



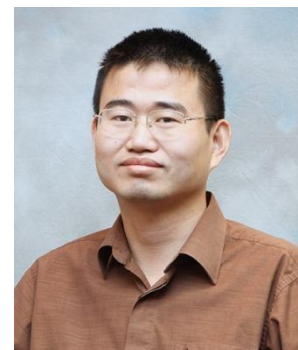
北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Search for Majorana and Weyl Fermions in Spin-Orbit Coupled Fermionic Gases

Chuanwei Zhang
Department of Physics
the University of Texas at Dallas



Time: 10:00am, May 13, 2015 (Wednesday)

: 2015 5 13 10:00

**Venue: Room W563, Physics Building, Peking University
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Abstract

Topological quantum matter has been an active research field in physics in the past three decades with numerous celebrated examples, including quantum Hall effect, chiral superconductor, topological insulator, etc. Majorana fermions, first envisioned by E. Majorana to describe neutrinos, often emerge as topological quasiparticle excitations in topological superconductors. Majorana fermions satisfy non-Abelian anyonic statistics and have potential applications in topological quantum computation. On the other hand, Weyl fermions, first proposed for describing massless chiral Dirac fermions in particle physics, have been studied extensively as the band touching points of single-particle energy dispersions in certain solid state materials (named Weyl semimetals). In this talk, I will discuss our recent theoretical work on the search for Majorana and Weyl fermions using spin-orbit coupled fermionic cold atomic gases.

Relevant recent publications

- [1] M. Gong, S. Tewari, and C. Zhang, BCS-BEC Crossover and Topological Phase Transition in 3D Spin-Orbit Coupled Degenerate Fermi Gases, *Phys. Rev. Lett.* 107, 195303 (2011)
- [2] M. Gong, G. Chen, S. Jia, C. Zhang, Searching for Majorana Fermions in 2D Spin-orbit Coupled Fermi Superfluids at Finite Temperature, *Phys. Rev. Lett.* 109, 105302 (2012).
- [3] C. Qu, Z. Zheng, M. Gong, Y. Xu, L. Mao, X. Zou, G. Guo, C. Zhang, Topological Superfluids with Finite Momentum Pairing and Majorana Fermions, *Nature Communications* 4, 2710 (2013).
- [4] Y. Xu, L. Mao, B. Wu, C. Zhang, Dark Solitons with Majorana Fermions in Spin-Orbit-Coupled Fermi Gases, *Phys. Rev. Lett.* 113, 130404 (2014).
- [5] Y. Xu, R. Chu, C. Zhang, Anisotropic Weyl Fermions from Quasiparticle Excitation Spectrum of a 3D Fulde-Ferrell Superfluid, *Phys. Rev. Lett.* 112, 136402 (2014). PRL Editors' Suggestion
- [6] Y. Xu, C. Zhang, Berezinskii-Kosterlitz-Thouless Phase Transition in 2D Spin-Orbit Coupled FF Superfluids, *Phys. Rev. Lett.* 114, 110401 (2015).
- [7] Y. Xu, F. Zhang, C. Zhang, Structured Weyl Points in Fulde-Ferrell Superfluids, arXiv:1411.7316

About the Speaker

Chuanwei Zhang received his BS in Physics from University of Science and Technology of China in 2000 and PhD in Physics from the University of Texas at Austin in 2005. After two and a half year's postdoctoral training at the University of Maryland at College Park, he joined Washington State University in 2008 as an assistant professor. In 2012, he moved to the University of Texas at Dallas as an associate professor. He was a recipient of DARPA Young Faculty Award in 2010. He has published over 70 peer-reviewed articles, including 22 in Physical Review Letters.