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Re:	IEEE 802.16Rev2/D6a, Sponsor ballot Technical Comments
Abstract	Current Standards specifies MIMO for unicast applications but support for MIMO MBS is missing. As MIMO processing is supported in the BS and MS it could be easily used for MBS as well
Purpose	Accept the proposed specification changes on IEEE P802.16Rev2/D6a.
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MIMO support for MBS

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1. Introduction

In 802.16e-2005, MIMO application is specified for unicast and MIMO support for multicast is missed. However, if a BTS and MS implement MIMO, there is no reason that it should not transmit in MIMO format for MBS.

2. Proposal text change

Modifiy ***Table 323— Extended DIUC code assignment for DIUC = 15*** on page 739

Extended- DIUC (hexadecimal)	Usage
00	Channel Measurement IE
01	STC Zone IE
02	AAS DL IE
03	Data Location in Another BS IE
04	CID Switch IE
05	~~*Reserved*~~ MIMO MBS MAP IE
06	*Reserved*
07	HARQ Map Pointer IE
08	PHYMOD DL IE
09	*Reserved*
0A	Broadcast Control Pointer IE
0B	DL PUSC Burst Allocation in Other Segment IE
0C	PUSC ASCA ALLOC IE
0D	H-FDD Group Switch IE
0E	*Reserved*
0F	UL Interference and Noise Level IE

Insert the following section on page 832

8.3.5.3.31 MIMO MBS MAP IE

In the DL-MAP, a BS may transmit DIUC = 14 with the MIMO MBS_MAP_IE() to indicate when the next data for a multicast and broadcast service flow will be transmitted using STC transmission in the format specified by STC and Matrix Indicator fields. The usage of this MAP IE shall follow the description of 8.4.5.3.12

Table XXX – MIMO MBS MAP IE

Syntax	Size (bit)	Notes
MIMO_MBS_MAP_IE() {	-	-
Extended DIUC	4	MIMO MBS MAP IE = 0x05

Length	8	-
MBS Zone identifier	7	MBS Zone identifier corresponds to the identifier provided by the BS at connection initiation
Macro diversity enhanced	1	0: Non Macro-Diversity enhanced zone; 1: Macro-Diversity enhanced zone
If(Macro diversity enhanced = 1){	-	-
Permutation	2	0b00: PUSC permutation 0b01: FUSC permutation 0b10: Optional FUSC permutation 0b11: Adjacent subcarrier permutation
DL_PermBase	5	-
PRBS_ID	2	-
OFDMA Symbol Offset	7	The offset of the OFDMA symbol measured in OFDMA symbols from beginning of the DL frame in which the DL-MAP is transmitted. Counting from the frame preamble and starting from 0
STC	2	0b00: No STC 0b01: STC using 2/3 antennas 0b10: STC using 4 antennas 0b11: FHDC using 2 antennas

Matrix Indicator	2	STC matrix (see 8.4.8.1.4)
		if (STC == 0b01 or STC == 0b10)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 = Matrix C
		0b11 = Reserved
		}
		Else if (STC == 0b11)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 – 11 = Reserved
		}

MIMO MBS MAP message allocation included indication	1	Used to indicate if the MIMO MBS MAP message allocation parameters are included
Reserved	3	Shall be set to zero
if (MIMO MBS MAP messsage allocation included = 1) {	-	-
Reserved	3	-
Boosting	3	Refer to Table 318

DIUC	4	-
No. Subchannels	6	Indication of burst size of MIMO MBS MAP message with the number of subchannels
NO. OFDMA symbols	6	Indication of burst size of MIMO MBS MAP message with the number of OFDMA symbols
Repetition Coding Indication	2	0b00—No repetition coding 0b01—Repetition coding of 2 used 0b10—Repetition coding of 4 used 0b11—Repetition coding of 6 used
}	-	-
} else {	-	-
DIUC	4	-
CID	16	CID for Single BS MBS service
OFDMA Symbol Offset	8	The offset of the first OFDMA symbol of the MBS region measured in OFDMA symbols from beginning of this DL frame.
Subchannel offset	6	The lowest index OFDMA subchannel used for carrying the burst, starting from subchannel 0.
Boosting	3	Refer to Table 318
SLC_3_indication	1	Used to notify sleep mode class 3 is used for single BS MBS service
NO. OFDMA Symbols	6	-
NO. Subchannels	6	-
Repetition Coding Indication	2	0b00—No repetition coding 0b01—Repetition coding of 2 used 0b10—Repetition coding of 4 used 0b11—Repetition coding of 6 used
if (SLC 3_indication = 1) {	-	-
Next MIMO_MBS_MAP_IE Frame Offset	8	The Next MIMO MBS_MAP_IE Frame Offset value is lower 8 bits of the frame number in which the BS shall transmit the next MIMO MBS MAP IE frame.
}	-	-
}	-	-
if !(byte boundary) {	-	-
Padding Nibble	*variable*	Padding to reach byte boundary
}	-	-
}	-	-

