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Re:	IEEE P802.16e/D5a
Abstract	The document contains suggestions for extending the Normal MAP for MIMO H-ARQ support.
Purpose	Adoption of proposed changes into P802.16e /D5a-2004
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Normal MAP Extension for MIMO H-ARQ

1. Introduction

This contribution is a companion document to IEEE C802.16e-05/023 [1] and provides H-ARQ functionality for MIMO bursts within the normal MAP structure. Just as is described in [1], the proposed solution is a two level allocation: to first define a 2D region, and then partition this region in a 1D frequency-first manner into bursts. All the bursts in the 2D allocation share the same burst profile and boosting parameters (similar to PDU concatenation in non-HARQ burst).
The extended MIMO MAP IEs for DL and UL are introduced in order to support different modes and the required text changes are made throughout the document. The proposed texts provide simpler and more efficient MAP support for MIMO bursts, both for H-ARQ and non H-ARQ cases, than using the H-ARQ MAP package in the standard.

2. Specific Text Changes

[Add a new section 8.4.5.9.2 as follows]

8.4.5.9.2 H-ARQ DL MAP Extension for MIMO

Table 306f H-ARQ MIMO DL MAP IE Format

Syntax	Size	Note
H-ARQ MIMO DL MAP IE {		
Extended DIUC	6 bits	
Length	8 bits	
RCID_Type	2 bits	00 = Normal CID 01 = RCID11 10 = RCID7 11 = RCID3
While (data remains) {		
OFDMA Symbol offset	8 bits	Offset from the start symbol of DL sub-frame
Subchannel offset	6 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	7 bits	
No. Subchannels	6 bits	
N sub burst	3 bits	Number of sub-bursts in 2D region
Mode	2 bit	Indicates the mode of this IE Bit #1 : 0 = No H-ARQ, 1 = H-ARQ Bit #0: 0 = DIUC/Length, 1 = Nep/Nsch
If (Mode==00) {		
MIMO DL DIUC Sub-Burst IE ()	variable	
} else if (Mode==01) {		
MIMO DL Nep Sub-Burst IE ()	variable	
} else if (Mode==10) {		
MIMO DL H-ARQ CC Sub-Burst IE ()	variable	
} else if (Mode==11) {		
MIMO DL H-ARQ IR Sub-Burst IE ()	variable	
}		
}		

}		

Table 306g MIMO DL DIUC Sub-Burst IE Format

MIMO DL DIUC Sub-Burst IE {		
For (j=0; j< N sub burst; j++){		
RCID_IE()	variable	
Length	10 bits	
Dedicated Control Indicator	1 bit	
If (Dedicated Control Indicator ==1) {		
Dedicated Control IE ()	variable	
}		
For (i=0;i<N_layer;i++) {		
DIUC	4 bits	
}		
}		
}		

Table 306h MIMO DL Nep Sub-Burst IE Format

MIMO DL H-ARQ IR Sub-Burst IE {		
For (j=0; j< N sub burst; j++){		
RCID_IE()	variable	
Nsch	4 bits	
Dedicated Control Indicator	1 bit	
If (Dedicated Control Indicator ==1) {		
Dedicated Control IE ()	variable	
}		
For (i=0;i<N_layer;i++) {		
Nep	4 bits	
}		
}		
}		

Table 306i MIMO DL H-ARQ CC Sub-Burst IE Format

MIMO DL H-ARQ CC Sub-Burst IE {		
For (j=0; j< N sub burst; j++){		
RCID_IE()	variable	
Length	10 bits	
Dedicated Control Indicator	1 bit	
If (Dedicated Control Indicator ==1) {		
Dedicated Control IE ()	variable	
}		
For (i=0;i<N_layer;i++) {		
DIUC	4 bits	

