

Curriculum Vitae

ELNAZ IRANI

Personal Information:

Full Name: **ELNAZ IRANI**

Email address: e.irani@modares.ac.ir ; irani.elnaz@yahoo.com,

Date of Birth: 19 Sep. 1984

Sex: Female

Nationality: Iranian

Phone number: 82884436

Room No. 5410

Lab No. 4206

Current Position:

Associate Professor

Address: Department of Physics, Tarbiat Modares University, Tehran, Iran;

Research area: Theoretical and experimental atomic and molecular physics; Laser technology and quantum-based description of laser-matter interaction; Ultrafast spectroscopy and ultrafast molecular dynamics by time dependent density functional theory (TDDFT); Disorder Media and applications,

Education:

***Ph.D.** in Atomic-Molecular Physics; Sharif University of technology, Tehran-Iran, **2010-2014**.

Total GPA without final thesis: **19.48/20**, (First in class).

Final thesis grade: **Excellent degree**

PHD thesis title: Molecular Dynamics study in the interaction of intense femtosecond laser pulse with methane molecule;

Supervisors: Dr. R. Sadighi-Bonabi(SUT), Dr. A. Anvari (SUT), Advisor: Dr. R. Asgari (IPM)

***M.Sc** in Atomic-Molecular Physics, Sharif University of technology, Tehran, Iran, **2007- 2009**.

Total GPA: **18.34/20**

Final thesis: **20/20**

M.Sc thesis title: Surveying the process of photo-dissociation of methane using the femtosecond lasers.

Supervisor: Dr. R. Sadighi-Bonabi (SUT)

***B.S. in Atomic-Molecular Physics , Iran, 2004- 2007;**

Total GPA: **16.39/20**

***High school diploma-** Hajar school, Iran, **2003**. Total GPA: **19/20**.

Work Experiences:

Visiting Researcher (Industry and society Study Opportunity), Ara Kavosh Pajouh Knowledge-Based Company, Tehran, Iran (Mar 2025-Sep 2025)

Associate Professor, Department of Physics, Tarbiat Modares University, Tehran, Iran (June 2023-present)

Assistant Professor, Department of Physics, Tarbiat Modares University, Tehran, Iran (Jan.2017-June 2023)

Postdoc Researcher, Sharif University of Technology (SUT), Tehran Iran, (Sep.2014-Jan2017)

Awards and Honors:

1st place, among Ph.D. candidates in Physics department, Sharif University of Technology (SUT). (2014)

Received the best Paper award and the best speaker of laser conference in Trabiati-Modares university (2014)

Received the Dr. Shahid Kazemi Ashtiani award from Iran's National Elites Foundation (2016)

Received the Dr. Shahid Chamran award from Iran's National Elites Foundation (2016)

Received the research grant from the National Science Foundation (2016)

Received the research International Young Assistant professors grant from National Elites Foundation (2017)

Received the research grant from the National Science Foundation (2018)

Received the international grant for Iran-Austria joint program (IAJP) from Ministry of Science, Research and Technology (2018)

Distinguished researcher of Tarbiat Modares University in the field of applied projects and supervision of impact-oriented theses (2022)

Distinguished Researcher of Tarbiat Modares University in the field of co-publishing with industry and supervisor of the top M.Sc.thesis of Faculties of Basic Sciences in Tarbiat Modares University (2023)

Distinguished Researcher for supervisor of the top M.Sc. thesis of Faculties of Basic Sciences in Tarbiat Modares University (2024).

Professional Experiences:

Head of Physics Department, Faculty of Basic Sciences-Jun 2020 to Sep 2024

Head of Atomic and Molecular Physics Group, Tarbiat Modares University-Apr 2020 to Aug 2024

Member of the Safety Committee, Faculty of Basic Sciences=Jul 2019 to Nov 2023

Research Interest:

Laser and optics, Laser-matter interaction, Femtosecond and attosecond phenomena, Molecular dynamics and molecular spectroscopy, Laser Ablation, Disorder media and random lasers, Photonics, Biophysics in general

[1] Interaction of laser with molecules

[2] Laser technology and applications

[3] Quantum mechanical/molecular mechanical (QM/MM) simulations

[4] Photo-dissociation and Photo-ionization of molecules

[5] Computational Quantum Chemistry

[6] Time Dependent Density Functional Theory, Linear and Non-Linear response subject

[7] Ultra-fast laser spectroscopy

[8] Disorder media and random lasers

ISI Papers:

[1] R. Sadighi-Bonabi , **E. Irani**, B. Safaie, Kh. Imani, M. Silatani, S. Zare, “Possibility of ultra-intense laser transmutation of ^{93}Zr (c, n) ^{92}Zr a long-lived nuclear waste into a stable isotope”, **Energy Conversion and Management**, 51, 636–639, (2010).

