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Pure dephasing from quasiparticle tunneling in superconducting qubits GIANLUIGI CATELANI, Yale University — Quasiparticles tunneling across Jospehson junctions provide an intrinsic decoherence mechanism in superconducting qubits. The quasiparticle current spectral density $S_{\rm qp}(\omega)$ determines both the relaxation rate and the pure dephasing rate. The latter is in general proportional to the the spectral density evaluated at zero frequency. In the case of quasiparticle, however, $S_{\rm qp}(\omega)$ diverges logarithmically as frequency goes to zero, potentially leading to very fast dephasing. Here we show how to regularize this divergence in a self-consistent way. This enable us to estimate the dephasing rate due to quasiparticle tunneling and to study its magnetic flux dependence for various qubit designs.

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