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Re:	This is a response to Call for Technical Proposals regarding IEEE Project P802.16j.
Abstract	The document contains technical proposals for IEEE P802.16j that would provide a Data Relay of RS using additional MAP_IE().
Purpose	The document is submitted for review by 802.16 Working Group members.
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MAP-based Data Relay for Transparent RS

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ETRI

1. Introduction

All the radio resources are allocated by the BS and resource allocation information is broadcasted to all the MSs in IEEE 802.16 specifications. The MAP messages describe all the resource allocations in both downlink and uplink. The MS receives the MAP message in the symbols followed by the preamble and gets information about allocated resources to the MS. The PHY burst in the allocated resource consists of MAC PDUs.

DL-MAP_IE() and UL-MAP_IE() describe the allocations in downlink and uplink, respectively. The MAP messages describe the radio resources as symbols and subchannels in 2D expression. Within the rectangular resource the allocations is done in frequency-first order in downlink. HARQ DL-MAP_IE() in downlink uses this two-step description of the allocations. The uplink resources are allocated in time-first order. HARQ UL-MAP_IE() consists of bursts. There are sub-bursts in the burst in both HARQ DL-MAP_IE() and HARQ UL-MAP_IE().

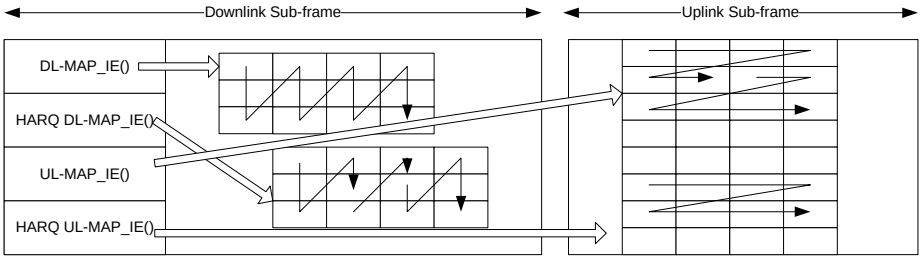

Figure 1 MAP IEs and allocations.

Legacy MAP IEs in the IEEE 802.16 specifications are designed only for the MS that is a terminator in downlink and a originator in uplink. The RS requires new MAP IEs having information about both the allocation for receiving and the allocation for sending.

2. Proposed Solution

MR-BS and Transparent RSs within a cell use one MAP in a frame and all the transparent RSs can receive the MAP. (Note: This characteristics is independent of adapting signal regeneration function like repeaters which have been available in the cellular systems.) If the radio resource is managed only by the MR-BS within the cell, the allocated information shall be delivered to the RSs so that the RSs can generate related signals in the pointed resources. This proposal is based on the MAP messages for delivering the resource-allocated information to the RSs.

This contribution introduces new Relay IEs in the MAP messages. The BS informs the RSs of the allocated resource. The RS receives Relay IEs that consists of Rx resource description, RS identifiers, and Tx resource description. The resource description may be either MAP IE index or the resources specified by 2D-expression or 1D-expression. The MAP IE index just indicates the index of the MAP IE that has the resource description. Generally the Relay IE has the resource for RS's receiving and the MAP IE index identifying the MAP IE of the resource for RS's transmitting. Also the Relay IE has the RS identifiers that notify the

involved RSs. The involved RSs shall receive the data in the Rx resource and buffer it until transmitting. The involved RSs receive the MAP IE pointed by Tx MAP IE index and transmit the data in the Tx resource. Multiple RSs can transmit the same data to other RS or the MS in a Tx resource allocation. These Relay IEs have an instance of the specification of cooperative RSs.

DL-Relay_IE() and HARQ DL-Relay_IE() are introduced in downlink and UL-Relay_IE() and HARQ UL-Relay_IE() are introduced in uplink. DL-Relay_IE() and UL-Relay_IE() have information about one hop operation of one allocation. HARQ DL-Relay_IE() and HARQ UL-Relay_IE() has information about one hop operation of multiple sub-bursts in multiple bursts. Those MAP IEs are based on MAP IEs including DL-MAP_IE(), UL-MAP_IE(), HARQ DL-MAP_IE(), and HARQ UL-MAP_IE(). Newly added MAP IEs describe the relay operations with similar allocation styles. Figure 3 shows a downlink example that the RSs use DL-Relay_IE() and the MS uses legacy DL-MAP_IE(). The first DL-Relay_IE() forces RS1 to relay the data. RS1 and RS2 shall relay the same data at the same time so that the MS receives the data with more good quality. The MS uses the legacy DL-MAP_IE(). Because one MAP describes one hop operation, the various configurations are possible. This example shows four possibilities from Time Example A to Time Example D the MMR-BS. The MMR-BS can select the resource allocation with various options.

