

CURRICULUM VITAE

Marianna S. Safronova

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Research Areas

- Studies of fundamental symmetries. Weak interactions in heavy atoms. Search for permanent atomic electric-dipole moment. Calculations of the parity-nonconserving amplitude, determination of the weak charge and anapole moment.
- Theoretical atomic clock research, calculations of blackbody radiation shifts.
- Ultracold atoms, cooling and trapping schemes, and magic wavelengths.
- Development of high-precision methodologies for atomic calculations.
- 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.
- Quantum computing with neutral atoms. Design considerations for fast Rydberg quantum gates.
- Application of high-performance computing to large-scale atomic physics calculations. Automatic generation of codes for atomic physics calculations. Development of codes for analytical calculations.

Education

- B.S. and M.S., 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.*

Professional Positions

- Graduate Teaching Assistant, University of Notre Dame, Department of Physics (1994-1995)
- Graduate Research Assistant, University of Notre Dame, Department of Physics (1995-2001)
- Postdoctoral Research Associate, University of Notre Dame, Department of Physics (January 2001-July 2003)
- Guest researcher at National Institute of Standards and Technology (September 2001 - 2004, 2012 - present), full time at NIST (September 2001 - July 2003)
- Assistant Professor, Department of Physics and Astronomy, University of Delaware (August 2003 - August 2008)
- Associate Professor, Department of Physics and Astronomy, University of Delaware (September 2008 - present)

Research, Teaching, and Service Summary

The areas of Marianna Safronova's research in the field of theoretical atomic physics include study of weak interactions in heavy atoms, search for permanent atomic electric-dipole moment, study of ultracold atoms, atomic clock research, 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 (fundamental symmetries) and applications of atomic physics to future technological developments (such as atomic clocks). She is the author of more than 100 peer-reviewed papers. She has given over 100 presentations at colloquiums, seminars, and conferences in US and abroad. She is currently a principal investigator on two three-year grants, from National Science Foundation and National Institute of Standards and Technology. Another three-year NSF proposal (PIF) has been recommended for funding.

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), 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) and Quantum Computation courses to increase student participation and student comprehension of the material. These lectures include sets of in-class exercises as well as allow students to participate in derivation of formulas carried out in class. She has carried out independent student evaluations to evaluate effectiveness of these approaches. All lecture notes are available at her web site <http://www.physics.udel.edu/~msafrono/> (PHYS424, PHYS425, PHYS650).

Four of the Ph. D. students that she has advised have graduated and are continuing their scientific careers. She is presently advising two graduate students. She is also an academic advisor to undergraduate students.

She has served on the National Science Foundation (NSF) Atomic Theory panel (three times), NSF Committee of Visitors that reviews the work of US National Science Foundation, and NSF Panel: “What are the Grand Challenges for Symbolic, Numeric and Algebraic Scientific Computing?” She has reviewed the proposals to the National Science Foundation and Department of Energy as well as reviewed manuscripts for Physical Review Letters, Physical Review A, Physical Review E, Journal of Physics B, 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, New Journal of Physics, and Addison Wesley.

She is presently serving on the AMO seminar, Ph.D. Candidacy exam, Undergraduate studies, Undergraduate advising, and several Ph.D. thesis committees at the Department of Physics and Astronomy. She is a mentor to a recent faculty member, Virginia Lorenz. She is a member of the Editorial boards of the Journal of Computational Methods in Science and Engineering and Journal “Atoms”. She is a member of American Physical Society committee on status of women in physics and Division of Atomic, Molecular, and Optical Physics thesis prize committee. She has been elected to DAMOP executive committee in 2012.

Honors and Awards

- 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:

- *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 Students: Z. Zuhrianda, Matt Simmons

Graduated:

- Bindiya Arora (Ph.D, 2008)
- Rupsi Pal (Ph.D, 2008)
- Eugeniya Tchoukova (Ph.D, 2008)
- Dansha Jiang (Ph.D, 2010)

Visiting Scholars:

Dr. Mikhail Kozlov, Petersburg Nuclear Physics Institute, St. Petersburg, Russia (Visited University of Delaware several times for 1-2 months, 2008-2011)

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.

