Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 17.1.1 (E)

Geometric Phases, Noise and Non-adiabatic Effects in Multi-level Superconducting Systems S. BERGER, M. PECHAL, A.A. ABDUMALIKOV, L. STEFFEN, A. FEDOROV, A. WALLRAFF, S. FILIPP, ETH Zurich — Geometric phases depend neither on time nor on energy, but only on the trajectory of the quantum system in state space. In previous studies [1], we have observed them in a Cooper pair box qubit, a system with large anharmonicity. We now make use of a superconducting transmon-type qubit with low anharmonicity to study geometric phases in a multi-level system. We measure the contribution of the second excited state to the geometric phase and find very good agreement with theory treating higher levels perturbatively. Furthermore, we quantify non-adiabatic corrections by decreasing the manipulation time in order to optimize our geometric gate. Geometric phases have also been shown to be resilient against adiabatic field fluctuations [2]. Here, we analyze the effect of artificially added noise on the geometric phase for different system trajectories.
[1] P. J. Leek *et al.*, *Science* **318**, 1889 (2007)
[2] S. Filipp *et al.*, *Phys. Rev. Lett.* **102**, 030404 (2009)

Simon Berger
sberger@phys.ethz.ch
ETH Zurich

[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 28 Dec 2011 Electronic form version 1.4