Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Gate control of single-electron spins through Berry Phase in a realistic asymmetric confining potentials in III-V semiconductor Quantum Dots SANJAY PRABHAKAR, JAMES RAYNOLDS, Ualbany Nanoscience — Among recent proposals for next-generation, non-charge-based logic is the notion that a single electron can be trapped and its spin can be manipulated through the application of gate voltages (Rev. Mod. Phys.79, 1217 (2007)). In this talk we present numerical simulations of Berry Phase of electron spins in single electron devices for realistic asymmetric confining potentials in support of experimental work at the University at Albany, State University of New York aimed at the practical development of post-CMOS concepts and devices. We solve the Schrödinger equation including spin-orbit effects using a numerical finite-element based technique. We will discuss the calculation of Berry Phase for electrons (Phys. Rev. B 73, 125330 (2006)) in electrostatically defined quantum dots including the Rashba and Dresselhaus spin-orbit interactions computed numerically from realistic asymmetric confining potentials. The new simulation results open the possibility of spin manipulation through the gate induced Berry phase. This work is supported through funding from the DARPA/NRI INDEX center.

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Date submitted: 20 Nov 2008 Electronic form version 1.4