

CURRICULUM VITAE

Marianna S. Safronova
Professor

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Research Areas

- Search for new physics beyond the Standard Model
 - Studies of fundamental symmetries. Weak interactions in heavy atoms: determination of the weak charge and anapole moment.
 - Search for permanent atomic electric-dipole moment.
 - Search for violation of local Lorentz invariance.
 - Search for the variation of fundamental constants.
- Development of high-precision methodologies for atomic calculations.
- Theoretical atomic clock research.
- Ultracold atoms, cooling and trapping schemes, and magic wavelengths.
- Study of long-range interactions.
- Study of superheavy atoms.
- Quantum computing with neutral atoms. Design considerations for fast Rydberg quantum gates.
- High-precision relativistic calculations of atomic properties of energy levels, fine structures, electric-dipole matrix elements, transition rates, lifetimes, isotope shifts, hyperfine constants, polarizabilities, dispersion coefficients, and atom-wall interaction constants.

- Application of high-performance computing to large-scale atomic physics calculations. Automatic generation of codes for atomic physics calculations, including analytical calculations.

Education

- B.S. and M.S. equivalent, Moscow State University, Department of Physics, Quantum statistics and Field theory group, Moscow, Russia (1988-1994). Thesis title: *Renormalization of Topological Yang-Mills Theory*. Award: *Diploma with excellent grades*.
- Ph.D, Department of Physics, University of Notre Dame (1994-2001). Thesis title: *High-precision Calculations of Atomic Properties and Parity Nonconservation in Systems with One Valence Electron*. Ph. D. Advisor: Walter R. Johnson.

Professional Positions

- Professor, Department of Physics and Astronomy, University of Delaware (2013 - present)
- Adjunct Fellow, Joint Quantum Institute, NIST and University of Maryland, College Park, MD (2012 - present)
- Associate Professor, Department of Physics and Astronomy, University of Delaware (2008 - 2013)
- Assistant Professor, Department of Physics and Astronomy, University of Delaware (2003 - 2008)
- Guest researcher at National Institute of Standards and Technology (September 2001 - 2004, 2012 - present), full time at NIST (September 2001 - July 2003)
- Postdoctoral Research Associate, University of Notre Dame, Department of Physics (January 2001-July 2003). Notre Dame postdoctoral advisor: Walter R. Johnson; NIST postdoctoral advisor: Charles W. Clark.
- Graduate Research Assistant, University of Notre Dame, Department of Physics (1995-2001)
- Graduate Teaching Assistant, University of Notre Dame, Department of Physics (1994-1995)

Visiting Positions and Travel Grants

- Visiting Professor, CNRS-Universite de Provence, Marseille, France, June 2008.

- Visiting Scientist, Joint Quantum Institute, NIST and University of Maryland, June 2010 and June/July 2012.
- Recipient of Dinastia Fond (Russia) travel grant for short term visit of foreign scientists to Russia (two weeks visit, May 2012).
- Godfrey Fellow, School of Physics, University of New South Wales, Australia, December 2012.
- Godfrey Fellow, School of Physics, University of New South Wales, Australia, November - December 2014.

Research and Teaching Summary

Research. The areas of Marianna Safronova’s research in the field of theoretical atomic physics include study of weak interactions in heavy atoms, search for violation of local Lorentz invariance and variation of fundamental constants, search for permanent atomic electric-dipole moment, study of ultracold atoms, atomic clock research, study of long-range interactions, development of high-precision methodologies for the calculation of the atomic properties and applications of such calculations. Her research involves both the study of the fundamental physics problems (search for new physics with atomic systems) and applications of atomic physics to future technological developments (such as atomic clocks). She is the author of over 130 peer-reviewed papers. She has given over 110 presentations at colloquiums, seminars, and conferences in US and abroad. She is currently a principal investigator on four grants, from National Science Foundation and National Institute of Standards and Technology.

Teaching. Marianna Safronova has taught the courses at both undergraduate and graduate levels at the University of Delaware: Fundamentals of Physics I (undergraduate), Quantum Mechanics I (undergraduate), Quantum Mechanics II (undergraduate), Quantum Computation (undergraduate/graduate), Atomic Physics (undergraduate/graduate), Quantum Mechanics II (graduate), and Electromagnetic Theory II (graduate). She has developed Quantum Computation graduate/undergraduate and Quantum Mechanics II undergraduate courses that have not been previously taught at the University of Delaware. She has developed a set of “interactive” lectures for Quantum Mechanics I and II (undergraduate), Quantum Computation, and Atomic Physics courses to increase student participation and student comprehension of the material. These lectures include sets of in-class exercises as well allow students to participate in derivation of formulas carried out in class. All lecture notes are available at her web site <http://www.physics.udel.edu/~msafrono/> (PHYS424, PHYS425, PHYS650, PHYS626).

Service

- Chair of Gordon Atomic Physics Conference (2015 - 2017)
- Member of DAMOP Education Committee (2015 - 2017), Vice Chair for 2016.
- Workshop organiser, Tests of Fundamental Symmetries (2015)
- Member of DCOMP nomination Committee (2015 - 2016)
- Member of Mid-Atlantic APS Executive Committee (2015 - 2016)
- Vice-Chair of Gordon Atomic Physics Conference (2013 - 2015)
- Member of the Editorial board of the Physical Review A (2012 - 2015)
- Secretary/Treasurer of the American Physical Society (APS) Precision Measurement and Fundamental Symmetries Group (2013 - 2016)
- Member of the National Research Counsel Committee on Atomic, Molecular, and Optical Sciences (CAMOS) (2014 - 2015)
- Member of the Executive Committee for the Division of the Atomic, Molecular, and Optical Physics (DAMOP) (2012 - 2015)
- Member the DAMOP Program committee (2014 - 2015)
- Member the DAMOP Thesis Prize committee (2012 - 2013)
- Member of the APS Committee on the Status of Women in Physics (2011 - 2014)
- Chair of the Maria Goeppert Mayer Award APS committee (2014)
- Member of the Maria Goeppert Mayer Award APS committee (2013)
- The National Science Foundation (NSF) Atomic Theory panel (three times)
- NSF Committee of Visitors that reviews the work of US National Science Foundation
- NSF Panel: “What are the Grand Challenges for Symbolic, Numeric and Algebraic Scientific Computing?”
- Reviewer for the National Science Foundation, Department of Energy, Natural Sciences and Engineering Research Council of Canada, German Research Foundation, Science, Nature Communications, Physical Review Letters, Physical Review A, Physical Review E, New Journal of Physics, Journal of Physics B, Astrophysical Journal, Atomic Data and Nuclear Data Tables, The European Physical Journal

