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| Project                      | <b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >  |   |
| Title                        | <b>Example Uplink Encoding</b>  |   |
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| Re:                          | Comments relating to P802.16ab-01/01r2  |   |
| Abstract                     | This document is a proposed addition to 802.16ab.   |   |
| Purpose                      | The purpose of these sections is to clarify the randomization, FEC, interleaving and modulation upstream algorithms used by the subscriber in OFDM and OFDMA modes.   |   |
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## Example Uplink Encoding

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### 8.3.5.3.3.7 Example OFDM Uplink Frame

Below is an example of one frame of OFDM uplink data, illustrating each process from randomization through subcarrier modulation.

OFDM Modulation Mode: QPSK, rate 3/4, Slot Offset: 14, UIUC: 7 (decimal values)

#### Input Data (Hex)

45 29 C4 79 AD 0F 55 28 AD 87 B5 76 1A 9C 80 50 45 1B 9F D9 2A 88 95 EB AE B5 2E 03 4F 09 14 69 58 0A 5D F5

#### Randomized Data (Hex)

D5 0E A4 AA EF E4 DB 51 88 91 6B 00 DF AA 1E E7 02 A8 0E 70 4F 7F C9 D8 66 1D 9D F0 E7 20 E4 9D 7A 32 91 67

#### Reed-Solomon encoded Data (Hex)

D5 0E A4 AA EF E4 DB 51 88 91 6B 00 DF AA 1E E7 02 A8 0E 70 4F 7F C9 D8 66 1D 9D F0 E7 20 E4 9D 7A 32 91 67 61 37 B9 20

#### Convolutionally Encoded Data (Hex)

29 CB 69 26 CD B5 96 21 10 D2 43 85 FE 83 8B B0 DC 67 85 A9 E0 C5 A8 C9 99 D1 3D 8B F8 D1 EE 7A 3B C2 4C 08 31 3A B4 39 03 5D FB 3F 1C 1D 0E E0

#### Interleaved Data (Hex)

7A 09 4F EC 39 60 C8 63 68 90 29 95 82 DC 3F 90 9B 9B A3 FD 93 4B 68 02 F8 B4 CD CA 67 D1 E3 C7 90 55 9B 6B FF 1B 62 E5 21 36 43 D1 22 D2 40 E1

#### Carrier Mapping (subchannel number: I value Q value)

-100: 1 -1, -99: -1 -1, -98: -1 -1, -97: -1 -1, -96: -1 1, -95: -1 1, -94: -1 1, -93: 1 1, -92: 1 1, -91: -1 1, -90: 1 1, -89: -1 -1, -88: -1 1, -87: 1 -1, -86: 1 -1, -85: 1 1, -84: -4/3 0, -83: 1 -1, -82: -1 -1, -81: 1 1, -80: 1 1, -79: -1 -1, -78: -1 -1, -77: -1 -1, -76: 1 -1, -75: -1 -1, -74: -1 -1, -73: -1 1, -72: 1 1, -71: -1 -1, -70: -1 1, -69: 1 1, -68: -1 1, -67: 1 1, -66: 1 -1, -65: -1 -1, -64: -1 1, -63: -1 1, -62: 1 -1, -61: 1 -1, -60: -4/3 0, -59: -1 -1, -58: 1 -1, -57: -1 -1, -56: -1 1, -55: 1 -1, -54: 1 1, -53: 1 1, -52: 1 1, -51: 1 -1, -50: -1 -1, -49: -1 -1, -48: 1 1, -47: -1 1, -46: -1 1, -45: 1 1, -44: 1 1, -43: -1 -1, -42: 1 -1, -41: -1 -1, -40: -1 1, -39: 1 1, -38: 1 1, -37: 1 -1, -36: -4/3 0, -35: -1 -1, -34: -1 -1, -33: 1 -1, -32: -1 1, -31: -1 1, -30: 1 -1, -29: -1 1, -28: 1 1, -27: 1 1, -26: 1 1, -25: -1 1, -24: 1 -1, -23: 1 -1, -22: 1 -1, -21: 1 1, -20: 1 -1, -19: 1 1, -18: 1 -1, -17: 1 1, -16: -1 1, -15: -1 1, -14: 1 -1, -13: -1 1, -12: -4/3 0, -11: -1 1, -10: 1 -1, -9: -1 -1, -8: -1 1, -7: 1 -1, -6: 1 -1, -5: -1 1, -4: 1 -1, -3: -1 1, -2: 1 -1, -1: -1 -1, 0: DC, 1: -1 1, 2: -1 -1, 3: 1 1, 4: -1 -1, 5: 1 1, 6: -1 -1, 7: -1 1, 8: -1 -1, 9: -1 -1, 10: 1 1, 11: 1 -1, 12: -4/3 0, 13: 1 -1, 14: -1 -1, 15: -1 1, 16: 1 1, 17: -1 -1, 18: 1 1, 19: 1 -1, 20: -1 -1, 21: -1 1, 22: -1 -1, 23: 1 1, 24: -1 -1, 25: -1 1, 26: -1 1, 27: -1 -1, 28: 1 -1, 29: -1 1, 30: 1 1, 31: 1 -1, 32: 1 1, 33: 1 -1, 34: -1 1, 35: 1 1, 36: -4/3 0, 37: 1 -1, 38: -1 1, 39: -1 1, 40: 1 1, 41: -1 -1, 42: 1 -1, 43: -1 1, 44: 1 1, 45: 1 -1, 46: -1 -1, 47: -1 1, 48: 1 -1, 49: -1 -1, 50: -1 1, 51: -1 1, 52: 1 -1, 53: -1 1, 54: 1 1, 55: 1 1, 56: 1 1, 57: -1 -1, 58: -1 -1, 59: -1 -1, 60: -4/3 0, 61: -1 -1, 62: -1 -1, 63: 1 -1, 64: -1 -1, 65: 1 1, 66: 1 -1, 67: 1 -1, 68: -1 1, 69: 1 1, 70: 1 -1, 71: -1 1, 72: 1 1, 73: 1 1, 74: -1 -1, 75: -1 1, 76: 1 -1, 77: -1 -1, 78: 1 1, 79: 1 -1, 80: -1 1, 81: 1 1, 82: -1 -1, 83: -1 1, 84: -4/3 0, 85: 1 -1, 86: 1 -1, 87: -1 1, 88: 1 1, 89: -1 1, 90: 1 1, 91: 1 1, 92: 1 1, 93: 1 1, 94: -1 -1, 95: 1 1, 96: -1 1, 97: 1 1, 98: 1 1, 99: -1 1, 100: 1 -1,

