Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 17.1.1 (E)

Measurement-induced qubit state mixing from upconverted low frequency noise[1] D.H. SLICHTER, R. VIJAY, S.M. WEBER, I. SIDDIQI, UC Berkeley, QNL — We observe readout-induced qubit state mixing in a flux-tunable transmon qubit coupled to a planar resonator. Our results indicate that dephasing noise at the qubit-cavity detuning frequency Δ is upconverted by photons in the readout cavity, causing spurious qubit state transitions in agreement with theory [1]. Using a superconducting parametric amplifier to perform continuous high-fidelity qubit measurement, we characterize the transition rate dependence on cavity photon population and the intensity of added low frequency noise injected from a broadband fast flux excitation line. From the remnant excitation rate in the absence of added noise, we extract a noise spectral density at frequencies ~ 1 GHz. We also measure the noise spectral density from 0.02-0.5 Hz and 1-20 MHz using Ramsey fringes and Rabi oscillations, respectively. Postulating that flux noise is the dominant source of dephasing in our qubit, we fit the measured noise to a $1/f^{\alpha}$ power law, finding a slope $\alpha = 0.6$ and amplitude $(1.4\mu\Phi_0)^2$/Hz at 1 Hz. These values are in agreement with other measurements of low-frequency flux noise. Our results suggest that 1/f flux noise persists to GHz frequencies.

[1] Boissonneault et al., PRA 79, 013819 (2009).

[1]This research was supported by the ARO QCT program.

- [X] Prefer Oral Session
- [ ] Prefer Poster Session

Daniel Slichter
slichter@berkeley.edu
UC Berkeley, QNL

Date submitted: 15 Dec 2011

Electronic form version 1.4