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Title	Long block size CTC for chase combining H-ARQ DL/UL MAP IE
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Re:	IEEE P802.16e/D5a
Abstract	This contribution includes the specific text for long block size CTC code. This code shall be used only in the H-ARQ DL/UL MAP IEs.
Purpose	Adoption of proposed changes into P802.16e /D5a-2004
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## **Long block size CTC for chase combining H-ARQ DL/UL MAP IE**

### **1. Motivation**

Current block size of CTC is confined to 480 bits. It is not enough to take full advantages of CTC codes. This contribution includes the specific text for long block size CTC code. This code shall be used only in the H-ARQ DL/UL MAP IEs that are defined in C80216e-05\_023rxx.doc.

### **2. Details**

The current concatenation scheme for H-ARQ CTC only allows maximum 10 subchannels to be concatenated. It results in the maximum information bit size of 480 bits. We propose to increase the maximum number of the concatenated subchannels to 20 subchannels. To this end, we provides some texts for the concatenation rule, CTC interleaving parameters and the subblock interleaving parameters.

### 3. Changes summary

[Add the following text an the end of table 323 in 8.4.9.2.3.1]

For the H-ARQ DL/UL MAP IEs, following concatenation rule shall be used.

**Table 322a—Subchannel concatenation rule for CTC in H-ARQ DL/UL MAP IEs**

<u>Number of subchannels</u>	<u>Subchannels concatenated</u>
<u><math>n \leq j</math></u> <u><math>n \neq 7</math> or 14</u>	<u>1 block of n subchannels</u>
<u><math>n=7</math></u>	<u>1 block of 4 subchannels</u> <u>1 block of 3 subchannels</u>
<u><math>n=14</math></u>	<u>1 block of 8 subchannels</u> <u>1 block of 6 subchannels</u>
<u><math>n &gt; j</math></u>	<p>If( <math>n \bmod j = 0</math> )</p> <p><u>k blocks of j subchannels</u></p> <p>else</p> <p><u>(k-1) blocks of j subchannels</u></p> <p><u>1 block of <math>L_{b1}</math> subchannels</u></p> <p><u>1 block of <math>L_{b2}</math> subchannels</u></p> <p>Where:</p> <p><u><math>L_{b1} = \text{ceil}((m+j)/2)</math></u></p> <p><u><math>L_{b2} = \text{floor}((m+j)/2)</math></u></p> <p><u>If (<math>L_{b1} == 7</math>) or (<math>L_{b2} == 7</math>)</u></p> <p><u><math>L_{b1} = L_{b1} + 1; L_{b2} = L_{b2} - 1;</math></u></p> <p><u>If (<math>L_{b1} == 14</math>) or (<math>L_{b2} == 14</math>)</u></p> <p><u><math>L_{b1} = L_{b1} + 1; L_{b2} = L_{b2} - 1;</math></u></p>

**Table 323a—Encoding Subchannel concatenation for different allocations and modulations in CTC for H-ARQ DL/UL MAP IEs**

<u>Modulation and rate</u>	<u>j</u>
<u>QPSK 1/2</u>	<u><math>j = 20</math></u>
<u>QPSK 3/4</u>	<u><math>j = 13</math></u>
<u>QAM16 1/2</u>	<u><math>j = 10</math></u>
<u>QAM16 3/4</u>	<u><math>j = 6</math></u>
<u>QAM64 1/2</u>	<u><math>j = 6</math></u>
<u>QAM64 2/3</u>	<u><math>j = 3</math></u>
<u>QAM64 3/4</u>	<u><math>j = 4</math></u>
<u>QAM64 5/6</u>	<u><math>j = 4</math></u>

[Add the following text an the end of table 324 in 8.4.9.2.3.1]

For the CTC defined for H-ARQ DL/UL MAP IEs, CTC interleaving parameters in table 324a shall be used.

