

## Considerations on DL power control in closed user group femtocell BS

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Venue:

IEEE 802.16m-08/040“Call for Contributions on Project 802.16m System Description Document (SDD)”, in response to the following topics: “TGm SDD: Femtocells”, MAC related

Base Contribution:

N/A

Purpose:

to be discussed and adopted by TGm for the 802.16m SDD

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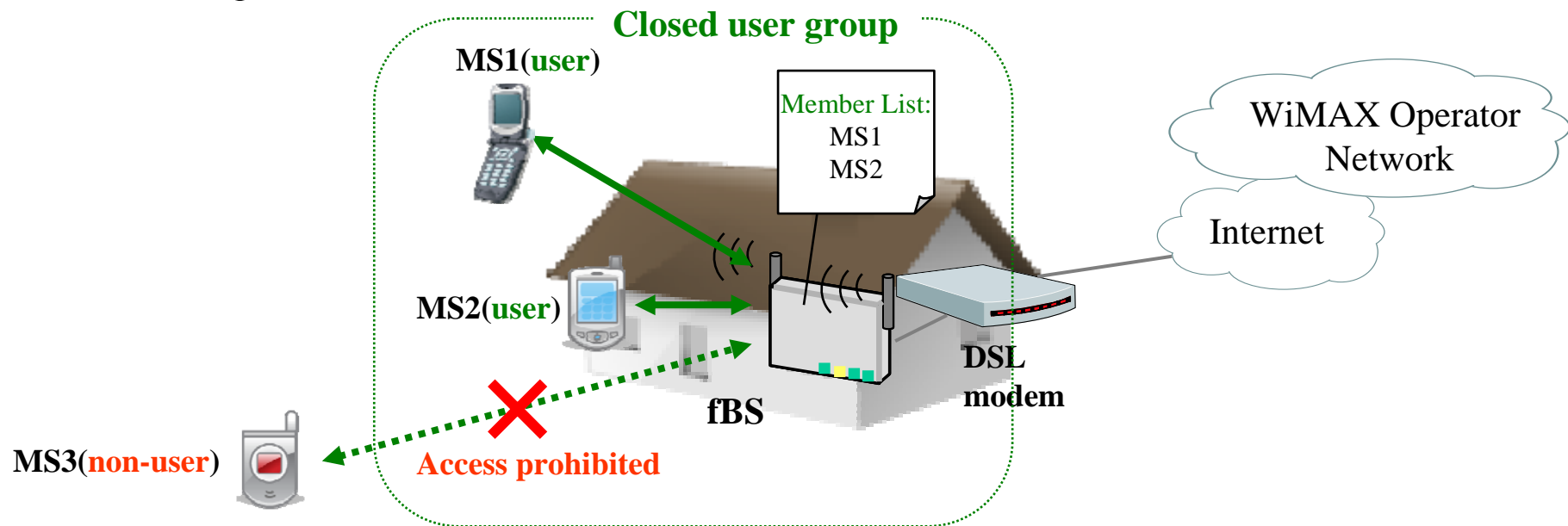
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# Closed user group Femtocell BS

- SRD specifies requirements for a femtocell BS (fBS) to provide access to closed user group (CUG).
  - 9.5 Support for Femtocells
    - “A Femtocell is a low power BS, typically installed by a subscriber in his/her home or SOHO to provide access to closed or open group of users as configured by the subscriber and/or the access provider.”
- In CUG operation, the CUG members shall be managed by fBS.
  - In such case, non-user MS (both 16m and legacy) may perform NW entry to the target fBS but the access is denied.

