IEEE P802.11
Wireless LANs

|  |
| --- |
| D6 Comment Resolution, brianh, part 1 |
| Date: 2013-08-22 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Brian Hart | Cisco Systems | 170 W Tasman Dr, San Jose, CA 95134, USA |  | brianh@cisco.com |

##### Baseline is 11ac D6.0. Changes indicated by a mixture of Word track-changes and instructions. For equation changes, Tex notation is sometimes used. E.g. a\_{xyz}^b denotes axyzb .

CIDs: 11035, 11022

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 11035 | Schelstraete, Sigurd | 22.3.8.2.1 | 264 | 40 | Do we need to specify Cyclic shifts for more than 8 antennas? Are these values even correct? It seems they were just copied from the line above, giving complete freedom for antennas 9 and above. If this is required, the standard should be more specific. Giving this freedom now may make it harder to define specific values later.Note also that in other places in the standard, there is the implicit assumpion that the number of antennas is 8 or less (see e.g. p303,L62).For comparison, 11n only specified shift values for up to 4 antennas. | Remove last row of Table 22-10 | Revised. See comments 13/989r <motionedRev#> that question the basis for the comment but clean up related language at P303L62 and in Annex C.  |

***Discussion***

Due to issues that were identified in 802.11n timeframe, there is a strong and continued desire to constrain the cyclic shifts to a narrow window, regardless of the number of transmit-chains. This desire is reflected in the 11n spec, where the individual cyclic shifts for up to 4 transmit chains and the cyclic shifts for more than 4 transmit chains (see 20.3.9.3.2) are constrained to a -200 to 0 ns window.



11ac is consistent with 11n wherein the individual cyclic shifts for up to 8 transmit chains and the cyclic shifts for transmit chains above the max number of spatial time streams are also constrained to be within the -200 to 0 ns window.

In general, having a priori known cyclic shifts was recognized as highly desirable in the 11n timeframe, and hence the cyclic shifts are precisely defined for 1-4 transmit chains in the 11n spec. 11ac follows the same process in precisely defining the cyclic shifts for up to 8 transmit chains, and constrains the cyclic shifts to be used if more than 8 transmit chains are used.

The 11n text included some minor drafting ambiguities:

a) the text constrains what happens for more than 4 transmit chains but does not explicitly state a requirement for the first 4 transmit chains yet the language strongly implies that they should be the same as for when the STA has 4 transmit chains, and

b) 20.3.10 references the table but really intends to reference both the table and the following paragraph

These oversights are both addressed in the 11ac spec, where the first 8 values are explicitly specified in the table, including the behavior for more than 8 transmit chains, for convenience of referencing by 22.3.9.1.

To the commenter’s specific questions:

“It seems they were just copied from the line above” – true, so that precise knowledge is available to the recipient.

“giving complete freedom for antennas 9 and above.” – well, not complete freedom. The requirement for transmit chains is to be bounded by the -200 to 0ns window.

“If this is required, the standard should be more specific. Giving this freedom now may make it harder to define specific values later.” - The spec is unambiguous in regards to these two points (defined values for the first 8 transmit chains and a constraint for more than 8). Further, 11ac has added additional requirements beyond those defined 11n without problem.

“Note also that in other places in the standard, there is the implicit assumpion that the number of antennas is 8 or less (see e.g. p303,L62).” – Good catch. This is fixed below.

Also an equivalent issue in Annex C, as further identified by the commenter via email discussions, is also fixed below.Here the MIB variable is intended to be transmitted by the MAC in the Beamformee STS Capability field in the VHT Capabilities element, so copy that definition directly into the MIB definition.

“For comparison, 11n only specified shift values for up to 4” – This is probably a formally correct reading of the 802.11n text, but the discussions during the development of 11n and the actual 802.11n language strongly hint at a different intended interpretation (i.e. this is a drafting error, as above): The final sentence in “Number of transmit chains = 4 | Cyclic shifts for transmit chain 1/2/3/4 = 0/-50/-100/-150. With more than four transmit chains, each cyclic shift on the additional transmit chains shall be between -200 ns and 0 ns inclusive.” makes little sense unless there is also an understanding that there was a constraint on the first 4 transmit chains also. Such a constraint, not appearing elsewhere, presumably refers to the immediately preceding entry in the table – i.e. “Number of transmit chains = 4 | Cyclic shifts for transmit chain 1/2/3/4 = 0/-50/-100/-150.” Given the history of discussions during 802.11n, any other reading is not the intended reading.

