Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Josephson Phase Qubit as a Flux-Noise Spectrum Analyzer DANIEL SANK, RADOSLAW BIALCZAK, MIKE LENANDER, ERIK LUCERO, MATTEO MARIANTONI, MATTHEW NEELEY, AARON O'CONNELL, HAOHUA WANG, MARTIN WEIDES, JAMES WENNER, TSUYOSHI YAMAMOTO[1], YI YIN, ANDREW CLELAND, JOHN MARTINIS, UCSB — Increasing the phase coherence time of the Josephson phase qubit will require understanding and eliminating magnetic flux noise. Although this noise was first observed in SQUIDs thirty years ago, its origin has been elucidated only recently. We will show that a qubit can be used to measure the power spectrum of the flux noise from about 0.001 Hz to 100 MHz, a range of eleven orders of magnitude in frequency. At MHz frequencies we use the noise filtering property of Rabi oscillation decays. For low frequencies we introduce an improvement over a previous schemes, the "Ramsey Tomography Oscilloscope," based on repeated Ramsey fringe decays, which should be easy to implement in other qubit architectures. The integrated noise over intermediate frequencies is also measured using a traditional decay envelope of Ramsey fringes. We believe these measurements of the noise spectrum will place constraints on the appropriate microscopic model of the flux noise.

[1]NanoElectronics Research Laboratories, NEC Corporation, Japan

Daniel Sank
UCSB

Date submitted: 18 Dec 2009 Electronic form version 1.4