Project	**IEEE 802.16 Broadband Wireless Access Working Group**
Title	**CR on SDD Chapter 15: Restrict Connection between Non-CSG-Closed Users and Femtocell Basestation in IEEE 802.16m**
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Re:	Category: SDD comments / Area: Chapter 15 (Femtocell) "Comments on SDD 15 Femtocell"

Abstract	This contribution is a high level proposal for the definition of femtocell subscriber type CSG-Closed in IEEE 802.16m

Purpose	To discuss and adopt the proposed text in the next revision of the 802.16m SDD.

Restrict Connection between Non-CSG Users and Femtocell Basestation in IEEE 802.16m

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1. Introduction

Femtocell 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-Closed 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-Closed MS is in the coverage area of a femtocell.

2. Problem Statement

In IEEE 802.16m-08/003r9a, subscriber types are categorised into CSG-Closed, CSG-Open and OSG .
When a non-CSG-Closed MS enters an area, which is covered only by one/several CSG-Closed Femtocell BSs, its communication with its macrocell BS may be severely interfered, or even totally interrupted. It against the general principle that the deployment of a femtocell should cause as less interference to the overlapping macrocell as possible. However, according to the current definition of CSG-Closed, this problem can not be solved.

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-Closed 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 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-Closed MS based on the signaling information provided by non-CSG-Closed 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.

*Insert the following text into the "Support for Femtocell" clause (*IEEE 802.16m-08/003r9a*):*

-- Proposed text ---

15 Support for Femtocell BS

15.2 Types of Base stations

A femtocell BS may belong to one of the following subscriber types.

- **CSG-Closed Femtocell BS: The data service of A~~a~~ CSG-Closed Femtocell BS is accessible only to the MSs, which are in its CSG, except for emergency services. MSs which are not the members of the CSG, should not try to access CSG-Closed Femtocell BSs for data service.**