

Phase and Amplitude Modulation Noise Metrology

Craig Nelson, NIST Boulder

e-mail: craig.nelson@nist.gov

Abstract:

Noise is everywhere. Its ubiquitous nature interferes with or masks desired signals and fundamentally limits all electronic measurements. Noise in the presence of a carrier is experienced as amplitude and phase modulation noise. Modulation noise will be covered from its theory, to its origins and consequences. The effects of signal manipulation such as amplification, frequency translation and multiplication on spectral purity are examined. Practical techniques for measuring AM and PM noise, from the simple to complex will be discussed. Calibration of measurements and common problems and pitfall will also be covered.

Craig Nelson is an electrical engineer at the Time and Frequency Division of the National Institute of Standards and Technology. He received his BSEE from the University of Colorado in Boulder in 1990. After co-founding SpectraDynamics, he joined the staff at the NIST. He has worked on the synthesis and control electronics, as well as software for both the NIST-7 and F1 primary frequency standards. He is presently involved in research and development of ultra-stable synthesizers, low phase noise electronics, and phase noise metrology. Current areas of research include optical oscillators, high-speed pulsed phase noise measurements and phase noise metrology in the 100 GHz range. He has published over 35 papers and teaches classes, tutorials, and workshops at NIST, the IEEE Frequency Control Symposium, and several sponsoring agencies on the practical aspects of high-resolution phase noise metrology.