

# **Antennas for Software Defined and Cognitive Radio Applications**

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A Cognitive Radio (CR) system, built on a Software Defined Radio (SDR) platform, aims to improve spectral and power utilization by dynamically interacting with any RF environment. The two main objectives of cognitive radios are to ensure highly reliable communication links whenever and wherever needed (in space and terrestrial applications), and to efficiently utilize the radio spectrum. In order to meet these requirements, cognitive radio systems are expected to use “machine learning” techniques to software-control not only the antenna structure but the entire radio system to sense the channel activity over a wide range of frequencies, tune the radiation and communication characteristics accordingly, and self-learn from past experience. The aim of this short course is to introduce the subject of cognitive radio and the role that antennas can play now and in the future.

The outline of the presentation is as follows:

- 1- Introduction to software defined radio
- 2- Introduction of cognitive radio and its difference from software defined radio
- 3- Classification of different cognitive radio communication systems
- 4- Antenna design requirements and limitations
- 5- Wideband sensing antennas
- 6- Use of reconfigurable antennas
  - a- Different reconfiguration techniques (electrical/optical/mechanical/material based)
  - b- FPGA and software controlled reconfigurable antennas
- 7- Machine learning algorithms for cognitive radio
- 8- Wideband Bandwidth and power optimization