

# IEEE 802.16m support for femto-cell

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Venue: Re: “Support for Femtocells”. IEEE 802.16m-08/040 Call for Comments and Contributions on Project 802.16m System Description Document (SDD) for Session 58.

Base Contribution:

Purpose: Discussion and approval of the proposal into the IEEE 802.16m System Description Document

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

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# Problems to solve in this contribution

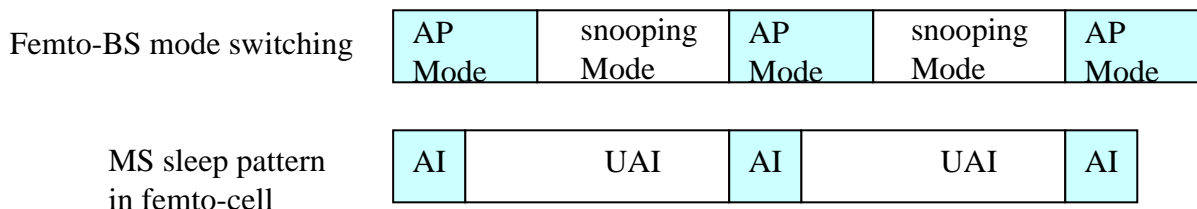
- Femto-BS synchronization
  - No GPS
  - Packet-switched backbone, no IEEE1588
- Mobility management for HO into Femto-cell
  - Too much overhead to include femto-BS in NBR-ADV
  - Topology acquisition may cause unnecessary scanning

# Synchronization in two cases of deployment

- Femto-BS has overlay coverage with macro-BS
  - Femto-BS can hear macro-BS
  - **Snooping method** for femto-BS automatically synchronize with macro-BS
- Femto-BS does not have overlay coverage with macro-BS
  - Femto-BS can not hear macro-BS
  - **MS-assisted method** for femto-BS to synchronize with macro-BS

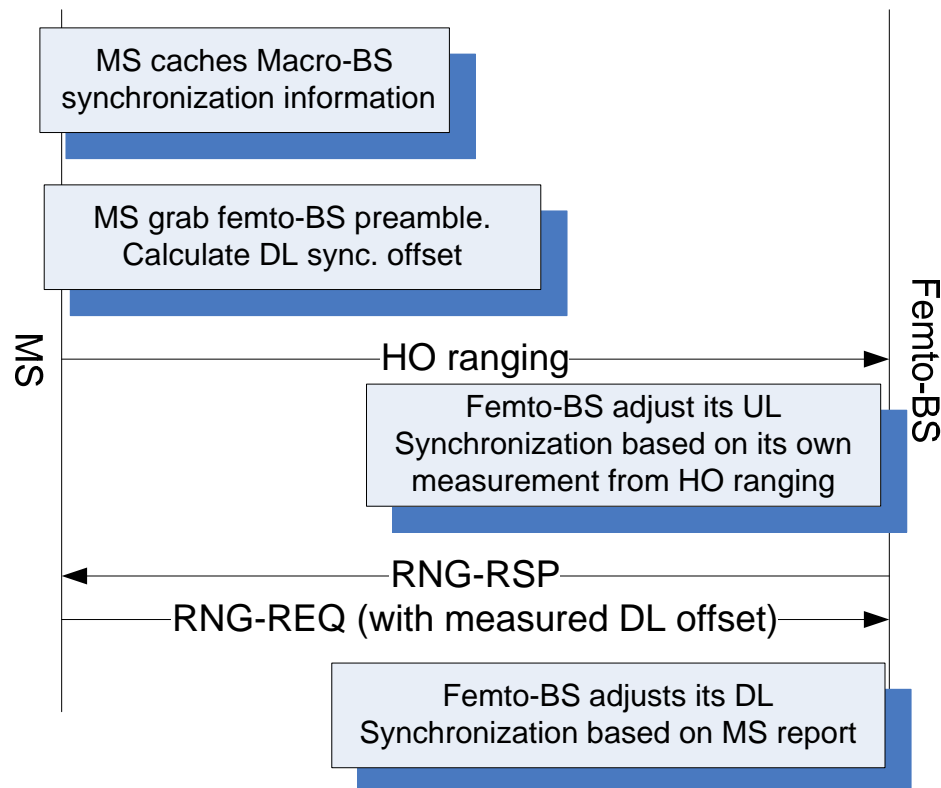
# Snooping method

- Femto-BS operate in two modes
  - Regular access point (AP) mode for femto-cell
  - Snooping the macro-BS (periodic but infrequent)
- During the snooping mode
  - Achieve self-synchronization with the macro-BS by listening to macro-BS preamble
  - Transparent to MS in femto-cell with sleep cycle alignment



# MS-assisted method

- MS has reasonable synchronization with macro-BS before HO
- MS measures the DL/UL offset of femto-BS during network entry
- Femto-BS adjusts its DL/UL synchronization based on MS report



# HO Procedure for Femtocell

- Topology acquisition → femto-cell enhancements

- HO decision and initialization
- Synchronization to target BS downlink
- Ranging
- Termination of MS context
- HO cancellation



