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Title	**Indication of changes in the offset of relay region**
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Re:	Call for technical proposals regarding IEEE project P802.16j
Abstract	This contribution proposes a scheme with which MMR-BS indicates dynamic resource allocation of relay region and access region.
Purpose	Discussion and Adoption in IEEE 802.16j
Notice	
Release	
Patent Policy and Procedures	

Indication of changes in the offset of relay region

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Introduction

This contribution proposes a method with which a RS is informed of the starting point of the relay region in the next frame. With this scheme, the MMR-BS dynamically changes the time resources of relay region and access region.

Problem Statement

In MMR-BS/RS frames, there are DL/UL-subframes. These DL/UL-subframes are further splitted into two time regions, i.e., Access region and Relay region. The access region is the first time region for the access link in each DL/UL subframe, while the relay region is the second time region for the relay link in each DL/UL subframe. Figures 1, 2 depict the MMR-BS frame and RS frame, respectively.

The RS frame is the same as the MMR-BS frame other than Relay region where the RS communicates with the MMR-BS. In the relay region of the DL/UL subframes, MMR-BS frame and RS frame operate Tx/Rx modes and Rx/Tx modes, respectively.

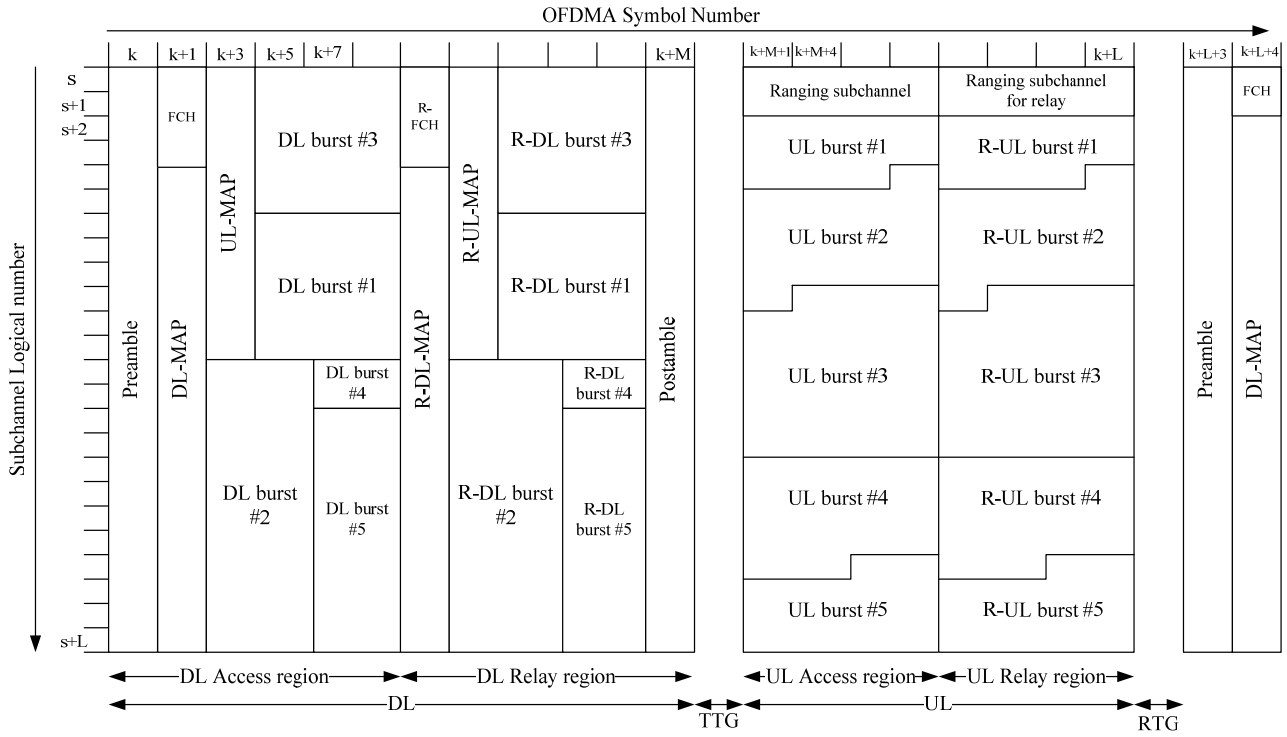

Figure 1. An example of MMR-BS frame structure

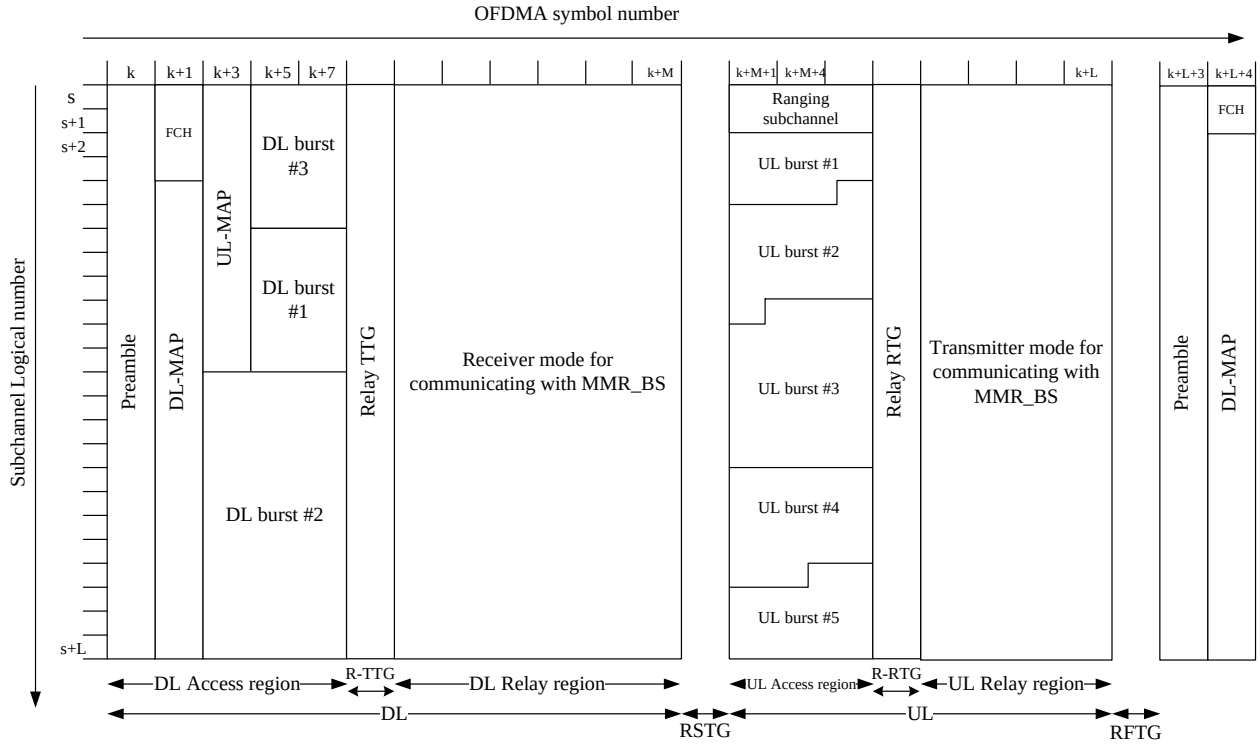

Figure 2. An example of RS frame structure

MMR-BS allocates time resources (i.e. OFDMA symbol duration) for the Access region and the Relay region in the DL/UL subframes at (n)th frame. At (n+1)th frame, the MMR-BS may change the allocated time resources of the Access region and the Relay region. For example, at (n)th frame MMR-BS allocates 10 OFDMA symbol duration and 8 OFDMA symbol duration for DL-Access region and DL-Relay region, respectively. At (n+1)th frame, the MMR-BS decides to allocate more time resource to DL-Relay region such that 6 OFDMA symbol duration and 12 OFDMA symbol duration are allocated for DL-Access region and DL-Relay region, respectively. In this case, RS should be informed of the change of time allocation at (n+1)th frame.

