Zong-Qi Shen

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Education Background

Department of Physics, Fudan University Shanghai, China

Bachelor of Science in Physics Sep.2018-Present

- Overall GPA: **3.74**/4, Rank: top 5% in the department of physics
- Graduate Courses: Advanced QM, Many-body Physics, Solid State Theory, Superconductivity, Group Theory, Statistical Physics II, Scattering Physics
- Standard Tests: TOEFL 104 (Speaking 23)

Research Interest

Emergent phenomena in strongly correlated electronic systems including superconductivity and magnetism

- PLD growth and characterization of oxide interfaces
- Unconventional superconductors and topological superconductivity
- Theory: simulating transport properties of mesoscopic systems

Publications

1. Tianzhong Yuan*, Da Jiang*, Huanyi Xue*, **Zongqi Shen**, Lijie Wang, Muyuan Zou, Junwei Ma, Guanqun Zhang, Gang Mu, Wei Peng, Xinyuan Wei, Shiwei Wu, Zhenghua An, Yan Chen and Wei Li, "**Time-reversal and rotational symmetries breaking in a spinel superconductor**", *under review in Nature Physics*
2. Lijie Wang, Huanyi Xue, Guanqun Zhang, Junwei Ma, **Zongqi Shen**, Shiwei Wu, Zhenghua An, Yan Chen and Wei Li, "**Two-dimensional superconductivity at heterostructure of Mott insulating titanium sesquioxide and polar semiconductor**", *arXiv:2106.06948*
3. **Zongqi Shen** and Wei Li, "**Finite-size effects of the zero-bias peak in topological superconductors**", *in preparation*

Research Experience

Two-dimensional superconductivity at oxide interfaces Sep.2020-Present

Supervised by Prof. Wei Li, Artificial Interface Lab, Fudan University

- Grew and optimized single crystal oxide thin films on $SrTiO_3(111)$ substrates with pulsed-laser deposition
- Studied the transport and magnetic properties of the heterointerface at low temperatures
- Helped to identify the Bose metallic state with a wide range of temperature-independent resistance associated with vanishing Hall resistance
- Currently working in search for ferromagnetic insulator in double perovskite thin films and possible superconducting phase via voltage gating

Time reversal and rotational symmetry breaking in superconductors Sep.2020-Dec.2020

Supervised by Prof. Wei Li, Artificial Interface Lab, Fudan University

- Analyzed the pairing symmetry in our sample with group theory and helped to explain the coexistence of ferromagnetism and superconductivity
- Analyzed STS data and calculated LDOS spectrum of triplet-pairing superconductors using Green's function
- Proposed a topological origin of the two-fold symmetry in transverse resistance, which provided a new explanation of similar results reported in *Nature* 547, 432–435 (2017)
- Gained rich experience in combining experiments with theories to better understand the interplay between magnetism and superconductivity

2D materials and device fabrication Nov.2018-June.2019

Supervised by Prof. Faxian Xiu, Nanodevice Lab, Fudan University

- Synthesized high quality Bi_2SeO_3 sample using chemical vapor deposition method (CVD)
- Peeled off single-layered graphene for heterostructure fabrication
- Helped establish a platform for stacking layers of 2D materials controlled by LabView
- Received technical training in device fabrication and transport measurement

Fingerprints of Majorana zero mode in topological superconductors June.2019-Present

Supervised by Prof. Wei Li, Artificial Interface Lab, Fudan University

- Used nonequilibrium Green's function method (NEGF) and analytical methods to calculate the transport properties of p+ip and d+id superconductors
- Studied the finite-size effects of the zero-bias conductance peaks in topological superconductors
- Received systematic training in the theory of superconductivity

Honors & Awards

- National Scholarship (Highest scholarship awarded by the Chinese government) *Dec 2020*
- National Top Talent Undergraduate Training Program *May 2021*
- First Prize in Chinese College Physics Competition *Oct 2020*
- Excellent Student Award from Fudan University *Sep 2019*

Skills

Computational:

- Programming: python, C, Mathematica
- Simulation: Kwant, Comsol

Laboratory:

- PLD and CVD growth of thin films and nanofabrication
- Transport measurement and structural characterization
- RHEED, AFM