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Re:	Call for Technical Proposals regarding IEEE project P802.16j
Abstract	Propose demodulation and forwarding method within a single frame in RS and change the technical tables.
Purpose	Adoption of the proposed text and tables
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Demodulation and Forwarding Method in Relay Station

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1. Introduction

We propose the demodulation and forwarding method in RS. The demodulation and forwarding method means that RS performs only demodulation without channel decoding for received signals and then modulation only without channel encoding procedure while forwarding the data in modem of RS.

We are expected to use this demodulation and forwarding method assuming simple RS optionally. If we may use this forwarding method, we can also change modulation order of forwarded data by RS. This forwarding method can change only modulation order without changing of channel coding rates. Therefore, all of the modulation types of BS-to-RS should include a variety of channel coding rates of RS-to-MS.

Finally, we would like to change the technical tables of UCD and DCD burst profile encoding tables and CTC channel coding per modulation tables.

2. Suggested Remedy

2.1 Demodulation and Forward

There have two methods to forward data in RS, which are decoding and forwarding method and demodulation and forwarding method. We may apply decoding and forwarding method to the full functional RS in the figure1, demodulation and forwarding method to simple RS in the figure2. And also, we may apply decoding and forwarding method to channel status such as coverage extension and demodulation and forwarding method to channel status such as coverage hole in the figure3.

We would like to consider only demodulation and forwarding method in RS. Demodulation and forwarding method have main procedural blocks of FFT, QAM de-mapping, QAM mapping and IFFT without channel decoding and encoding procedures. But, we can change the modulation order in QAM mapping block prior to regeneration to forward data. For example, received data of having a 16QAM and 1/2 code rate can be changed to QPSK, 1/2 without changing code rate of 1/2.

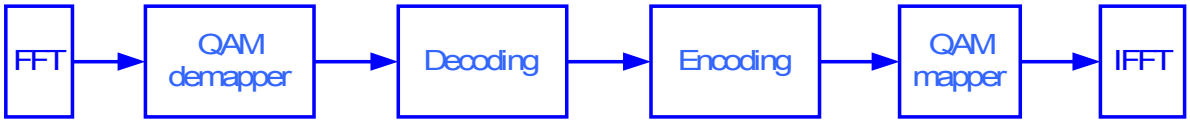

Figure1. Decoding and Forwarding method in full functional RS

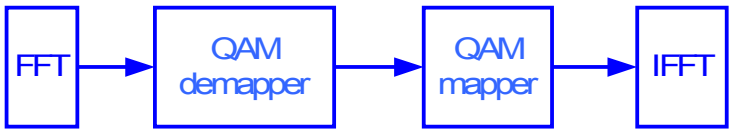

Figure2.Demodulation and Forwarding method in simple RS

2.2 Usage Scenario

Figure3 shows you usage scenario considering MS's position.

There are three kinds of MS which are in the good channel, coverage hole and coverage extension area. MS in the good channel can be directly communicated with MMR-BS. MS in the coverage hole can be applied to demodulation and forwarding method in RS. And coverage extension can be applied to decoding and forwarding method in RS.

For example, in the case of using the demodulation and forwarding in RS for downlink, you can see that dark blue colored line indicates a BS-to-RS link and light blue colored line indicates a RS-to-MS link. It has not change code rate and encoding packet size, but modulation order of 64 QAM has changed by QPSK which can be forwarded to MS. Then, all of the MS should have channel decoding procedure.