D, Europhysics Letters, Physics Letters A, Chemical Physics, Optics Communications, Journal of Mathematical Physics, Physica Scripta, Central European Journal of Physics, International Journal of Mass Spectrometry, Journal of Quantitative Spectroscopy and Radiative Transfer, and Addison Wesley.

Honors and Awards

- Gordon Godfrey Fellowship, UNSW, Australia, 2014
- University of Delaware College of Arts and Sciences Outstanding Scholar Award, 2013
- Gordon Godfrey Fellowship, UNSW, Australia, 2012
- Women Physicist of the Month Award (2012)
<http://www.aps.org/programs/women/scholarships/womanmonth/2012.cfm>
- Marianna Safronova have been elected a fellow of the American Physical Society (APS) in 2011 for **innovative development of high-accuracy first-principles methods of computational atomic structure and dynamics, and their application to optical atomic clocks, quantum computing with neutral atoms, and tests of fundamental symmetries**. She was nominated by the Division of Atomic, Molecular and Optical Physics.
- 2000 SGI Award for Excellence in Computational Sciences and Visualization at the University of Notre Dame for work *Parity Nonconservation in Atomic Francium*. This award recognizes outstanding contributions by a graduate student in the areas of computational sciences and visualization.

Research Grants:

- *A multi-year collaborative research on highly-charged ions for precision measurements*, National Institute of Standards and Technology, 2015 - 2020 (\$251,500).
- *Modeling of optically trapped atoms for quantum information and atomic clocks*, National Institute of Standards and Technology, 2014 - 2017 (\$227,760).
- *Development of Atomic Theory for Tests of Fundamental Symmetries*, 2014 - 2017 (\$180,000).
- *Development of a relativistic atomic code for accurate treatment of complex correlations*, National Science Foundation Computational Physics, 2015 - 2016 (\$90,000).
- *Development of a relativistic atomic code for accurate treatment of complex correlations*, National Science Foundation (Physics at the Information Frontier program), 2012-2015 (\$315,000).

- *New Directions in Atomic PNC*, National Science Foundation, 2011-2014 (\$225,000).
- *Modeling of optically trapped atoms for quantum information and atomic clocks*, National Institute of Standards and Technology, 2011-2014 (\$180,000).
- *New Directions in Atomic PNC*, National Science Foundation, 2008-2011 (\$255,000).
- *Modeling of optically trapped atoms for quantum information and atomic clocks*, National Institute of Standards and Technology, 2008-2011 (\$165,000).
- *Collaborative research: New Directions in Atomic PNC*, National Science Foundation, 2005-2008 (UD part: \$180,000).
- *Modeling of quantum logic operations with trapped neutral atoms*, National Institute of Standards and Technology, 2004-2007 (\$147,000).
- *Optical atomic clock with trapped ytterbium atoms*, University of Delaware Research Foundation, 2005 (\$25,000).

Research Group

Research Scientist: Dr. Sergey Porsev

Current Graduate Student: Z. Zuhrianda, Dadong Huang, Aung Naing

Graduated:

- Bindiya Arora (Ph.D, 2008)
- Rupsi Pal (Ph.D, 2008)
- Eugeniya Tchoukova (Ph.D, 2008)
- Dansha Jiang (Ph.D, 2010)
- Matt Simmons (M.S., 2012)

Visiting Scholars:

Dr. Mikhail Kozlov, Petersburg Nuclear Physics Institute, Gatchina, Russia (Visited University of Delaware several times for 1-2 months, 2008-2015)

Prof. Ilya Tupitsyn, University of St. Petersburg, Petergof, Russia (Visited University of Delaware three times for 1 month, 2013-2015)

Dr. Vladimir Dzuba, School of Physics, University of New South Wales, Australia, (Visited University of Delaware from September 2004 to December 2004)

Professional Organizations

American Physical Society, The Division of Atomic, Molecular and Optical Physics of the American Physical Society, The Topical Group on Precision Measurement and Fundamental Constants, Mid-Atlantic section of APS.

