

NATHANIEL BRAHMS

Curriculum Vitae

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Education

Harvard University, Ph.D. in Physics, May 2008. Thesis: "Buffer gas trapping of one Bohr magneton species"

Brown University, Sc.B. with Honors in Physics, May 2001.

Research Experience

- 2009- **University of California, Berkeley** *Dan Stamper-Kurn*
Probed ultracold atomic ensembles with a high-finesse optical cavity. Demonstrated nondestructive MRI of ultracold atoms and nonlinear optomechanical effects at low photon number.
- 2008-2009 **Massachusetts Institute of Technology** *Daniel Kleppner*
Discovered and described molecular formation process in buffer-gas-loaded magnetic traps, including formation of AgHe molecules. Studied spin relaxation at sub-Kelvin temperatures.
- 2002-2008 **Harvard University** *John Doyle*
Designed, built, and ran a buffer-gas cooling experiment for weakly magnetic atoms and demonstrated trapping of dense samples of lithium, copper, silver, and gold. Developed initial prototype of high-flux buffer-gas beam source, now used by multiple research groups for molecular cold collision experiments.
- 2001 **Harvard University** *Melissa Franklin*
Analyzed systematic effects on operation of Fermilab's CDF detector. Developed stabilization system for CDF's drift chamber.
- 1999-2001 **Brown University** *Richard Partridge*
Demonstrated method for analyzing high-energy particle decays involving multiple neutrinos. Constructed luminosity detector and trigger for Fermilab's D0 detector.

Research Interests

Cold chemistry & collisions, hybrid AMO / circuit QED, quantum optics, condensed matter simulation with ultracold atoms

Teaching Experience

- 2004 **Cyclekids** – *Cambridge, MA* *Julianne Idlet*
Developed and taught curricula for teaching bicycling skills, nutrition, and science to disadvantaged youth in after-school programs.
- 2001 **Harvard University** *Gary Feldman*
Led sections and office hours for a core curriculum course on the physics of time.
- 1999-2000 **Brown University** *Michael Rosen*
Led sections and office hours for undergraduate mathematics courses.

Awards

- Wallace-Noyes prize, Harvard University
- Cash prize in physics, Brown University
- Meiklejohn prize in logic and the philosophy of science, Brown University

Publications

11. T.P. Purdy, N. Brahms, D.W.C. Brooks, T. Botter, & D.M. Stamper-Kurn, “Optical cavity-aided magnetic resonance imaging of atoms in an optical lattice”, submitted for publication.
10. B. Newman, N. Brahms, Y.S. Au, C. Johnson, C. Connolly, J.M. Doyle, D. Kleppner, & T.J. Greytak, “Magnetic reorientation in collisions of trapped atomic dysprosium”, submitted for publication.
9. N. Brahms & D.M. Stamper-Kurn, “Spin optodynamics analogue of cavity optomechanics”, *Phys. Rev. A* **82**, 041804(R) (2010).
8. T.P. Purdy, D.W.C. Brooks, T. Botter, N. Brahms, Z.-Y. Ma, & D.M. Stamper-Kurn, “Tunable cavity optomechanics with ultracold atoms”, *Phys. Rev. Lett.* **105**, 133602 (2010).
7. C. Johnson, B. Newman, N. Brahms, J.M. Doyle, D. Kleppner, & T.J. Greytak, “Zeeman relaxation of cold atomic iron and nickel in collisions with ^3He ”, *Phys. Rev. A* **81**, 062706 (2010).
6. N. Brahms, T.V. Tscherbul, P. Zhang, J. Klos, H.R. Sadeghpour, A. Dalgarno, J.M. Doyle, & T.G. Walker, “Formation of van der Waals molecules in buffer-gas-cooled magnetic traps”, *Phys. Rev. Lett.* **105**, 033001 (2010).
5. T.V. Tscherbul, P. Zhang, H.R. Sadeghpour, A. Dalgarno, N. Brahms, Y.S. Au, & J.M. Doyle, “Collision-induced spin depolarization of alkali-metal atoms in cold ^3He gas”, *Phys. Rev. A* **78**, 060703 (2008).
4. N. Brahms, B. Newman, C. Johnson, T.J. Greytak, D. Kleppner, & J.M. Doyle, “Magnetic trapping of silver and copper, and anomalous spin relaxation in the Ag-He system”, *Phys. Rev. Lett.* **101**, 103002 (2008).
3. S.E. Maxwell, N. Brahms, R. deCarvalho, D.R. Glenn, J.S. Helton, S.V. Nguyen, D. Patterson, J. Petricka, D. DeMille, & J.M. Doyle, “High-flux beam source for cold, slow atoms or molecules”, *Phys. Rev. Lett.* **95**, 173201 (2005).
2. R. deCarvalho, N. Brahms, B. Newman, J. M. Doyle, D. Kleppner, and T. Greytak, “A new path to ultracold hydrogen”, *Can. J. Phys.* **83**, 293 (2005).
1. J.G.E. Harris, R.A. Michniak, S.V. Nguyen, N. Brahms, W. Ketterle & J.M. Doyle, “Buffer gas cooling and trapping of atoms with small effective magnetic moments”, *Europhys. Lett.* **67**, 198 (2004).

Invited Presentations

- “Tunable cavity optomechanics with ultracold atoms”, APS March Meeting, 2010.
- Harvard / MIT Center for Ultracold Atoms ten-minute talks, 2007 and 2005.

Contributed Presentations

- “Formation of weakly bound molecules in buffer-gas cooling experiments with silver atoms”, APS DAMOP, 2009
- “Magnetic trapping of copper and silver using buffer gas loading”, APS DAMOP, 2008
- “A general cold atomic and molecular beam source”, APS DAMOP, 2005