{insert the following text on page 271}

6.2.2.3.60 MIMO_MBS_MAP (multicast and broadcast service map) message

The MIMO_MBS_MAP message defines the MBS transmission using STC. The BS shall send an MIMO_MBS_MAP message on the Broadcast CID to specify the location and size of multi-BS MBS data bursts which are located in DL permutation zones for MBS in frames that are from 2 to 5 frames in the future from the frame containing the MIMO_MBS MAP message. If present, an MIMO_MBS_MAP message shall be located in the first data region in the DL permutation zone for MBS. In terms of multi-BS MBS, a DL permutation zone for MBS is considered an MBS portion. The MIMO_MBS_MAP message format is presented in Table YYY. This message includes the MIMO_MBS_DATA_IE, Extended_MIMO_MBS_DATA_IE and MIMO_MBS_DATA_Time_Diversity_IE which define the access information for the MBS burst. See Table YYY.

Table YYY – MIMO MBS MAP message format

Syntax	Size (bit)	Notes
MIMO_MBS_MAP Message format (){	-	-
Management Message Type = 70	8	
MBS_DIUC_Change_Count	8	-
#MIMO_MBS_DATA_IE	4	The number of included MIMO_MBS DATA IEs
for (i = 0; i < *n*; i++){	-	*n* = #MBS DATA IEs
MIMO_MBS_DATA_IE	variable	-
}	-	-
#Extended_MIMO_MBS_DATA_IE	4	The number of included Extended MIMO_MBS DATA IEs
for(i = 0; i < *k*; i++) {	-	The number of included Extended MIMO_MBS DATA IEs
Extended_MIMO_MBS_DATA_IE()	variable	-
}		
#MIMO_MBS_DATA_Time_Diversity_IE	4	The number of included MIMO_MBS DATA Time Diversity IEs
for(i = 0; i < *m*; i++){		*m* = #MIMO_MBS DATA Time Diversity IEs
MIMO_MBS_DATA_Time_Diversity_IE()	*variable*	-
}		
if(!byte boundary){	-	-
Padding Nibble	4	-
}		
TLV encoding element	-	-
}	-	-

Table ZZZ – MIMO MBS MAP types

MIMO_MBS_MAP type	Description
0	MMO_MBS_DATA_IE
1	MIMO_MBS_DATA_Time_Diversity_IE
2	Extended_MIMO_MBS_DATA_IE
3	*Reserved*

Table AAA – MIMO MBS DATA IE format

Syntax	Size (bit)	Notes
MIMO_MBS_DATA_IE(){	-	-
MIMO_MBS_MAP Type = 0	2	MIMO_MBS_DATA_IE
MBS Burst Frame Offset	2	This indicates the burst located by this IE will be shown after MBS Burst Frame Offset + 2 frames.
Next MIMO_MBS MAP change indication	1	This indicates whether the size of MIMO MBS MAP message of next MB S frame for these Multicast CIDs included this IE will be different from the size of this MIMO MBS MAP message.
No. of Multicast CID	3	-
for(i = 0; i < No. of Multicast CID; i++){	-	-
Multicast CID	12	12 LSBs of CID for multicast.
}	-	-
MBS DIUC	4	-
OFDMA Symbol Offset	8	OFDMA symbol offset with respect to start of next (MBS Burst Frame offset + 2)th frame.
Subchannel Offset	6	OFDMA subchannel offset with respect to start of the next (MBS Burst Frame offset +2)th frame.
Boosting	3	Refer to Table 318.
No. OFDMA Symbols	7	The size of MBS data.
No. Subchannels	6	-
Repetition Coding Indication	2	0b00 - No repetition coding 0b01 - Repetition coding of 2 used 0b10 - Repetition coding of 4 used 0b11 - Repetition coding of 6 used

Matrix Indicator	2	STC matrix (see 8.4.8.1.4)
		if (STC == 0b01 or STC == 0b10)
		{

		0b00 = Matrix A
		0b01 = Matrix B
		0b10 = Matrix C
		0b11 = Reserved
		}
		Else if (STC == 0b11)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 – 11 = Reserved
		}

