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Charge and spin transport in inhomogeneous semiconductor nanostructures using a Boltzmann equation approach[1] DAN CSONTOS, SERGIO E. ULLOA, Department of Physics and Astronomy, and Nanoscale and Quantum Phenomena Institute, Ohio University — We report on a self-consistent computational approach based on the semiclassical, steady-state Boltzmann transport equation and the Poisson equation for the study of charge and spin transport in inhomogeneous semiconductor structures. We treat scattering within the relaxation time approximation, using both constant and realistic energy-dependent scattering rates. We solve the nonlinear, coupled Boltzmann-Poisson system of equations numerically, using finite difference and relaxation methods. In order to consider nonequilibrium spin transport we adopt a two-component model based on two electron distributions, one for spin-up, and one for spin-down electrons, satisfying two *coupled* Boltzmann equations in the presence of spin relaxation. We demonstrate our method by numerical calculations of the transport characteristics of model inhomogeneously doped semiconductor structures.

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