MobiCoM

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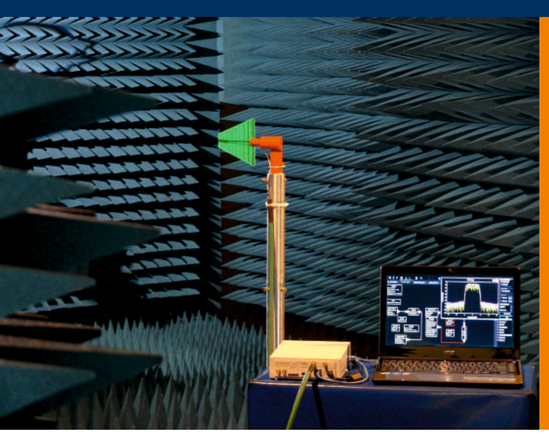

Cognitive Radio Research Activities

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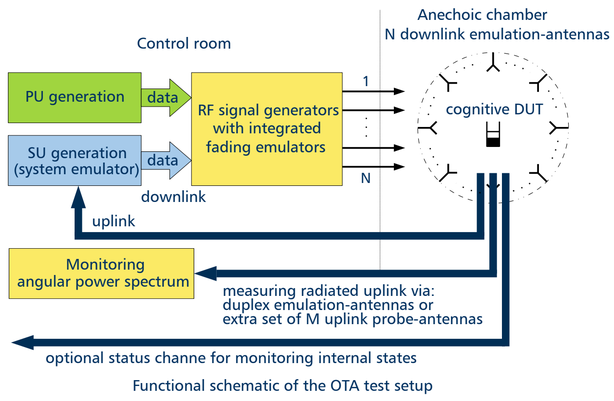
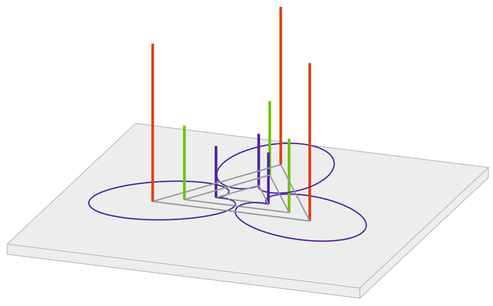
S. Khan, A. Mahdi, M. Kalil, R. Sharma

Over-The-Air Testing

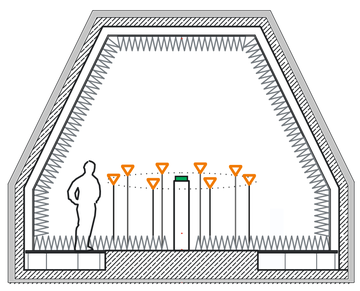
- Performance evaluation and verification of CR nodes
- Emulation of a defined authentic radio environment
- Inclusion of the antenna, focus on direction-selective sensing and transmissions



Functional schematic of the OTA test setup



Sketch of the frequency- and space-sensitive antenna array



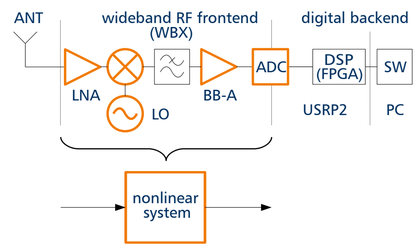
Sketch of the OTA test facility

Antenna Strategies

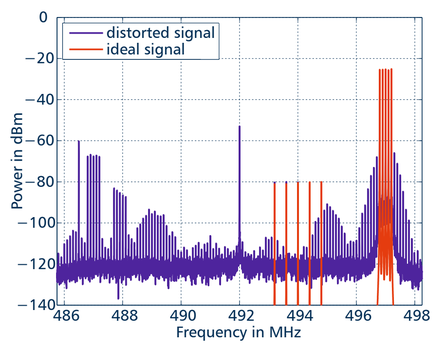
- Typical CRs consider frequency resource only
- Spatial resource as additional degree of freedom
- Directional transmissions and direction estimation

