Nathan D. Lemke

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Positions

Postdoctoral Fellow, Argonne National Laboratory, 2013 – present

Postdoctoral Researcher, Physikalisch-Technische Bundesanstalt, 2012

Graduate Researcher, National Institute of Standards and Technology, 2007–2012

Education

Ph.D. Physics, University of Colorado-Boulder, 2012.
Thesis: *Optical Lattice Clock with Spin-1/2 Ytterbium Atoms*, directed by Chris W. Oates and Jun Ye

B.S. Physics & Applied Physics, *Summa Cum Laude*, Bethel University, 2006.

Fields of Research Interest

Laser cooling and trapping of divalent atoms (e.g. Ra, Yb, Sr, Ca)

Quantum optics and precision measurements with cold atoms

Ultrastable lasers and optical frequency metrology

Publications

[1] K. Beloy, J. A. Sherman, N. D. Lemke, N. Hinkley, C. W. Oates, and A. D. Ludlow, Determination of the $5d6s\ ^3D_1$ state lifetime and blackbody-radiation clock shift in Yb, *Phys. Rev. A* **86**, 051404 (2012).

[2] T. M. Fortier, C. W. Nelson, A. Hati, F. Quinlan, J. Taylor, H. Jiang, C. W. Chou, T. Rosenband, N. Lemke, A. Ludlow, D. Howe, C. W. Oates, and S. A. Diddams, Sub-femtosecond absolute timing jitter with a 10 GHz hybrid photonic-microwave oscillator, *Applied Physics Letters* **100**, 231111 (2012).

[3] J. A. Sherman, N. D. Lemke, N. Hinkley, M. Pizzocaro, R. W. Fox, A. D. Ludlow, and C. W. Oates, High-Accuracy Measurement of Atomic Polarizability in an Optical Lattice Clock, *Physical Review Letters* **108**, 153002 (2012).

[4] A. D. Ludlow, N. D. Lemke, J. A. Sherman, C. W. Oates, G. Quéméner, J. von Stecher, and A. M. Rey, Cold-collision-shift cancellation and inelastic scattering in a Yb optical lattice clock, *Physical Review A* **84**, 052724 (2011).

[5] N. D. Lemke, J. von Stecher, J. A. Sherman, A. M. Rey, C. W. Oates, and A. D. Ludlow, p-Wave Cold Collisions in an Optical Lattice Clock, *Physical Review Letters* **107**, 103902 (2011).

[6] Y. Jiang, A. Ludlow, N. Lemke, J. Sherman, J. von Stecher, R. Fox, L. Ma, A. Rey, and C. Oates, Improving the stability and accuracy of the Yb optical lattice clock, *2011 Joint Conference of the IEEE International Frequency Control Symposium and the European Frequency and Time Forum* **1**, 2 (2011).

[7] T. Fortier, M. Kirchner, F. Quinlan, J. Taylor, N. Lemke, A. Ludlow, Y. Jiang, T. Rosenband, J. Bergquist, C. Oates, and S. Diddams, Photonically generated 10 GHz microwaves with close-to-carrier phase noise $\leq$100 dBc/Hz, *2011 Joint Conference of the IEEE International Frequency Control Symposium and the European Frequency and Time Forum* **1**, 915 (2011).

[8] F. Quinlan, T. M. Fortier, M. S. Kirchner, J. A. Taylor, M. J. Thorpe, N. Lemke, A. D. Ludlow, Y. Jiang, and S. A. Diddams, Ultralow phase noise microwave generation with an Er:fiber-based optical frequency divider, *Optics Letters* **36**, 3260 (2011).

[9] T. Fortier, M. Kirchner, F. Quinlan, J. Taylor, J. C. Bergquist, N. Rosenband, T.and Lemke, A. Ludlow, Y. Jiang, C. Oates, and S. Diddams, Generation of ultra-stable microwaves via optical frequency division, *Nature Photonics* **5**, 425 (2011).

[10] Y. Y. Jiang, A. D. Ludlow, N. D. Lemke, R. W. Fox, J. A. Sherman, L. S. Ma, and C. W. Oates, Making optical atomic clocks more stable with 10^{-16}-level laser stabilization, *Nature Photonics* **5**, 158 (2011).

[11] V. I. Yudin, A. V. Taichenachev, C. W. Oates, Z. W. Barber, N. D. Lemke, A. D. Ludlow, U. Sterr, C. Lisdat, and F. Riehle, Hyper-Ramsey spectroscopy of optical clock transitions, *Physical Review A* **82**, 011804 (2010).

[12] A. V. Taichenachev, V. I. Yudin, C. W. Oates, Z. W. Barber, N. D. Lemke, A. D. Ludlow, U. Sterr, C. Lisdat, and F. Riehle, Compensation of field-induced frequency shifts in Ramsey spectroscopy of optical clock transitions, *JETP Letters* **90**, 713 (2010).

[13] N. D. Lemke, A. D. Ludlow, Z. W. Barber, T. M. Fortier, S. A. Diddams, Y. Jiang, S. R. Jefferts, T. P. Heavner, T. E. Parker, and C. W. Oates, Spin-1/2 Optical Lattice Clock, *Physical Review Letters* **103**, 063001 (2009).

