Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Coulomb Blockade I-V Characteristics in Nanowires[1] SARAH JOY, GUNEETA SINGH-BHALLA, ARTHUR HEBARD, AMLAN BISWAS, SELMAN HERSHFIELD, University of Florida — The current-voltage (I-V) characteristics of manganite nanowires seen in an experiment closely resemble the hallmark I-V curves of the Coulomb blockade. Unlike normal Coulomb blockade curves, these curves have multiple lines instead of one, branching out from the zero current point. In order to discover an explanation for these I-V curves a simulation based on the Coulomb blockade was done for multiple junctions, because the experiments were done in a regime where multiple islands of ferromagnetic material are separated by insulating regions, as a result of intrinsic phase separation. The simulation results show I-V curves that are in good qualitative agreement with the experiment. The branching of I-V curves is due to a large change in resistance between the islands – not a change in the capacitance. Analytic work shows that the change in the junction resistance is too large to be explained by the tunneling magnetoresistance, but consistent with a change in the barrier thickness or composition. Simulations of the effect of gates show that the low voltage regime changes periodically with the gate voltage, while the high voltage regime is independent of gate voltage.

[1]Supported by the U.F. Physics REU program

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Date submitted: 21 Nov 2008 Electronic form version 1.4