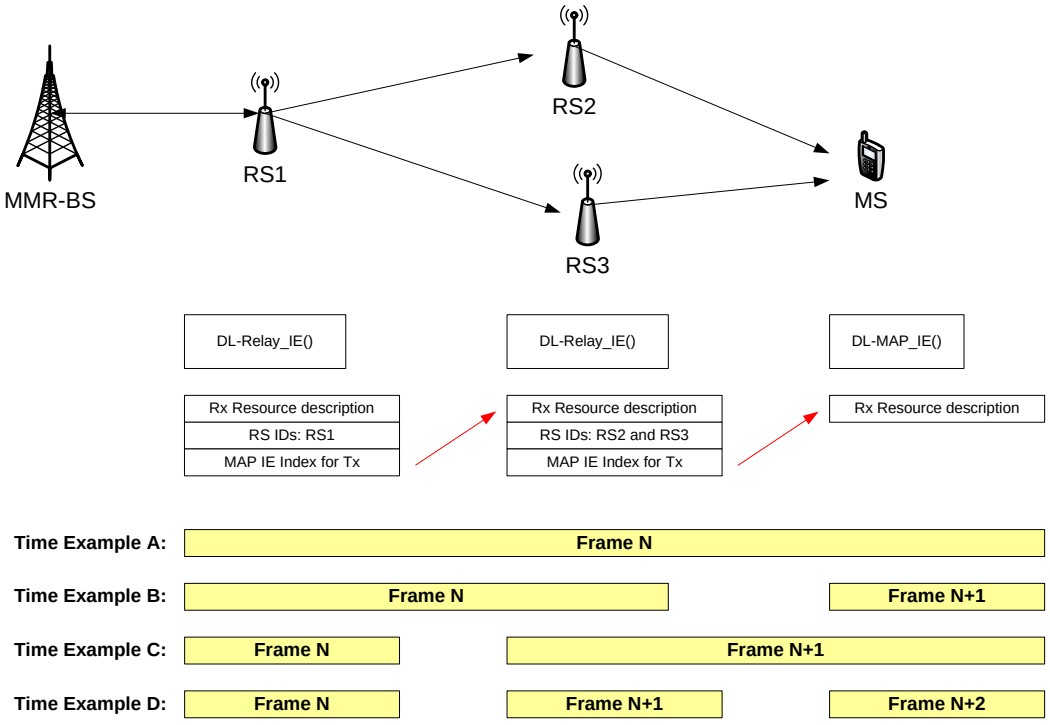

Figure 2 Relaying downlink data using relay MAP, DL-Relay_IE().

Figure 4 shows an uplink example that the MS uses legacy UL-MAP_IE() and the RSs use UL-Relay_IE(). The MS send the data in the uplink allocation of UL-MAP_IE(). In the same frame UL-Relay_IE() shall exist. This UL-Relay_IE() forces RS2 and RS3 to receive the signal from MS and send it. The last UL-Relay_IE() has information that the RS1 sends the data. Because one MAP describes one hop operation, the various configurations are possible. This example shows four possibilities from Time Example A to Time Example D. The MMR-BS can select the resource allocation with various options.

HARQ DL-Relay_IE() and HARQ UL-Relay_IE() are designed with the same concept of describing RS's one hop operation. As

legacy HARQ DL-MAP_IE() and HARQ UL-MAP_IE() have sub-bursts of bursts in a information element, HARQ DL-Relay_IE() and HARQ UL-Relay_IE() have descriptions of sub-bursts of bursts in a information element.

This contribution introduces the MAP IE index that points the MAP IE(). Generally MAP IE() may not be completed by itself but also related to other information. The index method uses just linking information and all the other MAP information is described in the pointed MAP information. This index method reduces the cost of describing the same information.

