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# BO-HAN WU

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## Research Interests

Developing machine learning co-designed quantum systems to explore design spaces in quantum photonics and quantum information science. I am interested in leveraging machine learning to identify innovative solutions beyond human intuition, optimizing the performance and scalability of quantum technologies.

## Professional Experience

2025 - current	<b>Assistant Professor</b>	<i>Electrical and Computer Engineering (ECE), University of Hawai'i, Mānoa (UHM), Honolulu, HI</i>
2023 - 2025	<b>Postdoctoral Researcher</b>	<i>Research Laboratory of Electronics (RLE), Massachusetts Institute of Technology (MIT), Cambridge, MA Advisor: Prof. Dirk Englund</i>
2022	<b>Visiting Student</b>	<i>Electrical Engineering and Computer Science (EECS), University of Michigan, Ann Arbor, MI Advisor: Prof. Zheshen Zhang</i>
2014 - 2016	<b>Research Assistant</b>	<i>Institute of Atomic and Molecular Sciences (IAMS), Academia Sinica, Taipei, Taiwan Advisor: Dr. Ying-Cheng Chen</i>

## Education

2017 - 2022	<b>Ph.D., Physics,</b>	<i>The University of Arizona (UArizona), Tucson, AZ, USA Advisor: Prof. Zheshen Zhang and Prof. Quntao Zhuang (co-advised) Thesis: Continuous-variable photonic quantum information processing</i>
2011 - 2014	<b>M.S., Physics,</b>	<i>National Tsing Hua University (NTHU), Hsinchu, Taiwan Advisor: Prof. Ite Yu Thesis: Studies of Transient Effects from Single-<math>\Lambda</math> to Double-<math>\Lambda</math> Systems under the All-Resonant Condition</i>
2007 - 2011	<b>B.S., Electrophysics,</b>	<i>National Chiao Tung University (NCTU), Hsinchu, Taiwan</i>

## Grants Experience

2025	NSF 25-543, Pending, <u>Prof. Bo-Han Wu (UHM)</u> and Prof Hyeonrak Choi (SBU)
2024	AFRL (FA8750-25-2-0500), <b>Awarded</b> , Co-write with Dr. A. Kumar and Prof. D. Englund
2023	DARPA-INSPIRED (HR001123S0052), <b>Awarded</b> , Co-write with Prof. M. Yu (USC), Dr. Z. Chen (USC), Prof. D. Englund (MIT) and Prof. Q. Zhuang (USC)
2023	HRI-MIT collaboration statement of work, <b>Approved</b> by Honda Research Institute (HRI) USA

## Invited Talks

- 2026, 3. UHM (Department of Electrical and Computer Engineering), Seminar @ Honolulu, USA
- 2025, 12. UHM (Department of Physics and Astronomy), Colloquium @ Honolulu, USA
- 2025, 10. UHM (Department of Mathematics), Colloquium @ Honolulu, USA
- 2024, 5. Cornell University (Department of Applied and Engineering Physics), Seminar @ Zoom
- 2023, 1. NTHU (Department of Physics), Colloquium @ Hsinchu, Taiwan
- 2023, 1. National Yang Ming Chiao Tung University (Department of Photonics), Colloquium @ Hsinchu, Taiwan
- 2023, 1. Academia Sinica (Institute of Atomic and Molecular Sciences), Colloquium @ Taipei, Taiwan
- 2022, 12. [Hon-Hai Research Institute, Seminar @ Zoom](#)
- 2022, 11. MIT EECS, Optical and Quantum Electronics Seminar @ [Zoom](#)

## Awards and Honors

- 2012 Shang-Keng Ma Scholarship: Outstanding Statistical Mechanics study (Top 5%)
- 2010 Movie Physics Competition: Creating videos that analyzed the physics in movies (Top 5%)
- 2007, 2008 Joint Calculus Examinations (I, II): Calculus competition (Top 2%)

