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Re:	Task Group Review of IEEE 802.16d/D2
Abstract	Revise the Preamble of UL OFDMA in 256 FFT OFDM mode.
Purpose	Change the text of the initial working documents (*P802.16d/D2*)
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Comment on Subchannelization for 256FFT UL-OFDMA

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1. Introductions

This contribution intends to propose a new subchannelization for 256FFT UL-OFDMA.

2. Technical discussion

Subcarrier allocation of subchannel had got a long discussion, and the consensus had been got that the following design criteria should be used.

1) The subcarriers allocation of subchannels should be based on cluster division.
2) Each subchannel of 8_subchannels case should has one pilot
3) The pilots of each subchannel for 4_ or 2_subchannels case should be apart from each other as much as possible
4) The PAPR of preamble for each subchannel (subchannelization preamble) should be as low as possible.
5) Each subchannel should have 4 diversity legs.

3. The proposal for subcarrier allocation

We propose the new subcarrier allocation of subchannel for 256FFT UL-OFDMA; the subcarrier allocation meets all the design criteria. Furthermore, only one sequence is need for all subchannel cases with better PAPR among the previous subcarrier allocation schemes as follows,

```
Seq [-100:100]=[
-1-i +1+i +1+i -1-i -1+i -1-i -1-i +1+i +1+i -1-i -1+i -1-i -1+i -1-i +1+i +1+i -1-i -1+i -1-i -1-i
+1+i +1+i -1-i -1+i -1-i -1-i +1-i -1-i -1-i +1+i +1+i -1-i +1-i -1-i -1-i +1+i +1+i +1-i -1-i +1-i
-1-i -1-i +1+i +1+i -1-i +1-i -1-i -1-i +1+i +1+i -1+i -1-i -1+i -1+i -1+i +1-i -1+i -1-i -1+i -1+i
-1+i +1-i -1-i +1-i +1+i +1-i +1-i +1-i -1+i +1-i +1+i +1-i +1-i +1-i -1+i +1+i +1+i -1-i +1+i +1-i
+1+i +1+i +1+i -1-i +1+i +1-i +1+i -1-i -1-i -1-i +1+i -1-i -1+i -1-i -1-i -1-i +1+i -1-i -1+i -1-i
0
-1+i +1-i +1-i +1-i -1-i +1-i +1-i -1+i -1+i -1+i +1+i -1+i -1+i -1+i +1-i +1-i +1-i -1-i +1-i +1-i
-1+i -1+i -1+i +1+i -1+i +1-i +1+i +1-i -1+i +1-i +1-i -1+i -1-i -1+i +1-i -1+i -1+i +1+i +1-i +1+i
+1-i -1+i +1-i +1-i -1+i -1-i -1+i +1-i -1+i -1+i +1+i -1+i +1+i -1-i -1-i +1+i -1-i +1-i -1-i +1+i
+1+i -1-i +1+i -1-i +1-i -1-i +1+i +1+i -1-i +1+i -1+i +1+i -1-i -1-i +1+i -1+i -1+i +1-i +1-i -1-i
+1-i +1-i +1-i -1+i -1+i +1+i -1+i -1+i +1-i +1-i -1+i -1+i +1+i -1+i -1+i -1+i +1-i +1-i -1-i +1-i
];
```