List of Publications in Peer-Reviewed Journals

1. *Magic wavelengths for optical cooling and trapping of lithium*, M. S. Safronova, U. I. Safronova, Charles W. Clark, submitted to Phys. Rev. A (2012), arXiv:1206.7115.
2. *Correlation effects in Yb^+ and implications for parity violation*, S. G. Porsev, M. S. Safronova, M. G. Kozlov, Phys. Rev. A 86, 022504 (2012).
3. *Electric dipole moment enhancement factor of thallium*, S. G. Porsev, M. S. Safronova, M. G. Kozlov, Phys. Rev. Lett. 108, 173001 (2012).
4. *Polarizabilities of Si^{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).
5. *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).
6. *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).
7. *Atomic theory in cesium, implications for searches for physics beyond the standard model*, M. S. Safronova, Il Nuovo Cimento C 35 (2012).
8. *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).
9. *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).
10. *Atomic properties of Pb III* , M. S. Safronova, M. G. Kozlov, and U. I. Safronova, Phys. Rev. A 85, 012507 (2012).
11. *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).
12. *Correlation and relativistic effects in actinide ions*, M. S. Safronova and U. I. Safronova, Phys. Rev. A 84, 052515 (2011).
13. *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).

14. *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).
15. *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).
16. *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).
17. *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) .
18. *Atomic calculations for tests of fundamental physics*, M. S. Safronova, Can. J. Phys. 89, 371 (2011).
19. *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).
20. *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).
21. *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).
22. *Blackbody radiation shift in ^{87}Rb frequency standard*, M.S. Safronova, Dansha Jiang, and U.I. Safronova, Phys. Rev. A 82, 022510 (2010) .
23. *State-insensitive bichromatic optical trapping*, Bindiya Arora, M.S. Safronova, and Charles W. Clark, Phys. Rev. A 82, 022509 (2010) .
24. *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).
25. *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).
26. *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).

27. *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).
28. *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).
29. *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).
30. *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).
31. *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).
32. *Polarizabilities of the Mg^+ and Si^{3+} ions*, J. Mitroy and M. S. Safronova, accepted for publication in Physical Review A (2009).
33. *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).
34. *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).
35. *Theoretical study of lifetimes and polarizabilities in Ba^+* , E. Iskrenova-Tchoukova and M. S. Safronova, Phys. Rev. A 78, 012508 (2008).
36. *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).
37. *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).
38. *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).
39. *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).

40. *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).
41. *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).
42. *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).
43. *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).
44. *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).
45. *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) .
46. *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).
47. *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).
48. *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).
49. *Determination of the static polarizability of the $8s^2S_{1/2}$ state of atomic cesium*, Mevan Gunawardena, D.S. Elliott, M.S. Safronova, and U.I. Safronova, Phys. Rev. A 75, 022507 (2007).
50. *Level-crossing spectroscopy of the 7, 9, and $10D_{5/2}$ states of ^{133}Cs and validation of relativistic many-body calculations of the polarizabilities and hyperfine constants*, M. Auzinsh, K. Bluss, R. Ferber, F. Gahbauer, A. Jarmola, M. S. Safronova, U. I. Safronova, and M. Tamanis Phys. Rev. A 75, 022502 (2007).
51. *Excitation energies, polarizabilities, multipole transition rates, and lifetimes in Th IV*, U.I. Safronova, W.R. Johnson, and M.S. Safronova, Phys. Rev. A 74, 042511 (2006).

