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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

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
4) …

Thus, we can find~~ound~~ 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

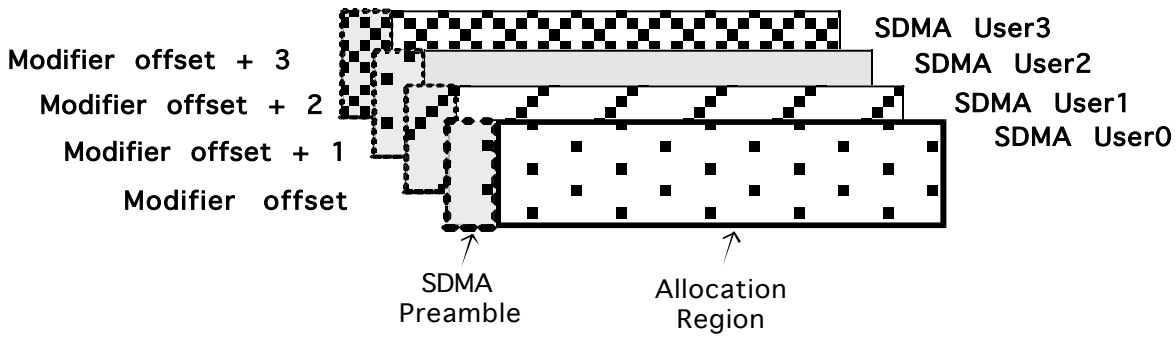

Fig. 1. Proposed SDMA Allocation Scenario

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 "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
Padding	~~6~~ 5	
}		

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
Padding	~~5~~ 4	
}		

[Create a new AAS_~~H-ARQ~~SDMA_DL_IE in Sec. 8.4.5.3.x and AAS_~~H-ARQ~~SDMA_UL_IE in Sec. 8.4.5.4.x]

AAS_~~H-ARQ~~SDMA_DL_IE in Sec. 8.4.5.3.x

Syntax	Size (bit)	Notes
AAS_~~H-ARQ~~SDMA_DL_IE(){		
Extended DIUC	4	AAS_~~H-ARQ~~SDMA_DL_IE = 0x ??
Length	4	Length in bytes of following fields
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 symbols
No. subchannels	6 bits	
Else {		
Subchannel offset	6 bits	
No. OFDMA Symbols	7 bits	
No. subchannels	6 bits	

Subchannel offset No of OFDMA symbols No of subchannels }	8 bits 8 7 7	
Number of Users	3	SDMA users for the assigned region
For (ii jj = 1: Num_Users) {		
RCID12	12	LSB 12 bit of CID
Encoding Mode	2	00: No H-ARQ 01: H-ARQ Chase Combining 10: H-ARQ Incremental Redundancy 11: Reserved
CQICH Allocation	1	0: Not Included 1: Included
ACKCH Allocation	1	0: Not Included 1: Optionally included for H-ARQ users
ACKCH AllocationPilot Pattern Modifier	1	0: Not Not IncludedApplied 1: Applied Optionally included for H-ARQ users
Preamble Modifier Index	4	Preamble Modifier Index
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 (Mode = = 00) {		
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
}		
else if (Mode = = 01) {		
If (ACKCH Allocation) {		
ACK CH Index	5	0b xxxx0 for the first half slot for ACK signaling 0b xxxx1 for the second half slot for ACK signaling where xxxx denotes slot index within ACKCH region
}		
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	
}		
else if (Mode = = 10) {		
If (ACKCH Allocation) {		
ACK CH Index	5	0b xxxx0 for the first half slot for ACK signaling 0b xxxx1 for the second half slot for ACK signaling where xxxx denotes slot index within ACKCH region
}		
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 (CQICH Allocation Included) {		
Allocation index	6	
Reporting period	2	
Frame offset	3	
Reporting duration	4	
}		
}		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
AAS_SDMA_UL_IE(){		
Extended UIUC	4	AAS_SDMA_UL_IE = 0x ??
Length	4	Length in bytes of following fields
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
~~Pilot Pattern Modifier~~ ~~0: Not Applied~~ ~~1: Applied~~ ~~If (Pilot Pattern Modifier) {~~ ~~Pilots per beam~~ ~~Pilot Pattern~~ ~~See sections 8.4.8.1.5 (Fig. 249) and 8.4.6.3.3~~ ~~00: Pattern #A , 01: Pattern #B~~ ~~10: Pattern #C , 11: Pattern #D~~	~~1~~ ~~2~~	
~~}~~		
For (jj = 1: Num_Users) {		
RCID12	12	LSB 12 bit of CID
Encoding Mode	2	00: No H-ARQ 01: H-ARQ Chase Combining 10: H-ARQ Incremental Redundancy 11: Reserved
Power Adjust	1	0: Not Included 1: Included; Signed integer in 0.25 dB Unit
Pilot Pattern Modifier	1	0: Not Applied 1: Applied
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 8.4.6.3.3 00: Pattern #A , 01: Pattern #B 10: Pattern #C , 11: Pattern #D
}		
If (Mode = = 00) {		
DIUC	4	
Repetition Coding Indication	2	00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6
}		
else if (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	
}		
else if (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 (Power Adjust Included) {		
Power adjustment	8	Signed integer in 0.25 dB Unit
}		
}		End of User loop
}		End of Burst Region Loop
Padding	variable	
}		

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.

