Project	IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>
Title	Relay-Station Power Control and Channel Reuse
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Re:	Call for Technical Proposals regarding IEEE Project P802.16j (IEEE 802.16j-06/027)
Abstract	This contribution proposes relay-station power control and channel reuse scheme to improve the MR-BS system capacity.
Purpose	Propose the text regarding relay-station power control and channel reuse
Notice	
Release	
Patent Policy and Procedures	

Relay-Station Power Control and Channel Reuse

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1. Introduction

In the MR-BS (Multihop Relay- Base Station) system, neighboring RS (Relay Station) coverage areas may be overlapped with different preamble segment values as defined in PUSC mode application. In order to increase the MR-BS system capacity, we propose RS power control with step size of 1 dB which not only minimizes the unnecessary channel interference to its neighboring RSs/BSs, but also has enough power to serve all the mobiles under its service. The power control rate can be at the same rate as the handover measurement reports so that the update rate is about every 0.5 second. For further increasing channel reuse possibility, we may also utilize the network channel management algorithm to group the set of MSs from each of different RSs within the MR-BS coverage, where the set of MSs with the C/I value above the pre-defined threshold value is grouped. Therefore, the set of MSs in the group can reuse the same channel simultaneously.

2. RS Power Control for Each Data Burst

In the MR-BS system, the MS reports channel measurement results during the handover process which provides the serving cell C/I and the neighboring cell RSS (receive signal strength) measurements approximately every 0.5 second. After that, we can estimate the received C/I value for each MS under its serving RS. If the MS with the estimated C/I result is higher than the pre-defined threshold value, the serving RS will decrease its transmission power to that particular MS, thereby maintaining that all the MSs under its control with a similar receive power from its serving RS. The detailed algorithm is implementation dependence and out of the scope of this proposal. The maximum RS transmit power that is required to transmit in order to serve its MS in the longest link range. The RS downlink power for each MS data burst is specified in the boosting field of the 802.16e standard. By applying such a power control mechanism at the RS, the RS can reduce the co-channel interference from the neighboring RSs, as an example in Fig. 1. Thus, MS_0 served by RS_0 and MS_1 served by RS_1 in Fig. 1 may reuse channel simultaneously without co-channel interference.

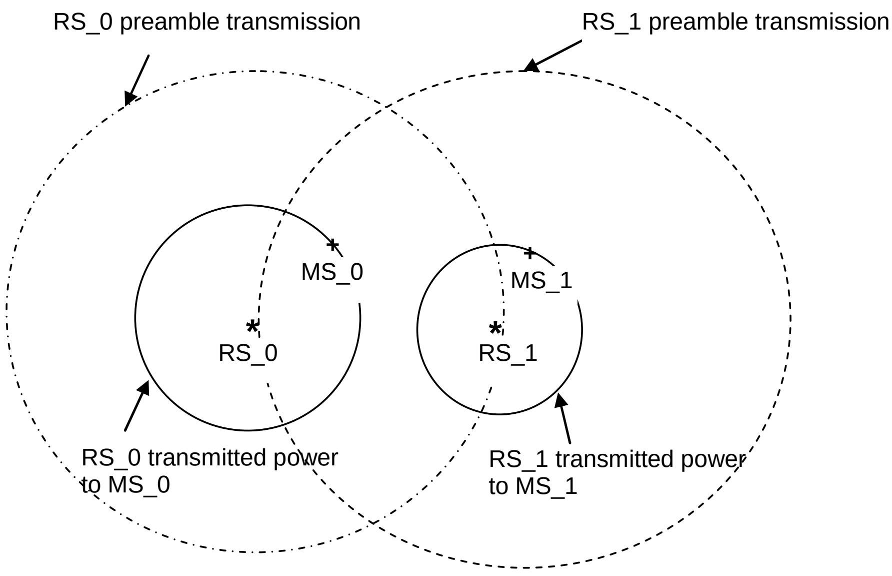

Figure 1. An example of RS power control scheme. RS_0/RS_1 only transmits the necessary power that satisfies the C/I threshold value to MS_0/MS_1.

