



US5

Cognitive Systems and Cellular Networks

Demo for Year2 Review Meeting
Dublin, November 2012



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Demo Setup

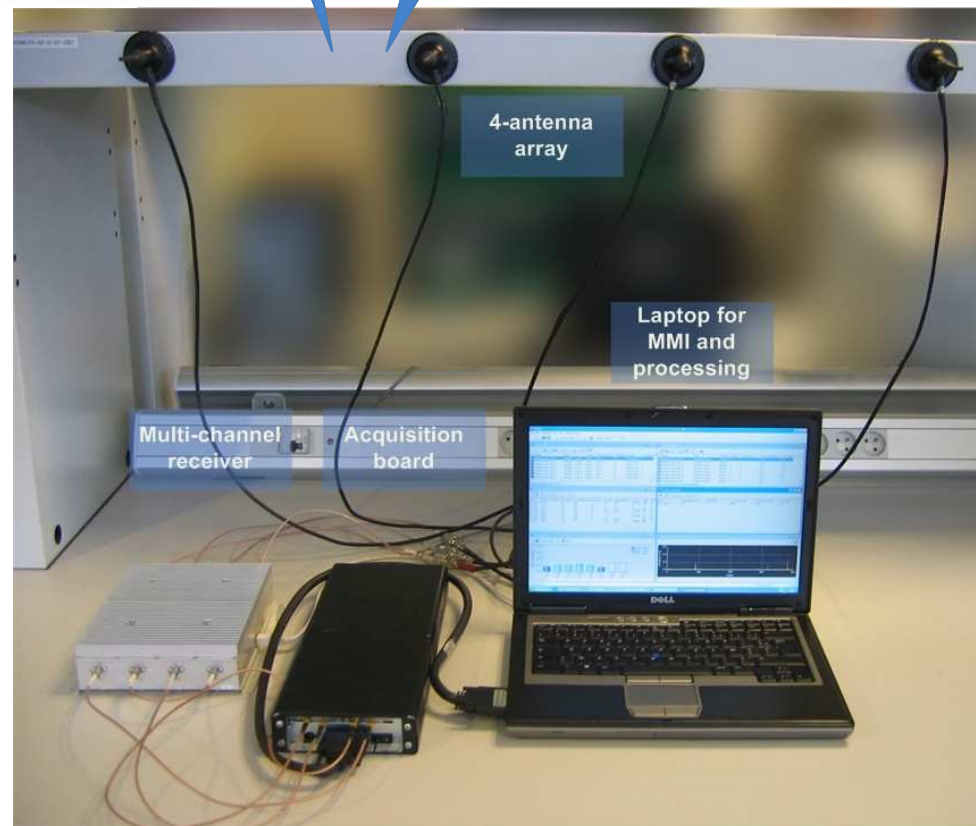
Primary system
(5 MHz LTE signal)



Secondary system
(Random 5 MHz signal)



**TCS Multi-antenna
Cognitive device
(LTE sensing agent)**



The power of the secondary system is increased to determine the detection limit with 1 and 4 antennas



