**An NTIA/ITS High-Performance CW Channel Sounder**
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Recent advances in emerging wireless technologies pose major challenges to radio spectrum utilization. It is essential for new wireless systems to have high spectral efficiency and to be able to dynamically share spectrum with other wireless systems. There is an urgent need to provide our spectrum policy makers and regulators well-informed and accurate electromagnetic compatibility (EMC) models to insure optimal and trouble-free use of the radio spectrum. A key to the accurate modeling of EMC wireless systems is accurate propagation measurements.

In early 2010, engineers at NTIA's Institute for Telecommunication Sciences (ITS) began the development and design of a new channel sounder system. The team identified four design objectives: 1) a fundamental propagation measurement system that is traceable to sampled voltages, 2) a simple and spectrally-efficient system that is stable, accurate, and easy to operate, 3) a system that acquires a continuous set of data with audio-frequency sampling rates (1-5 kHz) with modest data storage requirements, and 4) the accurate measurement of propagation parameters such as path loss, fast-fading, and Doppler power spectrum.

We have developed a channel sounder receiver architecture that is based on both a Vector Signal Analyzer (VSA) and a Spectrum Analyzer. We provide precise time references on both the receiver and the CW transmitter using rubidium frequency references. The VSA receives the transmitted signal for the entire duration of a test and ensures continuity of data acquisition. The in-phase, quadrature (I-Q) data capture format yields high measurement fidelity and flexibility in the extraction of propagation parameters. The use of rubidium clocks ensures high accuracy and stability in the time base of sampled data and permits accurate geolocation of measured data.

In this talk we will: 1) describe the development of the ITS channel sounder, 2) provide details of system operation, and 3) discuss signal processing to extract path loss, Rician K-factors, and Doppler power spectral characteristics. We will also show results from recent in-building and outdoor measurement campaigns.