**Table 324a—CTC channel coding per modulation for H-ARQ DL/UL MAP IEs**

Modulation	Data block size (bytes)	Encoded data block size (bytes)	Code rate <sup>∞</sup>	N	P 0	P 1	P 2	P 3
QPSK	6	12	1/2	24	5	0	0	0
QPSK	12	24	1/2	48	13	24	0	24
QPSK	18	36	1/2	72	11	6	0	6
QPSK	24	48	1/2	96	7	48	24	72
QPSK	30	60	1/2	120	13	60	0	60
QPSK	36	72	1/2	144	17	74	72	2
<a href="#">QPSK</a>	<a href="#">48</a>	<a href="#">96</a>	1/2	<a href="#">192</a>	<a href="#">11</a>	<a href="#">96</a>	<a href="#">48</a>	<a href="#">144</a>
<a href="#">QPSK</a>	<a href="#">54</a>	<a href="#">108</a>	1/2	<a href="#">216</a>	<a href="#">13</a>	<a href="#">108</a>	<a href="#">0</a>	<a href="#">108</a>
<a href="#">QPSK</a>	<a href="#">60</a>	<a href="#">120</a>	1/2	<a href="#">240</a>	<a href="#">13</a>	<a href="#">120</a>	<a href="#">60</a>	<a href="#">180</a>
<a href="#">QPSK</a>	<a href="#">66</a>	<a href="#">132</a>	1/2	<a href="#">264</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">72</a>	<a href="#">144</a>	1/2	<a href="#">288</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">78</a>	<a href="#">156</a>	1/2	<a href="#">312</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">90</a>	<a href="#">180</a>	1/2	<a href="#">360</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">96</a>	<a href="#">192</a>	1/2	<a href="#">384</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">102</a>	<a href="#">204</a>	1/2	<a href="#">408</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">108</a>	<a href="#">216</a>	1/2	<a href="#">432</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">114</a>	<a href="#">228</a>	1/2	<a href="#">456</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">120</a>	<a href="#">240</a>	1/2	<a href="#">480</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
QPSK	9	12	3/4	36	11	18	0	18
QPSK	18	24	3/4	72	11	6	0	6
QPSK	27	36	3/4	108	11	54	56	2
QPSK	36	48	3/4	144	17	74	72	2
<a href="#">QPSK</a>	<a href="#">45</a>	<a href="#">60</a>	3/4	<a href="#">180</a>	<a href="#">11</a>	<a href="#">90</a>	<a href="#">0</a>	<a href="#">90</a>
<a href="#">QPSK</a>	<a href="#">54</a>	<a href="#">72</a>	3/4	<a href="#">216</a>	<a href="#">13</a>	<a href="#">108</a>	<a href="#">0</a>	<a href="#">108</a>
<a href="#">QPSK</a>	<a href="#">72</a>	<a href="#">96</a>	3/4	<a href="#">288</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">81</a>	<a href="#">108</a>	3/4	<a href="#">324</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">90</a>	<a href="#">120</a>	3/4	<a href="#">360</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">99</a>	<a href="#">132</a>	3/4	<a href="#">396</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">108</a>	<a href="#">144</a>	3/4	<a href="#">432</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QPSK</a>	<a href="#">117</a>	<a href="#">156</a>	3/4	<a href="#">468</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
QAM16	12	24	1/2	48	13	24	0	24
QAM16	24	48	1/2	96	7	48	24	72
QAM16	36	72	1/2	144	17	74	72	2
<a href="#">QAM16</a>	<a href="#">48</a>	<a href="#">96</a>	1/2	<a href="#">192</a>	<a href="#">11</a>	<a href="#">96</a>	<a href="#">48</a>	<a href="#">144</a>
<a href="#">QAM16</a>	<a href="#">60</a>	<a href="#">120</a>	1/2	<a href="#">240</a>	<a href="#">13</a>	<a href="#">120</a>	<a href="#">60</a>	<a href="#">180</a>
<a href="#">QAM16</a>	<a href="#">72</a>	<a href="#">144</a>	1/2	<a href="#">288</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM16</a>	<a href="#">96</a>	<a href="#">192</a>	1/2	<a href="#">384</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM16</a>	<a href="#">108</a>	<a href="#">216</a>	1/2	<a href="#">432</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>

