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# DC transport in a dissipative superconducting quantum point contact

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We study theoretically and experimentally the charge transport through a dissipative quantum point contact between two fermionic superfluids. Superconducting junctions are known to exhibit multiple Andreev reflections - a high-order cotunneling of a quasiparticle together with multiple Cooper pairs - which gives rise to a current at chemical potential biases below the energy gap. An interesting question is the fate of such a high-order coherent process in the presence of dissipation. To study this theoretically, we develop a model with a local particle loss as a dissipation mechanism and compute the DC particle current and loss rate using the Keldysh formalism. We find that the current generated by the seemingly delicate high-order tunneling is surprisingly robust to particle losses [1]. This result agrees with experimental data measured in a cold-atom transport setup with a lossy quantum point contact between two fermionic superfluid reservoirs. We apply a pair-breaking, spin-dependent dissipation at the contact and observe that the excess current characteristic of superfluidity survives even at dissipation strength larger than the superfluid gap [2].

[1] A.-M. Visuri et al., arXiv:2304.00928
[2] M.-Z. Huang et al., Phys. Rev. Lett. 130, 200404 (2023)

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