Current and Future Research Goals for Spectrum Sharing with Small Cells

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The Current Focus of R&D in LTE SON for Small Cells

- Self-Configuration

- Self-Optimization

- Self-Healing

LTE – Long Term Evolution
SON – Self Organizing Network

Self-Configuration

- Automatic configuration of initial radio transmission parameters
  - Cell ID, power, tilt
- Automatic neighbor relation (ANR) management
  - Lots of possible number and types of networks
- Automatic connectivity management
  - Auto-connectivity system provides the ability for the new base station to automatically connect to its domain management
- Self test
- Automatic Inventory

Self-Optimization

- Needed because channel and situations change
- Mobility robustness optimization, especially on when to handover
- Mobility load balancing and traffic steering
- Energy saving: reducing carriers, sleep, alternative energy
- Coverage and capacity optimization: antenna and power optimization
- RACH optimization: handset reporting (e.g., number of times before completion)

RACH – Random Access Channel

Self-Healing

- Self-healing of hardware faults - outage detection and hardware backup

- Self recovery of software – what do you do with a bad software upgrade?

- Cell outage compensation – alternative mode when in trouble

- Cell outage recovery – e.g., restart

Needed Future Technologies (1)

- Customization of self configuration, optimization, and healing to contend with the legacy signal environment.

- Mixing of different types of systems, macro and small cells, and different standards

- Tolerance to radar

- Strategies for mixing shared access with dedicated licensed spectrum

- Intelligence

Needed Future Technologies (2)

- Network sharing with small cells

- Energy reduction

- Propagation measurements & experimental work

- Security, information assurance, and privacy vulnerabilities: military and civilian

- Automated regulatory and enforcement methods

Key Closing Points

- The regulations should establish a basic framework to allow for continuing innovation.

- Very likely this is going to be a very long technological evolution (good) and lots of promising technologies on the horizon.

- Ability to immediately use this new spectrum is in reach.