Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Supplement for comments from Yigal Leiba**
Date Submitted	**2004-03-13**
Source(s)	Yigal Leiba Runcom Ltd. Hachoma 2 St. 75655 Rishon Lezion, Israel Voice: +972-3-9528440 Fax: +972-3-9528805 yigall@runcom.co.il
Re:	Sponsor ballot on IEEE P802.16-REVd/D3-2004
Abstract	Supplementary text and drawings to comments submitted to sponsor ballot
Purpose	Adopt text into the standard
Notice	
Release	
Patent Policy and Procedures	

1. Active AAS scan DL scan

Update the text in page 464, line 1 (8.4.4.7) with the following,

8.4.4.7 Optional active DL AAS scan

Sub-channels ~~30~~58 and ~~31~~59 of the DL frame may be dedicated at the discretion of the BS for active AAS scanning. When these subchannels are used for this purpose, they shall not be allocated in the normal DL-MAP message and shall be used only on the AAS portion of the DL sub-frame. These sub-channels will be used to transmit the AAS_DL_Scan_IE(), whose physical construction is shown in Figure aaa. The AAS_DL_Scan_IE() is transmitted with a well known modulation and coding, namely QPSK rate 1/2 with 4 repetitions.

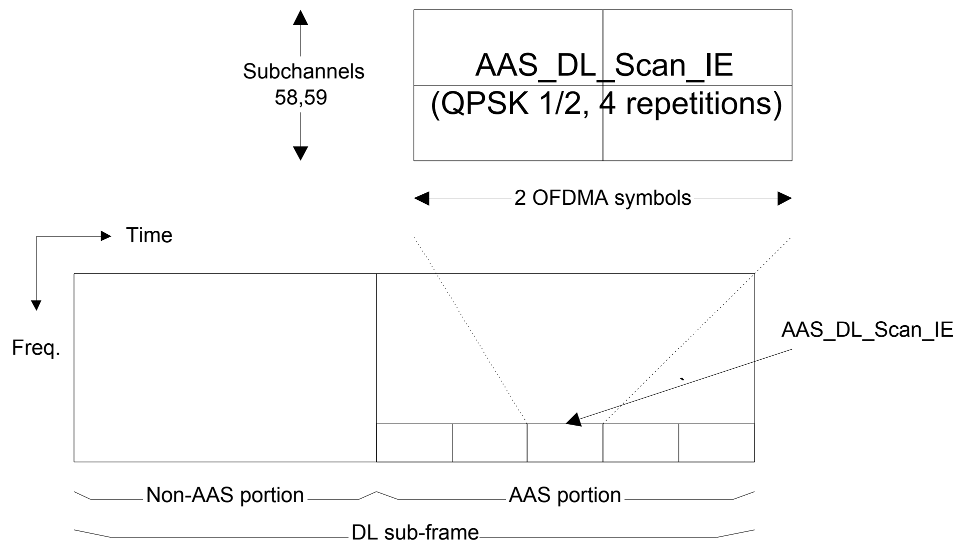

Figure aaa—Example of allocation for AAS_DL_Scan IE

The contents of the AAS_DL_Scan_IE() payload is described by Table bbb.

Table bbb—OFDMA AAS_DL_Scan_IE format

Syntax	Size	Notes
AAS_DL_Scan_IE() {		
AAS beam direction index	6 bits	This index shall correspond to the direction the AAS beam is pointing at. The range of angles the AAS element should be linearly covered by the range 0-63 of this field.
Private_Ranging_Allocation_IE(){		
~~OFDMA Symbol~~ Ranging Slot offset	~~10~~12 bits	
~~Sub-channel offset~~	~~6 bits~~	
No. ~~OFDMA Symbols~~ Ranging Slots	~~7~~5 bits	
Ranging Method	2 bits	00 - Initial Ranging over two symbols 01 - Initial Ranging over four symbols 10 - BW Request/Periodic Ranging over one symbol 11 - BW Request/Periodic Ranging over three symbols
}		
Private_MAP_Allocation_IE(){		
OFDMA ~~Symbol~~ Slot offset	~~10~~12 bits	
~~Sub-channel offset~~	~~5 bits~~	

Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;
No. OFDMA ~~Symbols~~ Slots	~~9~~8 bits	
~~**No. Sub-channels**~~	~~5 bits~~	
}		
}		

The AAS_DL_Scan_IE() is transmitted by the BS with in a specific direction of the AAS beam, and includes a preamble to facilitate channel equalization by the AAS SS. ~~The preamble used in sub-channels 30, 31 is defined in section 8.4.6.1.1, and shall be selected to have the same segment number as the DL frame preamble, and the cell ID shall equal *(DL-Preamble cell-ID + 16) mod 32*.~~ The IE is composed of the Private_Ranging_Allocation_IE() that indicates to the AAS SS a suitable slot to perform UL ranging. The BS should point its AAS beam to appropriate direction in the time indicated by this IE, such that it can receive the SS UL ranging. Should a response to the UL ranging attempt by the SS fail to arrive, the SS shall apply the exponential backoff algorithm for selecting the next opportunity to perform UL ranging.

