Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Tunable quantum beam splitters for quantum manipulation of a hybrid tripartite qubit system[1] G.Z. SUN, J. CHEN, P.H. WU, Research Institute of Superconductor Electronics, School of Electronic Science and Engineering, Nanjing University, X.D. WEN, Y. YU, Department of Physics, Nanjing University, Nanjing 210093, China, B. MAO, S.Y. HAN, Department of Physics and Astronomy, University of Kansas, Lawrence, KS 66045, USA — We demonstrated coherent control of quantum states in a tripartite system consisting of a superconducting qubit and two microscopic two-level states (TLS). An initially prepared qubit state was swept through qubit-TLS avoided crossings in the energy-level spectrum. The avoided crossings act as tunable quantum beam splitters of wave function. In an analogy to optics, the transmission coefficient of the beam splitters can be varied from zero to unity or any value in between by adjusting the rate of energy sweep. When performed within the decoherence time, consecutive crossings through the beam splitters lead to coherent quantum oscillations between the quantum states of the tripartite qubit-TLS system. This Landau-Zener-Stueckelberg interference controlled by the sweeping rate provides an alternative means to manipulate multiple qubits and demonstrates macroscopic quantum coherence.

[1]Supported by NCET, NSFC, the MOST of China (2011CB922104), NSF (DMR-0325551), and DMEA (H94003-04-D-0004-0149).

Yang Yu
Department of Physics, Nanjing University, China

Date submitted: 23 Nov 2010 Electronic form version 1.4