Simulation of System Capacity and Quality of Coverage in UMTS Microcells

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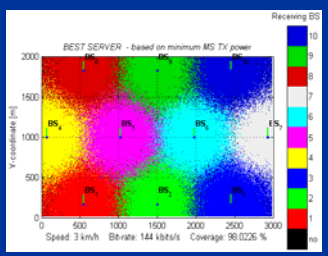
Motivation

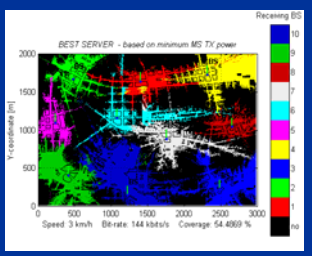
Microcellular environment is very important for new wireless personal communication systems such as UMTS. In UMTS networks the base station sensitivity is dependent on number of users and used bit rate in each cell. In WCDMA systems all users share the same interference resource and so they can not be analysed self-containedly. The whole prediction process was done iteratively. The simulations were executed at the real town plan in the centre of the city of Prague.

Coverage prediction

For determination of allowed propagation loss the empirical UMTS Pedestrian Micro Model and the Berg's Recursive Model was used.



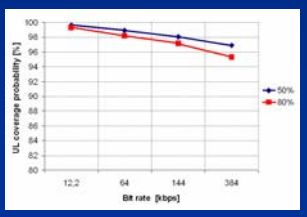
The uplink coverage probability for the 144 kbps data service – UMTS Pedestrian Micro Model.



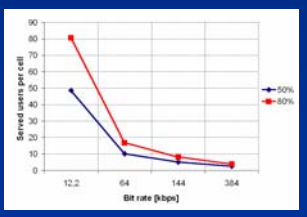
The uplink coverage probability for the 144 kbps data service – Berg's Recursive Model.

Simulations

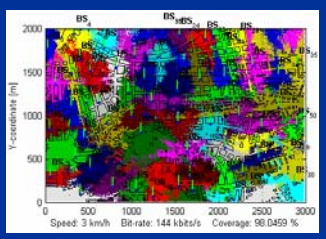
The simulations of system capacity were made in NPSW – a static radio network planning tool for WCDMA. Next figures illustrate the results of simulations of network projected for full coverage of target area for 144 kbps data service and 50% uplink loading. 59 Node B were utilized.



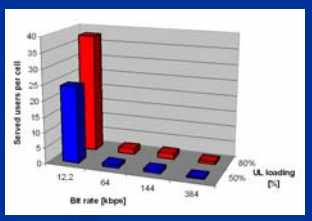
The uplink coverage probability as a function of service and uplink loading.



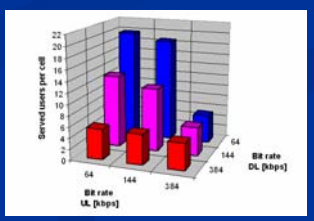
The average number of served users per cell as a function of service and uplink loading.



The uplink coverage probability for the 144 kbps data service based on Berg's Recursive Model.



The number of served users per cell for the mix of services as a function of service and uplink loading.



The number of served users per cell for the asymmetry of bit rate and uplink loading 80%.

Conclusions

- In the microcellular environment a propagation model that takes into account a profile of a surrounding built-up area is necessary to use.
- It is possible to use a more uplink loading without critical impact on the coverage area.
- Suitable choice of a position of antennas of Node B increases a system capacity.

References

[1] Holis, J.; Pechac P.: Effective Propagation Predictions in Urban Microcells, Accepted for International Wireless Summit 2005, Aalborg, Denmark, September 2005

[2] Laiho, J; Wacker, A.; Novosad, T.: Radio Network Planning and Optimization for UMTS, John Wiley & Sons, 2001

[3] Holis, J.: Radio Network Planning of 3G Mobile Networks (UMTS), Diploma thesis, CTU Prague, Department of Electromagnetical Field, 2005