Turker Topcu CURRICULUM VITAE DEC 2021

CONTACT INFORMATION

Department of Mathematics
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CITIZENSHIP

United States

EDUCATION

Ph.D., Physics, Auburn University, Auburn, AL, 2007

M.Sc., Physics, Auburn University, Auburn, AL, 2005 (non-thesis)

B.Sc., Physics, Marmara University, Istanbul, Turkey, 2002 (Summa Cum Laude)

PROFESSIONAL EXPERIENCE

2019- **Visiting Assistant Professor**, Department of Mathematics, Virginia Polytechnic Institute and State University

2015-2019 **Temporary Faculty**, Department of Mathematics and Statistics, University of Nevada, Reno

2015-2017 **Volunteer Research Scholar**, Department of Physics, University of Nevada, Reno

2012-2015 **Postdoctoral Scholar**, Department of Physics, University of Nevada, Reno

2014 **Visiting Fellow**, Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP) at the Smithsonian Astrophysical Observatory and Harvard University

2009-2012 **Postdoctoral Research Fellow**, Department of Physics, Auburn University

2007-2008 **Postdoctoral Research Associate**, Department of Physics, Kansas State University

2002-2007 **Graduate Research Assistant**, Department of Physics, Auburn University

TEACHING EXPERIENCE

Operational Methods (Math 4564)
Virginia Tech, Sole Instructor, Fall 2021

Calculus of Several Variables (Math 3214)
Virginia Tech, Sole Instructor, Spring 2020/2021/2022

Introduction to Multivariable Calculus (Math 2204)
Virginia Tech, Sole Instructor, Fall 2019/2020/2021, Spring 2020/2021/2022

Differential Equations (Math 285)
University of Nevada, Reno, Sole Instructor, Fall 2016, Summer 2019

Multivariable Calculus (Math 283)
University of Nevada, Reno, Sole Instructor, Fall 2015/2017/2018; Spring 2017/2018

Engineering Physics I (Phys 1600)
Auburn University, Sole Instructor, Fall 2011

Introductory Calculus for Business and Social Sciences (Math 176)
University of Nevada, Reno, Sole Instructor, Fall 2015

Engineering Physics Lab. I (Phys 1600)
Auburn University, Teaching Assistant, Fall 2002

Publications

Graduate students are underlined for publications resulted from research I directed. The undergraduates* further carry an asterisk.

28. **T. Topcu**, E. A. Bleda, and Z. Altun, Drastically enhanced high-order harmonic generation from endofullerenes, Phys. Rev. A **100**, 063421 (2019)
27. P. Kómár, **T. Topcu**, E. M. Kessler, A. Derevianko, V. Vuletić, J. Ye, and M. D. Lukin, Quantum Network of Atom Clocks: A Possible Implementation with Neutral Atoms, Phys. Rev. Lett. **117**, 060506 (2016)
26. **Turker Topcu** and Andrei Derevianko, Possibility of triple magic trapping of clock and Rydberg states of divalent atoms in optical lattices, J. Phys. B **49**, 144004 (2016) *(Special Issue on Rydberg Physics)*
25. **Turker Topcu** and Andrei Derevianko, Rydberg blockade with multivalent atoms: effect of Rydberg series perturbation on van der Waals interactions, *arXiv:***1505.07152** [physics.atom-ph], (2015) *Submitted to Physical Review A*
24. A. Derevianko, P. Kómár, **T. Topcu**, R. M. Kroeze, and M. D. Lukin, Effects of molecular resonances on Rydberg blockade, Phys. Rev. A **92**, 063419 (2015)
23. K. Orazymbetov, E. A. Bleda, Z. Altun, and **T. Topcu**, High-order harmonic generation from confined Rydberg atoms, Proceeings of XXIX International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC15), Journal of Physics: Conference Series **635**, 092125 (2015)
22. A. Arakelyan, **T. Topcu**, F. Robicheaux, and T. F. Gallagher, Spectrum of quasistable states in a strong microwave field, Phys. Rev. A **90**, 013413 (2014)
21. I. Yavuz, E. A. Bleda, Z. Altun, **T. Topcu**, Phase-dependent interference fringes in the wavelength scaling of harmonic efficiency, Phys. Rev. A **89**, 055801 (2014)
20. **Turker Topcu** and Andrei Derevianko, Divalent Rydberg atoms in optical lattices: intensity landscape and magic trapping, Phys. Rev. A **89**, 023411 (2014)
19. **Turker Topcu** and Andrei Derevianko, Tune-out wavelengths and landscape-modulated polarizabilities of alkali-metal Rydberg atoms in infrared optical lattices, Phys. Rev. A **88**, 053406 (2013)
18. E. A. Bleda, I. Yavuz, Z. Altun, and **T. Topcu**, High-order-harmonic generation from Rydberg states at fixed Keldysh parameter, Phys. Rev. A **88**, 043417 (2013)
17. **Turker Topcu** and Andrei Derevianko, Dynamic polarizability of Rydberg atoms: Applicability of the near-free-electron approximation, gauge invariance, and the Dirac sea, Phys. Rev. A **88**, 042510 (2013)

