Abstract Submitted for the DAMOP17 Meeting of The American Physical Society

Imaging transport of ultracold atoms through a quantum wire SAMUEL HAUSLER, MARTIN LEBRAT, DOMINIK HUSMANN, LAURA COR-MAN, SEBASTIAN KRINNER, ETH Zurich, SHUTA NAKAJIMA, Kyoto University, JEAN-PHILIPPE BRANTUT, EPFL Lausanne, TILMAN ESSLINGER, ETH Zurich — We report on a scanning gate technique to experimentally image the transport of fermionic lithium atoms through a quantum wire, similar to what is applied to solid state devices. The gate is created with a tightly focused repulsive laser beam whose aberrations are holographically corrected. By scanning its position over the wire and measuring the subsequent variations of conductance, we spatially map the transport at a resolution close to the transverse wave function of atoms inside the channel. The gate extends on the scale of the Fermi wavelength making it sensitive to quantum tunneling. Furthermore, our knowledge of the optical potential allows a direct comparison with an analytical and a numerical model for non-interacting particles. The flexibility offered by programmable holograms make it relatively simple to imprint more complex structures, such as a one-dimensional lattice inside the wire. This opens the path to study metal-insulator physics with strong attractive interactions.

> Samuel Hausler ETH Zurich

Date submitted: 03 Feb 2017

Electronic form version 1.4