Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Imaging Spatial Current Eigenmodes in Nanoscopic Quantum Networks[1] TANKUT CAN, University of Chicago, DIRK MORR, University of Illinois-Chicago — Using the Keldysh Green's function formalism, we study the non-equilibrium charge transport in nanoscopic quantum networks [1]. Due to quantum confinement, charge transport takes place via current eigenmodes that possess characteristic spatial patterns of current paths. In the ballistic limit, these patterns exhibit unexpected features such as current backflow and closed loops of circulating currents. These current eigenmodes are the non-equilibrium analogue of eigenmodes in the local density of states of confined systems [2]. Moreover, we demonstrate that dephasing leads to a smooth evolution of the current patterns, and ultimately reproduces the charge transport in a classical resistor network. Finally, we propose a new method using scanning tunneling spectroscopy to image the spatial current patterns associated with individual current eigenmodes in nanoscopic quantum networks.

[1] T. Can, H. Dai, and D.K. Morr, in preparation
[2] M. Crommie, C. Lutz, and D. Eigler. Confinement of electrons to quantum corrals on a metal surface. Science, 262, 1993.

[1]This work is supported in part by the U.S. Department of Energy under Award No. DE-FG02-05ER46225. T.C. is supported by a Department of Education GAANN fellowship.

Tankut Can
University of Chicago

Date submitted: 19 Dec 2011 Electronic form version 1.4