

Ian B. Spielman

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Junior Fellow, Joint Quantum Institute
National Institute of Standards and Technology
100 Bureau Drive, Stop 8424
Gaithersburg, MD 20899-8424
USA

email: ian.spielman@nist.gov
tel: (301) 975-8664
fax: (301) 975-8272

Current research program

My current experiments lie at the intersection of condensed matter and atomic physics. In general, we realize of many-body systems in ultra-cold atom systems, i.e., the Bose-Hubbard model for Rubidium atoms in an optical lattice. I am interested in studying more complicated model-systems, for example, creating a magneto-optical configurations leading to effective magnetic fields – making the charge *neutral* bosons move like charged particles in a magnetic field.

Education

Ph.D. in Physics June 1998 – June 2004
California Institute of Technology; Pasadena, California
Thesis: “Evidence for the Josephson Effect in Quantum Hall Bilayers”

B.S. in Physics and Mathematics (Suma Cum Laude) Aug. 1994 – May 1998
University of Oklahoma; Norman, Oklahoma

Research experience

Physicist Oct. 2007 – Present
National Institute of Standards and Technology; Gaithersburg, MD

Postdoctoral Researcher Aug. 2004 – Oct. 2006
National Institute of Standards and Technology; Gaithersburg, MD

Research on ultra cold atoms in optical lattices, focusing on condensed matter model systems. We focused very carefully on the superfluid to insulator transition in the realized 2D Bose-Hubbard model.

Postdoctoral Researcher July 2004
California Institute of Technology; Pasadena, CA

Studied the connection between coherent tunneling in quantum Hall bilayers and the local GaAs nuclear spin polarization.

Graduate Research Assistant Aug. 1998 – June 2004

California Institute of Technology; Pasadena, CA

Found evidence for an excitonic condensate via electron tunneling in GaAs heterostructures with large magnetic fields and at milli-Kelvin temperatures.

Undergraduate Research Assistant May 1997 – June 1998
University of Oklahoma; Norman, OK

Studied a possible metal insulator transition in 2d electron systems. Constructed gated InSb samples. Work done for Dr. S. Q. Murphy.

Undergraduate Research Assistant Aug. 1995 – May 1997
University of Oklahoma; Norman, OK

Tested silicon micro-strip detectors for the CLEO and ATLAS projects.

Summer student June 1996 – Aug. 1996
University of Texas Science and Technology Center; Austin, TX

Calculations and design of a cylindrical RF plasma source for use in a GaN MBE system.

Summer student June 1995 – Aug. 1995
Indiana University Cyclotron Facility; Bloomington, IN

Analyzed the data for the MEGA project, an experiment aimed at detecting non-conservation of lepton family number.

Teaching experience

Instructor Aug. 2007 – Dec. 2007
University of Maryland; College Park, MD
Co-taught the graduate level Atomic, molecular and optical physics class.

Graduate Teaching Assistant March 2000 – June 2000
California Institute of Technology; Pasadena, CA
Graded for Ph103, an upper division class on mesoscopic physics.

Graduate Teaching Assistant Aug. 1998 – June 1999
California Institute of Technology; Pasadena, CA
Taught the freshman computational physics series: Ph20a, b and c.

Peer reviewed publications

The Mott insulator transition in a 2D atomic Bose gas

I. B. Spielman, W. D. Phillips, and J. V. Porto.
Phys. Rev. Lett. **98** 080404 (2007)

Collisional de-excitation in a quasi-2D degenerate Bose gas

I. B. Spielman, P. R. Johnson, J. H. Huckans, C. D. Fertig, S. L. Rolston, W. D. Phillips,
and J. V. Porto.
Phys. Rev. A **73**, 020702(R) (2006).

Spin Transition in Strongly Correlated Bilayer Two Dimensional Electron Systems

I. B. Spielman, L. A. Tracy, J. P. Eisenstein, L. N. Pfeiffer and K. W. West.
Phys. Rev. Lett. **94**, 076803 (2005).

*Onset of Interlayer Phase Coherence in a Bilayer Two-Dimensional Electron System:
Effect of Layer Density Imbalance*

I. B. Spielman, M. Kellogg, J. P. Eisenstein, L. N. Pfeiffer and K. W. West.
Phys. Rev. B **70**, 081303 (2004).

Resistivity of dilute 2D electrons in an undoped GaAs heterostructure

M. P. Lilly, J. L. Reno, J. A. Simmons, I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, K.
W. West, E. H. Hwang, and S. Das Sarma.
Phys. Rev. Lett. **90**, 056806 (2003).

