	IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>
Title	**Radio Resource Reuse in access zone and relay zone**
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Re:	Call for technical proposals regarding IEEE project P802.16j
Abstract	The location information and signal strength information from other stations could be used for radio reuse.
Purpose	This contribution proposes the interference measurement method for radio reuse in both access and relay zone.
Notice	
Release	
Patent Policy and Procedures	

Radio Resource Reuse in access zone and relay zone

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1. Introduction

In this document, we propose interference measurement methods for the purposes of resource reuse. We consider methods for coarse resource allocation and fine resource allocation. The coarse method is based either on the location of the infrastructure stations or the interference measurement as reported by the infrastructure stations. The fine resource allocation can be refined in the access zone by utilizing the scan report messages from the MSs.

2. Coarse Resource Allocation Methods

2.1. Allocation Based on Location Information

The geographical location can be used for the purposes of resource reuse. Even if the actual interference from other stations could be different from geographical information, the interference from other stations has an intermediate relation with path loss.

2.1.1 Location information report when initial entry.

MR-BS can determine the radio reuse based on this location information when FRS is installed in a certain area in the initial time

2.1.2 Location information update for MRS

MRS moves to the other area during operation. If necessary, MR-BS requests the location information to RS, RS report the present location information to MR_BS.

2.2 Coarse Resource Allocation Based on Interference Measurement

Actual interference measurement results can be used to further refine the radio resource reuse.

2.2.1 Interference measurement when initial entry

When RS is initially power on or loss of signal, RS find the downlink channel for finding neighboring station. After that RS choose the one station and acquire DL/UL parameters for communication. After succeeding registration to MR-BS, MR-BS should allocate the segment/sector to this RS. Hence, If RS stores the preamble

index and each RSSI or CINR, when initial process of network entry, RS can report this information to MR-BS. Therefore, MR-BS can grant initial sector/segment to an RS before starting MR-BS and RS communication.

2.2.2 Interference measurement during RS operation

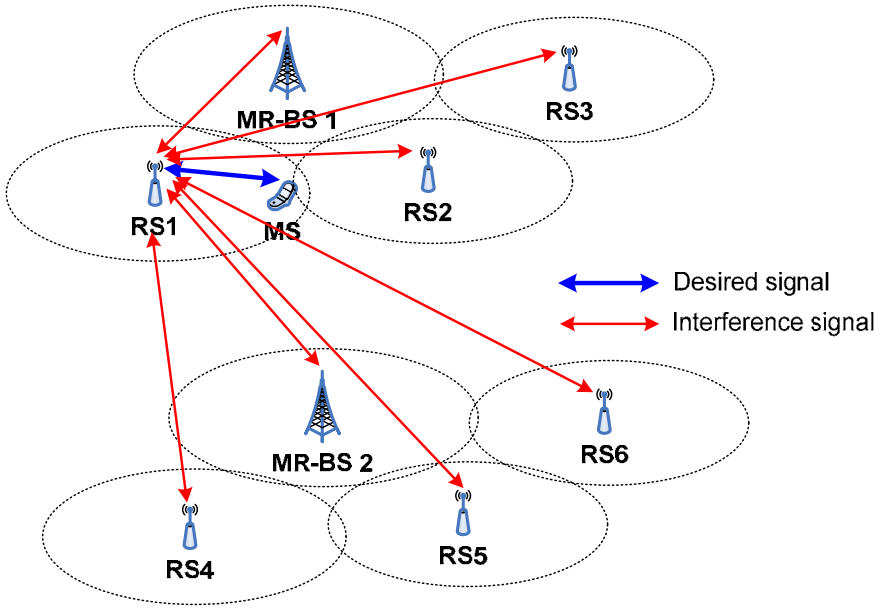

Figure 1. Coarse interference measurement in 2 hop topology

Figure 1 shows the coarse interference measurement in the case of a 2 hop topology. In multi-cell environments, RS needs to measure signals from the neighboring MR-BS and report it. RS can measure the interference from the neighboring MR-BS using DL synchronization symbol within the DL Relay zone as illustrated in Figure 2.

