

Curriculum Vitae - Taha Koohrokhi

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Profile Summary

I am a theoretical physicist and Associated Professor of Physics at Golestan University (Iran), holding a Ph.D. in plasma physics (Mazandaran University, 2012). My research expertise spans advanced quantum systems (including supersymmetric and PT-symmetric models) and theoretical nuclear fusion. I have led projects on shape-invariant superpotentials and non-Hermitian quantum models, contributing to our understanding of fusion reaction dynamics. These efforts have resulted in numerous peer-reviewed publications and presentations at international conferences.

- **Research & Projects:** Conduct theoretical research in advanced quantum systems and nuclear models. This includes exploring supersymmetric (shape-invariant) and PT-symmetric quantum potentials (complex isospectral deformations, anti-PT transformations) and developing novel nuclear interaction models (effective deuteron potentials, tritium/helium-3 breeding in ICF fuel).

- **Publications & Authorship:** Authored numerous peer-reviewed articles (e.g., in *Annals of Physics*, *Journal of Fusion Energy*) and advanced physics textbooks. Translated key texts into Persian (*Supersymmetric Quantum Mechanics*, 2022; *Quantum Field Theory*, 2021); an in-press book on experimental measurement and data analysis underscores a commitment to science education.

- **Teaching & Curriculum Development:** Designed and taught a broad range of physics courses at undergraduate and graduate levels (Physics Laboratories, Electromagnetism, Nuclear & Particle Physics, Analytical Mechanics, Mathematical Methods in Physics). Developed specialized Quantum Mechanics courses covering supersymmetric and PT-symmetric topics, using multimedia tools to enhance student engagement and understanding.

- **Academic & International Experience:** Holds an Assistant Professorship at Golestan University (2012–present) and has held visiting researcher appointments at Istanbul University (2017, 2023). Presented research at international workshops on pseudo-Hermitian Hamiltonians and plasma physics (e.g., in Turkey and China), fostering global collaborations.

My career blends rigorous research with innovative teaching, contributing to the advancement of theoretical physics and mentoring the next generation of scientists.

Research Interests

1. Ultra-sensitive EP-based sensors (strain, refractive index, rotation, chemical) with prototype demonstrations and noise-robust response analysis.
2. PT/anti-PT topological circuits (SSH-like) for nonreciprocal routing and amplification; PCB demonstrators with measured admittance bands.
3. Charged-particle stopping and alpha heating in warm dense matter; validated Fokker–Planck module integrated into ICF workflows with UQ.
4. Ion/neutral energy distributions and wall interactions in low-temperature plasmas for EUV lithography; predictive models for uniformity and damage.
5. Range/RBE uncertainty reduction using FP-based energy loss and angular spread models; Monte Carlo plug-ins with phantom validation.
6. Inferring FP drift/diffusion from single-cell trajectories (RNA velocity) to predict therapy resistance; open-source inference tools.
7. Mapping non-Hermitian Hamiltonians to simulable biorthogonal/metric forms; algorithms and prototype demonstrations on photonic/phononic platforms.

Professional Experience

1. Assistant Professor at Golestan University, Gorgan, Iran (since 2012).
2. Visiting Researcher at Istanbul University, Istanbul, Turkey (2023).
3. Visiting Researcher at Istanbul University, Istanbul, Turkey (2017).
4. Founder a private school named "University Teachers", Gorgan, Iran (2014).
5. Founder of Incubator of Golestan Science and Technology Park, Gorgan, Iran (2013).

Characteristics and Skills

Research and Projects

Awards and Honors

Main

- Multidimensional
- Always learning to grow and stay current
- Critical Thinking
- Problem-Solving
- Attention to Detail
- Innovative
- Technical Proficiency
- Collaboration
- **Adaptability**
- Ethical Awareness

Education

- Professor
- Instructional Designer

Programming

- Simulation
- Modelling
- Python
- Fortran
- OriginPro
- Maple

Computer

- Articulate Storyline
- Adobe Premiere Pro
- Adobe Photoshop
- Microsoft Office
- LaTeX

Health (Certified by NSCA)

- Personal Trainer (Level 3 and 4)
- Nutrition Specialist
- Corrective Exercise Specialist

Language

- Persian (Farsi)-Native
- English – fluent.

1. Title: "Complex Isospectral Deformations of Conventional Shape-Invariant Superpotentials" Golestan University, Gorgan, Iran (2025).
2. Title: "Anti-PT Transformations and Complex Non-Hermitian PT-Symmetric Superpartners" Istanbul University, Istanbul, Turkey (2023).
3. Title: "A New Effective Potential for Deuteron" Istanbul University, Istanbul, Turkey (2022).
4. Title: "Effect of Internal Breeding of Tritium and Helium-3 on the Ignition of an Inertial Confinement Fusion (ICF) Fuel Pellet" (2016).
5. Title: "Calculation of Light Nuclei Fusion Cross Section Using the Optical Model", Golestan University, Gorgan, Iran (2016).

