Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	**Relay Frequency Reuse Scheme**	
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Re:	SDD Change Request	
Abstract	This contribution specifies Relay Frequency Reuse scheme	
Purpose	For consideration and adoption into the 16m SDD document.	
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Relay Frequency Reuse scheme

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Relay Frequency Reuse scheme

Introduction

The latest version of the IEEE802.16m SDD [1] specifies a Fractional Frequency Reuse (FFR) technique between different sectors of the cell and Inter-ABS Coordination in order to control the level of interference and optimize the reuse of frequency resources in the deployment. The SDD also specifies support of ARS in the cell sector. However, no mechanism is specified to control interference level and reuse of frequency resources within relay-enabled sector.

This contribution proposes a frequency reuse scheme that can be used by the ABS and ARSs within a sector. We use the term Relay Frequency Reuse (RFR) to describe this scheme.

Motivation

When several ARSs are used in the same sector, operating simultaneously in the same frequency resources, additional cell edges are formed within the sector. Allowing the ABS and ARSs to operate simultaneously on the same frequency increases the degree of frequency reuse and thus increases system capacity, but the AMSs located at the cell edges between the ARSs and ABS experience interference from the stations within the sector. This problem can be solved by applying the RFR scheme between the ABS and ARSs to enable different levels of frequency reuse between the access stations in the sector.

In accordance with the RFR scheme the communications within the sector may be arranged in several ways:

- Several access stations within the sector (ABS and/or ARSs) may share the time-frequency resources to serve different AMSs simultaneously thus taking advantage of high frequency reuse factor between stations.
- Access stations may communicate with their associated AMSs in different time-frequency resources thus taking advantage of reduced interference level between the stations within the sector.

To enable the RFR in the 802.16m frame structure it is proposed to implement RFR partitions in the frequency domain, each partition for use by one or more access stations. Note that an access station uses more than one partition to communicate with different AMSs. For example, the ABS may serve AMSs located close to it in an RFR partition exploited by the ABS and several ARSs simultaneously, and the ABS may communicate with another AMS located far it in an RFR partition used only by the ABS to arrange interference-free communication session.

The assignment of access stations to specific RFR partitions and setting partitions' sizes and their locations in the frequency band may be performed in an adaptive way taking into account factors such as traffic load at the access stations, link qualities between access stations and the associated AMSs in different RFR partitions, reuse factors and the interference levels.

References

[1] IEEE 802.16m System Description Document (IEEE 802.16m-08/003r7)
[2] IEEE 802.16m Evaluation Methodology Document

Text Proposal

Insert the following text into section 15 of the SDD

15.4.x Relay Support for Interference Mitigation

15.4.x.1 Relay Frequency Reuse

15.4.x.1.1 RFR Frequency Partitions

When ARSs are used within a deployment, frequency partitions can be used to implement a Relay Frequency Reuse (RFR) scheme between the ABS and ARSs within a sector. RFR Frequency partitions can be created within the ABS and ARS frame. The ABS and ARSs within the sector can be assigned to transmit or be idle within each of the partitions, allowing different levels of reuse to be performed in different partitions. AMSs are assigned to be served in a given frequency partition or partitions based on interference measurements reported by the ARSs in a manner similar to DL and UL FFR as described in section 20.1. An example of frequency partition assignment for the sector with two ARSs is shown in Figure X.

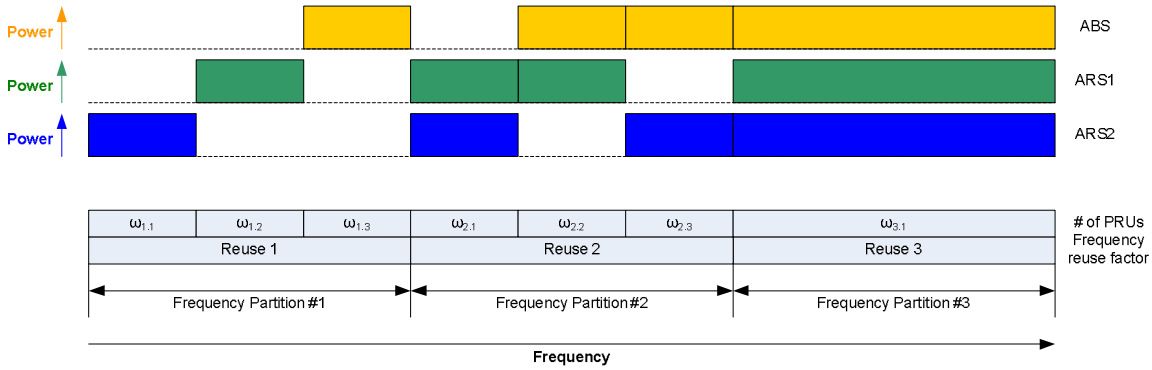

Figure X. Basic Concept of Relay Frequency Reuse

RFR and FFR can be used together by creating FFR partitions and assigning them across sectors and then further partitioning the frequencies assigned to a sector into RFR partitions.

15.4.x.1.2 Interference measurements and signaling support

The interference measurements and signaling support for RFR is the same as for FFR. Interference measurement and signaling support for the DL is described in section 20.1.1.1 and for the UL is described in section 20.1.2.1.