IEEE P802.11
Wireless LANs

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| Proposed SFD Text on code matrices for length 1344 LDPC codeword |
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Abstract

This document provides specification framework document text for including the code matrices for length 1344 LDPC codeword that is being proposed for 802.11ay. The proposal is captured in [2].

*Instructions to the editor: Please add the contents below to the IEEE 802.11ay Specification Framework Document[1]*

* + 1. LDPC parity matrices
			1. General

An LDPC codeword of size equal to 1344 bits is defined through the use of lifting matrices. A lifting matrix acts on the code matrix to generate a larger matrix as follows:

* A ‘0’ in the lifting matrix acts on the Z×Z cyclic-permutation matrix *Pi* in the code matrix (at the same location) to create the 2Z×2Z matrix:

|  |  |
| --- | --- |
| i | -1 |
| -1 | i |

* A ‘1’ in the lifting matrix acts on the Z×Z cyclic-permutation matrix *Pi* in the code matrix (at the same location) to create the 2Z×2Z matrix:

|  |  |
| --- | --- |
| -1 | *i* |
| *i* | -1 |

* A ‘-1’ in the lifting matrix acts on the Z×Z zero matrix in the code matrix to create the 2Z×2Z zero matrix.

NOTE—The cyclic-permutation matrix *Pi* is defined in 20.3.8.

* + - 1. Rate-1/2 LDPC code matrix for generating 1344 bits codeword

The lifting matrix in Table 2 is applied to the rate-1/2 LDPC code matrix specified in Table 20-6.

1. —Rate-1/2 lifting matrix

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | -1 | 1 | -1 | 0 | -1 | 1 | -1 | 0 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| 0 | -1 | 0 | -1 | 1 | -1 | -1 | 1 | 0 | 0 | -1 | -1 | -1 | -1 | -1 | -1 |
| -1 | 0 | -1 | 1 | -1 | 0 | -1 | 1 | -1 | 1 | 0 | -1 | -1 | -1 | -1 | -1 |
| -1 | 1 | -1 | 1 | -1 | 1 | 0 | -1 | -1 | -1 | 0 | 0 | -1 | -1 | -1 | -1 |
| 0 | -1 | 1 | -1 | 1 | -1 | 0 | -1 | 0 | -1 | -1 | 1 | 0 | -1 | -1 | -1 |
| 1 | -1 | 1 | -1 | -1 | 1 | -1 | 0 | -1 | 1 | -1 | 1 | -1 | 0 | -1 | -1 |
| -1 | 0 | -1 | 0 | -1 | 1 | -1 | 0 | -1 | -1 | 0 | -1 | -1 | 1 | 0 | -1 |
| -1 | 0 | -1 | 1 | 0 | -1 | 0 | -1 | 0 | -1 | -1 | -1 | 1 | -1 | 0 | 0 |

* + - 1. Rate-5/8 LDPC code matrix for generating 1344 bits codeword

The lifting matrix in Table 3 is applied to the rate-5/8 LDPC code matrix specified in Table 20-7.

1. —Rate-5/8 lifting matrix

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | -1 | 1 | 0 | -1 | -1 | -1 | -1 | -1 |
| 0 | 1 | -1 | 1 | -1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | -1 | -1 | -1 | -1 |
| 0 | -1 | 1 | -1 | 1 | -1 | 0 | -1 | 0 | -1 | -1 | 1 | 0 | -1 | -1 | -1 |
| 1 | -1 | 1 | -1 | -1 | 1 | -1 | 0 | -1 | 1 | -1 | 1 | 1 | 0 | -1 | -1 |
| -1 | 0 | -1 | 0 | -1 | 1 | -1 | 0 | -1 | 0 | 0 | -1 | -1 | 1 | 0 | -1 |
| -1 | 0 | -1 | 1 | 0 | -1 | 0 | -1 | 0 | -1 | -1 | -1 | -1 | -1 | 0 | 0 |

* + - 1. Rate-3/4 LDPC code matrix for generating 1344 bits codeword

The lifting matrix in Table 4 is applied to the rate-3/4 LDPC code matrix specified in Table 20-8.

1. —Rate-3/4 lifting matrix

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | -1 | -1 | -1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | -1 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | -1 | 1 | 0 | -1 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | -1 | 1 | 0 | 1 | 0 | 0 | 0 |

* + - 1. Rate-13/16 LDPC code matrix for generating 1344 bits codeword

The lifting matrix in Table 5 is applied to the rate-13/16 LDPC code matrix specified in Table 20-9.

1. —Rate-13/16 lifting matrix

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | -1 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | -1 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |

**References:**

[1] <https://mentor.ieee.org/802.11/dcn/15/11-15-1358-03-00ay-specification-framework-for-tgay.doc>

[2] Shadi Abu-Surra et.al., “Length 1344 LDPC codes for 11ay”, IEEE 802.11-16/0676r0