Zhifan Zhou

Curriculum Vitae

+1-240-521-9320
zhifan@umd.edu
https://zhifanzhou.com

Current Appointment

2019-present Research Scientist (equivalent to a postdoc), **Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland**, USA.

Education

2008-2013 **Ph.D. in Optics**, *East China Normal University (ECNU)*, Shanghai, China.
including an exchange program from 2010-2011 with the National Institute of Standards and Technology and Joint Quantum Institute at the University of Maryland at College Park.

2004-2008 **B.Eng. in Electronic Science and Technology, Minor in Public Relationship and Management**, *East China Normal University (ECNU)*, Shanghai, China.

Research Interests

I am interested in many topics related to atomic molecular and optical physics, quantum information science, nanofabrication, condensed-matter physics, and the intersection between quantum mechanics and general relativity. My current research focuses on multi-mode entangled lights, networked quantum computing/sensing, atom chip, clock interferometry and geometric phase.

Research Experience

2019.11- Research Scientist (equivalent to a postdoc), - Advisor: Paul Lett, **University of Maryland at College Park**, USA. Joint Quantum Institute.

2014.09-2019.11 PBC Postdoctoral Fellow and Research Fellow, - Advisor: Ron Folman, **Ben-Gurion University of the Negev**, Israel. Department of Physics.

01/2014 Postdoctoral Researcher (7 months), - Advisor: Thomas Halfmann, **Technical University of Darmstadt**, Germany. Institute of Applied Physics.

07/2013 Postdoctoral Researcher (6 months), - Advisor: Jietai Jing and Weiping Zhang, **East China Normal University**, China. Department of Physics.

2008-2010, 2011-2013 Research Assistant, - Advisor: Jietai Jing and Weiping Zhang, **East China Normal University**, China. Department of Physics.

2010.09-2011.08 Guest Researcher, - Advisor: Paul Lett, **National Institute of Standards and Technology**, USA. Laser Cooling and Trapping Group, Quantum Measurement Division.

Publications

Summary 20+ publications with 690+ citations and an h-index of 13 (according to Google Scholar), including 1 paper in Science, 2 papers in Science Advances, 1 paper in Physics Review Letters, 1 paper in Classical and Quantum Gravity, 2 papers in New Journal of Physics, 3 papers in Applied Physics Letters, 2 papers in Optics Letters, and 2 papers in Optics Express.

Conferences

Conference papers earlier than 2021 are not listed below.

2023 [C7] **Nonlocal phase modulation of multi-frequency-mode twin beams: toward networked quantum computing and sensing**.
Zhifan Zhou, Luis E. E. Araujo, Matthew DiMario, B. E. Anderson, Jie Zhao, Kevin M. Jones, Paul D. Lett.
SPIE, Paper 12447-42, 2023.

2022 [C6] **Nonlocal phase modulation of continuous-variable twin beams**.
Zhifan Zhou, Luis E. E. Araujo, Matthew DiMario, B. E. Anderson, Jie Zhao, Kevin M. Jones, Paul D. Lett.
Frontiers in Optics, Laser Science (**FIO, LS**), FW1B.2, 2022.

[C5] **Dissipative Kerr solitons in a warm atomic vapor system**.
Zhifan Zhou, Jie Zhao, Matthew DiMario, B. E. Anderson, Kevin M. Jones, Paul D. Lett.
Conference on Lasers and Electro-Optics (**CLEO**), FS4B.8., 2022.

[C4] **Kerr soliton formation in nondegenerate phase-conjugate resonators**.
Jie Zhao, Matthew DiMario, **Zhifan Zhou**, B. E. Anderson, Kevin M. Jones, Paul D. Lett.
Conference on Lasers and Electro-Optics (**CLEO**), JTu3A.42., 2022.

[C3] **Generation of Squeezed Light from Non-Degenerate Backwards Four-Wave Mixing in Warm Rubidium**.
Matthew DiMario, Jie Zhao, **Zhifan Zhou**, B. E. Anderson, Kevin M. Jones, Paul D. Lett.
Conference on Lasers and Electro-Optics (**CLEO**), FM3B.5., 2022.

2021 [C2] **A self-oscillating phase-conjugate resonator as an optical frequency comb**.
Zhifan Zhou, Jie Zhao, Rory W. Spiers, Nicholas Brewer, Meng-Chang Wu, Paul D. Lett.
Conference on Lasers and Electro-Optics (**CLEO**), JTu3A.48., 2021.

[C1] **Investigations on phase conjugation based on nondegenerate four wave mixing in a Rb vapor cell**.
Jie Zhao, **Zhifan Zhou**, Paul D. Lett.
Optical and Quantum Sensing and Precision Metrology (**SPIE**), 11700, 76-89, 2021.

Preprints

Preprint papers earlier than 2021 are not listed below.

2023 [P1] **Quantum Test of the Local Position Invariance with Internal Clock Interferometry**.
Zhifan Zhou
arXiv:2301.11258, 2023.

