Fangzhao Alex An

Research Experience

Ultracold Atom Research, *University of Illinois*, Gadway lab, 2014–2020.

- Built a brand new cold neutral atom experiment, laser trapping and cooling atoms down to Bose–Einstein condensation for quantum simulation experiments, with a focus on lattice models. Constructed vacuum systems, operated diode lasers, built electronics and magnetic field coils, and used a variety of optics and optoelectronic devices to control and manipulate cold atoms.
- Conducted six quantum simulation experiments from start to finish: planned the experiment, took and analyzed data, and organized data into figures for presentations and publications. Wrote four first-author publications (two in preparation), and delivered presentations at large (DAMOP) and small conferences (midwest cold atom workshop).
- Utilized Mathematica extensively for data analysis and data visualization, numerical simulations of ongoing experiments, and probing viability of future experiments.
- Communicated with other experimental groups regularly, and created a journal club for graduate students of atomic and optical physics groups. Collaborated with several theory groups both local (UIUC) and nonlocal (Rice, UT Dallas, Rutgers, Barcelona).
- Supervised two current graduate researchers and several summer undergraduate researchers. Worked in close collaboration with another graduate student to set up first apparatus (rubidium-87), and led efforts to set up a second apparatus (ongoing, potassium-39).

Quantum Optics Research, *Harvey Mudd College*, Lynn lab, 2011–2014.

- Improved efficiency of detecting pairs of single photons entangled in orbital angular momentum as part of a quantum communications experiment. Updated LabVIEW programs for instrument control.

Computational Physics Research, *Harvey Mudd College*, Haskell lab, 2012–2013.

- Implemented "Interferometric Synthetic Aperture Microscopy" algorithm in MATLAB and CUDA (parallel programming) to refocus images from frequency-domain optical coherence microscopy.

Education

2020 **University of Illinois at Urbana-Champaign**, *Ph.D. Physics*, GPA: 4.0/4.0.
Advisor: Bryce Gadway

2014 **Harvey Mudd College**, *B.S. Physics*, High Distinction and Department Honors, GPA: 3.91/4.0.
Advisors: Theresa Lynn, Richard Haskell

Skills

Software Mathematica, Python, LabVIEW, MATLAB, Latex, Adobe Illustrator

Technical Laser systems, Optics, Electronics/circuits, Vacuum systems, Machining

Awards and Honors

2020 John Bardeen Award (UIUC Physics)

2019 Drickamer Research Fellowship (UIUC Physics)

2019 Lindau Nobel Laureate Meeting

2016 UIUC University Fellowship (UIUC Physics)

2012 Rojansky Writing Award for Quantum Physics (HMC Physics)

2011 CRC Press Chemistry Achievement Award (HMC Chemistry)

Publications

1. *Exploring quantum signatures of chaos on a Floquet synthetic lattice*
   Eric J. Meier, Jackson Ang'ong'a, **Fangzhao Alex An**, and Bryce Gadway
   Phys. Rev. A **100**, 013623 (2019). [arXiv:1705.06714]
2. *Engineering tunable local loss in a synthetic lattice of momentum states*
   Samantha Lapp, Jackson Ang'ong'a, **Fangzhao Alex An**, and Bryce Gadway
   New J. Phys. **21**, 045006 (2019). [arXiv:1811.06046]
3. *Observation of the topological Anderson insulator in disordered atomic wires*
   Eric J. Meier, **Fangzhao Alex An**, Alexandre Dauphin, Maria Maffei, Pietro Massignan, Taylor L. Hughes, and Bryce Gadway
   Science **362**, 929 (2018). [arXiv:1802.02109]
4. *Engineering a flux-dependent mobility edge in disordered zigzag chains*
   Fangzhao Alex An, Eric J. Meier, and Bryce Gadway
   Phys. Rev. X **8**, 031045 (2018). [arXiv:1705.09268]
5. *Correlated dynamics in a synthetic lattice of momentum states*
   Fangzhao Alex An, Eric J. Meier, Jackson Ang'ong'a, and Bryce Gadway
   Phys. Rev. Lett. **120**, 040407 (2018). [arXiv:1708.01237]
6. *Diffusive and arrested transport of atoms under tailored disorder*
   Fangzhao Alex An, Eric J. Meier, and Bryce Gadway
   Nat. Commun. **8**, 325 (2017). [arXiv:1701.07493]
7. *Direct observation of chiral currents and magnetic reflection in atomic flux lattices*
   Fangzhao Alex An, Eric J. Meier, and Bryce Gadway
   Sci. Adv. **3**, e1602685 (2017). [arXiv:1609.09467]
8. *Observation of the topological soliton state in the Su-Schrieffer-Heeger model*
   Eric J. Meier, **Fangzhao Alex An**, and Bryce Gadway
   Nat. Commun. **7**, 13986 (2016). [arXiv:1607.02811]
9. *Atom optics simulator of lattice transport phenomena*
   Eric J. Meier, **Fangzhao Alex An**, and Bryce Gadway
   Phys. Rev. A **93**, 051602(R) (2016). [arXiv:1601.05785]
10. *Experimental Realization of Slowly Rotating Modes of Light*
    Fangzhao A. An
    HMC Senior Theses, Paper 53 (2014).
11. *Robust, real-time, digital focusing for FD-OCM using ISAM on a GPU*
    Luke R. St. Marie, **Fangzhao A. An**, Anthony L. Corso, John T. Grasel, and Richard C. Haskell
    Proc. SPIE **8934**, 89342W (2014).