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Zhuan Li

Education

University of Pittsburgh — PA, United State
Ph.D. in Physics, Advisor: Prof. Roger Mong — Sep 2019 –Apr 2024

University of Bristol — Bristol, United Kingdom
Visiting student — Jan 2018 –Jun 2018

University of Chinese Academy of Sciences — Beijing, China
B.Sc. in Physics, Advisor: Prof. Pan Zhang — Sep 2015 –Jul 2019

Teaching

Teaching Assistant at University of Pittsburgh

- Fall 2019, PHYS 0212 Introduction to laboratory physics
- Spring 2020, PHYS 0212 Introduction to laboratory physics
- Summer 2020, PHYS 0111 Introduction to physics 2
- Spring 2021, PHYS 0212 Introduction to laboratory physics
- Spring 2022, PHYS 0212 Introduction to laboratory physics

Skills

- Python, Mathematica, MATLAB,LaTeX
- Basic knowledge on TensorFlow
- Basic knowledge on C++

Research Areas

- **Topological phase of matter.** After the discovery of the Integer Quantum Hall effect and the Fractional Quantum Hall effect, more and more bizarre phases of matter that cannot be described by the Landau-Ginzburg symmetry breaking paradigm were found. The non-local order parameters of these topological orders are robust to small deformations, which makes them potential candidates for the fault-tolerant quantum computation.

- **ϕ_0-Josephson junction.** ϕ_0-Josephson junction can be induced by a combination of 1D nanowire, superconductivity, spin-orbit interaction, and spin splitting. Unlike a normal Josephson junction, ϕ_0 junction can establish a super current without the phase difference. There has been a growing interest in ϕ_0 junction for its application in making super current qubits.

- **Random matrices.** Without knowing much about a physical state, one can first investigate its typical properties (entropy, mutual information, etc.) by averaging over a random matrix ensemble. With the properly chosen random matrix ensemble, we can easily predict the behavior of the complex physics system.

- **Josephson parametric amplifier.** Parametric amplifiers made by Josephson junctions have been wildly used in superconducting quantum machines because of their near-quantum limited performance. I am interested in designing a new Josephson parametric amplifier with higher efficiency.

Awards

2022, Thomas-Lain essay competition.

Publications

- Z. Li and R. S. K. Mong, Detecting topological order from modular transformations of ground states on the torus, Phys. Rev. B 106, 235115 (2022).
- B. Zhang, Z. Li, V. Aguilar, P. Zhang, M. Pendharkar, C. Dempsey, J. Lee, S. Harrington, S. Tan, J. Meyer, et al., Evidence of phi0-josephson junction from skewed diffraction patterns in sn-insb nanowires, arXiv preprint arXiv:2212.00199 (2022).
- Z. Li and R. S. K. Mong, Estimating the entanglement of purification, (in preparation).

Conference Talks

- Zhuan Li, and Roger SK Mong. "Detecting topological order from modular transformations of ground states on the torus." Bulletin of the American Physical Society (2022).