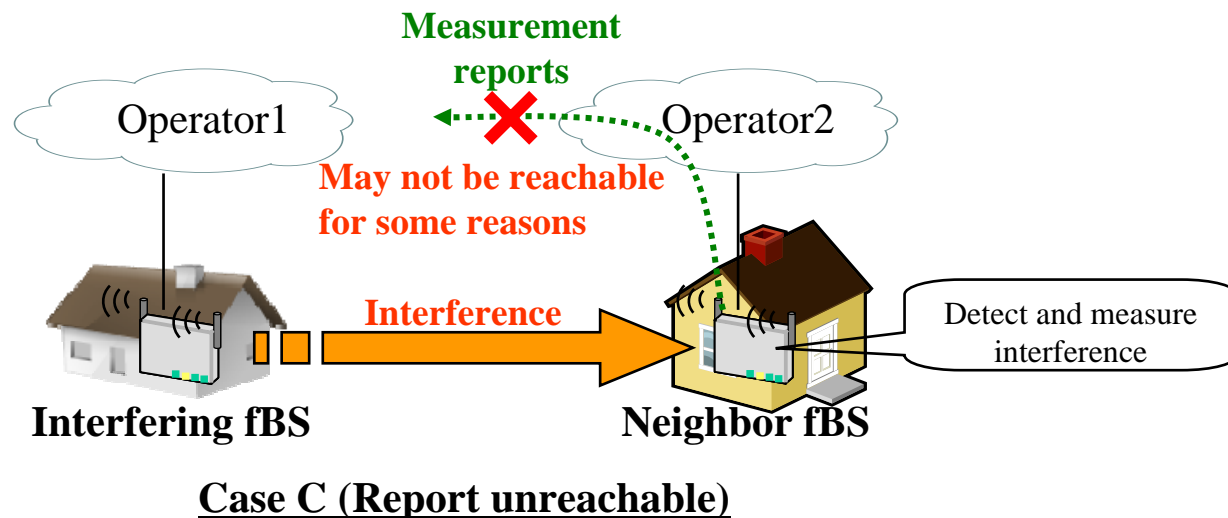
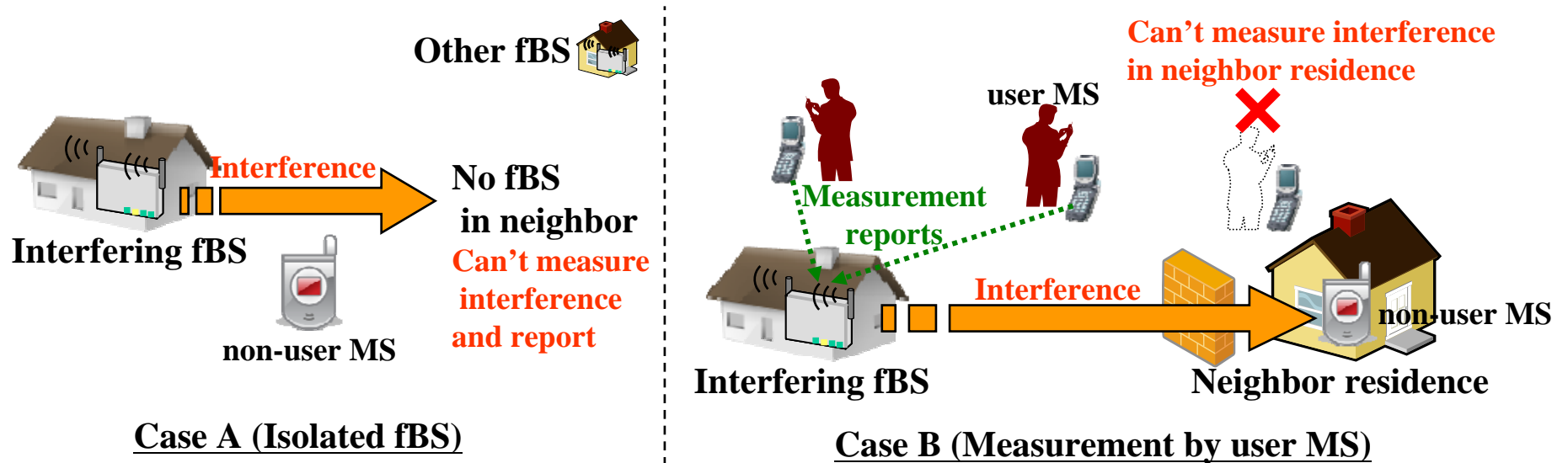


# Interference mitigation for CUG fBS(1)

- fBS is a low power BS, however, the radio signals will cover more than the user's residence. (specially in the dense deployment case)
  - The interference degrades performance and causes undesirable NW entry from non-user MS.
- SRD specifies requirement for interference detection and mitigation.
  - 9.5 Support for Femtocells
    - “The air interface should support over the air measurements by BS or MS for interference detection and mitigation between femto-cell and microcells or among femtocells.”
- In some situations, over the air measurements and the related reports may not be available or they might not be practical. (See next slide)
  - A. The interfering fBS is isolated, none of neighbor fBS can measure, or the impact upon the neighbor fBS is negligible.
  - B. The interfering fBS performs its user MS measurement. The user MS would need to execute measurements inside the interfering fBS coverage, which may no be possible (e.g. inside the neighbor's property).
  - C. Neighbor fBS can measure interference, but for some reasons (ex. different operators), the interfering fBS may not be able to obtain measurement report.

