

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Measuring the Quantum Capacitance of a Differential Single Cooper-Pair Box¹ MATTHEW SHAW, JUSTIN SCHNEIDERMAN, University of Southern California, PER DELSING, Chalmers University of Technology, Microtechnology and Nanoscience, MC2, HANS BOZLER, University of Southern California, PIERRE ECHTERNACH, Jet Propulsion Laboratory, California Institute of Technology — We present a simple method for measuring the quantum capacitance (QC) of a charge qubit based on a Differential Single Cooper-Pair Box using a Differential Radio-Frequency Single Electron Transistor. Measurement of the QC, which is proportional to the second derivative of the energy bands, can in principle be used for state readout at the degeneracy point, where decoherence due to charge fluctuations is at a minimum. The QC is measured by examining the response of the qubit to a small-amplitude AC excitation. Using this technique, we make an independent measurement of the qubit energy relaxation time. Although we have performed this experiment with a differential SCB and differential charge readout, the technique can easily be applied to a conventional SCB.

¹This work was made possible by a grant from the National Security Agency.

Matthew Shaw
University of Southern California

Date submitted: 30 Dec 2005

Electronic form version 1.4