



Contact Information

First Name: Malek

Last Name: Bagheri Harouni

Professional Address: University of Isfahan Department of physics, Hezar Jerib St., Isfahan, Iran

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Personal Information:

Date of Birth: September 21, 1980

Place of Birth: Isfahan, Iran

Citizenship: Iran

Gender: Male

Marital Status: Married

Spouse's Name: Zeynab

Children: Yes

Research activity and education

Faculty member of the University of Isfahan: Assistant professor 2009-2015

Faculty member of the University of Isfahan: Associate professor 2015 to present

Ph. D: Theoretical Physics (Quantum Optics), University of Isfahan, Iran (2009)

Thesis: *Theoretical schemes for generation of nonlinear coherent states in nano-structures*

M. Sc: Physics (Elementary Particles), Shahid Beheshti University (National university of Iran), Iran (2004)

Thesis: *Brane cosmology with Gauss-Bonnet term*

B. Sc: Physics, Bu-Ali-Sina University, Iran (2002)

Thesis: *Free electron Laser*

Fields of Research:

- ❖ Theoretical Quantum Optics:
 1. -Cavity Quantum Electrodynamics
 2. -Decoherence Phenomena
 3. -State preparation
- ❖ Quantum Optical Properties of Semiconductors:
 1. -Quantum Optics Properties of Quantum Dots

2. -Decoherence Phenomena in Quantum Dots
3. -Quantum Information Manipulation with Quantum Dots
4. Hybrid Quantum Systems include Quantum Dots and Metal Nano-particles

- ❖ Quantum Control
- ❖ Realization of mathematical structures

Awards:

Honor Ph. D. student of the University of Isfahan (2009)

Grants and Fellowships:

Iranian Nanotechnology Initiative (2008)

Ministry of science and technology (6 months stay in Berlin)

Technical University Berlin (2008-2009)

Papers (Refereed Journals):

- 1) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi
Nonlinear coherent states of an exciton in a wide quantum dot,
J. Phys. B: At. Mol. Opt. Phys. **41**, 225501 (2008).
- 2) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi
Spatial confinement effects on a quantum harmonic oscillator: nonlinear coherent states approach
J. Phys. A: Math. Theor. **42**, 045403 (2009).
- 3) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi
Q-deformed description of excitons and associated physical results
J. Phys. B: At. Mol. Opt. Phys. **42**, 095501 (2009).
- 4) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi
Influences of phonons on exciton-photon interaction and photon statistics of a quantum dot
Phys. Rev. B **79**, 165304 (2009).
- 5) E. Karimzadeh Esfahani, **M. Bagheri Harouni**, R. Roknizadeh
Quantization of electromagnetic fields in the presence of a spherical semiconductor quantum dot and spontaneous decay of an excited atom doped in this nanostructure
Int. J. Opt. Photonic (IJOP) **3**, 19 (2009)
- 6) A. Carmele, F. Milde, M.-R. Dachner, **M. Bagheri Harouni**, R. Roknizadeh, M. Richter, A. Knorr
Formation dynamics of an entangled photon pair: a temperature dependent analysis
Phys. Rev. B **81**, 195319 (2010).
- 7) M. Davoudi Darareh, **M. Bagheri Harouni**
Nonclassical properties of a particle in a finite range trap: The f -deformed quantum oscillator approach
Phys. Lett. A **374**, 4099 (2010).
- 8) **M. Bagheri Harouni**, and M. Davoudi Darareh
A single trapped ion in a finite range trap
Annals of Physics **326**, 968 (2011).
- 9) S. A. A. Ghorashi, R. Roknizadeh, **M. Bagheri Harouni**
Generalized coherent state approach to deformation quantization
Int. J. Mod. Phys. **27**, 1250095 (2012).
- 10) Z. Harsij, **M. Bagheri Harouni**, R. Roknizadeh, and M. H. Naderi

