北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Probing geometric phases in cold atomic topological bands

Lih-King Lim

IAS Tsinghua University

Time: 4:00pm, Dec. 13, 2017 (Wednesday)

时间：2017年12月13日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Thanks to recent progress in engineering topological band structures with cold atoms, the accessible parameter regime of artificial crystal extends beyond that of its solid-state counterpart. For example, the physics of 2D Dirac cones merging as well as the 2D topological Haldane model were realized with cold atoms in tunable optical lattices. Furthermore, cold atomic systems also open the door for probing interesting geometric quantities which are otherwise difficult to observe. Specifically, we study Landau-Zener processes in topological bands with Bloch-oscillations-type experiment. The latter can reveal the full geometric information of the band eigenstates beyond the first Brillouin zone [1]. Furthermore, we study an interferometer formed by two energy bands, the so-called Stuckelberg interferometer. A new geometric phase shift is identified in the interference fringes [2].

[1] L.-K. Lim, J.-N. Fuchs, and G. Montambaux, Phys. Rev. Lett. 108, 175303 (2012); L.-K. Lim, J.-N. Fuchs, and G. Montambaux, Phys. Rev. A 92, 063627 (2015); T. Li et al, Science 352, 1094 (2016); Tarnowski et al, Phys. Rev. Lett. 118, 240403 (2017).
[2] L.-K. Lim, J.-N. Fuchs, and G. Montambaux, Phys. Rev. Lett. 112, 155302 (2014).

About the speaker

Lih-King Lim obtained his PhD (2010) in Theoretical Physics from Utrecht University, The Netherlands. He continued post-doctoral work (2010-2015) at LPS and Institut d'Optique, CNRS, Orsay, France, and Max Planck Institute PKS, Dresden, Germany. Since 2015, he joined IAS Tsinghua University as an associate member. His research interests are theoretical studies of macroscopic manifestation of topological/geometric effects in quantum materials, as realized in both cold atomic and condensed matter systems. He has work on theoretical studies of artificial gauge fields in cold atoms and its associated many-body effects, Landau-Zener transitions in Dirac cone systems, as well as pseudospin models for topological semimetals.