

Initial Relay region indicator

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Introduction

This contribution proposes a method that provides a RS with the initial relay region in the MMR-BS frame, where the relay region is the period for the Relay link.

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.

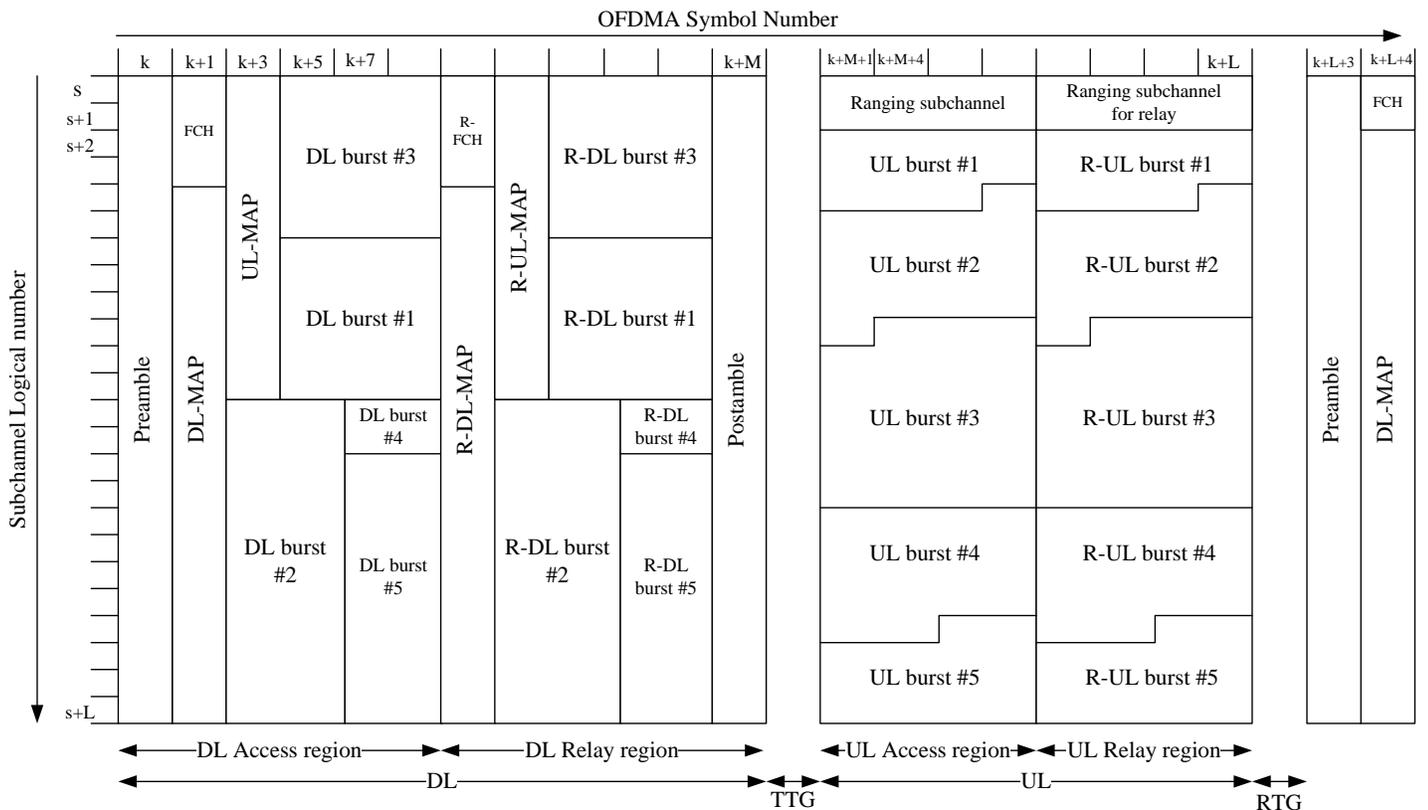


Figure 1. An example of MMR-BS frame structure

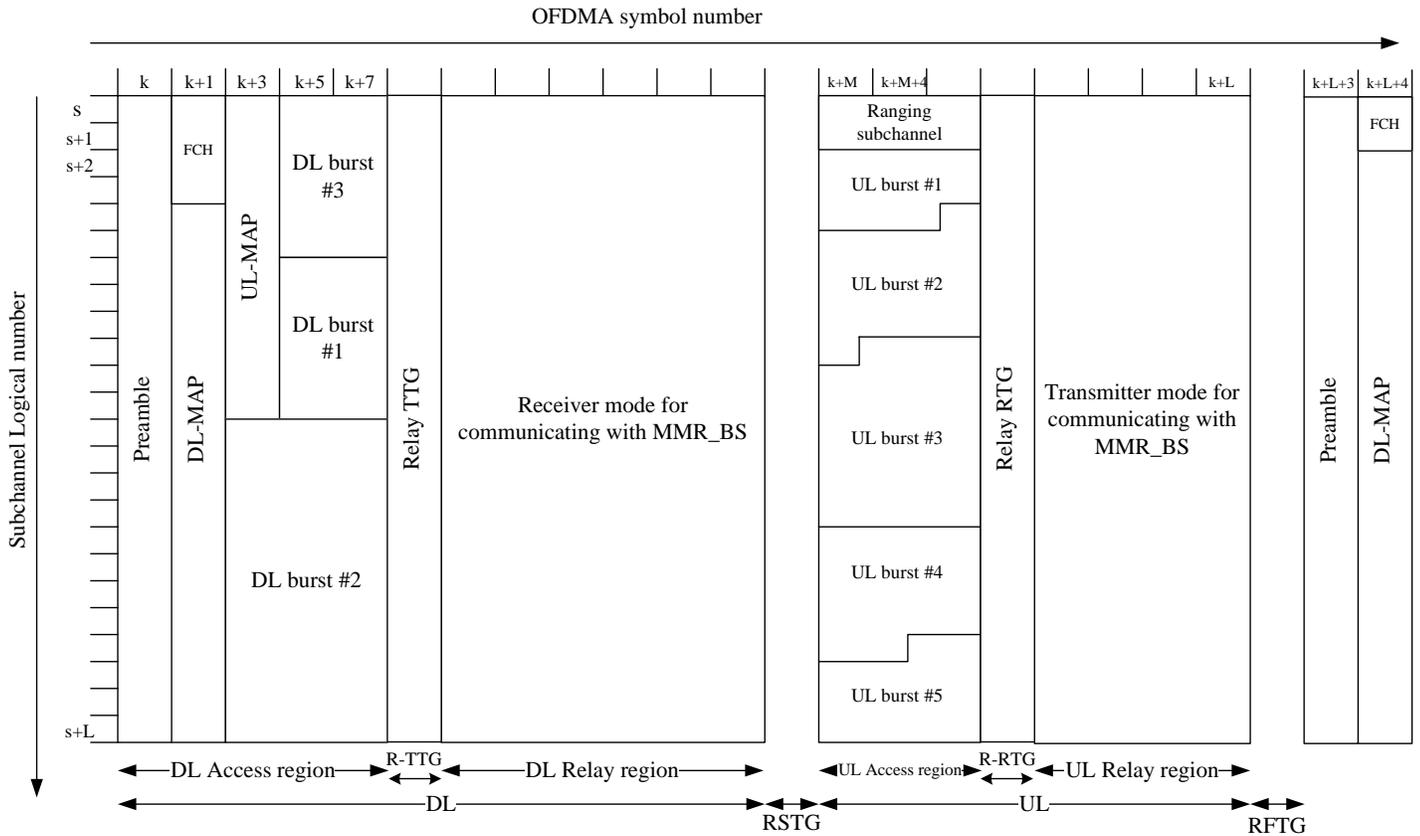


Figure 2. An example of RS frame structure

On initialization, we assume that a RS performs initial network entry with an MMR-BS in the same way that an MS does. In the beginning, RS detects a preamble in the MMR-BS frame and establishes synchronization with the MMR-BS. RS continues to perform the remaining initial network entry procedures in the access region of the MMR-BS frame.

After the RS completes its network entry, to continue communicating with the MMR-BS in the relay region of the MMR-BS frame, the RS needs to be informed of the relay region in the MMR-BS frame.

Suggested Remedy

A method of initially indicating the relay region in the MMR-BS frame is proposed. When the MMR-BS transmits DL-MAP in the DL-Access region of MMR-BS frame, the MMR-BS may transmit DIUC=15 with STC_DL_ZONE_IE() to indicate that the subsequent allocations shall be used with a specific permutation or mode. Therefore, the MMR-BS extends the STC_DL_ZONE_IE to include the Relay region indicator and gives the RS the information of the DL-Relay region of MMR-BS frame by sending the extended STC_DL_ZONE_IE(). If the RS receives DL-MAP including the extended STC_DL_ZONE_IE(), the RS recognizes the information about the Relay region, starting symbol offset of the relay region, in the DL

