Jiachen He

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SKILLS SUMMARY

- **Instrumentation & Electronics**: Optics and Laser Analysis, Optical Alignment, Fiber Optics, Polarimeter, External Cavity Diode Lasers (ECDL), PIDs, cryogenic system, vacuum chamber, Fluxgate/Hall Effect Magnetometer, Lock-in Amplifier, Photoelastic Modulator (PEM), Electro-optic Modulator (EOM), RF Signal Generator, RF Amplifier, Spectrum Analyzer, Oscilloscope, Photo Detectors, Optical Chopper, DVMs.
- **Languages**: English, Chinese(Mandarin), Python, C++, LaTeX
- **Software**: COMSOL Multiphysics, MATLAB, Mathematica, Autodesk Inventor, LabVIEW, Microsoft Office
- **Platforms**: Unix based OS (Linux, Mac OS), Microsoft Windows
- **Soft Skills**: Leadership, Effective Time Management, Event Coordination, Technical Writing, Public Speaking & Presentations, Data Analysis, Module Development, Strong Communication & Collaboration, Analytical Reasoning, Problem Solving, Project Management.

PROFESSIONAL EXPERIENCE

- **Graduate Research Assistant** — University of Kentucky
  Research on sensitive optical magnetometer using resonant Faraday effect — *August 2019 - Present*
  - **Software Development**: Developed Python package for the wavelength meter, facilitating efficient communication and buffer usage without relying on low-level SCPI commands.
  - **Data Analysis**: Created and implemented multiple Python scripts for comprehensive Faraday rotation data analysis. All scripts and packages are available on GitHub to promote transparency and collaboration in scientific research.
  - **Synchronous Data Acquisition (SDAQ)**: Proficient in developing modular Python-based SDAQ systems for communication with scientific instruments such as digital I/O interfaces, wavelength meters, laser controllers, lock-in amplifiers, and Gaussmeters. The system efficiently initializes, configures, and synchronizes instruments, sending TTL-level pulse trigger signals and recording data in their buffers.
  - **Polarization Modulation Ellipsometer (PME)**: Expert in birefringence measurement system, including calibration and optimization. Performed precise optical alignment, utilizing lock-in amplifiers, Muller calculus, and waveform analysis to achieve sub-μrad accuracy in sensitive optical signal measurements.
  - **Merritt Coil Development and Implementation**: Designed and simulated (using Python) a Merritt coil system, followed by Autodesk Inventor modeling to incorporate mechanical engineering tasks for its development and construction. Collaborated closely with machine shop teams to ensure successful project delivery.
  - **Magnetic Field Design**: Independently developed a magnet box prototype, applying finite element analysis (COMSOL) to create uniform magnetic fields with shielding. This early-career project deepened my experience with FEA software and involved leveraging concepts like magnetic scalar potential and image fields.
  - **Laser Frequency Stabilization**: Extensive experience in spectroscopic laser frequency stabilization using PDH and DSAS techniques with alkali metals (Rb, K).
  - **Cryogenic and Vacuum Systems**: Contributed to system calibration and maintenance of a cryogenic system, gaining hands-on experience with vacuum technologies over five years.
  - **Ongoing Projects**: Machine learning algorithms for real-time magnetic field cancellation, Python package for Gaussmeter and implementing side-band laser locking using EOM.

- **Summer Research** — University of Kentucky
  Research on Etch Track-Directed Growth of Carbon Nanotubes on Graphite — *May 2018 - August 2018*
  - Making graphene/boron nitride samples with attached gold particles using chemical vapor deposition, studied frictional properties on the surface of graphene using microfluidic probe.

- **Graduation Project** — Shenzhen University
  Research on the Control System of Intelligent Fish Tank Based on Single Chip Microcomputer — *September 2015 - May 2016*

- **Open Laboratory Fund Project** — Shenzhen University
  Research on the Design of Temperature-controlled Automatic Watering Device — *September 2012 - October 2013*

TEACHING EXPERIENCE

- **University of Kentucky** — Lexington, US
  Graduate Teaching Assistant — *August 2017 - May 2019*
  - Instructed undergraduate students in Newtonian mechanics, electromagnetism, and physical optics through hands-on lab sessions and interactive recitations, fostering a deeper understanding of core physics concepts.

