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Title	**A MAP IE for H-ARQ and SDMA Allocation in AAS Zone**
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Re:	Call for reply comments **(Original Comment # 2189)**
Abstract	A new efficient Normal MAP IE supporting for Hybrid ARQ and SDMA allocation in AAS zone is proposed.
Purpose	Adoption in **IEEE 802.16e_D6**
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A MAP IE for H-ARQ and SDMA Allocation in AAS Zone

[Note: The contribution was accepted in session #35. Changes were not implemented due to an editorial error in the original contribution. This is fixed in this revision. Also, page numbers have been updated according to 802.16e/D6]

Introduction

In the current text, there is no efficient way to support Hybrid ARQ and SDMA allocations in AAS zone simultaneously. The operation scenario of the current schemes for SDMA allocation and Hybrid ARQ is as follows

1) H-ARQ pointer IE in (compressed) DL MAP to H-ARQ MAP

2) First PHY_MOD_IE in H ARQ MAP (undefined yet) to specify the first SDMA preamble

- Describe absolute 2D (DL) / 1D (UL) burst allocation regions
- Describe the corresponding H-ARQ related IEs for each region

3) Second PHY_MOD_IE in H-ARQ MAP to specify the second SDMA preamble

- Describe absolute 2D (DL) / 1D (UL) burst allocation regions
- Describe the corresponding H-ARQ related IEs for each region…

Thus, we can find out that bandwidth allocation overhead linearly increases as the number of SDMA users. Also, the number of PHY_MOD_IEs can be up to the maximum number of reused beams.

Proposed Solution

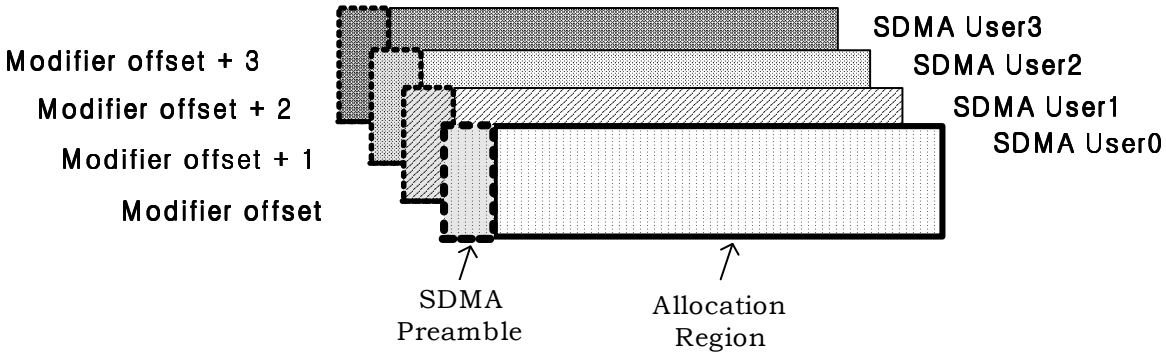

Fig. 1. Proposed SDMA Allocation Scenario

The burst allocation region of SDMA users can be fixed for scheduling simplicity and lower signaling overhead. In addition, modifier index for SDMA preamble can be extracted from description order of SDMA users. The proposed solution can be summarized as follows

1) Introduce Extended IUC in DL/UL MAP for SDMA allocation (not available yet)

2) Use ‘1’ of ‘5’ reserved bits in AAS_IE() to specify modifier type, “Time” or “Freq.” shift

3) Describe the shared 2D (DL) or 1D (UL) allocation regions

- Specify {CID, modulation/coding schemes (IUC or H-ARQ)} fields
- ~~Implicitly assign SDMA preamble index with description order of CIDs. Due to limited length of Extended IUC, starting offset of preamble modifier is included.~~
- Optionally include CQICH/ACKCH allocation IE for DL burst and uplink power adjustment IE.
- Optionally specify pilot patterns for SDMA users

4) Use a pointer IE for special Sub Map including the all information elements described above.

