

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >
Title	<b>CR on SDD Section 17: Facilitating Entry of New Femto BS into the Network</b>
Date Submitted	<b>2009-02-24</b>
Source(s)	Karthik Sundaresan, Sampath Rangarajan, <a href="mailto:karthiks@nec-labs.com">karthiks@nec-labs.com</a> Linghang Fan, Nader Zein, Tetsu Ikeda, Andreas Maeder, Amir Khojastepour, Mohammad Madihian NEC
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 entry of a new femto BS into the network.
Purpose	For discussion and approval by IEEE 802.16m TG
Notice	<i>This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.</i>
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: < <a href="http://standards.ieee.org/guides/bylaws/sect6-7.html#6">http://standards.ieee.org/guides/bylaws/sect6-7.html#6</a> > and < <a href="http://standards.ieee.org/guides/opman/sect6.html#6.3">http://standards.ieee.org/guides/opman/sect6.html#6.3</a> >. Further information is located at < <a href="http://standards.ieee.org/board/pat/pat-material.html">http://standards.ieee.org/board/pat/pat-material.html</a> > and < <a href="http://standards.ieee.org/board/pat">http://standards.ieee.org/board/pat</a> >.

# Facilitating Entry of New Femto BS into the Network

*Karthik Sundaresan, Sampath Rangaraja, Linghang Fan*

*NEC*

## Resource Allocation on Entry of a New Femto BS

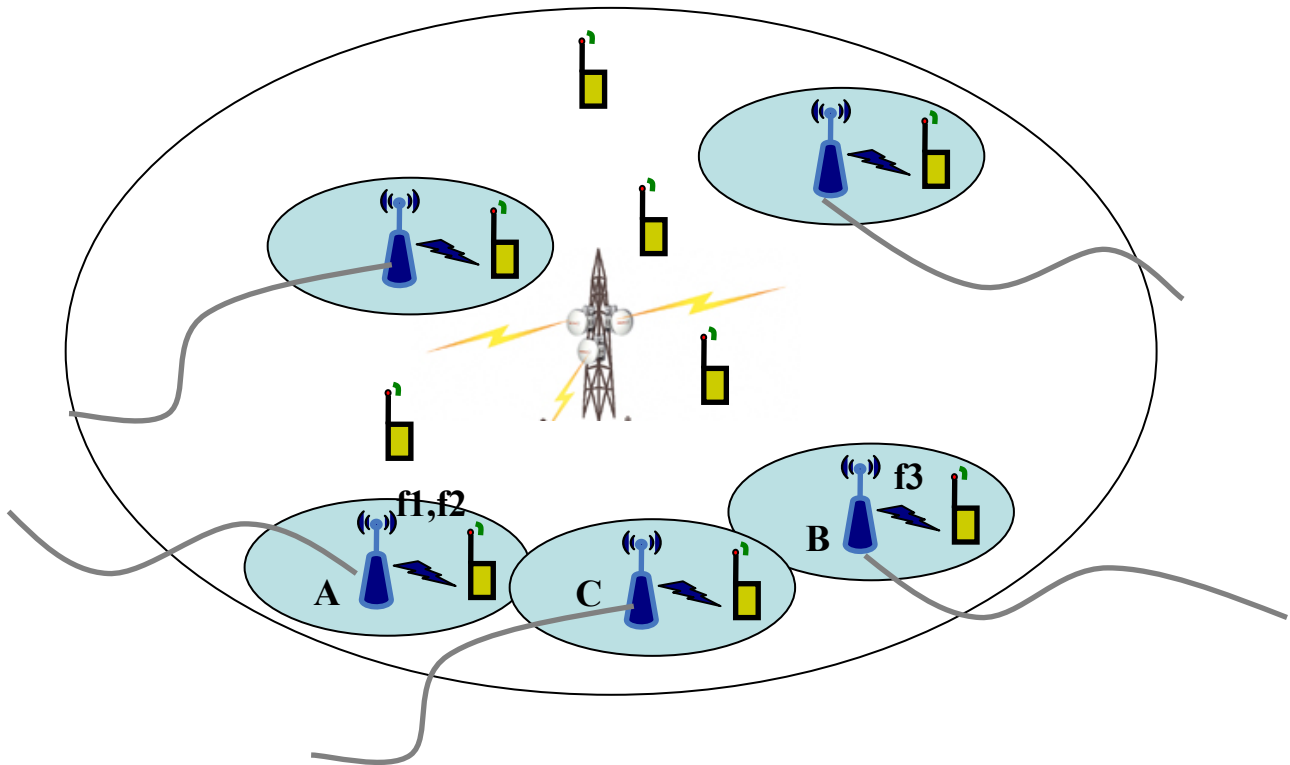


Figure 1. Femto/Macro Network Illustration.

It is often possible that the macro BS may not be able to coordinate resource allocation among femto cells and the femto BS have to autonomously determine their resource region. This is especially likely in moderate to high load scenarios. The SDD currently specifies that a femto BS will measure power on all carriers from neighboring femto/micro/macro BS and accordingly choose a carrier perceived to have low interference. However, in moderate to high load scenarios, where the available resources are being utilized by existing femto BS, a new femto BS entering the network is likely to see high interference on all available resources from its neighboring femto/micro cells. This could potentially result in starvation of the new femto cell being deployed in the network. For eg., consider the scenario shown in Figure 1, where there are three carriers/channels available in the network:  $f_1, f_2$  and  $f_3$ . Femto BS A and B have already been deployed and split the resources as say  $f_1, f_2$  for A and  $f_3$  for B. Now when the femto BS C gets deployed, it finds strong interference on all the available carriers from its neighbors. This leads to starvation of the newly deployed femto BS C and its associated clients.

This problem is exacerbated in cases, where there is no coordination of resources (to be used by the femto BS) by the macro BS and the femto BS have to autonomously determine their resource region of operation.

To address this starvation problem, it is essential for the femto BS to have the notion of “resource readjustment”. This essentially means that mechanisms for (centralized/distributed) resource allocation should be executed by the femto/macro BS either periodically or based on triggers (eg. entry of new femto BS), which would allow for resources to be shared fairly taking into account the change in network and load dynamics. In the above example, a periodic resource allocation mechanism would trigger the three femto BS to enter into a resource re-allocation phase, whereby the three frequencies would get shared as  $f_1$  for A,  $f_2$  for C and  $f_3$  for B respectively.

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

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

### **17.8 Interference Avoidance and Interference Mitigation**

It is possible that when a new femto BS is initially deployed, all channels (carriers) could be occupied by neighboring femto/micro BS. In such scenarios, the new femto BS will see high interference level on all channels, resulting in its consequent starvation. To avoid such scenarios, which are common in moderate-high load conditions, mechanisms (centralized/distributed) for resource allocation at the femto/micro BS should be enabled either periodically or based on network triggers.

+++++