Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Dual MOSFET Charge Sensing in PbS Nanocrystal Quantum Dots NIRAT RAY, TAMAR MENTZEL, KENNETH MACLEAN, DARCY WANGER, MOUNGI BAWENDI, MARC KASTNER, Massachusetts Institute of Technology — We use nanoscale metal-oxide-semiconductor field-effect transistors (MOSFETs) as charge sensors for measuring transport in a nearby nanocrystal array. While our technique enables a high resistance measurement, and enables us to probe a wide range of conductance, the main limitations of using single MOSFET charge sensors is the step-like switching of the current caused by electrons tunneling into and out of traps, presumably in the oxide. This makes it difficult to distinguish events that originate in the film from those that originate in the MOSFETs. We use two MOSFETs as simultaneous charge sensors to perform a correlation analysis and distinguish these events. We pattern a 80 nm wide ordered array of PbS nanocrystals, approximately 50 nm away from each sensor, to maximize the signal in the MOSFETs from charge fluctuations in the nanocrystal film. This configuration then enables us to probe electron transport in the nanocrystal array.

Nirat Ray
Massachusetts Institute of Technology

Date submitted: 13 Dec 2011 Electronic form version 1.4