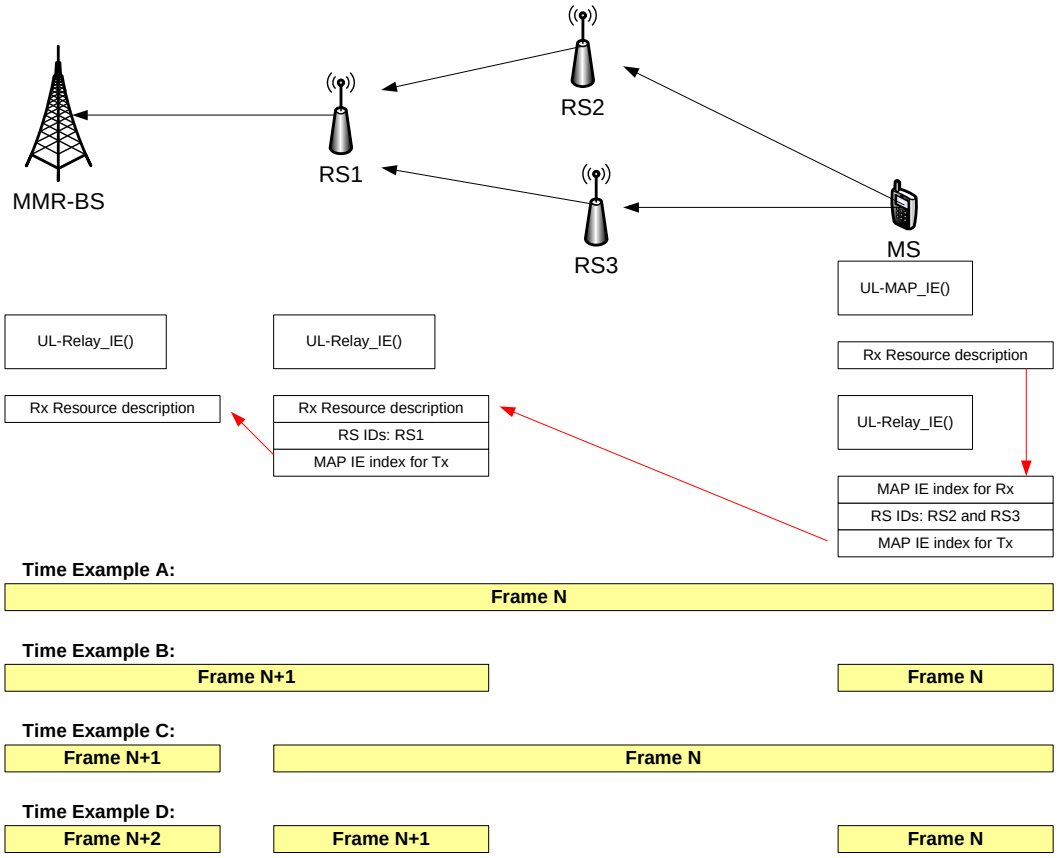

Figure 3 Relaying uplink data using relay MAP, UL-Relay_IE().

Text Proposals

[Insert the text after 6.3.7.7:]

6.3.7.7.1 Relaying data burst

Exchanging data between the MS and the MMR-BS is based on the resource allocation and its notification to two communication entities. The MMR-BS allocates the radio resources and broadcasts allocation information to corresponding entities. The allocation resource information described in the MAP message is sent by the MMR-BS to all the RSs and MSs within cell coverage. The RS shall get information about the allocation in which it may receive the relayed data. The RS holds the received data in a few frame and transmits the data in the allocation.

The allocation information of RS in downlink is the form of DL-Relay_IE() and HARQ DL-Relay_IE(). For the uplink UL-Relay_IE() and HARQ UL-Relay_IE() are added. Commonly the relay information about both the burst in either DL-MAP_IE() or UL-MAP_IE() and the sub-burst in either HARQ DL-MAP_IE() or HARQ UL-MAP_IE(), contists of three parts: the allocation for receiving, RS identifiers, and the allocation for sending. The allocation may be either the allocated resource description or the pointer of related MAP information element. The allocation for sending may be in the same frame that the allocation for receiving is. Also the allocation for sending may be in a few frames later. The DL-MAP_IE() is the last information element in the downlink and the UL-MAP_IE() is the first information element in the uplink when a relay path between the MMR-BS and the MS is established.

In the view of receiving the signal, RSs sending the same data increase the received signal strength in the receiver. If the BS allocates an allocation, RSs in the selected path should send the same data so that the receiver can get the received signal at a time. The sending RS can adjust its transmitting power level according to the amount specified by the MAP message.

