Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

An Ultra-Wideband Cross-Correlation Radiometer for Mesoscopic Experiments[1] RYAN TOONEN, CYRUS HASELBY, HUA QIN, MARK ERIKSSON, ROBERT BLICK, University of Wisconsin at Madison — We have designed, built and tested a cross-correlation radiometer for detecting statistical order in the quantum fluctuations of mesoscopic experiments at sub-Kelvin temperatures. Our system utilizes a fully analog front-end–operating over the X- and Ku-bands (8 to 18 GHz)–for computing the cross-correlation function. Digital signal processing techniques are used to provide robustness against instrumentation drifts and offsets. The economized version of our instrument can measure, with sufficient correlation efficiency, noise signals having power levels as low as 10 fW. We show that, if desired, we can improve this performance by including cryogenic preamplifiers which boost the signal-to-noise ratio near the signal source. By adding a few extra components, we can measure both the real and imaginary parts of the cross-correlation function–improving the overall signal-to-noise ratio by a factor of sqrt[2]. We demonstrate the utility of our cross-correlator with noise power measurements from a quantum point contact.

[1]Funding for this project was provided in part by the National Science Foundation (DMR-0325634).

Ryan Toonen
University of Wisconsin

Date submitted: 20 Nov 2006 Electronic form version 1.4