MAR13-2012-020137

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

Conduction properties of strongly interacting Fermions

JEAN-PHILIPPE BRANTUT, ETH Zürich

We experimentally study the transport process of ultracold fermionic atoms through a mesoscopic, quasi two-dimensional channel connecting macroscopic reservoirs. By observing the current response to a bias applied between the reservoirs, we directly access the resistance of the channel in a manner analogous to a solid state conduction measurement. The resistance is further controlled by a gate potential reducing the atomic density in the channel, like in a field effect transistor. In this setup, we study the flow of a strongly interacting Fermi gas, and observe a striking drop of resistance with increasing density in the channel, as expected at the onset of superfluidity. We relate the transport properties to the in-situ evolution of the thermodynamic potential, providing a model independant thermodynamic scale. The resistance is compared to that of an ideal Fermi gas in the same geometry, which shows an order of magnitude larger resistance, originating from the contact resistance between the channel and the reservoirs. The extension of this study to a channel containing a tunable disorder is briefly outlined.