[Insert the text after 8.4.5.3.27:]

8.4.5.3.28 DL-Relay_IE()

The DL-Relay IE() consists of downlink allocation part for receiving, RS identifiers, and downlink allocation part for transmitting. The RSs receive the data from the downlink allocations and relay the data in the downlink allocations for transmission. The downlink allocation for the transmission of the RS may be in same downlink sub-frame or a few downlink sub-frames later. The legacy DL-MAP_IE() sent to the MS is the last in a relaying path from the MMR-BS to the MS.

Table bbb- DL-Relay_IE() format

Syntax	Size	Notes
DIUC	4 bits	15
DL_extended-2_IE() {	-	
Extended-2 DIUC	4 bits	? (B-D, F)
Length	8 bits	
Rx OFDMA Symbol offset	8 bits	
Rx Subchannel offset	6 bits	
Rx Boosting	3 bits	000: Normal (not boosted); 001: 6dB; 010: -6dB; 011: +9dB; 100:+3dB; 101:-3dB; 110:-9dB; 111:-12dB
Rx No. OFDMA Symbols	7 bits	
Rx No. Subchannels	6 bits	
Rx Repetition Coding Indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
Rx DIUC	4 bits	
N_RS_RxTx	2 bits	The number of Relay Station

Reserved	2 bits	
For (n=0; n<N_RS_RxTx; n++) {		
RxTx RS ID	16 bits	Basic CID
Tx Boosting Adjustment	4 bits	Signed value in units of 0.5 dB units
}		
Tx DL-MAP_IE frame offset	2 bits	
Tx DL-MAP_IE Sub-MAP offset	2 bits	0b00: default MAP 0b01-0b11: Sub-MAP offset
Tx DL-MAP_IE offset	4 bits	
Padding	variable	Number of bits required to align to byte length. Shall be set to zero.
}		

Rx OFDMA Symbol offset

The offset of OFDMA symbol in which the burst starts

Rx Subchannel offset

The lowest index OFDMA subchannel used for carrying the burst, starting from subchannel 0.

Rx Boosting

Power boost applied to the data subcarriers of the burst.

Rx No. OFDMA Symbol

The number of OFDMA symbols for the allocation.

Rx No. Subchannel

The number of Subchannels for the allocation.

Rx Repetition Coding Indication

Indicates the repetition code used inside the allocated burst.

Rx DIUC

DIUC used for the burst

N_RS_RxTx

The number of RSs that receive the data in the allocations for receiving and transmit it in the allocations for sending.

RxTx RS ID

Indicates the RS that receives the data in the allocations for receiving and transmit it in the allocations for sending.

Tx Boosting Adjustment

The RS specified by “Rx RS ID” sends the data in the downlink allocation that is identified by “Tx DL-MAP_IE frame offset”, “Tx DL-MAP_IE Sub-MAP offset”, and “Tx DL-MAP_IE offset”. When the RS transmits the signal, power boosting is applied to the allocated data subcarriers.

Tx DL-MAP_IE frame offset

Indicates the frame offset, in which the allocated resource for the transmission is. The frame is starting from this frame.

Tx DL-MAP_IE Sub-MAP offset

Indicates the Sub-MAP offset in the frame specified by “Tx DL-MAP_IE frame offset”, in which the allocated resource for the transmission of RSs is.

Tx DL-MAP_IE offset

Indicates the DL-MAP_IE() in Sub-MAP specified by “Tx DL-MAP_IE sub-MAP offset”, in which the allocated resource for the transmission of RSs is.

8.4.5.3.29 HARQ DL-Relay_IE()

The HARQ DL-Relay_IE() may include several bursts. Each burst consists of downlink allocation part for receiving, RS identifiers, and downlink allocation part for transmitting. The RSs receive the data from the downlink allocations and relay the data in the downlink allocation for transmission. The slots are allocated in a frequency-first order. Downlink allocation for the transmission of the RS may be in same downlink sub-frame or a few downlink sub-frames later. The legacy DL-MAP_IE() sent to the MS is the last in a relaying path from the MMR-BS to the MS.