[14] N. D. Lemke, A. D. Ludlow, Z. W. Barber, N. Poli, C. W. Hoyt, L. S. Ma, J. E. Stalnaker, C. W. Oates, L. Hollberg, J. C. Bergquist, A. Brusch, T. M. Fortier, S. A. Diddams, T. Heavner, S. Jefferts, and T. Parker, The Yb Optical Lattice Clock, *Proceedings of the 7th Symposium Frequency Standards and Metrology* **1**, 200 (2009).

[15] A. D. Ludlow, G. K. Campbell, S. Blatt, M. M. Boyd, M. J. Martin, T. L. Nicholson, M. Swallows, J. W. Thomsen, T. Fortier, C. W. Oates, S. A. Diddams, N. D. Lemke, Z. Barber, S. G. Porsev, and J. Ye, Quantum Metrology with Lattice-confined Ultracold Sr Atoms, *Proceedings of the 7th Symposium Frequency Standards and Metrology* **1**, 73 (2009).

[16] G. K. Campbell, M. M. Boyd, J. W. Thomsen, M. J. Martin, S. Blatt, M. D. Swallows, T. L. Nicholson, T. Fortier, C. W. Oates, S. A. Diddams, N. D. Lemke, P. Naidon, P. Julienne, J. Ye, and A. D. Ludlow, Probing Interactions Between Ultracold Fermions, *Science* **324**, 360 (2009).

[17] N. Poli, Z. W. Barber, N. D. Lemke, C. W. Oates, L. S. Ma, J. E. Stalnaker, T. M. Fortier, S. A. Diddams, L. Hollberg, J. C. Bergquist, A. Brusch, S. Jefferts, T. Heavner, and T. Parker, Frequency evaluation of the doubly forbidden $^1S_0 \rightarrow {}^3P_0$ transition in bosonic ^{174}Yb, *Physical Review A* **77**, 050501 (2008).

[18] Z. W. Barber, J. E. Stalnaker, N. D. Lemke, N. Poli, C. W. Oates, T. M. Fortier, S. A. Diddams, L. Hollberg, C. W. Hoyt, A. V. Taichenachev, and V. I. Yudin, Optical Lattice Induced Light Shifts in an Yb Atomic Clock, *Physical Review Letters* **100**, 103002 (2008).

[19] A. D. Ludlow, T. Zelevinsky, G. K. Campbell, S. Blatt, M. M. Boyd, M. H. G. de Miranda, M. J. Martin, J. W. Thomsen, S. M. Foreman, J. Ye, T. M. Fortier, J. E. Stalnaker, S. A. Diddams, Y. Le Coq, Z. W. Barber, N. Poli, N. D. Lemke, K. M. Beck, and C. W. Oates, Sr lattice clock at 1×10^{-16} fractional uncertainty by remote optical evaluation with a Ca clock, *Science* **319**, 1805 (2008).

[20] Z. W. Barber, C. W. Hoyt, J. E. Stalnaker, N. Lemke, C. W. Oates, T. M. Fortier, S. Diddams, and L. Hollberg, Lattice-based optical clock using an even isotope of Yb, *Time and Frequency Metrology* **6673**, E6730 (2007).

Conference and Seminar Presentations

Optical Lattice Clock with Spin-1/2 Ytterbium Atoms

Optical Clock Seminar, PTB Braunschweig, December 7 2012

Fundamentals and Applications of Ultra-cold Matter Colloquium, Leibniz Universität Hannover, November 1, 2012

Medium Energy Physics Seminar, Argonne National Laboratory, May 24, 2012.

Ph.D. dissertation defense, University of Colorado-Boulder, March 22, 2012.

Collisional Frequency Shifts in a Fermionic Yb Lattice Clock

Time and Frequency Division Seminar, NIST, February 24, 2011

42nd Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Atlanta (GA), June 16, 2011.

Yb Optical Lattice Clock in Higher Dimensions

Optical Clocks: a new frontier in high accuracy metrology, Torino (Italy), December 3, 2010.

A Two-dimensional Optical Lattice Clock

2010 IEEE International Frequency Control Symposium, Newport Beach (CA), June 2, 2010.

A Spin-1/2 Optical Lattice Clock based on Yb Atoms

40th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Charlotesville (VA), May 20, 2009.

Ytterbium Optical Lattice Clock

Gordon Research Conference on Atomic Physics, Tilton (NH), July 1, 2009

Boulder Labs Postdoctoral Poster Symposium, Boulder (CO), June 17, 2009

Methods in Chemistry Seminar, University of Colorado-Boulder, December 3, 2008

39th Annual Meeting of the APS Division of Atomic, Molecular, and Optical Physics, State College (PA), May 30, 2008.

Colorado Photonics Industry Association Annual Poster Session, University of Colorado-Boulder, November 15, 2007

Honors, Awards, & Fellowships

Director's Postdoctoral Fellowship, Argonne National Labotatory, awarded 2012

Student Paper Contest winner, IEEE International Frequency Control Symposium, 2010.

Journal article *Spin-1/2 Optical Lattice Clock* selected as "Editor's Suggestion" in Phys. Rev. Lett. and highlighted as "Synopsis" on APS website.

Outstanding Presentation, Boulder Labs Postdoctoral Poster Symposium, 2009.

Optical Science & Engineering Program fellowship, CU-Boulder & NSF IGERT, 2006.

Summer Undergraduate Research Fellowship, NIST, 2005.

Professional Activities

Member, American Physical Society, 2004–Present.

Member, *Sigma Pi Sigma* (a physics honor society), inducted 2004.

President, Bethel University Society of Physics Students, 2005-06.

Last updated: March 3, 2013