52. *Third-order many-body perturbation theory calculations for the beryllium and magnesium isoelectronic sequences*, H.C. Ho, W.R. Johnson, S.A. Blundell, and M.S. Safronova, Phys. Rev. A **74**, 022510 (2006).
53. *Relativistic many-body calculations of the Stark-induced amplitude of the $6P_{1/2} - 7P_{1/2}$ transition in thallium*, M.S. Safronova, W.R. Johnson, U.I. Safronova, and T. E. Cowan, Phys. Rev. A **74**, 022504 (2006).
54. *Nonlinear optical approach to matrix-element spectroscopy of the $5s^2S_{1/2} \rightarrow 5p^2P_j \rightarrow 5d^2D_j$ transitions in ^{87}Rb* , S.B. Bayram, M.D. Havey, M.S. Safronova, and A. Sieradzan, J. Phys. B **39**, 2545, (2006).
55. *Excitation energies, hyperfine constants, E1 transition rates, and lifetimes of $4s^2nl$ states in neutral gallium*, U.I. Safronova, T.E. Cowan, and M.S. Safronova, J. Phys. B **39**, 749 (2006).
56. *Breit interaction and parity nonconservation in many-electron atoms*, V.A. Dzuba, V. V. Flambaum, and M.S. Safronova, Rev. A **73**, 022112 (2006).
57. *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).
58. *Relativistic many-body calculations of energies, E2, and M1 transition rates of $4s^24p$ states in Ga-like ions*, U.I. Safronova and M.S. Safronova, Phys. Lett. A **348**, 293 (2006).
59. *Calculation of isotope shifts for cesium and francium*, V. A. Dzuba, W. R. Johnson, and M. S. Safronova, Phys. Rev A **72**, 022503 (2005).
60. *Relativistic many-body calculations of electric-dipole lifetimes, transitions rates, and oscillator strengths for $2l-13l'$ states in Ne-like ions*, U.I. Safronova and M.S. Safronova, J. Phys. B **38**, 2741 (2005).
61. *Excitation energies, hyperfine constants, E1, E2, M1 transition rates, and lifetimes of $6s^2nl$ states in Tl I and Pb II*, U. I Safronova, M. S. Safronova, and W. R. Johnson, Phys. Rev. A **71**, 052506 (2005).
62. *Experimental and theoretical study of the $3d^2D$ -level lifetimes of ^{40}Ca* , A. Kreuter, C. Becher, G.P.T. Lancaster, A.B. Mundt, C. Russo, H. Häffner, C. Roos, W. Hänsel, F. Schmidt-Kaler, R. Blatt, and M.S. Safronova, Phys. Rev. A **71**, 032504 (2005).
63. *Relativistic many-body calculations of energies for doubly-excited $1s2l2l'$ and $1s3l3l'$ states in Li-like ions*, U.I. Safronova and M.S. Safronova, Can. J. Phys. **82**, 743 (2004).

64. *Relativistic many-body calculations of E1, E2, M1, and M2 transition rates for the $1s2l2l' - 1s^22l$ lines in Li-like ions*, U.I. Safronova and M.S. Safronova, Mol. Phys. 102, **1331** (2004).
65. *Finite-field evaluation of the Lennard-Jones atom-wall interaction constant C_3 for alkali-metal atoms*, W.R. Johnson, V.A. Dzuba, U.I. Safronova, M.S. Safronova, Phys. Rev. A **69**, 022508 (2004).
66. *Precision study of $6p^2P_j - 8s^2S_{1/2}$ relative transition matrix elements in atomic Cs*, A. Sieradzan, M. D. Havey, M. S. Safronova, Phys. Rev. A **69**, 022502 (2004).
67. *Third-order relativistic many-body calculations of energies and lifetimes of levels along the silver isoelectronic sequence*, U.I. Safronova, M.S. Safronova, I.M. Savukov, and W.R. Johnson, Phys. Rev. A **68**, 062505 (2003).
68. *Inconsistencies between lifetime and polarizability measurements in Cs*, M.S. Safronova and Charles W. Clark, Phys. Rev. A **69**, 040501 (2004).
69. *Relativistic many-body calculations of electric-dipole matrix elements, lifetimes, and polarizabilities in rubidium*, M.S. Safronova, Carl J. Williams, and Charles W. Clark, Phys. Rev. A **69**, 022509 (2004).
70. *Combined effect of coherent Z exchange and the hyperfine interaction in atomic PNC*, W.R. Johnson, M.S. Safronova, and U.I. Safronova, Phys. Rev. A **67**, 062106 (2003)
71. *Optimizing the fast Rydberg quantum gate*, M.S. Safronova, Carl J. Williams, and Charles W. Clark, Phys. Rev. A **67**, 040303 (2003).
72. *Energies, transition rates, and electron electric dipole moment enhancement factors for Ce IV and Pr V*, I.M. Savukov, W.R. Johnson, U.I. Safronova, and M.S. Safronova, Phys. Rev. A **67**, 042504 (2003).
73. *Relativistic many-body calculations of electric-dipole lifetimes, transition rates, and oscillator strengths for $n = 3$ states in Al-like ions*, U.I. Safronova, M. Sataka, J.R. Albritton, W.R. Johnson, and M. S. Safronova, At. Data and Nucl. Data Tables **84**, 1 (2003).
74. *Relativistic many-body calculations of transition rates from core-excited states in sodiumlike ions*, U.I. Safronova, W.R. Johnson, M.S. Safronova, and J.R. Albritton, Phys. Rev. A. **66**, 052511 (2002).
75. *Relativistic many-body calculations of energies for core-excited states in sodiumlike ions*, U.I. Safronova, W.R. Johnson, M.S. Safronova, and J.R. Albritton, Phys. Rev. A, **66**, 042506 (2002).