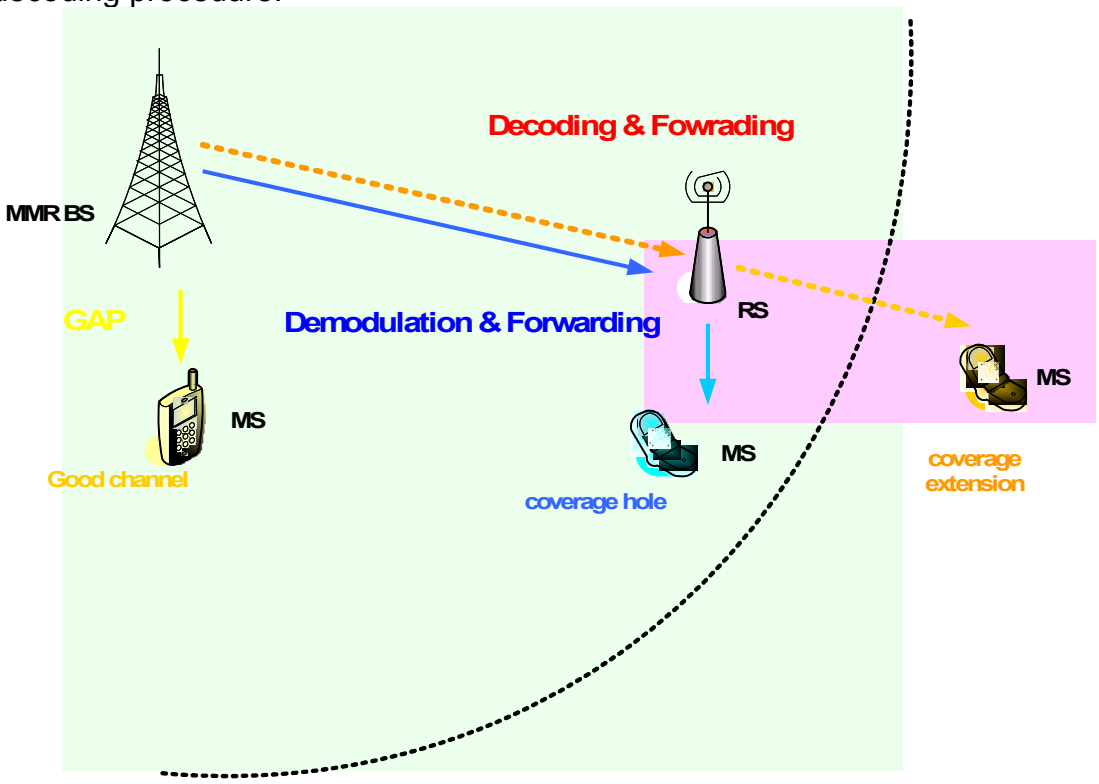

Figure3. Usage Scenario for Demodulation and Forwarding Method

2.3 Operation Scenario

The figure4 depicts that burst#1 at the BS-to-RS region can be forwarded to burst#2 at the RS-to-MS region and burst#3 at the BS-to-RS region can be forwarded to burst#4 at the RS-to-MS region.

If burst#2's MCS should have QPSK, 1/2 code rate, burst#1's MCS may have 16QAM or 64QAM without changing of code rates. And also, if legacy MS should have MCS of 64QAM, 5/6 code rate at the RS-to-MS, burst#3's MCS may have 16QAM, 5/6. However, the legacy specifications of MS have not defined 5/6 code rate for 16QAM modulation type.

Finally, we may define all of the modulation types and channel coding rate for BS-to-RS to include a variety of modulation type and channel coding rates specifying for the legacy MS.