16. **Turker Topcu** and Andrei Derevianko, Intensity landscape and the possibility of magic trapping of alkali Rydberg atoms in infrared optical lattices, Phys. Rev. A **88**, 043407 (2013)
15. I. Yavuz, Z. Altun, and **T. Topcu**, Wavelength scaling of high-order-harmonic-generation efficiency by few-cycle laser pulses: Influence of carrier-envelope phase, Phys. Rev. A **86**, 043836 (2012)
14. **Turker Topcu** and Francis Robicheaux, Dichotomy between tunneling and multiphoton ionization in atomic photoionization: Keldysh parameter γ versus scaled frequency Ω, Phys. Rev. A **86**, 053407 (2012)
13. I. Yavuz, E. A. Bleda, Z. Altun, and **T. Topcu**, Generation of a broadband xuv continuum in high-order-harmonic generation by spatially inhomogeneous fields, Phys. Rev. A **85**, 013416 (2012)
12. **Turker Topcu** and Francis Robicheaux, Multiphoton population transfer in systems violating classical twist condition: a comparative study of separatrix crossing in phase space, Phys. Rev. E **83**, 046607 (2011)
11. I. Yavuz, Z. Altun, and **T. Topcu**, Enhancement of high-order harmonic generation in the presence of noise, J. Phys. B **44**, 135403 (2011)
10. P. H. Donnan*, K. Niffenegger*, **T. Topcu**, and F. Robicheaux, Calculation of State Selective Field Ionization of hydrogen atoms in a strong magnetic field, J. Phys. B **44**, 184003 (2011) *(Special Issue on Rydberg Physics)*
9. **Turker Topcu** and Francis Robicheaux, Multiphoton population transfer in HF: adiabatic rapid passage in a diatomic molecule, J. Phys. B **43**, 205101 (2010)
8. **Turker Topcu** and Francis Robicheaux, Multiphoton population transfer in a kicked Rydberg atom: adiabatic rapid passage by separatrix crossing, J. Phys. B **43**, 115003 (2010)
7. **Turker Topcu** and Francis Robicheaux, Multiphoton adiabatic rapid passage: classical transition induced by separatrix crossing, J. Phys. B **42**, 044014 (2009)
6. **Turker Topcu** and Francis Robicheaux, Chaotic ionization of a highly excited hydrogen atom in parallel electric and magnetic fields, J. Phys. B **40**, 1925 (2007)
5. Michael S. Pindzola, F. Robicheaux, Stuart D. Loch, J. C. Berengut, **T. Topcu**, J. Colgan, M. Foster, D. C. Griffin, Connor P. Ballance, R. Schultz, T. Minami, N. R. Badnell, M. C. Witthoeft, D. R. Plante, D. M. Mitnik, J. Ludlow and U. Kleiman, The time-dependent close-coupling method for atomic and molecular collision processes, J. Phys. B **40**, R39 (2007)
4. **T. Topcu**, M. S. Pindzola, C. P. Ballance, D. C. Griffin and F. Robicheaux, Electron impact ionization of highly excited hydrogen-like ions in a collinear s-wave model, Phys. Rev. A **74**, 062708 (2006)
3. **Turker Topcu** and Francis Robicheaux, Radiative cascade of highly excited hydrogen atoms in strong magnetic fields, Phys. Rev. A **73**, 043405 (2006)
2. U. Kleiman, **T. Topcu**, M. S. Pindzola, and F. Robicheaux, The search for oscillations in the near threshold photo-double ionization cross section of helium, J. Phys. B **39**, L61 (2006)

1. F. Robicheaux, J. V. Hernandez, **T. Topcu**, and L. D. Noordam, Simulation of Coherent interactions between Rydberg Atoms, Phys. Rev. A **70**, 042703 (2004)

