Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Dispersive Microwave Readout of NanoSQUIDs R. VIJAY, AIDIN FATHALIZADEH, IRFAN SIDDIQI, QNL, Department of Physics, University of California, Berkeley, CA 94720, MICHAEL HATRIDGE, JOHN CLARKE, University of California, Berkeley and Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720 — Superconducting quantum interference devices (SQUIDs) based on Josephson tunnel junctions have long been used as sensitive magnetic flux detectors. NanoSQUIDs, which use submicron weak link junctions for enhanced flux coupling, are attractive candidates for magnetic measurements of molecules. We present a novel method for nanoSQUID readout which involves embedding the SQUID in a superconducting transmission line cavity operating at microwave frequency. The magnetic flux dependence of the total SQUID inductance modulates the cavity resonant frequency; these frequency changes are determined using microwave reflectometry. This dispersive microwave measurement allows detection of changes in magnetic flux at submicrosecond timescales without creating dissipation in the vicinity of the molecule. Moreover, we can exploit the Josephson nonlinearity of the nanoSQUID for bifurcation amplification to enhance sensitivity. Optimization of the nanoSQUID design and cavity parameters for maximizing detector sensitivity and bandwidth is discussed. We also discuss the various sources of noise in this measurement scheme and how to minimize their impact. This work is supported by AFOSR and USDOE.

Rajamani Vijayaraghavan
QNL, Department of Physics, UC Berkeley, Berkeley CA 94720

Date submitted: 19 Dec 2008 Electronic form version 1.4