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Transport of ultracold atoms through a quantum point contact SAMUEL HUSLER, MARTIN LEBRAT, DOMINIK HUSMANN, LAURA CORMAN, SEBASTIAN KRINNER, ETH Zurich, CHARLES GRENIER, ENS Lyon, JEAN-PHILIPPE BRANTUT, EPFL Lausanne, TILMAN ESSLINGER, ETH Zurich — We explore transport of neutral particles through a quantum point contact with tunable interactions. The contact is optically imprinted onto the center of a cigar-shaped cloud of fermionic lithium 6 atoms connected to macroscopic reservoirs on each side. We create a particle, spin or temperature bias between the reservoirs and measure the induced conductance. At weak attractive interactions we observe quantized particle conductance at multiples of 1/h, an upper bound for Fermi liquid reservoirs. Upon increasing attraction the plateaus contineously increase to non-universal values as high as 4/h before the gas becomes superfluid. At stronger interactions, the plateaus in the particle conductance disappear while spin transport is suppressed, signaling the emergence of superfluid pairing. The anomalous quantization challenges a Fermi liquid description of the normal phase, shedding new light on the strongly attractive gas. Complementary to particle and spin transport we study the thermoelectric response to a temperature gradient between the reservoirs. We observe that resonant interactions strongly modify the particle and energy evolution compared to the weakly attractive case.

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