Table ccc- HARQ DL-Relay_IE() format

Syntax	Size	Notes
DIUC	4 bits	15
DL_extended-2_IE() {	-	
Extended-2 DIUC	4 bits	? (B-D, F)
Length	8 bits	
N_Burst	4 bits	The number of bursts in the frame
For (i=0; i<N_Burst; i++) {		
Rx Boosting	3 bits	000: Normal (not boosted); 001: 6dB; 010: -6dB; 011: +9dB; 100:+3dB; 101:-3dB; 110:-9dB; 111:-12dB
Rx Region_ID use indicator	1 bit	0: not use Region_ID 1: use Region_ID
If (Rx Region_ID use indicator == 0) {		
Rx OFDMA Symbol offset	8 bits	
Rx Subchannel offset	7 bits	
Rx No. OFDMA Symbols	7 bits	
Rx No. Subchannels	7 bits	
Reserved	3 bits	
} else {		
Rx Region_ID	8 bits	Index to the DL region defined in DL region definition TLV in DCD
}		
N_Sub-Burst	4 bits	The number of sub bursts in the 2D region
For (j=0; j<N_Sub-Burst; j++) {		

Rx Sub-Burst Mode	2 bits	0b00 – DIUC 0b10 – N_{EP}, N_{SCH} 0b01 – The same Sub-Burst Mode as the previous Sub-Burst 0b11 – No operation
Reserved	2 bits	
If (Rx Sub-Burst Mode == 0b00) {		
Rx Duration	10 bits	In units of OFDMA slots
Rx DIUC	4 bits	
Rx Repetition Coding Indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
} else if (Rx Sub-Burst Mode == 0b10) {		
Rx N_{EP}	4 bits	
Rx N_{SCH}	4 bits	
} else {		
Rx Duration	10 bits	In units of OFDMA slots
Reserved	6 bits	Shall be set to zero
}		
If (Rx Sub-Burst Mode != 0b11) {		
N_RS_RxTx	2 bits	
Reserved	2 bits	
For (n=0; n<N_RS_RxTx; n++) {		
RxTx RS ID	16 bits	Basic CID
Tx Boosting Adjustment	4 bits	Signed value in units of 0.5 dB units
}		
Tx DL-MAP_IE frame offset	2 bits	
Tx DL-MAP_IE Sub-MAP offset	2 bits	0b00: default MAP 0b01-0b11: Sub-MAP offset
Tx DL-MAP_IE offset	4 bits	
Tx DL-MAP_IE burst offset	2 bits	
Tx DL-MAP_IE sub-burst offset	4 bits	
}		
}		
}		
Padding	variable	Number of bits required to align to byte length, shall be set to zero

}		

N_Burst

The number of Bursts.

Rx Boosting

Power boost applied to the data subcarriers of the burst.

Rx Region_ID use indicator

Indicates the way that the region is describes. If 0, the region is specified by the starting point, OFDMA Symbol offset and Subchannel offset, and sizes, No. OFDMA Symbol and No. Subchannel. If 1, Region_ID identifies the region that is specified in the DCD message.

Rx OFDMA Symbol offset

The offset of OFDMA symbol in which the burst starts, measured from beginning of the designated transmission uplink frame.

Rx Subchannel offset

The lowest index OFDMA subchannel used for carrying the burst, starting from subchannel 0.

Rx No. OFDMA Symbol

The number of OFDMA symbols for the region.

Rx No. Subchannel

The number of Subchannels for the region.

N_Sub-Burst

The number of Sub-Bursts in a Burst.

Rx Sub-Burst Mode

0b00: DIUC style.

0b10: N_{FP}/N_{SCH} style.

0b01: The same Sub-Burst Mode as the previous Sub-Burst.

0b11: No operation in the allocation.

Rx Duration

Indicates the duration, in units of OFDMA slots, of the allocation.

Rx DIUC

DIUC used for the sub-burst

Rx Repetition Coding Indication

Indicates the repetition code used inside the allocated burst.

Rx N_{FP}/Rx N_{SCH}

N_RS_RxTx

The number of RSs that receives the data in the allocated resource.

RxTx RS ID

Indicates the RS that receives the data in the allocated resource.

Tx Boosting Adjustment

The RS specified by “Rx RS ID” sends the data in the downlink allocation that is identified by “Tx DL-MAP_IE frame

offset", "Tx DL-MAP_IE Sub-MAP offset", "Tx DL-MAP_IE offset", "Tx DL-MAP_IE burst offset", and "Tx DL-MAP_IE sub-burst offset". When the RS transmits the signal, power boosting is applied to the allocated data subcarriers.

