

CONTACT AND
PERSONAL
INFORMATION

Department of Physics, University of Maryland
3162 Physical Sciences Complex
4296 Stadium Dr, College Park, MD 20742, USA.
E-mail: davoudi@umd.edu

EDUCATION

Ph.D., Theoretical Physics, University of Washington, Seattle, 2010-2014
Thesis title: *Formal Developments for Lattice QCD with Applications to Hadronic Sys-*
tems. Thesis advisor: Prof. Martin J. Savage.

M.Sc., Theoretical Physics, Sharif University of Technology, Tehran, Iran, 2007-2009.

B.Sc., Physics, Sharif University of Technology, Tehran, Iran, 2003-2007.

ACADEMIC
APPOINTMENTS
AND
PROFESSIONAL
VISITS

Assistant professor, University of Maryland, College Park, 2017-.

Fellow of RIKEN-Brookhaven Research Center, University of Maryland, College Park,
2017-.

Post-doctorate research associate, Center for Theoretical Physics, Massachusetts Insti-
tute of Technology, 2014-2017.

Visiting researcher, Kavli Institute for Theoretical Physics, Santa Barbara, CA, August
2015.

Visiting researcher and program organizer, Institute for Nuclear Theory, Seattle, WA,
March-May 2016.

Visiting researcher, Kavli Institute for Theoretical Physics, Santa Barbara, CA, September-
November 2016.

RESEARCH
INTERESTS

1) Developing and applying effective field theories and lattice quantum chromodynamics (LQCD) technique aiming at: i) A reliable determination of nuclear and hypernuclear few-body interactions to supplement experimental nuclear-physics programs worldwide, such as the facility for rare isotope beams (FRIB), and to refine studies of extreme astrophysical environment, such as the interior of neutron stars. ii) Constraining hadronic contributions to Standard Model and beyond-the-Standard Model processes, with an impact on both low-energy nuclear physics and high-energy particle physics research, removing some of the long-standing uncertainties in reactions such as those occurring in sun or in fusion research facilities, the cross section of various dark-matter candidates scattering off heavy nuclei in experiments, and the rate of exotic processes such as the neutrinoless double-beta decay.

2) Developing and benchmarking frameworks for quantum simulation of lattice gauge theories and nuclear effective field theories, in light of rapid progress in quantum-computing technologies worldwide. A long-term goal of this research is to combat the long-standing sign problem inherent in traditional Monte Carlo computations of fermionic systems (relevant for studies of dense matter in nature) and real-time dynamics of strongly-interacting matter (relevant for studies of the evolution of matter

after Big Bang or after the collision of heavy nuclei in experiments). This problem can potentially be eliminated through mapping and tracking the dynamics of the systems on a quantum simulator. Both the algorithmic developments for efficient implementations of the problems on near-term and future digital quantum-computing platforms, as well as accurate engineering of Hamiltonians of controlled quantum systems for implementations on analog quantum simulators (e.g., ion-trap platforms) are pursued for benchmark problems.

