Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	Text proposal for usage of multiple frequencies/carriers to avoid inter-tier interference in hierarchical networks	
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Re:	Call for contributions for the 802.16 PPC	
Abstract	It proposes usage of multiple frequencies/carriers to avoid inter-tier interference in Hierarchical Networks Study Report.	
Purpose	For discussion	
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TEXT PROPOSAL FOR USAGE OF MULTIPLE FREQUENCIES/CARRIERS TO AVOID INTER-TIER INTERFERENCE IN HIERARCHICAL NETWORKS

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Introduction

This contribution suggests usage of distinct frequencies/carriers between wireless back-haul link and access link to avoid inter-tier interference in C802.16ppc-11/0004r1. The proposed text is described in the usage model section.

Proposed text change

Adopt the following remedies in IEEE 802.16ppc-11/0004r1.

---------- The start of text ----------

[Remedy #1: Modify the texts as indicated.]

2 Usage Models

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2.1.1.2.2 Multiple Carriers Case

Large cells, such as macrocells, and small cells, such as femto or pico cells, can be deployed over the distinct set of carriers to avoid inter-tier interference. Large cells and small cells can also be deployed over the same set of carriers or having carriers overlapped, where resource (carrier, power, time, space, etc.) allocation can be made, to avoid or mitigate the inter-tier interference. With good design of resource allocation, the coverage hole problem caused by the small cell to the non-member mobile station can be solved. For cells of the same tier, resource (carrier, power, time, space, etc.) allocation can also be made in order to better manage intra-tier interference.

One particular scenario is a deployment of multi-carrier cells. For example, a Carrier Aggregation (CA) method can be used, where the carriers can be aggregated to cover a larger band, and by doing so the system can have more resources and more flexibility to properly allocate the resources. IEEE 802.16m has provided support for multi-carrier cells, however, the main focus ~~there~~ is in addressing macrocells while multi-tier networks ~~is~~are not in focus. With multi-tier deployment, multi-carrier technologies need to be revisited, so that the design can be

taking into account the multi-tier networks with large cells overlaying small cells, especially addressing resource allocation for interference and mobility management. For example, to support co-existing picocells and femtocells, there is a need to further study the advanced design of multi-carrier systems in combination with SON algorithms. In order to avoid inter-tier interference, separate frequencies/carriers can be assigned for the link between the macro BS and the small BS (backhaul link), and the link between the small BS and the user (access link).

In distinct frequency/carrier multi-tier deployments, the carrier management schemes among tiers may be applied. For example, base stations of multi-tiers may use respectively different carriers among multi-carriers based on the measurement of interference from other base stations. Or the different region of time/frequency resource in multi-carriers is allocated to DL/UL control channels of each base station for robust transmission of control channels, respectively.

As mentioned in both single carrier and multi-carrier cases, an advanced interference mitigation scheme needs to achieve cell throughput enhancement. For example, the interference by the signal of CSG femto is critical to devices in macro cell. The efficient spectrum reuse is considered to avoid the interference among tiers. And the interference cancellation/ mitigation techniques of transmitter/receiver such as enhanced MIMO scheme (PMI coordination, etc) or the signaling/ feedback methods between base station of infrastructure tiers and/or devices can be considered. The techniques and methods are not fully addressed by the IEEE 802.16m standard.
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