Channel Sounder Measurement Verification: Best Practices
USNC-URSI National Radio Science Meeting

C. Hammerschmidt[(2)], J. Quimby[(1)], A. Koepke[(1)], J. Rezac[(1)], R. Johnk[(2)], J. Jargon,[(1)], R. Leonhardt[(1)], P. Hale[(1)], K. Remley[(1)], P. McKenna[(2)], I. Stange[(2)], M. Chang[(2)], S. Tran[(2)], N. DeMinco[(2)]
(1) NIST Communication Technology Laboratory, Boulder, CO, 80305, https://www.nist.gov/ctl/rf-technology-division/metrology-wireless-systems-group
(2) Institute for Telecommunication Sciences, Boulder, CO, 80305, https://www.its.bldrdoc.gov/about-its/contact-us.aspx

Trustworthy channel sounder measurements require "best practices," including hardware and data post-processing and thorough documentation of the measurement campaign. Highly accurate channel sounder measurements start with the researcher understanding his or her system's channel sounder hardware capabilities, limitations and post-processing methods. Verifying system performance using sound metrological foundations in a controlled environment provides an in-depth understanding of system operation and uncertainties. Documentation of environmental effects and unusual occurrences during the measurement campaign is also important. These best practices ensure measurements are repeatable, can be reproduced by other researchers, and can be used to understand the processes used to make measurements with a given confidence interval.

During 2016 - 2018, the US Department of Commerce National Institute of Standards and Technology (NIST) and the Institute for Telecommunication Sciences (ITS) researchers conducted a metrology-grade channel sounder verification on three distinct channel sounder architectures with a reference instrumentation. The reference instrumentation was a NIST Vector Network Analyzer (VNA) with a comprehensive error analysis. The channel sounders were a correlation-based channel sounder, a continuous scanning probe channel sounder and a direct pulse channel sounder. Best practices developed by the team will be discussed to illustrate techniques for a successful measurement campaign.