International Workshops

Oral Presentations

1. Title: "PT-Symmetric Nuclear Optical Model" in the 20th International Workshop on Pseudo-Hermitian Hamiltonians in Quantum Physics, Koç University, Istanbul (2023).
2. Title: "Complex Superpartners with Central Symmetry" in the 19th International Workshop: Pseudo-Hermitian Hamiltonians in Quantum Physics XIX, Tsinghua Sanya International Mathematics Forum (TSIMF), China (2019).
3. Title: "Calculation of Range and Penetration Depth for Proton Fast Ignition" in the 4th International Workshop on Plasma Science and Applications, Amirkabir University of Technology (Tehran Polytechnic), Tehran (2011).

Instructional Design

Using multimedia tools, I have designed and implemented various instructional courses, including: Physics Laboratories, Nuclear and Particle Physics, Quantum Mechanics, Electromagnetism, Mathematical Methods in Physics, Supersymmetric Quantum Mechanics, PT-Symmetric Quantum Mechanics, Analytical Mechanics, Fundamental of Physics.

- 2022

Book of the Year Award
Ministry of Culture and Islamic Guidance
- 2014

Rank First in the Top Ideas Festivals
Semnan Science and Technology Park
- 2013

Top Researcher
Golestan Science and Technology Park
- 2013

Top Teacher
Golestan University
- 2012

Top Young
Ministry of Sport and Youth
- 2008

Rank First in the PhD Entrance Exam
Mazandaran University

Education

- 2008 – 2012

Ph.D. Physics
Mazandaran University

Thesis Title: Study of Charged Particles Transport Theory in Fusion Plasma
- 2006 – 2008

M.Sc. Physics
Mazandaran University

Thesis Title: Study of Helium-3 Effect on Inertial Confinement Fusion Plasma with D-D Fuel.
- 2001 – 2006

B.Sc. Physics
Ferdowsi University of Mashhad

Publications

Books

1. Title: "Measurement and Laboratory Data Analysis" (In Press).
2. Title: "Supersymmetric Quantum Mechanics: An Introduction" (2022) translated into Persian.
3. Title: "Quantum Field Theory" (2021) translated into Persian.

