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Measurements of the normal state persistent current in Au rings at high and low magnetic fields[1] IVANA PETKOVIC, DUSTIN NGO, ANTHONY LOLLO, JACK HARRIS, Department of Physics, Yale University — Flux biased normal metal rings smaller than the phase coherence length can sustain persistent current (PC). We employ cantilever torque magnetometry to detect PC with high sensitivity, efficient background rejection, and in an electromagnetically clean environment. Previously, our group focused on the high magnetic field regime, where the PC is well described by single-particle theory. However at low magnetic field (few flux quanta) interaction effects are expected to be dominant. Previous low field studies by other groups employing SQUID and resonator-based techniques have found that Au, Ag, Cu, and GaAs rings show a large diamagnetic average PC, indicative of attractive e-e interactions. One possible explanation is that the superconductivity that would normally arise from this interaction is suppressed by a small number of magnetic impurities ($\sim$ 1 ppm), while the interaction-enhanced persistent current is not [1]. In this talk we will describe measurements of Au rings. We have fabricated arrays of 100,000 rings with 125 nm radius on ultrasensitive silicon cantilevers. At high magnetic fields, we find that the PC agrees with single-particle theory. We also describe the results at low field, expected to give further insight into the many body ground state of this system.

[1] H. Bary-Soroker, O. Entin-Wohlman and Y. Imry, Phys. Rev. Lett. 101, 057001 (2008).

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