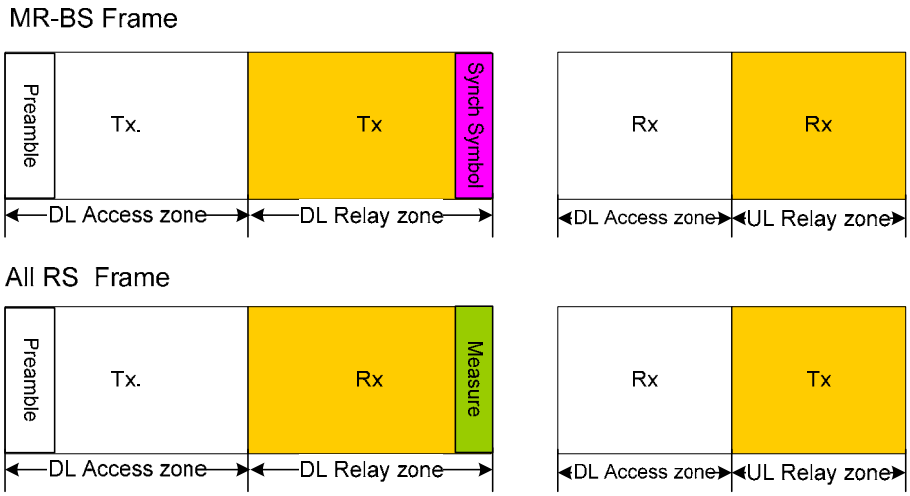

Figure 2. Interference measurement from MR-BS

RS can also measure the interference from the other RSs as shown in Figure 3. When one RS transmits its signature to all other RSs in the DL relay zone when MR-BS do not transmit synchronization symbol, the other

RSs can listen and report the results. In this case, RS1 has one R-RTG overhead. The other RSs can receive in the Rx. mode without any mode transition gap.

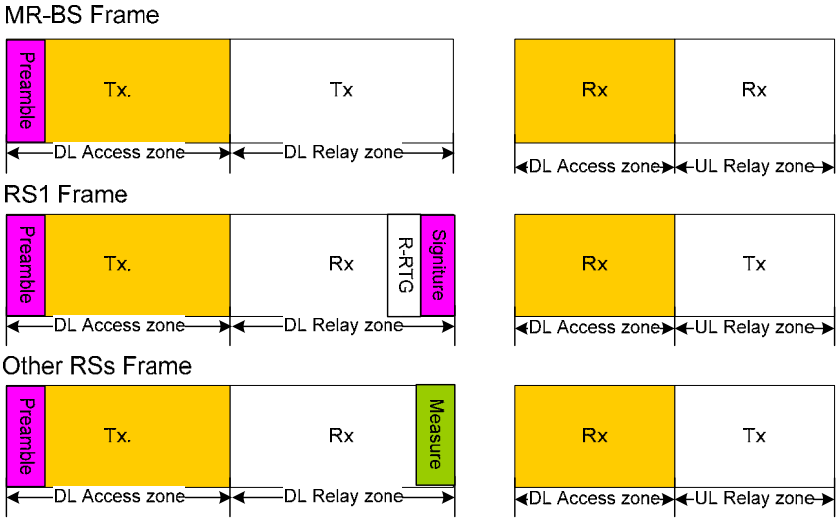

Figure 3. Interference measurement from the other RSs

If the RS1 transmits the RS signal in UL relay zone, other RSs should change the mode from Tx to Rx for receiving the RS1 signature signal.

3. Refining the Resource Allocation in the Access Zone

In access zone, the exact interference measurement is at the MS not RS. This interference measurement error increases in case RS coverage is large or RS uses directional antenna with MR-BS. Therefore, some case, MR-BS needs to know the interference situation from MSs for fine resource allocation for the access link.

However, if MR-BS receives interference report from all MSs, the message overhead will be large. Therefore, when MR-BS wants to update the interference situation, the message needs to be optimized.

For MS handover, RS may allocate time for MS to scanning neighbor stations, and collect the data from all serving MSs. However, for the purpose of interference measurement, RS need not report this whole MS scanning to MR-BS.

Figure 4 shows basic idea in this proposal. In Figure 4, RS may manage this MS scanning information. Assume that when this scanning information is sorted regarding neighbor RSs, the first column is more important than the last columns for MR-BS to know interference from neighbor stations. Hence, the MR-BS needs to only know the representative RSSI or CINR values of each neighbor station not know MS CID. This is a main difference of scanning report for handover.

