

Collective dynamics of quantized vortices in superfluidity and superconductivity

Weizhu BAO

National University of Singapore

Abstract : Quantized vortices have been experimentally observed in type-II superconductors, superfluids, nonlinear optics, etc. In this talk, I will review different mathematical equations for modeling quantized vortices in superfluidity and superconductivity, including the nonlinear Schrodinger/Gross-Pitaevskii equation, Ginzburg-Landau equation, nonlinear wave equation, etc. Asymptotic approximations on single quantized vortex state and the reduced dynamic laws for quantized vortex interaction are reviewed and solved approximately in several cases. Colective dynamics of quantized vortex interaction based on the reduced dynamic laws are presented. Extension to bounded domains with different boundary conditions are discussed.