

File Number: 0501-EX-PL-2010
Confirmation number: EL581126
Date: November 10, 2010

Form 442 Question 7: Experimentation Description

Rice University will be deploying experimental whitespace radios in an urban radio access context in order to explore planning, deployment, and operational issues involved with TV band whitespaces. We intend to explore energy-efficient and low-cost approaches to providing urban-scale access to wireless internet resources in an under-resourced neighborhood in Pecan Park, Houston, Texas. In addition to exploring combinations of various unlicensed-band technologies (e.g. 2.4 and 5 GHz WiFi, Bluetooth, whitespaces), we intend to use the deployed wireless backhaul to support in-home medical monitoring pilot programs and energy-efficient mobile networking studies.

While our ISM-band equipment complies with all pertinent FCC regulations, we are applying for an experimental STA to operate experimental UHF TV-band (512-698 MHz) radio equipment provided by two manufacturers: Metric Systems and Alcatel-Lucent Bell Labs. These experimental radios operate as programmable frequency up/downconverters for commercial 2.4 GHz WiFi cards. Modulation and power characteristics will be the same as commercial 802.11g cards with the additional out-of-band emissions constraint discussed next.

In order to meet the spectral mask requirements of FCC 08-260 (Second Report & Order, Nov 14, 2008) and FCC 10-174 (Second Memorandum & Order, Sept 23, 2010) with frequency-shifted WiFi equipment, we will incorporate additional UHF transmit filter masks on all whitespace devices. We will perform experiments with equipment that meets the Part 15.709 technical requirements on channels that we have identified as "unoccupied" via both direct power measurements and preliminary results from some prototype whitespace databases that predict the protected contours of terrestrial television stations.

Deployed nodes operating in TV bands will be of two types: 1) fixed nodes that will be programmed with their GPS coordinates and the TV channels available for operation in their location and updated in a timely manner to ensure that primary radio users (DTV stations) are protected, and 2) mobile nodes that will either be integrated with GPS devices for geolocation and database lookup, or will be forced to listen to fixed nodes for a list of available channels. In each case, devices will be tested and monitored with mobile spectrum analyzers in order to ensure that all spectral emissions meet Part 15.709 requirements. We include with this filing a plot of the filter mask of the transmit filters we will use to ensure compliance.

We intend to plan, deploy and operate the first urban-scale whitespace network with fully-programmable wireless nodes and the flexibility to incorporate additional radio interfaces to investigate network-side and client-side decisions associated with multiple diverse-frequency network interfaces. As a new technology, there is little experience with at-scale whitespace deployments and our network will serve as a technical testbed and motivating example for ISPs and governmental organizations the world over that are interested in cognitive radio and spectrum recycling. As they become available, our testbed can also serve to validate and test new spectrum databases that are to be established through the Office of Engineering and Technology as per FCC Part 0.241. We will perform unique mobility studies involving mobile clients in a dynamic environment with diverse spectrum choices available, a situation that is rapidly becoming a reality for many mobile users. Data and results will be made public through publication and will constitute a substantial contribution to the field.