Manuscripts in Preparation

3. **Turker Topcu** and Andrei Derevianko, Long-range interactions between divalent Rydberg atoms in optical lattices: engineering asymmetry for quantum entangling gates, *To be submitted to Physical Review A*
2. **Turker Topcu**, Multiphoton excitations in a non-twist system kicked by an impulsive pulse train, *To be submitted to Physical Review E*
1. **Turker Topcu**, Dipole blockade between symmetric combinations of Rydberg Stark states, *To be submitted to Physical Review A*

News Coverage

2. Method to entangle thousands of atoms could lead to record clock stability, Lisa Zyga, featured on Phys.org on 8/19: `http://phys.org/news/2016-08-method-entangle-thousands-atoms-clock.html` (2016)
1. Multiphoton population transfer in a kicked Rydberg atom, **Turker Topcu** and Francis Robicheaux, Europhysics News **41/4** (2010)

Grants and Proposals

Undergraduate students are underlined.

3. **Turker Topcu**, *High-order harmonic generation from endofullerenes*, Computational resourse allocation, Virginia Tech Advanced Research Computing (ARC) (2020-2021)
2. Rebekah Bodily, **Turker Topcu**, *Multiphoton excitation of cold Rydberg atoms in optical lattices*, Submitted for Spring 2019 Nevada Undergraduate Research Award (2018)
1. C. P. Ballance, T. G. Lee, **T. Topcu**, S. D. Loch, M. S. Pindzola, F. J. Robicheaux, W. Yu, J. P. Colgan, C. J. Fontes, N. R. Badnell, and B. M. McLaughlin, *Large-scale computational atomic and molecular collision calculations*, Awarded 8 million processor hours in *Extreme Science and Engineering Discovery Environment (XSEDE)* to run on *Kraken CRAY XT5* at Oak Ridge National Laboratory. Grant Number *PHY090083* (2012)

Conference talks and posters

Talks

7. Enhancement of high-order harmonic generation from endohedrally confined atoms, Online Meeting of the APS Division of Atomic, Molecular and Optical Physics, June 1-5 (2020)
6. Multiphoton population transfer in a kicked Rydberg atom: adiabatic rapid passage by separatrix crossing, 41st Meeting of the APS Division of Atomic, Molecular and Optical Physics, Rice University, Houston, TX, May 25-29 (2010)
5. Multiphoton population transfer in a kicked Rydberg atom, Winter Workshop on Atomic Physics, Callaway Gardens, Pine Mountain, GA, Jan 11-14 (2010)
4. Multiphoton adiabatic population transfer in Rydberg atoms: Classical versus Quantum picture, 39th Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Penn State, State College, PA, May 27-31 (2008)

3. Ionization of a highly excited hydrogen atom in parallel electric and magnetic fields, 37th Meeting of the Division of Atomic, Molecular and Optical Physics of APS, University of Tennessee, Knoxville, TN, May 16-20 (2006)
2. Electron-impact ionization of hydrogen-like ions in line-land model, 36th Meeting of the Division of Atomic, Molecular and Optical Physics of APS, University of Nebraska, Lincoln, NE, May 17-21 (2005)
1. Double photoionization cross section of helium near threshold, Winter Workshop on Atomic Physics, Rollins College, Winter Park, FL, January 10-14 (2005)

Posters

13. **T. Topcu**, E. A. Bleda, Z. Altun, *High-order harmonic spectra in different gauges can disagree when there is confinement*, APS March Meeting (Virtual), March 15-19 (2021)
12. **T. Topcu** *Computational approach to quantum gate evaluation and design*, Undergraduate Research Mixer, Virginia Tech, Blacksburg, VA, October 16 (2019)
11. A. Derevianko, P. Komar, **T. Topcu**, R. Kroeze and M. Lukin, *Detrimental effects of molecular resonances on Rydberg blockade* , 47th Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Providence, RI, May 23-27 (2016)
10. P. Komar, E. Kessler , **T. Topcu**, A. Derevianko and M. Lukin, *Entangled optical clocks via Rydberg blockade* , 46th Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Columbus, OH, June 8-12 (2015)
9. K. Orazymbetov, E. A. Bleda, Z. Altun, and **T. Topcu**, *High-order harmonic generation from confined Rydberg atoms*, XXIX International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC15), Toledo, Spain, July 22-28, Proceedings: Journal of Physics: Conference Series **635** (2015) 092125 (2015)
8. **Turker Topcu** and Andrei Derevianko, *Intensity-modulated polarizabilities and magic trapping of alkali-metal and divalent Rydberg atoms in infrared optical lattices* , 45th Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Madison, WI, June 2-6 (2014)
7. **Turker Topcu** and Andrei Derevianko, *Long wavelength magic trapping of alkali-metal Rydberg atoms in optical lattices*, The 21st International Conference on Laser Spectroscopy (ICOLS 2013), University of California, Berkeley CA, June 9-14 (2013)
6. A. Arakelyan, **T. Topcu**, F. Robicheaux, and T. F. Gallagher, *Metastable states in microwave ionization*, 2013 Joint Meeting of the APS Division of Atomic, Molecular and Optical Physicsand the CAP Division of the Atomic, Molecular and Optical Physics, Quebec City, Quebec, Canada, June 3-7 (2013)
5. E. A. Bleda, I. Yavuz, Z. Altun, and **T. Topcu**, *Exploring the high-order harmonic generation from Rydberg states with a fixed Keldysh parameter*, 43rd Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Orange County, California, June 4-8 (2012)