PUBLICATIONS AND
ARXIV PREPRINTS

- [1] Z. Davoudi, M. Hafezi, C. Monroe, G. Pagano, A. Seif, A. Shaw, *Towards analog quantum simulations of lattice gauge theories with trapped ions* (2019), arXiv:1908.03210 [quant-ph].
- [2] V. Cirigliano, Z. Davoudi, T. Bhattacharya, T. Izubuchi, P. Shanahan, S. Syritsyn, M. Wagman, *The Role of Lattice QCD in Searches for Violations of Fundamental Symmetries and Signals for New Physics* (2019), arXiv:1904.09704 [hep-lat].
- [3] Z. Davoudi, J. Harrison, A. Jüttner, A. Portelli and M. J. Savage, *Theoretical aspects of quantum electrodynamics in a finite volume with periodic boundary conditions*, Phys. Rev. D **99**, 034510 (2019), arXiv:1810.05923 [hep-lat].
- [4] E. Chang, Z. Davoudi, W. Detmold, A. S. Gambhir, K. Orginos, A. Parreno, M. J. Savage and P. E. Shanahan, M. L. Wagman, F. Winter, *Scalar, axial and tensor interactions of light nuclei from lattice QCD*, Phys. Rev. Lett. **120**, 152002 (2018), arXiv:1712.03221 [hep-lat].
- [5] M. L. Wagman, F. Winter, S. R. Beane, E. Chang, Z. Davoudi, W. Detmold, K. Orginos, A. Parreno, M. J. Savage and P. E. Shanahan and B. C. Tiburzi, *Baryon-Baryon Interactions and Spin-Flavor Symmetry from Lattice Quantum Chromodynamics*, Phys. Rev. D **96**, no. 11, 114510 (2017), arXiv:1706.06550 [hep-lat].
- [6] S. R. Beane, E. Chang, Z. Davoudi, W. Detmold, K. Orginos, A. Parreno, M. J. Savage and P. E. Shanahan, B. C. Tiburzi, M. L. Wagman and F. Winter, *Comment on "Are two nucleons bound in lattice QCD for heavy quark masses? - Sanity check with Lüscher's finite volume formula -"*, arXiv:1705.09239 [hep-lat] (2017).
- [7] B. C. Tiburzi, M. L. Wagman, F. Winter, E. Chang, Z. Davoudi, W. Detmold, K. Orginos, M. J. Savage and P. E. Shanahan, *Double- β Decay Matrix Elements from Lattice Quantum Chromodynamics*, Phys. Rev. D **96**, no. 5, 054505 (2017), arXiv:1702.02929 [hep-lat].
- [8] P. E. Shanahan, B. C. Tiburzi, M. L. Wagman, F. Winter, E. Chang, Z. Davoudi, W. Detmold, K. Orginos and M. J. Savage, *The isotensor axial polarisability and lattice QCD input for nuclear double- β decay phenomenology*, Phys. Rev. Lett. **119**, no. 6, 062003 (2017), arXiv:1701.03456 [hep-lat].
- [9] M. J. Savage, P. E. Shanahan, B. C. Tiburzi, M. L. Wagman, F. Winter, S. R. Beane, E. Chang, Z. Davoudi, W. Detmold and K. Orginos, *Proton-proton fusion and tritium β -decay from lattice quantum chromodynamics*, Phys. Rev. Lett. **119**, no. 6, 062002 (2017), arXiv:1610.04545 [hep-lat].
- [10] Z. Davoudi and W. Detmold, *Composite Vector Particles in External Electromagnetic Fields*, Phys. Rev. D **93**, 014509 (2016), arXiv:1510.02444 [hep-lat].

- [11] Z. Davoudi and W. Detmold, *On the Implementation of General Background Electromagnetic Fields on a Periodic Hypercubic Lattice*, Phys. Rev. D **92**, 074506 (2015), arXiv:1507.01908 [hep-lat].
- [12] R. A. Briceno, Z. Davoudi and T. C. Luu, *Nuclear Reactions from Lattice QCD*, review article on the workshop hosted by the Institute for Nuclear Theory on March 2013, Journal of Physics G: Nuclear and Particle Physics **42**, 023101, arXiv:1406.5673 [hep-lat] (2015).
- [13] Z. Davoudi and M. J. Savage, *Finite-volume Electromagnetic Corrections to the Masses of Mesons, Baryons, and Nuclei*, Phys. Rev. D **90**, 054503 (2014), arXiv:1402.6741 [hep-lat].
- [14] R. A. Briceno, Z. Davoudi, T. Luu and M. J. Savage, *Two-Baryons Systems with Twisted Boundary Conditions*, Phys. Rev. D **89**, 074509 (2013), arXiv:1311.7686 [hep-lat].
- [15] R. A. Briceno, Z. Davoudi, T. Luu and M. J. Savage, *Two-nucleon systems in a finite volume: (II) $3S1$ - $3D1$ coupled channels and the deuteron*, Phys. Rev. D **88**, 114507 (2013), arXiv:1309.3556 [hep-lat].
- [16] R. A. Briceno, Z. Davoudi and T. C. Luu, *Two-nucleon systems in a finite volume: (I) Quantization conditions*, Phys. Rev. D **88**, 034502 (2013), arXiv:1305.4903 [hep-lat].
- [17] R. A. Briceno and Z. Davoudi, *Three-particle scattering amplitudes from a finite volume formalism*, Phys. Rev. D **87**, 094507 (2013), arXiv:1212.3398 [hep-lat].
- [18] S. R. Beane, Z. Davoudi and M. J. Savage, *Constraints on the Universe as a Numerical Simulation*, Eur. Phys. J. A **50** 148 (2014), arXiv:1210.1847 [hep-ph].
- [19] Z. Davoudi and M. J. Savage, *Restoration of Rotational Symmetry in the Continuum Limit of Lattice Field Theories*, Phys. Rev. D **86**, 054505 (2012), arXiv:1204.4146 [hep-lat].
- [20] R. A. Briceno and Z. Davoudi, *Moving multi-channel systems in a finite volume*, Phys. Rev. D **86**, 094507 (2012), arXiv:1204.1110 [hep-lat].
- [21] Z. Davoudi and A. Karch, *Surface plasmons on a thin film topological insulator*, arXiv:1109.5723 [cond-mat.mes-hall] (2011).
- [22] Z. Davoudi and M. J. Savage, *Improving the volume dependence of two-body binding energies calculated with lattice QCD*, Phys. Rev. D **84**, 114502 (2011), arXiv:1108.5371 [hep-lat].

