Larry D. Isenhower

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Education

2005-2010	University of Wisconsin- Madison
	Ph.D. Physics- May 2010 Advisor: Mark Saffman, Ph.D.
	Thesis: *Demonstration of Rydberg Blockade, a Neutral Atom CNOT Gate, and Entanglement Generation*
2001-2005	Abilene Christian University
	B.S. Physics- *summa cum laude* Received Fred J. Barton Award for top physics graduate

Work Experience

2016-present	Abilene Christian University Assistant Professor Engineering and Physics Department
2014-2016	Abilene Christian University Instructor Engineering and Physics Department
2011-2014	University of Wisconsin- Madison
	Assistant Scientist
	Assisted leading development and testing of a multi-qubit neutral atom quantum computer
2010-2011	University of Wisconsin- Madison
	Postdoctoral researcher
	Responsible for design and implementation of laser systems for use in a multi-qubit neutral atom quantum computer

Research Experience

2015-present	Started work on a Cesium MOT at ACU, developed proposals for submission to NSF based on applications of Rydberg atoms to make a particle beam monitor
2010-2014	Helped lead development of a multi-qubit neutral atom quantum computer.
2006-2010	Graduate research on quantum computing with neutral atoms. Demonstrated the first Controlled-NOT quantum gate between two individual neutral atoms.
2005	Worked on modeling and simulating the proposed detector for Fermilab experiment E906 using GEANT4, a C++ based Monte Carlo simulator.
2001-2004	Worked on the PHENIX experiment at Brookhaven National Laboratory repairing and upgrading readout electronics for the Muon Tracker and implementing an internet database used to record important detector characteristics during experimental runs.

Teaching Experience

2016-present	Assistant Professor in Engineering and Physics Department at Abilene Christian University
2014-2016	Instructor in Engineering and Physics Department at Abilene Christian University
2008-2014	Assisted leading several undergraduate and graduate students through research projects in Mark Saffman's lab group
2005-2006	Graduate teaching assistant at the Univ. of Wisconsin- Madison Taught discussion and lab sections for calculus based General Physics course.
2001-2005	Teaching assistant at Abilene Christian University Laboratory instructor for General Physics, Engineering Physics and Modern Physics courses
2000-2005	Astronomy Laboratory Technician at Abilene Christian University Taught astronomy laboratories, maintained equipment, and instructed other student teaching assistants on the use of the laboratory equipment.

Research Interests

Rydberg atom interactions, ultra-stable lasers and cavities, laser frequency combs, nuclear physics measurements in atomic physics, electronic feedback circuits, computer simulation and modeling, and solid state analogs in atomic physics

References

Dr. Jess Dowdy	Chair ACU Eng. and Physics Dept. jtd10a@acu.edu	325-674-2165
Dr. Mark Saffman	Co-worker and Ph. D. advisor msaffman@wisc.edu	608-265-5601
Dr. Thad Walker	Co-worker and Ph. D. co-advisor tgwalker@wisc.edu	608-262-4093

Publications

Atomic Physics Papers

Maller, K. M. , et al., Rydberg-blockade controlled-NOT gate and entanglement in a two-dimensional array of neutral-atom qubits, *Physical Review A*, **92**, 022336 (2015)

Xia, T., et al., Randomized Benchmarking of Single-Qubit Gates in a 2D Array of Neutral-Atom Qubits, *Physical Review Letters,* **114**, 100503 (2015)

Piotrowicz, M. J., et al. Two-dimensional lattice of blue-detuned atom traps using a projected Gaussian beam array, *Physical Review A*, **88**(1), 013420, 2013

Zhang, X., et al., Fidelity of a Rydberg-blockade quantum gate from simulated quantum process tomography, *Physical Review A*, **85**(4), 042310, 2012

Li, G., et al., Crossed vortex bottle beam trap for single-atom qubits, *Optics Letters*, **37**(5), 851-853, 2012

Isenhower, L., Saffman, M., Molmer, K., Multibit CkNOT quantum gates via Rydberg blockade, *Quantum Information Processing*, **10**(6), 755-770, 2011

Molmer, K., Isenhower, L., Saffman, M., Efficient Grover search with Rydberg blockade, *Journal of Physics B*, **44**(18), 184016, 2011

Saffman, M., et al., Rydberg state mediated quantum gates and entanglement of pairs of neutral atoms, *Journal of Physics: Conference Series*, **264**, 012023, 2011

Zhang, X., et al., Deterministic entanglement of two neutral atoms via Rydberg blockade, *Physical Review A*, **82**(3), 030306, 2010

Knoernschild, C., et al., Independent individual addressing of multiple neutral atom qubits with a micromirror-based beam steering system, *Applied Physics Letters*, **97**(13), 134101, 2010

Isenhower, L., et al., Demonstration of a Neutral Atom Controlled-NOT Quantum Gate, *Physical Review Letters*, **104**(1), Jan 8 2010

(These results received a news highlight in the Feb. 2010 Physics Today)

Isenhower, L., et al., Atom trapping in an interferometrically generated bottle beam trap. O*ptics Letters*, **34**(8):1159–1161, Apr 15 2009

Urban, E., et al., Observation of Rydberg blockade between two atoms, *Nature Physics*, **5**(2):110-114, Feb 2009

Johnson, T. A., et al., Rabi oscillations between ground and rydberg states with dipole-dipole atomic interactions, *Physical Review Letters*, **100**(11), Mar 21 2008

Nuclear Physics Papers

During my undergraduate research I worked on the PHENIX experiment at Brookhaven National Lab. I took shifts and worked on construction and maintenance of the Muon Tracker system during this time. I am an author on 3 experimental runs because of this work. Data from these runs has led to ~100 papers. My work on the Muon Tracker detector had a direct impact on the papers listed here.

Adare, A., et al., J/psi production versus transverse momentum and rapidity in p+p collisions at root s=200 GeV, Physical Review Letters, **98**(23), Jun 8 2007

Adare, A., et al., J/psi production versus centrality, transverse momentum, and rapidity in Au+Au collisions at root S-NN=200 GeV, Physical Review Letters, **98**(23), Jun 8 2007

Adcox, K, et al., Formation of dense partonic matter in relativistic nucleus-nucleus collisions at RHIC: Experimental evaluation by the PHENIX Collaboration, Nuclear Physics A, **757**(1-2):184-283, Aug 8 2005

Adcox, K, et al., PHENIX detector overview, Nuclear Instruments & Methods in Physics Research Section A, **499**(2-3):469-479, Mar 1 2003

Akikawa, H, et al., PHENIX Muon Arms, Nuclear Instruments & Methods in Physics Research Section A, **499**(2-3):537-548, Mar 1 2003

Invited Talks and Colloquia

ACU physics colloquium, “The wonderful world of lasers”, Mar. 2013

DAMOP APS meeting, “Towards quantum computing with Rydberg atoms”, C7.00002 Jun 5, 2012

ACU physics colloquium, “Quantum computing using neutral atoms”, Mar. 2010

Midwest Cold Atom Workshop, “Demonstration of a Rydberg mediated neutral atom CNOT gate”, Nov. 2009