List of Publications in Peer-Reviewed Journals

1. *Strongly enhanced effects of Lorentz symmetry violation in entangled Yb^+ ions*, V. A. Dzuba, V. V. Flambaum, M. S. Safronova, S. G. Porsev, T. Pruttivarasin, M. A. Hohensee, and H. Häffner, arXiv:1507.06048, submitted to Nature Physics (2015).
2. *Towards a Mg lattice clock: Observation of the $^1S_0 - ^3P_0$ transition and determination of the magic wavelength*, A. P. Kulosa, D. Fim, K. H. Zipfel, S. Rühmann, S. Sauer, N. Jha, K. Gibble, W. Ertmer, E. M. Rasel, M. S. Safronova, U. I. Safronova, and S. G. Porsev, arXiv:1508.01118, submitted to Phys. Rev. Lett. (2015).
3. *Actinide ions for testing the spatial α -variation hypothesis*, V. A. Dzuba, M. S. Safronova, U. I. Safronova, and V. V. Flambaum, arXiv:1508.07681, submitted to Phys. Rev. A (2015).
4. *Energy shift due to anisotropic black body radiation*, V. V. Flambaum, S. G. Porsev, and M. S. Safronova, arXiv:1508.01242, submitted to Phys. Rev. Lett. (2015).
5. *High precision measurement of the ^{87}Rb D-line tune-out wavelength*, R. H. Leonard, A. J. Fallon, C. A. Sackett, and M. S. Safronova, arXiv:1507.07898, Phys. Rev. A, in press (2015).
6. *Extracting transition rates from zero-polarizability spectroscopy*, M. S. Safronova, Z. Zuhrianda, U. I. Safronova, and Charles W. Clark, Phys. Rev. A 92, 040501 (2015).
7. *Observation of an unexpected negative isotope shift in $^{229}\text{Th}^+$ and its theoretical explanation*, M.V. Okhapkin, D.M. Meier, E. Peik, M.S. Safronova, M.G. Kozlov, and S.G. Porsev, Phys. Rev. A 92, 020503(R) (2015).
8. *A Michelson-Morley test of Lorentz symmetry for electrons*, T. Pruttivarasin, M. Ramm, S. G. Porsev, I. I. Tupitsyn, M. Safronova, M. A. Hohensee, and H. Häffner, Nature 517, 592 (2015).
9. *Systematic evaluation of an atomic clock at 2×10^{-18} total uncertainty*, T. L. Nicholson, S. L. Campbell, R. B. Hutson, G. E. Marti, B. J. Bloom, R. L. McNally, W. Zhang, M. D. Barrett, M. S. Safronova, G. F. Strouse, W. L. Tew, and J. Ye, Nature Commun. 6, 6896 (2015).
10. *Relativistic configuration-interaction plus all-order calculations of U III energies, g factors, transition rates, and lifetimes*, I. Savukov, U. I. Safronova, and M. S. Safronova, submitted to Phys. Rev. A (2015).

11. *Transitions between the 4f-core-excited states in Ir¹⁶⁺, Ir¹⁷⁺, and Ir¹⁸⁺ ions for clock applications*, U. I. Safronova, V. V. Flambaum, M. S. Safronova, Phys. Rev. A 92, 022501 (2015).
12. *CI-MBPT: A package of programs for relativistic atomic calculations based on a method combining configuration interaction and many-body perturbation theory*, M. G. Kozlov, S. G. Porsev, M. S. Safronova, and I. I. Tupitsyn, Comput. Phys. Commun. 195, 199 (2015).
13. *Magic wavelengths for the 5s – 18s transition in rubidium*, E. A. Goldschmidt, D. G. Norris, S. B. Koller, R. Wyllie, R. C. Brown, J. V. Porto, U. I. Safronova, and M. S. Safronova, Phys. Rev. A 91, 032518 (2015).
14. *Correlation effects in La, Ce, and lanthanide ions*, M. S. Safronova, U. I. Safronova, and Charles W. Clark, Phys. Rev. A 91, 022504 (2015).
15. *Time Trials for Fundamental Constants*, M. S. Safronova, Physics 7, 117 (2014).
16. *Atomic properties of Cd-like and Sn-like ions for the development of frequency standards and search for the variation of the fine-structure constant*, M. S. Safronova, V. A. Dzuba, V. V. Flambaum, U. I. Safronova, S. G. Porsev, and M. G. Kozlov, Phys. Rev. A 90, 052509 (2014).
17. *Relativistic calculations of C₆ and C₈ coefficients for strontium dimers*, S. G. Porsev, M. S. Safronova, and Charles W. Clark, Phys. Rev. A 90, 052715 (2014).
18. *Relativistic all-order calculations of Th, Th⁺ and Th²⁺ atomic properties*, M. S. Safronova, U. I. Safronova, and Charles W. Clark, Phys. Rev. A. 90, 032512 (2014).
19. *Study of highly-charged Ag-like and In-like ions for the development of atomic clocks and search for α -variation*, M. S. Safronova, V. A. Dzuba, V. V. Flambaum, U. I. Safronova, S. G. Porsev, and M. G. Kozlov, Phys. Rev. A 90, 042513 (2014).
20. *Atomic properties of superheavy elements No, Lr, and Rf*, V. A. Dzuba, M. S. Safronova, U. I. Safronova, Phys. Rev. A 90, 012504 (2014).
21. *Highly-charged ions for atomic clocks, quantum information, and search for α -variation*, M. S. Safronova, V. A. Dzuba, V. V. Flambaum, U. I. Safronova, S. G. Porsev, and M. G. Kozlov, Phys. Rev. Lett. 113, 030801 (2014).
22. *Spectroscopic observation of SU(N)-symmetric interactions in Sr orbital magnetism*, X. Zhang, M. Bishof, S. L. Bromley, C. V. Kraus, M. S. Safronova, P. Zoller, A. M. Rey, J. Ye, Science 345, 1467(2014).

