北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Routes to quantum anomalous Hall effect from magnetic topological insulators $MnBi_2Te_4/(Bi_2Te_3)_n$

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Time: 4:00pm, Oct. 21, 2020 (Wednesday)

时间：2020年10月21日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

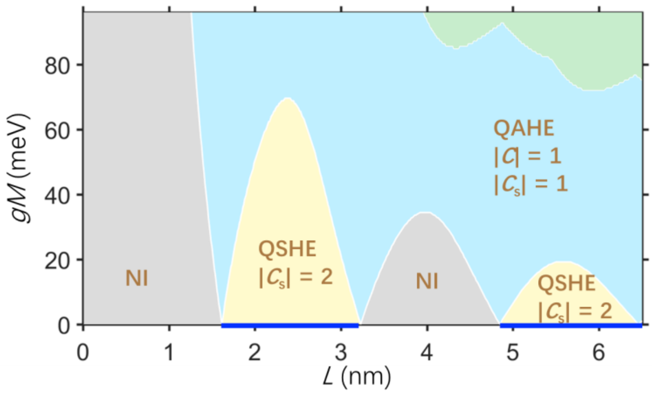
地点：北京大学物理楼，西563会议室

Abstract

The rising of topological materials $MnBi_2Te_4/(Bi_2Te_3)_n$ with built-in magnetization provides a great platform for the realization of both Chern-insulator and axion-insulator phases, manifesting integer and half-integer quantum anomalous Hall (QAH) effects, respectively [1-3]. Using both model Hamiltonian and first-principles calculations, we demonstrate that rich 2D and 3D topological phase diagrams can be established with the mapping of $MnBi_2Te_4/(Bi_2Te_3)_n$ systems. For the 2D topological phases, we provide design principles to trigger integer QAH states by tuning experimentally accessible knobs, such as slab thickness and magnetization [2]. For the 3D topological phases, we find that the surface anomalous Hall conductivity in the axion-insulator phase is a well-localized hanging around $e^2/2h$, depending on the magnetic homogeneity [3]. We then discuss the preconditions and several experimental proposals to reveal the surface anomalous Hall effect in $MnBi_2Te_4/(Bi_2Te_3)_n$. Finally, some experimental progresses and theoretical insights on the issue of the surface gaps in $MnBi_2Te_4/(Bi_2Te_3)_n$ is discussed (if time permits) [4-7].

References

[1] C. Hu et al. ***Nat. Commun.*** 11, 97 (2020).
[2] H. Sun et al. ***Phys. Rev. Lett.*** 123, 096401 (2019).
[3] M. Gu et al. arXiv:2005.13943 (2020).
[4] Y. Hao et al. ***Phys. Rev. X*** 9, 041038 (2019).
[5] X. Wu et al. ***Phys. Rev. X*** 9, 041038 (2020).
[6] X. Ma et al. arXiv:2004.09123 (2020).
[7] R. Lu et al. arXiv:2009.04140 (2020).



About the speaker

刘奇航，南方科技大学副教授，本科及博士均毕业于北京大学物理学院（2003-2012），曾任美国西北大学博士后、美国科罗拉多大学博尔德分校助理研究员；主要从事以密度泛函理论为主的凝聚态理论研究，研究兴趣包括理解材料中新奇的电学，磁学，光学，缺陷，自旋极化，拓扑等物性，以及功能导向的新型材料设计及预测。工作期间以主要作者身份已发表包括Nat. Phys.、Nat. Commun.、Phys. Rev. X、Phys, Rev. Lett.、Nano Lett.、JACS等多篇学术论文；署名作者共计已发表学术论文60余篇，Google Scholar统计引用超过3700次；2018年入选“国家特聘青年专家”。