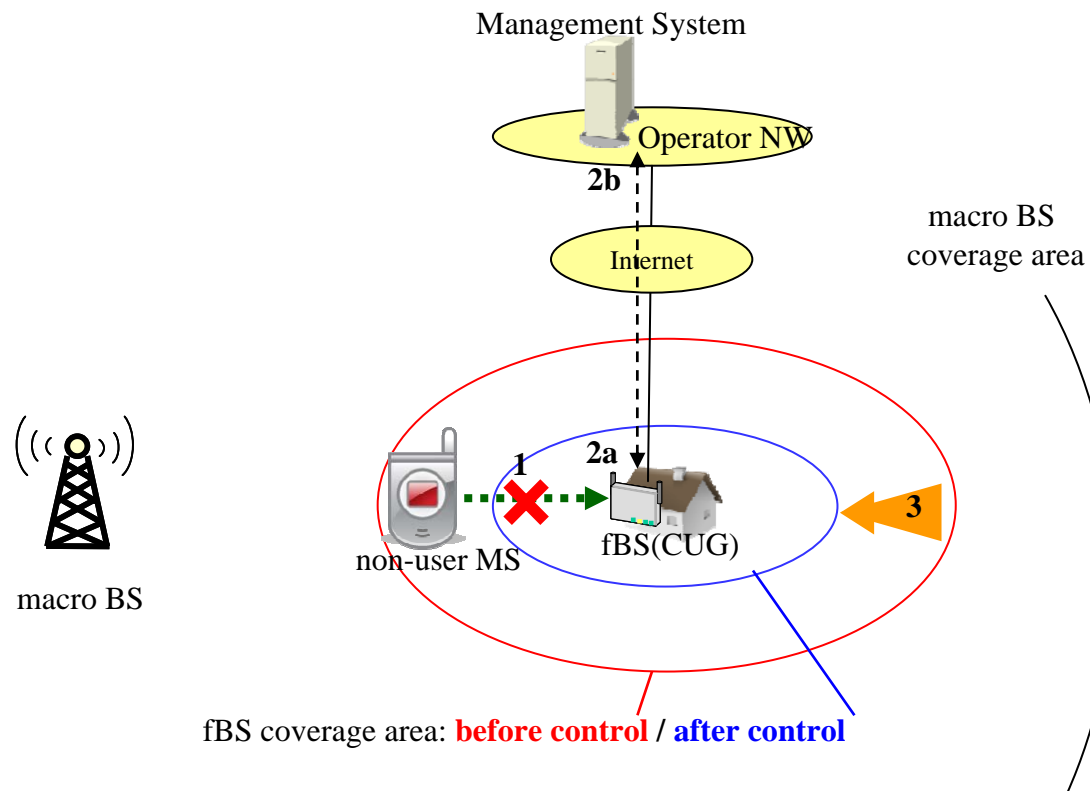
# Interference mitigation for CUG fBS(2)

- Possible cases for over the air measurements:



# DL power control in CUG fBS(1)

- In addition to a typical interference mitigation using over the air measurements, DL power control in fBS should also support complementary interference mitigation without over the air measurements.
- Based on the statistics of NW entry denials from non-user MS, fBS recognizes itself as an interfering source and adjust DL Tx power.



# DL power control in CUG fBS(2)

Example of DL power control procedure (previous slide):

- step1

When fBS DL transmission power is strong, some non-user of CUG attempts network entry, but it's denied.

- step2

The fBS counts such a denial and calculates the frequency of repetitious denial (ex. x times/hour, y times/day). If the frequency exceeds a threshold, the fBS recognizes itself as an interfering source. Then it performs either step2a or 2b:

- step2a

The fBS determines a new DL transmission power (lower) autonomously.

- step2b

The fBS reports to management system (ex. Num/frequency of denials). Network operator determines optimal DL transmission power, then instructs it to the fBS.

- step3

The fBS changes its DL transmission power. The coverage area of the fBS becomes smaller. After that, non-user of closed group will select macro BS.

- After step3, when DL transmission power is still strong, step 1-3 may happen repeatedly.
- And when DL transmission power becomes too weak, RSSI or CINR of its own CUG MS may become worse inside the residence. Then, the fBS will increase DL transmission power slightly the coverage for its own CUG MS autonomously or under the network SON.
- By repetition of these up and down, DL transmission power will converge to an optimal level.

# Proposed Text

*[Insert the following new subclause to the section 17 (Support for Femtocell)]*

----- Start of the Text -----

## 17 Support for femtocell

### 17.x Transmission power control in femtocell

Femtocell BS supporting closed user group shall deny network entry to the MS users not subscribed to the closed group, calculates the frequency of such denials, and may report it further to the network. In order to prevent an increased number of undesirable network entry procedures and thus an increased interference upon the neighboring femtocell BS, based on the frequency of the network entry denials, the femtocell BS shall change transmission power autonomously or under the network management system.

----- End of the Text -----