### 8.3.5.3.4.4.2.1 Example OFDMA Uplink Frame

Below is an example of one frame of OFDMA uplink data, illustrating each process from randomization through subcarrier modulation.

OFDMA Modulation: 16QAM Rate 1/2 , Slot Offset: 50, Subchannel Offset: 3, IDcell: 5, UIUC: 4 (values in decimal)

#### Input Data (Hex)

45 29 C4 79 AD 0F 55 28 AD 87 B5 76 1A 9C 80 50 45 1B 9F D9 2A 88 95 EB AE B5 2E 03 4F 09 14 69 58 0A 5D F5

#### Randomized Data (Hex)

5B 23 80 44 35 82 06 07 47 67 CB 37 1F 1A 9D 44 0B 62 3A CC F4 F4 50 E1 30 8A 6A 80 D4 00 4E 5E 84 BA 96 57

#### Reed-Solomon encoded Data (Hex)

5B 23 80 44 35 82 06 07 47 67 CB 37 1F 1A 9D 44 0B 62 3A CC F4 F4 50 E1 30 8A 6A 80 D4 00 4E 5E 84 BA 96 57 3A CE  
4E 81 36 AB DA 26 13 3E D1 3B

#### Convolutional encoded Data (Hex)

F4 51 D6 42 63 7E D1 B0 90 E7 B2 BA A5 1B E8 BA 57 B5 37 BC F7 66 B1 A6 CF 04 A4 39 69 77 02 79 A7 5D D9 05 64 F7  
FF F0 BC 3E ED EA C0 34 F2 11 AF 30 E8 A5 B7 A7 EC E9 71 27 FC FF A4 44 F7 48 AA 42 ED 92 03 5E 2C 7F

#### Interleaved Data (Hex)

72 4C 64 A4 06 5F 16 57 99 F2 3B F2 AC 15 D2 B7 46 62 0E A0 C2 05 FD FA 8B B3 10 F5 6C 7A 9E 43 77 E5 BB 1F F2 4F  
1B 9F 93 5A E3 5C ED F6 12 7E 3C 45 3B 94 CB 63 24 A1 BC F7 E3 9B BE 8F BD 2F CD 23 2E F5 42 B2 C9 8F

#### Carrier Mapping (subchannel subcarrier number - useable subcarrier number:

I value Q value,) preamble not shown.

