Exploiting Femtocellular Networks for Emergency Telemedicine Applications in Multiple Dwelling Units

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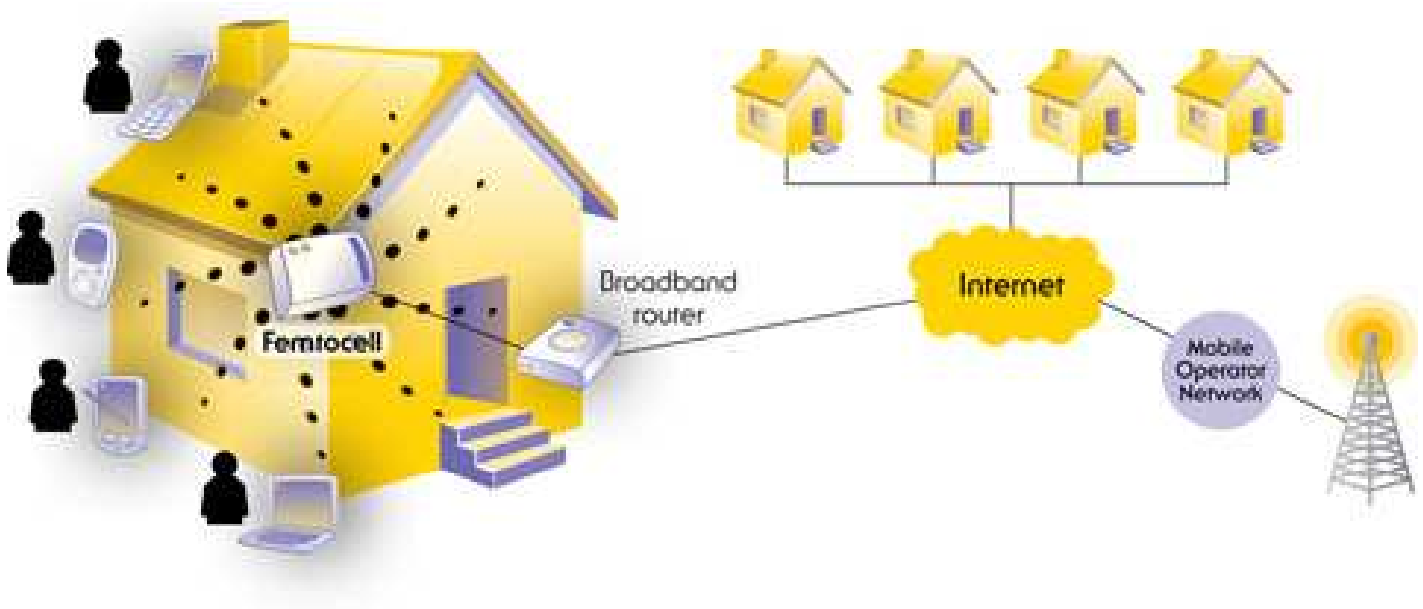
What is femtocell?

