Zheng-Hao Liu, PhD candidate

Date of Birth: 25 Jun. 1995
Nationality: Chinese
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Objective

To contribute to the excellence and success in your group as a *postdoctoral research associate* with my experience in experimental quantum optics, strong ethics of research, creativity and enthusiasm.

Summary of Expertise

- Experience with various systems like synthetic dimensions, fibre optics and colour centres.
- Solid background in experimental linear quantum optics with significant publications.
- Extensive social network maintaining close collaboration with theoretical groups.
- Adept in teamwork and organising, leading and completing research projects.
- Work-oriented, self-driven researcher with a pursuit of discovery.

Education

2017 – 2022 **Ph.D. in physics, University of Science and Technology of China**
CAS Key Laboratory of Quantum Information. Mentor: Prof. Jin-Shi Xu.
Research focus: Optical quantum information processing, quantum simulation, theoretical investigations and experimental tests of quantum foundations.

2016 **Exchange student, University of Michigan**, Ann Arbor, MI, USA.
College of Literature, Science and the Arts. Project advisor: Prof. Hui Deng.

2013 – 2017 **B.Sc., University of Science and Technology of China**, Hefei, China.
Yan Ji-Ci Talent Program in Physics, School of Physics. GPA:3.76/4.3.
Bachelor of Science dissertation title: Experimental half-degenerate optical orbital angular momentum resonant cavities.

Research Highlights

- Observing two"quantum Cheshire cats" exchanging grins. [*Nat. Commun.* **11**, 3006 (2020)]
- Optical simulation of the dynamics of contextuality in topological systems and its application in fault-tolerant, universal quantum computing. [*PRX Quantum* **2**, 030303 (2021)].
- Constructing and testing a family of generalized Greenberger–Horne–Zeilinger-type paradoxes for quantum state verification of graph states. [*npj Quant. Inf.* **7**, 66 (2021)]

Awards

2022 **Wang Daheng elite Ph.D. fellowship** by the Chinese Optical Society.

Elite graduate student by University of Science and Technology of China.

2021 **National scholarship** for doctoral students in China (¥30k).

Light: Science & Applications **(LSA) academic league** for doctoral students in optics and optical engineering, advanced to grand finals (top 30 in China) at Changchun Institute of Optics, Fine Mechanics and Physics.

Review article commissioned by LSA (pending drafting). Certification.

2020 **PFUNT best oral report award**, first prize, at Nanjing University.

China Aerospace Science and Technology fellowship, first prize (¥10k), by University of Science and Technology of China.

2017 **Elite undergraduate student** by University of Science and Technology of China.

Employment History, Community Service, etc.

2021 – **Consultant research associate, QBoson**.
Development of high-speed optical fiber network for coherent Ising machine.

2020 – **Referee** for *Light: Science & Applications* and *Annalen der Physik*.

2019 **Conference assistant** in *Quantum Optics Science and Tech Forum*, Chuzhou.

Volunteer in *Chinese Optical Society Conference* at Hefei.

2016 **Teaching assistant**, University of Science and Technology of China.
Course: electromagnetism. Lecturer: Dr. Xiao-Ping Tao. Responsibility includes deliver exercise lessons, overreading homework and examination papers.

Skills

Languages Strong, comprehensive competencies for oral/written English.
Certified proficiency in Japanese (JLPT N2, Dec. 2020).

Coding Mathematica, Python, C++. With a focus on graph theory and quantum circuit.

References

Available upon Request

Appendix: List of Publications

Journal Articles

1 **Liu**, **Z.-H.**, Pan, W.-W., Xu, X.-Y., Yang, M., Zhou, J., Luo, Z.-Y., Sun, K., Chen, J.-L., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2020). Experimental exchange of grins between quantum cheshire cats. *Nature Communications*, **11**, 3006. https://doi.org/10.1038/s41467-020-16761-0

2 **Liu**, **Z.-H.**, Sun, K., Pachos, J. K., Yang, M., Meng, Y., Liao, Y.-W., Li, Q., Wang, J.-F., Luo, Z.-Y., He, Y.-F., Ding, G.-R., Xu, J.-S., Han, Y.-J., Li, C.-F., & Guo, G.-C. (2021). Topological contextuality

and anyonic statistics of photonic-encoded parafermions. *PRX Quantum*, **2**, 030323. https://doi.org/10.1103/10.1103/PRXQuantum.2.030323

