Fluctuation-dissipation relations of a tunnel Junction driven by a quantum circuit

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Abstract

We derive fluctuation-dissipation relations for a tunnel junction driven through a resonator displaying strong quantum fluctuations. We find that the fluctuation-dissipation relations derived for classical external drives hold, provided the effect of the circuit’s quantum fluctuations is incorporated into the modified nonlinear current voltage characteristics. We also demonstrate that all quantities measured under a time dependent bias can be reconstructed from their values measured under a dc bias using photoassisted tunneling relations. We confirm these predictions by implementing the circuit and measuring the dc current through the junction, its high frequency admittance, and its current noise at the frequency of the resonator.

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