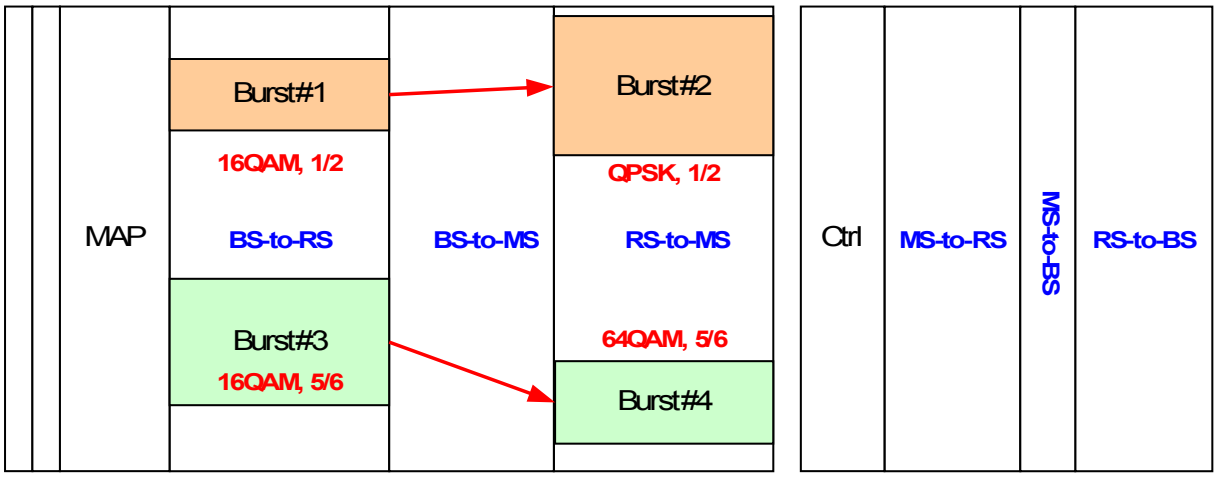

Figure4. Burst allocation for Demodulation and Forwarding

3. Proposed Text Change

[Change Table 277c as indicated.]

Table 277c—Extended-2 DIUC code assignment for DIUC=14

Extended-2 DIUC (hexadecimal)	Usage
00	MBS_MAP_IE
01	HO_Anchor_Active_DL_MAP_IE
02	HO_Active_Anchor_DL_MAP_IE
03	HO_CID_Translation_MAP_IE
04	MIMO_in_another_BS_IE
05	Macro-MIMO_DL_Basic_IE
06	Skip_IE
07	HARQ DL MAP IE
08	HARQ ACK IE
09	Enhanced DL MAP IE
0A	Closed-loop MIMO DL Enhanced IE
0B	RS Forwarding DL_IE
~~0B-0D~~	~~*Reserved*~~
0C-0D	*Reserved*
0E	AAS_SDMA_DL_IE
0F	*Reserved*

Insert a new sub clause 8.4.5.3.28

8.4.5.3.28 RS Forwarding DL IE format

This IE is sent by MS-BS to RS to notify the demodulation and forwarding method of downlink for relaying within a single frame without decoding and re-encoding procedures. If this IE indicates demodulation and forwarding, RS should relay signal from MR-BS with FFT, demodulation, modulation and IFFT.

Table 286za – RS Forwarding DL IE

Syntax	Size	Notes
RS Forwarding DL IE() {		
Extended-2 DIUC=	4bits	0x0B
Length	8bits	
Forwarding Method Type	1bit	0: decoding and forwarding, 1: demodulation and forwarding
reserved	3bits	Shall be set to zero

Forwarding Method Type
Indicates the forwarding method which is demodulation and forwarding, decoding and forwarding

[Change Table 290a as indicated.]

Table 290a—Extended UIUC Code Assignment for UIUC=15

Extended UIUC (hexadecimal)	Usage
00	Power_control_IE
01	Mini-subchannel_allocation_IE
02	AAS_UL_IE
03	CQICH_Alloc_IE
04	UL Zone IE
05	PHYMOD_UL_IE
06	MIMO_UL_Basic_IE
07	UL-MAP_Fast_Tracking_IE
08	UL_PUSC_Burst_Allocation_in_Other_Segment_IE
09	Fast_Ranging_IE
0A	UL Allocation Start IE
0B~~… 0F~~	~~*Reserved*~~ RS Forwarding UL IE
0C … 0F	*Reserved*

Insert a new sub clause 8.4.5.4.29

8.4.5.4.29 RS Forwarding UL IE format

This IE is sent by MS-BS to RS to notify the demodulation and forwarding method of uplink for relaying within a single frame without decoding and re-encoding procedures. If this IE indicates demodulation and forwarding method for relaying, RS should relay signal from MS with FFT, demodulation, modulation and IFFT.

Table 302w – RS Forwarding UL IE

Syntax	Size	Notes
RS Forwarding UL IE() {		
Extended UIUC=	4bits	0x0B
Length	8bits	
Forwarding Method Type	1bit	0: decoding and forwarding, 1: demodulation and forwarding
reserved	3bits	Shall be set to zero

Forwarding Method Type
Indicates the forwarding method which is demodulation and forwarding, decoding and forwarding

4. References

[1] C802.16j-07_251r1, “Demodulation and Forwarding method in Relay Station”
[2] C802 16j-07_003, “Direct Relaying Zone”
[3] C802 16j-06_250r2, “Hybrid Relay Structure within a Single Frame”