDs is: 1376,

**references: Draft P802.11bf\_D1.1**