subframe of the MMR-BS frame. Upon receipt of the extended `STC_DL_ZONE_IE()`, an MS cannot interpret the DL Relay region indicator field but the MS indicates the existence of another region in the DL subframe.

It is assumed that R-UL-MAP message, which indicates the uplink resource allocation in the UL-Relay region of the MMR-BS frame, 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 knows the information of UL-Relay region of the MMR-BS frame. The MMR-BS may inform the MS of the existence of another region in the UL subframe by transmitting `UL_ZONE_IE`.

Table 1 shows the example of R-UL-MAP message format to indicate the uplink resource allocation in UL-Relay region of 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 zone
While (map data remains) {		
R-UL-MAP_IE()	Variables	
}		
If !(byte boundary) {		
Padding nibble	4 bits	Padding to reach byte boundary
}		
}		

Table 1 Example of R-UL-MAP message

Therefore we propose the remedies as follows:

- Clarify the operation that indicate Relay region of MMR-BS frame.
 - Use `STC_DL_ZONE_IE` to indicate the downlink of Relay region in the MMR-BS frame.
 - ◆ Insert a new field ‘DL Relay region indicator’
 - Use `UL_ZONE_IE` to indicate the uplink of Relay region in the MMR-BS frame

Proposed Text Change

[Remedy1: Insert the followings at the end of section 8.4.5.3.4 in page 376]

[Insert the followings:]

In the DL-MAP, MMR-BS transmits the STC_DL_Zone_IE() with DL Relay region indicator=1 to indicate that the subsequent allocation is the downlink period of Relay region in the MMR-BS frame. Upon receipt of the STC_DL_Zone_IE() with DL Relay region indicator=1, the RS shall recognize that the allocation in the STC_DL_Zone_IE() is the DL-Relay region in MMR-BS frame.