23. *Relativistic many-body calculation of energies, transition rates, lifetimes, and multipole polarizabilities in Cs-like La III*, U. I. Safronova and M. S. Safronova, Phys. Rev. A 89, 052515 (2014).
24. *Relativistic many-body calculations of van der Waals coefficients for Yb-Li and Yb-Rb dimers*, S. G. Porsev, M. S. Safronova A. Derevianko and Charles W. Clark, Phys. Rev. A 89, 022703 (2014).
25. *All-order relativistic many-body theory of low-energy electron-atom scattering*, Yongjun Cheng, Li Yan Tang, J. Mitroy, and M. S. Safronova, Phys. Rev. A 89, 012701 (2014).
26. *Long-range interaction coefficients for ytterbium dimers*, S. G. Porsev, M. S. Safronova A. Derevianko and Charles W. Clark, Phys. Rev. A 89, 012711 (2014).
27. *Magnetic dipole and electric quadrupole moments of the ^{229}Th nucleus*, M. S. Safronova, U. I. Safronova, A. G. Radnaev, C. J. Campbell, and A. Kuzmich, Phys. Rev. A 88, 060501(R) (2013).
28. *Relativistic many-body calculation of energies, oscillator strengths, transition rates, lifetimes, polarizabilities, and quadrupole moment of Fr-like Th IV ion*, M. S. Safronova and U. I. Safronova, Phys. Rev. A 87, 062509 (2013).
29. *Thallium $7p$ lifetimes derived from experimental data and ab initio calculations of scalar polarizabilities*, M. S. Safronova and P. K. Majumder, Phys. Rev. A 87, 042502 (2013).
30. *Polarizabilities, Stark shifts, and lifetimes of In atom*, M. S. Safronova, U. I. Safronova, and S. G. Porsev, Phys. Rev. A 87, 032513 (2013).
31. *Critically evaluated theoretical atomic properties of Y III*, U. I. Safronova and M. S. Safronova, Phys. Rev. A 87, 032501 (2013).
32. *Laser cooling and trapping of potassium at magic wavelengths*, M. S. Safronova and U. I. Safronova and Charles W. Clark, Phys. Rev. A 87, 052504 (2013).
33. *Relativistic many-body calculation of energies, lifetimes, polarizabilities, and hyperpolarizabilities in Li-like Be^+* , U. I. Safronova and M. S. Safronova, Phys. Rev. A 87, 032502 (2013).
34. *Blackbody radiation shift in the Sr optical atomic clock*, M. S. Safronova, S. G. Porsev, U. I. Safronova, M. G. Kozlov, and Charles W. Clark, Phys. Rev. A 87, 012509 (2013).
35. *Ytterbium in quantum gases and atomic clocks: van der Waals interactions and blackbody shifts*, M. S. Safronova, S. G. Porsev, and Charles W. Clark, Phys. Rev. Lett. 109, 230802 (2012).

36. *Precision Measurement of Transition Matrix Elements via Light Shift Cancellation*, C. D. Herold, V. D. Vaidya, X. Li, S. L. Rolston, J. V. Porto, and M. S. Safronova, Phys. Rev. Lett. 109, 243003 (2012).
37. *Magic wavelengths for optical cooling and trapping of lithium*, M. S. Safronova, U. I. Safronova, Charles W. Clark, Phys. Rev. A 86, 042505 (2012).
38. *Correlation effects in Yb^+ and implications for parity violation*, S. G. Porsev, M. S. Safronova, M. G. Kozlov, Phys. Rev. A 86, 022504 (2012).
39. *Electric dipole moment enhancement factor of thallium*, S. G. Porsev, M. S. Safronova, M. G. Kozlov, Phys. Rev. Lett. 108, 173001 (2012).
40. *Polarizabilities of Sr^{2+} : A benchmark test of theory and experiment*, M. S. Safronova, S. G. Porsev, M. G. Kozlov, and Charles W. Clark, Phys. Rev. A 85, 052506 (2012).
41. *Quadrupole polarizabilities with combined configuration interaction and coupled-cluster method*, S. G. Porsev, M. S. Safronova, M. G. Kozlov, Phys. Rev. A 85, 062517 (2012).
42. *Anomalously small blackbody radiation shift in the Tl^+ frequency standard*, Z. Zuhrianda, M. S. Safronova, and M. G. Kozlov, Phys. Rev. A 85, 022513 (2012).
43. *Atomic theory in cesium, implications for searches for physics beyond the standard model*, M. S. Safronova, Il Nuovo Cimento C 35 (2012).
44. *Blackbody radiation shifts in optical atomic clocks*, M. S. Safronova, M. G. Kozlov, and Charles W. Clark, IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control 59, 439 (2012).
45. *Relativistic many-body calculation of energies, oscillator strengths, transition rates, and lifetimes of Sc III ion*, M. S. Safronova and U. I. Safronova, Phys. Rev. A 85, 022504 (2012).
46. *Atomic properties of Pb III* , M. S. Safronova, M. G. Kozlov, and U. I. Safronova, Phys. Rev. A 85, 012507 (2012).
47. *Precision Calculation of Blackbody Radiation Shifts for Optical Frequency Metrology*, M. S. Safronova, M. G. Kozlov, and Charles W. Clark, Phys. Rev. Lett. 107, 143006 (2011).
48. *Correlation and relativistic effects in actinide ions*, M. S. Safronova and U. I. Safronova, Phys. Rev. A 84, 052515 (2011).