Tx DL-MAP_IE frame offset

Indicates the frame offset, in which the allocated resource for the transmission is. The frame is counted from this frame.

Tx DL-MAP_IE Sub-MAP offset

Indicates the Sub-MAP offset in the frame specified by "Tx DL-MAP_IE frame offset", in which the allocated resource for the transmission of RSs is.

Tx DL-MAP_IE offset

Indicates the DL-MAP_IE() in Sub-MAP specified by "Tx DL-MAP_IE sub-MAP offset", in which the allocated resource for the transmission of RSs is.

Tx DL-MAP_IE burst offset

Indicates the burst offset in DL-MAP_IE() specified by "Tx DL-MAP_IE offset", in which the allocated resource for the transmission of RSs is.

Tx DL-MAP_IE sub-burst offset

Indicates the sub-burst offset in the burst offset specified by "Tx DL-MAP_IE burst offset", in which the allocated resource for the transmission of RSs is.

[Insert the text after 8.4.5.4.28:]

8.4.5.4.30 UL-Relay_IE()

The UL-Relay IE() consists of uplink allocation part for receiving, RS identifiers, and uplink allocation part for transmtting. The RSs receive the data from the uplink allocations and relay the data in the uplink allocation for transmission. The slots are allocated in a time-first order. The uplink allocation for the transmission of the RS may be in same uplink sub-frame or a few uplink sub-frames later. The legacy UL-MAP_IE() sent to the MS is the first in a relaying path from the MS to the MMR-BS.

Table ddd- UL-Relay_IE() format

Syntax	Size	Notes
CID	16 bits	
UIUC	4 bits	11
DL_extended-2_IE() {	-	
Extended-2 DIUC	4 bits	? (9-D)
Length	8 bits	
Relay control	4 bits	Bit #0: Rx resource allocation Bit #1: Relay information Bit #2-#3: Reserved
If (Rx resource allocation == 1) {		
Rx UIUC	4 bits	
Rx Duration	10 bits	In units of OFDMA Slots
Rx Repetition Coding Indication	2 bits	0b00 – No repetition coding

		0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
} else {		
Rx UL-MAP_IE Sub-MAP offset	2 bits	0b00: default MAP 0b01-0b11: Sub-MAP offset
Rx UL-MAP_IE offset	4 bits	
Reserved	2 bits	
}		
If (Relay information == 1) {		
N_RS_RxTx	2 bits	
Reserved	2 bits	
For (n=0; n<N_RS_RxTx; n++) {		
RxTx RS ID	16 bits	Basic CID. If Relay information == 1, the first CID in this IE() is the first RS_ID.
Tx Boosting Adjustment	4 bits	Signed value in units of 0.5 dB units
}		
Tx UL-MAP_IE frame offset	2 bits	
Tx UL-MAP_IE Sub-MAP offset	2 bits	0b00: default MAP 0b01-0b11: Sub-MAP offset
Tx UL-MAP_IE offset	4 bits	
}		
Padding	variable	Number of bits required to align to byte length. Shall be set to zero.
}		

Relay control

Bit #0: “Rx resource allocation”. If 1, the allocated resource is described, otherwise the MAP pointer that indicates the MAP of the resource allocation is described.

Bit #1: Relay information. If 1, the relay information about RS and its resource for transmission is.

Bit #2-#3: Reserved

Rx Duration

Indicates the duration, in units of OFDMA slots, of the allocation.

Rx UIUC

UIUC used for the sub-burst

Rx Repetition Coding Indication

Indicates the repetition code used inside the allocated burst.

Rx UL-MAP_IE Sub-MAP offset

Indicates the Sub-MAP offset, in which the allocated resource for the receipt is. The Sub-MAP is in this UL sub-frame.

Rx UL-MAP_IE offset

Indicates the burst offset in Sub-MAP specified by “Rx UL-MAP_IE sub-MAP offset”, in which the allocated resource for the receipt is.

N_RS_RxTx

The number of RSs that receive the data in the allocated resource.

RxTx RS ID

Indicates the RS that receives the data in the allocated resource.

