Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Stuff, the sequel**
Date Submitted	**2002-10-15**
Source(s)	Nico van Waes Nokia Wireless Routers
Re:	IEEE LMSC Sponsor Ballot recirculation of P802.16a/D5
Abstract	Proposed material referenced by submitted comments. All changes compared to r1 are indicated in green.
Purpose	Adoption
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Stuff, the sequel

Nico van Waes
Nokia Wireless Routers

Change paragraph on page 2, line 9:

Additional MAC features are also introduced, such as ARQ on a per-connection basis to deal with the inherent lossy behavior of the wireless medium, and the support of mesh topologies.

Change paragraph on page 2, line 18:

The physical environment for the 2-11 GHz license-exempt bands is similar to that of 2-11 GHz licensed bands as described in 1.2.2. However, the license-exempt nature introduces additional interference and co-existence issues, whereas regulatory constraints limit the allowed radiated power. In addition to the features described in 1.2.2, the PHY and MAC introduce mechanisms such as DFS to detect and avoid interference. ~~and support for Mesh topologies.~~

Change Table 0a

Table 0a—Air Interface Nomenclature

Designation	Applicability	PHY specification	Additional MAC requirements	Options	Duplexing alternative
WirelessMAN-SC	10-66 GHz	8.2			TDD FDD
WirelessMAN-SCa	2-11 GHz licensed bands	8.3		AAS (6.2.7.7) ARQ (6.2.4) STC (8.3.3)	TDD FDD
WirelessMAN-OFDM	2-11 GHz licensed bands	8.4		AAS (6.2.7.7) ARQ (6.2.4) Mesh (6.2.6.7) STC (8.4.8)	TDD FDD
WirelessMAN-OFDMA	2-11 GHz licensed bands	8.5		AAS (6.2.7.7) ARQ (6.2.4) STC (8.5.8)	TDD FDD
WirelessHUMAN	2-11 GHz license-exempt bands	REF 8.3, 8.4 or 8.5 and 8.6	DFS (6.2.14)	AAS (6.2.7.7 ARQ (6.2.4) Mesh (6.2.6.7) STC (8.3.x.x/ 8.4.8/8.5.8)	TDD

change paragraph on page 3, line 6:

Implementations of this standard for license-exempt frequencies between 2 and 11 GHz (such as those listed in B.1) shall comply with the WirelessMAN-SCa PHY as described in 8.3, the WirelessMAN-OFDM PHY as described in

8.4, or the WirelessMAN-OFDMA PHY as described in 8.5. They shall further comply with the DFS protocols (6.2.14) and with REF 8.6.

Change paragraph on page 56, line 61

~~For each ARQ fragment received without errors (including duplicates), an acknowledgment message may be sent to the transmitter. Acknowledgments may be either for specific ARQ fragments (i.e. contain information on the acknowledged ARQ fragment numbers), or cumulative (i.e. contain the highest ARQ fragment number below which all ARQ fragments have been received correctly) or a combination of both (i.e., cumulative with selective).~~ For each ARQ fragment received, an acknowledgment shall be sent to the transmitter. Acknowledgment for fragments outside the sliding window shall be cumulative. Acknowledgments for fragments within the sliding window may be either for specific ARQ fragments (i.e. contain information on the acknowledged ARQ fragment numbers), or cumulative (i.e. contain the highest ARQ fragment number below which all ARQ fragments have been received correctly) or a combination of both (i.e., cumulative with selective). Acknowledgments shall be sent in the order of the ARQ fragment numbers they acknowledge. The frequency of acknowledgement generation is not specified here and is implementation dependent.

Insert under Tabe 56k

Table 56l—MSH-NCFG Channel Information Element

Syntax	Size	Notes
MSH-NCFG_Channel_IE() {		for licensed channels
for (i=0; i< Channels; ++i) {		
Physical Channel center frequency	24 bits	Positive integer in kHz
Physical Channel width	8 bits	Positive integer in 100 kHz
}		
Channel Re-use	3 bits	Minimum number of hops of separation between links, before a channel can be re-used by the centralized scheduling algorithm. Range is 1 hop to 7 hops, 0 for no re-use.
Reserved	5 bits	
}		

Replace 6.2.10 up to 6.2.10.2.1 with:

The WirelessMAN-OFDMA PHY specifies a Ranging Subchannel and a set of special pseudo-noise Ranging Codes. Subsets of codes shall be allocated in the UCD Channel Encoding for Initial Ranging, Periodic Ranging and BW Requests, such that the BS can determine the purpose of the received code by the subset to which the code belongs. An example of Ranging channel in OFDMA frame structure is specified in REF Figure 128ax.