3. Channel Reuse handled by Network Channel Management

Even applying the RS power control scheme at each data burst for MS_01 and MS_12, as an example shown in Fig. 2, may still interfere with each other. In this instance, network channel management (i.e., the exact algorithm is implementation vendor-specific) is used so that channel reuse is applied to the group of MSs that include the first group of MS_01 and MS_11 and a second group of MS_02 and MS_12. This channel management would not select channel reuse to the group of MSs that include MS_01 and MS_12 since they have strong channel interference, even though the other group of MS_02 and MS_11 would be an acceptable group. By using network channel management to collaboratively group the transmission channel from different RSs, we can improve the system channel capacity. The same channel reuse concept could also be applied to the uplink channels. The flow chart of channel reuse based on the RS power control and network channel management is given in Fig. 3 and the message signaling is described in Fig. 4.

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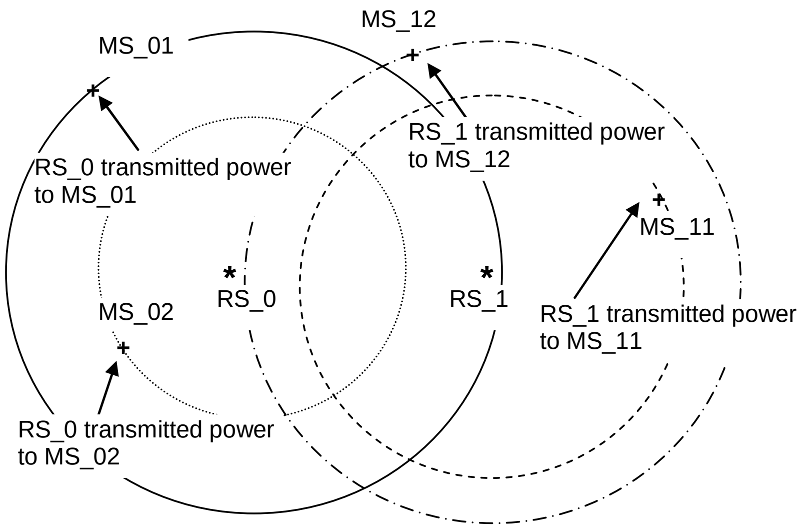

The 1st group of MS_01 & MS_11 and a 2nd group of MS_02 & MS_12 can have channel reuse without interference, but MS_01 & MS_12 would not be an accepted group for channel reuse due to interference.

Figure 2. An example of channel reuse handled by network channel management.

