Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Conduction of Ultracold Fermions Through a Mesoscopic Channel DAVID STADLER, JEAN-PHILIPPE BRANTUT, JAKOB MEINEKE, SEBASTIAN KRINNER, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich, QUANTUM OPTICS TEAM — In a mesoscopic conductor electric resistance is detected even if the device is defect-free. We engineer and study a cold-atom analog of a mesoscopic conductor. It consists of a narrow channel connecting two macroscopic reservoirs of fermions that can be switched from ballistic to diffusive. We induce a current through the channel and find ohmic conduction, even for a ballistic channel. An analysis of in-situ density distributions shows that in the ballistic case the dissipation is localized at the entrance and exit of the channel, revealing the presence of contact resistance. In contrast, a diffusive channel with disorder displays dissipation over the whole channel. Our approach opens the way towards quantum simulation of mesoscopic devices with quantum gases.

David Stadler
Institute for Quantum Electronics, ETH Zurich

Date submitted: 27 Jan 2012 Electronic form version 1.4