SSs that wish to perform one of the aforementioned operations shall select, with equal probability, one of the codes of the appropriate subset, modulate it onto the Ranging Subchannel and subsequently transmit in a with equal probability selected (pair of) OFDM symbol(s) within the appropriate UL allocation. Details on the modulation and Ranging Codes are specified in REF 8.5.7

Copy 8.4.4.2.2 (or the new 8.4.6.2.2) to and insert above 8.3.1.4.5.3:

When a channel measurement report is needed (see 6.2.14), the extended DIUC = 15 is used with the sub-code 0x00 and with 8-bit Channel Nr value as shown in REF Table 116aq. The ~~OFDM DFS~~ Channel Measurement IE shall be followed by the Null IE (DIUC=14). When used, the CID of the DL-MAP_IE() shall be set to the broadcast CID.

Table 56m—SCa Channel measurement Information Element format

Syntax	Size	Notes
Report_Information_Element() {		
extended DIUC	4 bits	DFS = 0x00
Channel Nr	8 bits	Channel number (see Table 116cm) Set to 0x00 for licensed bands
Offset	12 bits	
Reserved	4 bits	
}		

Change Table 116 aa:

Table 116aa—OFDM Symbol Parameters

Parameter	Value
N_{FFT}	256
N_{used}	200
F_s/BW	licensed channel bandwidths which are multiples of 1.75 MHz and license-exempt: 8/7 any other bandwidth: 7/6
(T_g/T_b)	1/4, 1/8, 1/16, 1/32
Number of lower frequency guard carriers	28
Number of higher frequency guard carriers	27
Frequency offset indices of guard carriers	-128,-127...,-101 +101,+102,...,127
Frequency offset indices of BasicFixedLocationPilots	-84,-60,-36,-12,12,36,60,84
Subchannel number: Allocated frequency offset indices of carriers	1:{-100,…,-89},{-50,...,-39},{1,...13},{51,...,63} 2:{-88,…,-76},{-38,...,-26},{14,...,25},{64,...,75} 3:{-75,…,-64},{-25,...,-14},{26,...,38},{76,...,88} 4:{-63,…,-51},{-13,...,-1},{39,...,50},{89,...,100}

Change Table 116 ab:

Table 116ab—The inner Convolutional code with Puncturing Configuration

	Code Rates			
Rate	1/2	2/3	3/4	5/6
d_{free}	10	6	5	4
X	1	10	101	10101
Y	1	11	110	11010
XY	X_1Y_1	$X_1Y_1Y_2$	$X_1Y_1Y_2X_3$	$X_1Y_1Y_2X_3Y_4X_5$

Replace paragraph on page 144, line 62 with:

The encoding is performed by first passing the data in block format through the RS encoder and then passing it through a zero-terminating convolutional encoder.

Replace paragraph on page 146, line 28 with:

The encoding is performed by first passing the data in block format through the RS encoder and then passing it through a convolutional encoder. A single 0x00 tail byte is appended to the end of each allocation. In the RS encoder, the redundant bits are sent before the input bits, keeping the 0x00 tail byte at the end of the allocation.

Add under Table 116ac:

When sub-channelization is active (see REF 8.4.4.3.5), the FEC shall bypass the RS encoder and use the Overall Coding Rate as indicated in Table 116ac as CC Code Rate. The Uncoded Block Size and Coded Block size may be computed by dividing the values listed in REF Table 116ac by 4 and 2 for 1 and 2 sub-channel allocations respectively.

Add in Table 116af:

Q=6
Q=6
Q=4
Q=4
Q=2
Q=5

Add at end of 8.4.3.6:

The following preamble vectors are used in conjunction with subchannelization transmissions. The preamble carriers that do not fall within the subchannels allocated shall not be transmitted:

P_{s0x1}(-100:-89,-50:-39,1:13,51:63) = { -1 0 1 0 1 0 -1 0 -1 0 -1 0 1 0 1 0 1 0 -1 0 1 0 -1 0 0 1 0 -1 0 1 0 1 0 -1 0 -1 0 0 -1 0 -1 0 -1 0 -1 0 1 0 -1 0 }*2

P_{s0x2}(-88:-76,-38:-26,14:25,64:75) = { -1 0 -1 0 -1 0 1 0 -1 0 1 0 1 -1 0 1 0 -1 0 -1 0 1 0 -1 0 -1 1 0 -1 0 -1 0 1 0 1 0 1 0

1 0 -1 0 1 0 1 0 1 0 -1 0 }*2

P_{s0x3}(-75:-64,-25:-14,26:38,76:88) = { 0 -1 0 -1 0 1 0 -1 0 -1 0 -1 0 -1 0 1 0 1 -1 0 1 0 1 0 1 0 -1 0 -1 0 -1
-1 0 1 0 1 0 1 0 1 0 -1 0 1 }*2

P_{s0x4}(-63:-51,-13:-1,39:50,89:100) = { 0 -1 0 1 0 1 0 -1 0 -1 0 -1 0 1 0 1 0 1 0 -1 0 1 0 -1 0 1 0 -1 0 -1 0 1 0 -1 0 1 0 1 0 -1 0 -1
0 -1 0 -1 0 -1 0 -1 0 1 0 -1 }*2

P_{s0x5}(-100:-89,-75:-64,-50:-39,25:-14,1:13,26:38,51:63,76:88) = { -1 0 1 0 1 0 -1 0 1 0 -1 0 0 -1 0 1 0 1 0 1 0 1 0 1
1 0 1 0 1 0 -1 0 -1 0 -1 0 0 -1 0 1 0 1 0 -1 0 -1 0 -1 0 1 0 1 0 1 0 -1 0 1 0 1 0
-1 0 1 0 1 0 -1 0 1 0 1 0 -1 0 1 0 1 0 -1 0 1 0 -1 0 1 0 -1 0 -1 0 -1 0 -1 0 -1 0 -1}*2

P_{s0x6}(-88:-76,-63:-51,-38:-26,-13:-1,14:25,39:50,64:75,89:10) = { -1 0 -1 0 1 0 -1 0 1 0 -1 0 1 0 -1 0 1 0 -1 0 1 0 1 0 -1 0
-1 0 -1 0 1 0 1 0 -1 0 1 0 -1 0 -1 0 1 0 -1 0 1 0 1 0 -1 0 1 0 1 0
0 1 0 1 0 -1 0 -1 0 1 0 1 1 0 -1 0 -1 0 -1 0 1 0 -1 0 0 1 0 1 0 1 0 -1 0 -1 0 -1}*2

Change Table 116 am:

Table 116am—OFDM Frame durations (T_F ms)

Code(N)	PMP	Code(N)	Mesh
0-4	round((*N*/2+3)/T_s)*T_s	0-8	round((2*N*+4)/T_s)*T_s
5-6	round((*N*+2)/T_s)*T_s		
7-12	round((2*N*-4)/T_s)*T_s		
13-255	Reserved	9-255	Reserved

Delete sentence on page 161, line 58-59. Add on page 164, line 27:

The subsequent DL allocations shall span an even number of OFDM symbols.

Change Table 116 at:

Table 116at—OFDM UL-MAP information element format

Syntax	Size	Notes
UL-MAP_information_element() {		
CID	16 bits	
UIUC	4 bits	
if (UIUC == 4)		
Focused_contention_IE()	28 bits	
else if (UIUC == 15)		
Extended UIUC dependent IE	variable	Power_Control_IE() or AAS_UL_IE()
else {		
if (subchannelization[a]) {		
Subchannel Index	3 bits	0x1 Sub-channel 1 0x5 Sub-channel 1 and 3 0x2 Sub-channel 2 0x6 Sub-channel 2 and 4 0x3 Sub-channel 3 0x0 Reserved 0x4 Sub-channel 4 0x7 Reserved
Duration	5 bits	in OFDM symbols
Reserved	4 bits	Reserved
} else		
Duration	12 bits	in OFDM symbols
}		
}		

a.When sub-channelization is active (see REF 8.4.4.3.5), only UIUC's 5 through 13 shall be used.

Insert 8.4.4.3.5

8.4.4.3.5 UL-MAP sub-channelization IE Format

Within a frame, the BS may allocate a portion of the UL allocations to sub-channelized traffic.

The UL Subchannelization_IE implicitly indicates the start of the allocation and explicitly indicates the Duration and the Number of Allocations. A SS not capable of sub-channelization shall skip the next Number of Allocations UL-

MAP_IEs in the UL-MAP and resume interpreting the UL-MAP afterwards with the start of the next allocation Duration OFDM symbols after the last allocation ended.

Table 116ay—OFDM sub-channelization information element format

Syntax	Size	Notes
sub-channelization_Information_element() {		
extended UIUC	4 bits	AAS = 0x0x
Duration	12 bits	
Number of allocations	12 bits	
}		

A SS capable of sub-channelization shall decode the sub-channelized allocations, whereby the 12 bit Duration field in non-sub-channelized UL-MAP messages is replaced by a 3 bit Subchannel Index field, a 5 bit Duration field and 4 reserved bits as shown in REF Table 116at. A sub-channelized allocation shall start when all preceding allocations to the allocated sub-channels have terminated.

and above Table 116ay:

If the BS supports subchannelization, the last C_{SE} contention codes shall only be used by subchannelization-enabled SSs that wish to receive a sub-channelized allocation. In response, the BS may provide the requested allocation as a sub-channelized allocation, may provide the requested allocation as a full (default) allocation, or may provide no allocation in at all. The value of C_{SE} is transmitted in the UCD channel encoding TLV messages. The default value of C_{SE} is 0.

Rename 8.4.11.1 to 8.6 WirelessHUMAN specific components

Rename 8.4.11.2.1 to Mesh frame structure and insert as 8.4.5.

Delete 8.4.11.2.2 header and move text, minus first sentence to 8.4.3.6.

Replace Figure 128ax with:

<ITZIK FIGURE SOURCE HERE>

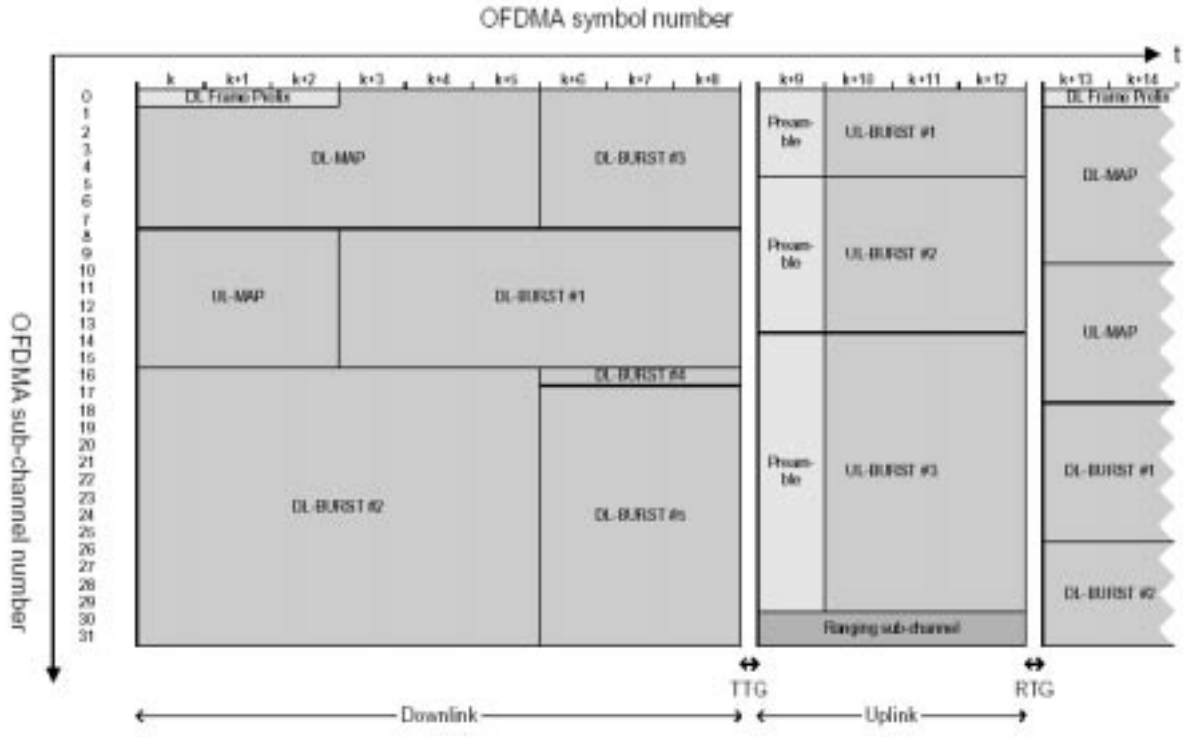

Figure 128ax—Time Plan - One TDD time frame

Change in Table 116bi

~~57~~

Delete sentence starting on page 192, line 57. Add above STC_IE format (see comment 324):

The subsequent DL allocations shall span a multiple of 6 OFDM symbols in time.

Delete 8.5.15

Add under header 10.1 Global values:

Change "SS UL-MAP processing time" and insert additional rows shown in Table 118 as shown in Table 118a

Table 118a—Parameters and constants

System	Name	Time reference	Minimum value	Default value	Maximum value
BS	SS UL-MAP processing time	Time provided between arrival of the last bit on a UL-MAP at an SS and effectiveness of that map	200 µ s except for OFDMA: 1 FEC block		
SS, BS	T17	Wait for ARQ-Reset			0.5 s
mesh node	T18	Network Entry: Detect network	1 s		
mesh node	T19	Network Entry: Accumulate MSH-NCFG messages		120 s	
mesh node	T20	Network Entry: Wait for MSH-NENT / MSH-NCFG		1 s	

In Table 122, add

Name= Subchannelization focused contention code
Type=18
Length=1
Value= Number of contention codes (C_{SE}) that shall only be used to request a sub-channelized allocation. Default value 0. Allowed values 0-48
PHY scope = OFDM

Change Type 10 Value in Table 124 to:

DL channel number as defined in REF 8.6. Used for license-exempt operation only.

and change scope to:

SCa, OFDM, OFDMA

In 11.4.1.6, add

bit #3=0: No OFDM subchannelization support
bit #3=1: OFDM subchannelization support