Observation of Quantized Hall Drag in a Strongly Correlated Bilayer Electron System

M. Kellogg, I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer and K. W. West.
Phys. Rev. Lett. **88**, 126804 (2002).

Observation of a Linearly Dispersing Goldstone Mode in a Quantum Hall Ferromagnet

I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West.
Phys. Rev. Lett. **87**, 036803 (2001).

Resonantly Enhanced Tunneling in a Double Layer Quantum Hall Ferromagnet

I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West.
Phys. Rev. Lett. **84**, 5808 (2000).

Kinetic Inductance of the Two-Dimensional Electron Gas

P. J. Burke, I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West.
Appl. Phys. Lett. **76**, 745 (2000).

Non-peer reviewed

*Bilayer 2D electron systems at $\nu_T=1$: phase boundary between weak and strong
coupling*

J. P. Eisenstein, M. Kellogg, I. B. Spielman, L. N. Pfeiffer, and K. W. West
Physica E **20**, 111 (2003).

Evidence of superfluidity in double layer 2D electron systems

J. P. Eisenstein, I. B. Spielman, M. Kellogg, L. N. Pfeiffer, and K. W. West
Physica E **18**, 103 (2003).

Tunneling in a quantum Hall excitonic condensate

J. P. Eisenstein, I. B. Spielman, L. N. Pfeiffer, and K. W. West
Int. J. of Mod. Phys. B **16**, 2923 (2002).

Talks and posters

2D Bosons in an optical lattice

University of Texas at Austin physics colloquia (2007)

Cold atoms and the 2D Bose-Hubbard mode

APS DAMOP meeting (2007, invited)

Measurements in a 2D Bose-Hubbard system

NIST Atomic physics division seminar (2007)

Mott Insulator - Superfluid Transition in a 2D Bose Gas

Kavli Institute for Theoretical physics (2007)

Phases of 2D Bose-Hubbard systems

APS March Meeting (2007, contributed)

Bose-Hubbard model in an optical lattice

DARPA OLE presentation day (2006, poster)

Bosons in a 2D optical lattice: an experimental study

Boston College Condensed Matter Physics Seminar (2006)

Yale Solid State and Optics Seminar Series (2006)

Size of Mott domains measured by noise correlations

APS March Meeting (2006, contributed)

Lifetimes of excited quantum-mechanical states in a 2D BEC

Towson University Physics Seminar (2005)

Vibrational lifetimes in a 2D BEC

Virginia Tech Condensed Matter Seminar (2005)

Vibrational state lifetimes in a 1D optical lattice

APS March Meeting (2005, contributed)

The onset of the $\nu = 1$ bilayer quantum Hall effect

Boston College Special Condensed Matter Physics Lecture (2006)

Emergent Phenomena in Quantum Hall Systems (2005, invited)

PCCM Workshop on Strongly Correlated Electronic Materials (2005, invited)

Indications of excitonic superfluidity in a quantum Hall bilayer
20th EPS CMD General Conference (2004, invited)

Incomplete electronic spin polarization in the $\nu_T = 1$ bilayer quantum Hall state
APS March Meeting (2004, contributed)

New observations in a quantum Hall ferromagnet via tunneling spectroscopy
NATO ASI at Windsor (2001, poster)

Observation of a linearly dispersive Goldstone mode in a quantum Hall ferromagnet via tunneling spectroscopy
APS March Meeting (2001, invited)

Tunneling in a bilayer quantum Hall ferromagnet
APS March Meeting (2000, contributed)

Honors

Postdoctoral (National Institute of Standards and Technology)

National Research Council Postdoctoral Associate: 2004-2006

Graduate Honors (California Institute of Technology)

National Defense Science and Engineering Graduate Fellowship: 1999-2002

Caltech karate club captain: 2001-2003.

Undergraduate Honors (University of Oklahoma)

Fowler Prize for the outstanding senior in physics and astronomy: 1998

Barry M. Goldwater scholar: 1997-1998

Phi Kappa Phi honors society: 1998

Clarence Kaucher award for outstanding achievement in physics: 1996

University of Oklahoma Physics Kaucher scholarship: 1995-1997