

Vita

Eric R. Hudson

Education and Training:

2000	B.S., Physics and Mathematics, Morehead State University
2004	M.S., Physics, University of Colorado - Boulder
2006	Ph.D, Physics, University of Colorado - Boulder
2008	Yale "AMO Prize" Postdoctoral Fellow, Yale University

Research and Professional Experience:

2008-	Assistant Professor of Physics and Astronomy, UCLA <ul style="list-style-type: none">• Established laboratory employing one postdoctoral researcher, two graduate students, and two undergraduate students• Proposed new method for ultracold molecular ion production and begun its implementation• Begun construction of solid-state optical clock based on nuclear transition in ^{229}Th
2006-2008	Yale "AMO Prize" Postdoctoral Fellow, Yale University Prof. David DeMille, Postdoctoral Advisor <ul style="list-style-type: none">• Constructed optimized, second-generation photo-association experiment with the capability to optically trap ultra-cold polar molecules• Performed first-ever measurement of the inelastic collision cross-sections of ultra-cold polar molecules
2001-2006	Graduate student researcher working on the production and study of cold polar molecules via Stark deceleration, University of Colorado – Boulder, JILA Prof. Jun Ye, Thesis Advisor <ul style="list-style-type: none">• Created optimized molecular beam sources of the hydroxyl radical and formaldehyde molecule.• Design, construction, and optimization of Stark deceleration apparatus for production of cold polar molecules• Developed extensive 3D Monte Carlo simulations to aid understating and increase efficiency of Stark deceleration• Performed high-resolution spectroscopy of OH lambda

doublet utilizing a slowed molecular beam. This measurement places constraints on the evolution of the fine-structure constant, α .

2000-1999

Undergraduate research assistant, MRT – Morehead State Radio Telescope, Space Science Center, Morehead, KY
Prof. Benjamin Malphrus, Research Advisor,

- Characterized gain of the radio telescope
- Developed a software package for analyzing both intensity and spectral data from the radio telescope
- Maintained radio telescope electronics

1. J. R. Bochinski, Eric R. Hudson, H. J. Lewandowski, Gerard Meijer, and Jun Ye, "Phase Space Manipulation of Cold Free Radical OH Molecules," *Physical Review Letters* 91, (2003), pp. 243001. RESEARCH ARTICLE
2. J. R. Bochinski, Eric R. Hudson, H. J. Lewandowski, and Jun Ye, "Cold free-radical molecules in the laboratory frame," *Physical Review A* 70, (2004), pp. 043410. RESEARCH ARTICLE
3. Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, Brian C. Sawyer and Jun Ye, "Efficient Stark deceleration of cold polar molecules," *European Physical Journal D* 31, (2004), pp. 351-358. Invited contribution to special issue on cold polar molecules. RESEARCH ARTICLE
4. H.J. Lewandowski, Eric R. Hudson, J.R. Bochinski and Jun Ye, "A pulsed, low-temperature beam of supersonically cooled free radical OH molecules," *Chemical Physics Letter* 395, (2004), pp. 53-57. RESEARCH ARTICLE
5. Eric R. Hudson, H. J. Lewandowski, Brian C. Sawyer, and Jun Ye, "Using cold molecules to constrain alpha-dot: A high resolution measurement of the OH lambda doublet splitting," *Physical Review Letters*, 96 (2006), pp. 143003. RESEARCH ARTICLE
6. Eric R. Hudson, Brian C. Sawyer, Craig A. Taatjes, H.J. Lewandowski, J.R. Bochinski, and Jun Ye, "Production of cold formaldehyde molecules for study and control of chemical reaction dynamics with hydroxyl radicals," *Physical Review A* 73, (2006), pp. 063404. RESEARCH ARTICLE
7. Jun Ye, Sebastian Blatt, Martin M. Boyd, Seth M. Foreman, Eric R. Hudson, Tetsuya Ido, Benjamin Lev, Andrew D. Ludlow, Brian C. Sawyer, Benjamin Stuhl, and Tanya Zelevinsky, "Precision Measurement Based on Ultracold Atoms and Cold Molecules," in *Proceedings, International Conference on Atomic Physics*, (2006). RESEARCH ARTICLE
8. Benjamin L. Lev, Edmund R. Meyer, Eric R. Hudson, Brian C. Sawyer, John L. Bohn, and Jun Ye, "OH hyperfine ground state: From precision measurement to molecular qubits," *Physical Review A* 74, (2006), pp. 061402. RESEARCH ARTICLE