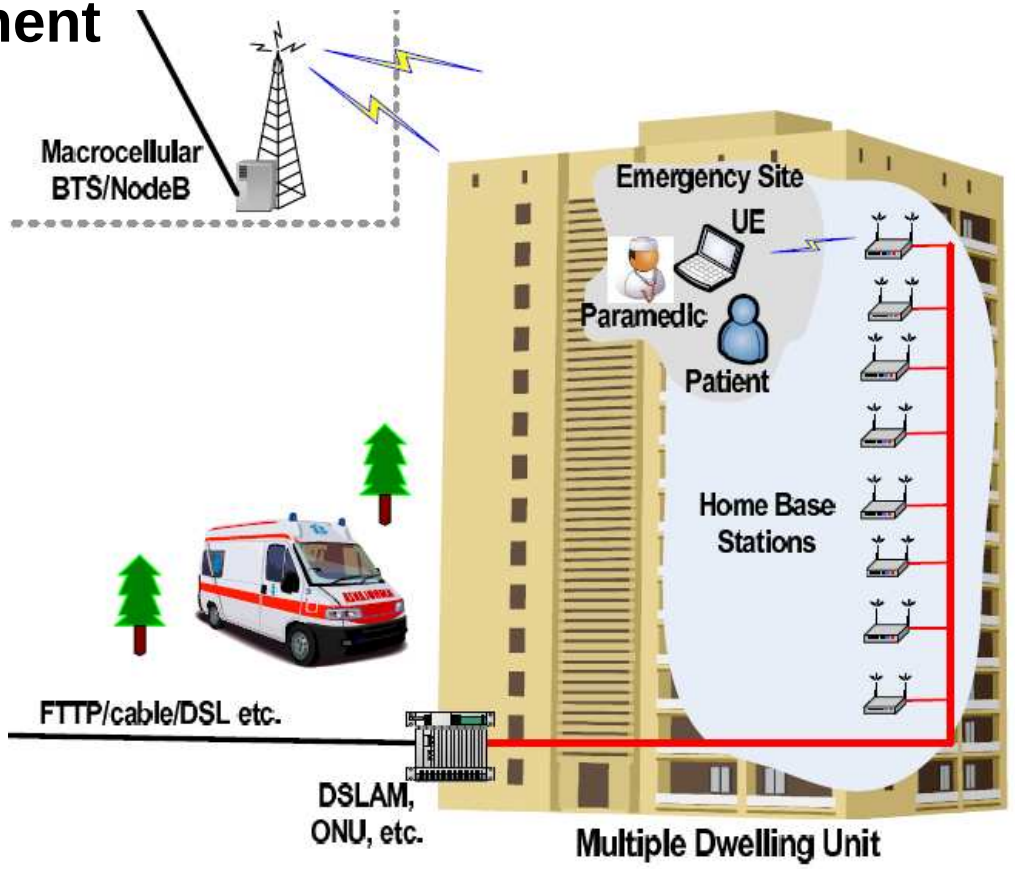
- **Low manufacturing cost, short radio coverage home base station with 3G radio capability**
- **Radio traffic is backhauled by premise broadband connection to mobile network**
- **Current 3GPP standardization admits a Close Subscriber Group (CSG) configuration**
- **Improved indoor coverage with reduced CAPEX and OPEX**



Scenario description

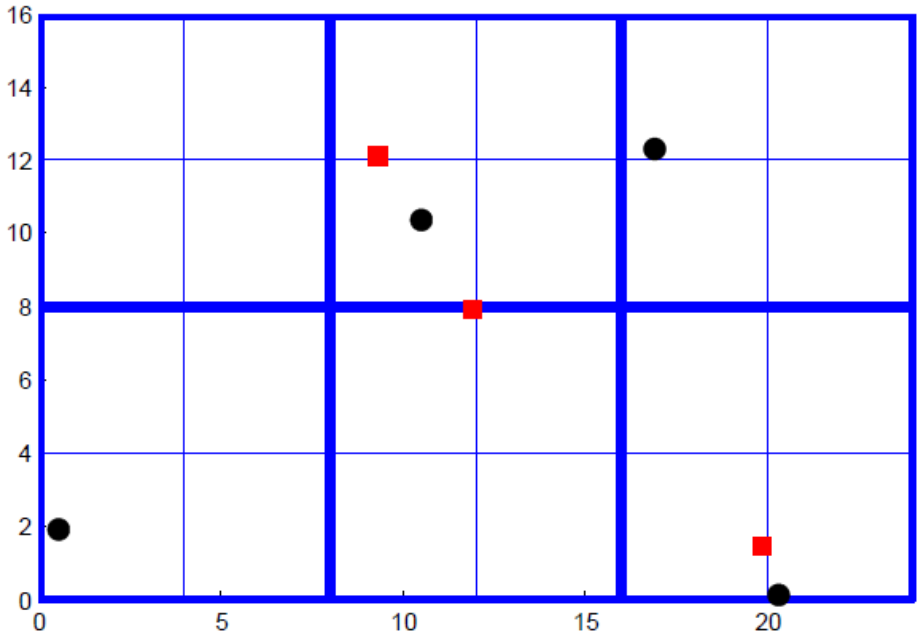
- **Emergency teletrauma service delivered by 3G femtocell from patient apartment**
- **Offer on-site personnel with videoconferencing and other rich multimedia medical data transfer to remote surgeon, receiving hospital etc.**
- **Mobile equipment uses nearby femtocell base station either in own apartment or in neighboring apartment**

