



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: A Pseudospin Vortex-Ring with a Nodal Line in Three Dimensions

Speaker: Lih-King Lim
Institute for Advanced Study, Tsinghua

Time: 10:45am, Monday, July 18, 2016

Venue: Conference Hall 322, Science Building, Tsinghua University

Abstract

I will give an informal presentation of our recent work on 3D topological nodal line system. We present a model whose energy spectrum exhibits a nodal line acting as a vortex ring; this in turn is linked by a pseudospin structure akin to that of a smoke ring. Contrary to a Weyl point node spectrum, the vortex ring gives rise to skyrmionic pseudospin patterns in cuts on both sides of the nodal ring plane; this pattern covers the full Brillouin zone, thus leading to a new, 'maximal', anomalous Hall effect in a 3D semimetal. Tuning a model parameter shrinks the vortex ring until it vanishes, giving way to a pair of Weyl nodes of opposite chirality. This establishes a connection between two distinct momentum-space topologies - that of a vortex ring (a circle of singularity) and a monopole-anti-monopole pair (two point singularities). We present the model both as a low-energy continuum and a two-band tight-binding lattice model.

This talk is based on arXiv:1606.00982 by L.-K. Lim and R. Moessner.

About the speaker: Undergraduate physics at Imperial College, UK. Master degree at Cambridge University, UK, and Master thesis on Technicolor Model (supervisor: Prof. G. 't Hooft, Utrecht University, the Netherlands). PhD thesis (2006-2010) entitled "Novel superfluid phases in ultracold bosons and fermions" (supervisor: Prof. Cristiane Morais Smith, Utrecht University, the Netherlands). For postdoc, he spent 4 years (2010-2014) in University Paris Sud, France, and 1 year (2015) at the Max Planck Institute for Complex Systems, Dresden, Germany. Since Oct 2015, he has worked as an associate member at the Institute of Advanced Study Tsinghua University, Beijing, China, and is enrolled in the national Thousand Talents Plan for young professionals.