

**Abstract Submitted for the 53rd Annual Meeting
Division of Plasma Physics
November 14–18, 2011, Salt Lake City, Utah**

Category Number and Subject: 10.0.0 Undergraduate or High School
Research

Theory Experiment

Effect of clock jitter on plasma density measurements relying on direct digital demodulation techniques,* B.W. Hamming, *Whitworth University*; R.A. Colio, *CSU-San Marcos*; D.F. Finkenthal, *Palomar College*; M.A. Van Zeeland, T.M. Deterly, *General Atomics* – Real-time measurement of plasma density is essential to effective closed-loop plasma control systems in fusion-type reactors. The DIII-D tokamak currently employs a Michelson-type interferometer in combination with heterodyned lasers to make real-time density measurements utilizing embedded digital signal processing (DSP) techniques. This technique relies on high-speed analog-to-digital converters clocking at four times the 40 MHz reference frequency, and clock jitter becomes a critical source of noise in the measurement indistinguishable from phase noise of the interferometer signals. We present a study of the effect of clock jitter on system noise and recommendations for improvement.

*Work supported in part by US DOE under DE-FC02-04ER54698 and the National Undergraduate Fellowship in Fusion Science and Engineering.