The other part of the AAS_DL_Scan_IE() is a Private_MAP_Allocation_IE(). This IE indicates to the AAS SS where and when it might find its private DL-MAP ~~and~~ in the next DL sub-frame, such that AAS SS can start the process of network entry. An AAS SS may respond to the AAS_DL_Scan_IE() when performing initial network entry, and also as a means of tracking whether it has shifted position with regards to the direction the AAS beam should be pointing in order to communicate with it.

2. Fast Feedback channel

Update the text in page 475, line 12, (8.4.5.4.5) with the following,

8.4.5.4.5 ~~ARQ-ACK~~ FAST_FEEDBACK message mapping

Each ~~ARQ-ACK~~ FAST_FEEDBACK message occupies one ~~ARQ-ACK~~ FAST_FEEDBACK Slot which consists the UL preamble and the ~~ARQ-ACK~~ FAST_FEEDBACK message payload. ~~ARQ-ACK~~ FAST_FEEDBACK messages are mapped in to the region marked by UIUC=0 in the UL-MAP, in a time-first order, as shown in Figure ddd.

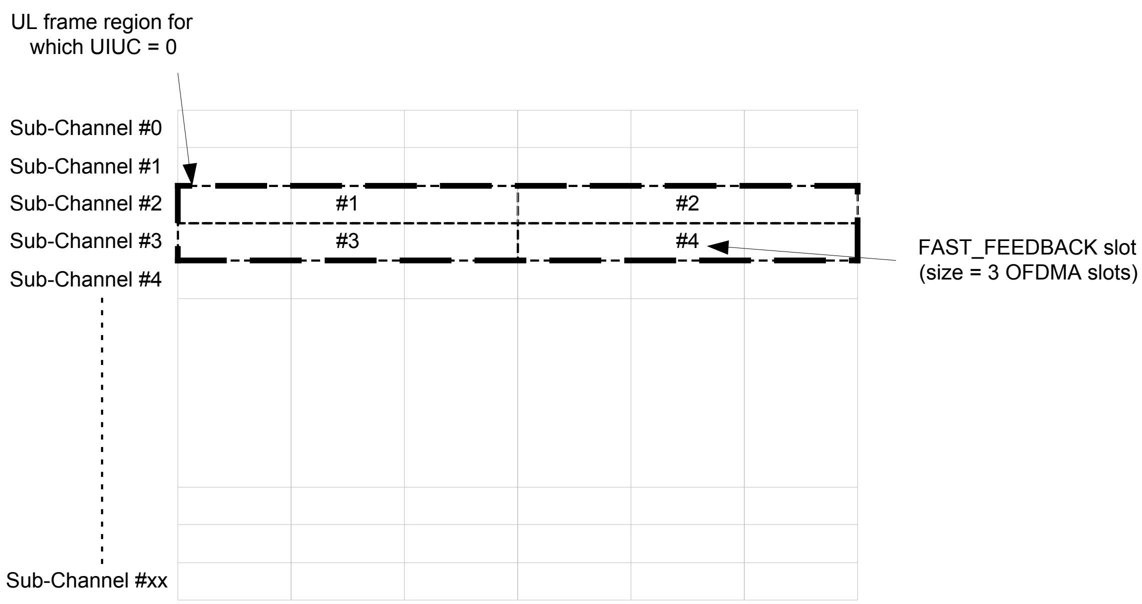

Figure ddd—Mapping order of ~~ARQ-ACK~~ FAST_FEEDBACK messages to the ~~ARQ-ACK~~ FAST_FEEDBACK region

Replace occurrences of 'ARQ_ACK' with 'FAST_FEEDBACK' in,
page 472, line 58 (table 238)
page 55, line 36 (table 6)
page 57, line 8

Remove the last line from table 280 on page 608, line 25.

Update the text in page 60, line 1, (6.4.2.2.6) with the following,

6.4.2.2.6 ~~ARQ_ACK~~ Fast-feedback allocation subheader

The format of the ~~ARQ_ACK~~ FAST_FEEDBACK allocation subheader is specified in Table ccc. The ~~ARQ_ACK~~ FAST_FEEDBACK allocation sub-header, when used, shall always be the last per-PDU subheader as specified in 6.4.2.2. .

