Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Non-exponential energy decay and quasi-particle fluctuations in a superconducting flux qubit SIMON GUSTAVSSON, FEI YAN, MIT, GIANLUIGI CATELANI, Forschungszentrum Ju?lich, Germany, ARCHANA KAMAL, MIT, JONAS BYLANDER, Chalmers University of Technology, Sweden, FUMIKI YOSHIHARA, NICT, Japan, YASUNOBU NAKAMURA, The University of Tokyo, Japan, TERRY ORLANDO, MIT, WILLIAM OLIVER, MIT Lincoln Laboratory
— We measure pronounced non-exponential energy relaxation in a superconducting flux qubit, observing a decay function that exhibits a fast initial decay followed by a much slower decay for long times. When applying a sequence of pi pulses to the qubit and measuring the decay after the last pi pulse, we observe strong modifications to the decay function, including a slow-down of the fast initial decay and a three-fold increase of the 1/e-time. If we attribute the non-exponential decay to quasiparticle number fluctuations, we speculate that the improvements in T1 are due to a qubit-mediated shuffling of quasiparticles between the metallic islands of the device, which will eventually pump them away from the Josephson junctions to a larger ground plane where their contribution to qubit energy relaxation become negligible.

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Date submitted: 14 Nov 2014 Electronic form version 1.4