PHD THESIS

- [23] Z. Davoudi, *Formal Developments for Lattice QCD with Applications to Hadronic Systems*, Ph.D. thesis, University of Washington, arXiv:1409.1966 [hep-lat] (2014).

PROCEEDINGS AND
NEWS ARTICLES

- [24] Z. Davoudi, *Light Nuclei from Lattice QCD: Spectrum, Structure and Reactions*, invited contribution to the proceedings of the “XXII International Conference on Few-Body Problems in Physics”, July 9-13, 2018, Caen, France, arXiv:1902.0495 [hep-lat].

- [25] Z. Davoudi, *The path from finite to infinite volume: Hadronic observables from lattice QCD*, invited contribution to the proceedings of the “36th International Symposium on Lattice Field Theory” (LATTICE2018), 22-28 July, 2018, Michigan State University, East Lansing, MI, USA. arXiv:1812.11899 [hep-lat].
- [26] Y. Cai and Z. Davoudi, *QED-corrected Lellouch-Lüscher formula for $K \rightarrow \pi\pi$ decay*, contribution to the proceedings of the “36th International Symposium on Lattice Field Theory” (LATTICE2018), 22-28 July, 2018, Michigan State University, East Lansing, MI, USA. arXiv:1812.11015 [hep-lat].
- [27] Z. Davoudi, *Lattice QCD input for nuclear structure and reactions*, invited contribution to the proceedings of the “35th International Symposium on Lattice Field Theory”, Granada, Spain, June 2017, arXiv:1711.02020 [hep-lat].
- [28] Z. Davoudi, *Nuclear Physics in the Spotlight: From exploring nature’s most extreme environments to testing its most fundamental symmetries*, invited contribution to the Kavli Institute for Theoretical Physics Newsletter, Spring 2017.
- [29] Z. Davoudi, *Two-Baryon Systems with Twisted Boundary Conditions*, PoS LATTICE **2014**, 108 (2014), arXiv: 1411.2010 [hep-lat].

SEMINARS, TALKS
AND LECTURES

- [1] *Lattice QCD and nucleon(us) structure*, three invited lectures presented at the first CFNS summer school on the “Physics of the electron-ion collider”, Stony Brook University, Long Island, NY, August 2019.
- [2] *Multi-hadron physics and lattice QCD*, six invited lectures presented at the TALENT course on “From Quarks and Gluons to Nuclear Forces and Structure”, ECT*, Trento, Italy, July-August 2019.
- [3] *Towards neutrinoless double-beta decay from lattice QCD*, invited talk presented at the program on “Advances in lattice gauge theories”, CERN, Switzerland, July 2019.
- [4] *Lattice QCD for neutrinoless double-beta decay*, invited talk presented at the workshop on “Progress and challenges in neutrinoless double beta decay”, ECT*, Trento, Italy, July 2019.
- [5] *Fundamental symmetries*, invited talk presented at the “Department of Energy’s review of the USQCD project”, Rockville, MD, July 2019.
- [6] *Bound nuclear and hypernuclear systems from lattice QCD*, invited talk presented at the “Bound states in QCD and beyond III” workshop, St. Goar, Germany, April 2019.
- [7] *Towards analog and digital quantum simulations of strongly-interacting dynamics*, invited talk presented at the “Nuclear and Particle Seminars”, University of Connecticut, March 2019.
- [8] *The road to nuclear physics from the Standard Model*, invited colloquium presented at the Physics department, Duke University, February 2019.
- [9] *Towards analog and digital simulations of interactions relevant to nuclear and particle physics*, invited talk presented at the kick-off meeting on pre-pilot program in QC and QIS for nuclear theory, January 2019.

