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Title	**Efficient Signaling to Support Group Switching for H-FDD Operation**
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Re:	IEEE 802.16 Working Group Letter Ballot Recirc #26b
Abstract	A mechanism is defined to enable switching of MSs between the two groups in H-FDD operation.
Purpose	Accept the proposed specification changes on IEEE P802.16Rev2/D2.
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Efficient Signaling to Support Grouping Switching for H-FDD Operation

1. Introduction

In H-FDD operation, a group of user terminals transmit in the temporal region where another group of user terminals receive. This divides the user terminals into two groups, and divides any particular frame in two temporal regions or partitions. The assignment of user terminals to the groups can be done dynamically or statically, depending on BS implementation and deployment preferences. For load-balancing or to enable advanced grouping of users, the BS may require switching a user terminal from one group to the other. A low-overhead mechanism is needed to enable fast switching of a user terminal from one group to the other. This contribution provides details of the signaling mechanism.

2. Proposed Solution

In H-FDD operation, for a HARQ-enabled MS in non-MIMO mode, the BS shall signal the group association to the MS using a new “Group Indicator” field in DL HARQ Chase Subburst IE or DL HARQ IR Subburst IE, using one of the reserved bits. In the case of a group switch, BS may request an acknowledgement by allocating a one-time additional CQI channel to the MS for transmitting a special CQICH code. After the transmission of the special acknowledgement, the MS will switch to the other group. If BS chooses not to request any acknowledgement, no CQI feedback channel shall be assigned. If the BS does not detect the MS acknowledgement CQI, it could re-transmit the group switch message. In case a HARQ-enabled MS does not have any DL allocation, the BS may issue a DL HARQ Chase Subburst IE with the Group Indicator and “null” subchannel allocation (i.e., zero subchannel) for that MS.

The BS may signal the group association by using the H-FDD Group Switch IE. If the MS also gets a CQICH channel assignment in the same frame of group switch command, which means that the BS requests an explicit acknowledgement, the SS shall transmit a special code in the fast feedback region as instructed.

3. Proposed Text

[Change two rows of Table 346 on page 732 Section 8.4.5.3.21 as indicated in red:]

Table 346 -- DL HARQ Chase Subburst IE format

Syntax	Size (bits)	Notes
DL_HARQ_Chase_Sub-Burst_IE() {		
N sub burst	4	Number of sub-bursts in the 2D rectangular region is this field value plus 1
N ACK channel	8	4 Number of HARQ ACK enabled subbursts in the 2D region.
For (j = 0; j < Number of sub-bursts; j++) { — —	—	—
RCID_IE()	*variable*	—
Duration	10	Duration in slots

Sub-Burst DIUC Indicator	1	If Sub-Burst DIUC Indicator is 1, it indicates that DIUC is explicitly assigned for this subburst. Otherwise, this subburst will use the same DIUC as the previous subburst If j is 0 then this indicator shall be 1. *Reserved* 1 Shall be set to zero.
~~*Reserved*~~	~~1~~	
Group Indicator	1	Used for FDD case only to indicate the group assignment of the MS (see 8.4.4.1 for FDD frame structure and group definition) 0b0: Group #1 0b1: Group #2
If(Sub-Burst DIUC Indicator == 1){		

Add the following paragraph after line 64 Section 8.4.5.3.21 on page 733

In H-FDD operation, for HARQ enabled MS, the BS shall include the Group Indicator field to signal the group index that the MS should be associated with. If the BS requests explicit acknowledgment, it shall assign a CQI channel in the DL HARQ Chase Subburst IE that contains a group switch instruction, by setting the LSB #0 of the Dedicated DL Control Indicator to 1. MS shall acknowledge the group change with a MAP ACK command as described in section 8.4.5.4.10.16 in the assigned CQICH channel indexed by the Allocation Index (*Note to editor: section number to be confirmed by related Persistent scheduling comments)*. When the MS is instructed to switch from one group to the other, the periodic CQI allocations for MS shall be deallocated after the MS sends the acknowledgement CQI code.

[Change three rows of Table 347 on page 734 Section 8.4.5.3.21 as indicated in red:]

Table 346 -- DL HARQ IR CTC Subburst IE format

Syntax	Size (bits)	Notes
DL_HARQ_IR_CTC_Sub-Burst_IE() {		
N sub burst	4	Number of sub-bursts in the 2D rectangular region is this field value plus 1
N ACK channel	4	4 Number of HARQ ACK enabled subbursts in the 2D region.
For (j = 0; j < Number of sub-bursts; j++) { — —	—	—
RCID_IE()	*variable*	—
N_{EP}	4	—
N_{SCH}	4	—
SPID	2	—
ACID	4	—
AI_SN	1	—

