LTE-TDD Spectral Sensing

João Milheiro* (1), José Pedro Borrego (2), and Nuno Borges de Carvalho (1)
(1) Instituto de Telecomunicações, Departamento de Eletrónica, Telecomunicações e Informática, Universidade de Aveiro, Portugal, e-mail: joao.milheiro@ua.pt; nbcarvalho@ua.pt
(2) Autoridade Nacional de Comunicações – ANACOM, Portugal, e-mail: jose.borrego@anacom.pt

Due to consumers demand. the spectrum regulatory entities must find better methods to guarantee mobile communications services with more efficiency and higher quality. With this in mind, the Radio Spectrum Policy Group proposed the Licensed Shared Access (LSA) model in 2013. The LSA goal is to support the spectrum management and to simplify the concept of spectrum sharing. This model makes use of use of three dimensions to perform the frequency sharing: time, frequency and position. The basic concept of the LSA is to allow the attribution of allocated frequencies, that are being unused at that specific time and/or area, to a LSA licensee. This way it is possible to reutilize the same frequency for different applications and ensure the proper QoS and liability as before.

The LSA model involve at least three entities: The incumbent, which is the primary user of the spectrum resource; The licensee(s) which is the secondary user attributed to the spectrum resource; and the National Regulatory Authority (NRA), which is responsible to ensure the priorities and rules for the frequency sharing, also to guarantee the QoS of the services provided. The major components that constitute the LSA are the LSA repository, which contain real time information about the spectrum usage, the availability of each spectrum resources and the conditions that are associated to them. This repository is controlled by the NRA or the incumbent, and will manage the spectrum allocation and conditions for the incumbents/licensees for each spectrum resources; The LSA controller will manage the access of the licensee to the designated spectrum resource, making use of the sharing rules and conditions, available in the repository, to make the decisions. In Figure 1 is a representation of the model and it is shown how entities communicate with every component.

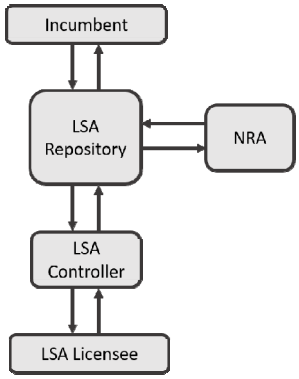

Figure 1. LSA model diagram

The LSA controller must have information about the spectrum resource availability in order to make the proper decision in the spectrum sharing aspect. This way, the incumbent's devices must have the capability to sense the surrounding spectrum and gather its position. The goal of this paper is to present a possible solution for this spectrum analyzer called LSA warner. It has the capabilities to communicate with the repository via GSM/GPRS, get the position and time of the device and verify the existence of any LTE-TDD signals in the frequency band of the 2.3 – 2.4 Ghz. This warner is composed by a FPGA with a RF module capable to receive signals in the frequency band desired, a GPS module to get the position of the device and a microcontroller which serves as a control unit, to gather all the information from the GPS and FPGA, and send it to the repository.