数学与系统科学研究院

计算数学所系列学术报告

报告人：　**Prof. Weizhu Bao**

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报告题目：

Numerical Methods and Analysis for Problems in Quantum and Plasma Physics

邀请人：　　周爱辉研究员

报告地点：　　科技综合楼三层 **311**

计算数学所报告厅

Course Outline:

In this short course, efficient and accurate numerical methods and their error estimates are presented for nonlinear dispersive equations with applications in quantum and plasma physics. I will begin with the derivation of the nonlinear Schrodinger equation (NLS) or Gross-Pitaevskii equation (GPE) for modeling Bose-Einstein condensation (BEC) and nonlinear optics, then review its main properties, present numerical methods for computing ground & excited states and dynamics of NLS, and extend these numerical methods for dampled NLS, GPE with angular momentum rotation, coupled GPEs, Schrodinger-Poisson equations, etc. Then I will present and compare different numerical methods for nonlinear wave-type equation, and extend them for nonlinear dispersive coupled systems including Zakharov system for plasma physics, Klein-Gordon-Schrodinger equations, Maxwell-Dirac system, etc. I will also carry out rigorous error estimates for some numerical methods based on the energy method. Finally, emerging applications of these methods for problems arising in quantum and plasma physics will be presented.

In addition, during the second week, I will run discussion and working seminar as well as hand-out exercies in the afternoon.

Course Schedule：

Lecutre 1: 9:00---11:30am, 20 June (Monday)

The derivation of the nonlinear Schrodinger equation (NLS) and its properties

Lecture 2: 9:00---11:30am, 22 June (Wednesday)

Analysis and computation for ground and excited states of NLS

Lecture 3: 9:00-- 11:30am, 24 June (Friday)

Analysis and computation for dynamics of NLS

Lecture 4: 9:00---11:30am, 27 June (Monday)

Error estimates of numerical methods for NLS

Lecture 5: 9:00---11:30am, 29 June (Wednesday)

Numerical methods for nonlinear wave equations and their error estimates

Lecture 6: 9:00---11:30am, 1 July (Friday)

Numerical methods for nonlinear dispersive coupled systems

欢迎大家参加！