RF Impairments in Wideband Receivers

- Nonlinear characteristics affect spectrum sensing
- Mitigation by digital signal processing (Dirty RF)
- Cancellation of strong interferer signals



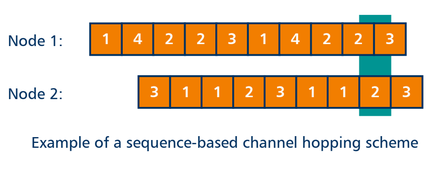
Nonlinear components in a typical SDR Rx architecture (USRP2+WBX)



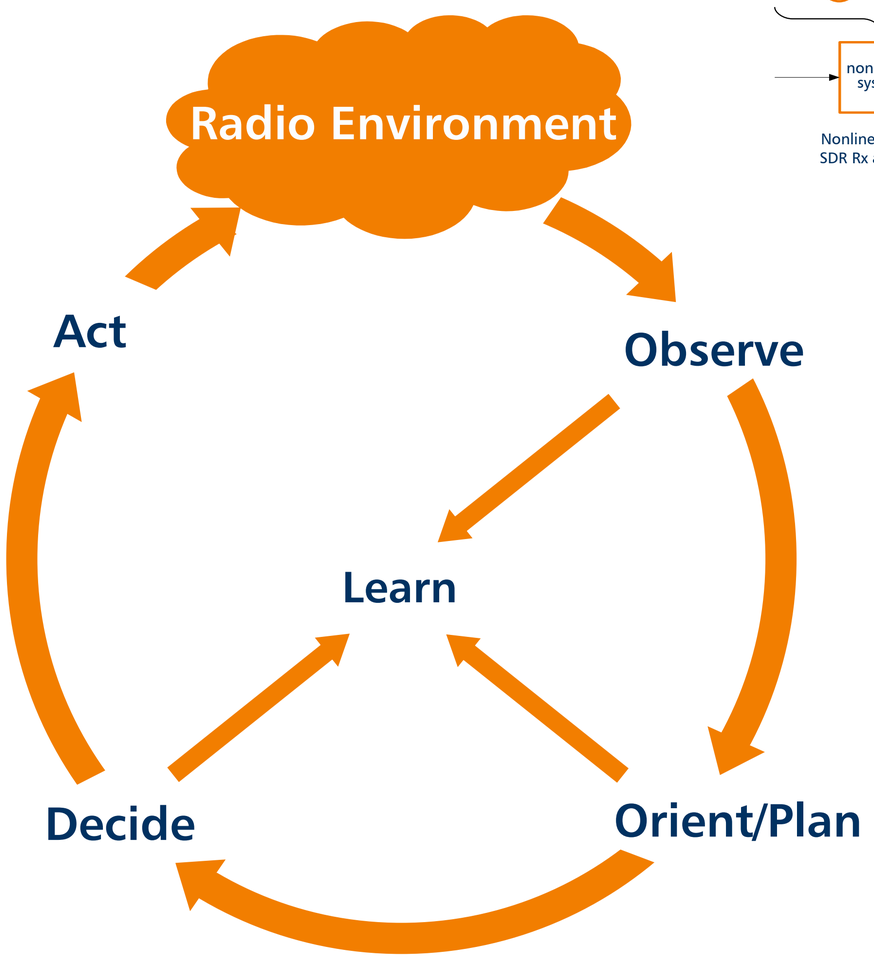
Typical measurement results of nonlinear distortions and further RF impairments of the SDR under test

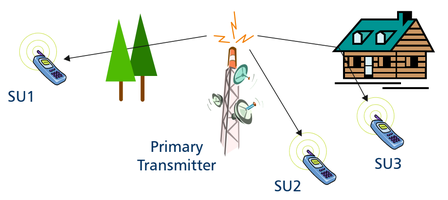
Robust and Flexible Rendezvous

- Ever-changing spectrum availability/occupancy
- Provide efficient means to establish network
- Utilize sequence-based channel hopping