[2] **E. Irani**, S. Zare, H.A. Navid, Z. Dehghani, and R. Sadighi-Bonabi, “The effect of intense short pulse laser shapes on generating of the optimum wakefield and dissociation of methane molecule”, **Laser and Particle Beams**, 30, 357, (2012).

[3] **E. Irani**, S. K. Sadighi, S. Zare, R. Sadighi-Bonabi, “Laser-induced photo transmutation of ^{126}Sn – A hazardous nuclear waste product-into short-lived nuclear medicine of ^{125}Sn ”, **Energy Conversion and Management**, 64, 466, (2012).

[4] S. Zare , **E. Irani**, H. A. Navid, Z. Dehghani, A. Anvari, R. Sadighi-Bonabi, “Dissociation of C-H Molecular Bond of Methane by Pulse Shaped Ultra-Intense Laser Field”, **Chem. Phys. Lett.** 560,60-65, (2013).

[5] **E. Irani**, H. Omidvar, R. Sadighi-Bonabi, “Gamma Rays Transmutation of Palladium by Bremsstrahlung and Laser Inverse Compton Scattering”, **Energy Conversion and Management**, 77, 558-563, (2013).

- [6] H.A. Navid, **E. Irani**, R. Sadighi-Bonabi, “The effect of ultraviolet lasers on conversion of methane into higher hydrocarbons”, **Laser and Particle Beams**, 31,481, (2013).
- [7] **E. Irani**, R. Sadighi- Bonabi, A. Anvari, “Investigation of intense femtosecond laser ionization and dissociation of methane with time -dependent density functional approach”, **Chem. Phys. Lett.** 604, 60, (2014).
- [8] A.Mostafai, **E.Irani**, R.Sadighi-Bonabi, “Alignment dependence of ionization probability of Cl₂, Br₂ and S₂ molecules by intense femto-second laser pulse”, **Journal of Molecular Structure**, 1072, 122, (2014).
- [9] **E. Irani**, R. Sadighi- Bonabi, A. Anvari, “Dissociative ionization of methane in an elliptical pulse shaped laser field”, **Journal of Molecular Structure**,1079,454, (2014).
- [10] S.Rasti, **E. Irani**, R. Sadighi-Bonabi, “Optimal control of dissociation of nitrogen molecule with ultra-short laser pulse shaping”, **Journal of Molecular Structure**, 1083,121, (2015).
- [11] S.Rasti, **E. Irani**, R. Sadighi-Bonabi, “Efficient photo-dissociation of CH₄ and H₂CO molecules with optimized ultra-short laser pulses” , **AIP Advances**, 5,117105, (2015).
- [12] H. Navid, **E. Irani**, R. Sadighi-Bonabi, “Possibility of methane conversion into heavier hydrocarbons using nanosecond lasers”, **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy**, 156,18-22, (2016).
- [13] A.M. Koushki, M. Mohsen-Nia, R. Sadighi-Bonabi, **E. Irani**, “Ionization dynamics of orbitals and high-harmonic generation of N₂ and CO molecules at the various XC potentials by TD-DFT ”, **Computational and Theoretical Chemistry**, 1095,104-111, (2016).
- [14] L. Hedayatifar, **E.Irani**, M. Mazarei, S. Rasti, Y. Taghipour Azar, A. Rezakhani, A. Mashaghi, F. Shayeganfar, M. Anvari, T. Heydari, A. Rahimitabar, N.Nafari, M.A. Vesaghi, R. Asgari and M.Reza Rahimitabar, “Optical absorption and electronic spectra of chlorophylls: TDDFT studies”, **RSC Advances**, 6,109778, (2016).
- [15] H. Ghaforyan, **E. Irani** , R. Sadighi-Bonabi , “The effect of chirped laser pulses on the Argon cluster interaction”, **Advances in high energy physics**, 2016, (2016).
- [16] **E. Irani**, A. Anvari, R. Sadighi-Bonabi, “Selective photo-dissociative ionization of methane molecule with TDDFT study”, **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy**, 171, 325-329, (2017).
- [17] **E Irani**, A Anvari, R Sadighi-Bonabi, M Monfared, “Multielectron dissociative ionization of methane and formaldehyde molecules with optimally tailored intense femtosecond laser pulses”, **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy**, 185, 298-303, (2017).

