北京大学量子材料科学中心

International Center for Quantum Materials, PKU

# Weekly Seminar

# Self-localization of a single hole in Mott antiferromagnets


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清华大学高等研究院


**Time**: 4:00pm,Nov 7, 2012 (Wednesday)

**时间**：2012年11月7日 （周三）下午4:00

**Venue**: Room 607, Conference Room A , Science Building 5

**地点**：理科五号楼607会议室

## Abstract


Anderson localization -- quantum suppression of carrier diffusion due to disorders -- is a basic notion of modern condensed matter physics. Here I will talk about a novel localization phenomenon totally contrary to this common wisdom. Strikingly, it is purely of strong interaction origin and occurs without the assistance of disorders. Specifically, by combined numerical (density matrix renormalization group) method and analytic analysis, we show that a single hole injected in a quantum antiferromagnetic ladder is generally self-localized even though the system respects the translational symmetry. The localization length is found to monotonically decrease with the increase of leg number, indicating stronger self-localization in the two-dimensional limit. We find that a peculiar coupling between the doped charge and the quantum spin background causes quantum interference among different hole paths. The latter brings the hole's itinerant motion to a halt, a phenomenological analogy to Anderson localization. Our findings are opposite to the common belief of the quasiparticle picture for the doped hole and unveil a completely new paradigm for lightly doped Mott insulators.


## About the Speaker

1982中国科大物理学士学位， 1987年中国科大物理博士学位，1988 - 2001美国休斯顿大学/德州超导中心博士后、研究助理教授，2001年清华大学高等研究中心教授。现任高等研究院副院长。