

# Femto 802.16m Base Stations

## IEEE 802.16 Presentation Submission Template (Rev. 9)

Document Number:

IEEE C802.16m-08/400 , Femto 802.16m Base Stations

Date Submitted:

2008-05-12

Source: Pantelis Monogioudis,

+1 973 386 4804

Alcatel-Lucent

E-mail: {monogiou}@alcatel-lucent.com

\*<<http://standards.ieee.org/faqs/affiliationFAQ.html>>

Venue:

Base Contribution:

IEEE C802.16m-08/400, Femto 802.16m Base Stations

Purpose:

Input to 802.16m SDD. To drive standardization and the introduction of femto base stations in 802.16m.

Notice:

*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.*

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:

<<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <<http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

Further information is located at <<http://standards.ieee.org/board/pat/pat-material.html>> and <<http://standards.ieee.org/board/pat>>

## Cell Sniffing Issue

As for any cellular network, interferences limit the coverage.

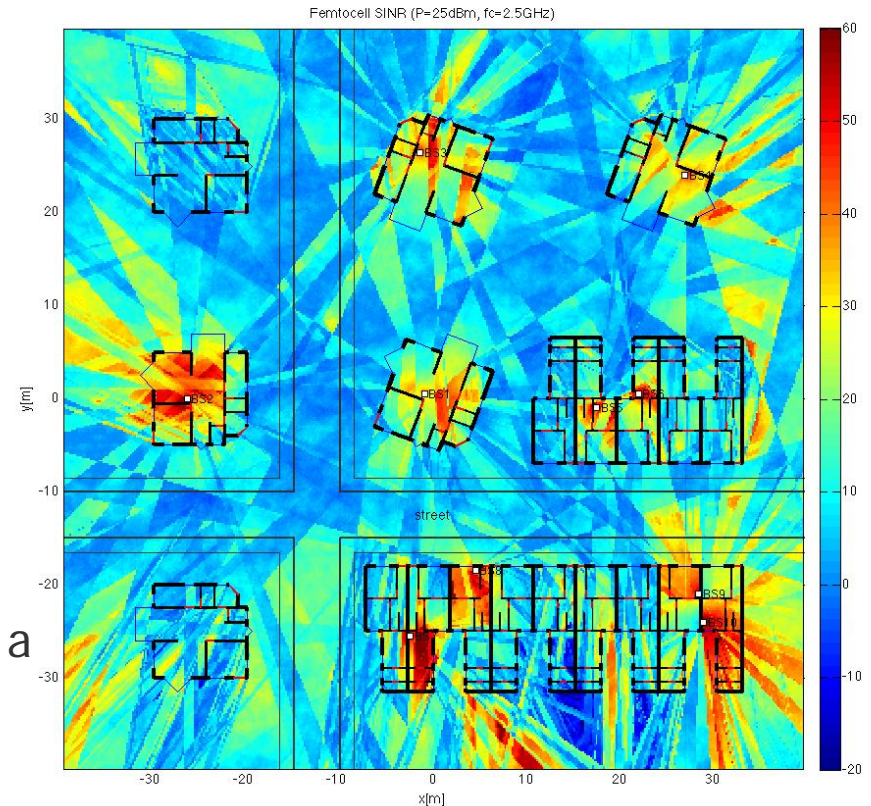
Optimal management of Macro/Femto interferences and Femto/Femto interferences imply dynamic configuration mechanisms.

- Automatic frequency selection, automatic power setting, automatic segmentation activation

Good auto-configuration implies to have a clear view on the RF environment.

It implies some cell sniffing capabilities.

- Measurements from MS are not enough.
- It is really better to distinguish the signal of each surrounding cell.



## Handover Issue (1/2)

---

Operators can have different usage model for Femto BS: restricted to a Closed User Group or Open Access.

Operators will be willing to implement specific charging plan when a MS is using a Femto BS, in particular the one of the MS' user.

It results in various requirements for Femto BS:

- It must be possible to manage Femto->Macro handover, Macro->Femto handover and Femto->Femto handover.
- MS must be able to stick to a Femto BS even if it gets better signal from other sources.
- It must be possible to refuse handover toward a Femto BS to a MS without any impact on the service.

## Handover Issue (2/2)

---

Various technical issues must be considered when implementing these requirements:

- Macro BS cannot broadcast a list of neighbor cells including hundreds of Femto BS.
- Femto BS could need to know its surrounding cells but there is no way to know very precisely the position of a Femto BS.
- Number of handover attempts must stay reasonable to avoid that signaling load becomes unacceptable or that the rate of loss of service increases.
- It is not possible to require very high frequency synchronization, such as 30 ppb, to optimize handover. 3GPP requirement of 250 ppb for Femto BS is much more reasonable.

## MS-BS Proximity Issue

With a Femto BS, MS and BS can be very near, radio field power received could be higher than limits defined for WiMAX.

- Lab Measurements:

Condition		Result						
BS TX Power	20dBm	Distance	30cm	40cm	50cm	50cm	70cm	70cm
CPE Ant. Direction	0° when face BS	CPE Ant. Direction	0°	270°	0°	90°	0°	180°
BS Ant. gain	2dBi	CINR on CPE Side	15dB	20dB	27dB	32dB	33dB	34dB
UL Traffic	80Kbps(UGS)	RSSI on CPE Side	-13dBm	-13dBm	-13dBm	-14dBm	-15dBm	-17dBm
DL Traffic	1Mbps(BE)	CPE TX Power	-55dBm	-48dBm	-45dBm	-41dBm	-43dBm	-43dBm
CPE TX Power	Controlled by BS	UL Modulation	16QAM3/4	16QAM3/4	16QAM3/4	16QAM3/4	16QAM3/4	16QAM3/4
CPE Ant. gain	2dBi	DL Modulation	QPSK3/4	16QAM3/4	64QAM5/6	64QAM5/6	64QAM5/6	64QAM5/6
Operating Freq.	2.570GHz	UL Packet Loss	60%	2%	4%	0%	2%	0%
CPE Type	MAX-200M1(Indoor CPE)	DL Packet Loss	2%	0%	0%	0%	0%	0%

For WiFi, limit supported by MS is -20 dBm. It would be interesting to have the same one (or higher) on WiMAX terminals.

In the same way, supported signal for Femto BS should be increased.

Ability to support power control on BS should be studied.

## Near-Far MS Issue

---

Some MS can be very near of Femto BS and some other quite far away

- A MS can be 30 cm away of Femto BS that must support then high power field
- Attenuation in indoor environment can be quite brutal, sensitivity of Femto BS should stay good

Consequently, requirement on Rx Power Range is very high, more than 50 dB, too much for a low cost equipment as Femto BS. It would be necessary to use different Rx gains for different MS.

- How can it be done ?
- How can the initial connection be managed ?

On Tx, high power needed for far away MS could dazzle near MS. It could be necessary to use different Tx power for different MS.

- How can it be done ?
- How can the initial connection be managed ?

## Paging Issue

---

Paging must be supported by Femto BS to avoid unacceptable consequences on MS' power consumption and on signaling load from inactive MS.

But there are two serious issues:

- Impossible to put thousands of Femto BS in a paging group, else the signaling load will become too high.
- Impossible to support millions of paging group because Paging Group ID is 16 bits

Paging mechanism must be modified to support correctly Femto BS.

[www.alcatel-lucent.com](http://www.alcatel-lucent.com)