49. *Blackbody radiation shift, multipole polarizabilities, oscillator strengths, lifetimes, hyperfine constants, and excitation energies in Hg^+* , M. Simmons, U. I. Safronova, and M. S. Safronova, Phys. Rev. A 84, 052510 (2011).
50. *Tune-out wavelengths of alkali-metal atoms and their applications*, Bindiya Arora, M. S. Safronova, and Charles W. Clark, Phys. Rev. A 84, 043401 (2011).
51. *Critically evaluated theoretical energies, lifetimes, hyperfine constants, and multipole polarizabilities in ^{87}Rb* , M. S. Safronova and U. I. Safronova, Phys. Rev. A 83, 052508 (2011).
52. *Resolving all-order method convergence problems for atomic physics applications*, H. Gharibnejad, E. Eliav, M. S. Safronova, and A. Derevianko, Phys. Rev. A 83, 052502 (2011).
53. *Experimental and theoretical study of the $6d_{3/2}$ polarizability of cesium*, A. Kortyna, C. Tinsman, J. Grab, M. S. Safronova, and U. I. Safronova, Phys. Rev. A 83, 042511 (2011) .
54. *Atomic calculations for tests of fundamental physics*, M. S. Safronova, Can. J. Phys. 89, 371 (2011).
55. *Excitation energies, $E1$, $M1$, and $E2$ transition rates, and lifetimes in Ca^+ , Sr^+ , Cd^+ , Ba^+ , and Hg^+* , U. I. Safronova and M. S. Safronova, Can. J. Phys. 89, 465 (2011).
56. *Blackbody radiation shift, multipole polarizabilities, oscillator strengths, lifetimes, hyperfine constants, and excitation energies in Ca^+* , M.S. Safronova and U.I. Safronova, Phys. Rev. A 83, 012503 (2011).
57. *TOPICAL REVIEW: Theory and applications of atomic and ionic polarizabilities*, J. Mitroy, M.S. Safronova, and Charles W. Clark, J. Phys. B 43, 202001 (2010).
58. *Blackbody radiation shift in ^{87}Rb frequency standard*, M.S. Safronova, Dansha Jiang, and U.I. Safronova, Phys. Rev. A 82, 022510 (2010) .
59. *State-insensitive bichromatic optical trapping*, Bindiya Arora, M.S. Safronova, and Charles W. Clark, Phys. Rev. A 82, 022509 (2010) .
60. *Blackbody Radiation Shifts and Theoretical Contributions to Atomic Clock Research*, M. S. Safronova, Dansha Jiang, Bindiya Arora, Charles W. Clark, M. G. Kozlov, U. I. Safronova, and W. R. Johnson, IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control 57, 94 (2010).
61. *Two-photon transitions in Ca^+ , Sr^+ , and Ba^+ ions*, M.S. Safronova, W. R. Johnson, and U. I. Safronova, Journal of Physics B 43, 074014 (2010).

62. *Relativistic many-body calculations of the oscillator strengths, transition rates, and polarizabilities in Zn-like ions*, U. I. Safronova and M.S. Safronova, Journal of Physics B 43, 074025 (2010).
63. *Development of a configuration-interaction plus all-order method for atomic calculations*, M.S. Safronova, M. G. Kozlov, W. R. Johnson and Dansha Jiang, Phys. Rev. A 80, 012516 (2009).
64. *Calculation of parity-nonconserving amplitude and other properties of Ra^+* , Rupsi Pal, Dansha Jiang, M.S. Safronova, and U.I. Safronova, Phys. Rev. A 79, 062505 (2009).
65. *New directions in atomic PNC*, M.S. Safronova, Rupsi Pal, Dansha Jiang, M.G. Kozlov, W.R. Johnson, and U.I. Safronova, Nuclear Physics A 827, 411c (2009).
66. *Third-order relativistic many-body calculations of energies, transition rates, hyperfine constants, and black-body radiation shift in $^{171}Yb^+$* , U. I. Safronova and M. S. Safronova, submitted to Physical Review A (2009).
67. *Correlation and relativistic effects for the $4f - nl$ multipole transitions in Yb III ions*, U. I. Safronova and M. S. Safronova, submitted to Physical Review A (2009).
68. *Polarizabilities of the Mg^+ and Si^{3+} ions*, J. Mitroy and M. S. Safronova, accepted for publication in Physical Review A (2009).
69. *High-accuracy calculation of energies, lifetimes, hyperfine constants, multipole polarizabilities, and blackbody radiation shift in ^{39}K* , U.I. Safronova, M. S. Safronova, Phys. Rev. A 78, 052504 (2008).
70. *Electric quadrupole moments of metastable states of Ca^+ , Sr^+ , and Ba^+* , Dansha Jiang, Bindiya Arora, and M. S. Safronova, Phys. Rev. A 78, 022514 (2008).
71. *Theoretical study of lifetimes and polarizabilities in Ba^+* , E. Iskrenova-Tchoukova and M. S. Safronova, Phys. Rev. A 78, 012508 (2008).
72. *The nuclear magnetic moment of ^{210}Fr , a combined theoretical and experimental approach*, E. Gomez, S. Aubin, L.A. Orozco, G.D. Sprouse, E. Iskrenova-Tchoukova, and M.S. Safronova, Phys. Rev. Lett **100**, (2008).
73. *Relativistic many-body calculation of energies, lifetimes, hyperfine constants, and polarizabilities in 7Li* , W. R. Johnson, U. I. Safronova, A. Derevianko, and M. S. Safronova, Phys. Rev. A 77, 022510 (2008).
74. *Relativistic many-body calculations of the energies of $n = 4$ states along the zinc isoelectronic sequence*, S. A. Blundell, W. R. Johnson, M.S. Safronova, and U. I. Safronova, Phys. Rev. A 77, 032507 (2008).