Medium	Application	Degree of symmetry	Data rate
Video	Videophone	Two-way	32-384 kbps
Data	Still image	Primarily one-way	
Data	Bulk data transfer	Primarily one-way	< 384 kbps



Building structure: multiple dwelling units

- **Regular grid-layout structure. Each apartment/house has same room layout.**
- **The number of femto base stations follows market statistics-femtocell penetration ratio**
- **System level simulations are repeated for high-rise apartment block building and terraced houses**



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Simulation result - high-rise building

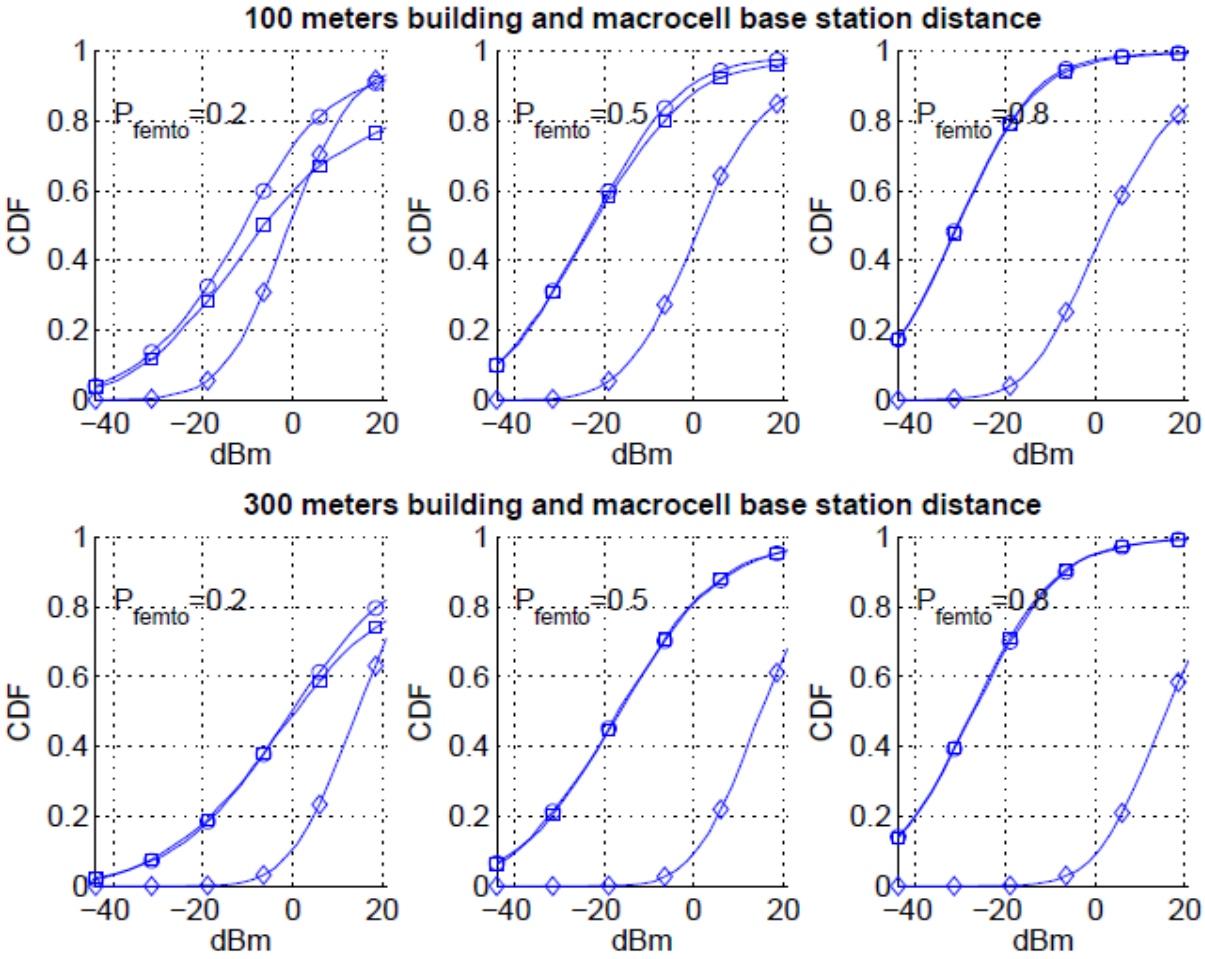

Fig. 5. CDFs of EUE transmission power in multi-floor apartment block. Line with circle denotes both MBS and HBSs are granted access to EUE. Line with square denotes only HBSs access. Line with diamond denotes only MBS access