- [10] *Nuclear physics from underlying interactions of nature using lattice QCD*, talk presented at the University of Tsukuba, department of Physics, January 2019.
- [11] *Nuclear physics from underlying interactions of nature using advanced computing*, invited talk presented at the “International workshop on massively parallel programming for quantum chemistry and physics”, January 2019.
- [12] *Nuclear physics and lattice QCD*, invited talk presented at the program on “Interface of effective field theories and lattice gauge theory”, Munich Institute for Astro- and Particle Physics (MIAPP), November 2018.
- [13] *The road to nuclear physics from the Standard Model*, invited colloquium presented at the Physics department, University of Iowa, October 2018.
- [14] *Spectrum, reaction and structure of light nuclei from lattice QCD*, invited plenary talk presented at the “9th international workshop on chiral dynamics”, Durham, NC, September 2018.
- [15] *Prospect of analog simulations of interactions relevant to nuclear and particle physics with trapped ions*, invited talk presented at the INT workshop on “Advances in Monte Carlo techniques for many-body quantum systems”, Institute for Nuclear Theory, Seattle, WA, August 2018.
- [16] *The path from finite to infinite volume: Hadronic observables from lattice QCD*, award presentation at “The 36th international symposium on lattice field theory”, Michigan State University, July 2018.
- [17] *Higher moments of parton distribution functions from lattice QCD*, talk presented at “The 36th international symposium on lattice field theory”, Michigan State University, July 2018.
- [18] *Light nuclei from lattice QCD: spectrum, structure and reactions*, invited plenary talk presented at “The 22nd international conference in few-body physics”, Caen, France, July 2018.
- [19] *From quantum chromodynamics to hypernuclear interactions*, invited plenary talk presented at “The 13th International Conference on Hypernuclear and Strange Particle Physics”, Portsmouth, VA, June 2018.
- [20] *Axial properties of nuclei from lattice QCD and EFT*, invited talk presented at the INT workshop on “Fundamental physics with electroweak probes of light nuclei”, Institute for Nuclear Theory, Seattle, WA, June 2018.
- [21] *Nuclear and hypernuclear forces from lattice QCD*, invited talk presented at the ECT* workshop on “New ideas in constraining nuclear forces”, European Center for Theoretical Studies in Nuclear Physics and Related Areas, Trento, Italy, June 2018.
- [22] *Standard Model input for nuclear physics*, invited talk presented at “The Joint Science Meeting”, Institute for Advanced Computational Sciences, Stony Brook University, Stony Brook, NY, May 2018.
- [23] *Topics in lattice QCD for nuclear physics*, three invited talks presented at the workshop on “Scattering from the Lattice, Applications and Phenomenology”, Hamilton Mathematics Institute, Trinity College, Dublin, Ireland, May 2018.
- [24] *Fundamental symmetries and signals for new physics*, invited talk presenting progress report on a planned whitepaper at the “USQCD collaboration’s all-hands meeting”, Fer-

milab, Batavia, IL, April 2018.

[25] *The road to nuclear physics from Standard Model*, invited colloquium at the Department of Physics, University of Maryland, College Park, April 2018.

[26] *The road from QCD to nuclear double- β decays*, invited talk presented at the Theory Seminar Series, Fermilab, Batavia, IL, April 2018.

[27] *Higher moments of parton distribution functions from lattice QCD*, invited talk at the “Lattice PDF” workshop, University of Maryland, College Park, April 2018.

[28] *Baryon-baryon scattering and nuclear forces from lattice QCD*, invited talk at the workshop on “Multi-hadron physics from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, February 2018.

[29] *Towards unraveling nuclear and hypernuclear forces from QCD*, invited seminar at the FRIB/NSCL seminar series, Michigan State University, East Lansing, January 2018.

