Abstract Submitted for the MAR06 Meeting of The American Physical Society

Violation of Bell's Inequality using Josephson Phase Qubits MARKUS ANSMANN, R. BIALCZAK, N. KATZ, E. LUCERO, R. MCDER-MOTT, M. NEELEY, M. STEFFEN, E.M. WEIG, A.N. CLELAND, J.M. MARTI-NIS, UC Santa Barbara — Recent improvements of the measurement visibility and coherence times in Josephson Phase Qubits have enabled first tests of two- qubit quantum gates and examination of quantum phenomena using these devices. Here, we present an experiment in which we attempt to violate Bells Inequality, which would be further proof that the system at hand behaves in a truly quantum mechanical way. The violation of Bells Inequality is the primary argument against the possible existence of a hidden- variable-theory as an alternative to quantum mechanics. This experiment illustrates the use of coherent control over capacitatively coupled qubits with always-on coupling, including the establishment of the system in eigenstates of the coupling, e.g. the singlet state. Single qubit rotations combined with a simultaneous, fast, high-visibility readout allow for state- tomography on the system.

> John Martinis UC Santa Barbara

Date submitted: 02 Dec 2005

Electronic form version 1.4