

**SIMULATION AND ANALYSIS OF ENERGY DETECTION  
IN A COGNITIVE RADIO BY USING MATLAB**

Dissertation Submitted

in the partial fulfillment of the requirements for award of degree of

**Master of Engineering**

In

**Electronics and Communication Engineering (Systems and Signal Processing)**

By

**Mr. MOHAMMED MEHDI SALEH (100512744216)**

Under the guidance of

**Dr. R . HEMALATHA RALLAPALLI**

Asst. Prof. ECE Dept, UCE, OU



**Department of Electronics and Communication Engineering,**

**University College of Engineering(A)**

**Osmania University**

**2013-2014**

## ABSTRACT

The increasing demand for wireless communication introduces efficient spectrum utilization challenges. To address this challenge, cognitive radio (CR) has emerged as the key technologies, which enables opportunistic access to the spectrum and have ability to adapt to the conditions of the environment by analyzing, observing and learning. Cognitive radio is an exciting promising technology which not only has the potential of dealing with the inflexible prerequisites but also the scarcity of the radio spectrum usage. Such an innovative and transforming technology presents an exemplar change in the design of wireless communication systems, as it allows the efficient utilization of the radio spectrum by transforming the capability to dispersed terminals or radio cells of radio sensing, active spectrum sharing and self-adaptation procedure.

The CR has the capability to sense the spectrum and determine the vacant bands, for the purpose of using underutilized frequency bands without causing harmful interference to legacy networks.

Model is presented, that allows secondary (unlicensed) users to transmit in FM radio environment without cause harmful interference to primary (licensed) users. This model will reduce the time required to detect an empty channel in the desirable band and allow the secondary user to start transmitting. It is based on spectrum sensing using energy detection by selecting appropriate threshold, assuming we have a noisy channel. The main disadvantage in traditional energy detection, that it is not effective in low SNR. Here a scheme is found that improves the spectrum sensing ability greatly in low SNR situations. We have modeled the radio environment is modeled in MATLAB where the primary users transmit after random intervals with a specific band and the empty channels during these intervals in this band are used by secondary users.

**Keywords**— Cognitive radio, spectrum sensing, energy detection, primary users, secondary users