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Energy Relaxation in Josephson Phase Qubits[1] RAYMOND SIMMONDS, K. CICAK, S. OH, K. OSBORN, J. A. STRONG, D. P. PAPPAS, NIST, Boulder, M. ANSMANN, K. B. COOPER, R. MCDERMOTT, M. STEFFEN, JOHN M. MARTINIS, UC Santa Barbara — The characteristic energy relaxation time T_1 of any "isolated" quantum system depends on the degree of isolation, or the strength with which a number of "environmental" degrees of freedom couple to that system. In order for superconducting based quantum bits to be a viable technology for quantum computing, these systems must be sufficiently isolated from their environment to enable them to undergo relatively undisturbed quantum evolutions. Additionally, they must be controlled precisely in order to perform quantum operations. This operation time is ultimately limited by the single qubit T_1 time. Recently, we have investigated a number of different Josephson phase qubit design geometries in order to identify what, where, and how environmental degrees of freedom couple to individual qubits, reducing T_1. These measurements will help to improve the operation of future coupled phase qubit systems.

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