

Weekly Seminar

Visualization of quantum interference on Weyl semimetal surfaces via a scanning tunneling microscopy



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Time: 4:00pm, Sep. 28, 2016 (Wednesday)

时间: 2016年9月28日 (周三) 下午4:00

Venue: w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Weyl semimetal is a new topological phase of matter that extends the topological classification beyond insulators which provides the first ever realization of Weyl fermions in physics. Weyl semimetal exhibits quantum anomalies and possesses exotic surface Fermi arc electron states. In a Weyl semimetal, the chirality of the Weyl nodes gives rise to topological charges, which can be understood as monopoles and anti-monopoles of Berry flux in momentum space. They are separated in momentum space and are connected only through the crystal's boundary by an unusual topological surface state, a Fermi arc. The surface of a Weyl semimetal has been predicted to exhibit interesting tunneling and transport properties, leading to potential electronic and spintronic applications.

We employed scanning tunneling microscopy/spectroscopy to directly visualize the coherent quasiparticle interferences on both type-I and type-II Weyl semimetal surfaces. On NbP (type-I Weyl) surface, we discovered that the surface interference channels are restricted by their surface spin and/or orbit textures. On $\text{Mo}_x\text{W}_{1-x}\text{Te}_2$ (type-II Weyl), the topological Fermi arc derived quantum interference is clearly discerned. Our results may pave a new way towards the future's research on a Weyl fermion related surface transport phenomena and devices.

About the Speaker

Dr. Hao Zheng received Ph.D in Institute of Physics, Chinese Academic of Sciences from 2002 to 2007. He was a Postdoctoral research fellow in Department of Physics, University of Birmingham, UK from 2007 to 2009, and a Postdoctoral scholar Department of Physics, University of Kiel, Germany from 2009 to 2014. Since then, Dr. Hao Zheng has been an Associate research scholar in Department of Physics, Princeton University, USA. Dr. Hao Zheng has published 35 papers, including 1 in Science, 1 in Nature Physics, 4 in Nature Communications, and 6 in Phys. Rev. Lett. Hao Zheng is interested in the research of experimental condensed matter physics, surface science and nano-technology. He employed scanning tunneling microscopy/spectroscopy and molecule beam epitaxy techniques to investigate oxide surfaces, quantum electronics in a semiconductor matrix and topological matters such as topological insulators and Weyl semimetals and the growth of thin films from novel materials.