[30] *From QCD to nuclear physics*, two invited lectures delivered at the 10th Odense Winter School on Theoretical Physics, CP3-Origins Institute, Odense, Denmark, December 2017.

[31] *Double-beta decay processes from lattice quantum chromodynamics*, invited presentation at the mini-Symposium on Nuclear Matrix Element Calculations for Neutrinoless Double-Beta, Fall Meeting of the APS Division of Nuclear Physics, Pittsburgh, Pennsylvania, October 2017.

[32] *Beyond nucleon properties from lattice QCD*, invited presentation at the 11th International Workshop on the Physics of Excited Nucleons, University of South Carolina, Columbia, SC, August 2017.

[33] *Status of LQCD calculations for nuclear and multi-nucleon systems*, invited talk delivered at the “Lattice QCD input for neutrinoless double-beta decay” workshop, Institute for Nuclear Theory, Seattle, WA, July 2017.

[34] *The road to nuclear physics from standard model*, invited seminar delivered at Universitat de Barcelona, Spain, June 2017.

[35] *Lattice QCD input for nuclear structure and reactions*, invited plenary talk at the International Symposium for Lattice Gauge Theory, Granada, Spain, June 24, 2017.

[36] *Nuclear and hypernuclear interactions from QCD*, seminar delivered at MIT’s lattice club, Center for Theoretical Physics, MIT, Cambridge, MA, April 2017.

[37] *The road to nuclear physics from Standard Model*, invited seminar delivered at the Brookhaven National Laboratory, Department of Physics, Long Island, NY, April 2017.

[38] *The road to nuclear physics from Standard Model*, invited colloquium delivered at the Old Dominion University, Department of Physics, Norfolk, VA, March 2017.

[39] *Lattice QCD and few-body observables*, invited talk presented at the Jefferson Laboratory, Theory Group, Newport News, VA, March 2017.

[40] *The road to nuclear physics from Standard Model*, invited talk presented at the University of Connecticut, Department of Physics, Mansfield, CT, March 2017.

- [41] *QCD input for nuclear double-beta decays*, invited talk presented at the University of Massachusetts, Department of Physics, Amherst, MA, February 2017.
- [42] *The road to nuclear physics from Standard Model*, invited talk presented at the University of Maryland, Department of Physics, College Park, MD, February 2017.
- [43] *Can we reliably predict nuclear forces and/or nuclei from QCD?*, invited talk presented at the workshop on “The tower of the effective field theories and the emergence of the nuclear phenomena”, the Commissariat à l’énergie atomique (CEA), Saclay, France, January 2017.
- [44] *Neutrinoless double-beta decay: The role of effective field theory and lattice QCD*, invited talk presented at the symposium on “Advances in Effective Field Theories”, Forschungszentrum, Jülich, Germany, November 2016.
- [45] *Bottom-Up approach to nuclear physics*, invited talk presented at the “Rising Stars in Physics” workshop, MIT, Cambridge, MA, October 2016.
- [46] *Effective field theory and lattice QCD input for neutrinoless double-beta decay*, invited talk presented at the MIT’s Center for Theoretical Physics, “Nuclear and Particle Theory Seminar”, Cambridge, MA, October 2016
- [47] *Neutrinoless double-beta decay: The role of effective field theory and lattice QCD*, invited talk presented at the University of Maryland, Department of Physics, “Nuclear Theory group Seminar”, College Park, MD, September 2016.
- [48] *Towards lattice QCD studies of high moments of parton distribution functions*, invited talk presented at the “Spin Conference”, University of Illinois, Urbana Champaign, IL, September 2016.
- [49] *LQCD for few-body observables*, invited talk presented at “Frontiers in Nuclear Physics” program, Kavli Institute for Theoretical Physics, Santa Barbara, CA, August 2016.
- [50] *Charge radii and higher electromagnetic moments with lattice QCD in nonuniform background fields*, talk presented at the “34nd International Symposium on Lattice Field Theory”, University of Southampton, Southampton, UK, July 2016.
- [51] *Hadronic observables with QED interactions in a finite volume: classical and quantum views*, invited talk presented at Columbia University, department of Physics, “Theory Group Seminar”, NYC, NY, November 2015.
- [52] *Lattice QCD with Background Electromagnetic Fields: Implementation and Applications*, invited talk presented at the “Brookhaven Forum 2015: Great Expectations, a New Chapter”, Brookhaven National Laboratory, Upton, NY, October 2015.
- [53] *Hadronic few-body systems in a finite volume*, invited talk presented at the “Lattice gauge theory for the LHC and beyond” program, Kavli Institute for Theoretical Physics, Santa Barbara, CA, August 2015.
- [54] *Single-hadron states in a finite volume in the presence of QED interactions*, invited talk presented at the “Multi-hadron and nonlocal matrix elements in lattice QCD”, a RIKEN-BNL research-center workshop, Brookhaven National Laboratory, Upton, NY, February 2015.
- [55] *Two-baryons systems with twisted boundary conditions*, talk presented at the “32nd International Symposium on Lattice Field Theory”, Columbia University, New York,

