Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Applications of R-Matrix Theory to Solid State Devices THUSHARI JAYASEKERA, N. GOEL, MICHAEL MORRISON, KIERAN MULLEN, University of Oklahoma — R-matrix theory is a computationally efficient method for solving quantum collision problems. First introduced in nuclear physics and later applied in atomic and molecular physics, R- matrix theory is also a useful tool for calculating transport properties of solid-state devices. We have improved upon the existing implementations of R-matrix theory in device physics by inroducing boundary conditions that dramatically speed convergence. Moreover, we have extended the R-matrix formalism to scattering systems with very complicated, non-spherical device geometries. This new formalism, which we call "the R-matrix connection formula," can be used to calculate the transport properties of practical solid-state devices. As an application, we calculate the bend resistance of InSb-based four-terminal devices. We compare our results with experimental data from a group at University of Oklahoma. In these experiments, the bend resistance was measured in a four-terminal device with an applied perpendicular magnetic field. A negative bend resistance was measured at zero magnetic field. This work is supported by NSF PHY-0354858, NSF MRSEC DMR- 0080054, and NSF EPS-9720651.

Thushari Jayasekera
University of Oklahoma

Date submitted: 30 Nov 2004 Electronic form version 1.4