

**Channel Sounder Measurement Verification: Open Area Test Site  
Measurement Campaigns  
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Wireless communication sensors and devices must operate efficiently in a heavily trafficked radio propagation channel. Unfortunately, these congested channels must be precisely and accurately captured for effective spectrum sharing of the channel. Success of the channel models depends heavily on obtaining trustworthy measurements of the channels.

Obtaining trustworthy measurements requires “best practices”, which include verification of the channel sounder’s hardware and data post-processing and thorough documentation of the measurement campaign. Verification of the channel sounder’s hardware and post-processing requires separating measurement error from the channel variations. Measurement error comes from the signals passing through real components that introduce distortions at every step of the hardware process from signal generation and transmission to signal reception and demodulation. Characterization of the measurement uncertainty and distortions is the first step in achieving trustworthy measurements and may be determined using a metrology-grade channel sounder verification methodology.

In 2017-2018, the US Department of Commerce National Institute of Standards and Technology (NIST) and the Institute for Telecommunication Sciences (ITS) conducted channel sounder verification at the Open Area Test Site on the Boulder, NIST campus for further channel sounder verification. Using a transmitter and receiver switch matrices, the channel sounders were connected to the same transmit and receive antennas that were separated by three different distances. The channel sounders operated in the 3.5 GHz frequency band. The measurement error, including the antenna effects and channel variations in the channel sounders, were studied by comparing the measurements of a repeatable channel to a reference measurement made by a vector network analyzer.

Path gain results, best-practices procedures and guidance are provided to allow the readers to perform similar verifications of their channel sounders.