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Energy Decay in Josephson Qubits from Off-Resonant Coupling to Two-Level States J. MARTINIS, M. ANSMANN, R. BIALCZEK, N. KATZ, E. LUCERO, UC Santa Barbara, R. MCDERMOTT, University of Wisconsin-Madison, M NEELEY, A. O'CONNELL, M. STEFFEN, E. WEIG, A. CLELAND, UC Santa Barbara — Decoherence of Josephson qubits is thought to be protected from dielectric loss of two-level states by using sub-micrometer tunnel junctions that statistically avoids resonant coupling. Here, we calculate that off-resonant coupling and the subsequent phonon radiation of the two-level states may produce significant energy loss even for ultra-small junctions. This theory possibly explains several key features in a variety of experimental data for phase, flux, and charge qubits, such as the magnitude of the observed energy decay time, its statistical variation, and the increased decay rate with qubit area and frequency.

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