

Abstract Submitted
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Current fluctuations in rough Josephson tunnel junctions¹

FRANK WILHELM, GEORG HEINRICH, University of Waterloo — The barrier material of superconducting tunnel junction has become the focus of interest as there is evidence that it limits the intrinsic quantum coherence of superconducting qubits. It is also potentially responsible for $1/f$ noise in SQUIDs. We study the model of a “sieve” junction of many opaque transport channels plus few pinholes, modeling a rough tunnel barrier. Even if the pinholes have a small effect on the subgap current, they completely dominate the shot noise at low voltages. Remarkably, even a fully open pinhole contributes shot noise because the size of the charge quantum it carries is uncertain. The full-counting statistics of charge transfer leads to a multimodal distribution. It is discussed, to what extent this distribution can be interpreted as the onset of telegraph or $1/f$ noise. This theoretical work is based on an extensive full counting statistics calculation using Keldysh Green’s function.

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