9. Brian C. Sawyer, Benjamin L. Lev, Eric R. Hudson, Benjamin K. Stuhl, Manuel Lara, John L. Bohn, and Jun Ye, "Magneto-electrostatic Trapping of Ground State OH Molecules," *Physical Review Letters* 98, (2007), pp. 253002. RESEARCH ARTICLE
10. Benjamin L. Lev, Andras Vukics, Eric R. Hudson, Brian C. Sawyer, Peter Domokos, Helmut Ritsch, and Jun Ye, "Prospects for the cavity-assisted laser cooling of molecules," *Physical Review A* 77, (2008), pp. 023402 RESEARCH ARTICLE
11. Brian C. Sawyer, Benjamin K. Stuhl, Benjamin L. Lev, Jun Ye, and Eric R. Hudson, "Mitigation of loss within a molecular Stark decelerator," *European Physical Journal D* 48, (2008) pp. 197. RESEARCH ARTICLE
12. Eric R. Hudson, Nathan B. Gilfoy, S. Kotochigova, Jeremy M. Sage, D. DeMille, "Inelastic collisions of ultracold heteronuclear molecules in an optical trap," *Physical Review Letters* 100, (2008) pp. 203201. RESEARCH ARTICLE
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Since Coming to UCLA:

13. David DeMille and Eric R. Hudson, "Ultracold molecules: The coldest polar region," *Nature Physics* 4, (2008), 911. POPULAR ARTICLE
14. Eric R. Hudson, "A new method for producing ultracold molecular ions," *Physical Review A* 79, (2009), 032716. RESEARCH ARTICLE
15. Eric R. Hudson, "Deceleration of continuous molecular beams," *Physical Review A* 79, (2009), 061407. RESEARCH ARTICLE
16. Rob A Jackson, Jomar B Amaral, Mario E G Valerio, Dave P DeMille and Eric R Hudson, "Computer modelling of thorium doping in LiCaAlF_6 and LiSrAlF_6 : application to the development of solid state optical frequency devices," *Journal of Physics: Condensed Matter* 21, (2009), 325403. RESEARCH ARTICLE

Section C: Works in Progress

- C1.** W.G. Rellergert, D. DeMille, and Eric R. Hudson,
“Investigation of the optical ^{229}Th nuclear transition: Solid-
state optical frequency standard and fundamental constant
variation,” *Physical Review Letters*, submitted, (2009).

RESEARCH
ARTICLE

Invited Presentations:

1. Exploring Cold Free Radical Neutral OH Molecules

Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, and Jun Ye
Japanese Domestic Symposium on Physical Chemistry, Kyoto, Japan, 2003.

2. Cold Neutral Free Radicals Molecules

Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, Brian C. Sawyer, and Jun Ye
American Chemical Society National Meeting, Cold Molecules Symposium, Philadelphia, PA (2004).

3. Cold Molecule Production and Experiments

Eric R. Hudson, Brian C. Sawyer, and Jun Ye
Sandia National Laboratories, Livermore, CA (2005).

5. Cold Molecule Production via Stark Deceleration

Eric R. Hudson, Brian C. Sawyer, and Jun Ye
COMOL'06/CATS'06 "Achievements and Perspectives of Cold Molecules", Les Houches, France (2006).

6. Cold Molecule Production via Stark Deceleration

Eric R. Hudson, Brian C. Sawyer, and Jun Ye
Atomic physics colloquium, The University of British Columbia, Vancouver, Canada (2006).