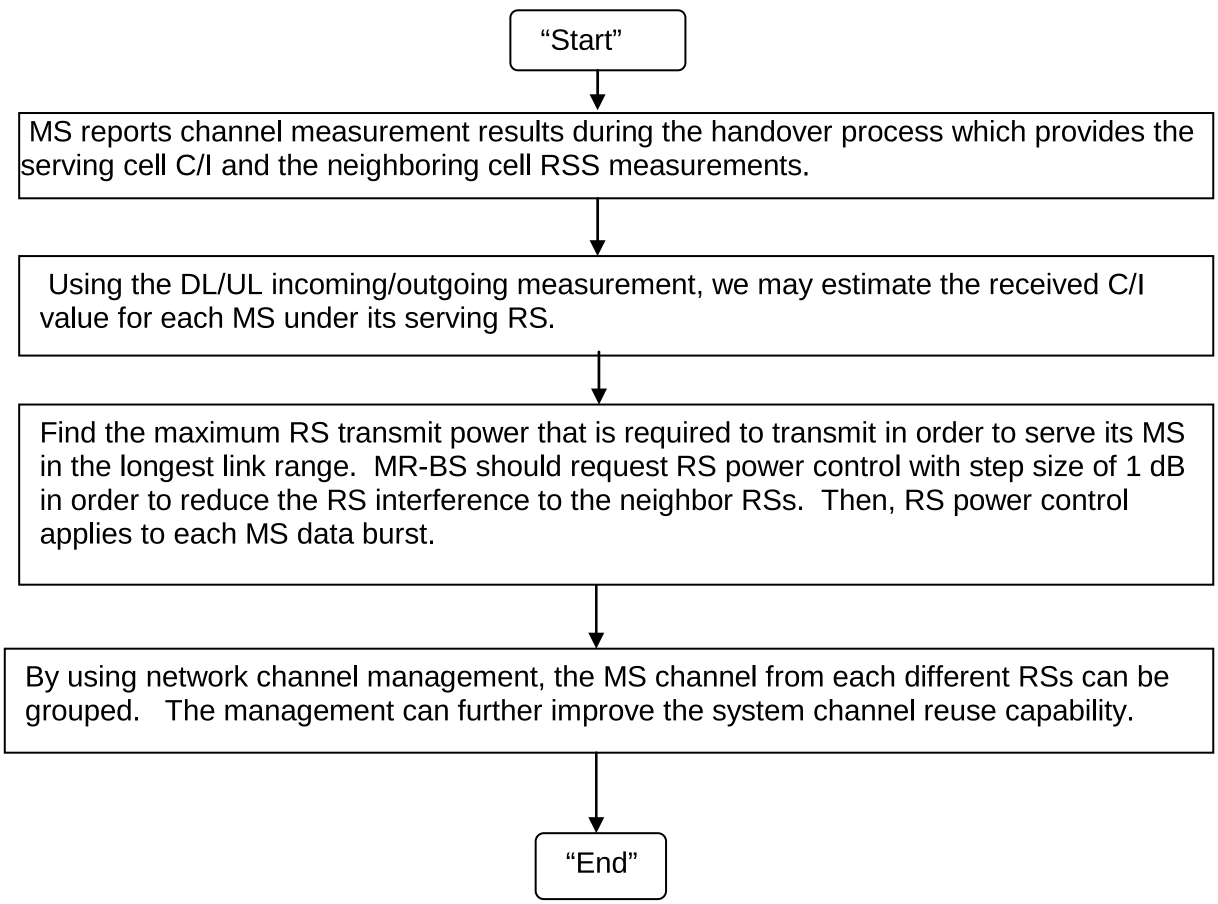

Figure 3. Flow chart of channel reuse based on the RS power control and network channel management.

