Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Vortex blockade and conductance fluctuations of superconducting strips in magnetic fields PAUL GOLDBART, University of Illinois at Urbana Champaign, GIL REFAEL, California Institute of Technology, DAVID PEKKER, Harvard University — Recent experiments on the conductance of a thin, narrow superconducting strip found periodic fluctuations as a function of the perpendicular magnetic field, with the period corresponding to approximately two flux quanta per strip area [1]. Using vortex-charge duality, we explore the possibility that the superconducting strip is the dual of a quantum dot, with vortices playing the role of the electrons, the magnetic field appearing as the gate voltage, and the applied current replacing the source-drain voltage. As with a quantum dot, extrema of the conductance are obtained when configurations with n and $n+1$ vortices have equal energy; in the bias-current versus magnetic-field plane, the conductance displays blockade diamonds. Furthermore, we find that there is a simple relation between the linear-response conductance and the critical current, as they are both set by the barrier to vortex tunneling on to and off of the strip. [1] A. Johansson et al. Phys. Rev. Lett. 95, 116805 (2005).

David Pekker
Harvard University

Date submitted: 21 Nov 2008 Electronic form version 1.4