7. Probing the Variation of Fundamental Constants with Polar Molecule Microwave Spectroscopy

Eric R. Hudson, H.J. Lewandoski, and Jun Ye
Weak Interaction Discussion Group, Yale Univeristy, (2007).

8. Optical Production of Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
JILA Optical Sciences and Enigneering Program Colloquium, Boulder, CO, (2007).

9. Probing the Variation of Fundamental Constants with Polar Molecule Microwave Spectroscopy

Eric R. Hudson, H.J. Lewandoski, and Jun Ye
Fundamental Neutron Physics Workshop, Institute of Nuclear Theory, University
of Washington, Seattle, WA (2007).

**10. Probing the Variation of Fundamental Constants with Polar Molecule
Microwave Spectroscopy**

Eric R. Hudson, H.J. Lewandoski, and Jun Ye
Atomic, Molecular, and Optical Physics Seminar, University of Connecticut,
Storrs, CT (2007).

11. Optical Production of Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
University of California – Los Angeles, Department Seminar, Los Angeles, CA (2008).

12. Enhanced Sensitivity to Variation of m_e/m_p in Molecular Spectra

Eric R. Hudson and D. DeMille, Yale University
In Search for Variations of Fundamental Couplings and Mass Scales, Perimeter Institute for
theoretical physics, <http://pirsa.org/08070026/>, Waterloo, Canada (2008).

13. Optical Production of Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
AMO Seminar, University of California – Berkeley, Berkeley, CA (2008).

Since Coming to UCLA:

14. Optical Production of Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
University of California – Los Angeles, Physics department colloquium, Los Angeles, CA
(2008).

15. Optical Production of Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
Laser Science XXIV, Rochester, NY (2008).

16. A new method for producing ultracold molecular ions

Eric R. Hudson
New Laser Scientist Meeting of the OSA, Rochester, NY (2008).

17. Optical Production of Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
University of Nevada - Reno, Physics department colloquium, Reno, NV (2008).

18. Investigation of the optical transition in ^{229}Th : Solid-state optical frequency standard and fundamental constant variation

Eric R. Hudson
Invited seminar, Los Alamos National Lab, Los Alamos, NM (2009).

19. A new method for producing ultracold molecular ions

Eric R. Hudson
Cold Atoms and Molecules: Collisions, Field-Effects, and Applications, Kyoto University, Kyoto, Japan (2009).

CONTRIBUTED PRESENTATIONS

1. Stark Deceleration of Neutral OH Molecules

J. R. Bochinski, Eric R. Hudson, and Jun Ye
Poster, ICAP Boston, MA, July 2002.

2. Stark Deceleration of Neutral OH Molecules

J. R. Bochinski, Eric R. Hudson, H. J. Lewandowski, and Jun Ye
N4.002 DAMOP Boulder, CO, May 2003.

3. Phase Space Manipulations of Cold Molecular Packets

Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, and Jun Ye
N4.003, DAMOP Boulder, CO, May 2003.

4. Stark Manipulation of the Free Radical OH

Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, and Jun Ye
QThL2, QELS Baltimore, MD, June 2003.

3. Cold Neutral Free Radicals Molecules

Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, and Jun Ye
T3.005 DAMOP, Tucson, AZ, May 2004.

5. Cold Collisions between atomic Rubidium and molecular OH

Heather Lewandowski, Eric Hudson, Jason Bochinski, and Jun Ye
C4.007 DAMOP, Tucson, AZ, May 2004.

6. Cold Molecules: Stark Deceleration of OH

Eric R. Hudson, J. R. Bochinski, H.J. Lewandowski, and Jun Ye
Poster C0287, Rio de Janeiro, Brazil, July 2004.

7. Stark deceleration and atom-molecule collisions of hydroxyl radicals

Heather Lewandowski, Eric Hudson, Jason Bochinski, and Jun Ye
Poster C0227, Rio de Janeiro, Brazil, July 2004.