Suggested Remedy

A method of informing a RS of the change on relay region for the next frame is proposed. It is assumed that the MMR-BS transmits R-FCH, which includes RS DL frame prefix, in the beginning of DL-Relay region at each frame. The RS DL frame prefix contains the information of R-DL-MAP message length, repetition coding of the R-DL-MAP message, and so on. Moreover, the R-DL-MAP message includes the information of resource allocation for DL-Relay region. To inform the RS of the change of the DL-Relay region at the next frame, it is proposed to insert a new field ‘OFDMA symbol offset change’ to the RS DL frame prefix. The ‘OFDMA symbol offset change’ indicates whether the offset of DL-Relay region is changed at the next frame. If the ‘OFDMA symbol offset change’ is set to 0b00000, this informs the RS of no change of the starting OFDMA symbol location of DL-Relay region at the next frame. Otherwise, RS is informed of change of the starting OFDMA symbol location of DL-Relay region. When the starting OFDMA symbol location of DL-Relay region is changed at the next frame, the ‘OFDMA symbol offset change’ provides the degree of change as well as the positive offset or the negative offset over the starting point of DL-relay region of the current frame. More specifically, if the first MSB (most significant bit) is set to 1, this indicates the negative offset on the starting point. On the other hand, if the first MSB is set to 0, this indicates the positive offset on the starting point. The rest 4 bits indicate the degree of change on the offset of the next frame over the offset of the current frame. For example, as an example of the positive offset, the ‘OFDMA symbol offset change’ is set to 0b00010, the RS detects that the starting point of the DL-Relay region at the next frame moves back 2 symbols compared to the offset of the current frame. As an example of the negative offset, the ‘OFDMA symbol offset change’ is 0b10010, the RS detects that the allocation applies to DL-Relay region 2 symbols ahead of the DL-Relay region of the current frame.

It is assumed that R-UL-MAP message, which indicates the uplink resource allocation in the UL-Relay region, has the same format with a legacy 16 UL-MAP message. The R-UL-MAP message includes the information of ‘Allocation start time’ and ‘No. OFDMA symbols’ so that the RS is informed of the UL-Relay region of each frame. Therefore, there is no need to define a specific method such as ‘OFDMA symbol offset change’ to inform the change of offset of the UL-Relay region.

Table 1 shows an example of R-UL-MAP message format to indicate the uplink resource allocation in the UL-Relay region of the MMR-BS frame.

Syntax	Size	Notes
R-UL-MAP_Message_Format(){		
Management Message Type = TBD	8 bits	-
UCD count	8 bits	
Allocation start time	32 bits	Effective start time of the uplink allocation defined by the R-UL-MAP
No. OFDMA symbols	8 bits	Number of OFDMA symbols in the UL Relay region
While (map data remains) {		
R-UL-MAP_IE()	Variables	
}		
If !(byte boundary) {		
Padding nibble	4 bits	Padding to reach byte boundary
}		
}		

Table 1 An example of R-UL-MAP message

Therefore we propose the remedies as follows:

- Define a format of RS DL frame prefix in R-FCH
  - Insert a new field 'OFDMA symbol offset change' in the RS-DL frame prefix that indicates the change on offset of the DL-Relay region at the next frame.

Proposed Text Change

[Remedy: Insert a new table for RS-DL frame prefix format]

[Insert Table xxx as indicated:]

Table xxx - RS DL Frame Prefix format

Syntax	Size	Notes
RS_DL_Frame_Prefix() {		
Used subchannel bitmap	6 bits	Bit #0: subchannel group 0 Bit #1: subchannel group 1 Bit #2: subchannel group 2 Bit #3: subchannel group 3 Bit #4: subchannel group 4 Bit #5: subchannel group 5
Repetition_coding_indication	2 bits	0b00: No repetition coding on R-DL-MAP 0b01: Repetition coding of 2 used on R-DL-MAP

		0b10: Repetition coding of 4 used on R-DL-MAP 0b11: Repetition coding of 6 used on R-DL-MAP
Coding_indication	3 bits	0b000: CC encoding used on R-DL-MAP 0b001: BTC encoding used on R-DL-MAP 0b010: CTC encoding used on R-DL-MAP 0b011: ZT CC encoding used on R-DL-MAP 0b100: CC encoding with optional interleaver 0b101: LDPC encoding used on R-DL-MAP 0b110-0b111: Reserved
R-DL-MAP length	8 bits	-
OFDMA symbol offset change	5 bits	Indicate whether the starting point of DL-Relay region in the next frame is changed. If this field is set to 0b0000, there is no change in the OFDMA symbol offset of DL-Relay region of the next frame. Otherwise, this field includes the positive or negative of the offset of the DL-Relay region in the next frame. 0b00000: no change 0b0xxxx: positive offset; moves back xxxx symbols 0b1xxxx: negative offset; xxxx symbols ahead of current DL-Relay region
}	-	-

References

[1] IEEE 802.16j-06/0xx, “Frame Structure for 2hop relay”, Samsung Electronics, November 2006.