4. **Turker Topcu** and Francis Robicheaux, *An assessment of tunneling-multiphoton dichotomy in atomic photo-ionization: Keldysh parameter versus scaled frequency*, 43rd Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Orange County, California, June 4-8 (2012)
3. **Turker Topcu** and Francis Robicheaux, *Multiphoton population transfer between rovibrational states of HF: adiabatic rapid passage in a diatomic molecule*, 42nd Meeting of the Division of Atomic, Molecular and Optical Physics of APS, Atlanta, GA, June 13-17 (2011)
2. U. Kleiman, **T. Topcu**, M. S. Pindzola, and F. Robicheaux, *The search for oscillations in the near-threshold double photoionization cross section of helium*, Spring Meeting of the German Physical Society, Frankfurt, Germany, March 13-17 (2006)
1. U. Kleiman, **T. Topcu**, M. S. Pindzola, and F. Robicheaux, *Double photoionization cross Section of helium near threshold*, 37th EGAS Conference, Dublin City University, Dublin, Ireland, August 3-6 (2005)

Campus talks

12. Quantum network of entangled atoms: neutral atom quantum information processing, Colloquium, SUNY Polytechnic Institute, Utica, NY (2019)
11. Quantum network of entangled atoms: Rydberg physics in quantum information processing, Colloquium, Western Illinois University, Macomb, IL (2017)
10. Entangling gates using divalent atoms for distributed entanglement, Atomic lunch series, University of Nevada, Reno, Reno, NV (2015)
9. Generation of maximally entangled GHZ states of divalent atoms, ITAMP Topical Lunch Seminar, Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP), Boston, MA (2014)
8. Generation of maximally entangled GHZ states of divalent atoms, Lukin Group Meeting, Harvard University, Boston, MA (2014)
7. Generation of maximally entangled GHZ states of divalent atoms, Atomic lunch series, University of Nevada, Reno, Reno, NV (2014)
6. Maximally entangled GHZ states for increased Atomic clock precision, Atomic lunch series, University of Nevada, Reno, Reno, NV (2013)
5. Long wavelength magic trapping of alkali-metal Rydberg atoms in optical lattices for quantum gate operations, Atomic lunch series, University of Nevada, Reno, Reno, NV (2013)
4. Quantum control and strong field physics with Rydberg atoms, Colloquium, University of Nevada, Reno, Reno, NV (2012)
3. Ionization from Rydberg states in the strong field regime , Atomic and molecular physics seminar, Auburn University, Auburn, AL (2012)
2. Propagation effects in high-order harmonic generation, Atomic and molecular physics seminar, Auburn University, Auburn, AL (2009)
1. Propagation effects in high-order harmonic generation from macroscopic gas targets, Atomic and molecular physics seminar, Kansas State University, Manhattan, KS (2008)

Professional Memberships

3. American Physical Society (since 2005)
2. Alpha Theta Chi Collegiate Honor Society (since 2004)
1. National Scholars Honor Society (since 2006)

Professional Service

Peer Review

Physical Review A
Physical Review Letters
Journal of Physics B: Atomic, Molecular and Optical Physics
New Journal of Physics
Physica Scripta
Optics Express
Physics Letters A

University Service

Virginia Tech Undergraduate Honor System faculty hearing panel, 2021
Scholarship Commitee, Department of Mathematics, Virginia Tech, 2020/2021
Proctor, Credit by Exam, Department of Mathematics, Virginia Tech, 2020/2021

Outreach

Referee, Virginia State Science and Engineering Fair (VSSEF), 2021
Referee, Auburn University Regional Science Olympiad, 2006, 2007, 2011

Computer Experience

Operating systems: UNIX, Linux, MS-DOS/Windows, Solaris
Operating system tools: UNIX shell scripting, awk
Programming languages: C, C++, Fortran, Python, IDL
Parallel programming: MPI, openMP
Symbolic languages: Mathematica