



Seminar

A cascade of phase transitions in an orbitally mixed half-filled Landau level

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Venue: Room W563, Physics Building, Peking University

地点: 北京大学物理楼 西563

Abstract

Landau levels (LL) in high quality two-dimensional electron systems (2DES) host an array of fractionalized electronic phases whose nature depends on their polarization in competing orbital and spin degrees of freedom. The LL index (N) plays an important role in determining the ground state of a half filled level, with the emergent Fermi-sea that forms in $N=0$ to displaying instabilities towards a gapped phase in $N=1$ and a nematic stripe phase in $N=2$. In this presentation I will discuss the physics of high mobility ZnO-based 2DES at filling factor $n = 5/2$ as the orbital character of electrons is continuously tuned between $N=1$ and 0 character. In stark contrast to the naive expectation of a first-order transition between level-polarized states, a rich cascade of five phases with distinct transport features are resolved as charge is gradually transferred between the two levels. In addition to incompressible (in $N=1$) and compressible (in $N=0$) states, intermediate polarizations witness additional compressible, incompressible and anisotropic nematic phases. The emergence of these unexpected phases in an orbitally mixed regime when the levels are near degeneracy motivates speculation this is a promising system for realizing unanticipated flavors of inter-level coherent states at fractional filling factors.

About the Speaker

Joseph Falson博士, 从事氧化物材料的分子束外延生长和极低温强磁场输运性质研究。2015年在日本东京大学获得博士学位, 此后在德国马克斯普朗克固态研究所从事博士后研究。Joseph Falson博士在ZnO异质结中的分数量子霍尔效应上做出了许多重要工作, 包括首次在ZnO中发现分母为偶数的分数量子霍尔态等, 他已经在Nature Phys., Phys. Rev. Lett., Rep. Prog. Phys. 等杂志发表学术论文30篇, 做会议报告15次, 其中邀请报告3次。