[Remedy2: Insert the 'DL Relay region indicator' field in STC_DL_Zone_IE]

[Replace Table 279 with the following table:]

Table 279-OFDMA downlink STC_DL_Zone IE format

<u>Syntax</u>	<u>Size</u>	<u>Notes</u>
<u>STC_DL_ZONE_IE() {</u>	<u>=</u>	<u>=</u>
<u>Extended DIUC</u>	<u>4bits</u>	<u>STC/DL_ZONE_SWITCH = 0x01</u>
<u>Length</u>	<u>4bits</u>	<u>Length=0x04</u>
<u>OFDMA symbol offset</u>	<u>8bits</u>	<u>Denotes the start of zone (counting from the frame preamble and starting from 0)</u>
<u>Permutation</u>	<u>2bits</u>	<u>0b00 = PUSC permutation</u> <u>0b01 = FUSC permutation</u> <u>0b10 = Optional FUSC permutation</u> <u>0b11 = Optional adjacent subcarrier permutation</u>
<u>Use All SC indicator</u>	<u>1bit</u>	<u>0 = do not use all subchannels</u> <u>1 = use all subchannels</u>
<u>STC</u>	<u>2bits</u>	<u>0b00 = no STC</u> <u>0b01 = STC using 2/3 antennas</u> <u>0b10 = STC using 4 antennas</u> <u>0b11 = FHDC using 2 antennas</u>
<u>Matrix indicator</u>	<u>2bits</u>	<u>STC matrix (see 8.4.8.1.4)</u> <u>If(STC==0b01 or STC==0b10)</u> <u>{</u> <u> 0b00 = Matrix A</u> <u> 0b01 = Matrix B</u> <u> 0b10 = Matrix C</u> <u> 0b11 = Reserved</u> <u>}</u> <u>else if(STC==0b11)</u> <u>{</u> <u> 0b00 = Matrix A</u> <u> 0b01 = Matrix B</u> <u> 0b10-11 = Reserved</u> <u>}</u>
<u>DL_PermBase</u>	<u>5bits</u>	<u>=</u>
<u>PRBS_ID</u>	<u>2bits</u>	<u>Value: 0..2. Refer to 8.4.9.4.1</u>
<u>AMC type</u>	<u>2bits</u>	<u>Indicates the AMC type in case permutation type=0b11.</u>

		<p>otherwise shall be set to 0.</p> <p>AMC type (N×M=N bits by M symbols)</p> <p>0b00 - 1×6</p> <p>0b01 - 2×3</p> <p>0b10 - 3×2</p> <p>0b11 - Reserved</p> <p>Note that only 2×3 Band AMC subchannel type (AMC Type=0b01) is supported by MS.</p>
<u>Midamble presence</u>	<u>1bit</u>	<p>0 = not present</p> <p>1 = present at the first symbol in STC zone</p>
<u>Midamble boosting</u>	<u>1bit</u>	<p>0 = no boost</p> <p>1 = Boosting (3dB)</p>
<u>2/3 antennas select</u>	<u>1bit</u>	<p>0 = STC using 2 antennas</p> <p>1 = STC using 3 antennas</p> <p>selects 2/3 antennas when STC=0b01</p>
<u>Dedicated pilots</u>	<u>1bit</u>	<p>0 = Pilot symbols are broadcast</p> <p>1 = Pilot symbols are dedicated. An MS should use only pilots specific to its burst for channel estimation</p>
<u>DL Relay region indicator</u>	<u>1bit</u>	<u>Indicates DL Relay region of MMR-BS frame</u>
<u>Reserved</u>	<u>3bits</u>	<u>shall be set to zero</u>
<u>1</u>		-

DL Relay region indicator

indicates the information of the DL-Relay region in the MMR BS frame. If the DL Relay region indicator is set to 1, it means that the STC DL Zone IE includes the information of the DL-Relay region in the MMR-BS frame. Otherwise, the STC DL Zone IE is applied to MS.

[Remedy 3: Insert the followings at the end of section 8.4.5.4.7 at page 436]

[Insert the followings:]

To indicate the UL-Relay region in the MMR-BS frame, the MMS-BS transmits UL Zone-IE() in the UL-MAP. Upon receipt of the UL Zone IE(), MS recognizes the existence of another zone in the UL subframe.

[Remedy 4: Insert the followings at the end of the third paragraph in section 8.4.4.2 at page 357 or at the new section for MMR frame structure]

[Insert the followings:]

The RS knows the information of UL-Relay zone of MMR-BS frame from 'Allocation start time' and 'No. OFDMA symbols' which are included in R-UL-MAP message.

References

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