Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Determination of time-reversal symmetry breaking lengths in an InGaAs Sagnac interferometer array SHAOLA REN, J.J. HEREMANS, Virginia Tech, C.K. GASPE, S. VIJEYARAGUNATHAN, T.D. MISHIMA, M.B. SANTOS, University of Oklahoma — Time-reversed trajectories in Aharonov-Bohm ring Sagnac interferometers yield AAS oscillations if time-reversal symmetry is preserved. The quantum interference oscillations can be used to quantify time-reversal symmetry breaking, more particularly the mesoscopic dephasing length associated with time-reversal symmetry breaking under applied magnetic field, an effective magnetic length. We measured AAS oscillations with periodicity 13 G, corresponding to h/2e flux in the 650 nm radius rings of a 5 $\times$ 5 Sagnac interferometer array fabricated on a 2D electron system in an InGaAs/InAlAs heterostructure at 0.4 K. The oscillation amplitudes were investigated over magnetic field spanning 2.2 T, with the amplitude estimated by Fourier transform over segments of 0.04 T as optimum between resolution and Fourier signal. As the magnetic field increases, the amplitude decreases due to time-reversal symmetry breaking by the magnetic flux in the interferometer arms. A dephasing model for coherent networks allows extraction of the effective magnetic length. In wide diffusive system this length corresponds theoretically and experimentally to the usual magnetic length, whereas the data show that corrections enter for ballistic quasi-1D systems (DOE DE-FG02-08ER46532, NSF DMR-0520550).

Shaola Ren
Virginia Tech

Date submitted: 13 Nov 2014 Electronic form version 1.4