NY, June 2014.

[56] *Three-body finite-volume formalism for lattice QCD*, invited talk presented at the Institute for Nuclear Theory's (INT) program "Universality in few-body systems: Theoretical challenges and new directions", Institute for Nuclear Theory, Seattle, WA, May 2014.

[57] *Finite-volume formalism for lattice QCD: Two-nucleon systems and the deuteron*, invited talk presented at the College of William and Mary, "Nuclear Physics Group Seminar", Williamsburg, VA, October 2013.

[58] *On the extraction of tensor force from lattice QCD*, the fall meeting of the APS division of nuclear physics, Newport News, VA, October 2013.

[59] *Three-particle scattering amplitudes from a finite volume formalism*, INT workshop on "Nuclear reactions from lattice QCD", Institute for Nuclear Theory, Seattle, WA, March 2013.

[60] *Restoration of rotational symmetry from the continuum limit of lattice field theories*, invited talk presented at the INT program on "Lattice QCD studies of excited resonances and multi-hadron systems", Institute for Nuclear Theory, Seattle, WA, July 2012.

[61] *Coupled-channel systems in a finite volume*, the fall meeting of the APS division of nuclear physics, Newport Beach, CA, October 2012.

[62] *Nuclear forces from lattice QCD*, invited lecture delivered at the TALENT/INT course on nuclear forces, Institute for Nuclear Theory, Seattle, WA, July 2013.

PUBLIC TALKS,
INTERVIEWS AND
OUTREACH

[1] Invited speaker at the summer camp for (female) high-school students presenting a talk entitled "*Simulating fundamental particles and forces of nature*", University of Maryland, College Park, July 2019.

[2] Invited speaker of TEDxUMD presenting a talk entitled "*Towards simulating nature From fundamental particles and interactions*", University of Maryland, College Park, April 2019.

[3] Scientist collaborator on the TED-ED project featuring the topic of simulating laws of nature, to be released in 2019.

[4] Faculty panelist at the graduate students advising session at the "36th International Symposium on Lattice Field Theory" (LATTICE2018), 22-28 July, 2018, Michigan State University, East Lansing, MI, USA.

[5] *From QCD to nuclear physics*, invited seminar at the "Foundations and Frontiers of Physics Seminar for Physics Graduate Students" at the University of Maryland, College Park, February 2018.

[6] *Simulating fundamental particles and forces of nature...and why I like it!*, invited seminar at the Professional Physics Seminar for Undergraduate Students at the University of Maryland, College Park, October 2017.

[7] *Is universe a simulation?*, invited panelist of the "2016 Isaac Asimov Memorial Debate", hosted by Neil deGrasse Tyson at the American Museum of Natural History, NYC, NY, April 2016. This debate was broadcasted live and has been viewed by almost 2 million viewers on the Museum's youtube channel so far.

[8] *Universe as a numerical simulation?*, invited public talk presented at the Art Institute of Seattle, Seattle, WA, January 2013.

AWARDS AND
RESEARCH
GRANTS

The 2019 *Sloan Research Fellowship* for a project titled: “Computing Complex Hadronic Processes for Tests of the Standard Model and Searches for New Physics”, award amount: **\$70,000**, award period: 2019-2021.

Department of Energy, Office of Science Early Career Award for a project titled: “Analog and Digital Quantum Simulations of Strongly Interacting Theories for Applications in Nuclear Physics”, grant amount: **\$750,000**, grant period: 2019-2024.

