

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Observation of Berry's Phase in a Superconducting Qubit P.J.

LEEK, J.M. FINK, Department of Physics, ETH Zurich, A. BLAIS, Departement de Physique, Universite de Sherbrooke, R.J. SCHOELKOPF, Departments of Applied Physics and Physics, Yale University, A. WALLRAFF, Department of Physics, ETH Zurich, ETH QUANTUM DEVICE TEAM, YALE CIRCUIT QED TEAM — In quantum information science, the phase of a wavefunction plays an important role in encoding information. While most experiments in this field rely on dynamic effects to manipulate this information, an alternative approach is to use geometric phase, which has been argued to have potential fault tolerance [1]. Here we demonstrate the controlled accumulation of a geometric phase, Berry's phase, in a superconducting qubit, manipulating the qubit geometrically using microwave radiation, and observing the accumulated phase in an interference experiment [2]. This is achieved utilising the excellent phase coherence and qubit control possible in Circuit QED [3]. We find excellent agreement with Berry's predictions, and also observe a geometry dependent contribution to dephasing.

[1] J.A. Jones et al, Nature 403, 869 (2000)

[2] P.J. Leek et al, Science, 22 November 2007 (10.1126/science.1149858)

[3] A. Wallraff et al, Nature 431, 162 (2004)

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Date submitted: 04 Dec 2007

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