3 **Liu**, **Z.-H.**, Liang, X.-B., Sun, K., Li, Q., Meng, Y., Yang, M., Li, B., Chen, J.-L., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2021). Photonic implementation of quantum information masking. *Physical Review Letters*, **126**, 140505. https://doi.org/10.1103/PhysRevLett.126.140505

4 **Liu**, **Z.-H.**, Zhou, J., Meng, H.-X., Yang, M., Li, Q., Meng, Y., Su, H.-Y., Chen, J.-L., Sun, K., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2021). Experimental test of the Greenberger–Horne–Zeilinger-type paradoxes in and beyond graph states. *npj Quantum Information*, **7**, 66. https://doi.org/10.1038/s41534-021-00397-z

5 Sun, K., **Liu**, **Z.-H.**, Wang, Y., Hao, Z.-Y., Xu, X.-Y., Xu, J.-S., Li, C.-F., Guo, G.-C., Castellini, A., Lami, L., Winter, A., Adesso, G., Compagno, G., & Lo Franco, R. (2022). Activation of indistinguishability-based quantum coherence for enhanced metrological applications with particle statistics imprint [co-first author]. *Proceedings of the National Academy of Sciences*, **119**, e2119765119. https://doi.org/10.1073/pnas.2119765119

6 **Liu**, **Z.-H.**, Meng, H.-X., Xu, Z.-P., Zhou, J., Ye, S., Li, Q., Sun, K., Su, H.-Y., Cabello, A., Chen, J.-L., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2019). Experimental observation of quantum contextuality beyond Bell nonlocality. *Physical Review A*, **100**, 042118. https://doi.org/10.1103/PhysRevA.100.042118

7 **Liu**, **Z.-H.**, Xu, J.-S., & Li, C.-F. (2022). Quantum information masking [invited review]. *Acta Optica Sinica*, **42**, 0327001. https://www.opticsjournal.net/Articles/OJd696d25acb8fbfb3/Abstract

8 Yang, M., **Liu**, **Z.-H.**, Cheng, Z.-D., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2019). Deep hybrid scattering image learning [co-first author]. *Journal of Physics D: Applied Physics*, **52**, 115105. https://doi.org/10.1088/1361-6463/aafa3c

9 Wang, J.-F., **Liu**, **Z.-H.**, Yan, F.-F., Li, Q., Yang, X.-G., Guo, L., Zhou, X., Huang, W., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2020). Experimental optical properties of single nitrogen vacancy centers in silicon carbide at room temperature. *ACS Photonics*, **7**, 1611–1616. https://doi.org/10.1021/acsphotonics.0c00218

10 Cheng, Z.-D., **Liu**, **Z.-H.**, Li, Q., Zhou, Z.-W., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2019). Flexible degenerate cavity with ellipsoidal mirrors. *Optics letters*, **44**, 5254–5257. https://doi.org/10.1364/OL.44.005254

11 Sun, K., Wang, Y., **Liu**, **Z.-H.**, Xu, X.-Y., Xu, J.-S., Li, C.-F., Guo, G.-C., Castellini, A., Nosrati, F., Compagno, G. et al. (2020). Experimental quantum entanglement and teleportation by tuning remote spatial indistinguishability of independent photons. *Optics Letters*, **45**, 6410–6413. https://doi.org/10.1364/OL.401735

12 Yang, M., Li, Q., **Liu**, **Z.-H.**, Hao, Z.-Y., Ren, C.-L., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2020). Experimental observation of an anomalous weak value without post-selection. *Photonics Research*, **8**, 1468–1474. https://doi.org/10.1364/PRJ.393480

13 Zheng, Y., Yang, M., **Liu**, **Z.-H.**, Xu, J.-S., Li, C.-F., & Guo, G.-C. (2021). Detecting momentum weak value: Shack–Hartmann versus a weak measurement wavefront sensor. *Optics Letters*, **46**, 5352–5355. https://doi.org/10.1364/OL.439174

14. Zheng, Y., Yang, M., **Liu**, **Z.-H.**, Xu, J.-S., Li, C.-F., & Guo, G.-C. (2022). Toward practical weak measurement wavefront sensing: Spatial resolution and achromatism. *Optics Letters*, **47**, 2734–2737. https://doi.org/10.1364/OL.460873