76. *Relativistic many-body calculations of excitation energies and transition rates in ytterbiumlike ions*, U.I. Safronova, W.R. Johnson, M.S. Safronova, J.R. Albritton, Phys. Rev. A **66**, 022507 (2002).
77. *Measurement of the $6s - 7p$ transition probabilities in atomic cesium and a revised value for the weak charge Q_W* , A.A. Vasilyev, I.M. Savukov, M.S. Safronova, and H.G. Berry, Phys. Rev. A **66**, 020101 (2002).
78. *Relativistic many-body calculations of energies of $n = 3$ states in aluminiumlike ions*, U. I. Safronova, C. Namba, J. R. Albritton, W. R. Johnson, and M. S. Safronova, Phys. Rev. A **65**, 022507 (2002).
79. *Third-order isotope-shift constants for alkali-metal atoms and ions*, M.S. Safronova and W.R. Johnson, Phys. Rev. A **64**, 052501 (2001).
80. *Electric-dipole, electric-quadrupole, magnetic-dipole, and magnetic-quadrupole transitions in the neon isoelectronic sequence*, U. I. Safronova, C. Namba, I. Murakami, W. R. Johnson, and M. S. Safronova, Phys. Rev. A **64**, 012507 (2001).
81. *Breit correction to the PNC amplitude in cesium*, V. A. Dzuba, C. Harabati, W. R. Johnson, and M. S. Safronova, Phys. Rev. A **63** 044103, 1 (2001).
82. *High-precision calculation of parity-nonconserving amplitude in francium*, M. S. Safronova and W. R. Johnson, Phys. Rev. A **62**, 022112 (2000).
83. *Relativistic many-body calculations of energy levels, hyperfine constants, electric-dipole matrix elements, and static polarizabilities for alkali-metal atoms*, M. S. Safronova, W. R. Johnson, and A. Derevianko, Phys. Rev. A **60**, 4476 (1999).
84. *Relativistic many-body calculations of transition probabilities for the $2l_1 2l_2 [LSJ] - 2l_3 3l_4 [L'S'J']$ lines in Be-like ions*, U.I. Safronova, A. Derevianko, M.S. Safronova, W.R. Johnson, J. Phys. B **32**, 3527 (1999).
85. *Ab initio calculations of off-diagonal hyperfine interaction in cesium*, A. Derevianko, M.S. Safronova, W.R. Johnson, Phys. Rev. A **60**, R1741 (1999).
86. *High-precision calculations of dispersion coefficients, static dipole polarizabilities, and atom-wall interaction constants for alkali-metal atoms*, A. Derevianko, W.R. Johnson, M.S. Safronova, J.F. Babb, Phys. Rev. Lett. **82**, 3589 (1999).
87. *Relativistic many-body calculations of transition probabilities for the $2l_1 2l_2 [LSJ] - 2l_3 2l_4 [L'S'J']$ lines in Be-like ions*, U.I. Safronova, W.R. Johnson, M.S. Safronova, A. Derevianko, Phys. Scr. **59**, 286 (1999).
88. *Relativistic many-body calculations of energies of $n=3$ states for the Boron isoelectronic sequence, $Z=6-30$* , U.I. Safronova, W.R. Johnson, M.S. Safronova, At. Data. Nucl. Data Tables. **69**, 183 (1998).