Table 1: new subcarrier allocation

<table>
<tr><td colspan="4">Pilot allocation: -88,-63, -38,-13,13,38,63,88</td></tr>
<tr><td>16 subchannels case</td><td>8 subchannels case</td><td>4 subchannels case</td><td>2 subchannels case</td></tr>
<tr><td>Subcarrier allocation of 16 subchannels</td><td>Subcarrier allocation of 8 subchannels</td><td>Subcarrier allocation of 4 subchannels</td><td>Subcarrier allocation of 2 subchannels</td></tr>
<tr><td>-91:-89, -41:-39, 1:3, 51:53</td><td rowspan="2">-94:-89, –44:-39, 1:6, 51:56, (-38)</td><td rowspan="4">-100:-89, -50:-38, 1:12, 51:63</td><td rowspan="6">-100:-76, -50:-26, 1:25,51:75 (Including pilots -38,13,-88,63)</td></tr>
<tr><td>-94:-92, -44:-42, 4:6, 54:56</td></tr>
<tr><td>-97:-95, -47:-45, 7:9, 57:59</td><td rowspan="2">-100:-95, -50:-45, 7:12, 57:62, (63)</td></tr>
<tr><td>-100:-98, -50:-48, 10:12, 60:62</td></tr>
<tr><td>-78:-76, -28:-26, 14:16, 64:66</td><td rowspan="2">-81:-76, -31:-26, 14:19, 64:69, (13)</td><td rowspan="4">-88:-76, -37:-26, 13:25, 64:75</td></tr>
<tr><td>-81:-79, -31:-29, 17:19, 67:69</td></tr>
<tr><td>-84:-82, -34:-32, 20:22, 70:72</td><td rowspan="2">-85:-82, -37:-32, 20:25, 70:75, (-88)</td></tr>
<tr><td>-87:-85, -37:-35, 23:25, 73:75</td></tr>
<tr><td>-66:-64, -16:-14, 26:28, 76:78</td><td rowspan="2">-69:-64, -19:-14, 26:31, 76:81, (-13)</td><td rowspan="4">-75:-64, -25:-13, 26:37, 76:88</td><td rowspan="4">-75:-51,-25:-1, 26:50,76:100 (Including pilots -13,38,-63,88)</td></tr>
<tr><td>-69:-67, -19:-17, 29:31, 79:81</td></tr>
<tr><td>-72:-70, -22:-20, 32:34, 82:84</td><td rowspan="2">-75:-70, -25:-20, 32:37, 82:87, (88)</td></tr>
<tr><td>-75:-73, -25:-23, 35:37, 85:87</td></tr>
</table>

-53:-51, -3:-1, 39:41, 89:91	-56:-51, -6:-1, 39:44, 89:94, (38)	-63:-51, -12:-1, 38:50, 89:100	
-56:-54, -6:-4, 42:44, 92:94			
-59:-57, -9:-7, 45:47, 95:97	-62:-57, -12:-7, 45:51, 95:100, (-63)		
-62:-60, -12:-10, 48:51, 98:100			

The following PAPR values were got by the 4 multiple interpolations with 1024 IFFT.

1) For 2 subchannels case

802.16d_OFDMA	Proposed_OFDMA	(802.16d_OFDMA-Proposed_OFDMA)
4.2200	3.9005	0.3195
4.0471	3.9799	0.0672

2) For 4 subchannels case

802.16d_OFDMA	proposed_OFDMA	(802.16d_OFDMA-proposed_OFDMA)
4.1864	4.2160	-0.0296
4.1794	4.1480	0.0314
4.1814	4.0989	0.0825
4.2009	4.0063	0.1946

3) For 8 subchannels case

802.16d_OFDMA	proposed_OFDMA	(802.16d_OFDMA-proposed_OFDMA)
3.9887	3.9175	0.0712
3.9699	3.9635	0.0064
3.9675	3.8633	0.1042
3.9769	3.9363	0.0406
3.9866	3.9169	0.0697
3.9887	3.9313	0.0574
3.9002	3.9323	-0.0321
3.8722	3.9272	-0.0550

4) For 16 subchannels case:

802.16d_OFDMA	proposed_OFDMA	(802.16d_OFDMA-proposed_OFDMA)
3.0097	3.0019	0.0078
3.0052	3.0074	-0.0022
3.0097	3.0085	0.0012
3.0052	3.0081	-0.0029
3.0071	3.0091	-0.0020
3.0097	3.0006	0.0091
3.0071	3.0096	-0.0025
3.0097	3.0096	0.0001
3.0052	3.0098	-0.0046
3.0097	2.9971	0.0126
3.0052	3.0033	0.0019

3.0097	3.0064	0.0033
3.0097	3.0077	0.0020
3.0071	3.0101	-0.0030
3.0097	3.0063	0.0034
3.0071	3.0076	-0.0005

5 Change to the specification

- Related to subcarrier allocation

1) Change to clause 5.6 in [1]

Replace:

In the UL, the preamble vectors shown in Table11 through Table 14 are used in conjunction with subchannelization transmissions. Preamble carriers that do not fall within the allocated subchannels shall not be transmitted.

