北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Unusual "normal state" of cuprates: a Bose liquid descriptions on Bad metal, Non-fermi liquid, kink, and pseudogap phase

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Time: 4: 00 pm, March 21, 2018 (Wednesday)

时间：2018年3月21日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Through thirty years of intensive studies, it has become clear that the key to uncover the puzzle of high-temperature superconductivity in the cuprates is really their unusual non-superconducting "normal state". Particularly in the hole-doped cuprates, the "normal state" is anything but normal. Nearly the entire low-temperature phase diagram are covered by a pseudo-gap phase that does not seem to break any symmetry but partially gaps out the Fermi surface into a Fermi arc. Even above the pseudogap temperature, the observed transport, optical conductivity, ARPES, and STM are all qualitatively distinct from normal metals. It is only fair to conclude that to-date a unified simple physical picture is still not available to explain all these non-fermi liquid "bad metal" behaviors.

This talk will present strong evidences that these seemingly unexplained unusual behaviors are in fact quite generic features of a simple emerged Bose liquid. These include the features in optical conductivity, temperature-linear resistivity, non-Fermi liquid behavior and kinks in the ARPES. The same picture also provides explanation on the demise of superconductivity at low doping, where a new "Bose metal" phase can be realized that is actually the true nature of the pseudogap phase. In essence, these comparisons suggest a new paradigm that cuprates are the simplest prototype of a emerged Bose liquid that describes a big class of strongly correlated condensed matter systems. The intrinsic behaviors of Bose liquid call for a second volume of Solid State Physics textbook parallel to the one for the Fermi liquid.

About the speaker

Wei Ku，上海交通大学致远讲席教授。1991年毕业于台湾淡江大学物理学系，2000年美国田纳西大学物理系获博士学位。2001-2003年在美国加州大学戴维斯分校博士后。2003年受聘为美国布鲁克海文国家实验室研究员并担任美国石溪大学物理系兼任教授。2016年入选国家千人计划全职加入上海交大。主要研究领域为凝聚态理论和量子材料计算，在铁基超导体，电子激发，第一性原理多体计算方法等方向有国际上广为人知的贡献，受邀在国际学术会议作邀请报告100余次。