北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Nonlinear Hall effect

Hai-Zhou Lu

Southern University of Science and Technology of China

Time: 4: 00 pm, March. 27, 2019 (Wednesday)

时间：2019年3月27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

Unconventional responses upon breaking discrete or crystal symmetries open avenues for exploring emergent physical systems and materials. By breaking inversion symmetry, a nonlinear Hall signal can be observed, even in the presence of time-reversal symmetry, quite different from the conventional Hall
effects. However, less is known when a strong nonlinear Hall signal can be measured, in particular, its connections with the band-structure properties. By using model analysis, we find prominent nonlinear Hall signals near tilted band anticrossings and band inversions [1]. These band signatures can be used to explain the strong nonlinear Hall effect in the recent experiments on two-dimensional WTe2 [2]. Disorder plays indispensable roles in various linear Hall effects. We derive the formulas of the nonlinear Hall conductivity in the presence of disorder scattering and construct the general scaling law of the nonlinear Hall effect, which may help in experiments to distinguish disorder-induced contributions to the nonlinear Hall effect [3].

References:

[1] Zongzheng Du, Chunming Wang, HZL*, Xincheng Xie, PRL 121, 266601 (2018).
[2] Qiong Ma, Su-Yang Xu, Liang Fu, Gedik, Pablo Jarillo-Herrero et al., Nature 565, 337 (2019).
[3] Zongzheng Du, Chunming Wang, HZL*, Xincheng Xie, arXiv:1812.08377.

About the speaker

Hai-Zhou Lu obtained his Ph.D. in Physics from Institute for Advanced Study, Tsinghua University, Beijing, in 2007. From 2007 to 2015, he was a Postdoc and then Research Assistant Professor at the University of Hong Kong. He is now a Professor of physics at Southern University of Science and Technology, Shenzhen. His research is on the quantum transport in topological states of matter. He has published over 70 articles in physics journals, including 14 PRL, 1 Nature Physics, 5 Nature Commun., 2 Nature, with a citation over 3000 and h-index of 28.