

SIAM/APPLIED AND NUMERICAL ANALYSIS SEMINAR

Date: March 31, 2021

Speaker: Victor DeCaria

Title: A new implicit solver for semiconductor models

Abstract:

We present a new implicit solver for a Boltzmann-Poisson system which models the evolution of electron densities in semiconductor devices. This system is difficult to solve numerically due to the high dimension of the phase space, stiffness arising from collisions, and the potential wide range of time scales which necessitate implicit time integration.

Our main development is a new Schur complement formulation which poses the problem on a reduced dimension, and forms the basis of our new solvers. The reduced memory of the Schur complement enables acceleration of the iterative solvers using Anderson acceleration, which is a nonlinear extension of GMRES.

When collisions are strong, the problem becomes stiff, but the model limits to a lower dimensional drift-diffusion equation. This lets us use a drift-diffusion solver as an inexpensive correction to the full kinetic model, which further accelerates the nonlinear solver.