

ARMAN CINGOZ

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Education

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| May 2009 | Expected Ph.D. Degree in Physics, University of California at Berkeley.
Advisor: Prof. Dmitry Budker |
| May 2005 | Master's Degree in Physics, University of California at Berkeley. |
| May 2002 | Bachelor's Degree <i>summa cum laude</i> in Physics and Applied Mathematics
(highest honors in Physics), University of California at Berkeley. |
| May 1998 | High School Degree, salutatorian, Salesian High School, Richmond, California. |

Awards

- Lars Commins Award in Experimental Physics, UCB Physics Department, Spring 2007.
- Outstanding Graduate Student Instructor, The Academic Senate's Advisory Committee for GSI Affairs, Spring 2003.
- Golden Key National Honor Society (2000).
- Berkeley Physics Undergraduate Researcher Scholar, Spring 2001, Fall 2001, Spring 2002.
- Isadore Pomerantz Scholarship, UCB Physics Department (merit based), 2000-2001 academic year.
- James McDonald Scholarship, UCB Physics Department (merit based), 2001-2002 academic year.
- Undergraduate Research Fellowship held at E. O. Lawrence Berkeley National Laboratory, Center for Science and Engineering Education, Summer 2000.
- Richard Byrd Scholarship, merit based, 1998-2002.

Research Experience

Doctoral Research

Aug. 2004 – present, Graduate Research Assistant, University of California at Berkeley
Advisor: Prof. Dmitry Budker

My doctoral research involves ultra-high precision radio-frequency (rf) spectroscopy of nearly degenerate, opposite parity levels in atomic dysprosium to constrain possible temporal and gravitational potential variation of the fine-structure constant, α . The unique level structure of atomic dysprosium allows for a constraint independent of other fundamental constants in a single atom and does not require optical transfer cavities or femtosecond frequency combs. My measurements with a first generation apparatus has yielded a fractional temporal variation of (-2.7

$\pm 2.6) \times 10^{-15}$ per year and $(-8.7 \pm 6.6) \times 10^{-6}$ for the variation of α in a gravitational potential. I have been working on design and development of a second generation apparatus that has the potential of improving these results by up to three orders of magnitude. The design of the experiment has required a variety of skills including rf design and measurement, ultra-high vacuum design, cryogenics, electronic feedback systems for laser stabilization, as well as a variety of spectroscopy techniques. In addition to this research, I have been involved in the development of magnetometers utilizing nonlinear magneto-optical rotation, as well as some recent work attempting laser cooling of atomic dysprosium.

Undergraduate Research

June 2000 – May 2002, Undergraduate Research Assistant, University of California at Berkeley and Institute of Particle Astrophysics, Lawrence Berkeley National Laboratory

Advisor: Prof. George Smoot

Undergraduate Thesis: “Galactic Emission Mapping at 2.3 GHz”

My undergraduate work involved both the development of a 10GHz radio telescope looking for the polarization anisotropy of the Cosmic Microwave Background (CMB), as well as the analysis of data from a complementary experiment mapping the galactic emission at various frequencies in order to create accurate galactic templates used to subtract galactic contamination from CMB measurements. This work required microwave engineering, as well as astronomical data analysis and map making.

Teaching Experience

Sep 2002– Dec 2004 Graduate Student Instructor, University of California at Berkeley.

Courses: Physics 8B (lower division electromagnetism), Physics 110A (upper division electromagnetism), Physics 137A-137B (upper division quantum mechanics), Physics 111 BSC and Physics 111 Advanced (upper division electronics and physics labs).

Publications

N. A. Leefer, A. Cingöz, D. Budker, S. J. Ferrell, V. V. Yashchuk, A. Lapierre, A.-T Nguyen, S. K. Lamoreaux, J. R. Torgerson, *Variation of the Fine-Structure Constant and Laser Cooling of Atomic Dysprosium*, arXiv:physics/0811.3992v2, submitted to Proceedings of the 7th Symposium on Frequency Standards and Metrology.

A. Cingöz, N. A. Leefer, S. J. Ferrell, A. Lapierre, A.-T. Nguyen, V. V. Yashchuk, D. Budker, S. K. Lamoreaux, J. R. Torgerson, *A Laboratory Search for the Fine-Structure Constant Using Atomic Dysprosium*, European Physical Journal – Special Topics, **163**, 71-88 (2008).

A. Cingöz, A. Lapierre, A.-T. Nguyen, N. Leefer, D. Budker, S. K. Lamoreaux, and J. R. Torgerson, *Limit on the Temporal Variation of the Fine-Structure Constant Using Atomic Dysprosium*. Physical Review Letters **98**, 040801 (2007).

S. J. Ferrell, A. Cingöz, A. Lapiere, A.-T. Nguyen, N. Leefler, D. Budker, V. V. Flambaum, S. K. Lamoreaux, and J. R. Torgerson, *Investigation of the gravitational-potential dependence of the fine-structure constant using atomic dysprosium*. Physical Review A **76**, 062104 (2007).

S. Pustelny, A. Wojciechowski, M. Kotyrba, K. Sycz, J. Zachorowski, W. Gawlik, A. Cingöz, N. Leefler, J. M. Higbie, E. Corsini, M. P. Ledbetter, S. M. Rochester, A. O. Sushkov, and D. Budker, *All-optical atomic magnetometers based on nonlinear magneto-optical rotation with amplitude modulated light*, Proceedings of SPIE **6604** (2007).

C. Tello, T. Villela, S. Torres, M. Bersanelli, G. F. Smoot, I. S. Ferreira, A. Cingoz, J. Lamb, D. Barbosa, D. Perez-Becker, S. Ricciardi, J. A. Curriuan, P. Platania, D. Maino, *The 2.3 GHz continuum survey of the GEM project*, arXiv:astro-ph/07123141 (2007), submitted to Astronomy and Astrophysics.

A. Cingöz, A.-T. Nguyen, D. Budker, S. K. Lamoreaux, A. Lapiere, and J. R. Torgerson, *Collisional perturbation of radio-frequency E1 transitions in an atomic beam of dysprosium*. Physical Review A **72**, 063409 (2005).

Presentations/Workshops

Atomic and Molecular Physics of the Early Universe, Institute for Theoretical Atomic, Molecular and Optical Physics, Harvard-Smithsonian Center for Astrophysics, Boston, USA, March 2008.

Invited Speaker: “A Laboratory Search for Variation of the Fine-Structure “Constant” Using Atomic Dysprosium”

Young Optician School, Yerevan State University, Yerevan, Armenia, May 2007.

Invited Speaker: “Search for temporal variation of α using atomic dysprosium”

Atomic Physics Seminar, University of California, Berkeley, USA, October 2006.

Invited Speaker: “Search for temporal variation of α in rf transitions of dysprosium”

ICAP, Innsbruck, Austria, July 2006.

Poster: “A search for variation of the fine-structure constant in atomic dysprosium”

Laboratory Directed Research and Development Review, Los Alamos National Laboratory, Los Alamos, USA, May 2006.

Invited Speaker: “Dysprosium alphas experiment: a status report”

UC Berkeley Physics Department Poster Session, Berkeley, USA, April 2004.

Poster: “Towards a search for the fine-structure variation in atomic dysprosium”