



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告

Physics Seminars (biweekly)

- Title:** Nematic quantum paramagnet in spin-1 square lattice models: possible application to FeSe
- Speaker:** Fa Wang
Peking University
- Time:** 4:00pm, Wednesday, March 25, 2015
(3:30~4:00pm, Tea, Coffee, and Cookie)
- Venue:** Conference Hall 322, Science Building, Tsinghua University

Abstract

For spin-1/2 systems when quantum fluctuations destroy the Neel long-range order and open a spin gap, the resulting state usually breaks the lattice translation and rotation symmetries. This can be understood as reflecting a Berry's phase associated with the magnetic monopole of the Neel order parameter. Here we point out the same Berry phase causes spin-1 systems to spontaneously break the discrete rotational symmetry of the crystal while preserving its translation symmetry. We support this claim by presenting an exactly solvable microscopic model whose ground state is a nematic quantum paramagnet. In addition we derive a field theory to describe the continuous, Landau-forbidden phase transition between a Neel ordered state and a nematic quantum paramagnet, and compare the theory with existing numerical results. We propose that the nematic quantum paramagnetic state captures essential features of bulk FeSe which becomes nematic around 90K but does not develop any spin long range order down to the lowest measured temperature.