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Non-linear superflow of a unitary Fermi gas through a quantum point contact MARTIN LEBRAT, DOMINIK HUSMANN, ETH Zurich, SHUN UCHINO, RIKEN Center for Emergent Matter Science, SEBASTIAN KRINNER, SAMUEL HÄUSLER, JEAN-PHILIPPE BRANTUT, ETH Zurich, THIERRY GIAMARCHI, University of Geneva, TILMAN ESSLINGER, ETH Zurich — Point contacts provide simple connections between macroscopic particle reservoirs. In electric circuits, strong links between metals, semiconductors, or superconductors have applications for fundamental condensed-matter physics as well as quantum information processing. However, for complex, strongly correlated materials, links have been largely restricted to weak tunnel junctions. We studied resonantly interacting Fermi gases of ^{6}Li atoms connected by a tunable, ballistic quantum point contact, finding a nonlinear current-bias relation. At low temperature, our observations agree quantitatively with a theoretical model in which the current originates from multiple Andreev reflections. In a wide contact geometry, the competition between superfluidity and thermally activated transport leads to a conductance minimum. Our system offers a controllable platform for the study of mesoscopic devices based on strongly interacting matter.

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