Department of Energy’s ASCR Quantum Applications Teams for a project titled: “Software Stack and Algorithms for Automating Quantum-Classical Computing”, managed by the Oak Ridge National Laboratory, gPI’s share of grant: **\$500,000**: 2018-2022.

Department of Energy’s ASCR program in Accelerated Research in Quantum Computing for a project titled: “Fundamental Algorithmic Research for Quantum Computing”, managed by Sandia National Laboratory and Oak Ridge National Laboratory, PI’s share of grant: **\$310,000**, grant period: 2019-2024.

OTHER AWARDS
AND
RECOGNITIONS

The 2018 *Kenneth Wilson Award* for Excellence in Lattice Field Theory. Award citation: “For fundamental contributions to lattice field theory in a finite volume that are essential for performing lattice simulations of complex systems”, Summer 2018.

Sebastian Karrer prize in physics for excellence of scholastic record and professional promise, University of Washington, Spring 2010.

Graduate Research Fellowship, University of Minnesota, Summer 2010.

Sharif University of Technology’s Organization for Exceptional Talents Fellowship to pursue a Ph.D. program in Physics, Tehran, Iran, Summer 2009.

COMPUTING
AWARDS

Awarded **39M** Jpsi core hours on the KNL cluster and **1.2M** GPU hours on the GPU cluster (**76.2M** Jpsi core hours in total) at Jefferson National Accelerator Facility by the Department of Energy’s USQCD organization to perform calculations of “Nuclear Physics from Standard Model” (project co-PI), 2018-2019.

Awarded **65M** NERSC-hours through an Energy Research Computing Allocations Process (ERCAP) proposal on “The Spin-Flavor Structure of Light Nuclei” (project co-PI), 2017-2018.

Awarded **37.5M** KNL core hours at MARCONI-KNL machine at Cineca, Italy, through the 15th PRACE (Partnership for Advanced Computing in Europe) allocation with a proposal on “A Unified Computational Protocol for QCD Nuclei” (project co-PI), 2017-2018.

Awarded **6M** Jpsi cluster core hours, **180K** GPU hours and **73M** KNL core hours at Jefferson National Accelerator Facility by the Department of Energy’s USQCD organization to perform calculations of “The Quark and Gluon Structure of Light Nuclei and the EMC Effect” (project co-PI), 2017-2018.

Awarded **6M** Jpsi cluster hours at Jefferson National Accelerator Facility by the Department of Energy’s USQCD organization to continue performing calculations of “High

Moments of Parton Distribution Functions” (project PI), 2017-2018.

Awarded **9M** Jpsi cluster hours at the Fermi National Accelerator Laboratory by the Department of Energy’s USQCD organization to perform calculations of “High Moments of Parton Distribution Functions” (project PI), 2016-2017.

Received an ASCR Leadership Computing Challenge (ALCC) award for **40M** processor hours at Oak Ridge Leadership Computing Facility to perform calculations of “The Weak Structure of Light Nuclei” (project co-PI), 2016.

Awarded **1M** GPU hours and **30M** Jpsi cluster hours at Jefferson National Accelerator Facility by the Department of Energy’s USQCD organization to perform calculations of “The Weak Structure of Light Nuclei” (project co-PI), 2016-2017.

PROFESSIONAL
SERVICE

Co-chair of the USQCD collaboration’s working group to recognize future opportunities and formulate possible goals for lattice field theory calculations related to the topic of Fundamental Symmetries and Signals for New Physics (2018).

Referee of the American Physical Society journals, *Physical Review D*, *Physical Review Letters* and Journal of High energy Physics since 2014.

Invited reviewer of the U.S. Department of Energy’s Office of Science Graduate Student Research Program, 2018.

Reviewer of the National Science Foundation in Nuclear Theory (2018-).

Program organizer of the INT workshop on “Lattice QCD input for neutrinoless double-beta decay”, Institute for Nuclear Theory, Seattle, WA, July 2017, total budget granted: \$8,400.

Lead organizer of the INT program on “Nuclear physics from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, March-May 2016, total budget granted: \$156,800.

Program organizer of the INT workshop on “Nuclear reactions from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, March, 2013, total budget granted: \$6,750.

Invited reviewer of the Biruni Award, aimed to recognize the most promising Iranian graduate students in Physics in the U.S., 2016 and 2018.

LANGUAGES

Persian (Native)
English (Fluent)