- [18] A. M. Koushki, R. Sadighi-Bonabi, M. Mohsen-Nia, **E.Irani**, “The control of electron quantum trajectories on the high-order harmonic generation of CO and N₂ molecules in the presence of a low frequency field”, *The Journal of Chemical Physics*, 148, **(2018)**.
- [19] A.M. Koushki, R. Sadighi-Bonabi, M. Mohsen-Nia, **E Irani**, “High-order harmonic generation of CO and N₂ molecules under linearly-and bi circularly-polarized laser pulses by TD-DFT”, *Laser Physics* 28 (7), 075404, **(2018)**.
- [20] M. Pashazadeh, **E. Irani**, M.M. Golzan, R. Sadighi-Bonabi, “Controlling the properties of TiO₂ nanoparticles generated by nanosecond laser ablation in liquid solution”, *Laser Physics* 28 (8), 085601, **(2018)**.
- [21] M. Monfared, **E. Irani**, R. Sadighi-Bonabi; “Controlling the multi-electron dynamics in the high harmonic spectrum from N₂O molecule using TDDFT”, *The Journal of Chemical Physics* 148 (23), 234303, **(2018)**.
- [22] M. Mofared, **E. Irani**, R. Sadighi-Bonabi, “Enhancing high harmonic generation by the global optimization of a two-color chirped laser field”, **Physical Chemistry Chemical Physics** 21(18), 9302-9309, **(2019)**.
- [23] **E.Irani**, M. Monfared, “Efficient high harmonic generation of bromine molecule by controlling the carrier-envelope phase and polarization of driving laser pulse”, **Chemical Physics Letter** 719, 27-33, **(2019)**.
- [24] M. Amoli-Diva, **E. Irani**, K. Pourghazi, “Photocatalytic filtration reactors equipped with bi-plasmonic nanocomposite/poly acrylic acid-modified polyamide membranes for industrial wastewater treatment”, **Separation and Purification Technology**, 236, 116257 **(2020)**.
- [25] **E.Irani**, M. Amoli-Diva, “Hybrid adsorption–photocatalysis properties of quaternary magneto-plasmonic ZnO/MWCNTs nanocomposite for synergistic effect of photocatalytic removal and membrane filtration in wastewater treatment”, **Journal of Photochemistry and Photobiology**, **(2020)**.
- [26] M.S Hosseini, E. Yazdani, **E. Irani**, B. Sajad, F.Mehradnia, S. Bazire, A. Bayat, “Mode-controlled random laser assisted by stimulated Raman scattering”, **Optics Communications** 500, 127338, **(2021)**
- [27] M.R. Khodaverdi, **E.Irani**, “Investigation of ablation efficiency during pulsed laser ablation of zinc metal target in distilled water environment”, **OSA Continuum**, 4, **(2021)**
- [28] **E.Irani**, E.Yazdani, A. Bayat, “Enhancement and tuning of optical properties of CdTe/CdS core/shell quantum dots by tuning shell thickness”, **Optik**, 249, 168198, **(2022)**
- [29] A. Sadeghifaraz, **E.Irani**, M. Monfared, “Efficient attosecond pulse generation from WS₂ semiconductor by tailoring the driving laser pulse”, **Optics Communications**, **(2022)**

- [30] M.Monfared, **E.Irani**, C Lemell, J Burgdörfer, “Influence of coherent vibrational excitation on the high-order harmonic generation of diatomic molecules”, **Phys. Rev.A**, 106 (5), 053108 (**2022**)
- [31] A. Madhani, **E.Irani**, M. Monfared, “Generation of the isolated highly elliptically polarized attosecond pulse using the polarization gating technique: TDDFT approach”, **Optics Express**, 31(11), 18430-18443 (**2023**)
- [32] A.Sadeghifaraz, **E.Irani**, M.Monfared, “Exploring key factors influencing high harmonic generation in monolayer WS₂: insights from semi-conductor Bloch equations based on Haldane's model”, **The European Physical Journal Plus** 138 (11), 1-12 (**2023**)
- [33] A Sadeghifaraz, R Faghih-Latif, **E Irani**, M Monfared, “Investigating high harmonic yield from different alignments of WSe₂ semiconductor”, **Optics Communications** 552, 130054 (**2024**).
- [34] A Sadeghifaraz, **E.Irani**,” Generation of isolated attosecond pulses in CdS semiconductor using polarization gating technique and tailored two-color pulse system”, **Scientific Reports** 15, 7586 (**2025**)
- [35] S. Shapouri, E. Irani, P. Rajabi Kalvani, S. Pasini, G. Foti, A. Parisini, A. Bosio, “Substrate-Dependent Characteristics of CuSbS₂ Solar Absorber Layers Grown by Spray Pyrolysis”, **Coatings** 15, 683 (**2025**).