In this contribution, a new Normal MAP IE including the features 1) ~ 3) is proposed. Note that the mechanism supporting the feature 4) is a general MAC issue and is to be considered in other contributions (For example, see Sub Map mechanism in C80216e-05_23, Normal MAP Extension for H-ARQ)

Suggested Text Changes

[Add the following fields to the end of AAS_DL_IE in Sec. 8.4.5.3.3]

~~[Add "Preamble Type Bit" into AAS_DL_IE in Sec. 8.4.5.3.3 and AAS_UL_IE in Sec. 8.4.5.4.6]~~

~~AAS_DL_IE in Sec. 8.4.5.3.3~~

Syntax	Size (bits)	Notes
~~AAS_DL_IE(){~~		
~~Extended DIUC~~	~~4~~	~~AAS = 0x02~~
~~Length~~	~~4~~	~~Length in bytes of following fields (0x03)~~
~~Permutation~~	~~2~~	~~0b 00 = PUSC~~ ~~0b 01 = FUSC~~ ~~0b 10 = Optional FUSC~~ ~~0b 11 = AMC Permutation~~
~~DL PermBase~~	~~6~~	~~PermBase for AAS DL Zone~~
~~Symbol Offset~~	~~8~~	~~AAS zone starting offset referenced from DL frame preamble~~
~~AAS DL Preamble indication~~	~~2~~	~~0b 00 – 0 symbols~~ ~~0b 01 – 1 symbols~~ ~~0b 10 – 2 symbols~~ ~~0b 11 – 3 symbols~~
Preamble Type	1	0 – Frequency shifted preamble is used in this AAS zone 1 – Time shifted preamble is used in this AAS zone
Reserved	7	Shall be set to zero
}		

[Add the following fields to the end of AAS_UL_IE in Sec. 8.4.5.4.6]

AAS_UL_IE in Sec. 8.4.5.4.6

~~Syntax~~	~~Size (bits)~~	~~Notes~~
~~AAS_UL_IE(){~~		

~~Extended UIUC~~	~~4~~	~~AAS = 0x03~~
~~Length~~	~~4~~	~~Length in bytes of following fields (0x04)~~
~~Permutation~~	~~2~~	~~0b 00 = PUSC~~ ~~0b 01 = FUSC~~ ~~0b 10 = AMC Permutation~~ ~~0b 11 = Reserved~~
~~UL PermBase~~	~~7~~	~~PermBase for AAS UL Zone~~
~~Symbol Offset~~	~~8~~	~~AAS zone starting offset referenced from 'Allocation Start Time' in the UL MAP~~
~~AAS zone length~~	~~8~~	~~Number of OFDMA symbols in AAS zone~~
~~AAS UL Preamble indication~~	~~2~~	~~0b 00 0 symbols~~ ~~0b 01 1 symbols~~ ~~0b 10 2 symbols~~ ~~0b 11 3 symbols~~
Preamble Type	1	0 – Frequency shifted preamble is used in this AAS zone 1 – Time shifted preamble is used in this AAS zone
Reserved	7	Shall be set to zero
}		

[Create a new AAS_SDMA_DL_IE in Sec. 8.4.5.3.x and AAS_SDMA_UL_IE in Sec. 8.4.5.4.x]

AAS_SDMA_DL_IE in Sec. 8.4.5.3.x

Syntax	Size (bit)	Notes
AAS_SDMA_DL_IE(){		
Extended DIUC2	4	
Length	8	
RCID_Type	2 bits	00 = Normal CID 01 = RCID11 10 = RCID7 11 = RCID3
Num Burst Region	4	
For (ii = 1: Num Region) {		
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 bits	
No. OFDMA triple symbol	5 bits	Number of OFDMA symbols is given in multiples of 3
No. subchannels	6 bits	
Else {		
Subchannel offset	6 bits	
No. OFDMA Symbols	7 bits	
No. subchannels	6 bits	
}		
Number of Users	3	SDMA users for the assigned region
For (jj = 1: Num_Users) {		
RCID_IE()	Variable	
Encoding Mode	2	00: No H-ARQ 01: H-ARQ Chase Combining 10: H-ARQ Incremental Redundancy 11: H-ARQ Conv. Code Incremental Redundancy
CQICH Allocation	1	0: Not Included 1: Included

