



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告

Physics Seminars (biweekly)

Title: Nonsymmorphic topological semimetals and interaction-driven topological phases

Speaker: Chen Fang (*Institute of Physics, CAS*)

Time: 4:00pm, Wednesday, Oct 26, 2016
(3:30~4:00pm, Tea, Coffee, and Cookie)

Venue: Conference Hall 322, Science Building, Tsinghua University

Abstract

My talk consists of two independent parts, on topological semimetals protected by nonsymmorphic symmetries and on the diagnosis of a dynamically generated Chern insulator phase using exact diagonalization, respectively. In the first part, I will introduce nodal line semimetals [1] and Dirac semimetals [2] protected by nonsymmorphic space groups, and will derive their bulk invariants, illustrate the characteristic surface states, and make materials predictions. In the second part, I will introduce a newly developed scheme for diagnosis of topological gapped phases induced by weak interaction using exact diagonalization [3], and use it to confirm that a 2D spinless fermion system with half-filling and quadratic band touching enters a quantum anomalous phase under small nearest neighbor repulsion [4].

[1] Chen Fang*, Yige Chen, Hae-Young Kee and Liang Fu, “Topological nodal line semimetals with and without spin-orbital coupling”, *Phys. Rev. B* 92, 081201(R) (2015).

[2] Chen Fang*, Ling Lu, Junwei Liu and Liang Fu*, “Topological semimetals with helicoid surface states”, *Nature Physics* 12, 936 (2016).

[3] Han-Qing Wu, Yuan-Yao He, Chen Fang*, Zi Yang Meng*, and Zhong-Yi Lu, “Diagnosis of Interaction-driven Topological Phase via Exact Diagonalization”, *Phys. Rev. Lett.* 117, 066403 (2016).

[4] Kai Sun, Hong Yao, Eduardo Fradkin, and Steven A. Kivelson, “Topological Insulators and Nematic Phases from Spontaneous Symmetry Breaking in 2D Fermi Systems with a Quadratic Band Crossing”, *Phys. Rev. Lett.* 103, 046811 (2009).