<a href="#">QAM16</a>	<a href="#">120</a>	<a href="#">240</a>	1/2	<a href="#">480</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
QAM16	18	24	3/4	72	11	6	0	6
QAM16	36	48	3/4	144	17	74	72	2
<a href="#">QAM16</a>	<a href="#">54</a>	<a href="#">108</a>	3/4	<a href="#">216</a>	<a href="#">13</a>	<a href="#">108</a>	<a href="#">0</a>	<a href="#">108</a>
<a href="#">QAM16</a>	<a href="#">72</a>	<a href="#">96</a>	3/4	<a href="#">288</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM16</a>	<a href="#">90</a>	<a href="#">120</a>	3/4	<a href="#">360</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM16</a>	<a href="#">108</a>	<a href="#">144</a>	3/4	<a href="#">432</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
QAM64	18	36	1/2	72	11	6	0	6
QAM64	36	72	1/2	144	17	74	72	2
<a href="#">QAM64</a>	<a href="#">54</a>	<a href="#">108</a>	1/2	<a href="#">216</a>	<a href="#">13</a>	<a href="#">108</a>	<a href="#">0</a>	<a href="#">108</a>
<a href="#">QAM64</a>	<a href="#">72</a>	<a href="#">144</a>	1/2	<a href="#">288</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM64</a>	<a href="#">90</a>	<a href="#">180</a>	1/2	<a href="#">360</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM64</a>	<a href="#">108</a>	<a href="#">216</a>	1/2	<a href="#">432</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
QAM64	24	36	2/3	96	7	48	24	72
<a href="#">QAM64</a>	<a href="#">48</a>	<a href="#">72</a>	<a href="#">2/3</a>	<a href="#">192</a>	<a href="#">11</a>	<a href="#">96</a>	<a href="#">48</a>	<a href="#">144</a>
QAM64	<a href="#">72</a>	<a href="#">108</a>	2/3	<a href="#">288</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM64</a>	<a href="#">96</a>	<a href="#">144</a>	<a href="#">2/3</a>	<a href="#">384</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
QAM64	27	36	3/4	<a href="#">108</a>	11	54	56	2
<a href="#">QAM64</a>	<a href="#">54</a>	<a href="#">72</a>	<a href="#">3/4</a>	<a href="#">216</a>	<a href="#">13</a>	<a href="#">108</a>	<a href="#">0</a>	<a href="#">108</a>
QAM64	<a href="#">81</a>	<a href="#">108</a>	3/4	<a href="#">324</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM64</a>	<a href="#">108</a>	<a href="#">144</a>	<a href="#">3/4</a>	<a href="#">432</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM64</a>	<a href="#">30</a>	<a href="#">36</a>	<a href="#">5/6</a>	<a href="#">120</a>	<a href="#">13</a>	<a href="#">60</a>	<a href="#">0</a>	<a href="#">60</a>
<a href="#">QAM64</a>	<a href="#">60</a>	<a href="#">72</a>	<a href="#">5/6</a>	<a href="#">240</a>	<a href="#">13</a>	<a href="#">120</a>	<a href="#">60</a>	<a href="#">180</a>
<a href="#">QAM64</a>	<a href="#">90</a>	<a href="#">108</a>	<a href="#">5/6</a>	<a href="#">360</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>
<a href="#">QAM64</a>	<a href="#">120</a>	<a href="#">144</a>	<a href="#">5/6</a>	<a href="#">480</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>	<a href="#">∞</a>

[Add the following text at the end of table 327 in 8.4.9.2.3.4.2]

For the CTC defined for H-ARQ DL/UL MAP IEs, subblock interleaving parameters in table 324a shall be used.

**Table 327a– The parameters for the subblock interleavers for H-ARQ DL/UL MAP IEs**

Block size (bits) NEP	$N$	Subblock Interleaver Parameters	
		$m$	$J$
48	24	3	3
72	36	4	3
96	48	4	3
144	72	5	3
192	96	5	3
216	108	5	4
240	120	6	2
288	144	6	3
360	180	6	3
384	192	6	3
432	216	6	4
480	240	7	2
528	264	7	3
576	288	7	3
624	312	7	3
648	324	7	3
720	360	7	3
768	384	7	3
792	396	7	4
816	408	7	4
864	432	7	4
912	456	8	2
936	468	8	2
960	480	8	2