



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: Magnetic monopole condensation transition out of quantum spin ice

Speaker: Prof. Gang Chen (*Fudan University*)

Time: 4:00pm, Thursday, Nov 12, 2015

Venue: Conference Hall 322, Science Building, Tsinghua University

Abstract

We study the proximate magnetic orders and the related quantum phase transition out of quantum spin ice (QSI). We apply the electromagnetic duality of the compact quantum electrodynamics to analyze the condensation of the magnetic monopoles for QSI. The monopole condensation transition represents a unconventional quantum criticality with unusual scaling laws. The magnetic monopole condensation leads to the magnetic states that belong to the “2-in 2-out” spin ice manifold and generically have an enlarged magnetic unit cell. We demonstrate that the antiferromagnetic state with the ordering wavevector $Q = 2p(001)$ is proximate to QSI while the ferromagnetic state with the ordering wavevector $Q = (000)$ is not proximate to QSI. This implies that if there exists a direct transition from QSI to the ferromagnetic state, the transition must be strongly first order. We apply the theory to the puzzling experiments on two pyrochlore systems $\text{Pr}_2\text{Ir}_2\text{O}_7$ and $\text{Yb}_2\text{Ti}_2\text{O}_7$.