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## SYNOPSIS IN SHORT

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Static allocation of spectrum scheme around the world, which is allocated to specific technology based services, such as mobile, fixed, broadcast, fixed satellite and mobile satellite services is commonly used on exclusive basis. These wireless communication systems are representatives of 2G and 3G systems with all evolution phases towards 4G systems. The complexity of wireless networks requires a careful design, especially related to bandwidth and energy efficiency. Bandwidth efficiency is very important parameter, because it relates to frequency spectrum, which is naturally scarce resource. Many new wireless applications cannot be rolled out because of unavailability of free spectrum. The “Cognitive Radio” (CR) has been proposed to meet the ever increasing demand of the radio spectrum by allocating the spectrum dynamically without causing interference to the licensed users.

The work justifies the “Television White Space” (TVWS) opportunities for CR created due to “Digital Dividend” (DD) of 700MHz band and regulatory aspects in India for CR applications and the use cases for the exploitation of TVWS depending on users’ mobility and geo-location between the user and BS. In CR, spectrum sensing is the fundamental problem. A novel hybrid detection method is proposed which exploits the advantages of energy detection and covariance absolute value methods. It outperformed energy detection and covariance absolute value method under Rayleigh time varying fading channel for Digital

Video Broadcast for Terrestrial (DVB-T) signal and is more insensitive to the type of input data. The work also contributes in analyzing the cooperative power sensing of the received signal for spectrum sensing to detect whether the received signal is signal of interest or noise, based on the knowledge of noise power and its performance under various channel models. Finally, comparison of various Direction-of-Arrival (DoA) algorithms for narrow- and wide-angular separations for the application in CR networks is evaluated and proposal of a novel, better performing algorithm is done.

**Keywords:** Cognitive Radio, Television White Space, IEEE 802.11 af, Use cases for TVWS, Energy Detection, Covariance Absolute Value, Hybrid Detection Method, Fading Channel, Cooperative Sensing, DoA Estimation Algorithm.