

**CENTER FOR APPLIED MATHEMATICS AND STATISTICS**  
**COLLOQUIUM**

**Mathematical Analysis and Numerical  
Simulation of Bose-Einstein  
Condensation**

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**Abstract**

In this talk, I review the mathematical results of the dynamics of Bose-Einstein condensate (BEC) and present some efficient and stable numerical methods to compute ground states and dynamics of BEC. As preparatory steps, we take the 3D Gross-Pitaevskii equation (GPE) with an angular momentum rotation, scale it to obtain a four-parameter model and show how to reduce it to 2D GPE in certain limiting regimes. Then we study numerically and asymptotically the ground states, excited states and quantized vortex states as well as their energy and chemical potential diagram in rotating BEC. Some very interesting numerical results are observed. Finally, we study numerically stability and interaction of quantized vortices in rotating BEC. Some interesting interaction patterns will be reported.