Next MIMO_MBS Frame Offset	8	A relative value from the current frame number in which the next MIMO_MBS MAP message will be transmitted.
if (Next MIMO MBS MAP change indication == 1){	-	-
Next MIMO MBS No. OFDMA Symbols	6	It is to indicate the size of MIMO_MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
Next MIMO MBS No. OFDMA Subchannels	6	It is to indicate the size of MIMO_MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
}	-	-
}	-	-

Table BBB – Extended MIMO MBS DATA IE format

Syntax	Size (bit)	Notes
Extended_MIMO_MBS_DATA_IE(){	-	-
MIMO_MBS_MAP Type = 2	2	MIMO_MBS_DATA_IE
MBS Burst Frame Offset	2	This indicates the burst located by this IE will be shown after MBS Burst Frame Offset + 2 frames.
Next MIMO_MBS MAP change indication	1	This indicates whether the size of MIMO MBS MAP message of next MB S frame for these Multicast CIDs included this IE will be different from the size of this MIMO MBS MAP message.
No. of Multicast CID	3	-
for(i = 0; i < No. of Multicast CID; i++){	-	-

Multicast CID	12	12 LSBs of CID for multicast.
No. of Logical Channel ID	4	-
for(j = 0; j < No. of Logical Channel ID; j++) {	-	-
Logical Channel ID	8	-
}	-	-
}	-	-
MBS DIUC	4	-
OFDMA Symbol Offset	8	OFDMA symbol offset with respect to start of next (MBS Burst Frame offset + 2)th frame.
Subchannel Offset	6	OFDMA subchannel offset with respect to start of the next (MBS Burst Frame offset +2)th frame.
Boosting	3	-
No. OFDMA Symbols	7	The size of MBS data.
No. Subchannels	6	-
Repetition Coding Indication	2	0b00 - No repetition coding 0b01 - Repetition coding of 2 used 0b10 - Repetition coding of 4 used 0b11 - Repetition coding of 6 used

Matrix Indicator	2	STC matrix (see 8.4.8.1.4)
		if (STC == 0b01 or STC == 0b10)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 = Matrix C
		0b11 = Reserved
		}
		Else if (STC == 0b11)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 – 11 = Reserved
		}

Next MIMO_MBS Frame Offset	8	A relative value from the current frame number in which the next MIMO_MBS MAP message will be transmitted.
Next MIMO_MBS OFDMA Symbol Offset	8	The offset of the OFDMA symbol in which the next MBS portion starts, measured in OFDMA symbols from the beginning of the DL frame in which the MIMO_MBS_MAP is transmitted.

if (Next MIMO MBS MAP change indication == 1){	-	-
Next MIMO MBS No. OFDMA Symbols	6	It is to indicate the size of MIMO_MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
Next MIMO MBS No. OFDMA Subchannels	6	It is to indicate the size of MIMO_MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
}	-	-
}	-	-

Table CCC – MIMO MBS DATA Time Diversity IE format

Syntax	Size (bit)	Notes
MIMO_MBS_DATA_Time_Diversity_IE() {	-	-
MIMO_MBS_MAP Type = 1	2	-
MBS Burst Frame Offset	2	This indicates the burst located by this IE will be shown after MBS Burst Frame offset + 2 frames
OFDMA symbol offset	8	This indicates starting position of the region of MBS Bursts with respect to start of the next (MBS Burst Frame offset + 2)-th frame.
# of Data Sub-bursts	4	n = # of Data Sub-bursts with the same frame offset
for(i = 0; i < n; i++){	-	-
Multicast CID	12	12 LSBs of CID for multicast
N_EP code	4	-
N_SCH code	4	-
AI_SN	1	-
SPID	2	-
ACID	4	-

Matrix Indicator	2	STC matrix (see 8.4.8.1.4)
		if (STC == 0b01 or STC == 0b10)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 = Matrix C
		0b11 = Reserved

		}
		Else if (STC == 0b11)
		{
		0b00 = Matrix A
		0b01 = Matrix B
		0b10 – 11 = Reserved
		}

Next MIMO MBS MAP change indication	1	This indicates whether the size of MIMO_MBS MAP message of next MBS frame for these multicast CIDs included this IE will be different from the size of this MIMO MBS MAP message.
Next MIMO_MBS frame offset	8	-
Next MIMO_MBS OFDMA Symbol offset	8	-
if (Next MIMO_MBS MAP change indication == 1) {	-	-
Next MIMO_MBS No. OFDMA symbols	6	It is to indicate the size of MIMO_MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
Next MIMO_MBS No. OFDMA subchannels	6	It is to indicate the size of MIMO_MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
}	-	-
}	-	-
}	-	-