Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Visualizing singularities of a groundstate landscape using superconducting circuits ERIK LUCERO, Google, Inc., A. DUNSWORTH, UCSB, P. ROUSHAN, A. MEGRANT, Google, Inc., C. NEILL, UCSB, T. SOUZA, M. TOMKA, M. KOLODRUBETZ, Boston University, Y. CHEN, R. BARENDS, Google, Inc., B. CAMPBELL, Z. CHEN, B. CHIARO, UCSB, E. JEFFREY, J. KELLY, J. MUTUS, Google, Inc., P. O'MALLEY, C. QUINTANA, UCSB, D. SANK, Google, Inc., J. WENNER, UCSB, T. WHITE, Google, Inc., A. POLKOVNIKOV, Boston University, J. MARTINIS, Google, Inc. — The defining properties of condensed matter phases are set by their groundstate wavefunctions. The adiabatic theorem provides an experimental approach for realizing such states. However, a general protocol for applying this theorem is experimentally unexplored, in particular when the energy gap is small. Using two superconducting qubits, we adiabatically prepare the entire groundstate manifold in a region of the parameter-space where degeneracies are present. We prepare these states by varying the Hamiltonian along 'geodesics' in parameter-space, obtained by minimizing the local non-adiabatic error. From the measured total magnetization of the final state, we compute the Berry curvature, where degeneracies appear as singular points, allowing us to directly visualize the degeneracies in the groundstate landscape.

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Date submitted: 05 Nov 2015 Electronic form version 1.4