Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Conductance signatures of spin correlations and quantum phase transitions in parallel quantum dots[1] ARTURO WONG, Ohio U., WILLIAM LANE, Jacksonville U., LUIS DIAS, U. of Sao Paulo, KEVIN INGERSENT, U. of Florida, NANCY SANDLER, SERGIO ULLOA, Ohio U. — Semiconductor quantum dots provide a highly controllable environment to study strongly correlated phenomena and quantum phase transitions (QPT). A parallel double-quantum-dot system, in which dot 1 is in the Kondo regime and dot 2 behaves as a non-interacting resonant level, shows a QPT separating Kondo-screened and local-moment phases [1]. In this work, we use the numerical renormalization-group approach to explore the effect of a nonzero Coulomb interaction U_2 in dot 2. When dot-2 level is fixed at the Fermi energy, a critical value of U_2 separates local-moment and Kondo-screened phases. By contrast, if U_2 is increased keeping particle-hole symmetry in dot 2, the system evolves from a local-moment regime to an underscreened spin-1 regime. Signatures of these behaviors can be experimentally identified through the conductance of the system. We also calculated the spin-spin correlations between the dots and between each dot and the leads to identify how the spin-spin interactions are distributed throughout the structure.
[1] L. G. G. V. Dias da Silva, N. P. Sandler, K. Ingersent, and S. E. Ulloa, Phys. Rev. Lett. 97, 096603 (2006).

[1]Supported by NSF Grant DMR-0710581.

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Date submitted: 27 Dec 2010 Electronic form version 1.4