15. Li, Q., Zhou, J.-Y., **Liu**, **Z.-H.**, Xu, J.-S., Li, C.-F., & Guo, G.-C. (2019). Stable single photon sources in the near c-band range above 400 k. *Journal of Semiconductors*, **40**, 072902. https://doi.org/10.1088/1674-4926/40/7/072902

16. Cheng, Z.-D., Li, Q., **Liu**, **Z.-H.**, Yan, F.-F., Yu, S., Tang, J.-S., Zhou, Z.-W., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2018). Experimental implementation of a degenerate optical resonator supporting more than 46 laguerre-gaussian modes. *Applied Physics Letters*, **112**(20), 201104. https://doi.org/10.1063/1.5025132

17. Hao, Z.-Y., Sun, K., Wang, Y., **Liu**, **Z.-H.**, Yang, M., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2022). Demonstrating shareability of multipartite einstein-podolsky-rosen steering. *Physical Review Letters*, **128**(12), 120402. https://doi.org/10.1103/PhysRevLett.128.120402

18. Wang, J.-F., Yan, F.-F., Li, Q., **Liu**, **Z.-H.**, Liu, H., Guo, G.-P., Guo, L.-P., Zhou, X., Cui, J.-M., Wang, J., Zhou, Z.-Q., Xu, X.-Y., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2020). Coherent control of nitrogen-vacancy center spins in silicon carbide at room temperature. *Physical Review Letters*, **124**(22), 223601. https://doi.org/10.1103/PhysRevLett.124.223601

19. Wang, J.-F., Yan, F.-F., Li, Q., **Liu**, **Z.-H.**, Cui, J.-M., Liu, Z.-D., Gali, A., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2021). Robust coherent control of solid-state spin qubits using anti-stokes excitation. *Nature Communications*, **12**, 3223. https://doi.org/10.1038/s41467-021-23471-8

20. Yang, M., Xiao, Y., Liao, Y.-W., **Liu**, **Z.-H.**, Xu, X.-Y., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2020). Zonal reconstruction of photonic wavefunction via momentum weak measurement. *Laser & Photonics Reviews*, **14**(5), 1900251. https://doi.org/10.1002/lpor.201900251

21. Liao, Y.-W., Li, Q., Yang, M., **Liu**, **Z.-H.**, Yan, F.-F., Wang, J.-F., Zhou, J.-Y., Lin, W.-X., Tang, Y.-D., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2022). Deep-learning-enhanced single-spin readout in silicon carbide at room temperature. *Physical Review Applied*, **17**(3), 034046. https://doi.org/10.1103/PhysRevApplied.17.034046

Preprints

1. **Liu**, **Z.-H.**, Li, Q., Liu, B.-H., Huang, Y.-F., Xu, J.-S., Li, C.-F., & Guo, G.-C. (2022). *Twenty years of quantum contextuality at USTC* [Journal of University of Science and Technology of China, in press].

2. Meng, Y., **Liu**, **Z.-H.**, Zhao, Z., Yin, P., Wang, Y.-T., Liu, W., Li, Z.-P., Yang, Y.-Z., Wang, Z.-A., Xu, J.-S., Yu, S., Tang, J.-S., Li, C.-F., & Guo, G.-C. (2021). *Probing asymmetry in spatial-temporal correlations in quantum causal inference* [under review]. https://doi.org/10.21203/rs.3.rs-311195/v1

3. Wang, Y., Hao, Z.-Y., **Liu**, **Z.-H.**, Sun, K., Xu, J.-S., Li, C.-F., Guo, G.-C., Castellini, A., Bellomo, B., Compagno, G., & Lo Franco, R. (2021). *Experimental remote entanglement distribution in a photonic quantum network through multinode indistinguishability* [under review]. https://doi.org/10.48550/arXiv.2107.03999

4. Wang, Y., Piccolini, M., Hao, Z.-Y., **Liu**, **Z.-H.**, Sun, K., Xu, J.-S., Li, C.-F., Guo, G.-C., Morandotti, R., Compagno, G., & Lo Franco, R. (2021). *Direct measurement of particle statistical phase* [under review]. https://doi.org/10.48550/arXiv.2202.00575