Journals

2022 [J16] **Observation of Anomalous Moire Patterns**.
Omer Amit, Or Dobkowski, **Zhifan Zhou**, Yair Margalit, Yonathan Japha, Samuel Moukouri, Yigal Meir, Baruch Horovitz, Ron Folman
New Journal of Physics, 24, 073032, 2022.

2021 [J15] **Realization of a complete Stern-Gerlach interferometer: Towards a test of quantum gravity**.
Yair Margalit, Or Dobkowski, **Zhifan Zhou**, Omer Amit, Yonathan Japha, Samuel Moukouri, Daniel Rohrlich, Anupam Mazumdar, Sougato Bose, Carsten Henkel, Ron Folman.
Science Advances, 7, eabg2879, 2021.

2020 [J14] **An experimental test of the geodesic rule proposition for the non-cyclic geometric phase**.
Zhifan Zhou, Yair Margalit, Samuel Moukouri, Yigal Meir, Ron Folman.
Science Advances, 6, eaay8345, 2020.

2019 [J13] **Analysis of a high-stability Stern-Gerlach spatial fringe interferometer**.
Yair Margalit, **Zhifan Zhou**, Shimon Machluf, Yonathan Japha, Samuel Moukouri, Ron Folman.
New Journal of Physics, 21, 073040, 2019.

[J12] **T^3-Stern-Gerlach Matter-Wave Interferometer**.
O. Amit, Y. Margalit, O. Dobkowski, **Z. Zhou**, Y. Japha, M. Zimmermann, M. A. Efremov, F. A. Narducci, E. M. Rasel, W. P. Schleich, R. Folman.
Physics Review Letters, 123, 083601, 2019.

2018 [J11] **Quantum complementarity of clocks in the context of general relativity**.
Zhifan Zhou, Yair Margalit, Daniel Rohrlich, Yonathan Japha, Ron Folman.
Classical and Quantum Gravity, 35, 185003, 2018.

2015 [J10] **A self-interfering clock as a "which path" witness**.
Yair Margalit, **Zhifan Zhou**, Shimon Machluf, Daniel Rohrlich, Yonathan Japha, Ron Folman.
Science, 349, 1205, 2015.

2014 [J09] **Ultralow-light-level all-optical transistor in rubidium vapor**.
Jietai Jing, **Zhifan Zhou**, Cunjin Liu, Zhongzhong Qin, Yami Fang, Jun Zhou, Weiping Zhang.
Applied Physics Letters 104, 151103 (2014).

2012 [J08] **Optical logic gates using coherent feedback**.
Zhifan Zhou, Cunjin Liu, Yami Fang, Jun Zhou, Ryan T. Glasser, Liqing Chen, Jietai Jing, Weiping Zhang.
Applied Physics Letters 101, 191113 (2012).

[J07] **Temporally multiplexed storage of images in a gradient echo memory**.
Quentin Glorieux, Jeremy B. Clark, Alberto M. Marino, **Zhifan Zhou**, Paul D. Lett.
Optics Express, 20, 12350 (2012).

[J06] **Storing a short movie in an atomic vapor**.
Quentin Glorieux, Jeremy B. Clark, Alberto M. Marino, **Zhifan Zhou**, Paul D. Lett.
SPIE Newsroom, DOI: 10.1117/ 2.1201206.004337(2012).

[J05] **Imaging using quantum noise properties of light**.
Jeremy B. Clark, **Zhifan Zhou**, Quentin Glorieux, Alberto M. Marino, Paul D. Lett.
Optics Express, 20, 17050 (2012).

[J04] **Compact diode-laser-pumped quantum light source based on four-wave mixing in hot rubidium vapor**.
Zhongzhong Qin, Jietai Jing, Jun Zhou, Cunjin Liu, Raphael Pooser, **Zhifan Zhou**, Weiping Zhang
Optics Letters, 37, 3141 (2012).

[J03] **Squeezing bandwidth controllable twin beam light and phase sensitive nonlinear interferometer based on atomic ensembles**.
Jietai Jing, Cunjin Liu, **Zhifan Zhou**, et al.
Chinese Science Bulletin, 57, 1925 (2012).

2011 [J02] **Realization of a nonlinear interferometer with parametric amplifiers**.
Jietai Jing, Cunjin Liu, **Zhifan Zhou**, Z. Y. Ou, Weiping Zhang.
Applied Physics Letters 99, 011110 (2011).

[J01] **Realization of low frequency and controllable bandwidth squeezing based on a four-wave-mixing amplifier in rubidium vapor**.
Cunjin Liu, Jietai Jing, **Zhifan Zhou**, R. C. Pooser, F. Hudelist, Lu Zhou, Weiping Zhang.
Optics Letters, 36, 2979 (2011).