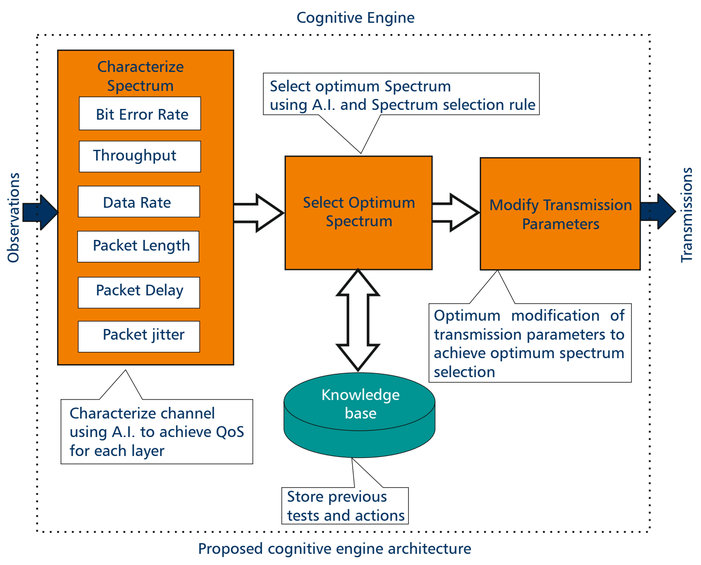


Example of a sequence-based channel hopping scheme

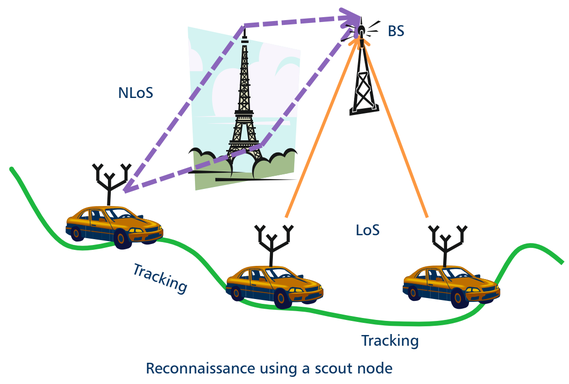




Collaborative spectrum sensing in a hidden-node scenario



Proposed cognitive engine architecture



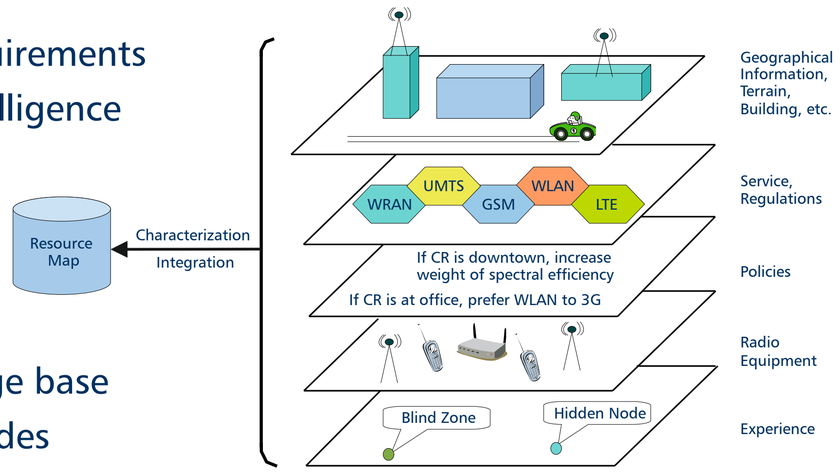
Reconnaissance using a scout node

Cognitive Engine

- Select spectrum to satisfy QoS requirements
- Characterization using artifical intelligence
- Optimized spectrum selection

Distributed Resource Map

- Abstract database driven knowledge base
- Provide network support for CR nodes
- Incorporates multi-domain information



Layer model of the distributed resource map
(figure derived from: B. A. Fette, Ed., Cognitive radio technology, 2009)

Collaborative Distributed Sensing

- Non-optimal decision by single nodes
- Data fusion for global view
- Interface to radio environment map

Radio Resource Reconnaissance

- One node with extended capabilities (scout)
- PHY mode identification and classification
- Input for a central radio environment map

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