- **Beijing Dasheng Online Science and Technology Co., Ltd.** — Shenzhen, China
  Oral English Teacher (Online) — *February 2016 - July 2016*
  - As an online English instructor, I taught fundamental communication skills to adult learners, enhancing their oral proficiency.

Education

- **University of Kentucky** United States
  Ph.D. in Physics *(Expected Graduation Date: May 2025) August 2019 - Present*
  Courses: *Advanced Mechanics, Quantum Mechanics, Electromagnetic Theory, Statistical Mechanics, Methods of Theoretical Physics, Solid State Physics, Fundamental Particle Physics, Computational Physics.*

  Focus: *Magnetic field design and modeling, electric and magnetic polarizability, light interaction with materials in magnetic field, optics and laser technology, interferometry, birefringence measurement system, polarization modulation ellipsometry, optical homodyne detection, atomic spectroscopy, balanced polarimetry, laser frequency stabilization.*

- **University of Kentucky** United States
  M.S. in Physics *August 2017 - May 2019*

- **Shenzhen University** China
  B.E. in Measurement Control Technology and Instruments *September 2010 - July 2017*
  Thesis: *Research on the Control System of Intelligent Fish Tank Based on Single Chip Microcomputer.*

Publications

- **Korsch, W., Broering, M., Timsina, A., Leung, K.K., Abney, J., Budker, D., Filippone, B.W., He, J., Kandu, S., McCrea, M. and Roy, M., 2024. Electric charging effects on insulating surfaces in cryogenic liquids.** Review of Scientific Instruments, 95(4).

Presentations

In Person

- **J. He, W. Korsch, "Resonant Faraday rotation measurements in a potassium vapor cell.":** American Physical Society April meeting, Sacramento, April 2024

Poster Presentations

- **J. He, W. Korsch, "Resonant Faraday rotation measurements in a potassium vapor cell.":** Department of Physics & Astronomy, University of Kentucky, August 2024
  Awarded Second Overall Best Poster

- **J. He, W. Korsch, "A compact magnet design to create low-gradient magnetic field in the presence of magnetic shielding.":** National Nuclear Physics Summer School, Massachusetts Institute of Technology, Cambridge, July 2022

- **J. He, W. Korsch, "A compact magnet design to create low-gradient magnetic field in the presence of magnetic shielding.":** Department of Physics & Astronomy, University of Kentucky, August 2021

Leadership & Awards

- Graduate Student Congress (GSC) representative of Physics, University of Kentucky *August 2023 - August 2024*

- Graduate Student Congress (GSC) Conference Award *April 2024*

- Huffaker Travel Scholarship, Department of Physics & Astronomy, University of Kentucky *July 2022, April 2024*

- Departmental fellowship for graduate students with an outstanding curriculum *August 2017 - May 2019*

- Max Steckler Fellowship, Graduate School Fellowship, University of Kentucky *August 2018*

Volunteering

- **Raleigh International** Gorkha, Nepal
  Venturer *July 2016 - August 2016*
  - Created a simple webpage using online tools and successfully raised £2000 within two days to support a charity program aiding the earthquake-affected village of Chuwatar, Nepal.
  - Contributed to the construction of sanitary installations, water purification systems, and the laying of water pipelines, including excavating the foundation for a water reservoir to improve local living conditions and ensure a reliable clean water supply.

- **Beijing Youngs Group Public Relation Planning Co., Ltd.** Shenzhen, China
  Volunteer Docent, Intel Developer Forum 2015 *August 15, 2015 - August 21, 2015*
  - Selected as one of the top 10 out of 500 volunteers and recognized as an "Exceptional Volunteer".