ACKCH Allocation	1	0: Not Included 1: Optionally included for H-ARQ users
Pilot Pattern Modifier	1	0: Not Applied 1: Applied
If (AAS DL Preamble Used) {		
Preamble Modifier Index	4	Preamble Modifier Index
}		
If (Pilot Pattern Modifier) {		
Pilot Pattern	2	See section 8.4.6.3.2 00: Pattern #A , 01: Pattern #B 10: Pattern #C , 11: Pattern #D
}		
If (Encoding Mode = = 00) {		No H-ARQ
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
}		
If (Encoding Mode = = 01) {		H-ARQ Chase Combining
If (ACKCH Allocation) {		
ACK CH Index	5	**See DL Ack channel index in 8.4.5.4.24**
}		
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
ACID	4	
AI_SN	1	
}		
If (Encoding Mode = = 10) {		H-ARQ Increamental Redundancy
If (ACKCH Allocation) {		
ACK CH Index	5	**See DL Ack channel index in 8.4.5.4.24**
}		
N_{EP}	4	
N_{SCH}	4	Indicator for the number of first slots used for data encoding in this SDMA allocation region
SPID	2	
ACID	4	
AI_SN	1	
}		
If (Encoding Mode = = 11) {		H-ARQ Conv. Code Increamental Redundancy
If (ACKCH Allocation) {		
ACK CH Index	5	**See DL Ack channel index in 8.4.5.4.24**
}		
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
SPID	2	
ACID	4	

AI_SN	1	
}		
If (CQICH Allocation Included) {		
Allocation Index	6 bits	Index to the channel in a frame the CQI report should be transmitted by the SS
Period (p)	3 bits	A CQI feedback is transmitted on the CQI channels indexed by the (CQI Channel Index) by the SS in every 2^p frames.
Frame offset	3 bits	The MSS starts reporting at the frame of which the number has the same 3 LSB as the specified frame offset. If the current frame is specified, the MSS should start reporting in 8 frames.
Duration (d)	4 bits	A CQI feedback is transmitted on the CQI channels indexed by the (CQI Channel Index) by the SS for $2^{(d-1)}$ frames. If d is 0b0000, the CQICH is de-allocated. If d is 0b1111, the MSS should report until the BS command for the MSS to stop
}		
}		End of User loop
}		End of Burst Region Loop
Padding	variable	
}		

AAS_SDMA_UL_IE in Sec. 8.4.5.4.x

Syntax	Size (bit)	Notes
Extended UIUC2	4	
Length	8	
RCID_Type	2 bits	00 = Normal CID 01 = RCID11 10 = RCID7 11 = RCID3
Num Burst Region	4	
For (ii = 1: Num Region) {		
Slot offset	12	Starting slot offset in AAS zone referenced to right after UL AAS preamble
Slot duration	10	
Number of Users	3	SDMA users for the assigned region
For (jj = 1: Num_Users) {		
RCID_IE()	Variable	
Encoding Mode	2	00: No H-ARQ 01: H-ARQ Chase Combining 10: H-ARQ Incremental Redundancy 11: H-ARQ Conv. Code Incremental Redundancy
Power Adjust	1	0: Not Included 1: Included; Signed integer in 0.25 dB Unit
Pilot Pattern Modifier	1	0: Not Applied 1: Applied
If (AAS UL Preamble Used) {		
Preamble Modifier Index	4	Preamble Modifier Index
}		
If (Pilot Pattern Modifier) {		Pilots per beam
Pilot Pattern	2	See sections 8.4.8.1.5 (Fig. 249) and 8.4.6.3.2 00: Pattern #A , 01: Pattern #B 10: Pattern #C , 11: Pattern #D
}		
If (Encoding Mode = = 00) {		
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
}		
If (Encoding Mode = = 01) {		
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
ACID	4	
AI_SN	1	
}		
If (Encoding Mode = = 10) {		
N_{EP}	4	

N_{SCH}	4	Indicator for the number of first slots used for data encoding in this SDMA allocation region
SPID	2	
ACID	4	
AI_SN	1	
}		
If (Encoding Mode = = 11) {		H-ARQ Conv. Code Incremental Redundancy
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
SPID	2	
ACID	4	
AI_SN	1	
}		
If (Power Adjust Included) {		
Power adjustment	8	Signed integer in 0.25 dB Unit
}		
}		End of User loop
}		End of Burst Region Loop
Padding	variable	
}		

[Add the following new section]

