Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Clarification of H-ARQ Operation with Reduced AAS Private Map**
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Re:	Recirculation of P802.16 REVe/D5a
Abstract	Some clarification and modification of Reduced AAS private map is proposed for reliable H-ARQ operation.
Purpose	Adoption of suggested changes into P802.16e/D6
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Problem Definition

(The text changes duration the revision is in pink. Some reserved bits for nibble alignment are added).

The reduced AAS private map concatenates MAP and DL data burst and apply the coding and modulation to the concatenated burst, which is designed to exploit beam-forming gain and signaling efficiency of bandwidth allocation. However, clarification and modification of reduced AAS private DL map is needed for reliable H-ARQ operation and MAP signaling. The H-ARQ operation allows the retransmission of coded symbols, which imply that each transmission cannot be decoded correctly. Consequently, the reduced AAS_private_map containing H-ARQ signaling information should be encoded separately from DL traffic burst itself to exploit the advantage of H-ARQ operation.

Fig. 1 illustrates the reduced AAS Private MAP operation when reduced AAS Private MAP points the allocation region for next frame. In the figure, dashed box denotes the absolute allocation region ~~and (n+1)th frame~~.

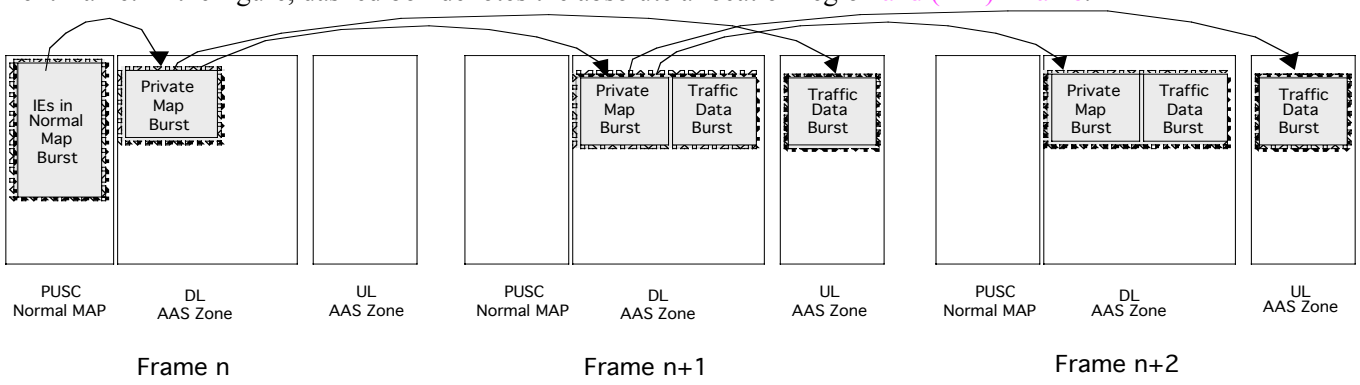

Fig. 1. Reduced AAS Private MAP Operation

Proposed Solution

To enable separate modulation and coding, the following fields are added in Reduced_AAS_Private_DL_MAP message. Note that when 'Separate MCS Enabled', DL data burst a reduced_AAS_Private_MAP including all AAS configuration change information, bandwidth allocation, H-ARQ signaling information are encoded separately.

- 'Separate MCS Enabled' to indicate separate coding for reduced AAS Private Map and DL data burst
- 'Slot Duration' to specify number of slots for transmitting reduced AAS_Private_MAP
- 'DIUC and Repetition Coding Indication' for reduced AAS_Private_MAP

Since the reduced AAS_Private_DL_MAP specifies the two-dimensional region for reduced AAS_Private_MAP and DL data burst, the data burst are transmitted through the remaining slots after assigning slots for reduced AAS_Private_MAP.

Also, H-ARQ related information field in reduced AAS_Private_DL/UL_MAP is clarified to support both chase-combining and incremental redundancy type.

Suggested text changes to 16.e standard

[Modify the table ZZZ in 8.4.5.8.1 "Reduced AAS Private DL-MAP"]

Table ZZZ- Reduced_AAS_Private_DL-MAP message format

Syntax	Size (bits)	Notes
Reduced_AAS_Private_DL-MAP(){		
Compressed map indicator	2	0b 11 for compressed format

Reserved	1	Shall be set to zero
UL-MAP appended	1	
Compressed Map Type	2	0b 11 for reduced private map
Multiple IE	1	0: Single IE Mode 1: Multiple IE Mode
If (Multiple IE) {		
NUM IEs	8	Set 1 for single IE mode
}		
For (ii =1: NUM IE) {		
CID Included	1	The CID shall be included in the first compressed private MAP if it was pointed by a DL-MAP IE with INC_CID == 0 or by a DL-MAP IE with a multicast CID.
DCD Count Included	1	
PHY modification Included	1	Preamble modifier
H-ARQ Enabled	1	
Separate MCS Enabled	**1**	**Separate coding applied for reduced AAS_Private_MAP and DL data burst**
If (Separate MCS Enabled) {		
Duration	**10**	**Slot duration for reduced AAS Private Map**
DIUC	**4**	**Modulation & Coding Level**
Repetition Coding Indication	**2**	**00: No repetition** **01: Repetition of 2** **10: Repetition of 4** **11: Repetition of 6**
}		
If (CID included) {		
CID	16	
~~CQICH_Control_IE ()~~	~~4/16~~	
Allocation Index	6 bits	CQICH Sub-channel index within Fast-feedback region marked with UIUC = 0
Report Period	2 bits	Reporting period indicator (in frames)
Frame offset	3 bits	Start frame offset for initial reporting
Report Duration	4 bits	Reporting duration indicator
Reserved	1	
}		
If (H-ARQ Enabled) {		
~~N_{SCH}~~	~~4~~	
ACK Allocation Index	6	ACK channel index within HARQ ACK region
~~H-ARQ Control IE()~~	~~4/8~~	
ACID	4 bits	H-ARQ channel ID
AI_SN	1 bit	H-ARQ Seq. Number Indicator
If (IR Type) {		Incremental Redundancy
N_{SCH}	4 bits	Indicator for IR coding/modulation
SPID	2 bits	H-ARQ Sub-packet ID
Reserved	2	
}		
Reserved	1	
}		
If (DCD Count Included) {		
DCD Count	8	
}		
If (PHY modification Included) {		
Preamble Select	1	0: Freq. shift preamble

