Kunhong Shen

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EDUCATION

Ph.D. in Physics, Purdue University, West Lafayette — 2019 – 2025 (Expected)
Advisor: Prof. Tongcang Li.

B.S. in Physics, University of Science and Technology of China (USTC) — 2015 – 2019

RESEARCH EXPERIENCE

Department of Physics and Astronomy, Purdue University — West Lafayette, IN
Research assistant — Dec. 2019 – Now

- On-chip optical levitation with a high NA metalens.
- Simulation of optical force and torque.
- Near field sensing with a nanodumbbell.
- Searching for non-contact Casimir friction.
- Spin readout and control with a levitated fast rotating diamond in high vacuum.

Helmholtz Institute — Mainz, Germany
Undergraduate summer research intern — July 2018 – Sept. 2018

- Zero to ultra-low filed (ZULF) nuclear magnetic resonance theory.
- Study the asymmetry of Zeeman splitting of ZULF experiment.

Key Laboratory of Quantum Information, USTC — Hefei, China
Undergraduate student — May 2017 – Dec. 2018

- Basic knowledge of the principle of optical tweezers and building a dual-beam optical trap.

SKILLS

- **Programming:** MATLAB, Python, C/C++, LabVIEW, Mathematica, Rust.
- **Software:** Blender, COMSOL, Ansys Lumerical-FDTD, Solidworks, Scuff-EM.
- **Technical:** AMO experiments, Optics, SEM, vacuum system, Clusters computation, FPGA (NI card, Red Pitaya).

HONORS AND REWARDS

Ross fellowship — 2019
Awarded to the most outstanding applicants to Purdue University.

Optics in 2022, Optics & Photonics News — 2022
The special issue highlights exciting peer-reviewed optics research over the past year.

PUBLICATIONS

First and co-first authors:

1. Jin, Y., **Shen, K.**, Ju, P., Gao, X., Zu, C., Grine, A.J. and Li, T., 2024. Quantum control and fast rotation of levitated diamonds in high vacuum. **Nature Communications**, 15, 5063.
2. **Shen, K.**, Duan, Y., Ju, P., Xu, Z., Chen, X., Zhang, L., Ahn, J., Ni, X. and Li, T., 2021. On-chip optical levitation with a metalens in vacuum. **Optica**, 8(11), pp.1359-1362.

The remainings:

1. Ju, P., Püschel, S., **Shen, K.**, Jin, Y., Tanaka, H. and Li, T., 2024. Purcell enhanced optical refrigeration. arXiv preprint arXiv:2404.19142.

2. Xu, Z., Ju, P., **Shen, K.**, Jin, Y., Jacob, Z. and Li, T., 2024. Observation of non-contact Casimir friction. arXiv preprint arXiv:2403.06051.
3. Ju, P., Jin, Y., **Shen, K.**, Duan, Y., Xu, Z., Gao, X., Ni, X. and Li, T., 2023. Near-field GHz rotation and sensing with an optically levitated nanodumbbell. **Nano letters**, 23(22), pp.10157-10163.
4. Gao, X., Vaidya, S., Dikshit, S., Ju, P., **Shen, K.**, Jin, Y., Zhang, S. and Li, T., 2023. Nanotube spin defects for omnidirectional magnetic field sensing. arXiv preprint arXiv:2310.02709.
5. Gao, X., Vaidya, S., Ju, P., Dikshit, S., **Shen, K.**, Chen, Y.P. and Li, T., 2023. Quantum sensing of paramagnetic spins in liquids with spin qubits in hexagonal boron nitride. **ACS Photonics**, 10(8), pp.2894-2900.
6. Xu, Z., Ju, P., Gao, X., **Shen, K.**, Jacob, Z. and Li, T., 2022. Observation and control of Casimir effects in a sphere-plate-sphere system. **Nature Communications**, 13(1), p.6148.
7. Gao, X., Vaidya, S., Li, K., Ju, P., Jiang, B., Xu, Z., Allcca, A.E.L., **Shen, K.**, Taniguchi, T., Watanabe, K. and Bhave, S.A., 2022. Nuclear spin polarization and control in hexagonal boron nitride. **Nature Materials**, 21(9), pp.1024-1028.
8. Gao, X., Jiang, B., Llacsahuanga Allcca, A.E., **Shen, K.**, Sadi, M.A., Solanki, A.B., Ju, P., Xu, Z., Upadhyaya, P., Chen, Y.P. and Bhave, S.A., 2021. High-contrast plasmonic-enhanced shallow spin defects in hexagonal boron nitride for quantum sensing. **Nano Letters**, 21(18), pp.7708-7714.

TEACHING EXPERIENCE

Department of Physics and Astronomy, Purdue University West Lafayette, IN
Teaching assistant Aug. 2019 – May. 2021

- Thermal and Statistical Physics (2019 Fall)
- Electricity and Magnetism I (2020 Spring & 2021 Spring)
- Electricity and Magnetism II (2020 Fall)

COMMUNITY SERVICE

Department of Physics and Astronomy, Purdue University
Community Quantum Open House, volunteer Nov. 22, 2022