

Mengbo GUO(郭孟博)

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### Education and Qualifications

09/2023-07/2025 Hong Kong University of Science and Technology  
Degree: Master of Science Major: Physics  
Supervisor: Gyu-boong Jo  
09/2019-06/2023 Wuhan University  
Degree: Bachelor of Science Major: Physics (Hongyi Honor College)  
GPA: 3.75/4.0

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### Research Experience

08/2024-12/2024 Using Acousto-optic deflector(AOD) to generate linear potential for Optical Stern-Gerlach(OSG)  
To get the information of polarization and momentum simultaneously, we plan to use a pattern whose intensity will vary linearly as OSG light. In bench test, I've got linear potential successfully.

05/2024-06/2024 Assembling a home-made external cavity diode laser(ECDL)  
To make a backup for seed laser of high power 1064nm amplifier, I assembled an ECDL and test it.

09/2023-02/2024 Using Spatial Light Modulator(SLM) to generate flat-top potential  
To observe the behavior of atoms in a uniform potential, we need to get the flat-top pattern at first. In bench test, I get a round flat-top pattern via SLM, whose minimum RMS error is 8%.

12/2022-03/2023 Quantum gate for neutral atoms  
In the program, I learned quantum optics and designed a scheme to accelerate single-qubit addressing by loading two isotopes into a hybrid atom array. Such a scheme can also be used to accelerate multi-qubit gates.

07/2021-01/2022 Selective transfer of quantum information  
(Supervised by Prof. Wenxian zhang)  
The original goal of the program was to propose new schemes for transferring information from the NV center to specific nuclear spins. During this program, I demonstrated that the scheme proposed by Bradley et al. has no limitations on the initial state of the NV center.

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### Professional Skills

Basic skills in programming and numerical simulation: matlab, C/C++, and Python (using QuTip to simulate quantum gate; using PyTorch to accelerate tensor calculation).  
Building optical system, including fiber coupling, aligning AOD and AOM.

Maintaining experimental machine, like fixing electronic device and optimizing the sequence setting to get target atom gas.  
Controlling SLM via Python Interface and getting phase mask through CG algorithm.  
Controlling AOD via C++ Driver Interface.

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## **Publications**

1. Chengdong He, Xin-Yuan Gao, Ka Kwan Pak, Yu-Jun Liu, Peng Ren, **Mengbo Guo**, Entong Zhao, Yangqian Yan, Gyu-Boong Jo. Thermodynamics of Spin-Imbalanced Fermi Gases with SU(N) Symmetric Interaction. Phys. Rev. Lett. 134 183406 (2025).
  2. Yu-Jun Liu, Ka Kwan Pak, Peng Ren, **Mengbo Guo**, Entong Zhao, Chengdong He and Gyu-Boong Jo. Third-Order Exceptional Point in Non-Hermitian Spin-Orbit-Coupled cold atoms. Phys. Rev. A In press  
arXiv:2412.17705 (2024)
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