ACID	4 bits	
AI_SN	1 bit	
}		
}		
}		

Table 306j MIMO DL H-ARQ IR Sub-Burst IE Format

MIMO DL H-ARQ IR Sub-Burst IE {		
For (j=0; j< N sub burst; j++){		
RCID_IE()	variable	
Nsch	4 bits	
SPID	2 bits	
ACID	4 bits	
AI_SN	1 bit	
Dedicated Control Indicator	1 bit	
If (Dedicated Control Indicator ==1) {		
Dedicated Control IE ()	variable	
}		
For (i=0;i<N_layer;i++) {		
Nep	4 bits	
}		
}		
}		

[End of "Add a new section 8.4.5.9.2 as follows"]

Dedicated DL Control IE for MIMO contains additional control information for each sub-burst in the tables above. Because each sub-burst may have its own control information format dependent on the MSS capability, the length of the Dedicated DL Control IE is variable.

[Add a new section 8.4.5.9.2.1 as follows]

8.4.5.9.2.1 Dedicated DL Control IE for MIMO

Table 306k Dedicated MIMO DL Control IE Format

Syntax	**size**	**Note**
Dedicated MIMO DL Control IE() {		
Length	4 bits	Length of following control information in Nibble.
Control Header	4 bits	Bit #0 : CQICH Control Info Bit #1 : MIMO Control Info Bit #2-#3: Reserved
If(CQICH Control Info == 1){		
Allocation Index	6 bits	
Period	2 bits	

Frame offset	3 bits	
Duration	4 bits	
Feedback type	3 bits	Type of feedback on this CQICH See 8.4.5.4.15
}		
if(MIMO Control Info == 1){		
Matrix	2 bits	Indicates transmission matrix (See 8.4.8) 00 = Matrix A (Transmit Diversity) 01 = Matrix B (Hybrid Scheme) 10 = Matrix C (Spatial Multiplexing) 11 = Reserved
Num layer	2 bits	Number of coding/modulation layers 00 = 1 layer 01 = 2 layers 10 = 3 layers 11 = 4 layers
if (MIMO mode == 01) {		MIMO mode in the preceding STC_Zone_IE()
Antenna Grouping Index }	3 bits	Indicates the index of antenna grouping See 8.4.8.3.4 and 8.4.8.3.5
elseif (MIMO mode == 10) {		
Antenna Selection Index }	3 bits	Indicates the index of antenna selection See 8.4.8.3.4 and 8.4.8.3.5
elseif (MIMO mode == 11) {		
Codebook Precoding Index }	6 bits	Indicates the index of precoding matrix W in the codebook See 8.4.8.3.6
}		
}		

Control Header
4 bits are used to indicate the following control information. If the first bit is set to 1, this means that CQICH Control information follows Control Indicator. If the second bit is set to 1, this IE shall contain MIMO control information. Other bits are reserved for future extension.

Allocation Index
Indicates position from the start of the CQICH region.

Period
Informs the SS of the period of CQI reports.

Frame Offset
Informs the SS when to start transmitting reports. The SS starts reporting at the frame number which has the same 3 LSBs as the specified Frame Offset. If the current frame is specified, the SS shall start reporting in 8 frames.

Duration
Indicates when the SS should stop reporting unless the CQICH allocation is refreshed beforehand. If Duration is set to 0b0000, the BS shall de-allocate the CQICH. If Duration is set to 0b1111, the CQICH is allocated indefinitely and the SS should report until it receives another MAP_IE with Duration set to 0b0000.

Feedback Type
Indicates the type of feedback content on the allocated CQICH by SS. See section 8.4.5.4.15 for more details.

