



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学学术报告

Physics Seminars (biweekly)

- Title:** Observation of thermally activated vortex pairs in a quasi-2D Bose gas
- Speaker:** Prof. Yong-il Shin(*Seoul National University*)
- Time:** 3:15pm, Wednesday, May 8, 2013
(2:45~3:15pm, Tea, Coffee, and Cookie)
- Venue:** Conference Hall 322, Science Building, Tsinghua University

Abstract

The Berezinskii-Kosterlitz-Thouless (BKT) theory provides a microscopic mechanism for the 2D phase transition, where vortices with opposite circulation are paired below a critical temperature. The BKT mechanism has been experimentally tested in many 2D systems, but there has been no direct observation of the vortex pairing in a 2D superfluid. In this talk, I will report on the observation of thermally excited vortex pairs in a trapped quasi-2D Bose gas. We measure the in-plane distribution of thermally activated vortices in a trapped quasi-2D Bose gas, where the visibility of density-depleted vortex cores is enhanced by radially compressing the sample before releasing the trap. The pairing of vortices is revealed by the two-vortex spatial correlation function obtained from the vortex distribution. The vortex density decreases gradually as temperature is lowered, and below a certain temperature, a vortex-free region emerges in the center of the sample. This represents a crossover from a Berezinskii-Kosterlitz-Thouless phase with vortex-pair excitations to a vortex-free Bose-Einstein condensate in a finite-size 2D system.