Abstract Submitted
for the NWS10 Meeting of
The American Physical Society

Fractal Conductance Fluctuations in Electron Billiards: The Nonlinear Regime IAN PILGRIM, BILLY SCANNELL, MATTHEW FAIRBANKS, RICK MONTGOMERY, University of Oregon, HEINER LINKE, Lund University, RICHARD TAYLOR, University of Oregon — As the characteristic length scale of electronic devices continues to shrink, it is becoming increasingly vital to develop robust models for conduction properties on the mesoscopic scale. In contrast to both the diffusive electron transport processes of the classical world and purely quantum mechanical descriptions of electrons, we treat scales at which electrons may be thought of as following classical trajectories but whose conduction behavior depends on quantum coherence effects. We find that magnetoconductance fluctuations in electron billiards exhibit fractal qualities that reliably follow an empirical pattern in the regime of low applied bias, but which deviate from such behavior in the high-bias regime in not-yet-understood ways.

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Date submitted: 07 Sep 2010 Electronic form version 1.4