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Re:	Change request to Project 802.16m System Description Document (SDD) (IEEE 802.16m-08/003r7)	
Abstract	This contribution provides text addition to SDD to facilitate Restrict Connection between Non-CSG Users and Femtocell Base station in IEEE 802.16m	
Purpose	For discussion and approval by IEEE 802.16m TG	
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Restrict Connection between Non-CSG Users and Femtocell Basestation in IEEE 802.16m

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1. Introduction

Femtocell is a new concept that allows users to install their small base station in indoor environment using licensed spectrum. It connects to wireless networks by broadband connection such as ADSL or FTH. This technology not only can increase the throughputs but also can reduce the cost of building a radio network due to reducing the number of required macrocell base station and the throughput requirements of each macrocell base station. On the other hand, the owner of femtocell base station may want to restrict access to his femtocell since he pays the expense of maintenance and the broadband connection to his premises. A closed subscriber group (CSG) femtocell base station is defined in 802.16m SDD and it is accessible only to MSs which are members of this base station except for emergency services. In this case, the users, who are within the coverage of a femtocell base station but are not members of this femtocell, will suffer and/or cause strong interference from and/or to the femtocell base station.

In this contribution, a restrict access to femtocell BS for non-CSG users is presented to reduce downlink interference to the MSs and uplink interference to femtocell base station when an non-CSG MS is in the coverage area of a femtocell.

2. Problem Statement

In IEEE 802.16m-08/003r7, the femtocell basestation are classified as CSG femtocell BS and OSG femtocell BS. When a non-CSG MSs is in the coverage of a femtocell BS, it may not keep good connection with its own macrocell base station/ femtocell base station and also may degrade the performance of the femtocell. In the downlink, the femtocell BS will cause strong interference to non-CSG MSs and for the uplink the non-CSG MSs may cause interference to the femtocell BS.

Exchanging information between femtocell BS and non-CSG MSs may help to reduce such kind of interference and thus improve the performance for both non-CSG MSs and the femtocell BS.

3. Restrict Connection between non-CSG Users and Femtocell BS

Our proposals are as follows:

The CSG femtocell BS shall maintain two lists:

- One is the member list, which includes the ID of all its members and the status of each member;

- The other is the non-member list, which includes any active MS within its coverage area but is not the member of this femtocell;

When one MS is in the coverage area of a femtocell, it can register itself to this femtocell as a non-member or member according to its access right and status. One MS may be included in the non-member lists of several femtocells base stations.

The MSs in the non-member list have restricted access to the related femtocell base station. The non-member MS should only be included in a non-member lists of femtocell BSs when non-member MS CINR and/or SINR of received signals from its serving BS is lower than the minimum requirements according to its QoS or non-member MS loses connection with its serving BS. The MSs can send or/and receive signaling information with the femtocell base station via this restricted connection, which cannot be used to transmit or receive traffic data. The signaling information may include channel state information, spectrum resource the MSs used, the power level of received interference, etc.

The femtocell base station can use various interference mitigation techniques to reduce the interference to the non-CSG MS based on the signaling information provided by non-CSG MSs. These technologies may include beamforming, power control, spectrum avoidance, and etc. The femtocell BS can use interference mitigation techniques to reduce the downlink interference to the non-member MSs and uplink interference to the femtocell BS based on the signaling information provided by non-member MSs. The femtocell base station may also inform the macrocell/other femtocell base stations and/or non-member MS base station about its unused resources, thus the unused resource can be allocated to non-member MSs. The femtocell may also negotiate with macrocell/femtocell base station of the non-member MS about the allocation of resources to optimise the overall network performance.

When the non-member MS becomes inactive or leave the coverage area of the femtocell base station, the femtocell base station shall remove it from the non-member list.

Modify the following text into the “Support for Femtocell” clause (IEEE 802.16m-08/003r7):

----- Proposed text -----

17 Support for Femtocell

17.1 Types of Base stations

A Femtocell BS is a BS with low transmit power, typically installed by a subscriber in home or SOHO to provide the access to closed or open group of users as configured by the subscriber and/or the access provider. A Femtocell BS is connected to the service provider's network via broadband (such as DSL, or cable).

Femtocell BSs typically operate in licensed spectrum and may use the same or different frequency as macrocells. Their coverage may overlap with macro BS.

A Femtocell BS may belong to one of the following types.

- CSG (Closed Subscriber Group) Femtocell BS: A CSG Femtocell BS is accessible only to the MSs, which are member of the CSG, except for emergency services. MSs, which are not the members of the CSG, ~~should not try to access CSG Femtocell BSs.~~ may have restricted access to CSG Femtocell BS and this restricted connection can be use to send and/or receive signaling information for interference mitigation purpose. The CSG Femtocell BS may maintain a member list and a non-member list including active non-member MSs. The non-member MS should only be included in a non-member lists of femtocell BSs when non-member MS CINR and/or SINR of received signals from its serving BS is lower than the minimum requirements according to its QoS or non-member MS loses connection with its serving BS. The member of the CSG can be modified by the service level agreement between the subscriber and the access provider.