Simulation result - terraced house

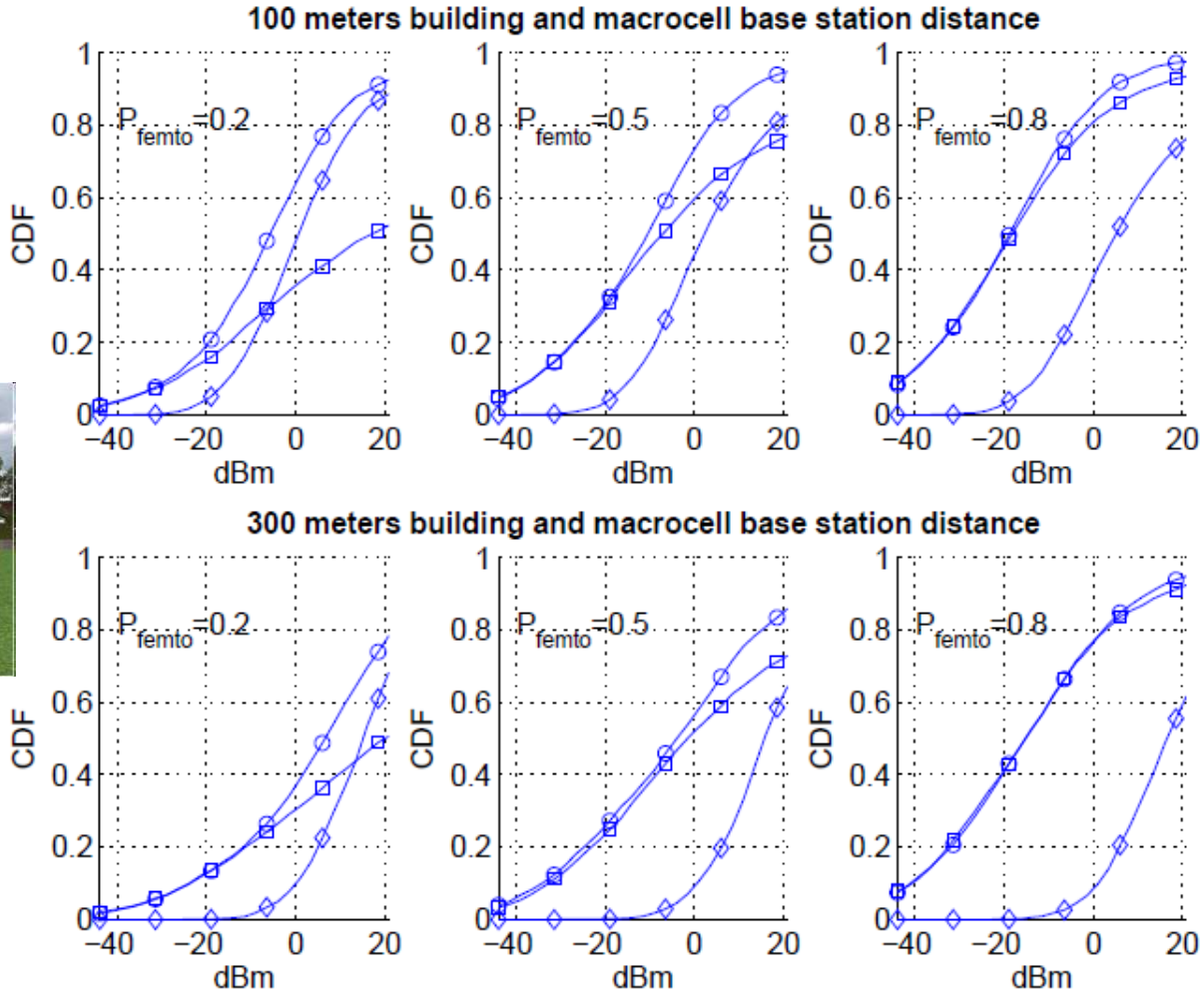

Fig. 6. CDFs of EUE transmission power in terraced houses. Line with circle denotes both MBS and HBSs are granted access to EUE. Line with square denotes only HBSs access. Line with diamond denotes only MBS access.

Conclusion

- **With a certain level of femtocell penetration ratio, the service can be delivered with sufficient low outage rate**