## Journal Publications

- 2026 1. “Bidirectional Nonlinear Optical Tomography: Unbiased Characterization of Off- and On-Chip Coupling Efficiencies,” **B.-H. Wu**, M. J. Mehrabad, D. Englund, arXiv: 2510.13110
- 2025 2. “Wafer-Scale Squeezed-Light Chips,” S. Liu, K. Zhou, Y. Zhang, A. Hariri, N. Reynolds, **B.-H. Wu**, Z. Zhang, arXiv: 2509.10445
- 2025 3. “All-optical reconfiguration of single silicon-vacancy centers in diamond for non-volatile memories,” Y. Xue, X. Ni, M. Titze, S. S. Su, **B.-H. Wu**, L. Zhang, C. Cui, S. Guha, M. Eichenfield, L. Fan, Nat. Commun. 16, 6275
- 2025 4. “Micro-Ring Perceptron Sensor for High-Speed, Low-Power Radio-Frequency Signal,” **B.-H. Wu**, S.-Y. Ma, S.-Y. Ma, S. K. Vadlamani, H. Choi, D. Englund, arXiv:2504.16119
- 2024 5. “Formation of Quasi-Bound States in the Continuum in a Single Deformed Microcavity,” S. Liu, **B.-H. Wu**, J. Huang, Z. Zhang, Photon. Res. 12, 2651
- 2024 6. “Distinguishing under- and over-coupled resonances without prior knowledge,” C. Cui, L. Zhang, **B.-H. Wu**, S. Liu, P.-K. Chen, L. Fan, Optica 11 (2), 176
- 2023 7. “Entanglement-assisted multi-aperture pulse-compression radar for angle resolving detection,” **B.-H. Wu**, S. Guha, Q. Zhuang, Quantum Sci. and Technol. 8 (3), 035016
- 2022 8. “Continuous-variable quantum repeaters based on bosonic error-correction and teleportation: architecture and applications,” **B.-H. Wu**, Z. Zhang, Q. Zhuang, Quantum Sci. and Technol. 7 (2), 025018
- 2020 9. “Quantum computing with multidimensional continuous-variable cluster states in a scalable photonic platform,” **B.-H. Wu**, R. N. Alexander, S. Liu, Z. Zhang, Phys. Rev. Research 2, 023138
- 2020 10. “Broadband coherent optical memory based on electromagnetically induced transparency,” Y.-C. Wei, **B.-H. Wu**, Y.-F. Hsiao, P.-J. Tsai, Y.-C. Chen, Phys. Rev. A 102 (6), 063720

- 2019 11. "Theoretical study of a memory-based optical converter with degenerate Zeeman states," P.-J. Tsai, Y.-C. Wei, **B.-H. Wu**, S.-X. Lin, Y.-C. Chen, *Phys. Rev. A* 100 (6), 063843
- 2017 12. "Enhanced spectral profile in the study of Doppler-broadened Rydberg ensembles," **B.-H. Wu**, Y.-W. Chuang, Y.-H. Chen, J.-C. Yu, M.-S. Chang, I. A. Yu, *Sci. Rep.* 7 (1), 9726
- 2016 13. "High conversion efficiency in resonant four-wave mixing processes," C.-Y. Lee, **B.-H. Wu**, G. Wang, Y.-F. Chen, Y.-C. Chen, I. A. Yu, *Opt. Express* 24 (2), 1008

## Conference Publications

- 2026 1. "Bidirectional Nonlinear Optical Tomography: Unbiased Characterization of Off- and On-Chip Coupling Efficiencies," **B.-H. Wu**, M. J. Mehrabad, D. Englund, SMT, Denver, CO, USA
- 2025 2. "Quantum Neuromorphic Sensor Network," **B.-H. Wu**, S.-Y. Ma, S.-Y. Ma, S. K. Vadlamani, H. Choi, D. Englund, SMT, Los Angeles, CA, USA
- 2023 3. "Generation of Squeezed Light in Silicon Nitride Photonic Integrated Chips," S. Liu, A. Hariri, **B.-H. Wu**, Y. Zhang, and Z. Zhang, *Conference on Lasers and Electro-Optics (CLEO)*, Charlotte, NC, USA
- 2020 4. "Continuous-variable quantum repeaters based on bosonic error-correction and teleportation: architecture and applications," **B.-H. Wu**, Z. Zhang and Q. Zhuang, *CLEO*, San Jose, CA, USA
- 2020 5. "Quantum-Computing Architecture based on Large-Scale Multi-Dimensional Continuous-Variable Cluster States in a Scalable Photonic Platform," **B.-H. Wu**, R. N. Alexander, S. Liu, Z. Zhang, *Conference on APS March meeting @ YouTube*.
- 2017 6. "Electromagnetically induced transparency based light storage in short pulse regime," **B.-H. Wu**, Y.-F. Hsiao, P.-J. Tsai, Y.-C. Chen, *Annual Meeting of the Physical Society of Taiwan*, Danshui, Taiwan
- 2014 7. "Studies of Conversion Efficiency and Energy Loss in Four-Wave Mixing Processes," **B.-H. Wu**, C.-Y. Lee, G. Wang, Y.-F. Chen, Y.-C. Chen, I. A. Yu, *Annual Meeting of the Physical Society of Taiwan*, Kaoshiung, Taiwan

