Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Robust 4π periodicity in ballistic graphene Josephson junctions ANNE DRAELOS, CHUNG-TING KE, Duke University, IVAN BORZENETS, University of Tokyo, MING-TSO WEI, ANDREW SEREDENSKI, Duke University, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, RUSSELL DEACON, RIEKEN, MICHIHISA YAMAMOTO, University of Tokyo, YURIY BOMZE, Duke University, SEIGO TARUCHA, University of Tokyo, FRANCOIS AMET, Appalachian State University, GLEB FINKELSTEIN, Duke University — We present direct current magnetic interference measurements on ballistic graphene Josephson junctions. The observed Fabry-Perot cavity is studied by applying a small magnetic field up to 5 mT to modulate the phase of the Josephson junction. Unlike the monotonic behavior at highly doped regions, irregular interference patterns are observed near the Dirac point. For highly doped regions, the uniform distribution of supercurrent can be seen. In the Fabry-Perot cavity region, the supercurrent distribution shows an edge-bulk type alternating feature. This can be understood as cavity quantization off or on resonance. However, an unexpected periodicity doubling is also observed that results in a single electron SQUID interference pattern. Instead of regular h/2e periodicity, a single electron supercurrent state can result in h/e periodicity, which may be observed as 4π periodicity in magnetic interference measurements. This 4π periodicity is seen in several different samples at many back gate locations. Moreover, it is robust against temperature changes.

Anne Draelos
Duke University

Date submitted: 11 Nov 2016 Electronic form version 1.4