Book Chapters

2021 [B1] **Stern-Gerlach Interferometry with the Atom Chip**.
Mark Keil, Shimon Machluf, Yair Margalit, **Zhifan Zhou**, Omer Amit, Or Dobkowski, Yonathan Japha, Samuel Moukouri, Daniel Rohrlich, Zina Binstock, Yaniv Bar-Haim, Menachem Givon, David Groswasser, Yigal Meir, Ron Folman
In: Friedrich B., Schmidt-Böcking H. (eds) Molecular Beams in Physics and Chemistry. Springer, Cham (2021).

Academic Activities

Journal Reviewers

Physical Review Letters, Physical Review Applied, Photonics Research, Optics Letters, Optics Express, Journal of the Optical Society of America A, Journal of the Optical Society of America B, and Physica Scripta.

Invited Talks

01/2023 **Nonlocal phase modulation of multi-frequency-mode twin beams: toward networked quantum computing and sensing**. Quantum Sensing, Imaging, and Precision Metrology **SPIE. Photonics West 2023.**

01/2020 **An experimental test of the geodesic rule proposition for the noncyclic geometric phase**. Atom Optics and Interferometry II, the 50th Winter Colloquium on the Physics of Quantum Electronics **PQE-2020.**

08/2015 **Coherent Stern-Gerlach matter-wave interferometer on an atom chip**. the 3rd International Conference on Molecular, Atomic, Nuclear and Particle Physics, Shanghai, China **MANPP 2015.**

Oral Presentations at Conferences

10/2022 **Nonlocal phase modulation of continuous-variable twin beams**. **FiO+LS 2022**. FW1B.2

05/2022 **Dissipative Kerr solitons in a warm atomic vapor system**. **CLEO 2022**. FS4B.8

06/2020 **Freezing of spinor dynamics in an ultracold Bose gas via microwave dressing**(virtual). Annual Meeting of the APS **DAMOP 2020**. N09. 00001

12/2018 **Quantum complementarity with clocks in the context of general relativity**. The Israel Physical Society annual meeting 2018, the section of Atomic, Molecular and Optical B, Jerusalem, Israel **2018 IPS**.

03/2014 **Detection of single photons using slow light**. Quantum Information and Measurement **QIM 2014** Berlin, Germany, paper: QTu2B.5.

06/2011 **Dual all-optical OR/NOR logic gates in hot rubidium vapor**. Annual Meeting of the APS **DAMOP 2011**, Atlanta, BAPS.2011.DAMOP.U5.10.

Media Coverage

06/2021 An atom chip interferometer that could detect quantum gravity, **Science Linx News**, **EurekAlert!** **AAAS**, **ScienceDaily**, **Paradigm**

03/2020 BGU Researchers Observe Geometric Phase, Which May Enable Revolutionary Quantum Technology, **Israel Science Info**

08/2015 One Clock in Two Places Simultaneously, **2physics**

08/2015 Einstein would have been pleased, **Jerusalem Post**

05/2012 World's First 'Atomic' Movie Is Stored in Vapor, **yahoo news**

07/2012 Storing a short movie in an atomic vapor, **SPIE**

07/2012 Short movies stored in an atomic vapor, **JQI news**, **nano werk**

Honors and Awards

2014 Planning and Budgeting Committee (PBC) fellowship for post-doctoral researchers, the Council for Higher Education, and the Ministry of Finance, *Israel*.

2012 Qualified in a global competition among young scientists worldwide to participate in the 62nd Lindau Nobel Laureate Meeting (Physics), *Germany*.

2009 Rank 1st in the Doctoral Qualification Exam to pursue a Ph.D. degree directly, *ECNU, China*.

Teaching and Mentoring Experience

Teaching

Spring 2010 Teaching Assistant at Atomic Molecular and Photonics (graduate level). ECNU

Spring 2009 Teaching Assistant at Atomic Physics (undergraduate level). ECNU

Fall 2008 Teaching Assistant at Linear Algebra (undergraduate level). ECNU

Mentoring

Summer 2021 **Conner Churko** (Undergraduate Student at UMD), Project on *Squeezed light and entanglement generation from four-wave mixing in hot rubidium vapor; Mechanically stabilized optical table and a three-layer temperature isolator for hot rubidium vapor.* *UMD*

2012-2013 **Jialu Yan** (Undergraduate Student at ECNU), Project on *Four-wave mixing in hot rubidium vapor.* *ECNU*
- *She continued her postgraduate study at the University of Missouri-Columbia, USA.*

2011-2012 **Zhu Wang** (Undergraduate Student at ECNU), Project on *Diode laser building and photon-electron detection.* *ECNU*
- *She continued her postgraduate study at University of Wisconsin-Madison, USA.*

2011-2013 Lianmin Cui (Master's Student at ECNU), Project on *Experimental Study of Quantum Correlation and Conical Emission based on Four-wave Mixing in Hot Atomic Vapor.* *ECNU*
- *After graduation, she worked as a lab instructor at University of Shanghai for Science and Technology, Shanghai, China.*