Ziyu He

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RESEARCH INTERESTS

Waveguide QED, Quantum Dynamics, Many-body physics, Quantum phase transition

EDUCATION

Sun Yat-sen University, Guangzhou, China 9.2021 — Present
Bachelor's Degree in Physics Cumulative GPA: 4.0/4.0, **Major GPA (Physics) GPA: 4.0/4.0, Ranking: 4/95**

ACADEMIC EXPERIENCE

Numerical Study of Quantum Pulse Interaction with Localized Quantum Systems 12.2023 — Present
Working with a PhD student Ruiyang Gong in SYSU, Supervisor: Prof Zeliang Xiang

- Spearheaded a research initiative leveraging the numerical methodology developed by Alexander Holm Kiilerich and Klaus Mølmer, focusing on the dynamics between incident light in varied quantum states and localized quantum systems within optical waveguides.
- Pioneered the generation of highly non-classical quantum light states through strategic localized quantum system configurations, contributing to the advancement of quantum communication technologies by facilitating efficient information encoding into optical waveform modes.
- Demonstrated proficiency in computational physics by adeptly applying the QuTiP library within Python to simulate the dynamical evolution of light-quantum system interactions, showcasing my ability to enhance algorithmic efficiency and reduce computational complexity from $O(N^3)$ to $O(N^2)$, thereby expediting data processing and analysis.

Tunable Giant Atom in a Dual-Rail Quantum Network 6.2023 — 12.2023
Working with a PhD student Ruiyang Gong in SYSU, Supervisor: Prof Zeliang Xiang

- Played a pivotal role in a project that theoretically conceptualized a three-level giant atom configuration within dual-rail waveguides, setting a new precedent in quantum routing and photon manipulation.
- Conducted comprehensive calculations to elucidate the scattering properties of incident photons on the novel configuration, enabling a suite of quantum functionalities, including quantum routing, optical quantum gates, quantum storage, and teleportation by adept manipulation of coupling parameters and phase adjustments.
- Key contributor in deriving the system's scattering matrix, where I unearthed crucial parameters essential for non-reciprocal photon transport. This discovery is instrumental in facilitating selective photon routing and optical quantum gate circuits.
- Currently collaborating in the preparation of our research findings for publication, underscoring the potential implications of our work in advancing the infrastructure for quantum networks.

PROJECTS

China Undergraduate Physics Tournament 11.2021 — 10.2022
Working as a Team Captain, Faculty Advisor: Prof Jian Tang

- Led a team through a challenging physics contest, navigating through seventeen intricate problems that demanded a blend of qualitative analysis, theoretical modeling, experimental design, and data interpretation, culminating in the development and defense of a comprehensive report.
- As the strategic team leader, I was pivotal in organizing the team's workflow, fostering a collaborative environment, and steering problem-solving initiatives that ensured our project's timely and successful execution.
- Took charge of the "Droplet Explosion" project, conducting an in-depth investigation into the wetting dynamics of water-ethanol solutions and the Rayleigh-Plateau instability at a three-phase contact line. My leadership in this segment illustrated my capability to unravel complex scientific challenges and significantly contribute to our team's overall achievement.
- Our concerted efforts were recognized with top honors, securing first place in the South Central Regional Competition, first prize, and fifth place in the National Competition. My standout performance in defending the "Droplet Explosion" subject earned me the prestigious 'Best Defender' award, highlighting my exceptional analytical prowess and skill in conveying complex concepts under intense scrutiny.

PUBLICATIONS

Journal paper

- Tunable Giant Atom in a Dual-Rail Quantum Network (In-Progress)

SELECTED COURSES

Theoretical Physics Courses

- Theoretical Mechanics: 96.4
- Electrodynamics: 95
- Thermodynamics and Statistical Physics: 98
- Quantum Mechanics: 97
- Optics: 93.4
- Atomic Physics: 95
- Solid State Physics: 95
- Methods of Mathematical Physics: 94
- Group Theory in Physics: 96

Numerical Methods&Experimental Physics Courses

- Structural and Object-Oriented Programming: 86
- Numerical Calculations: 98
- Engineering Drawing and CAD study: 88
- Analysis of circuits: 97
- Electronic Technology: Analog Electronics: 92
- Electronic Technology: Digital Circuit: 92
- Experiments in Electronic Technology: 93
- Basic Designed Physics Experiment: 90
- Advanced Laboratory I: 89

AWARDS

First Prize of SYSU Outstanding Student Scholarship 10.2023
Top 5% in Physics major, Sun Yat-sen University

First Prize of SYSU Outstanding Student Scholarship 10.2022
Top 5% in Physics major, Sun Yat-sen University

The 13th China Undergraduate Physics Tournament(Team) 10.2022
First prize, ranked fifth nationwide, working as a team captain

National Undergraduate Mathematical Contest in Modelling 9.2022
First Prize in Guangdong Province Division, China Society for Industrial and Applied Mathematics

The 13th China Undergraduate Physics Tournament (Central South Division)(Team) 5.2022
First prize, ranked first in the division, working as a team captain

The Best Player in the 13th China Undergraduate Physics Tournament (Central South Division) 5.2022
The top one in the Central South Division

OTHER EXPERIENCES

Society of Physics Students Guangzhou, China
Vice President 9.2022 — 7.2023

- Spearheaded the organization of academic seminars, enhancing the scholarly community by facilitating knowledge exchange and fostering academic discussions among students.
- Played a pivotal role in enriching the academic environment by inviting esteemed professors to deliver insightful reports on cutting-edge physics research and developments.
- Initiated and coordinated sessions led by senior students to share valuable scientific research skills, techniques, and experiences, contributing to the professional growth of peers.
- Provided tailored academic research guidance to junior undergraduates, nurturing a supportive educational atmosphere and encouraging the pursuit of scientific inquiry.

ENGLISH TESTS

TOEFL: 104
Listening: 29 — Reading: 29 — Speaking: 23 — Writing: 23
Test date: 10.2023

SKILLS

- **Programming:** Python Mathematica LaTeX QuTiP C++ Origin Powerpoint
- **Soft Skills:** Leadership, Teamwork, Communication, Problem-Solving, Stress Management, Motivation

REFERENCES

Prof. Zeliang Xiang
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