北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Tuning topological semimetals by high magnetic fields

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Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Topological semimetals host low energy excitations that mimic upon suitable renormalization the dynamics of massless relativistic Fermions, the Weyl- and Dirac-fermions. These unusual band structures are associated with exotic physical properties, such as the negative longitudinal magnetoresistance expected to appear from the famous chiral anomaly. This example already hints at the crucial role magnetic fields play at probing topological physics. Going into the high field regime, Landau quantization substantially modifies the electronic excitation spectrum yet the topological character of the band structure is preserved.

Here I will present recent studies on the monopnictide family of Weyl semi-metals (Nb,Ta)(As,P) in magnetic fields up to 95T. These field scales allow us to enter the quantum limit, where only the last Landau level (n=0) is populated. In this regime, the topological character of the underlying band structure is highlighted by the strong difference between the parabolic dispersion of the n=0 Landau level in trivial metals and the linearly dispersing, chiral Landau level of topological systems.

About the speaker

Philip Moll has worked on iron-based superconductors in high magnetic fields during his PhD Thesis with Bertram Batlogg at ETH in Zurich, Switzerland. During this time, he investigated spatially modulated superconductivity in these layered compounds, and its influence on their vortex matter. Then he joined UC Berkeley as a postdoc working with James Analytis on topological semi-metals. He studied the influences of the toplogical Fermi-arc states on the electric transport in mesoscale Dirac semi-metals. Starting as a research group leader at the Max-Planck-Institute CPFS in Dresden, Germany, he focused on ultra-pure metals and the emergence of novel hydrodynamic transport regimes. Recently, he has joined EPFL in Lausanne, Switzerland as an assistant professor driving the development of novel quantum materials research using microfabrication techniques.