8. Cold Molecule Production via Stark Deceleration

Eric R. Hudson, J.R. Bochinski, H.J. Lewandowski, Brian C. Sawyer, and Jun Ye
Poster M78, Aviemore, Scotland, July 2005.

9. Creating Cold Molecules to Constrain the Evolution of the Fine Structure Constant

Heather Lewandowski, Eric Hudson, Jason Bochinski, Brian C. Sawyer and Jun Ye
Poster H6.00106, DAMOP, Lincoln, NE, May 2005.

10. Production and Trapping of Ultra-cold RbCs Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, Sunil Sainis, and David DeMille
P4.00005 DAMOP Calgary, Alberta, Canada, May 2007.

11. Production and Trapping of Ultra-cold RbCs Molecules

Nathan B. Gilfoy, Eric R. Hudson, Jeremy Sage, Sunil Sainis, and David DeMille
K1.00117 DAMOP Calgary, Alberta, Canada, May 2007.

12. Magneto-electrostatic trapping of Stark decelerated OH

Brian C. Sawyer, Benjamin L. Lev, Eric R. Hudson, Benjamin K. Stuhl, Manuel Lara, John L. Bohn, and Jun Ye
P4.00007 DAMOP Calgary, Alberta, Canada, May 2007.

13 . Ultra-cold polar molecules in an optical trap

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
K2.00006 DAMOP College Station, PA, May (2008).

14 . Trapped Ground State Ultracold Polar Molecules

Eric R. Hudson, Nathan B. Gilfoy, Jeremy Sage, and David DeMille
Poster E1.00103 DAMOP College Station, PA, May (2008).

15. Ultracold Production and trapping of ultracold RbCs molecules

Eric R. Hudson, Nathan B. Gilfoy, Stephan Falke, C.D. Bruzewicz, S. Kotochigova, and D. DeMille

Poster, International Conference on Atomic Physics, Storrs, CT (2008).

16. Investigation of the optical transition in ^{229}Th : Solid-state optical frequency standard and fundamental constant variation

Eric R. Hudson, A.C. Vutha, S.K. Lamoreaux and D. DeMille

Poster, International Conference on Atomic Physics, Storrs, CT (2008).

Since Coming to UCLA:

17. Preliminary results on a new method for producing ultracold molecular ions

W.G. Rellergert, K. Chen, S. Sullivan, and Eric R. Hudson

Poster M1.00085, DAMOP, Charlottesville, VA (2009).

18. Toward Trapped Ultracold Molecules in the Absolute Ground State

Nathan Gilfoy, Stephan Falke, Colin Bruzewicz, Eric Hudson, and David DeMille

Poster M1.00086, DAMOP, Charlottesville, VA (2009).

19. Investigation of the optical transition in the ^{229}Th nucleus: Solid-state optical frequency standard and fundamental constant variation

W.G. Rellergert, D. DeMille, and Eric R. Hudson

Poster WT1.00012, DAMOP, Charlottesville, VA (2009).

20. Deceleration of continuous molecular beams

W.G. Rellergert and Eric R. Hudson

Poster T1.00117, DAMOP, Charlottesville, VA (2009).

21. Preliminary results on a new method for producing ultracold molecular ions

W.G. Rellergert, K. Chen, S. Sullivan, and Eric R. Hudson

B2.00007, DAMOP, Charlottesville, VA (2009).

Synergistic Activities:

- Taught graduate atomic, molecular, and optical physics course, UCLA, Winter 2008.

Collaborators:

<u>Name</u>	<u>Institution</u>
Bohn, J.	JILA/University of Colorado-Boulder
DeMille, D.*	Yale University
Helen, M.	Los Alamos National Laboratory
Jackson, R.A.	Keele University
Kotochigova, S.	Temple University
Lamoreaux, S.K.	Yale University
Meijer, G.	Fritz-Haber Institute, Berlin
Taatjes, C.	Sandia National Laboratory – Livermore
Torgerson, J	Los Alamos National Laboratory
Ye, J.**	JILA/University of Colorado-Boulder

*Postdoctoral advisor **Graduate advisor