75. *Experimental and theoretical study of the nf -level lifetimes of potassium*, M. Glódz, A. Huzandrov, M. S. Safronova, I. Sydoryk, J. Szonert, and J. Klavins, Phys. Rev. A **77**, 022503 (2008).
76. *High-precision study of Cs polarizabilities*, E. Iskrenova-Tchoukova, M. S. Safronova, and U. I. Safronova, Special Issue on Alkali clusters, Journal of Computational Methods in Science and Engineering (2008).
77. *Blackbody radiation shift in a $^{43}\text{Ca}^+$ ion optical frequency standard*, Bindiya Arora, M.S. Safronova, and Charles W. Clark, Phys. Rev. A **76**, 064501 (2007).
78. *Magic wavelengths for the ns - np transitions in alkali-metal atoms*, Bindiya Arora, M.S. Safronova, and Charles W. Clark, Phys. Rev. A **76**, 052509 (2007).
79. *Accurate determination of electric-dipole matrix elements in K and Rb from Stark shift measurements*, Bindiya Arora, M.S. Safronova, and Charles W. Clark, Phys. Rev. A **76**, 052516 (2007).
80. *Relativistic All-Order and MCHF Calculations of the $4d - 4f$ Energy Separation in Li I*, M. S. Safronova, C. Froese Fischer, and Yu. Ralchenko, Phys. Rev. A **76**, 054502 (2007).
81. *Excitation energies, polarizabilities, multipole transition rates, and lifetimes of ions along the francium isoelectronic sequence*, U. I. Safronova, W. R. Johnson, and M. S. Safronova, Phys. Rev. A **76**, 042504 (2007) .
82. *High-precision calculations of In I and Sn II atomic properties*, U.I. Safronova, M.S. Safronova, and M.G. Kozlov, Phys. Rev. A **76**, 022501 (2007).
83. *Relativistic coupled-cluster single-double method applied to alkali-metal atoms*, Rupsi Pal, M. S. Safronova, W. R. Johnson, Andrei Derevianko, and Sergey G. Porsev, Phys. Rev. A **75**, 042515 (2007).
84. *All-Order Methods for Relativistic Atomic Structure Calculations* (review paper), M.S. Safronova and W.R. Johnson, Advances in Atomic Molecular and Optical Physics series, volume **55**, 191, (2007).
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93. *Frequency-dependent polarizabilities of alkali atoms from ultraviolet through infrared spectral regions*, M.S. Safronova, Bindiya Arora, and Charles W. Clark, Phys. Rev. A **73**, 022505 (2006).
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141. *Correlation, relativistic and radiative effects for the energy levels of $1s^22s^22p^5nl$, $1s^22s2p^6nl$ ($n=3-6$, $l=s, p, d, f$) configurations of Ne-like ions with $Z=20-60$* , U.I. Safronova, M.S. Safronova, R. Bruch, Phys. Scr. **49**, 446 (1994).
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Talks (2007 - 2015)

1. *Atomic clocks and their applications*, Neutron Physics Group seminar, NIST, Gaithersburg, July 21, 2015.
2. *Search for new physics with atoms and molecules*, 47th Conference of the European Group on Atomic Systems, EGAS (plenary talk), Riga, Latvia, July 2015.
3. *Highly-charged ions for atomic clocks, search for variation of the fine-structure constant, and tests of Lorentz symmetry*, Fourteenth Marcel Grossmann Meeting, MG14 (invited talk), Rome, July 2015.
4. *Atomic clocks and variation of fundamental constants*, Atomic seminar, Physics Department, University of Virginia, Charlottesville, VA, July 8, 2015.
5. *Highly-charged ions for atomic clocks, search for α -variation and tests of Lorentz symmetry*, International Conference on Laser Spectroscopy, ICOLS (invited talk), Singapore, June 2015.
6. *Symmetry violations in atoms and molecules*, 6th International Symposium on Symmetries in Subatomic Physics, SSP (invited talk), Victoria, Canada, June 2015.
7. *AMO tests of fundamental symmetries and search for the physics beyond the standard model*, Twelfth Conference on the Intersections of Particle and Nuclear Physics, CIPANP (invited talk), Vail, CO, May 2015.
8. *Highly-charged ions for atomic clocks and search for the variation of the fine-structure constant*, IFCS-EFTF conference, Denver, CO, April 13, 2015.
9. *Tests of fundamental symmetries: introduction and overview*, TFS workshop, APS Topical Group on Precision Measurements and Fundamental Constants and the Few-body Topical Group, Baltimore, April 2015.
10. *Adventures in atomic physics: from quantum computers to dark matter*, University of Delaware, Zone 3 Society of Physics students meeting, April 25, 2015.
11. *Search for new physics with atoms and molecules*, University of Mainz Physics colloquium, Mainz, Germany, February 3, 2015.
12. *A Test of Lorentz invariance with Ca^+ ions and future perspectives*, Max-Planck-Institut für Kernphysik, Heidelberg, Germany, January 30, 2015.
13. *Search for new physics with atoms and molecules*, Center of Quantum Dynamics colloquia, University of Heidelberg, Heidelberg, Germany, January 29, 2015.

14. *Atomic clocks and the search for variation of fundamental constants*, Institut für Quantenoptik, University of Hannover, Hannover, Germany, January 22, 2015.
15. *Search for new physics with atoms and molecules*, CAMP Seminar, Penn State, November 11, 2014.
16. *Anapole moments and the search for EDM*, Nuclear Physics Seminar, Indiana University, Bloomington, October 31, 2014.
17. *Search for new physics with atoms and molecules*, Physics Colloquium, Indiana University, Bloomington, October 29, 2014.
18. *Search for new physics with atoms and molecules*, Chemistry Department Colloquium, University of Warsaw, Poland, October 2, 2014.
19. *Atomic clocks*, Nicolaus Copernicus University, Torun, Poland, September 30, 2014.
20. *Fundamental symmetries and the search for new physics with atoms and molecules*, Physikalisch-Technische Bundesanstalt, Berlin, Germany, September 26, 2014.
21. *Atomic clocks and the search for variation of fundamental constants*, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, September 25, 2014.
22. *Highly-charged ions for atomic clocks and search for the variation of the fine-structure constant*, Max-Planck-Institut für Kernphysik, Heidelberg, Germany, September 24, 2014.
23. *Precision calculations of atomic properties*, ICAMDATA conference (invited talk), Jena, Germany, September 22, 2014.
24. *Highly-charged ions for atomic clocks, search for the variation of the fine-structure constant, and quantum information*, 17th International Conference on the Physics of Highly Charged Ions (invited talk), September 4, 2014.
25. *The proton radius puzzle*, Neutron Physics Group seminar, NIST July 29, 2014.
26. *Search for EDMs with atoms and molecules*, Neutron Physics Group seminar, June 24, 2014.
27. *Atomic clocks, fundamental symmetries, and the search for new physics*, DAMOP (invited talk), Madison, Wisconsin, June 26, 2014.
28. *Highly-charged ions for atomic clocks, cosmology, and quantum information*, AMO seminar, University of California Berkeley, March 21, 2014.
29. *Atomic calculations for the development of future technology*, SPS meeting, University of Delaware, March 5, 2014.