Book:

- [1] **E. Irani**, R. Sadighi-Bonabi, A. Anvari, “ Interaction of intense femtosecond lasers with molecules”, **LAMBERT academic publishing** (**2017**).

International Conferences:

- [1] R. Sadighi-Bonabi, Z. Dehghani and **E. Irani**, “Optimization of two tailored rectangular femtosecond laser pulses in methane dissociation”, Publish in SPIE Belgium Journal, (**2009**).
- [2] **E. Irani**, Z.Dehghani, R.Sadighi-Bonabi, Study of the Dissociation Probability of Methane in Intense Laser Fields”, Publish in SPIE Belgium Conference , (**2009**).
- [3] **E. Irani**, Z.Dehghani, R.Sadighi-Bonabi ,” Photo Dissociation of Methane in the Strong Femtosecond Laser Field”, Publish in ECLIM Conference, (**2010**).
- [4] R. Sadighi-Bonabi, Z. Dehghani and **E. Irani**, “The effect of the two tailored femtosecond laser pulses in the enhancement of methane dissociation” Publish in ECLIM conference, (**2010**).
- [5] K. Sadighi, M. Monfared, **E.Irani**, R. Sadighi-Bonabi, “Generation of attosecond pulse in interaction of chirped femtosecond laser pulse with nitrous oxide molecule”, Bulletin of the American Physical Society, (**2016**).
- [6] **E. Irani**, M. Monfared, “Exploration of High-Harmonic Generation from Interaction of Optimized Intense Short Laser Field with N₂O Molecule using Time Dependent Density

Functional Theory (TDDFT)”, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, **(2018)**.

[7] **E.Irani**, “Ultra-short laser- molecule interaction for probing the ultra-fast electron dynamics” Humboldt University, Berlin, Germany, **(2018)**.

[8] A. Ashrafi Belgabad, R. Karimi, P. Parvin, M. Monfared, K.Tian, **E. Irani**, B.Wales, E. Bisson, S. Beaulieu, M. Giguere, J. Clad Kieffer, F. Legare, J. Sanderson, "Interaction of ultra-short laser pulses with OCS molecules and determination of orientation of the (2,2,2) channel ", 32nd International Conference on Photonic, Electronic and Atomic Collisions(**2021**).

[9] A. Ashrafi Belgabad, R. Karimi, M.Monfared, P. Parvin, **E.Irani**, J. Sanderson, “The role of molecular alignment in strong-field coulomb explosion”, International Conference of Photonic, Electronic and Atomic Collisions, Japan **(2025)**.

PhD and M.Sc. students:

PhD students:

[1] M. Monfared, Sharif university of technology, thesis: Optimization of high harmonic generation in interaction of strong femto-second laser with N₂O molecule (**Advisor 2018**), (**Graduated**).

[2] M. Koushki, Kashan University of technology, thesis: Dependence of the Molecular High-harmonic generation on the exchange-correlation potentials (**Advisor 2016**) (**Graduated**).

[3] Mahsa Pashazadeh, Uremia university of technology, thesis: Laser ablation of Titanium “experimental work” (**Advisor 2018**) (**Graduated**).

[4] Amin SadeghiFaraz, Tarbiat Modares University, thesis: “Optimization of high harmonic spectrum in semiconductor materials by time dependent density functional theory” (**supervisor 2019**) (**Graduated**).

[5] Saeed Talesh-Alikhani, Tarbiat Modares University, thesis: Correction of wavefront distortions caused by thermal distribution in Nd:YAG semiconductor laser” (**supervisor 2021**).

[6] Yeganeh Alvankar, Tarbiat Modares University, “Investigating nonlinear responses and topological properties of TMD materials using high harmonic generation” Tarbiat Modares University, (**supervisor 2022**).