89. *Relativistic Z-dependent corrections for Li- and Be-like ions*, U.I. Safronova, W.R. Johnson, M.S. Safronova, Phys. Scr. **58**, 348 (1998).
90. *Relativistic many-body calculations of energy levels, hyperfine constants, and transition rates for sodiumlike ions, Z=11–16*, M.S. Safronova, A. Derevianko, W.R. Johnson, Phys. Rev. A **58**, 1016 (1998).
91. *Relativistic many-body calculations of energies of n=3 states for beryllium isoelectronic sequence*, M.S. Safronova, W.R. Johnson, U.I. Safronova, Phys. Scr. **T73**, 48 (1997).
92. *Relativistic many-body calculations of energies of n=3 states for boron-like sodium*, W.R. Johnson, M.S. Safronova, U.I. Safronova, Phys. Scr. **T73**, 45 (1997).
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96. *Cross sections and rate coefficients for inner-shell excitation of Li-like ions with Z=6–42*, U.I. Safronova, M.S. Safronova, T. Kato, Phys. Scr. **54**, 68 (1996).
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99. *Relative intensity of dielectronic satellite spectra for highly charged He-like ions ($1s2l''nl - 1s^2n'l'$, $n, n'=2, 3$) with Z=6–54*, U.I. Safronova, M.S. Safronova, R. Bruch, J. Phys. B **28**, 2803 (1995).
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103. *Z-dependences of the energy levels of autoionization states for Be-like ions*, M.S. Safronova, U.I. Safronova, R. Bruch, *Phys. Lett. A.* **194**, 106 (1994).
104. *Relativistic perturbation theory calculation of two-electron doubly excited states*, U.I. Safronova, M.S. Safronova, N.J. Snyderman, V.G. Pal'chikov, *Phys. Scr.* **50**, 29 (1994).
105. *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).
106. *Z-dependences of atomic parameters of autoionization states of two-electron systems*, I.A. Ivanov, J. Nilsen, M.S. Safronova, U.I. Safronova, *Sov. Phys. J.* **33**, 670 (1990); Translated from: *Iz. Vyssh. Uchebn. Zaved., Fiz.*, **33**, 55 (1990).
107. *Z-dependences of the atomic characteristics for selected $2l4l'$ states*, J. Nilsen, U.I. Safronova, M.S. Safronova, *J. Quant. Spectrosc. Radiat. Transfer* **43**, 445 (1990).

Talks (2007 - 2012)

1. *Atomic clocks and the search for variation of fundamental constants*, NPL, UK, July 20, 2012.
2. *The search for new physics with atomic systems*, Neutron Physics Group, NIST, June 26, 2012.
3. *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.
4. *The World of Quantum Information*, St. Petersburg Electrotechnical Institute (LETI), Department of Electronics, May 22, 2012.
5. *Fundamental symmetries, atomic clocks and quantum computers*, St. Petersburg University, Quantum Mechanics Division, Petergof, Russia, May 18, 2012.
6. *Atomic calculations for studies of fundamental symmetries and atomic clock research*, St. Petersburg Institute of Nuclear Physics, Gatchina, Russia, May 17, 2012.
7. *The search for new physics with atomic systems*, AMO seminar, University of California, Berkeley, March 21, 2012.
8. *Atomic clocks and the search for variation of fundamental constants*, Joint Quantum Institute Seminar, NIST and University of Maryland, March 5, 2012.
9. *Atomic parity violation*, Oak Ridge national Lab, Physics Division Seminars, December 8, 2011.
10. *Atomic Calculations for Future Technology and Study of Fundamental Problems*, Rowan University colloquium, November 18, 2011.
11. *Atomic calculations for tests of fundamental physics*, Physics Department, University of Virginia colloquium, November 11, 2011, Charlottesville, VA.
12. *Atomic parity violation and implications for searches for physics beyond the standard model*, Jefferson Lab theory seminar, October 24, 2011, Newport News, VA.
13. *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.
14. *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.

