CV

Personal Information

Last Name	Huang	First Name	Longxiang
Nationality	Chinese	Mobile Phone	0162-3383969
Birth Date	06.03.2000	E-Mail	longxiang.huang@tum.de
Homepage	Welcome to Longxiang's page (qubitsfan.github.io)		

Education Background

Technical University of Munich (TUM) Munich, Germany

- Master of Science in Quantum Science & Technology 10.2022-now
- Quantum Information (1.0), Quantum Hardware (1.0), Quantum Optics (1.0), Quantum Computing with Superconducting Qubits (1.0), Tensor Network (1.0), Ultra-Cold Quantum Gases (1.0), Experimental Skills in Quantum Optics (2.3)

University of Science and Technology of China (USTC) Anhui, China

- Bachelor of Science in Physics (Atomic and Molecular Physics) 09.2018-06.2022
- GPA: 3.55/4.3; 85.67/100
- Honors: 01.2020 Excellent Student Scholarship-Bronze
  12.2018 Excellent Student Scholarship-Silver

Internship Experience

***Intern*, Walther-Meißner-Institute for Low Temperature Research (WMI), BAdW** 04.2023-now

- Researched the new architecture of superconducting qubits – fluxonium and implementation of the coupler-mediated two-qubit gate with high fidelity;
- Calculated energy spectrum and wavefunctions of the fluxonium and fluxonium-coupler and found the analytical expressions of those depending on fabrication parameters of fluxonium and coupler using perturbation theory;
- Simulated the two-qubit iSWAP gate on a fluxonium-coupled quantum circuit using scqubits library and got the evolution of qubits states to deeply understand the physical process of quantum gates;
- Calculated analytical expressions of coupling matrix elements between fluxoniums and resonators and investigated quasi-selection rules to obtain dispersive shift and Hamiltonians;

***Intern*, Shanghai Institute of Optics and Fine Mechanics, CAS** 07.2021-08.2021

- Researched the External Protection Circuit of the Atomic Chip and Fringe-free Absorption Images of Cold Atoms;
- Debugged and improved the external protection circuit of the atomic chip to prevent the continuous current from causing the wire on the chip surface to fuse;
- Developed programs based on Optimized Fringe Removal Algorithm to obtain absorption images of cold atoms without fringe;
- Participated in academic discussions with supervisor and graduate students on experiments in cold atomic physics.

Research & Project Experience

***Graduation Thesis*, Reduction of Qubits in Variational Quantum Eigensolver on Trapped Ions** 03.2022-06.2022

CAS Key Laboratory of Microscale Magnetic Resonance

- ✧ Learned the hybrid variational quantum eigensolver algorithms applied to solve problems in quantum chemistry, nuclear physics and condensed matter physics;
- ✧ Learned 'Strong Quantum Contextuality' that classifies non-contextual and contextual subspace of a given Hamiltonian, where reduced contextual Hamiltonian leads to reduction of qubits;
- ✧ Implemented 'Tapering Off' methods and contextual variational quantum eigensolver algorithm to calculate ground energy of the water molecular, where scale of Hamiltonian shrinks from original 14 qubits to 7 qubits;
- ✧ Designed the quantum circuit in 7 qubits on trapped ions based on hardware-efficient ansatz, and compared results simulated on Qiskit package in different scales and variational algorithms;

***Key Member,* Gate Pulse Shaping Technique for Mølmer-Sørensen Gates on Trapped Ions** 12.2021-03.2022

CAS Key Laboratory of Microscale Magnetic Resonance

- ✧ Deduced the Hamiltonian of ions interacting with bichromatic light to get the evolution operator under such Hamiltonian by Magnus formula;
- ✧ Developed a program implementing Lagrange multiplier to achieve the maximal fidelity of the Mølmer-Sørensen gate by optimizing the shape of laser pulses.
- ✧ Simulated high-fidelity two-qubit gate by Qutip achieved in optimized pulse shape with 99.998% fidelity, and computed the evolutions of phonons and spin of ions.

***Key Member,* Visualization of Position of Beam Based on 2D Lateral Effect PSD** 03.2020-08.2021

CAS Key Laboratory of Microscale Magnetic Resonance

- ✧ Learned 2D Lateral Effect PSD intended to report the specific position of the beam and assist in monitoring and stabilizing optical path in experiments;
- ✧ Designed a paradigm PCB for the double-channel dividing circuit using the operational amplifier and processed real displacement of the beam to the center of sensor by dividing output signals;
- ✧ Welded the circuit board independently and packaged the whole electronic system to realize signal division module, which was already used in doppler cooling system for trapping Ca;
- ✧ Designed and built a 405nm optical path with a 3-axis adjustable displacement platform for testing;
- ✧ Analyzed and compared processed output signals with real displacements, which is at least 99.8% linear relevant with 1.032 scale factor.

***Team Leader & Lecturer*, Experiment Based on Stimulated Raman Scattering of CVD-Diamond** 09.2020-01.2021

Physics Experiment Teaching Center, University of Science and Technology ofChina

- ✧ Explored the 532 nm laser frequency conversion technology based on the stimulated Raman effect of the diamond;
- ✧ Built an optical path for research using lasers and optical instruments, including an optical cavity that can select and amplify the output of a specific frequency;
- ✧ Used the stimulated Raman effect of diamond to transform the frequency of the incident laser and obtained a short and stable outgoing laser;
- ✧ Found the optical component of the frequency change (1st Stokes's effect in 573nm and 2nd Stokes's effect in 620nm) caused by diamond stimulated Raman effect after analyzing the frequency and intensity of the outgoing laser by a spectrum analyzer, which verified the existence of this effect;
- ✧ Calculated the photon conversion rate and energy conversion rate (1st stokes effect about 1% and 2nd stokes effect about 0.1%) of the laser through the whole device;
- ✧ Analyzed the undesired optical effects of unparallel surfaces of diamond and put forward improvement on the experiment;
- ✧ Won the second prize of the 16^{th} (2020) University Physics Innovative Research Experimental Paper Competition.

Skill

Computer skills: C, Python (especially **scqubits**, **Qutip** and **Qiskit**), Wolfram Mathematica, and MATLAB, *etc*.

Wet Laboratory: Circuit board (PCB) designing and drawing based on **Altium Designer**, Circuit board (PCB) wielding, Mechanical drawing and processing based on **Inventor**, Designing and Setting up simple optical path, and Simulation of multi-physical field coupling model based on **COMSOL,** *etc.*