Tx Boosting Adjustment

The RS specified by “Rx RS ID” sends the data in the uplink allocation that is identified by “Tx UL-MAP_IE frame offset”, “Tx UL-MAP_IE Sub-MAP offset”, “Tx UL-MAP_IE offset”, “Tx UL-MAP_IE burst offset”, and “Tx UL-MAP_IE sub-burst offset”. When the RS transmits the signal, power boosting is applied to the allocated data subcarriers.

Tx UL-MAP_IE frame offset

Indicates the frame offset, in which the allocated resource for the transmission is. The frame is counted from this frame.

Tx UL-MAP_IE Sub-MAP offset

Indicates the Sub-MAP offset in the frame specified by “Tx UL-MAP_IE frame offset”, in which the allocated resource for the transmission of RSs is. The Sub-MAP is in this UL sub-frame.

Tx UL-MAP_IE offset

Indicates the UL-MAP_IE() in Sub-MAP specified by “Tx UL-MAP_IE sub-MAP offset”, in which the allocated resource for the transmission of RSs is.

Tx UL-MAP_IE burst offset

Indicates the burst offset in UL-MAP_IE() specified by “Tx UL-MAP_IE offset”, in which the allocated resource for the transmission of RSs its.

Tx UL-MAP_IE sub-burst offset

Indicates the sub-burst offset in the burst offset specified by “Tx UL-MAP_IE burst offset”, in which the allocated resource for the transmission of RSs its.

8.4.5.4.31 HARQ UL-Relay_IE()

The HARQ UL-Relay IE() may include several bursts that is starting with either the starting symbol and subchannel or the global slot index. The allocation indexed by the global slot shall follow the last allocation. The slots are allocated in a time-first order. The uplink allocation for the sub-burst in the burst is pointed by parameters: Sub-MAP offset, UL-MAP_IE offset, burst offset, and sub-burst offset. The RSs receive the data from the uplink allocations and relay the data in the uplink allocations for transmission. The uplink allocation for the transmission of the RS is done in same uplink sub-frame or a few uplink sub-frames later. The legacy UL-MAP_IE() sent to the MS is the first in a relaying path from the MS to the MMR-BS.

Table eee- HARQ UL-Relay_IE() format

Syntax	Size	Notes
CID	16 bits	

UIUC	4 bits	11
DL_extended-2_IE() {	-	
Extended-2 DIUC	4 bits	? (9-D)
Length	8 bits	
N_Burst	2 bits	The number of bursts
Reserved	2 bits	
For (i=0; i<N_Burst; i++) {		
Rx Allocation Start Indication	1 bit	0: No allocation start information 1: Allocation start information follows
If (Rx Allocation Start Indication == 1) {		
Rx OFDMA Symbol offset	8 bits	This value indicates start Symbol offset of subsequent sub-bursts in this IE()
Rx Subchannel offset	7 bits	This value indicates start Subchannel offset of subsequent sub-bursts in this IE()
} else {		
Reserved	3 bits	
}		
N_Sub-Burst	4 bits	he number of bursts in this zone
For (j=0; j<N_Sub-Burst; j++) {		
Relay control	4 bits	Bit #0: Rx resource allocation Bit #1: Relay information Bit #2-#3: Reserved
If (Rx resource allocation == 1) {		
Rx Sub-Burst Mode	2 bits	0b00 – UIUC 0b10 – N_{EP}, N_{SCH} 0b01 – The same Sub-Burst Mode as the previous Sub-Burst. 0b11 – No operation
Reserved	2 bits	
If (Rx Sub-Burst Mode == 0b00) {		
Rx Duration	10 bits	In units of OFDMA slots
Rx UIUC	4 bits	
Rx Repetition Coding Indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
} else if (Sub-Burst Mode == 0b10) {		
Rx N_{EP}	4 bits	

Rx N_{SCH}	4 bits	
} else {		
Rx Duration	10 bits	In units of OFDMA slots
Reserved	6 bits	Shall be set to zero
}		
} else {		
Rx UL-MAP_IE Sub-MAP offset	2 bits	0b00: default MAP 0b01-0b11: Sub-MAP offset
Rx UL-MAP_IE offset	4 bits	
Rx UL-MAP_IE burst offset	2 bits	
Rx UL-MAP_IE sub-burst offset	4 bits	
}		
If (Relay information == 1) {		
N_RS_RxTx	2 bits	
For (n=0; n<N_RS_RxTx; n++) {		
RxTx RS ID	16 bits	Basic CID
Tx Boosting Adjustment	4 bits	Signed value in units of 0.5 dB units
}		
Tx UL-MAP_IE frame offset	2 bits	
Tx UL-MAP_IE Sub-MAP offset	2 bits	0b00: default MAP 0b01-0b11: Sub-MAP offset
Tx UL-MAP_IE offset	4 bits	
Tx UL-MAP_IE burst offset	2 bits	
Tx UL-MAP_IE sub-burst offset	4 bits	
}		
}		
}		
Padding	variable	Number of bits required to align to byte length. Shall be set to zero.
}		

N_Burst

The number of Bursts.