## Journal Reviewer

Communication Physics, *Phys. Rev. Research*, *Quantum Electronics*, *Appl. Phys. Lett.*, *Entropy*, *Optical and Quantum Electronics*, *IEEE JSAC*, *Phys. Rev. A.*, *Appl. Opt.*,

## Teaching Experience

- 2026 ECE470/PHYS460 (Physical Optics): UHM, Electrical and Computer Engineering and Physics and Astronomy - Lecturer
- 2025 ECE491D/693D (Introduction to Quantum Information Science): UHM, Electrical and Computer Engineering - Lecturer
- 2023 6.2410 (Quantum Engineering System): MIT, Electrical Engineering and Computer Science - Guest Lecturer
- 2019 MSE350 (Numerical Methods): UArizona, Materials Science and Engineering - Guest Lecturer
- 2018 PHYS241 (Introduction to Electricity and Magnetism): UArizona, Physics - Teaching Assistant
- 2017-2018 PHYS141 (Introductory Mechanics): UArizona, Physics - Teaching Assistant
- 2017 PHYS181 (Introductory Laboratory I): UArizona, Physics - Teaching Assistant

- 2012 Mathematical and Scientific Thinking Lecture (general education): NTHU, Physics - Teaching Assistant
- 2012 Daily Physics (general education): NTHU, Physics - Teaching Assistant
- 2011 Introduction to Electrodynamics (I), (II): NTHU, Physics - Teaching Assistant

## Previous Highlighted Research Projects

- 2023 **Quantum Neuromorphic Sensor network** (MIT): I proposed a quantum sensor-network structure, where each sensor nodes perform physics-based convolution on the RF signal to extract it feature information
- 2023 **Large-scale spin entanglement generation** (MIT): I developed digital twins using quantum Monte Carlo algorithm to generate high-fidelity nuclear electron-spin entanglement (>99%), simulating the nuclear spin entanglement generation with the proposed protocol (i.e. Barrett-Kok scheme and Humsphrey scheme)
- 2023 **High-rate quantum key distribution with single-photon** (MIT): I designed and simulated the quantum-key distribution (QKD) rate and the entanglement fidelity of the proposed atomic absorption-based quantum communication protocol
- 2021 **Quantum radar** (UArizona): I developed a radar scheme in the use of a transform-limited quantum microwave pulse field and demonstrated the appreciable quantum advantage (> 15 dB) by setting a finite pulse duration (0.1 second)
- 2020 **Quantum integrated photonic chip** (UArizona): I experimentally designed, fabricated and characterized the microstructure (e.g. ELS-7000, Versaline DSE III, MLA150, FC2500), and setting up free-space optical measurement system (Pound-Driver-Hall technique and homodyne measurement). In this experiment project, I achieved 0.83 dB level squeezing on silicon photonic platform (SiN). Moreover, I developed the theory in simulating the quantum dynamics in photonic chips to match the theory with experiments.
- 2016 **EIT based light storage** (IAMS): I studied the broadband optical memory based on the EIT protocol and provided a theoretical analysis of the requirements needed to achieve efficient and broadband EIT memory.
- 2014 **Rydberg EIT spectra under low atomic density** (NTHU): I investigated Rydberg-EIT spectra in room-temperature  $^{87}\text{Rb}$  atoms, developing a theoretical model to describe how the contrast of EIT transparency changes with probe field intensity. Initially, the transparency contrast increases, peaks, and then gradually decreases. At optimal intensity, the contrast is 2-4 times higher than at the lowest intensity.
- 2012 **Efficient conversion in four-wave mixing process** (NTHU): I proposed an efficiency scheme of the resonant four-wave mixing (FWM) for the frequency up or down conversion. In this new scheme, two control fields are spatially varied such that a probe field at the input can be converted to a signal field at the output. The efficiency of probe-to-signal energy conversion can be 90% at medium's optical depth of about 100.