No Change

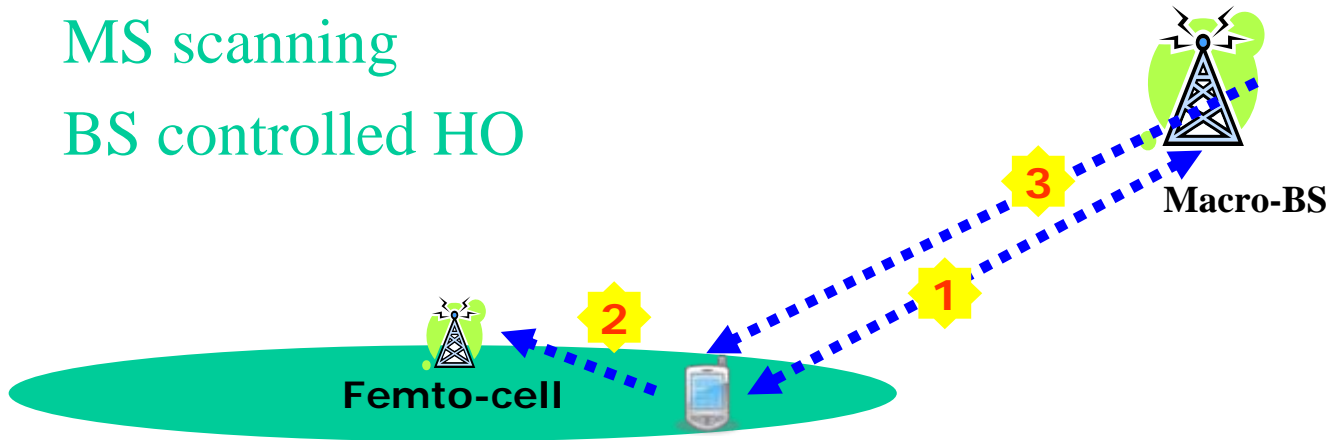
# Topology Acquisition for Femto-cell

## Macro-to-Femto HO

- Macro-cell BS should not broadcast femto-BS information
- Macro-cell BS may unicast femto-BSs to a particular MS, and MS may send unicast request to BS
  - Macro-BS/MS initiated
  - Femto-BS & Macro-BS collaboratively initiated
- To be efficient trigger for such actions: location (proximity)

# Location/Proximity based

1. MS sends request (MOB\_NBR-REQ) to BS, and then BS sends response to MS for the requested femtocell information. Alternatively, BS sends unsolicited response (MOB\_NBR-RSP) to notify MS the femtocell information.
2. MS scanning
3. BS controlled HO



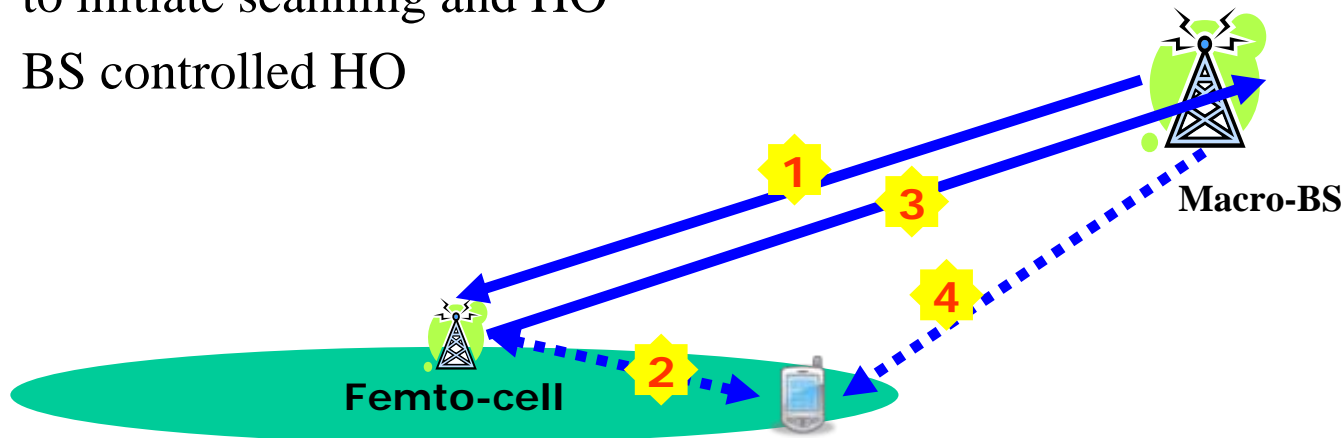
\* step-1 is location/proximity based, as it may happen if

- MS just enters the macro-BS
- MS location is known to macro-BS via GPS and MS enters femto-coverage
- MS is detected by femto-BS (next slide)



# Macro-femto Cell Collaborative HO

1. Macro-BS notifies femto-BS that MS is in range; transfer proper MAC context; obtain femto-BS snooping pattern.
2. Femto-cell-BS starts monitoring DL control channel and UL transmissions (no security layer involved). *Enabled by snooping of femto-BS mentioned earlier.*
3. Femto-cell-BS detects MS transmissions in the neighborhood, informs BS to initiate scanning and HO
4. BS controlled HO



# SDD text proposal

[insert the following text in IEEE 802.16m-08/003r5 Section 17]

-----SDD text starts-----

## 17.x synchronization of femtocell BS

Femto-BS may use different schemes to achieve synchronization with the network to handle various deployment scenario. Femto-BS may snoop the macro-BS's PSCH to automatically adjust its DL synchronization. Femto-BS may achieve DL/UL synchronization with networking by using the measurement report from a MS.

## 17.x Mobility management in femtocell

Macro-BS may not broadcast neighboring femto-BS system configurations to reduce overhead. To avoid unnecessary scanning and network entry attempts, the macro-BS may unicast femto-BS system configuration and initiate subsequent scanning/HO based on the proximity of MS to the femto-BS. The method of determining proximity is FFS.

-----SDD text ends-----