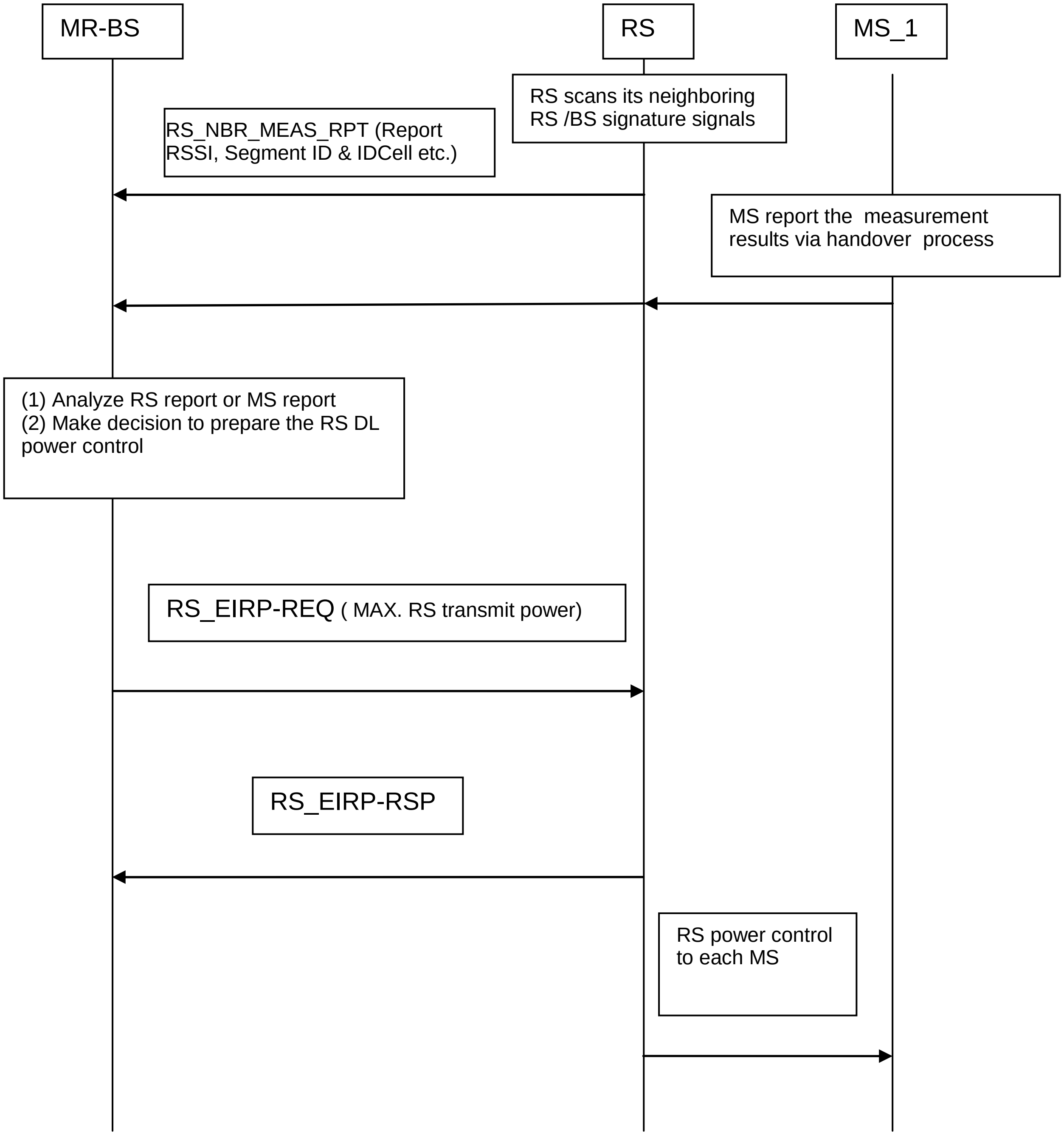

Figure 4. The message signaling for RS downlink power control.

4. Changes to the specification

Insert new subclause at the end of 6.3.9

After RSs measurement reported to MR-BS, MR-BS determines the RS DL transmission power and sends the RS EIRP value via the RS transmit power request message(6.3.2.3.62). The RS will change its RS EIRP through the DCD channel codlings (11.4.1)

4.1 Insert new subclause (6.3.2.3.62)

6.3.2.3.62 RS transmit power request (RS_EIRP-REQ) message

Syntax	Size	Notes
RS_EIRP-REQ_Message_Format() {		
Management Message Type = TBD	8 bits	
Downlink channel ID	8 bits	
Configuration change Count	8 bits	
Begin PHY Specific Section {		
For (i=0, i<N_NBR_LIST, i++){		
RS EIRP }	Variable	Physical specific
}		
}		

A RS shall generate DCDs in the format shown in Table 15, include all of the following parameters:

Configuration change Count
Incremented by one (modulo 256) by the RS whenever any of the values of this channel descriptor change. If the value of this count in a subsequent DCD remains the same, the MS can quickly decide that the remaining fields have not changed and may be able to disregard the remainder of the message.

Downlink Channel ID
The identifier of the downlink channel to which this message refer. The identifier is arbitrarily chosen by the RS and is unique only within the MAC domain. This acts as a local identifier for transactions such as ranging.

N_NBR_LIST
Number of neighboring RS/BS in the neighbor list.

6.3.2.3.62 RS transmit power response (RS_EIRP-RSP) message

Syntax	Size	Notes
RS_EIRP-RSP_Message_Format() {		
Management Message Type = TBD	8 bits	
Downlink channel ID	8 bits	
Configuration change Count	8 bits	
Begin PHY Specific Section {		
For (i=0, i<N_NBR_LIST, i++){		
Results }	Bit 1: Success	

	Bit 0: fail	
}		
}		

RS_EIRP is a TLV encoding that defines the value of RS transmitted power in dBm.

Insert new raw in 11.4.1 DCD channel encodings

The DCD Channel Encoding are provided in Table 358

Add RS EIRP Indicator in the Table 109g-Bit-by-bit definition of PHY Profile ID of the BS

Item	Size	Notes
RS EIRP Indicator	1 bit	If this bit is set, the RS EIRP follows the PHY Profile ID.

Table 358 – DCD channel encoding

Name	Type (1 byte)	Length	Value	PHY Scope
RS EIRP	2	2	Signal in units of 1 dBm	All