IEEE P802.11  
Wireless LANs

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| Discussion of CID 8147 | | | | |
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Abstract

This document contains and analysis and proposed resolution for CID 8147.

CID 166

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| --- | --- | --- | --- | --- | --- | --- |
| 8147 | 2603.13 | 21.3.20 |  | Equation (21-108) suggests N\_SYM can sometimes be N\_SYM minus 1 or 2, which only makes sense in (some) computer languages. Needs one or two primes (maybe 2, to avoid confusion with N'\_SYM above) | Add two prime glphs after N in N\_SYM at 2603.7, 2603.13 (leftmost only), 2603.26, 2603.32 | GEN |

## Background of the comment

The comment is about one of the intermediate calculations in the determination of PSDU\_LENGTH for LDPC-encoded data.

As part of the calculation, the value of N\_SYM can be replaced with N\_SYM-1 or N\_SYM-2, as a function of the value of the “STBC” and “LDPC Extra OFDM Symbol” fields in VHT-SIG-A. Currently, the text capturing this is as shown in the excerpt below:



This “modified” value of N\_SYM is then later used to calculate PSDU\_LENGTH.



The problem the commenter points out is that the same notation (N\_SYM) has different values in the text before and after the application of (21-108).

## Analysis

To understand the logic in adjusting the value of N\_SYM as described above, let’s review the LDPC encoding process at TX side.

The encoding process involves the following steps:

1. The number of uncoded bits going into the LDPC encoder is equal to N\_SYM,init \* N\_DBPS.



Per (21-114), N\_SYM,init is related to PSDU\_LENGTH as follows (for LDPC):



1. As part of the LDPC encoding of the input bits, the **actual** (i.e. physical) number of symbols at the output of the encoder can be increased by 1 or 2 relative to N\_SYM,init, depending on whether STBC is used and whether the number of puncturing bits exceeds a certain threshold. If this condition is met, this is indicated in the “LDPC Extra OFDM Symbol” field in VHT-SIG-A. This is also mentioned in 21.3.10.5.4:



Further details of the condition under which extra symbol(s) are added are given below:



Note that (19-41) can lead N\_SYM to have values that are larger than N\_SYM,init.

1. The LDPC encoding results in N\_SYM actual symbols of encoded data.
2. The difference between N\_SYM and N\_SYM,init is encoded in VHT-SIG-A

To summarize TX and RX processing:

1. N\_SYM\_init is used to parametrize the number of bits at the input of the LDPC encoder and number of bytes in PSDU\_LENGTH. This does not (necessarily) correspond to the physical number of OFDM symbols in the packet.
2. N\_SYM is the notation for **actual** (physical) number of OFDM symbols in the packet and can be equal to or larger than N\_SYM,init (either N\_ SYM,init, N\_ SYM,init +1 or N\_ SYM,init +2). The difference between N\_SYM and N\_SYM,init depends on the “STBC” and “LDPC Extra OFDM Symbol” fields in VHT-SIG-A, namely:

|  |  |  |
| --- | --- | --- |
| **STBC** | **LDPC Extra OFDM Symbol** | **N\_SYM** |
| 0/1 | 0 | N\_SYM,init |
| 0 | 1 | N\_SYM,init + 1 |
| 1 | 1 | N\_SYM,init + 2 |

1. At receiver side, the **actual** number of OFDM symbols (N\_SYM) can be calculated from (21-105) and (21-106). This is value applies to both BCC and LDPC encoded data.
2. Knowing N\_SYM and the values of the “STBC” and “LDPC Extra OFDM Symbol” fields in VHT-SIG-A, N\_SYM,init can be calculated as follows:

|  |  |  |
| --- | --- | --- |
| **STBC** | **LDPC Extra OFDM Symbol** | **N\_SYM,init** |
| 0/1 | 0 | N\_SYM |
| 0 | 1 | N\_SYM - 1 |
| 1 | 1 | N\_SYM - 2 |

This is what (21-108) currently instructs the reader to do, although the result of the calculation is wrongly called N\_SYM instead of N\_SYM,init.

1. From this follows PSDU\_LENGTH at receiver side:



## Proposed resolution

Revised.

Make the following changes in Draft 6.0:

* On page 2603, line 7, replace N\_SYM with N\_SYM,init
* In (21-108), replace “N\_SYM = ” with “N\_SYM,init =”
* In (21-109), replace N\_SYM with N\_SYM,init
* On page 2603, line 33, replace N\_SYM with N\_SYM,init