Context of US5.1



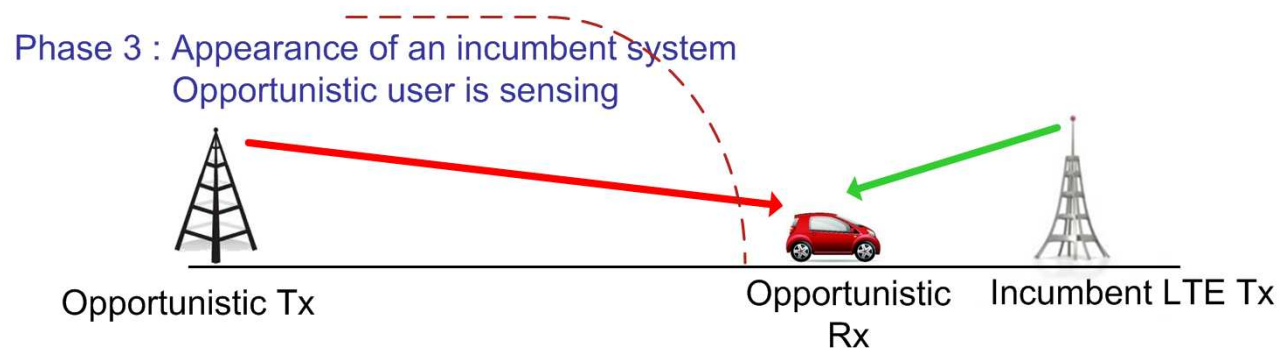
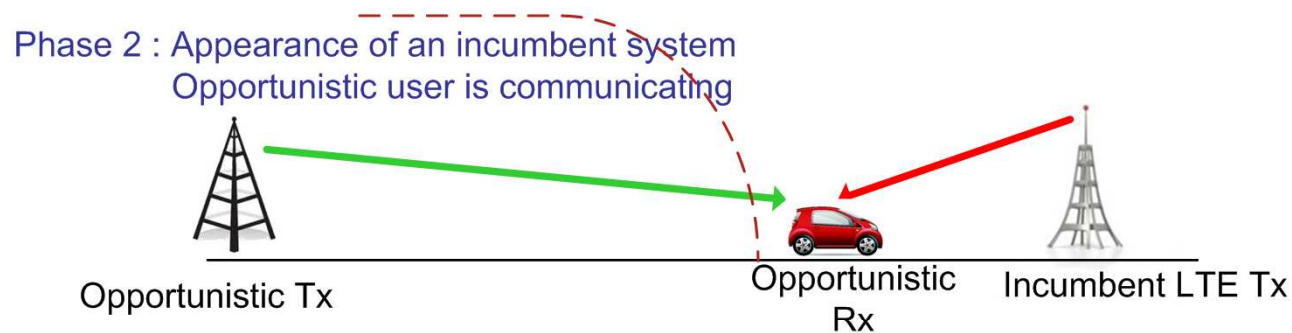
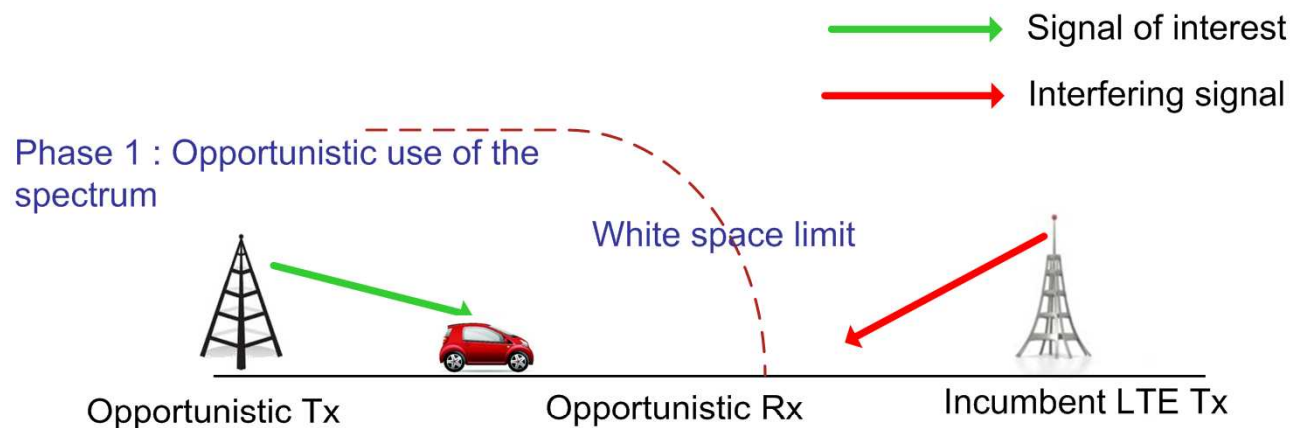
■ Motivation

- US5.1: Impact of cognitive networking on a cellular incumbent system
- The opportunistic system must not interfere in any way with the incumbent system
 - Find a spectrum band that is available
 - Periodically verify that the band is still available

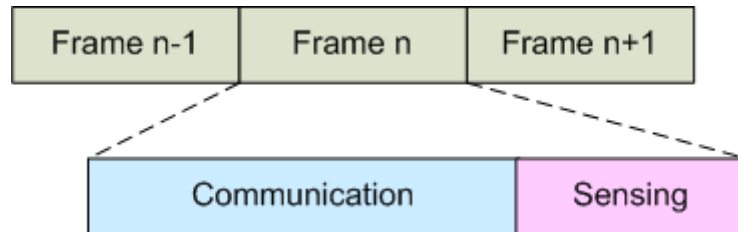
■ **Proposed solution**

- **Parallel sensing** approach based on antenna processing
- Use of TCS multi-antenna LTE sensing platform

Context of US5.1



Serial sensing



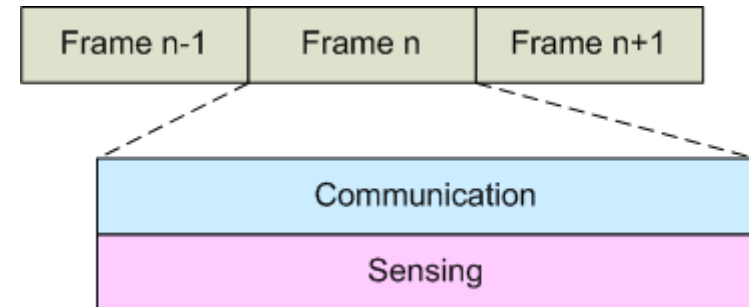
Advantages

- Classically high SIR
- High sensing sensitivity
- Basic sensing algorithms can be used

Drawbacks

- Need to **adjust the waveform** to sensing
 - Insertion of quiet periods
- Reduced capacity of the system

Parallel sensing



Advantages

- No need to adjust the waveform
- Higher system capacity

Drawbacks

- Current SIR is always low
- Need to use more robust sensing algorithm

⇒ **Reference based detection using antenna processing**



Demo Goals



- We will demonstrate that a LTE signal (primary) can be detected even in presence of a strong secondary signal
 - Use of a multi-antenna LTE sensing test-bed
 - Use of reference based detection algorithm for LTE

- We will prove that multi-antenna approach validate **parallel sensing**
 - Gain in SIR of around 30 dB
 - Over-the-air demo



Functionality to be demonstrated



- Functionality to be demonstrated
 - Interference rejection capabilities of the TCS multi-antenna LTE cognitive system
 - Validation of the parallel sensing approach