Demonstration of Spectrum Sharing between a Microwave Radiometer and a Communications System

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The limited available spectrum and the current inefficient spectrum usage has stimulated a flurry of research activities in the engineering community in search of better spectrum access policies such that better use can be made of the allocated radio spectrum. Efficient usage of spectrum is important not only for communications applications, but also for sensing systems used for both active and passive Earth observations.

In this paper, a spectrum sharing paradigm is demonstrated between a Dicke-switched microwave radiometer and a communication system. Since the radiometer receiver is periodically switched to measure antenna returns and internal calibration signals in turn, a simple sharing approach allows communications use of the spectrum as long as its resulting interference only falls within the time slots when the radiometer is performing internal measurement. The demonstration is performed using an existing Ohio State University microwave radiometer with Zigbee mote devices used for the communication system. Sharing is achieved in a cooperative manner via a newly introduced control mechanism to enable and disable the communications of the Zigbee motes appropriately. In light of the available communications hardware, communications are performed in only a 250 KHz bandwidth (within the 45 MHz radiometer channel.)

Results will be shown to demonstrate successful communications without interfering with radiometer observations. Results will also be shown to quantify the efficiency of spectrum usage achieved, subject to the limitations of the system and Zigbee microprocessor used in the demonstration. Further discussions will also be provided to describe further extensions of these results and additional concepts for spectrum allocation that allows scheduled use of non-allocated bands for passive sensing will also be provided.