



# Broadband Wireless Multimedia Communications Research Group excels

Kahesh Dhuness and Prof Sunil Maharaj

The Federal Communications Commission (FCC) published a report in November 2002 that contained limited spectrum measurements from various urban locations. It suggested that there are spectrum resources currently available. However, traditional policies prevent the efficient utilisation of such spectrum resources. As the demand for bandwidth increases, a natural approach would be better utilisation of such a resource. It is this factor that has made cognitive radio (CR) a promising concept.



The CR concept currently involves thinking of the frequency spectrum in terms of white spaces. A white space is a band of frequencies assigned to a primary user (PU), but at a particular time and geographic location. A secondary user (SU) is allowed to opportunistically use this white space, provided that it does not interfere with the PU's transmission. This process allows for more efficient utilisation of the frequency spectrum.

In a paper presented at the Institute of Electrical and Electronics Engineers (IEEE) Africon '11 conference (for which PhD student Kahesh Dhuness and Prof Sunil Maharaj of the Department of Electrical, Electronic and Computer Engineering won the best paper award), an energy detection method was used to detect an orthogonal frequency division multiplexing (OFDM) DVB-T2 transmission. The drawback associated with such a transmission is highly inefficient transmitters. In order to improve the efficiency of the transmitters, a method called offset modulation (OM-OFDM) was developed for DVB-T2 transmissions. This offers

a significant power performance improvement when compared to a traditional OFDM transmission.

The principle contribution of the paper was the derivation of a closed form equation, which can be used by an SU to determine the detection characteristics of any signal. To validate the derived equation, simulated and theoretical expected detection characteristics of OFDM and OM-OFDM transmissions were examined. Both the theoretically predicted and simulated results correlated reasonably well.

The OM-OFDM method has been shown to offer far superior detection characteristics than OFDM, which suggests that an SU should be able to easily detect an OM-OFDM transmission. Employing OM-OFDM will assist the SU from not interfering with the PU, thus making OM-OFDM a good candidate for CR applications. In addition to its good CR properties, OM-OFDM also offers good power efficiency characteristics when compared to an OFDM transmission. ⬆