Papers

- [1] T. Koohrokhi, and A. M. Izadpanah, *Complex Isospectral Deformations of Conventional Shape-Invariant Superpotentials*, Iranian Journal of Physics Research **25**(2) (2025) 201. <https://doi.org/10.47176/ijpr.25.2.22029>.
- [2] T. Koohrokhi, A. M. Izadpanah, and M. Gerayloo *A Unified Scheme of Central Symmetric Shape-Invariant Potentials*, Pramana-Journal of Physics, **98** (2024) 140. <https://doi.org/10.1007/s12043-024-02824-0>.
- [3] T. Koohrokhi, A. M. Izadpanah, and A. Shadmehr, *Time Independent of Drift Coefficients for Shape Invariant Potentials*, Journal of Research on Many-body Systems, **14** (2024) 55. <https://doi.org/10.22055/jrmb.2024.18896>.
- [4] T. Koohrokhi, A. M. Izadpanah, and S. J. Hosseinihah, *Investigation of Singularity of Central Shape Invariant Potentials*, Journal of Research on Many-body Systems, **13** (2024) 57. <https://doi.org/10.22055/jrmb.2024.18897>.
- [5] T. Koohrokhi, S. Kartal, and A. Mohammadi, *Anti-PT Transformations and Complex Non-Hermitian PT-Symmetric Superpartners*, Annals of Physics, **459** (2023) 169490, <https://doi.org/10.1016/j.aop.2023.169490>.
- [6] T. Koohrokhi and S. Kartal, *A New Effective Potential for Deuteron*, Communications in Theoretical Physics, **74**, (2022), 075301. <https://doi.org/10.1088/1572-9494/ac6fc3>
- [7] T. Koohrokhi, A. M. Izadpanah and S. K. Hosseini, *Fusion Cross Section of $T(d, n)^4\text{He}$ and $^3\text{He}(d, p)^4\text{He}$ Reactions by Four Parameters Formula*, Journal of Fusion Energy, **35** (6) (2016) 816-822. <https://doi.org/10.1007/s10894-016-0105-y>
- [8] T. Koohrokhi and R. Azadifar, *Effect of Internal Breeding of Tritium and Helium-3 on the Ignition of an ICF Fuel Pellet*, Journal of Fusion Energy, **35** (3) (2016) 493-497. <https://doi.org/10.1007/s10894-016-0077-y>
- [9] M. Mahdavi, R. Azadifar and T. Koohrokhi, *The Effect of Nuclear Elastic Scattering on Temperature Equilibration Rate of Ions in Fusion Plasma*, Advances in High Energy Physics, **2014** (2014)739491. <https://doi.org/10.1155/2014/739491>
- [10] M. Mahdavi, T. Koohrokhi and Z. Barfami, *The Effect of Energy Leakage Probability on Burn Propagation in an Optically Thick Fusion Plasma*, ISRN High Energy Physics, **2012** (2012) 838394. <https://doi.org/10.5402/2012/838394>
- [11] M. Mahdavi, T. Koohrokhi and R. Azadifar, *The interaction of quasi-monoenergetic protons with pre-compressed inertial fusion fuels*, Physics of Plasmas, **19** (2012) 082707. <https://doi.org/10.1063/1.4745862>
- [12] M. Mahdavi and T. Koohrokhi, *"Energy Deposition of Multi-MeV Protons in Compressed Targets of Fast-Ignition Inertial Confinement Fusion"*, Physical Review E, **85** (2012) 016405. <https://doi.org/10.1103/PhysRevE.85.016405>
- [13] M. Mahdavi and T. Koohrokhi, *Nuclear Elastic Scattering Effect on Stopping Power of Charged Particles in High-Temperature Media*, Modern Physics Letters A, **26** (2011) 1561–1570. <https://doi.org/10.1142/S0217732311036176>
- [14] M. Mahdavi, B. Kaleji and T. Koohrokhi, *Fusion Rate in μtt Muonic Molecular Using Linear Combination of Atomic Orbitals Method*, International Journal of Modern Physics E, **20** (2011) 629–636. <https://doi.org/10.1142/S0218301311018113>
- [15] M. Mahdavi and T. Koohrokhi, *Energy Leakage Probability Effect on Ignition Condition in an Inertial Confinement Fusion Plasma*, International Journal of Modern Physics B, **25** (2011) 3611-3622. <https://doi.org/10.1142/S021797921101983>
- [16] M. Mahdavi, B. Kaleji and T. Koohrokhi, *Bremsstrahlung Radiation in D/T Degenerate Plasma*, Modern Physics Letters B, **24** (2010) 2939–2945. <https://doi.org/10.1142/S0217984910025231>
- [17] M. Mahdavi and T. Koohrokhi, *Simultaneous Catalytic Regime of Tritium and Helium-3 in D-D Fusion without External Breeding*, Pramana-Journal of Physics, **74** (2010) 377-390. <https://doi.org/10.1007/s12043-010-0034-7>
- [18] M. Mahdavi, T. Koohrokhi, B. Kaleji and B. Jalalee, *Calculation of fusion cross section for $^3\text{He} + ^6\text{Li}$ system at near barrier energies*, International Journal of Modern Physics E, **19** (2010) 141–145. <https://doi.org/10.1142/S0218301310014686>
- [19] M. Mahdavi, T. Koohrokhi, B. Kaleji and B. Jalalee, *Reaction Rate of $^6\text{Li} + ^{12}\text{C}$ Nuclear Reaction at Sub-Barrier Energies*, Far East Journal of Dynamical Systems, **10** (2008) 317.

