Xiaodong Hu

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Education

Boston College
2018-2024 (expected)
Ph.D in Condensed Matter Theory
Advisor: *Ying Ran*

University of Science and Technology of China
2014-2018
B.S. in Theoretical Physics

Research Interests

My research is primarily focused on exploring the intricate emergent phenomena in strongly-correlated systems, with a particular emphasis on the interplay of symmetry and topology, such as fractional Chern insulators (lattice analogue of fractional Quantum Hall effect), Kitaev materials, and high-T_c superconductors. Both analytic methods and numerical simulations are used in my research.

Publications/Preprints

- X-D. Hu, D. Xiao, and Y. Ran, *Hyperdeterminants and Composite Fermion States in Fractional Chern Insulators*, (submitted to PRX)
- X-D. Hu, J-H. Han, and Y. Ran, *Supercurrent-induced anomalous thermal Hall effect as a new probe to superconducting gap anisotropy*, Phys. Rev. B **108**, L041106 (2023)
- X-D. Hu, and Y. Ran, *Engineering chiral topological superconductivity in twisted Ising superconductors*, Phys. Rev. B **106**, 125136 (2022)
- F. Bahrami, X-D. Hu, Y. Du, O. I. Lebedev, C. Wang, H. Luetkens, G. Fabbris, M. J. Graf, D. Haskel, Y. Ran, and F. Tafti, *First demonstration of tuning between the Kitaev and Ising limits in a honeycomb lattice*, Sci. Adv. **8**, eabl5671 (2022)

Presentations

- *Engineering Chiral Topological Superconductivity in Twisted Ising Superconductors*, Talk, APS March Meeting, 2023
- *Supercurrent-induced anomalous thermal Hall effect as a new probe to superconducting gap anisotropy*, Talk, online APS March Meeting, 2023

Techniques

Programming Languages	Julia, Rust, Python, Mathematica, C++, Bash.
DFT Tools	Quantum Espresso, ELK

Developed Packages

- `FCI.jl`, includes `LLL.jl`, `MODEL.jl`, `FCB_ED.jl`, `CF.jl`, `CF_MF.jl`, `CF_TDHF.jl`, `CF_PROJWFC.jl`, etc. for our big project of the projective construction of fractional Chern insulators.

- `TightBinding.jl` and `TightBindMeanField.jl` for tight-binding model construction, quantum transport study, and interface to `wannier90`.

Teaching Experiences

During my time at Boston College, I have served as a Teaching Assistant for several graduate courses, including Classical Mechanics, Electrodynamics, Quantum Mechanics I/II, Statistical Mechanics I/II, and Particle Physics. In the summer of 2023, I also served as an instructor for an undergraduate course, Introduction to Physics I/II.

Last updated: December 12, 2023