8.4.6.3.2 AMC support for SDMA

The pilots in an AMC AAS zone are regarded as part of the allocation, and as such shall be beamformed in a way that is consistent with the transmission of the allocation's data subcarriers. In an SDMA region, the pilots of each allocation may correspond to a different pilot pattern. A pilot pattern consists of location and polarity. The pilot patterns are depicted in figure XXX. Data subcarriers shall be punctured to obtain patterns #2 and #3. Subcarriers shall only be punctured if there is an allocation associated with the corresponding pattern, as described in the AAS_SDMA_DL_IE() and AAS_SDMA_UL_IE(). Only MSSs that support all four pilot patterns, as indicated by their capability in 11.8.3.7.X, shall be assigned allocations in an SDMA region where pilot patterns #2 and #3 are used. Data subcarriers shall be punctured after constellation mapping in the case of CC encoding, and prior to constellation mapping in the case of CTC encoding. In the latter case, the FEC block shall be truncated to accommodate the punctured subchannel structure, and the data subcarrier enumeration of Eq. (116) shall not be applied. Instead, data subcarriers within a slot shall be enumerated starting from the first OFDMA symbol at the data subcarrier that is lowest in frequency, continuing in ascending frequency order throughout the slot's subcarriers in the same symbol, then going to the next symbol at the subcarrier lowest in frequency, and so on.

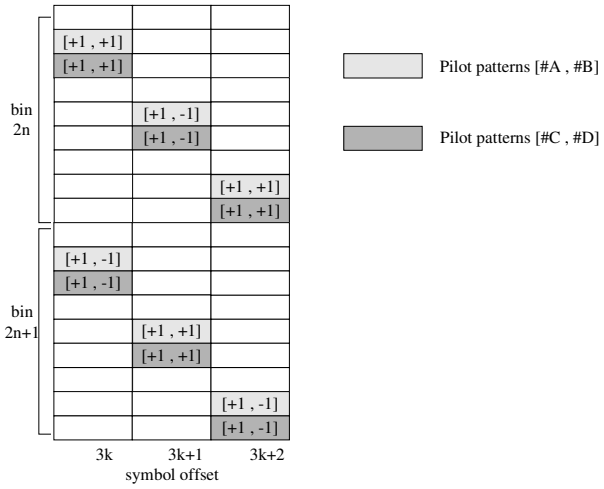

Figure XXX – Pilot patterns for AAS mode in AMC zone. Symbol offset is relative to the beginning of the zone. Pilot polarity for each pattern is given in brackets.

[Change text on page 618 lines 5-9 of 802.16-2004, to the following text:]

$$\mathrm{Re}\{c_k\} = \frac{8}{3}\left(\frac{1}{2} - w_k\right) \cdot p_k \qquad (135)$$

$$\mathrm{Im}\{c_k\} = 0$$

where p_k is the pilot's polarity (as described in section 8.4.6.3.2) for SDMA allocations in AMC AAS zone, and p_k = 1 otherwise.

[Modify reduced AAS-private DL-MAP on table ~~ZZZ~~308a, page ~~284~~357, line ~~42~~17:]

Preamble Shift Index	4 bits	Updated preamble shift index to be used starting with the frame specified by the Frame Offset.
~~***Reserved***~~ ***Pilot Pattern Modifier*** ***Pilot Pattern Index***	~~3 bits~~ 1 bit 2 bit	~~Set to zero~~ 0: Not Applied, 1: Applied pilot pattern used for this allocation (see section 8.4.6.3.2): 00 – Pilot pattern #A, 01 – Pilot pattern #B 10 – Pilot pattern #C, 11 – Pilot pattern #D

[Modify reduced AAS-private UL-MAP on table ~~ZZZ~~308b, page 360~~288~~, line 27~~9~~:]

Preamble Shift Index	4 bits	Updated preamble shift index to be used starting with the frame specified by the Frame Offset.
~~***Reserved***~~ ***Pilot Pattern Modifier*** ***Pilot Pattern Index***	~~3 bits~~ 1 bit 2 bit	~~Set to zero~~ 0: Not Applied, 1: Applied See sections 8.4.8.1.5 (Fig. 249) and 8.4.6.3.2: 00 – Pilot pattern #A, 01 – Pilot pattern #B 10 – Pilot pattern #C, 11 – Pilot pattern #D

11.8.3.7.X SDMA Pilot capability

Type	Length	Value	Scope
YYY	1	Bit #0-#1: SDMA pilot pattern support for AMC zone: 0b00 – no support 0b01 – support SDMA pilot patterns #A and #B 0b11 – support all SDMA pilot patterns 0b10 – reserved Bits #2-#7: Reserved	SBC-REQ SBC-RSP