北京大学量子材料科学中心

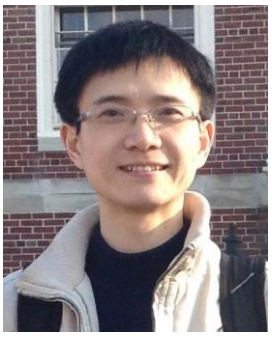
International Center for Quantum Materials, PKU

Weekly Seminar

Quantum Spin Liquid Phases in Extended Kitaev Model

Prof. Zheng-Xin Liu

Department of physics, Renmin University of China



Time: 4: 00 pm, Sept. 11, 2019 (Wednesday)

时间：2019年9月11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 Kitaev model on the honeycomb lattice offers exactly soluble examples of both gapped and gapless quantum spin liquids (QSLs). In addition to the Kitaev (K) interaction, candidate Kitaev materials also possess Heisenberg (J) and off-diagonal symmetric (Gamma) couplings. We investigate the quantum spin-1/2 K-J-Gamma model on the honeycomb lattice by a variational Monte Carlo (VMC) method. In addition to the Kitaev spin liquid (KSL) phase, we find that there is one proximate Kitaev Spin Liquid (PKSL) phase, while the rest of the phase diagram contains different magnetically ordered states. The KSL is known as a gapless state with 2 Majorana cones and a (almost) gapped spin response. In contrast, the PKSL has 14 Majorana cones and a gapless spin response. In a magnetic field applied normal to the honeycomb plane, it realizes two of Kitaev's gapped chiral spin-liquid states, namely, a non-Abelian phase with Chern number 5 and an Abelian phase with Chern number 4. The experimental characters of the chiral spin liquids are their thermal Hall conductances. Our phase diagram provides a clue in understanding the physics of candidate Kitaev materials.

About the speaker

Prof. Zheng-Xin Liu received his Ph.D in the Hong Kong University of Science and Technology in 2010. After that he worked in the Institute for Advanced Study in Tsinghua University as a post doctor and then as an associate member. He joined Renmin University of China in 2015 as an associate professor. Prof. Liu's research area includes symmetry protected topological phases, quantum magnetism, and many-body numerical computations. Recently, his interests are focused on the magnetic systems, including quantum spin liquid (such as Kitaev spin liquid) and magnetic semimetals.