Analysis and Comparison of Spectrum Measurements performed in Urban and Rural Areas to Determine the Total Amount of Spectrum Usage

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This paper will introduce the analysis of two broadband spectrum studies, presenting and comparing the level of spectrum usage. Two broadband spectrum studies were performed in urban Atlanta, GA and rural North Carolina over the frequency range from 400 MHz to 7.2 GHz. Over several months spectrum usage was measured in several azimuthal directions and in different linear polarizations for each of the two spectrum studies. These studies produced a database with five billion spectrum measurements. This database was analyzed with an advanced algorithm to determine the level of active spectrum usage. The detection method employed was designed at the Radio Spectrum Engineering Lab (RSEL) located at Georgia Tech and is optimized to detect signals that are marginally above the receiving system's thermal noise floor. The sophisticated algorithm uses the spectrum study's multidimensional aspect to achieve significantly better performance than conventional threshold detection. The results of this analysis can be used to identify areas of the spectrum that are unused or underused, creating opportunities for the use of frequency agile radio technologies.