

**Numerical Simulation on Vortex
Dynamics of Bose-Einstein
Condensates**

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Recently, vortex dynamics of Bose-Einstein condensates (BEC) are one of most interesting subjects in Physics. At extremely low temperature, Bose-Einstein condensates can be modelled by the famous Gross-Pitavskii equation(GPE) or coupled Gross-Pitavskii equations (GPEs). We propose a new time-splitting spectral method for the GPE (or GPEs) and study the vortex dynamics of rotating one-component BEC, rotating two-component BEC and spin-1 BEC at a very low temperature. This new numerical method is explicit, unconditionally stable, time reversible, time transverse invariant, and of spectral accuracy in space and second-order accuracy in time. Moreover, it conserves the position density in the discretized level. How to design such a method, detailed numerical study on the efficiency of the method and application of the method to study vortex dynamics will be presented.

Speaker Biography

Dr. Wang was awarded B.S at Central China Normal University in 1996, M.S at Beijing Institute of Technology in 2002 and Ph.D at National University of Singapore in 2006. He was working as a visiting scholar at the Hong Kong University of Science and Technology in 2007. He has done researches on numerical simulation on Bose-Einstein condensation and applications of level set techniques to study dislocation dynamics in material sciences. His primary research interest lies in applying numerical techniques to study emerging problems in physical science and engineering.

Host: Mathematical Imaging and Vision Research Group, Division of Mathematical Sciences, School of Physical and Mathematical Sciences

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