[7] Samaneh Shapouri, Tarbiat Modares University, thesis:”Fabrication and enhancement of CuSbS₂ thin-film charecteristics for solar cell applications” (**Advisor 2022**).

[8] Hamid Talkhabi, Tarbiat Modares University, thesis:” Investigating the effect of different parameters of double-layer semiconductor with Hexagonal Heterostructures on its nonlinear response and analyzing the spectrum of the resulting high-order harmonics using Bloch's approach” (**supervisor 2023**).

[9] Amir Abbasi, Tarbiat Modares University, (**supervisor 2023**).

[10] Ali Chehregani, Tarbiat Modares University, (**supervisor 2024**).

[11] Erfan Heydari, Tarbiat Modares University, **(supervisor 2025)**.

M.Sc students:

[1] A. Mostafai, Sharif university of technology, thesis: Study of alignment dependence of ionization probability of Cl₂, Br₂ and S₂ molecules by intense femto-second laser pulse, **(2011) (Graduated)**.

[2] H. Omidvar, Azad university of technology, thesis: Gamma rays Transmutation of palladium by Bremsstrahlung and laser inverse compton scattering, **(2012) (Graduated)**.

[3] S. Rasti, Sharif university of technology, thesis: Quantum optimal control of interaction ultra-short laser pulses with formaldehyde molecule, **(2014) (Graduated)**.

[4] Ramin Akradi, Tarbiat Modares university, thesis: Ultra-short attosecond pulse generation from high-order harmonics in Bromine molecule, **(supervisor 2018) (Graduated)**.

[5] Mandana Hoseini, Tarbiat Modares university, **(Advisor 2018) (Graduated)**.

[6] Zahra Hoseini, Tarbiat Modares university, thesis: Effect of laser polarization on the high harmonic generation from formaldehyde molecule **(supervisor 2020) (Graduated)**.

[7] Mohammad Rasoul Khodaverdi, Tarbiat Modares university, thesis: Investigating the structural features and physical properties of nanoparticles generated by laser ablation of Zn metal in liquid solution **(supervisor 2020) (Graduated)**.

[8] Ahmadreza Madhani, Tarbiat Modares university, thesis: Theoretical approach to single attosecond pulse generation with optical gating using time dependent density functional theory **(supervisor 2021) (Graduated)**.

[9] Razieh Faghih latif, Tarbiat Modares university, thesis: "Investigation of symmetric effects of high harmonic spectra on WSe₂ semiconductor" **(supervisor 2022) (Graduated)**.

[10] Elaheh Rahimi, Tarbiat Modares university, thesis: "Investigation of nonlinear optical properties of materials with near-zero electrical conductivity-doped CdTe" **(supervisor 2022) (Graduated)**.

[11] Kasma Buriaey, Tarbiat Modares university, thesis: "Investigation on the linear and nonlinear optical properties of iron- based metal-organic frameworks" **(supervisor 2022) (Graduated)**.

[12] Erfan heidary, Tarbiat Modares University, thesis: "Generation of single attosecond pulses based on the high harmonic generation from TMD materials with hexagonal crystal structure" **(supervisor 2023) (Graduated)**.

[13] Faezeh Hoseini, Tarbiat Modares University, thesis: "Modulation of linear and nonlinear optical properties in CdTe and CdS nanostructures by metal oxide nanocolloids" **(supervisor 2023) (Graduated)**.

[14] Reyhaneh Keshtkar, Tarbiat Modares University, thesis:” Analysis of linear and non-linear optical properties of Cu-based metal-organic framework HKUST-1” (**supervisor 2024**).

[15] Sahel Rostami, Tarbiat Modares University, (**supervisor 2025**).

[16] Sahel Saeedi, Tarbiat Modares University, (**supervisor 2025**).

Courses Taught:

- Quantum Optics (TMU)
- Nonlinear Optics (TMU)
- Advanced Electrodynamics (TMU)
- Photonics (TMU)
- Advanced Electrodynamics (TMU)
- Laser Physics (SUT, TA)
- Optics Lab. (SUT)
- Basic Physics Lab. (SUT)
- Mathematical Physics (Karaj University)

Languages:

English (fluent), Farsi (Native language), Turkey (Native Language), Arabic (Some information).

Computer Skills:

Computer skill: GAUSSIAN package, GAUSSIAN VIEW, GAMESS, OCTOPUS, Berkeley GW, ZEMAX, COMSOL , Fortran, C++ programming, Matlab, Python.