Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Skewness and Kurtosis of the Switching Current Distribution in Superconductor-Graphene-Superconductor Junctions and Superconductor-Nanowire-Superconductor Devices ANDREW MURPHY, THOMAS AREF, ULAS COSKUN, University of Illinois Urbana-Champaign, PHILLIP WEINBERG, ALEX LEVCHENKO, Michigan State University, VICTOR VAKARYUK, The Johns Hopkins University, ALEXEY BEZRYADIN, University of Illinois Urbana-Champaign — We study statistical properties of the switching current in superconductor-graphene-superconductor proximity junctions and superconductor-nanowire-superconductor devices. The fluctuations of the switching current are related to Little's phase slips, generated by thermal and quantum fluctuations of the superconducting order parameter. The study focuses on higher moments of the statistical probability distributions of the switching current. Namely we study the skewness, which defines the asymmetry of the distribution, and kurtosis, which is a measure of the "peakedness." The skewness is defined as sk= $m_3/m_2^{3/2}$ where m_2 is the second moment of the distribution, called the variance, and m_3 is the third moment. Kurtosis is defined as kur= m_4/m_2^2, where m_4 is the fourth moment of the distribution. It is known that for Gaussian distributions sk=0 and kur=3. On our devices we find, in most cases, sk $\sim$ -1 and kur $\sim$ 5. These results are in agreement with numerical simulations as well as an analytic model. Finally we present preliminary experimental results for a two-nanowire device. We have found that the standard deviation, skewness and kurtosis of the switching current distributions in these devices vary periodically with magnetic field.

Andrew Murphy
University of Illinois Urbana-Champaign

Date submitted: 11 Dec 2012 Electronic form version 1.4