Department of Mathematics

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Scientific Computing Seminar

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An Asymptotic-Preserving Scheme for the Semiconductor Boltzmann Equation toward the Energy-Transport Limit

Thursday, Sep. 26, 2013
3:00 PM- 4:00 PM
Room 646 PGH

Abstract:

We design an asymptotic-preserving scheme for the semiconductor Boltzmann equation which leads to an energy-transport system for electron mass and internal energy as mean free path goes to zero. To overcome the stiffness induced by the convection terms, we adopt an even-odd decomposition to formulate the equation into a diffusive relaxation system. New difficulty arises in the two-scale stiff collision terms, whereas the simple BGK penalization does not work well to drive the solution to the correct limit. We propose a clever variant of it by introducing a threshold on the stiffer collision term such that the evolution of the solution resembles a Hilbert expansion at the continuous level. Formal asymptotic analysis and numerical results are presented to illustrate the efficiency and accuracy of the new scheme.

This is joint work with Li Wang from UCLA.