

Spatial Interweave Demo: Implementation in OpenAirInterface Platform

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<http://www.openairinterface.org>

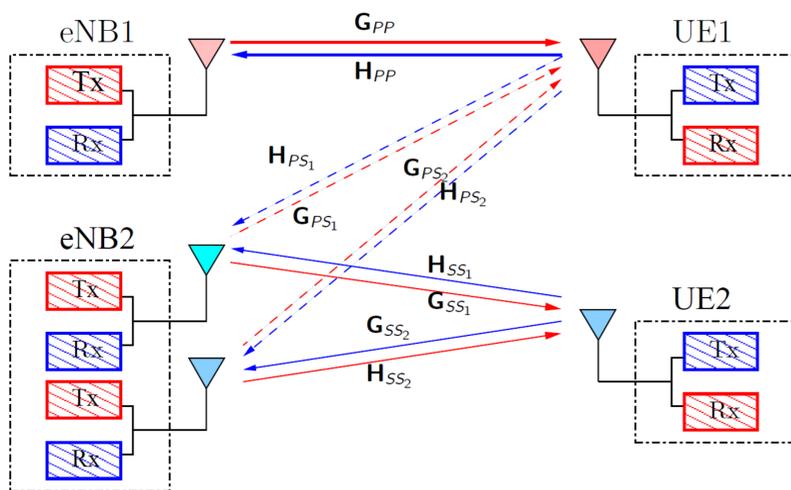
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1. About the CROWN Project

- The CROWN (Cognitive Radio Oriented Wireless Networks) project is funded under the FET-Open scheme within the Seventh Framework Programme
- The main purpose of the CROWN project is to understand the technical issues of Cognitive Radios, through a proof of concept demonstrator
- We demonstrate the real-time cognitive radio communication based on OpenAirInterface platform

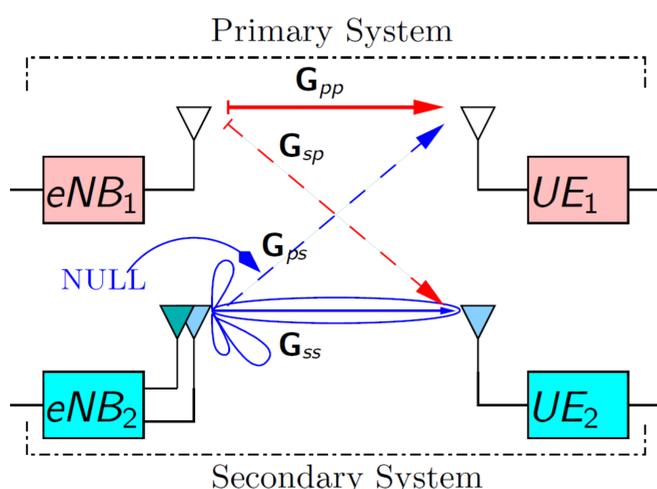
2. Cognitive Radio Scenario

- Two secondary users and two primary users in a system based on the LTE-TDD specification

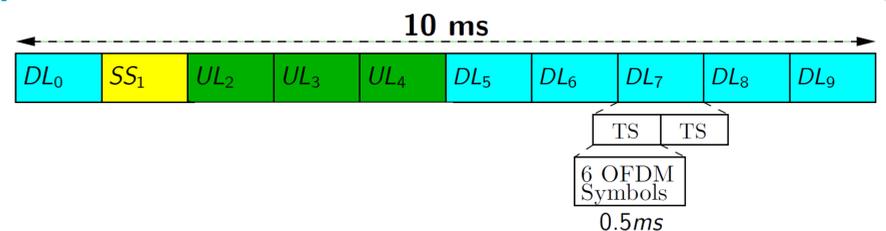


3. Reciprocity Calibration and Beamforming

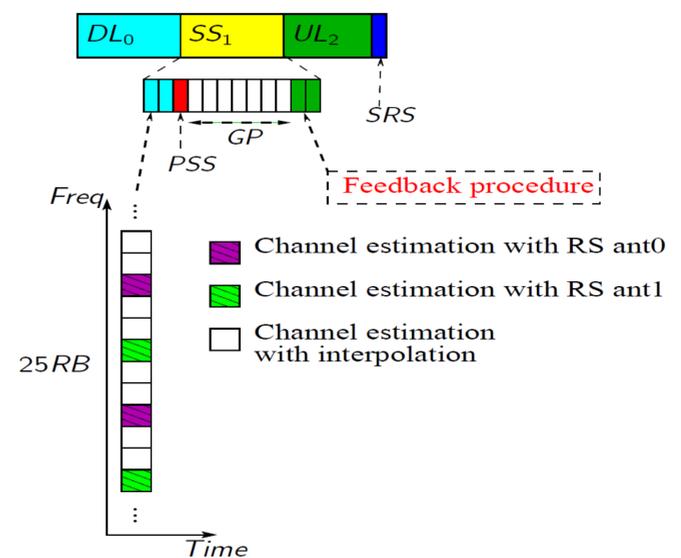
- Spatial Interweave: transmit in the "spatial gaps"
- The opportunistic user designs its beamformer in order to zero-force at the primary receive antenna, causing no interference to the latter
- We do not require any a priori knowledge of the channel information but we rely on channel reciprocity in TDD transmission
- We exploit the calibration parameters to define the beamforming technique allowing to reduce interference generated by the secondary system towards the primary system



4. OpenAirInterface LTE Frame Specification



- Implementation of LTE transmission mode 1 (with enhancements) and Interference aware receiver
- TDD-LTE frame configuration 3



- Transmission from a single eNB antenna port (mode 1)
- Exploit the special subframe (SS) to collect channel estimations

5. Hardware Modules



AgileRF Prototype and ExpressMIMO Baseband Engine

6. References

- Boris Kouassi, Bassem Zayen, Irfan Ghauri and Luc Deneire, "Reciprocity Calibration Techniques and its Implementation on the OpenAirInterface Platform", ISABEL'11, 4th International Symposium on Applied Sciences in Biomedical and Communication Technologies, 26-29 October, 2011, Barcelona, Catalonia, Spain..
- Francesco Negro, Irfan Ghauri, Dirk T. M. Slock, "Transmission techniques and channel estimation for spatial interweave TDD cognitive radio systems", Asilomar 2009, 43rd Asilomar Conference on Signals Systems and Computers, November 1-4, 2009, Pacific Grove, CA, USA