0-13: 4/3 0, 1-53: 3 -3, 2-79: 1 -1, 3-112: 3 1, 4-148: -3 1, 5-191: 3 -1,  
6-219: 3 1, 7-235: -1 -1, 8-270: 3 1, 9-288: 1 1, 10-345: 3 -1,  
11-382: 3 3, 12-390: -3 -3, 13-418: -4/3 0, 14-460: 1 3, 15-506: 3 -1,  
16-522: 3 3, 17-545: 3 -3, 18-580: -1 3, 19-636: -1 3, 20-662: -3 -3,  
21-681: 1 -1, 22-733: 1 -3, 23-741: -1 -3, 24-786: -3 -3, 25-817: 1 -1,  
26-856: -4/3 0, 27-883: 4/3 0, 28-899: -1 -1, 29-936: -3 1, 30-983: 1 3,  
31-999: 3 3, 32-1042: -3 3, 33-1082: 1 -1, 34-1108: -1 -3, 35-1141: 3 -3,  
36-1177: 3 1, 37-1188: 3 -1, 38-1216: 3 -1, 39-1264: 1 -1, 40-1299: -4/3 0,  
41-1317: 1 1, 42-1374: -3 -1, 43-1379: -1 -1, 44-1419: 1 1, 45-1447: -3 1,  
46-1489: 1 -1, 47-1535: 1 1, 48-1551: 3 3, 49-1574: -3 -3, 50-1609: -3 3,  
51-1633: -3 -3, 52-1691: -1 -1,

0-13: -1 1, 1-53: -1 -3, 2-79: 4/3 0, 3-112: -1 -3, 4-148: 1 -3, 5-191: 1 3,  
6-219: 1 1, 7-235: -3 -3, 8-270: 3 3, 9-288: 3 -1, 10-345: -3 1,  
11-382: 3 -3, 12-390: -1 -1, 13-418: -1 3, 14-460: -3 -1, 15-506: -4/3 0,  
16-522: 3 1, 17-545: 1 -3, 18-580: 3 -3, 19-636: 3 -3, 20-662: -3 -1,  
21-681: 3 3, 22-733: -1 -3, 23-741: -1 -3, 24-786: 1 3, 25-817: -3 -3,  
26-856: -4/3 0, 27-883: -3 -3, 28-899: 1 -1, 29-936: -4/3 0, 30-983: 3 1,  
31-999: -3 -3, 32-1042: 1 3, 33-1082: -1 -3, 34-1108: -1 3, 35-1141: -3 -3,  
36-1177: -1 3, 37-1188: 1 -3, 38-1216: 3 3, 39-1264: -1 -1, 40-1299: -3 -1,  
41-1317: 1 -3, 42-1374: 4/3 0, 43-1379: 3 3, 44-1419: -3 1, 45-1447: -3 -1,  
46-1489: -3 3, 47-1535: -3 -3, 48-1551: 3 -1, 49-1574: 1 3, 50-1609: 1 -1,  
51-1633: 3 -3, 52-1691: -3 -1,

0-13: 1 -3, 1-53: -3 1, 2-79: 3 1, 3-112: 3 3, 4-148: 4/3 0, 5-191: 1 -3,  
6-219: -1 -3, 7-235: -1 3, 8-270: 3 1, 9-288: -3 1, 10-345: -1 -3,  
11-382: 3 -1, 12-390: 1 -3, 13-418: 1 -1, 14-460: 3 1, 15-506: -1 -1,  
16-522: 1 3, 17-545: -4/3 0, 18-580: -1 -3, 19-636: -3 1, 20-662: -3 -3,  
21-681: 3 -3, 22-733: -3 -1, 23-741: 1 -3, 24-786: -1 3, 25-817: -1 -3,  
26-856: 4/3 0, 27-883: -1 -3, 28-899: -3 -1, 29-936: -1 1, 30-983: -3 -3,  
31-999: -4/3 0, 32-1042: -1 -3, 33-1082: -3 3, 34-1108: 1 -1, 35-1141: -3 -3,  
36-1177: -3 1, 37-1188: -3 3, 38-1216: 1 -1, 39-1264: 1 -3, 40-1299: 1 -1,

41-1317: -3 -1, 42-1374: -3 -3, 43-1379: 3 3, 44-1419: -4/3 0, 45-1447: 3 1,  
46-1489: 1 -1, 47-1535: -1 -3, 48-1551: 1 -1, 49-1574: -3 1, 50-1609: -1 3,  
51-1633: -1 1, 52-1691: -3 -3