Zhuan Li

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Ph.D. Candidate in Physics

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

Research Experience

- **Topological phase of matter.**
  - Determining and classifying the topological order by analytically calculating the overlaps of ground states wave functions.
  - Analyzing the behavior of current quantum correcting codes (toric code, color code) in an open system by using tensor networks algorithm (PEPS).
- **Quantum information**
  - Applying the entanglement measure on many body system at the critical point by using tensor networks algorithm (MPS).
  - Analytically calculating the entanglement properties of random matrices ensembles.
- **Quantum transport.**
  - Using python library *kwant* to simulate and analyze the Josephson junction under different conditions (with/without external magnetic filed, spin-orbital coupling, and orbital effect).
  - Optimizing the efficiency of the Josephson parametric amplifier based on input-output theory.

Skills

- **Coding**: Python, MATLAB, Mathematica, LaTeX, C++.
- **Simulation skill**:
  - Monte Carlo for random sampling
  - Tensor networks (MPS, PEPS) for many body system
  - *Kwant* for quantum transport problem
  - Different solvers for ODE/PDE (including direct time integration, harmonic balanced method)
- **Theoretical Knowledge Background**: Computational Physics, Advanced Statistical Mechanics, Quantum information, Quantum field theory

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).
- B. Zhang, Z. Li, V. Aguilar, P. Zhang, M. Pendharkar, C. Dempsey, J. Lee, S. Harrington, S. Tan, J. Meyer, et al., Supercurrent through single electron transverse mode in 1D Josephson junctions QPC, (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).