30. *Atomic clocks, fundamental symmetries, and the search for new physics*, University of Wisconsin-Madison, M. S. Safronova, Atomic Seminar, Madison, September 10, 2013.
31. *The search for new physics with atomic systems*, Gordon Research Conference on Atomic Physics, (invited talk), Newport, RI, June 2013.
32. *Highly-charged ions for atomic clocks, cosmology, and quantum information*, DAMOP 2013, Quebec City, Canada, June 2013.
33. *Atomic Parity Violation - new developments*, workshop of the APS Topical Group on Hadronic Physics, (invited talk), Denver, Colorado April 2013.
34. *Electric Dipole Moment Enhancement Factor of Thallium*, 20th Australian Institute of Physics Congress, Sydney, Australia, December 2012.
35. *Atomic clocks and the search for variation of fundamental constants*, NIST seminar, Boulder, Colorado, October 30, 2012.
36. *Atomic clocks, ultracold atoms, and fundamental symmetries*, Physics Department Colloquium, University of Notre Dame, Notre Dame, Indiana, October 24, 2012.
37. *Ytterbium in quantum gases and atomic clocks: van der Waals interactions and blackbody shifts*, (invited talk), International workshop on ultracold group II atoms, Tokyo, Japan, October 2012.
38. *Applications of quantum mechanics: from study of fundamental interactions to future technologies*, (invited talk), Theory and Applications of Computational Chemistry Congress, Pavia, Italy, September 2012.
39. *The study of fundamental symmetries with heavy atoms*, International Conference on Relativistic Effects in Heavy Elements - Chemistry and Physics (REHE), (invited talk) Corrientes, Argentina, September 2012.
40. *Atomic clocks and the search for variation of fundamental constants*, The National Physical Laboratory, UK, July 20, 2012.
41. *The search for new physics with atomic systems*, Neutron Physics Group, NIST, June 26, 2012.
42. *Relativistic many-body calculation of energies, oscillator strengths, transition rates, lifetimes, multipole polarizabilities, and hyperfine constants of Th IV ion*, DAMOP, Orange County, California, June 48, 2012.
43. *The World of Quantum Information*, St. Petersburg Electrotechnical Institute (LETI), Department of Electronics, May 22, 2012.

44. *Fundamental symmetries, atomic clocks and quantum computers*, St. Petersburg University, Quantum Mechanics Division, Petergof, Russia, May 18, 2012.
45. *Atomic calculations for studies of fundamental symmetries and atomic clock research*, St. Petersburg Institute of Nuclear Physics, Gatchina, Russia, May 17, 2012.
46. *The search for new physics with atomic systems*, AMO seminar, University of California, Berkeley, March 21, 2012.
47. *Atomic clocks and the search for variation of fundamental constants*, Joint Quantum Institute Seminar, NIST and University of Maryland, March 5, 2012.
48. *Atomic parity violation*, Oak Ridge national Lab, Physics Division Seminars, December 8, 2011.
49. *Atomic Calculations for Future Technology and Study of Fundamental Problems*, Rowan University colloquium, November 18, 2011.
50. *Atomic calculations for tests of fundamental physics*, Physics Department, University of Virginia colloquium, November 11, 2011, Charlottesville, VA.
51. *Atomic parity violation and implications for searches for physics beyond the standard model*, Jefferson Lab theory seminar, October 24, 2011, Newport News, VA.
52. *Coupled-cluster method for atomic clock research*, keynote talk, Ninth International Conference of Computational Methods in Sciences and Engineering (ICCSME), Halkidiki, Greece, October 2-7, 2011.
53. *Atomic calculations for studies of fundamental symmetries and atomic clock research*, invited talk, Precision Measurements with Ultracold Molecules ITAMP workshop, September 26 - 30, 2011, Cambridge, MA, USA.
54. *Atomic theory in cesium, implications for searches for physics beyond the standard model*, invited talk, PAVI2011 workshop "From Parity Violation to Hadronic Structure and more..", Rome, Italy
55. *Precision calculation of blackbody radiation shifts for metrology at the 18th decimal place*, the 42st Annual Meeting of the Division of Atomic Molecular and Optical Physics American Physical Society (DAMOP), June 2011, Atlanta, Georgia, USA.
56. *Magic-zero wavelengths of alkali-metal atoms and their applications*, M. S. Safronova, DAMOP, June 2011, Atlanta, Georgia, USA.