***Change:***

**22.3.8.2.1 Cyclic shift for pre-VHT modulated fields**

The cyclic shift value for the L-STF, L-LTF, L-SIG and VHT-SIG-A fields of the PPDU for transmit

chain out of a total of are defined in Table 22-10 (Cyclic shift values for L-STF, L-LTF, L-SIG and

VHT-SIG-A fields of the PPDU).

**Table 22-10—Cyclic shift values for L-STF, L-LTF, L-SIG and VHT-SIG-A fields of the PPDU**

**values for L-STF, L-LTF, L-SIG and VHT-SIG-A fields of the PPDU**

|  |  |
| --- | --- |
| **Total number of transmit chains (*NTX*)** | **Cyclic shift for transmit chain *iTX* (in units of ns)** |
| **1 2 3 4 5 6 7 8 >8** |

**22.3.10.11.1 Transmission in VHT format**

Note that implementations are not restricted to the spatial mapping matrix examples listed in Section 20.3.11.11.2 (Spatial mapping) and the number of transmit chains *NTX* could be higher than 4.

**Annex C**

dot11VHTBeamformeeNTxSupport OBJECT-TYPE

SYNTAX Unsigned32 (1..8)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute indicates the the maximum number of space-time streams that the STA

can receive in a VHT NDP, the maximum value for NSTS,total that can be sent to the STA in a

VHT MU PPDU if the STA is MU beamformee capable and the maximum value of Nr that the STA transmits in a VHT Compressed Beamforming frame."

::= { dot11VHTTransmitBeamformingConfigEntry 6 }

**22.3.7.4 Transmitted signal**

r\_{PPDU}^{iSeg,iTx} represents the complex baseband signal of frequency segment iSeg in transmit chain iTx;

**22.3.9 Transmission of NON\_HT and HT PPDUs with multiple transmit chains**

**22.3.9.1 Transmission of 20 MHz NON\_HT PPDUs with more than one transmit chain**

A VHT STA that transmits a NON\_HT PPDU shall apply the cyclic shifts defined in Table 22-10 (Cyclic

shift values for L-STF, L-LTF, L-SIG and VHT-SIG-A fields of the PPDU) to the preamble and Data field.

**22.3.9.2 Transmission of HT PPDUs with more than four transmit chains**

A VHT STA that transmits an HT PPDU with FORMAT equal to HT\_MF shall apply the cyclic shifts defined

in Table 22-10 (Cyclic shift values for L-STF, L-LTF, L-SIG and VHT-SIG-A fields of the PPDU) for the

non-HT portion of the PPDU, including the HT-SIG field.

**20.3.10 Transmission of NON\_HT format PPDUs with more than one transmit chain**

When an HT device transmits a NON\_HT format PPDU with the MODULATION parameter equal to

OFDM or ERP-OFDM using more than one transmit chain, it shall apply the cyclic shifts defined in

Table 20-9 (Cyclic shift for non-HT portion of packet) to the transmission in each chain.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 11022 | Schelstraete, Sigurd | 8.4.2.24.7 | 85 | 46 | What is the "zeroth frequency element"? | Clarify | Revised. Note, commenter means “frequency segment”. In all terms, text and tables, the terminology is frequency segment 0. See for example Figure 8-401bu, Table 8-183x, Figure 8-401bw, equation 22-11, and Table 22-7.Accordingly update the language to “center frequency of frequency segment 0” |

***Discussion:***

Offending text

|  |
| --- |
|  |

Examples of frequency segment indexing:











***Change***

If the PPDU carrying the received frame comprises non-contiguous frequency segments, the Operating Class and Channel Number fields identify the center frequency of frequency segment 0, and a Wide Bandwidth Channel Switch subelement is included.