

Smart Antennas and Radio Network Planning - 3G and beyond

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In 2nd generation systems, coverage planning is the most important but also sufficient issue for operating the network. Coverage prediction and capacity estimation are mostly well separable. In 3G networks, where all users operate on the same frequency carrier, the number of simultaneous connections directly influences the system capacity. Multiple services like speech, internet and high data rate interactive services will co-exist. Hence, 3G (UMTS) system planning and capacity estimation can no longer be separated into coverage and capacity estimation. Since higher bit-rate services will require higher capacity, the base station density will have to be increased dramatically.

The dramatic increase of required base stations for third generation communication systems also raised fears in wide sections of the population. These parts of the population exert such a pressure on many local governments and hence force them to restrict the construction of new base-station sites. As a direct implication of this the network roll-out will slow down and network operators lose millions of Euros/Dollars each day the operation is delayed. Hence, network owners and operators need new technologies where they can satisfy the traffic demand and increase the capacity without too many new base station sites.

Smart Antennas are well known to be *the key technology* for a capacity increase. Smart Antennas offer a mixed service capacity gain of more than 100% and hence the required number of base stations can be reduced to less than a half. Nevertheless, they have to be parameterized in a system environment in an optimum way to ensure a maximum spectral efficiency. This optimized performance can only be reached by knowing the system behavior and the current state of the traffic, the system load, the interference situation, the number of users and their services and many more. Doing so, the performance of the network can be simulated with adequate smart antenna radio network planning tools and hence the optimum parameters for the entire network configuration can be found.

The presentation includes the following items:

- * Challenges for multi-service network planning with smart antennas
 - channel modeling
 - interference considerations
 - space-time receiver structures
 - smart antenna algorithms
 - higher layer procedures
 - packet scheduling

* Smart Antenna Network Planning Targets

- cost reduction
- coverage efficiency
- performance vs. capacity maximization

* 2G - 2.5G - 3G co-planning with smart antennas

- what are the differences, what do they have in common?
- roll-out scenarios
- interoperability considerations

* Operation Optimization

- performance optimization by radio network planning
- network parameterization
- traffic- and service mix considerations

* Planning Considerations beyond 3G

- interoperability between 3G and beyond
- network planning for MIMO systems
- site specific network planning