Seminars and Conferences

1. A Unified Scheme of Classical Optics and Quantum Mechanics: Optical Waveguides and Nuclear Reactions, Presented at the National Conference on Structure and Nuclear Reactions 2023, Oral
2. Investigation of Pöschl-Teller II Potential Singularity in the Transitional Region, Presented at the Iran Physics Conference - Isfahan University, 2023 Poster
3. A New Theory for Nuclear Reactions, Presented at the National Conference on Structure and Nuclear Reactions 2021, Oral
4. The Potentials of the Unifying Form Created by a Superpotential with Central Symmetry, Presented at the Iran Physics Conference - Razi University of Kermanshah, 2020 Oral
5. Parity-Time Square-Well Supersymmetric Partners, Presented at the National Physics Conference of Iran - Razi University of Kermanshah, 2020 Poster
6. A New Theory for Calculating the Astrophysical S-factor of the $3\text{H}(\text{d},\text{n})4\text{He}$ Reaction, Presented at the National Physics Conference of Iran - Razi University of Kermanshah, 2020 Poster
7. Calculation of Nuclear Energy Spectrum Using Supersymmetric Quantum Mechanics, Presented at the National Nuclear Conference of Iran - Islamic Azad University, Science and Research Unit, 2019 Poster
8. Calculation of Reaction Cross Sections Using Symmetrization of Potential by Supersymmetry Method, Presented at the National Modern Researches in Science and Technology, 2019 Poster
9. Calculation of the Effective Radius as the Radius of the Energy-Dependent Potential in Relation to the Reaction Cross-section of Heavy Nuclei, Presented at the National Physics Conference of Iran - Ferdowsi University of Mashhad, 2018 Poster
10. The Energy Spectrum of Nuclear Bound States Using the Nuclear Superpotential, Presented at the Iran Nuclear Conference - Yazd University, 2018 Poster
11. Calculation of Fusion Cross Section of Deuterium-Tritium and Deuterium-Helium3 Using Complex Potential with Hard Core, Presented at the National Iran Nuclear Conference - Yazd University, 2018 Poster
12. The Effect of Hard Core on the Fusion Cross-section of Light Nuclei Using the National Optical Model, Presented at the Iran Nuclear Conference - Isfahan University, 2017 Poster
13. Calculation of Deuterium-Tritium Fusion Cross-section Using Complex Nuclear Phase Shift, Presented at the National Nuclear Conference of Iran - University of Isfahan, 2017 Poster
14. Investigating the Ignition and Propagation of Burns in a Pre-dense ICF Pellet Containing Deuterium Fuel, Presented at the National Nuclear Conference of Iran - University of Isfahan, 2016 Poster
15. Calculation of Ion Beam Energy Deposition Rate in Fast Ignition Method, Presented at the National Iran Nuclear Conference - Isfahan University, 2016 Poster
16. Calculation of Fusion Cross-section Using the Potential of the Optical Model and the National Hard Core, Presented at the Physics Conference of Iran-Zahedan, 2016 Poster
17. The Effect of the Internal Generation of Tritium and Helium-3 on the Ignition of an ICF Fuel Pellet, Presented at the National Iran Physics Conference - Birjand University, 2016 Poster
18. The Effect of Nuclear Elastic Scattering on the Equilibrium Rate of Ions in Fusion Plasma, Presented at the National Nuclear Conference of Iran - Gilan University, 2015 Poster
19. Proton Beam Transport Study in the Target of Rapid Ignition Fusion by Using of 3D Monte Carlo Simulation, Presented at the National Nuclear Conference of Iran - Yazd University, 2015 Oral
20. Calculating the Effect of Nuclear Elastic Scattering on the Stopping Power of Charged Particles in Fusion Plasma, Presented at the National Nuclear Conference of Iran - Iran Uranium Processing and Nuclear Fuel Production Company (FATSA), 2014 Oral
21. Calculation of Fusion Cross Section Using Effective Radius, Presented at the National Physics Conference of Iran - Hamadan University, 2014 Poster
22. Calculation of Bremsstrahlung Radiation Power in Degenerate Plasma in ICF Fusion, Presented at the Iran Nuclear Conference - Persian Gulf Biotechnology Park and Center - Qeshm, 2013 Oral
23. Calculation of the Fusion Rate in the μtt Molecule Using the Method of Linear Combination of Atomic Orbitals, Presented at the National Iran Nuclear Conference - Persian Gulf Biotechnology Park and Center - Qeshm, 2013 Oral
24. Correcting the Relation of the Effective Radius in the Expression of the Fusion Cross Section, Presented at the Iran National Nuclear Conference - Persian Gulf Biotechnology Park and Center - Qeshm, 2013 Oral
25. Simulation of Energy Loss Process in ICF Inertial Confinement Fusion Plasma, Presented at the Iran National Nuclear Conference - Persian Gulf Biotechnology Park and Center - Qeshm, 2013 Poster
26. The Effect of Stopping Charged Particles on the Ignition Condition of ICF Fusion Fuel Pellets, Presented at the National Physics Conference of Iran - University of Isfahan, 2012 Poster
27. The Effect of Helium-3 in Deuterium Plasma in a Fuel Pellet for Inertial Confinement Fusion (ICF), Presented at the National Iran Nuclear Conference - Golestan University, 2012 Poster
28. Calculating the Fusion Parameter of Nuclear Reactions $6\text{Li} + 12\text{C}$ at Energies Below the Coulomb Barrier, Presented at the National Physics Conference of Iran - Kashan University, 2011 Poster
29. Calculating the Fusion Parameter of the Reaction of Light Nuclei at Energies Below the Coulomb Barrier with a One-dimensional Model, Presented at the National Nuclear Conference of Iran - Yazd University, 2010 Poster