Abraham J. Olson

Contact Information

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Education

Purdue University, West Lafayette, IN USA
Ph.D., Department of Physics and Astronomy. (Jan. 2015)
Dissertation Title: "The dynamics of ultracold atoms in light-induced synthetic gauge fields"

University of Portland, Portland, Oregon USA
B.S., Physics (Math minor), May 2007. *Maxima Cum Laude.*

Academic Experience

Purdue University, West Lafayette, IN USA

NDSEG/NSF Graduate Research Fellow **Aug. 2009 - Feb. 2015**

- Computationally modeled the possibility of observing magnetic dipole-dipole interactions in alkali BECs. Presented the results at two conferences, and published in Phys. Rev. A.
- Constructed an apparatus to create Bose-Einstein condensates, the coldest state of matter in the universe.
  - Designed and built lasers, laser amplifiers, numerous optical components, RF driver circuits, and various circuits (e.g. PID feedback, op-amps, digital/TTL switching).
  - Developed automated computer control of the apparatus using Labview and Matlab.
  - Implemented new imaging optics and image processing software.
  - Presented results at five conferences, and published results in Phys. Rev. A.
- Mentored 6 undergraduate students in research
- Provided advice and editorial feedback for >10 students with NSF fellowship applications
- Conceived of and ran experiments on Landau-Zener transitions in a spin-orbit coupled Bose-Einstein condensate, resulting in a conference presentation and a publication.

Teaching Assistant / Graduate Student **Aug. 2008 - May 2009**

- Taught experimental Physics lab to bio/pre-med students. Taught programming physics to engineering and physics students. Shared responsibility for homework assignments, grades and exams.
- Passed qualifying exam on diagnostic attempt.
- Received the NDSEG and NSF graduate research fellowships.
- Completed required Purdue Physics PhD program courses with a 3.81 GPA.

Publications

A.J. Olson, C.H. Li, D.B. Blasing, R.J. Niffenegger, Y.P. Chen, "Engineering an atom-interferometer with modulated light-induced 3π spin-orbit coupling" submitted arXiv (2015).

A.J. Olson, S.J. Wang, R.J. Niffenegger, C.H. Li, C.H. Greene, Y.P. Chen, "Tunable Landau-Zener transitions in a spin-orbit coupled Bose-Einstein condensate" Phys. Rev. A 90, 013616 (2014).

A.J. Olson, D.L. Whitenack, and Y.P. Chen "Effects of magnetic dipole-dipole interactions in atomic Bose-Einstein condensates with tunable s-wave interactions", Phys. Rev. A 88, 043609 (2013).

A.J. Olson, R.J. Niffenegger, Y.P. Chen, "Optimizing the efficiency of evaporative cooling in optical dipole traps", Physical Review A 87, 053613 (2013).

A.J. Olson, S.K. Mayer,"Electromagnetically Induced Transparency in Rubidium", Am. J. Phys. Vol. 77, (Feb. 2009)116-121.

A.J. Olson, E.J. Carlson, S.K. Mayer, "Two photon spectroscopy of rubidium using a grating feedback diode laser", Am. J. Phys. 74, (March 2006) 218-223.

Presentations

AJ Olson, SJ Wang, CH Li, RJ Niffenegger, CH Greene, YP Chen, "Observation of Landau-Zener transitions in spin-orbit coupled Bose-Einstein condensates". Talk at 2013 DAMOP Meeting in Quebec City, Canada.

AJ Olson, R Niffenegger, Sourav Dutta, Chuan-hsun Li, Yong Chen. "Gauge fields, spin-orbit coupling, and photo-association." Talk at 2012 Midwest Cold Atom Workshop in Urbana, IL.

AJ Olson, R Niffenegger, YP Chen "Loading and high efficiency evaporative cooling to BEC with a

MACRO-FORT." Talk at 2012 APS DAMOP Meeting in Orange County, CA.

AJ Olson, R Niffenegger, Ping Wang, YP Chen "Bose-Einstein condensation in ^{87}Rb via all-optical, runaway evaporative cooling". Poster at 2011 Midwest Cold Atom Workshop in Evanston, IL.

AJ Olson, Ping Wang, R Niffenegger, Qianli Ma, YP Chen "All-optical ^{87}Rb Bose-Einstein condensation using a 1550nm dipole trap". Poster at 2011 APS DAMOP Meeting in Atlanta, GA.

Ping Wang, AJ Olson, R Niffeneger, YP Chen "Effects of dipole-trap induced AC Stark shifts on ultracold Rubidium gases". Poster at 2010 Midwest Cold Atom Workshop in Ann Arbor, MI.

Ping Wang, AJ Olson, Qianli Ma, Sourav Dutta, YP Chen "Optical trapping of ultra-cold ^{87}Rb with a 1550nm laser". Poster at 2010 APS DAMOP Meeting in Houston, TX.

AJ Olson, YP Chen "Variational Calculations for the Effects of Magnetic Dipole-Dipole Interaction in Bose-Einstein Condensates". Poster at 2010 APS DAMOP Meeting in Houston, TX.

AJ Olson "Magnetic dipole-dipole interactions in Bose-Einstein condensates". Invited talk at University of Portland. Portland, OR.

AJ Olson, YP Chen "Effects of magnetic dipole-dipole interactions in Bose-Einstein condensates: geometry and stability". Poster at 2010 March Meeting in Portland, OR.

Ping Wang, AJ Olson, Qianli Ma, Sourav Dutta, YP Chen "Toward a Dynamic, 2-D Atomic Gas System for Quantum Emulation". 2009 Midwest Cold Atom Workshop in Chicago, IL.

Honors and Awards

Dr. Warner Black Award, Purdue University 2014
Lindau Nobel Laureate Meeting Young Researcher (Joachim Herz Stiftung and NSF Fellow), 2012
National Science Foundation Graduate Research (NSF GRFP) Fellow, 2009
National Defense Science and Engineering Graduate (NDSEG) Fellow, 2009
Ross Fellowship at Purdue University, 2008-2009
Goldwater Scholar Honorable Mention. U of Portland Award for Outstanding Student in Science, UP's Presidents Scholarship, Honors Grant, Merle Starr Scholarship, Schlotfeldt Scholarship, Waldschmidt Scholarship, Joseph Mullaney Physics Scholarship, Community Foundation Scholarship

Skills

- Laboratory: lasers, optical assemblies, light detection, image analysis, vacuum equipment, machining (lathe and mill), circuit design and assembly, RF electronics and noise analysis
- Programming, proficient with: Matlab, Labview, LaTeX, OriginPro, HTML, CSS
- Programming, experience with: Igor, Visual Basic for Applications, Mathematica
- Applications: Photoshop/GIMP, Inkscape (SVG editor), common Windows spreadsheet, and presentation software
- Business: technical writing, lead management (Choice Theory), entrepreneurship experience
- Comfortable with public speaking and presenting. Regularly lead workshops of 30+ people.
- 4 years Tutoring and T.A. experience in physics and math