22 Dec Wednesday 1:30 – 2:15 Chair: YOU Jian Qiang (游建强)

Berry-Connection Polarizability and Third-Order Hall Effect

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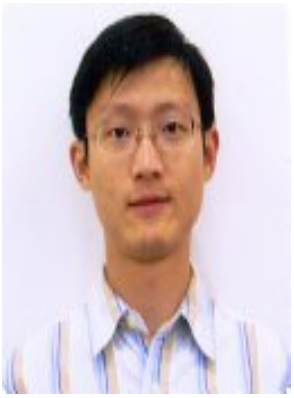

Professor YANG Shengyuan is an associate professor of physics at the Singapore University of Technology and Design (SUTD). He is from the city of Nanjing. After one year in Electrical Engineering at Tsinghua University, he transferred to Mathematics/Physics at The University of Hong Kong, where he obtained BSc in 2005. He received PhD in physics from The University of Texas at Austin in 2011. He worked as an imaging geophysicist in CGG (US) Services at Houston from 2011 to 2013, and joined SUTD since 2013. He is working on theoretical condensed matter physics, focusing on topological materials, 2D materials, transport theory, spintronics/valleytronics, etc.

Abstract:

Hall effect has a central position in condensed matter physics. The various Hall effects offer standard tools for material characterization, and understanding their microscopic mechanisms often unravels nontrivial properties of electrons in solids. One breakthrough twenty years ago is the recognition of the importance of geometric phase in anomalous Hall effect, i.e., the Hall effect in magnets without external magnetic field. Recently, the study has been extended to the nonlinear regime. I shall discuss our theoretical understanding of the second-order and the third-order anomalous Hall effect, and show that they reflect a new intrinsic band geometric quantity, the Berry-connection polarizability. We demonstrate the evaluation of this quantity from first-principles calculation for real materials, and experimental measurement of the third-Hall effect on MoTe2, WTe2, and TaIrTe4 (by Gao Weibo group) obtained results consistent with theory.