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Re:	Call for comments, maintenance task group
Abstract	
Purpose	
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Corrections to definitions of Downlink MIMO in OFDMA PHY

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1 Problem Statement

Several ambiguities exist in the definitions of downlink MIMO in 802.16REVd/D5, specifically:

1. MIMO_DL_Basic_IE() and MIMO_DL_Enhanced_IE() both describe DL allocations. This is similar in concept to the regular UL-MAP_IE. The first paragraph in the section is therefore not correct as it refers to a subsequent allocation and mentions ongoing relevance until the end of the frame.

2. The number of bits used in the MIMO DL IEs for 'No. of subchannels', 'Subchannel offset', etc., is not correct and does not support AMC 1x6 subchannels.

3. 'Boosting' is a burst-specific field, and such as should be specified per each burst the MIMO DL IEs.

4. Repetition code indication is omitted from the burst definition.

5. Padding and alignment bits are missing from the two MIMO DL IEs.

6. The value of 'Matrix Indicator' is not defined if transmit diversity mode is set to 'no diversity'. This configuration mode is a valid one since multiple MIMO transmission layers may be transmitted without STC encoding in each layer. A separate capability negotiation should be defined for establishing whether an SS supports decoding MIMO IEs.

7. Definition of downlink MIMO capability negotiation is missing.

2 Detailed Text Changes

1. Section 8.4.5.3.8:

[Modify text from page 528 line 49 to page 529 line 3 as follows]

-------- BEGIN --------

In the DL-MAP, a MIMO-enabled BS may transmit DIUC=15 with the MIMO_DL_Basic_IE() to ~~indicate the MIMO configuration of the subsequent downlink allocation to a specific MIMO-enabled SS CID~~ describe downlink allocations assigned to MIMO-enabled SSs. The MIMO mode indicated in the MIMO_DL_Basic_IE() shall only apply to the ~~subsequent downlink~~ allocations described in the IE ~~until the end of frame~~. The IE may be used in AAS zones as well (in which case the STC mode is assumed to be 0b00).

-------- END --------

[Modify table 281 as follows]

-------- BEGIN --------

Syntax	Size	Notes
Extended DIUC	4 bits	MIMO = 0x05
Length	4 bits	~~Length of the message in bytes (~~variable~~)~~
Num_Region	4 bits	
for (i = 0; i< Num_Region; i++) {		
If (zone permutation == AMC) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	8 bits	
No. OFDMA Symbols	7 bits	
No. subchannels	8 bits	
Else {		
OFDMA Symbol offset	8 ~~10~~ bits	
Subchannel offset	6 ~~5~~ bits	
~~**Boosting**~~	~~3 bits~~	
No. OFDMA Symbols	7 ~~9~~ bits	
No. subchannels	6 ~~5~~ bits	
}		

Matrix_indicator	2 bits	STC matrix (see 8.4.8.1.4.)
		Transmit_diversity = transmit diversity mode indicated in the latest TD_Zone_IE().
		if (Transmit_Diversity == 0b01)
		{
		00 = Matrix A
		01 = Matrix B
		10 – 11 = Reserved
		}
		elseif (Transmit_Diversity == 0b10)
		{
		00 = Matrix A
		01 = Matrix B
		10 = Matrix C
		11 = Reserved
		}
		else
		{
		00 – 11 = Reserved
		}

Num_layer	2 bits	
Reserved	1 bit	Shall be set to zero

for (j = 0; j< Num_layer; j++) {		
if (INC_CID == 1) {		
CID	16 bits	
}		
Layer_index	2 bits	
DIUC	4 bits	
Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;
Repetition coding indication	2 bits	00 - No repetition coding 01 - Repetition coding of 2 used 10 - Repetition coding of 4 used 11 - Repetition coding of 6 used
Reserved	1 bit	Shall be set to zero
}		
If (! Byte boundary) {		
Padding	4 bit	Shall be set to zero
}		
}		

-------- END --------

2. Section 8.4.5.3.9:

[Modify text on page 530 lines 15-20 as follows]

-------- BEGIN --------

In the DL-MAP, a MIMO-enabled BS may transmit DIUC=15 with the MIMO_DL_Enhanced_IE() to ~~indicate the MIMO mode of the subsequent downlink allocation to a specific MIMO-enabled SS~~ describe downlink allocations assigned to MIMO-enabled SSs, each identified by the CQICH_ID previously assigned to it ~~the SS~~. The MIMO mode indicated in the MIMO_DL_Enhanced_IE() shall only apply to the ~~subsequent downlink~~ allocations described in the IE ~~until the end of frame~~. The IE may be used in AAS zones as well (in which case the STC mode is assumed to be 0b00).

-------- END --------

[Modify table 282 as follows]

-------- BEGIN --------

Syntax	Size	Notes
Extended DIUC	4 bits	EN_MIMO = 0x06
Length	4 bits	~~Length of the message in bytes (~~variable~~)~~
Num_Region	4 bits	
for (i = 0; i< Num_Region; i++) {		
If (zone permutation == AMC) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	8 bits	
No. OFDMA Symbols	7 bits	
No. subchannels	8 bits	
Else {		
OFDMA Symbol offset	8 ~~10~~ bits	
Subchannel offset	6 ~~5~~ bits	
~~**Boosting**~~	~~3 bits~~	
No. OFDMA Symbols	7 ~~9~~ bits	
No. subchannels	6 ~~5~~ bits	

}		

Matrix_indicator	2 bits	STC matrix (see 8.4.8.1.4.)
		Transmit_diversity = transmit diversity mode indicated in the latest TD_Zone_IE().
		if (Transmit_Diversity == 0b01)
		{
		00 = Matrix A
		01 = Matrix B
		10 – 11 = Reserved
		}
		elseif (Transmit_Diversity == 0b10)
		{
		00 = Matrix A
		01 = Matrix B
		10 = Matrix C
		11 = Reserved
		}
		else
		{
		00 – 11 = Reserved
		}

Num_layer	2 bits	
Reserved	1 bit	Shall be set to zero
for (j = 0; j< Num_layer; j++) {		
if (INC_CID == 1) {		
CQICID	*variable*	Index to uniquely identify the CQICH resource assigned to the SS. The size of this field is dependent on system parameter defined in DCD.
}		
Layer_index	2 bits	
DIUC	4 bits	
Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;
Repetition coding indication	2 bits	00 - No repetition coding 01 - Repetition coding of 2 used 10 - Repetition coding of 4 used 11 - Repetition coding of 6 used
Reserved	1 bit	Shall be set to zero
}		
If (! Byte boundary) {		
Padding	4 bit	Shall be set to zero
}		
}		

-------- END --------

3. Add section 11.8.3.7.6: define downlink MIMO capability negotiation.

[Add new section 11.8.3.7.6]

-------- BEGIN --------

11.8.3.7.6 OFDMA SS MIMO downlink support

This field indicates the different MIMO options supported by a WirelessMAN-OFDMA PHY SS in the downlink. This field is not used for other PHY specifications. A bit value of 0 indicates "not supported" while 1 indicates "supported."

Type	Length	Value	Scope
155	1	Bit #0: 2-antenna STC matrix A	SBC-REQ (see 6.3.2.3.23)

		Bit #1: 2-antenna STC matrix B Bit #2: 4-antenna STC matrix A Bit #3: 4-antenna STC matrix B Bit #4: 4-antenna STC matrix C Bit #5-7: *reserved*	SBC-RSP (see 6.3.2.3.24)

Bit #5 specifies that the SS is able to decode MIMO_DL_Basic_IE and MIMO_DL_Enhanced_IE. This is regardless of its support for STC.

-------- END --------