Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Spin control in Rashba-Aharonov-Bohm quantum dot ring in the Kondo regime.[1] E. VERNEK, UFU-Brasil, N. SANDLER, S. E. ULLOA, Ohio U — Application of small magnetic fields in QDs embedded in Aharonov-Bohm (AB) ring geometries, as well as gate voltages that modify the Rashba spin-orbit interaction (RSOI), are possible experimental probes to control spin transport. One important feature of charge transmission through QDs is the Kondo effect, resulting from the strong Coulomb interactions in the dot and carrier hopping between dot and current leads. Although much work has focused on the Kondo regime in QDs, not much is known on how RSOI modifies charge transport through the dot or its role in spin-transport. Full understanding of RSOI on the Kondo regime is fundamental, as it studies the competition of different coherent phenomena and has potential applications in devices such as spin-filters. A study of this geometry included the role of RSOI perturbatively [1]. However, the full features of Kondo physics are subtle and not captured in perturbation theory. In this work, we present a numerical renormalization group study that addresses charge and spin transport properties in the zero-bias regime, and allows comparisons with perturbation results. We find that the presence of both AB fields and RSOI results in an intrinsic polarizing field that breaks the spin degeneracy. This allows a delicate control of spin polarization of the conductance in the system, while strong RSOI suppresses the Kondo effect.
[1] R. J. Heary et al., PRB 77, 115132 (2008)

[1]Supported by NSF-DMR MWN grant 0710581.

Sergio Ulloa
Ohio University

Date submitted: 20 Nov 2008 Electronic form version 1.4