Table 11, Table 12, Table 13, Table 14.

With:

In the UL,if using subchannelization, the preamle of allocated subchannel can be got from the following frequency domain squence, the subcarriers that do not fall within the allocated subchannel shall be set to zero. This kind of preamble is refered to as the subchannelization preamble.

```
Seq [-100:100]=[
-1-i +1+i +1+i -1-i -1+i -1-i -1-i +1+i +1+i -1-i -1+i -1-i -1+i -1-i +1+i +1+i -1-i -1+i -1-i -1-i
+1+i +1+i -1-i -1+i -1-i -1-i +1-i -1-i -1-i +1+i +1+i -1-i +1-i -1-i -1-i +1+i +1+i +1-i -1-i +1-i
-1-i -1-i +1+i +1+i -1-i +1-i -1-i -1-i +1+i +1+i -1+i -1-i -1+i -1+i -1+i +1-i -1+i -1-i -1+i -1+i
-1+i +1-i -1-i +1-i +1+i +1-i +1-i +1-i -1+i +1-i +1+i +1-i +1-i +1-i -1+i +1+i +1+i -1-i +1+i +1-i
+1+i +1+i +1+i -1-i +1+i +1-i +1+i -1-i -1-i -1-i +1+i -1-i -1+i -1-i -1-i -1-i +1+i -1-i -1+i -1-i
0
-1+i +1-i +1-i +1-i -1-i +1-i +1-i -1+i -1+i -1+i +1+i -1+i -1+i -1+i +1-i +1-i +1-i -1-i +1-i +1-i
-1+i -1+i -1+i +1+i -1+i +1-i +1+i +1-i -1+i +1-i +1-i -1+i -1-i -1+i +1-i -1+i -1+i +1+i +1-i +1+i
+1-i -1+i +1-i +1-i -1+i -1-i -1+i +1-i -1+i -1+i +1+i -1+i +1+i -1-i -1-i +1+i -1-i +1-i -1-i +1+i
+1+i -1-i +1+i -1-i +1-i -1-i +1+i +1+i -1-i +1+i -1+i +1+i -1-i -1-i +1+i -1+i -1+i +1-i +1-i -1-i
+1-i +1-i +1-i -1+i -1+i +1+i -1+i -1+i +1-i +1-i -1+i -1+i +1+i -1+i -1+i -1+i +1-i +1-i -1-i +1-i
];
```

2) Change to Table 1 in [1]

Replace the last row of Table 1 in [1] with the following table.

Parameter	Value
Subchannel number	Allocated frequency offset indices of carriers
0b00 0b0010 0b00100 0b00101 0b0011 0b00110 0b00111 0b01 0b010 0b0100 0b0101 0b011 0b0110 0b0111 0b1 0b10 0b100 0b1000 0b1001 0b101 0b1010 0b1011 0b11 0b110 0b1100 0b1101 0b111 0b1110 0b1111	{-91:-89 -41:-39 1:3; 51:53} (-38) {-94:-92; -44:-42; 4:6; ;54:56} {-97:-95; -47:-45; 7:9 ;57:59} (63) {-100:-98; -50:-48; 10:12; 60:62} {-78:-76 -28:-26 14:16 64:66} (13) {-81:-79 ;-31:-29; 17:19; 67:69;} {-84:-82; -34:-32 20:22; 70:72} (-88) {-87:-85; -37:-35 23:25 73:75}
	Note that pilot carriers are allocated only if two or more subchannels are allocated.

6 Conclusion

1) The proposed solution have better PAPR
2) The proposal meet all the main design criteria
3) This Item is now still open now.
4) We hope to propose best solution

7 Reference

[1] *P802.16d/D2*