**ABSTRACT**

Energy efficiency problem gains more and more attention these years. Many methods are found out to improve the energy efficiency. However, there are some limitations with these methods. In this project, a system model that jointly consider the sensing, transmission tradeoffs, wait and switch tradeoffs is built. The constraints on the reliability of sensing, the throughput and the delay of SU transmission is also considered.

The optimal value of sensing time and the probability of the SU waiting in the current channel are found out to minimize the energy consumption of one data packet transmission. In spectrum-sharing system, multiple secondary links share the spectrum with existing primary link. In this project primary and secondary user consider their respective spectrum for connecting the call.

When primary or secondary spectrum get overloaded the call will automatically connect to available free spectrum using cognitive radio network. This was implemented using Arduino microcontroller and RF module.