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Energy Decay from Nonequilibrium Quasiparticles in Josephson Qubits M. LENANDER, UC Santa Barbara, H. WANG, R. BIALCZEK, E. LUCERO, M. MARIANTONI, M. NEELEY, A. O'CONNELL, D. SANK, M. WEIDES, J. WENNER, T. YAMAMOTO[1], Y. YIN, A. CLELAND, J. MARTINIS — Nonequilibrium quasiparticle excitations are thought to be an important source of decoherence in Josephson qubits. We present a theory for resonators and qubits that predicts energy decay proportional to the quasiparticle density. Our theory computes a non-thermal energy spectrum for a generic quasiparticle source at higher energy. Using prior experimental measurements of quasiparticle density, the theory predicts decay rates that are roughly consistent with phase qubit and resonator energy decay times. We will also present experimental data comparing the decay rate to the fractional shift in frequency when quasiparticles are directly injected into the system. With basic agreement between theory and experiment, we hope to develop methods for improving qubit design and to show whether careful measurements can bound the contribution to energy decay from quasiparticles.

[1]NanoElectronics Research Laboratories, NEC Corporation, Japan

Michael Lenander
UC Santa Barbara

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