Abstract

Deterministic Computations for Acoustical-Optical-Phonon Collision Boltzmann-Poisson Systems[1]

Irene M. GAMBA

Department of Mathematics
The University of Texas at Austin
Austin, TX
USA

gamba@math.utexas.edu

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The Boltzmann-Poisson system is the most reliable model for the flow of charged particles in semiconductor devices. Real device models have not already been simulated by deterministic computations due to its high computational cost, although is very well known and general practice to solve these models by Monte-Carlo methods.

In this talk we focus in a rather easy and fast deterministic solver for a 50nm and 400nm channel flow for a Si diode.

The system of equations reduces to a linear evolution kinetic (non-local) 1-space 3-velocity dimensional space equation solved by WENO methods coupled with the Poisson equation for the force field acting on the particles. We will focus on the derivation of the method, simulation results for diodes and comparisons to other classical models in the field. In particular we compute, deterministically, the evolution probability density function with its first three moments. Difficulties to go to 2-space dimensions will be discussed.

[1]This work has been done in collaboration with J. A. Carrillo, A. Majorana and C.-W. Shu.