15. *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
16. *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.
17. *Magic-zero wavelengths of alkali-metal atoms and their applications*, M. S. Safronova, DAMOP, June 2011, Atlanta, Georgia, USA.
18. *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.
19. *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.
20. *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.
21. *Atomic Polarizabilities*, keynote talk, Eighth International Conference of Computational Methods in Sciences and Engineering (ICCSME), Kos, Greece, October 3-8, 2010.
22. *Atomic Polarizabilities for Study of Fundamental Problems and Future Technology*, Colloquium at the Department of Physics, University of Arizona, September 10, 2010.
23. *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.
24. *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.
25. *Atomic calculations: recent advances and modern applications*, Joint Quantum Institute Seminar, Maryland, July 2010.
26. *Blackbody radiation shifts and magic wavelengths for atomic clock research*, 2010 IEEE International Frequency Control Symposium, Newport Beach, California, June 2010.

27. *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.
28. *Atomic Calculations for Future Technology and Study of Fundamental Problems*, Georgia Tech School of Physics colloquium, November 11, 2009.
29. *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.
30. *Blackbody radiation shifts and Theoretical contributions to atomic clock research*, invited talk, 2009 IEEE International Frequency Control, Besancon, France, April 2009.
31. *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
32. *Calculation of Blackbody Radiation Shifts for Atomic Clock Research*, DAMOP 2009, Charlottesville, Virginia, May 1923, 2009
33. *Application of the Atomic Calculations: from Fundamental Symmetries to Atomic Clocks* JILA seminar, Boulder, CO, January 14, 2009.
34. *The World of Quantum Information*, School of Chemistry seminar, Tel Aviv University, Israel, November 16, 2008.
35. *New directions in atomic parity violation*, PANIC 2008 conference, Eilat, Israel, November 11, 2008.
36. *Development of the CI + all-order method and its applications*, School of Chemistry seminar, Tel Aviv University, Israel, November 9, 2008.
37. *Fundamental Symmetries, Atomic Clocks, and Magic Wavelength*, AMO seminar, Physics Department, Penn State, October 14, 2008.
38. *The World of Quantum Information*, Signal Processing and Communications seminar series, Department of Electrical and Computer Engineering, University of Delaware, October 6, 2008.
39. *Fundamental Symmetries, Atomic Clocks, and Magic Wavelength*, Physics Department Colloquium, University of Toledo, October 2, 2008.

40. *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).
41. *Polarizabilities, Atomic Clocks, and Magic Wavelengths*, University of Auckland Physics Department seminar, September 10, Auckland, New Zealand (2008)
42. *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
43. *Atomic PNC theory: current status and future prospects*, KVI seminar, Groningen, Netherlands, June 27, 2008.
44. *Fundamental symmetries, atomic clocks, and magic wavelengths*, Physique des interactions ioniques et moléculaires laboratory seminar, CNRS-Université de Provence, Marseille, France, June 23, 2008.
45. *State-insensitive two-color optical trapping*, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
46. *Development of the CI + all-order method for atomic calculations*, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
47. *Polarizabilities, Atomic Clocks, and Magic Wavelengths*, invited talk, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
48. *Theoretical study of the K, Rb, and Fr lifetimes*, DAMOP 2008 conference, State College, Pennsylvania, May 2008.
49. *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.
50. *Atomic PNC theory: current status and future prospects*, AMO seminar, University of California, Berkeley, March 18, 2008.
51. *Symbolic and Numeric Scientific Computing for Atomic Physics*, invited talk, Computational Science Initiative Meeting, University of Delaware, November 9, 2007.
52. *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.
53. *Atomic PNC theory: current status and future prospects*, invite talk, Rare Isotopes and Fundamental Symmetries workshop, Seattle, September 22, 2007.

54. *Fundamental symmetries, atomic clocks, and magic wavelengths*, Department of Physics and Astronomy colloquium, University of Delaware, September 5, 2007.
55. *Polarizabilities, atomic clocks, and magic wavelengths*, NIST QIBEC seminar, NIST, Gaithersburg, June 27, 2007.
56. *Accurate determination of the electric-dipole matrix elements in K and Rb from the Stark shift measurements*, DAMOP 2007 conference, Calgary, June 2007.
57. *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.
58. *The World of Quantum Information*, Physics Department Colloquium, Lafayette College, March 2, 2007.
59. *Applications of polarizability calculations: from quantum computation to parity nonconservation*, Physics Department AMO seminar, University of Connecticut, January 29, 2007.