Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Double quantum dot coupled to a superconducting single-electron transistor for measurement of back action MADHU THALAKULAM, Rice University, Houston, TX 77005, JOEL STETTENHEIM, A. J. RIMBERG, Dartmouth College, Hanover, NH 03755, L.N. PFEIFFER, K. W. WEST, Bell Laboratories, Lucent Technologies Inc., Murray Hill, NJ 079745 — The superconducting single electron transistor SET is a highly sensitive electrometer operating near the quantum limit. The back action current noise of the SET has been a topic of interest ever since the SET was proposed as a readout device for charge or spin based qubits [1]. We study the back-action noise of a superconducting SET by means of an electrostatically coupled double quantum dot (DQD) system. Inelastic current through the DQD is sensitive to the spectral density of voltage fluctuation in its electromagnetic environment [2,3]. By properly choosing the dot size and inter-dot tunnel barrier, one can cause inelastic processes to dominate the transport. A measurement of the inelastic current through the double dot system can then be used to calculate the spectral density of quantum noise associated with the RF-SET and hence its back-action. We have fabricated samples consisting of a DQD formed in a GaAs/AlGaAs heterostructure and strongly coupled to an Al/AlO_x/Al SET. Recent results of measurements on such devices will be discussed. [1] M.H. Devoret and R.J. Schoelkopf, Nature, **406**, 1039(2000). [2]T. Fujisawa et al., Science, **282**, 932 (1998). [3]R. Aguado and L. P. Kouwenhoven, Phys. Rev. Lett., **84**, 1986(2000).

Madhu Thalakulam
Rice University, Houston, TX 77005

Date submitted: 06 Jan 2006 Electronic form version 1.4