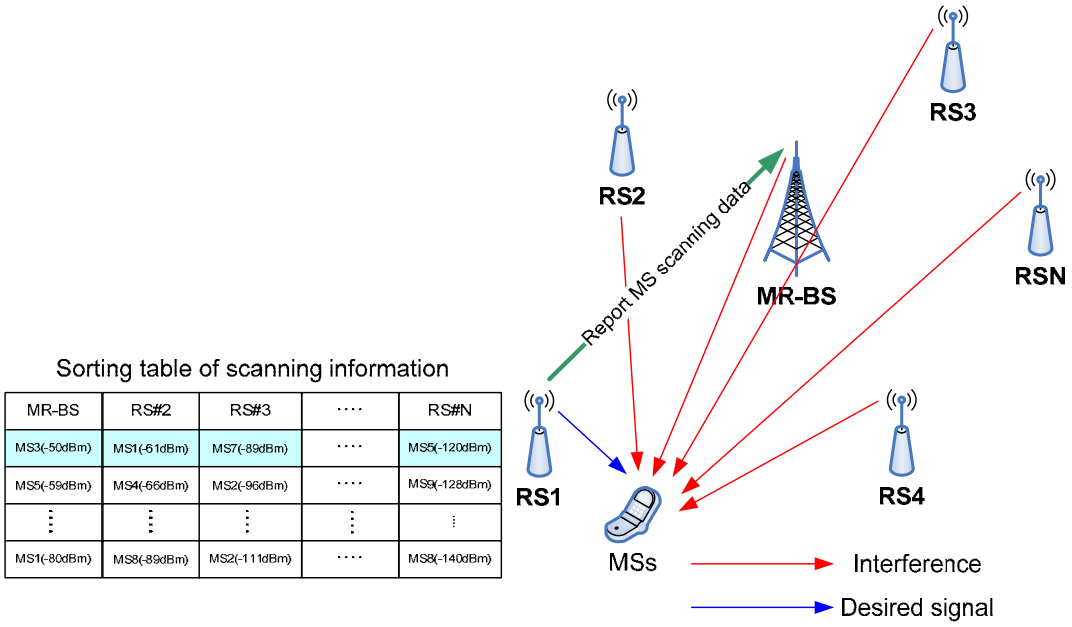

Figure 4. Interference measurement using scanning report of MSs

4. Proposed Text Change

Insert the new subclause 6.3.27:

6.3.27.x. RS location reporting for interference estimation

To estimate interference based on the calculation of the path loss between the RSs, MR-BS may use the information related to the location of the individual RSs with respect to each other. To obtain the location information, MR-BS can send a MR_LOC-REQ message to an RS while the RS responds with a MR_LOC-RSP message as described in 6.3.2.3.xx. An RS informs the MR-BS about location capability support during the network entry.

6.3.27.x. MS scanning report for interference estimation

To make a refined estimate of the interference in the access zone, the MR-BS may send MS_SCN-INF-REQ (see 6.3.2.3.xx) to the RSs, and the RS shall respond with a MS_SCN-INF-RSP (see 6.3.2.3.xx) to MR-BS containing the measurement reports from the MSs in its cell.

Insert the text end of the subclause 6.3.9.2:

6.3.9.2. Scanning and synchronization to the downlink

RS follows the scanning and synchronization procedure similar to that of the SS. In addition, however, the RS shall store preamble index and signal strength that are above a certain threshold value in order to report the stored values to the serving MR-BS after registration.

Insert the new subclause 6.3.9.16:

6.3.9.16. Interference report of neighboring stations to MR-BS

After registration with an MR-BS, the RS sends RS_NBR-MES-REP messages (see 6.3.2.3.xx), containing the signal strength measurement from other stations, to the MR-BS.

Insert the new subclause 6.3.2.3.61:

6.3.2.3.62. RS neighbor station measurement report (RS_NBR-MEA-REP) message

Syntax	Size	Notes
RS_NBR-MES-REP_Message_Format(){		
Management Message Type =TBD		
N_Preamble_Index	8 bits	Number of preamble of neighboring RS/BS
Begin PHY Specific Section {		
For (i=0, i< N_Preamble_Index, i++){		
Preamble Index	8 bits	Scan the preamble index and RSSI values in the neighboring list
}		
Report Request TLVs	Variable	TLV specific
}		

The Report Request TLV may include physical CINR or RSSI of the preamble index.

N_Preamble_Index
Number of preamble of neighboring RS/BS.

Insert the new subclause 6.3.2.3.61:

6.3.2.3.63. MS scanning information request (MS_SCN-INF-REQ) message

Syntax	Size	Notes
MS_SCN-INF-REQ Message_Format(){		
Management Message Type =TBD		
N_Recommended_STA_Index	8bit	Number of neighboring BS/RS in MOB_NBR-

		ADV message.
Report type	1 bit	0: CINR mean, 1: RSSI mean
For(j=0;j<N_Recommended_STA_Index;j++){		
Neighbor_STA_Index	8 bit	Neighboring BS/RS lndex in MOB_NBR-ADV message.
}		
}		
	7 bit	Reserved

6.3.2.3.64. MS scanning information response (MS_SCN-INF-RSP) message

Syntax	Size	Notes
MS_SCN-INF-RSP Message_Format(){		
Management Message Type =TBD		
N_Recommended_STA_Index	8bit	Number of neighboring BS/RS in MOB_NBR-ADV message.
Report type	1 bit	0: CINR mean, 1: RSSI mean
For(j=0;j<N_Recommended_STA_Index;j++){		
Neighbor_STA_Index	8 bit	Neighboring BS/RS lndex in MOB_NBR-ADV message.
Signal_strength	8bit	Report type [0: CINR, 1:RSSI]
}		
}		
____	7 bit	Reserved

References

[1] C80216j-07/136, “On the use of postamble for the relay link, January, 2007.

[2] 802.16e-2005, “Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1”, *IEEE Computer Society and the IEEE Microwave Theory and Techniques Society*, 28 Feb. 2006.