Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Shot and Johnson Noise Measurement in Graphene Using Wide-Bandwidth Measurement Technique[1] ARTEM TALANOV, JESSE CROSSNO, John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA 02138, USA, HUGO BARTOLOMEI, Department of Physics, Harvard University, Cambridge, MA 02138, USA, KEMEN LINSUAIN, Department of Physics, Harvard University, Cambridge, MA 02138, US, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute for Materials Science, Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan, THOMAS OHKI, KIN CHUNG FONG, Raytheon BBN Technologies, Quantum Information Processing Group, Cambridge, MA 02138, USA, PHILIP KIM, Department of Physics, Harvard University, Cambridge, MA 02138, US — We measure shot and Johnson noise in single and bilayer graphene devices as a function of carrier density. For this measurement, we have developed a technique for measuring high-frequency wide-bandwidth noise. We use a low-noise RF amplifier, high-frequency digitizer, and digital signal processing to measure noise in the range of several hundred MHz of a device whose resistance can vary several orders of magnitude. We precisely characterize the resistance-dependent gain and noise temperature of the entire circuit using Johnson noise from the device itself, in a temperature range of 3-300K. This technique presents a very flexible measurement of noise from devices, allowing device resistance fluctuations of several orders of magnitude, extreme nonlinear resistance behavior, and highly non-equilibrium conditions.

[1]NDSEG, FAME Center sponsored by SRC MARCO and DARPA

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Date submitted: 16 Nov 2016 Electronic form version 1.4