Table ccc—~~ARQ_ACK~~ FAST_FEEDBACK allocation subheader format

Syntax	Size	Notes
~~ARQ_ACK~~ FAST FEEDBACK allocation Subheader {		
Allocation offset	6 bits	
~~**Frame offset**~~ **Feedback Type**	2 bits	00 – Fast DL measurement 01 – Fast MIMO feedback, antenna #0 10 – Fast MIMO feedback, antenna #1 11 – Reserved
}		

Allocation offset
Defines the offset, in units of slots, from the beginning of the ARQ_ACK uplink bandwidth allocation (8.4.5.4.5), of the slot in which the SS servicing the CID appearing in the MAC generic header, must send an ARQ_ACK feedback message for the connection associated with the CID value. Range of values 0 to 63. The allocation applies to the UL sub-frame of the next frame.

~~**Frame offset**~~
~~Defines the offset, in units of frames, from the frame following the frame containing the subheader, in which an ARQ_ACK feedback message shall be sent. Range of values 0 to 3.~~

Add a new section in page 574, line 62, with the following text:

8.4.5.4.5 FAST_FEEDBACK channels

Fast feedback slots may be individually allocated to SS for transmission of PHY related information that requires fast response from the SS. The allocations are done in unicast manner through the FAST_FEEDBACK MAC subheader, and the transmission takes place in a specific UL region designated by UIUC=0.

Each Fast-feedback slot consists of 3 OFDMA slots mapped along the time axis in a manner similar to the mapping of normal uplink data. A fast feedback slot uses QPSK modulation on the 96 sub-carriers it contains, and can carry a data payload of 4 bits. Table eee defines the mapping between the payload bit sequences and the subcarriers modulation.

Table eee—FAST_FEEDBACK channel subcarrier modulation

4 bit payload	Code word for modulation
0000	0xbf0382090c3628b4f3ba299c
0001	0xa814951e1b213fa3e4ad3e8b
0010	0x922eaf24211b0599de9704b1
0011	0x8539b833360c128ec98013a6
0100	0xf14dcc47427866fabdf467d2
0101	0xe65adb50556f71edaae370c5
0110	0xdc60e16a6f554bd790d94aff
0111	0xcb77f67d78425cc087ce5de8
1000	0x3488098287bda33f7831a217
1001	0x239f1e9590aab4286f26b500
1010	0x19a524afaa908e12551c8f3a
1011	0x0eb233b8bd879905420b982d
1100	0x7ac647ccc9f3ed71367fec59
1101	0x6dd150dbdee4fa662168fb4e
1110	0x57eb6ae1e4dec05c1b52c174

1111	0x40fc7df6f3c9d74b0c45d663

The fast feedback slot includes 4 bits of payload data, whose encoding depended on the instruction given in the FAST_FEEDBACK subheader. The following sections define these encoding.

8.4.5.4.5.1 Fast DL measurement feedback

When the FAST_FEEDBACK subheader *Feedback Type* field is '00' the SS shall report the S/N it measures on the DL. The following formula shall be used,

$$\text{Payload bits nibble} = \begin{cases} 0 & ,S/N < -2dB \\ n & ,2\cdot n - 4 < S/N < 2\cdot n - 2 \text{ where } 0 < n < 15 \\ 15 & ,S/N > 26dB \end{cases} \qquad \text{(fff)}$$

8.4.5.4.5.2 Fast MIMO feedback

When the FAST_FEEDBACK subheader *Feedback Type* field is '01' or '10' the SS shall report the MIMO coefficient the BS should use for best DL reception (see section 8.4.8.8). The following mapping shall be used for the complex weights,

