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【406】Observing superfluid current through a dissipative quantum point contact

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We experimentally and theoretically investigate the robustness of fermionic superfluidity to spin-dependent dissipation in a unitary Fermi gas. We measure the influence of local, controllable particle loss on the superfluid flow that occurs at a quantum point contact connecting two superfluid reservoirs. This flow is characterized by a non-Ohmic current-bias relation due to multiple Andreev reflections (MAR). Instead of a critical dissipation strength, we find the supercurrent decaying smoothly with increasing dissipation, indicating surprising robustness of MAR. A mean-field model qualitatively reproduces our observations. Our current work extends to pure spin transport under dissipation. These results are relevant for dissipative engineering of transport properties and understanding dissipative non-equilibrium superfluid systems.

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