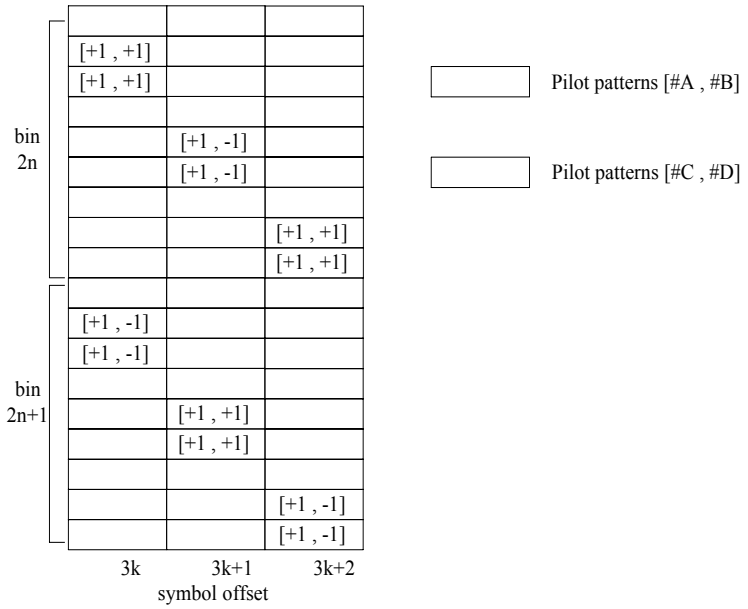

Figure XXX – Pilot patterns for AAS mode in AMC zone. Symbol offset is relative to the beginning of the zone. Pilot polarity for each pattern is given in brackets.

1. Add the following subsection

8.4.6.3.3 PUSC-ASCA support for SDMA

The pilots in a PUSC-ASCA 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. Pilot patterns are depicted in figure 251, with references to 'antenna' replaced with 'pattern'. 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().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.

2. Change text on page 618 lines 5-9 of 802.16-2004, to the following text

$$\begin{aligned}\mathrm{Re}\{c_k\} &= \frac{8}{3}\left(\frac{1}{2} - w_k\right)\cdot p_k \\ \mathrm{Im}\{c_k\} &= 0\end{aligned} \qquad (135)$$

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.

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 Bit #2-#3: SDMA pilot pattern support for PUSC-ASCA zone: 0b00 – no support 0b01 – support SDMA pilot patterns #A and #B 0b11 – support all SDMA pilot patterns 0b10 – reserved Bits #4-#7: Reserved	SBC-REQ SBC-RSP

~~AAS_H-ARQ_UL_IE in Sec. 8.4.5.4.x~~

~~Syntax~~	~~Size (bit)~~	~~Notes~~
~~AAS_H-ARQ_UL_IE(){~~		
~~Extended UIUC~~	~~4~~	~~AAS_H-ARQ_UL_IE = 0x ??~~
~~Length~~	~~4~~	~~Length in bytes of following fields~~
~~Slot offset~~	~~12~~	~~Starting slot offset in AAS zone refereneed to right after UL AAS preamble~~
~~Slot duration~~	~~10~~	
~~Number of Users~~	~~3~~	~~SDMA users for the assigned region~~
~~Preamble Modifier Index Offset~~	~~3~~	~~Starting offset of preamble modifier for SDMA users~~
~~For (ii = 1: Num_Users) {~~		
~~RCID12~~	~~12~~	~~LSB 12 bit of CID~~

~~Encoding Mode~~	~~2~~	~~00: No H-ARQ 01: H-ARQ Chase Combining 10: H-ARQ Incremental Redundancy 11: Reserved~~
~~Power Adjust~~	~~1~~	~~0: Not Included 1: Included; Signed integer in 0.25 dB Unit~~
~~If (Mode = = 00) {~~		
~~DIUC~~	~~4~~	
~~Repetition Coding Indication~~	~~2~~	~~00: No repetition 01: Repetition of 2 10: Repetition of 4 11: Repetition of 6~~
~~}~~		
~~else if (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~~	
~~}~~		
~~else if (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 (Power Adjust Included) {~~		
~~Power adjustment~~	~~8~~	~~Signed integer in 0.25 dB Unit~~
~~}~~		
~~}~~		~~End of User loop~~
~~Padding~~	~~variable~~	
~~}~~		