- **At least an order of magnitude reduction in service outage rates when femtocells are utilized, in the comparison to the macrocellular case**
- **A detached house case study will be included. And the service performance gain in downlink direction (e.g. HSDPA) will be studied.**

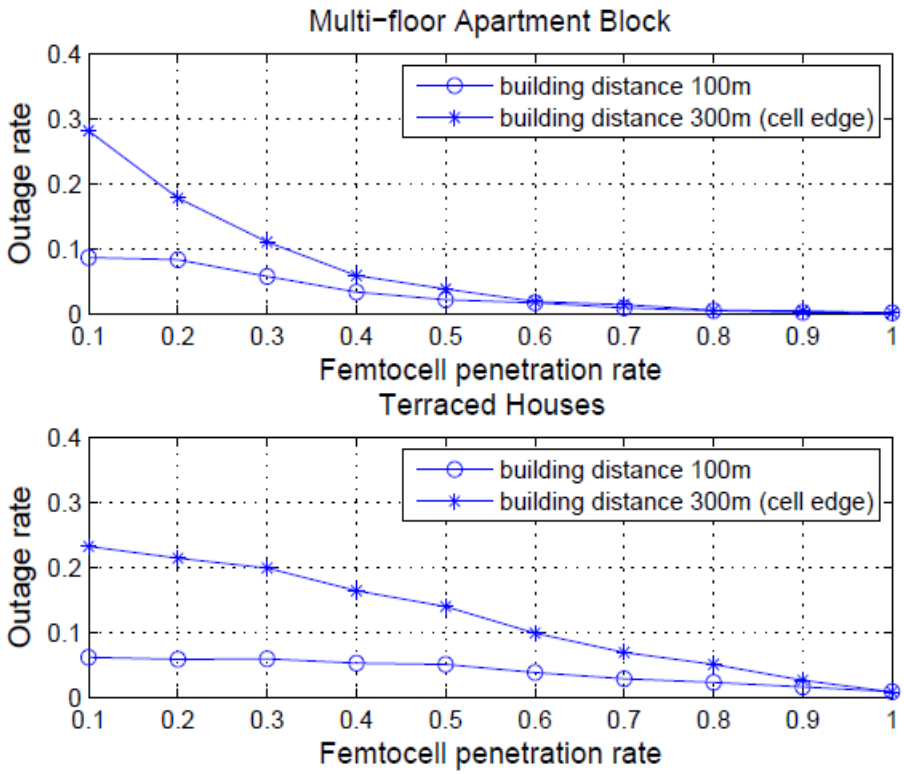

Fig. 7. Emergency service outage rate with different femtocell penetration ratios