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Critical current noise in rough Josephson junctions[1] PIERRE-LUC DALLAIRE-DEMERS, FRANK WILHELM, University of Waterloo — While dissipationless, Josephson junctions as elements in superconducting nanocircuits are plagued by intrinsic noise mechanisms that will limit the coherence time of future high-precision quantum devices. Important sources of noise may arise from the noncristallinity and disorder of the oxide layer sandwiched between the two superconducting leads. This work presents a microscopic calculation of the spectral density of noise of a rough superconducting tunnel junction. As for disordered conductors, a Josephson junction is modeled as a set of pinholes with a universal bimodal distribution of transmission eigenvalues that add their noise power incoherently. Each of these pinholes is treated as a ballistic point contact with an intrinsic thin barrier that modulates the transmission coefficient. The noise spectrum is computed using the quasiclassical Green's function method for superconductivity. This formalism allows us to investigate high and low transmission limits at finite temperature for any relevant frequency. As suggested by experiments, low transmission pinholes are expected to generate shot noise while fast switching between the subgap states of high transmission channels should create a strong non-poissonian low-frequency noise yet to be measured.

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