北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Multimodal investigation of topological semimetals and charge density wave material $EuTe_4$

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Time: 10:00am, March. 1, 2022 (Tuesday)

时间: 2022年3月1日 （周二）上午10:00

腾讯会议 ID: 722-225-759

Tencent Meeting ID: 722-225-759

Abstract

Quantum materials refer to a wide range of systems whose properties can't be described by semiclassical particles. Instead, the physics of quantum materials is usually dictated by topology and many-body interactions, as exemplified by topological insulators, topological semimetals, superconductors, and charge density wave materials. Studying these materials not only expands our knowledge of physics but also raises numerous possibilities for novel applications in (for example) the energy and device sectors. In the first part of my talk, I will show our experimental evidence of the long-sought Weyl fermions and unconventional fermions in topological semimetals TaAs and MoP, respectively. In particular, I will highlight the essential role of bulk-sensitive soft X-ray ARPES in visualizing the characteristic bulk band crossings of TaAs and MoP. In the second part of my talk, I will present our recent discovery of an unconventional hysteretic transition in the charge density wave phase of a quasi-2D compound, $EuTe_4$. By combining transport, photoemission, diffraction, and x-ray absorption measurements, we observed that the hysteresis loop has a temperature width of more than 400 K, setting a record among crystalline solids. The transition has an origin distinct from known mechanisms, and we interpret the hysteresis as an unusual switching of the relative CDW phases in different layers -- a phenomenon that is unique to quasi-2D compounds not present in purely 2D or strongly-coupled 3D systems.

About the speaker

Dr. Lv obtained his Ph.D. degree in 2018 from the Institute of Physics, Chinese Academy of Sciences under the supervision of Prof. Hong Ding and Prof. Tian Qian. He is currently a postdoc researcher at the Massachusetts Institute of Technology working with Prof. Nuh Gedik. Dr. Lv's research lies in the search, understanding, and manipulation of novel quantum phases in condensed matter physics.