



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 spinon Anderson localization in a spin-1/2 antiferromagnetic Heisenberg chain
- Speaker:** Prof. Shiyan Li (*Fudan University*)
- Time:** 3:15pm, Wednesday, April 3, 2013
(2:45~3:15pm, Tea, Coffee, and Cookie)
- Venue:** Conference Hall 322, Science Building, Tsinghua University

Abstract

Anderson localization is a general phenomenon of wave physics, which stems from the interference between multiple scattering paths. It was originally proposed for electrons in a crystal, but later was also observed for light, microwaves, ultrasound, and ultracold atoms. Actually, in a crystal, besides electrons there may exist other quasiparticles such as magnons and spinons. However the search for Anderson localization of these magnetic excitations is very rare so far. In this talk, we report the first observation of spinon localization in copper benzoate, an ideal compound of spin-1/2 antiferromagnetic Heisenberg chain, by ultra-low-temperature thermal conductivity and specific heat measurements. We find that the spinons thermal conductivity κ_s manifests linear temperature dependence down to 300 mK. Below 300 mK, κ_s/T decreases rapidly and vanishes at about 100 mK, while the spinon specific heat C_s displays linear temperature dependence all the way down to 50 mK. This result is a clear evidence for Anderson localization of spinons in one-dimensional spin chain. Our finding opens a new window for studying such a fundamental phenomenon in condensed matter physics.

I will also present the heat transport study of the quantum phase transition of an Ising chain in a transverse field, and briefly mention the spinon heat transport in spin liquid.