57. *Precision calculation of blackbody radiation shifts for metrology at the 18th decimal place*, 2011 Joint Conference of the IEEE International Frequency Control Symposium and European Frequency and Time Forum, San Francisco, May 2-5, 2011.
58. *Atomic Calculations for Future Technology and Study of Fundamental Problems*, M. S. Safronova, Colloquium at the Department of Physics, University of Nevada, Reno, March 22, 2011.
59. *Anomalously small BBR shift in In⁺ frequency standard*, M. S. Safronova, Optical Clocks: a new frontier in high accuracy metrology workshop Torino, Italy, 1-3 December 2010.
60. *Atomic Polarizabilities*, keynote talk, Eighth International Conference of Computational Methods in Sciences and Engineering (ICCSME), Kos, Greece, October 3-8, 2010.
61. *Atomic Polarizabilities for Study of Fundamental Problems and Future Technology*, Colloquium at the Department of Physics, University of Arizona, September 10, 2010.
62. *Atomic calculations for tests of fundamental physics*, invited talk, 10th International Colloquium on Atomic Spectra and Oscillator Strengths for Astrophysical and Laboratory Plasmas, Berkeley, California, August 2010.
63. *Combining CI and all-order methods for studies of fundamental symmetries*, invited talk, Variation of fundamental constants and violation of fundamental symmetries P, T(EDM), CPT, Lorentz invariance workshop, Cairns, 24-25 July, 2010.
64. *Atomic calculations: recent advances and modern applications*, Joint Quantum Institute Seminar, Maryland, July 2010.
65. *Blackbody radiation shifts and magic wavelengths for atomic clock research*, 2010 IEEE International Frequency Control Symposium, Newport Beach, California, June 2010.
66. *Development of a configuration-interaction plus all-order method for atomic calculations*, the 41st Annual Meeting of the Division of Atomic Molecular and Optical Physics American Physical Society (DAMOP), Houston, Texas, May 25-29, 2010.
67. *Atomic Calculations for Future Technology and Study of Fundamental Problems*, Georgia Tech School of Physics colloquium, November 11, 2009.
68. *Atomic Calculations for Future Technology and Study of Fundamental Problems*, keynote talk, International Conference of Computational Methods in Sciences and Engineering, Rhodes, Greece, October 30, 2009.

69. *Blackbody radiation shifts and Theoretical contributions to atomic clock research*, invited talk, 2009 IEEE International Frequency Control, Besancon, France, April 2009.
70. *Calculation of parity nonconserving amplitude and other properties of Ra^+* , Marianna Safronova, Rupsi Pal, Dansha Jiang, and Ulyana Safronova, 40th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics (DAMOP), Charlottesville, Virginia, May 1923, 2009
71. *Calculation of Blackbody Radiation Shifts for Atomic Clock Research*, DAMOP 2009, Charlottesville, Virginia, May 1923, 2009
72. *Application of the Atomic Calculations: from Fundamental Symmetries to Atomic Clocks* JILA seminar, Boulder, CO, January 14, 2009.
73. *The World of Quantum Information*, School of Chemistry seminar, Tel Aviv University, Israel, November 16, 2008.
74. *New directions in atomic parity violation*, PANIC 2008 conference, Eilat, Israel, November 11, 2008.
75. *Development of the CI + all-order method and its applications*, School of Chemistry seminar, Tel Aviv University, Israel, November 9, 2008.
76. *Fundamental Symmetries, Atomic Clocks, and Magic Wavelength*, AMO seminar, Physics Department, Penn State, October 14, 2008.
77. *The World of Quantum Information*, Signal Processing and Communications seminar series, Department of Electrical and Computer Engineering, University of Delaware, October 6, 2008.
78. *Fundamental Symmetries, Atomic Clocks, and Magic Wavelength*, Physics Department Colloquium, University of Toledo, October 2, 2008.
79. *New directions in atomic PNC*, invited talk, "Beyond the Non-Relativistic Schrödinger Equation From the Dirac Equation to Electroweak Theory" meeting, September 11, Auckland, New Zealand (2008).
80. *Polarizabilities, Atomic Clocks, and Magic Wavelengths*, University of Auckland Physics Department seminar, September 10, Auckland, New Zealand (2008)
81. *Development of the CI + all-order method for atomic calculations*, invited talk, Atomic, Chemical, and Nuclear Developments in Coupled Cluster Methods workshop, Seattle, Washington, July 2008
82. *Atomic PNC theory: current status and future prospects*, KVI seminar, Groningen, Netherlands, June 27, 2008.

83. *Fundamental symmetries, atomic clocks, and magic wavelengths*, Physique des interactions ioniques et moléculaires laboratory seminar, CNRS-Université de Provence, Marseille, France, June 23, 2008.
84. *State-insensitive two-color optical trapping*, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
85. *Development of the CI + all-order method for atomic calculations*, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
86. *Polarizabilities, Atomic Clocks, and Magic Wavelengths*, invited talk, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
87. *Theoretical study of the K, Rb, and Fr lifetimes*, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
88. *Applications of the All-order Method: From Parity Violation to Atomic Clocks*, invited talk, A Symposium on Atomic Physics: A Tribute to Walter Johnson, University of Notre Dame, April 5, 2008.
89. *Atomic PNC theory: current status and future prospects*, AMO seminar, University of California, Berkeley, March 18, 2008.
90. *Symbolic and Numeric Scientific Computing for Atomic Physics*, invited talk, Computational Science Initiative Meeting, University of Delaware, November 9, 2007.
91. *Polarizabilities, atomic clocks, and magic wavelength*, Joint Atomic Physics Colloquium, Institute for Theoretical Atomic and Molecular Physics and Harvard University Physics Department, Cambridge, October 17, 2007.
92. *Atomic PNC theory: current status and future prospects*, invite talk, Rare Isotopes and Fundamental Symmetries workshop, Seattle, September 22, 2007.
93. *Fundamental symmetries, atomic clocks, and magic wavelengths*, Department of Physics and Astronomy colloquium, University of Delaware, September 5, 2007.
94. *Polarizabilities, atomic clocks, and magic wavelengths*, NIST QIBEC seminar, NIST, Gaithersburg, June 27, 2007.
95. *Accurate determination of the electric-dipole matrix elements in K and Rb from the Stark shift measurements*, DAMOP 2007 conference, Calgary, June 2007.
96. *All-order calculation of spin-dependent PNC amplitude in Cs and a revised value of Cs anapole moment*, April APS meeting conference, Jacksonville, April 2007.

97. *The World of Quantum Information*, Physics Department Colloquium, Lafayette College, March 2, 2007.
98. *Applications of polarizability calculations: from quantum computation to parity nonconservation*, Physics Department AMO seminar, University of Connecticut, January 29, 2007.