Borui Li

liborui@mail.ustc.edu.cn borui.li@yale.edu
University of Science and Technology of China (USTC) +1 203 507 3528

EDUCATION

Department of Applied Physics, School of Physical Sciences,
University of Science and Technology of China (USTC) Hefei, China
B.S. in Applied Physics, Zhi-Yan Zhou Honors Program Sept. 2021 - Jul. 2025 (Expected)

- **Overall GPA: 3.80/4.30** (88.79/100)
- **Rank:** Top 13%

RELATED COURSES

○ Advanced Quantum Mechanics†	96	○ Quantum Mechanics A	90
○ Electrodynamics	96	○ Thermotics A	95
○ Solid State Physics A	90	○ Computational Physics	96
○ Computational Method	90	○ Function of Complex Variable A	91
○ Fundamental of Electronics	92	○ Computer Programming A	90
○ Equations of Mathematical Physics A	90	○ Introduction to Astrophysics	90
○ College Physics Experiment III	93	○ Probability Theory and Mathematical Statistics	95

† means course with graduate level

COMPUTER SKILLS

C, Python, Matlab, Lumerical, CST Microwave Studio, COMSOL, Mathematica, LabVIEW, Origin

RESEARCH EXPERIENCES

Summer Internship
Aug. 2024 - present

Advisor: **Prof. Peijun Guo**, School of Engineering & Applied Science, Yale University

Project: Self-trapped Exciton Transport Microimaging and Modeling

- **Description:** Utilized nanosecond-scale time-resolved spectroscopy to investigate the transport dynamics of self-trapped excitons in novel photoluminescent materials.
- **Contribution:** Experiment design, optical path setup, and data analysis
- **Achievement:** Developed a microscopic imaging system to characterize the photoluminescence of self-trapped excitons in $Cs_2(Ag_{0}.06Na_{0}.04)InCl_6$ and investigate exciton transport. The optical setup integrates a 375 nm laser for sample excitation, a 632 nm laser to optimize focus by determining the precise spot size, and white light for illumination. This configuration enables the detection of exciton diffusion, with the laser spot size approaching the spatial resolution limit, ensuring accurate imaging of exciton transport phenomena.

Project: Metasurfaces with Sub-Wavelength Structures Design

- **Description:** Designed metasurfaces with sub-wavelength structures optimized for high absorption at 100 GHz.
- **Contribution:** Simulation & Vapor deposition of metasurface
- **Achievement:** The metasurfaces exhibit 50% absorption at 100 GHz, featuring length and width scales in the micrometer range and a thickness of 200 nm. The simulations are primarily conducted using CST, with additional contributions from Lumerical and COMSOL, which have equipped me with a comprehensive understanding of the algorithmic principles and specific applications of each software.

Undergraduate Innovation and Entrepreneurship Program
May. 2023 - May. 2024

Advisor: **Prof. Zhiyuan Zhou**, USTC

Project: Tunable Mid-Infrared Continuous-Wave Optical Parametric Oscillator

- **Description:** Design an optical parametric oscillator (OPO) that can output wavelengths ranging from 1520 nm to 1620 nm by adjusting temperature
- **Contrbution:** Theoretical design, Optical path adjustment training
- **Achievement:** Designed two structures of dual-resonance external cavity OPOs using nonlinear optics and resonator theory, featuring a two-mirror linear cavity and a bow-tie four-mirror ring cavity. This setup allows continuous wavelength tunability from 1520 to 1620 nm with a theoretical gain of 48%. Analyzed the main causes of phase mismatch and their impact on the OPO's output characteristics, also considering astigmatism effects. Gaining extensive experience in optical path adjustment.

Research-oriented Experiment in College Physics
ept. 2023 - Dec. 2023

Advisor: **Prof. Zengming Zhang**, USTC

Project: Preparation and Characterization of Semi-Organic Nonlinear Optical single crystals

- **Description:** This work focuses on the synthesis and and characte of three semi-organic crystals(TALS, 4-DMAPLN, LMKHP) and exploring their potential to become high-quality nonlinear optical crystals.The specific topics included the optimize single crystal preparation methods, characterize and analyze samples, test sample properties and propose application prospects.
- **Contribution:** Experimental design and manipulation, data Measurement and analysis
- **Achievement:** Finally, crystals with a diameter of 0.4 mm were successfully produced. In addition, we have pioneered the investigation of the ferroelectric nature of TALS, and discussed its potential applications of periodically polarized crystals in the future.

YuChun Research Internship program
Dec. 2023 - Mar. 2024

Advisor: **Prof. Prof. Danfeng Li**, Department of Physics, City University of HongKong

Project: First Principle Calculations for Thin Film XRD

- **Description:** Computed the X-ray diffraction structure of $PbTiO_3$ thin films grown on $SrTiO_3$ substrates using MATLAB, based on lattice structures derived from X-ray diffraction theory.
- **Achievement:** The XRD calculations aligned well with experimental data, enabling successful determination of the number of film layers and lattice constants. Extended the calculation method by combining thin-film X-ray diffraction dynamics with kinematics to simulate superlattices. Demonstrated the impact of substrate thickness on XRD results, showing that smaller dimensions lead to more pronounced high-frequency oscillations in the curves.

Project: PCB Interface Design for Cryostat

- **Achievement:** Designed a PCB using *Altium Designer* for electrical signal measurements in a cryostat sample. Planned for sixteen π-filters and mounting holes to ensure compatibility with the bench and samples, enhancing the signal-to-noise ratio.

SCHOLARSHIPS

YuChun Program First Class Scholarship, Top5% 2024
Diligence Scholarship, Top5% 2023
Second place in an electromagnetism research paper competition, Top5% 2022
Silver Award for Outstanding Student Scholarship, Top10% 2022
First Prize of China General Nuclear Power Corporation Scholarship, Top2% 2021

TEACHING EXPERIENCE

Teaching Assistant of *Optics B* Feb. 2024 - July. 2024