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Long coherence time in a superconducting persistent-current qubit JONAS BYLANDER, SIMON GUSTAVSSON, Massachusetts Institute of Technology, FUMIKI YOSHIHARA, KHALIL HARRABI, The Institute of Physical and Chemical Research (RIKEN), Wako, Saitama 351-0198, Japan, YASUNOBU NAKAMURA, JAW-SHEN TSAI, Nano Electronics Research Laboratories, NEC Corporation, Tsukuba, Ibaraki 305-8501 and RIKEN, Wako, Saitama 351-0198, Japan, WILLIAM D. OLIVER, MIT Lincoln Laboratory — We report relaxation times T_1 in excess of 10 μs in aluminum persistent-current qubits (flux qubits), read out by a switching dc SQUID. At the sweet spot in flux bias, spin-echo refocusing gives a relaxation-limited coherence time $T_2 = 2T_1$. The free-induction decay time constant T_2^* reaches 2.5 μs. Detuning the quantization axis away from this optimal point, the much-increased sensitivity to flux noise enhances the phase-decay rate. We confirm the Gaussian phase decay indicative of flux noise with a nearly $1/f$ spectral density, as well as the magnitude of the noise reported in ref. [1]. Contrary to dephasing, the relaxation rate has weak dependence on quantization axis (flux-bias). Finding the microscopic mechanism for T_1 relaxation remains one of the most important topics in superconducting qubit research.
[1] Yoshihara *et al.*, PRL **97**, 167001 (2006)

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