

# 学术报告

## **Numerical methods for rotating Klein-Gordon equation in nonrelativistic limit regime**

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**Time:** 14:00-15:00, March 14 (Thursday) 2019

**Venue:** Room 111, Center for Applied Mathematics

**Abstract:** We consider numerics / asymptotics for the rotating nonlinear Klein-Gordon (RKG) equation, an important PDE in relativistic quantum physics that can model a rotating galaxy in Minkowski metric and serves also as a model e.g. for a “cosmic superfluid”. Firstly, we formally show that in the non-relativistic limit RKG converges to coupled rotating nonlinear Schrödinger equations (RNLS), which is used to describe the particle-antiparticle pair dynamics. Investigations of the vortex state of RNLS are carried out. Secondly, we propose three different numerical methods to solve RKG from relativistic regimes to non-relativistic regimes in polar and Cartesian coordinates. In relativistic regimes, a semi-implicit finite difference Fourier spectral method is proposed in polar coordinates where both rotation terms are diagonalized simultaneously. While in non-relativistic regimes, to overcome the fast temporal oscillations, we adopt the rotating Lagrangian coordinates and introduce two efficient multiscale methods with uniform accuracy, i.e. the multi-revolution composition method and the exponential integrator. Various numerical results confirm (uniform) accuracy of our methods. Simulations of vortices dynamics are presented.

欢迎大家参加！