ACK disable	1	When ACK Disable == 1, the allocated subburst does not require an ACK to be transmitted by the SS in the ACKCH Region (see 8.4.5.4.24). In this case, no ACK channel is allocated for the subburst in the ACKCH Region. For the burst, BS shall not perform HARQ retransmission and MS shall ignore ACID, AI_SN and SPID, which shall be set to 0 by BS if they exist. The CRC shall be appended at the end of each sub-burst regardless of the ACK disable bit
~~*Reserved*~~	~~2~~	
Reserved	1	
Group Indicator	1	Used for FDD case only to indicate the group assignment of the MS (see 8.4.4.1 for FDD frame structure and group definition) 0b0: Group #1 0b1: Group #2
Dedicated DL Control Indicator	2	LSB #0 indicates inclusion of CQI control LSB #1 indicates inclusion of Dedicated DL Control IE

Add the following paragraph after line 26 of Section 8.4.5.3.21 on page 735 (after table 347)

In H-FDD operation, for HARQ enabled MS, the BS shall include the Group Indicator field to signal the group index that the MS should be associated with. If the BS requests explicit acknowledgment, it shall assign a CQI channel in the DL HARQ Chase Subburst IE that contains a group switch instruction, by setting the LSB #0 of the Dedicated DL Control Indicator to 1. MS shall acknowledge the group change with a MAP ACK command as described in section 8.4.5.4.10.16 in the assigned CQICH channel indexed by the Allocation Index (*Note to editor: section number to be confirmed by related Persistent scheduling comments)*. When the MS is instructed to switch from one group to the other, the periodic CQI allocations for MS shall be deallocated after the MS sends the acknowledgement CQI code.

[Change two rows of Table 346 on page 732 Section 8.4.5.3.21 as indicated in red:]

Table 346 -- DL HARQ IR CC Subburst IE format

Syntax	Size (bits)	Notes
DL_HARQ_IR_CC_Sub-Burst_IE() {		
N sub burst	4	Number of sub-bursts in the 2D rectangular region is this field value plus 1
N ACK channel	8	4 Number of HARQ ACK enabled subbursts in the 2D region.
For (j = 0; j < Number of sub-bursts; j++) { — —	—	—
RCID_IE()	*variable*	—
Duration	10	Duration in slots

Sub-Burst DIUC Indicator	1	If Sub-Burst DIUC Indicator is 1, it indicates that DIUC is explicitly assigned for this subburst. Otherwise, the this subburst will use the same DIUC as the previous subburst If j is 0 then this indicator shall be 1. *Reserved* 1 Shall be set to zero.
~~*Reserved*~~	~~1~~	
Group Indicator	1	Indicates the group assignment of the MS (see 8.4.4.1 for FDD frame structure and group definition) 0b0: Group #1 0b1: Group #2
If(Sub-Burst DIUC Indicator == 1){		

Add the following paragraph after table 348 of Section 8.4.5.3.21 on page 736

In H-FDD operation, for HARQ enabled MS, the BS shall include the Group Indicator field to signal the group index that the MS should be associated with. If the BS requests explicit acknowledgment, it shall assign a CQI channel in the DL HARQ Chase Subburst IE that contains a group switch instruction, by setting the LSB #0 of the Dedicated DL Control Indicator to 1. MS shall acknowledge the group change with a MAP ACK command as described in section 8.4.5.4.10.16 in the assigned CQICH channel indexed by the Allocation Index (*Note to editor: section number to be confirmed by related Persistent scheduling comments)*. When the MS is instructed to switch from one group to the other, the periodic CQI allocations for MS shall be deallocated after the MS sends the acknowledgement CQI code.

Add the following section on page 753

8.4.5.3.29: H-FDD Group Switch IE

For H-FDD operation, for non-HARQ enabled MS and for HARQ enabled MSs that use MIMO mode, the DL Group Switch IE shall be used by the BS to signal one or more MS to switch H-FDD groups as indicated in Table YYY.

Table YYY – H-FDD Group Switch IE Format

Syntax	Size	Notes
HFDD_Group_Switch_IE() {	-	-
Extended DIUC	4	HFDD_Group_Switch_IE() = 0x0E
Length	4	
RCID_Type	2	0b00: Normal CID 0b01: RCID11 0b10: RCID7 0b11: RCID3
While (data remains){		
RCID	*variable*	
Group ID	1	

CQICH Allocation Included	1	0b0: CQICH Allocation Not Included 0b1: CQICH Allocation Included
if (CQICH Allocation Included==1) {		
Allocation Index	6	Index to the channel in a frame the CQI code should be transmitted by the SS
}		
}		
Padding	*Variable*	Padding to byte; shall be set to 0
}	-	-

Group ID

0b0: Group 1
0b1: Group 2

CQICH Allocation Included

If the CQICH Allocation Included is set to 1, the MS shall acknowledge the group change with a MAP ACK command as described in section 8.4.5.4.10.16 in the assigned CQICH channel indexed by the Allocation Index (*Note to editor: section number to be confirmed by related Persistent scheduling comments)*. This is a one-time CQICH allocation.

Change Table 321 Pg. 699 Section 8.4.5.3.2.2 as indicated:

Extended DIUC (Hexadecimal)	**Usage**
~~0D-0E~~	~~*Reserved*~~
0D	*Reserved*
0E	H-FDD Group Switch IE