Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Corrections and clarifications to the 802.16d OFDMA Channel Coding**	
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Re:	Response to the call for contributions to IEEE Standard 802.16-2004, IEEE 802.16maint-04/01, 2004-08-04. Header error fix to IEEE 802.16maint-04/28.	
Abstract	Some of the parameters in subblock interleave of CTC coding need to be added. The subchannel concatenation rule of FEC coding need to be clarified and modified.	
Purpose	To incorporate the text modification proposed in this contribution into IEEE 802.16REVd standard.	
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Corrections and clarifications to the OFDMA Channel Coding

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1. Section 8.4.9.2.3.4.2 subblock interleaving

The parameters of subblock interleavers are specified in Table 327.

Table 327—Parameters for the subblock interleavers

Block size (bits) N_{EP}	N	Subblock Interleaver Parameters	
		m	J
28	24	3	3
72	36	4	3
96	48	4	3
144	72	5	3
192	96	5	3
216	108	6	3
240	120	6	2
288	144	6	3
384	192	6	3
432	216	6	4
480	240	7	2

In Table 324 –Optimal CTC channel coding per modulation of Section 8.4.0.2.3.1 on CTC encoder, a CTC channel coding scheme is given as following:

Modulation	Data block size (bytes)	Encoded data block size (bytes)	Code rate	N	P0	P1	P2	P3
QPSK	45	60	3/4	180	11	90	0	90

In Table 324, the CTC channel coding pattern with N=180 exists. But in Table 327, subblock interleave parameters for CTC are absent when N equals to 180. So subblock interleave parameters for CTC when N=180 should be added to satisfy the integrity requirement of subchannel concatenation of CTC channel coding.

So Table 327 should be modified as following:

Table 327—Parameters for the subblock interleavers

Block size (bits) N_{EP}	N	Subblock Interleaver Parameters	
		m	J
28	24	3	3
72	36	4	3
96	48	4	3
144	72	5	3
192	96	5	3
216	108	6	3
240	120	6	2
288	144	6	3
360	180	6	3
384	192	6	3
432	216	6	4
480	240	7	2

add

2 Section 8.4.9.2 Encoding

The encoding block size shall depend on the number of subchannels allocated and the modulation specified for the current transmission.

Concatenation of a number of subchannels shall be performed in order to make larger blocks of coding where it is possible, with the limitation of not passing the largest block under the same coding rate (the block defined by 64-QAM modulation). Table 316 specifies the concatenation of subchannels for different allocations and modulations. The parameters in Table 315 and Table 316 shall apply to the CC encoding scheme (see 8.4.9.2.1) and the BTC encoding scheme (see 8.4.9.2.2), for the CTC encoding scheme (see 8.4.9.2.3), the concatenation rule is defined in 8.4.9.2.3.3.

For any modulation and FEC rate, given an allocation of n subchannels, we define the following parameters:

— j: parameter dependent on the modulation and FEC rate
— n: number of allocated subchannels
— k: floor (n / j)
— m: n modulo j

Table 315 shows the rules used for subchannel concatenation.

Table 315—Subchannel concatenation rule

Number of subchannels	Subchannels concatenated
$n \leq j$	1 block of n subchannels
$n > j$	$(k-1)$ blocks of j subcahnnels 1 block of ceil($(m+j)/2$) subchannels 1 block of floor($(m+j)/2$) subchannels

Suggested correction: the above sentences underlined have given the rule for channel coding subchannel concatenation. According to it, **when m equals to zero, the concatenation scheme of k blocks, with j subchannel concatenated in each block, is the best one.** But the protocol didn't comply with the rule described above by the sentences underlined. So Table 315 should be changed as follows:

Table 315—Subchannel concatenation rule

Number of subchannels		Subchannels concatenated
$n \le j$		1 block of n subchannels
$n > j$	$m = 0$	k blocks of j subcahnnels
	$m \neq 0$	$(k-1)$ blocks of j subcahnnels 1 block of ceil$((m+j)/2)$ subchannels 1 block of floor$((m+j)/2)$ subchannels

add

3. Section 8.4.9.2.3.1 CTC encoder

Table 322—Subchannel concatenation rule for CTC

Number of subchannels	Subchannels concatenated
$n \le j$ $n \neq 7$	1 block of n subchannels
$n = 7$	1 block of 4 subchannels 1 block of 3 subchannels
$n > j$	(k-1) blocks of j subcahnnels 1 block of L_{b1} subchannels 1 block of L_{b2} subchannels Where: L_{b1} = ceil$((m+j)/2)$ L_{b2} = floor$((m+j)/2)$ If ($L_{b1} = 7$) or ($L_{b2} = 7$) $Lb1 = Lb1 + 1$; $Lb2 = Lb2 - 1$;

The encoding block size shall depend on the number of subchannels allocated and the modulation specified for the current transmission. Concatenation of a number of subchannels shall be performed in order to make larger blocks of coding where it is possible, with the imitation of not passing the largest block under the same coding rate (the block defined by 64-QAM modulation). Table 323 specifies the concatenation of subchannels for different allocations and modulations. The concatenation rule shall not be used when using HARQ.

For any modulation and FEC rate, given an allocation of n subchannels, we define the following parameters:

j parameter dependent on the modulation and FEC rate.

n number of allocated subchannels

k = floor(n/j)

$m = n \bmod j$

Table 322 shows the rules used for subchannel concatenation:

Suggested correction: the underline sentences above have given the rule for channel coding subchannel concatenation. **When m equals to zero, the scheme of k blocks, with j**

subchannel concatenated in each block, is the best. But the protocol didn't comply with the rule described above by the underline sentences. So Table 315 should be changed as follows:

Table 322—Subchannel concatenation rule for CTC

Number of subchannels		Subchannels concatenated
$n \leq j$ $n \neq 7$		1 block of n subchannels
$n = 7$		1 block of 4 subchannels 1 block of 3 subchannels
$n > j$	$m = 0$	k blocks of j subcahnnels
	$m \neq 0$	(k-1) blocks of j subcahnnels 1 block of L_{b1} subchannels 1 block of L_{b2} subchannels Where: L_{b1} = ceil((m+j)/2) L_{b2} = floor((m+j)/2) If (L_{b1} = 7) or (L_{b2} = 7) $Lb1 = Lb1 + 1$; $Lb2 = Lb2 - 1$;

add

References:

1 IEEE P802.16-REVd/D5-2004, Draft IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems

2 Y. Ould-Cheikh-Mouhamedou, P. Kabal, P. Guinand, "Enhanced Max-Log-APP and Enhanced Log-APP Decoding for DVB-RCS", Proceedings of the 3rd International Symposium on Turbo Codes & Related Topics (Poster), Ecole Nationale Supérieure des Télécommunications de Bretagne, Brest, France, September 1-5, 2003.