[End of "Add a new section 8.4.5.9.2.1 as follows"]

[Add a new section 8.4.5.9.4 as follows]

8.4.5.9.4 H-ARQ UL MAP Extension for MIMO

Table 306q H-ARQ MIMO UL MAP IE

Syntax	Size	Note
H-ARQ MIMO UL MAP IE() {		
Extended UIUC	6 bits	
Length	8 bits	
RCID_Type	2 bits	00 = Normal CID 01 = RCID11 10 = RCID7 11 = RCID3
while (data remains) {		
Allocation Start Indication	1 bit	0: No allocation start information 1: Allocation start information follows
If (Allocation Start Indication == 1) {		
OFDMA Symbol offset	8 bits	This value indicates start Symbol offset of subsequent sub-bursts in this H-ARQ UL MAP IE
Subchannel offset	6 bits	This value indicates start Subchannel offset of subsequent sub-bursts in this H-ARQ UL MAP IE
}		
Mode	2 bit	Indicates the mode of each burst Bit #1 : 0 = No H-ARQ, 1 = H-ARQ Bit #0: 0 = DIUC/Length, 1 = Nep/Nsch
N Burst	4 bits	This field indicates the number of bursts in this UL MAP IE
For (i =0 ;i < N Sub-burst; i++){		
RCID IE()	Variable	
Dedicated Control Indicator	1 bit	
If (Dedicated Control Indicator ==1) {		
Dedicated Control IE ()	variable	
}		
if (Mode == 00) {		
MIMO UL UIUC Sub-Burst IE ()		
} else if (Mode== 01) {		
MIMO UL Nep Sub-Burst IE ()		
} else if (Mode== 10) {		
MIMO UL HARQ CC Sub-Burst IE ()		
} else if (Mode== 11) {		
MIMO UL HARQ IR Sub-Burst IE ()		
}		
}		
}		
}		

Table 306r MIMO UL UIUC Sub-Burst IE Format

MIMO UL UIUC Sub-Burst IE{		

Duration	10 bits	
For (i=0;i<N_layer;i++) {		
UIUC	4 bits	
}		
}		

Table 306s MIMO UL Nep Sub-Burst IE Format

MIMO UL Nep Sub-Burst IE{		
Nsch	4 bits	
For (i=0;i<N_layer;i++) {		
Nep	4 bits	
}		
}		

Table 306t MIMO UL HARQ CC Sub-Burst IE Format

MIMO UL HARQ CC Sub-Burst IE{		
Duration	10 bits	
For (i=0;i<N_layer;i++) {		
UIUC	4 bits	
ACID	4 bits	
AI_SN	1 bit	
}		
}		

Table 306u MIMO UL HARQ IR Sub-Burst IE Format

MIMO UL HARQ IR Sub-Burst IE{		
Nsch	4 bits	
SPID	2 bits	
ACID	4 bits	
AI_SN	1 bit	
For (i=0;i<N_layer;i++) {		
Nep	4 bits	
}		
}		

[End of "Add a new section 8.4.5.9.4 as follows"]

Dedicated UL Control IE for MIMO contains additional control information for each sub bursts.

[Add a new section 8.4.5.9.4.1 as follows]

8.4.5.9.4.1 Dedicated UL Control IE for MIMO

Table 306v Dedicated MIMO UL Control IE Format

Syntax	size	Note
Dedicated MIMO UL Control IE() {	-	-
Length	4 bits	Length of following control information in Nibble.
Control Header	4 bits	Bit #0 : MIMO Control Info Bit #1-#3: Reserved
if(MIMO Control Info == 1){		
Matrix	1 bits	Indicates transmission matrix (See 8.4.8) 0 = Matrix A (Transmit Diversity) 1 = Matrix C (Spatial Multiplexing)
Num layer	1 bits	Number of coding/modulation layers 0 = 1 layer 1 = 2 layers
}		
}		

Length
This field indicates the following control information including Control Header.
Control Header
4 bits are used to indicate following control information. All bits are reserved for future extension.

[End of "Add a new section 8.4.5.9.4.1 as follows"]

Reference

[1] IEEE C802.16e-05/023 Normal MAP Extension for H-ARQ, submitted for 35th 802.16 Meeting in Jan. 2005

[2] IEEE P802.16-REVd/D5-2004 Draft IEEE Standards for local and metropolitan area networks part 16: Air interface for fixed broadband wireless access systems

[3] IEEE P802.16e/D5a Air Interface for Fixed and Mobile Broadband Wireless Access Systems – Amendment for Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands