

Opportunistic Usage of the Maritime VHF Band Using a Software Defined Cognitive Radio

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Worldwide navigation lacks of alternatives to satellite communication links for data services, since legacy MF/HF and VHF systems are mostly narrowband and application-specific. Furthermore, new applications such as electronic navigation, unmanned systems and personal communications require fast data links, which is not currently available at an acceptable cost. The VHF band is the first choice for the majority of maritime communications, but due to its static allocation scheme, its inefficient use is very common.

Cognitive radios have been proposed as a solution to overcome spectrum congestion, by enabling opportunistic use of underutilized bands occupied by licensed users, which is typically the case of the VHF maritime band. Software defined radios (SDR) became very powerful tools for cognitive radio implementation, since they offer adequate flexibility and performance in terms of radio design.

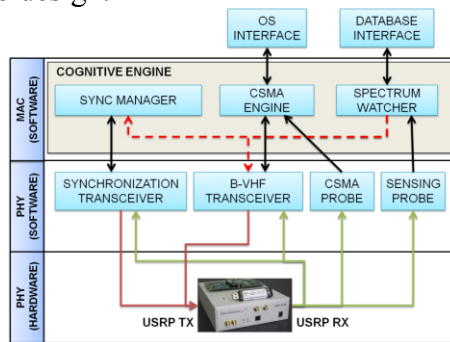


Fig. 1 - Cognitive station layer stack design.

An experimental software defined radio framework is proposed to opportunistically use vacant VHF maritime bands in a cognitive network environment. Cognitive nodes are implemented using GNU Radio software package for medium access and physical layer design, as well as Universal Software Radio Peripherals (USRP) for radio interfacing (Fig. 1). Incumbent users are detected through a spectrum sensor and synchronization protocol assures network connectivity. Then, frequency agile transceivers access vacant spectrum bands without interfering with primary users.

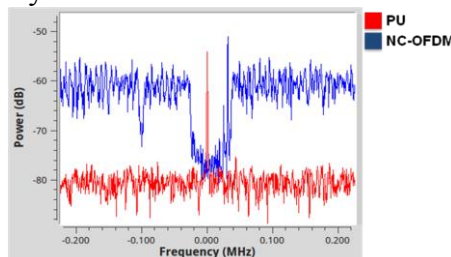


Fig. 2 - Interference evaluation between a primary and secondary user.

Detailed analysis and study on spectrum sensor, medium access and physical layer design, as well as results on detection and transceiver performance will be presented at the symposium. It will also be shown that the system is capable of detecting incumbent users and to use vacant spectrum bands without interfering with primary users (Fig. 2).