Nonlinear transport properties in topological materials

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Prof. Hui LI
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Venue: N23-4018
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Hosted by: Prof. Hongchao LIU

Abstract

Quantum geometry, characterized by two quantum geometric properties, quantum metric and Berry curvature, provides a framework for understanding a variety of physical phenomena, such as topological phases, nonlinear electromagnetic effects. In this talk, I will discuss our recent experimental investigations into the intricate connection between the quantum geometry and nonlinear transport properties in topological materials. I will introduce the control over of the second-order nonlinear transport features in bulk Weyl semimetal T_d-WTe_2 under applied external electric fields and perpendicular magnetic fields (B-fields) and highlight the observation of second-order quantum oscillations under out-of-plane B-fields [Li, Hui, et al. "Current induced second-order nonlinear Hall effect in bulk WTe_2." *Applied Physics Letters* 123.16 (2023).]. Following that, I will explore the third-order nonlinear transport in antiferromagnetic topological insulator $MnBi_2Te_4$ flakes in both longitudinal and transverse directions at temperatures below the antiferromagnetic transition temperature of $MnBi_2Te_4$ flakes, originating from the quantum metric quadrupoles and Berry curvature quadrupoles, respectively [Li, Hui, et al. "Quantum geometry quadrupole-induced third-order nonlinear transport in antiferromagnetic topological insulator $MnBi_2Te_4$." *Nature Communications* 15.1 (2024): 7779.].

Biography

Prof. Hui LI currently works as Professor in the Institute of Physical Science and Information Technology, Anhui University. He obtained his PhD degree at the University of Science and Technology of China in 2014. After that, he worked as a postdoctoral fellow in Prof. Jiannong WANG's group at the Hong Kong University of Science and Technology until 2018, when he joined Anhui University. From 2021 to 2023, he served as a research Assistant Professor at the Hong Kong University of Science and Technology. His research focuses on the exploring novel magnetotransport properties of low-dimensional quantum materials, with particular expertise in topological systems.