Rx Allocation Start Indication

When Allocation Start Indication is 1, the HARQ UL Relay IE() includes the starting symbol and subchannel of the allocation. Allocations made without an Allocation Start Indication, shall be based on the global slot index, each of these allocations shall follow the last allocation which did not contain Allocation Start indication

Rx OFDMA Symbol offset

The offset of OFDMA symbol in which the burst starts, measured from beginning of the designated transmission uplink frame.

Rx Subchannel offset

The lowest index OFDMA subchannel used for carrying the burst, starting from subchannel 0.

N_Sub-Burst

The number of Sub-Bursts in a Burst.

Relay control

Bit #0: “Rx resource allocation”. If 1, the allocated resource is described, otherwise the MAP pointer that indicates the MAP of the resource allocation is described.

Bit #1: Relay information. If 1, the relay information about RS and its resource for transmission is.

Bit #2-#3: Reserved

Rx Sub-Burst Mode

0b00: UIUC style.

0b10: N_{EP}/N_{SCH} style.

0b01: The same Sub-Burst Mode as the previous Sub-Burst.

0b11: No operation in the allocation.

Rx Duration

Indicates the duration, in units of OFDMA slots, of the allocation.

Rx UIUC

UIUC used for the sub-burst

Rx Repetition Coding Indication

Indicates the repetition code used inside the allocated burst.

Rx N_{EP}/Rx N_{SCH}

Rx UL-MAP_IE Sub-MAP offset

Indicates the Sub-MAP offset, in which the allocated resource for the receipt is. The Sub-MAP is in this UL sub-frame.

Rx UL-MAP_IE offset

Indicates the UL-MAP_IE() in Sub-MAP specified by “Rx UL-MAP_IE sub-MAP offset”, in which the allocated resource for the receipt is.

Rx UL-MAP_IE burst offset

Indicates the burst offset in UL-MAP_IE() specified by “Rx UL-MAP_IE offset”, in which the allocated resource for the receipt is.

Rx UL-MAP_IE sub-burst offset

Indicates the sub-burst offset in the burst offset specified by “Rx UL-MAP_IE burst offset”, in which the allocated resource for the receipt is.

N_RS_RxTx

The number of RSs that receives the data in the allocated resource.

RxTx RS ID

Indicates the RS that receives the data in the allocated resource.

Tx Boosting Adjustment

The RS specified by “Rx RS ID” sends the data in the uplink allocation that is identified by “Tx UL-MAP_IE frame offset”, “Tx UL-MAP_IE Sub-MAP offset”, “Tx UL-MAP_IE offset”, “Tx UL-MAP_IE burst offset”, and “Tx UL-MAP_IE sub-burst offset”. When the RS transmits the signal, power boosting is applied to the allocated data subcarriers.

Tx UL-MAP_IE frame offset

Indicates the frame offset, in which the allocated resource for the transmission is. The frame is counted from this frame.

Tx UL-MAP_IE Sub-MAP offset

Indicates the Sub-MAP offset in the frame specified by “Tx UL-MAP_IE frame offset”, in which the allocated resource for the transmission of RSs is. The Sub-MAP is in this UL sub-frame.

Tx UL-MAP_IE offset

Indicates the UL-MAP_IE() in Sub-MAP specified by “Tx UL-MAP_IE sub-MAP offset”, in which the allocated resource for the transmission of RSs is.

Tx UL-MAP_IE burst offset

Indicates the burst offset in UL-MAP_IE() specified by “Tx UL-MAP_IE offset”, in which the allocated resource for the transmission of RSs is.

Tx UL-MAP_IE sub-burst offset

Indicates the sub-burst offset in the burst offset specified by “Tx UL-MAP_IE burst offset”, in which the allocated resource for the transmission of RSs is.