

## ABSTRACT

The development of wireless telecommunication technology is inversely proportional to the availability of frequency spectrum. It is the background of the creation of the concept of Dynamic Spectrum Access (DSA) which is supported by technology Cognitive Radio (CR). Essential function of the CR is spectrum sensing which is to detect the presence of a primary user (PU) at a certain frequency so that it can be used by the secondary user (SU) to be more effective and efficient. Wide range of sensing methods performed for better detection process. Some sensing method is the matched filter, cyclostationary detector and the energy detector. There is still a deficiencies in energy detector method that requires information of the value of noise power, and are vulnerable to the uncertainty of noise, then used a new method based on the covariance matrix of the received signal. However, this signal covariance matrix is also problematic if there are additional interference, to resolve it using the cooperative or multiple users to suppress such interference. Cooperative spectrum sensing (CSS) is the one that is proposed as an effective and efficient method of sensing as it uses multiple nodes to detect the channels that will be analyzed before distribution to other nodes by utilizing spatial diversity.

This final project analyzed the cooperative spectrum sensing based signal covariance matrix. Started from the proof that signal covariance matrix is more resistant to noise uncertainty compared to the energy detector method, the signal covariance matrix performance may be suffer as there is interference and the increase of number of users or the so-called cooperative to resolve such interference. Cooperative Spectrum Sensing is a spectrum sensing method that combines information from each cognitive radio user to be processed at the Fusion Center before getting a global decision to use Fusion Rule to determine presence of primary users of a frequency spectrum.

Final study shows that the performance of the covariance matrix is better than Energy Signal Detector. It also proves that Cooperative Spectrum Sensing using method covariance matrix signals, the detection process is much better if there is noise uncertainty or interference. Good performance is marked by the value of the Probability of detection ( $P_d$ ) as high from each Probability false alarm ( $P_{fa}$ ). The scenarios performed with parameters such as SNR, the amount of cognitive radio users (CRU) and the uncertainty of noise to measure the value of probability of detection of each detector. Covariance matrix signals with cooperative model generates good detector performance that is resistant to noise uncertainty with  $P_d$  values close to 1 using 32 CRU.

Keywords: Energy Detector, Spectrum Sensing, Cooperative Spectrum Sensing, covariance matrix Signal, Noise Uncertainty