		1: Time shift preamble
Preamble Shift Index	4	Updated preamble index to be used starting with the frame specified by the Frame Offset
Pilot Pattern Modifier	1	0: Not Applied 1: Applied
If (Pilot Pattern Modifier) {		
Pilot Pattern	2	See sections 8.4.6.3.2 and 8.4.6.3.3 00: Pattern #A, 01: Pattern #B 10: Pattern #C , 11: Pattern #D
}		
}		
DIUC/N_{EP}	4	DIUC for non-H-ARQ/Chase Combining; N_{EP} for Incremental Redundancy H-ARQ
Frame Offset	3	Map relevance "0" indicates an allocation in the subsequent frame
If (FUSC or O-FUSC) {		
Zone symbol offset	8	The offset of the OFDMA symbol in which the zone containing the burst starts, measured in OFDMA symbols from beginning of the downlink frame referred to by the Frame Offset.
}		
OFDMA symbol offset	8	Starting symbol offset referenced to DL preamble of the downlink frame specified by the Frame Offset
If (Permutation = 0b11) {		For the AMC permutation (2 x 3 type)
Subchannel offset	8	
No. OFDMA triple symbol	5	Number of OFDMA symbols is given in multiples of 3 symbols
No. subchannels	6	
Else {		
Subchannel offset	6	
No. OFDMA Symbols	7	
No. subchannels	6	
}		
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
Reserved	1	
CRC-32	32	
}		End of NUM IE loop
Padding	Variable	Padding depends on H-ARQ operation IEs and appended AAS_UL_Private_Map
}		

Since the reduced AAS_Private_DL_MAP specifies the two-dimensional region for reduced AAS_Private_MAP and DL data burst, the data burst are transmitted through the remaining slots after assigning slots for reduced AAS_Private_MAP when Separate MCS Enabled.

[Modify the table YYY1 in 8.4.5.8.2 "Reduced AAS Private UL-MAP"]

Table YYY1- Reduced_AAS_Private_UL-MAP message format

Syntax	Size (bits)	Notes
Reduced_AAS_Private_UL-MAP(){		

For (ii =1: NUM IE) {		
AAS zone configuration Included	1	AAS configuration should be included in the first UL MAP of a private map chain to define the UL AAS Zone
AAS zone position Included	1	AAS zone position should be included in the first UL MAP of a private map chain to define/change the UL AAS Zone.
UCD Count Included	1	UCD Count should be included in the first allocation of a private map chain.
PHY modification Included	1	Preamble modifier (shift index)
Power Control Included	1	Power control value (Up/Down amount)
If (AAS Zone Config Included) {		
Permutation	2	0b 00: PUSC 0b 01: FUSC 0b 10: AMC 0b 11: Reserved
UL PermBase	7	
Preamble Indication	2	0b 00: 0 symbol 0b 01: 1 symbol 0b 10: 2 symbols 0b 11: 3 symbols
Padding	5	
}		
If (AAS Zone Position Included) {		
Zone Symbol Offset	8	
Zone Length	8	
}		
If (UCD Count Included) {		
UCD Count	8	
}		
If (PHY modification Included) {		
Preamble Select	1	0: Freq. shift preamble 1: Time shift preamble
Preamble Shift Index	4	Updated preamble index to be used starting with the frame specified by the Frame Offset
Pilot Pattern Modifier	1	0: Not Applied 1: Applied
If (Pilot Pattern Modifier) {		
Pilot Pattern	2	See sections 8.4.6.3.2 and 8.4.6.3.3 00: Pattern #A , 01: Pattern #B 10: Pattern #C , 11: Pattern #D
}		
}		
If (Power Control Included) {		
Power Control	8	Signed integer in 0.25 dB Unit
}		
If (H-ARQ Enabled) {		
~~H-ARQ Control IE()~~	~~4/8~~	
ACID	4 bits	H-ARQ channel ID
AI_SN	1 bit	H-ARQ Seq. Number Indicator
Reserved	3	
If (IR Type) {		Incremental Redundancy
N_{SCH}	4 bits	Indicator for IR coding/modulation
SPID	2 bits	H-ARQ Sub-packet ID
Reserved	3	
}		

}		
UIUC/N_{EP}	4	UIUC for non-H-ARQ/Chase Combining; N_{EP} for Incremental Redundancy H-ARQ
Frame Offset	3	Map relevance "0" indicates an allocation in the subsequent frame
Slot offset	12	Starting slot offset referenced to first slot of the UL AAS zone
Slot Duration	10	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
Padding	Variable	
}		
}		