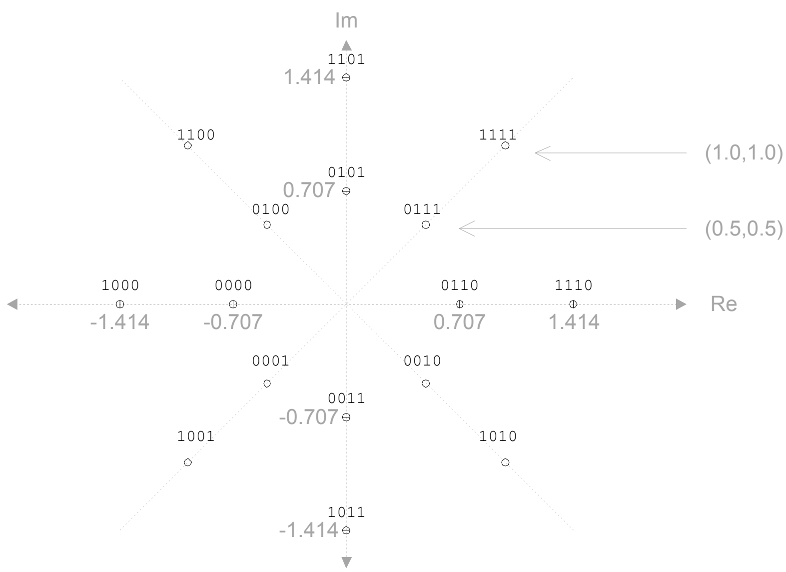

Figure ggg—Mapping of MIMO coeffcients to fast MIMO feedback payload bits

3. Update sub-channel concatenation block sizes

Update the text in page 537, line 55, (8.4.9.2) with the following,

8.4.9.2 Encoding

The coding method used as the mandatory scheme will be the tail biting convolutional encoding specified in section 8.4.9.2.1 and the optional modes of encoding in sections 8.4.9.2.2 and 8.4.9.2.3 shall be also sup-ported.
The encoding block size shall depend on the number of subchannels~~/mini-subchannels~~ allocated and the modulation specified for the current transmission. ~~Any encoding block shall be fully contained within one OFDMA symbol.~~
Concatenation of a number of subchannels~~/mini-subchannels~~ shall be performed ~~when using QPSK modulation~~ 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 64QAM modulation)~~, concatenation shall be performed only over subchannels from the same time burst~~. Table 251 specifies the concatenation of sub-channels for different allocations and modulations. ~~In the following sections parameters for encoding 64QAM rate 1/2 is given in the tables, these should be used for the concatenated case of the QPSK only, because there is no use of this combination of modulation and coding rate.~~

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

$$\begin{aligned} j &= \text{parameter dependent on the modulation and FEC rate} \\ n &= \text{number of allocated subchannels} \\ k &= \text{floor}(n / j) \\ m &= n \text{ modulo } j \end{aligned} \qquad \text{(hhh)}$$

Table iii shows the rules used for subchannel concatenation,

Table iii—Subchannel concatenation rule

Number of subchannels	Subchannels concatenated
n <= 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

Table 251—Encoding Subchannel concatenation for different allocations and modulations

~~Number of subchannels/ mini-subchannels allocated~~	~~Modulation~~	~~Subchannels concatenated~~	~~Comments~~
~~1~~	~~QPSK~~	~~1~~	~~When using 1 Subchannel concat-enation is not performed~~
~~2~~	~~QPSK~~	~~2~~	~~Using the 16QAM configuration~~
~~3~~	~~QPSK~~	~~3~~	~~Using the 64QAM configuration~~

~~4~~	~~QPSK~~	~~2,2~~	~~Using twice the 16QAM configuration~~
~~5~~	~~QPSK~~	~~3,2~~	~~Using the 64QAM then the 16QAM configuration~~
~~6~~	~~QPSK~~	~~3,3~~	~~Using twice the 64QAM configuration~~
~~n>6 (mod(n,3)=1)~~	~~QPSK~~	~~3,...,3,2,2~~	~~Using 64QAM, last two encoding done with 16QAM configuration~~
~~n>6 (mod(n,3)=2)~~	~~QPSK~~	~~3,...,3,3,2~~	~~Using 64QAM, last encoding done with 16QAM configuration~~
~~n>6 (mod(n,3)=0)~~	~~QPSK~~	~~3,...,3,3,3~~	~~Using only the 64QAM configuration~~
~~Not relevant~~	~~16 QAM~~	~~1~~	~~Concatenation is never performed~~
~~Not relevant~~	~~64 QAM~~	~~1~~	

Modulation and rate	**j**
QPSK 1/2	j = 6
QPSK 3/4	j = 4
QAM16 1/2	j = 3
QAM16 3/4	j = 2
QAM64 1/2	j = 2
QAM64 2/3	j = 1
QAM64 3/4	j = 1

Update the text in page 540, line 1, section 8.4.9.2.1 with the following,

Table 253 defines the basic sizes of the useful data payloads to be encoded in relation with the selected modulation type and encoding rate and concatenation rule.

Table 253—useful data payload for a subchannel

	QPSK		**16 QAM**		**64 QAM**		
Encoding rate	R=1/2	R=3/4	R=1/2	R=3/4	R=1/2	R=2/3	R=3/4
Allowed Data payload ~~in 48 symbols~~ (bytes)	6						
		9					
	12		12				
	18	18		18	18		
	24		24			24	
		27					27
	30						
	36	36	36	36	36		

Update table 256 in page 543, line 8, section 8.4.9.2.3.1 with the following,

Table 256—Optimal CTC channel coding per modulation

Modulation	Data block size (bytes)	Encoded data block size (bytes)	Code rate	N	P0	P1	P2	P3
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
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
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
QAM16	18	24	3/4	72	11	6	0	6
QAM16	36	48	3/4	144	17	74	72	2
QAM64	18	36	1/2	72	11	6	0	6
QAM64	36	72	1/2	144	17	74	72	2
QAM64	24	36	2/3	96	7	48	24	72
QAM64	27	36	3/4	108	11	54	56	2