- Influence of electron-phonon interaction on optical spectrum and quantum statistics in a quantum dot-cavity system: Master equation approach*
Phys. Rev. A **86**, 063803 (2012)
- 11) S. A. A. Ghorashi, **M. Bagheri Harouni**
Decoherence of quantum Brownian motion in noncommutative space
Phys. Lett. A **377**, 952 (2013)
 - 12) Sh. Dehdashti, A. Mahdifar, **M. Bagheri Harouni**, R. Roknizadeh
Decoherence of spin-deformed bosonic model
Annals of Physics **334**, 321 (2013)
 - 13) S. A. Rastghalam, **M. Bagheri Harouni**
Interaction between a semiconductor quantum dot microcavity and a squeezed vacuum in a cavity: effects on the photon statistics
Laser Phys. **23**, 115202 (2013)
 - 14) A. Mahdifar, M. Jamshidi, **M. Bagheri Harouni**
Curvature effects on the interaction of nonlinear sphere coherent states with a three-level atom
J. Opt. Soc. Am. B **30**, 2952 (2013)
 - 15) S. A. A. Ghorashi, M. H. Aminjavaheri, **M. Bagheri Harouni**
Quantum decoherence of Dirac fields in non-inertial frames beyond the single-mode approximation
Quant. Inf. Process. **13**, 527 (2013)
 - 16) **M. Bagheri Harouni**, R. Roknizadeh
Statistics of Exciton Emission in a Semiconductor Microcavity: Detuning and Exciton-Exciton Effects
Int. J. Opt. Photonic (IJOP) **7**, 19 (2013)
 - 17) M. J. Faghihi, M. K. Tavassoly, **M. Bagheri Harouni**
Three-partite entanglement dynamics and entropic squeezing of a three-level atom interacting with a bimodal cavity field
Laser Phys. **24**, 045202 (2014)
 - 18) M. H. Aminjavaheri, S. A. A. Ghorashi, **M. Bagheri Harouni**
Entanglement sudden death in the presence of quantum decoherence in non-inertial frames: beyond the single-mode approximation
Quant. Inf. Process. **13**, 146 (2014)
 - 19) **M. Bagheri Harouni**
Phonon-induced effects on exciton dynamics and photon emission from a semiconductor quantum dot microcavity: phonon coherent state representation
Laser Phys. **24**, 045201 (2014)
 - 20) Sh. Dehdashti, **M. Bagheri Harouni**, A. Mahdifar, R. Roknizadeh
Deformed Weyl–Heisenberg algebra and quantum decoherence effect
Laser Phys. **24**, 055203 (2014)
 - 21) **M. Bagheri Harouni**
Phonon impacts on entangled photon pair generation from the biexciton cascade in a quantum dot: phonon coherent state representation
Laser Phys. **24**, 115202 (2014)
 - 22) Sh. Dehdashti, **M. Bagheri Harouni**, B. Mirza, H. Chen
Decoherence speed limit in the spin-deformed boson model
Phys. Rev. A **91**, 022116 (2015)
 - 23) A. Mahdifar, T. Hosseinzadeh, **M. Bagheri Harouni**
Coherent states for the Kepler–Coulomb problem on a sphere
Ann. Phys. **355**, 21 (2015)
 - 24) M. Saberi, **M. Bagheri Harouni**, R. Roknizadeh, and H. Latifi
Energy transfer and quantum correlation dynamics in FMO light-harvesting complex
Molecular Phys. (2016), DOI: 10.1080/00268976.2016.1185548
 - 25) M. Saberi, **M. Bagheri Harouni**, R. Roknizadeh, and H. Latifi
New approach to energy transfer and quantum correlations in a molecular dimer
J. Phys. B: At. Mol. Opt. Phys., **49** 185501 (2016)

- 26) **M. Bagheri Harouni**, and M. Vaseghi
Preparation of vibrational quantum states in nanomechanical graphene resonator
Laser Phys. **26**, 115204 (2016)
- 27) Sh. Dehdashti, **M. Bagheri Harouni**, Z. Harsij, J. Shen, H. Wang, Z. Xu, B. Mirza, H. Chen
Stability of two interacting entangled spins interacting with a thermal environment
Quan. Inf. Comp. **16**, 1365 (2016)
- 28) **M. Bagheri Harouni** and M. Rafieian Najaf Abadi
Photon Statistics of a Hybrid Quantum Dot-Metal Nanoparticle Cluster
Plasmonics **12**, 1 (2017).
- 29) T. Moradi, **M. Bagheri Harouni**, M. H. Naderi
Highly entangled photon pairs generated from the biexciton cascade transition in a quantum-dot-metal-nanoparticle hybrid system
Phys. Rev. A **96**, 023836 (2017)
- 30) E. Afsaneh, **M. Bagheri Harouni**, M. Jafari
Entanglement between distant atoms mediated by a hybrid quantum system consisting of superconducting flux qubit and resonators
J. Phys. B: At. Mol. Opt. Phys. **51**, 145502 (2018)
- 31) T. Moradi, **M. Bagheri Harouni**, M. H. Naderi
Photon antibunching control in a quantum dot and metallic nanoparticle hybrid system with non-Markovian dynamics
Scientific Reports **8**, 12435 (2018)
- 32) E. Afsaneh, **M. Bagheri Harouni**
Robust entanglement of an asymmetric quantum dot molecular system in a Josephson junction
Heliyon **6**, e04484 (2020)
- 33) S. Dehdashti, F. Yasar, **M. Bagheri Harouni**, A. Mahdifar, B. Mirza
Quantum speed limit in the thermal spin-boson system with and without tunneling term
Quant. Inf. Process **19**, 1 (2020)
- 34) **M. Bagheri Harouni**
Quantum speed limit time and entanglement in a non-Markovian evolution of spin qubits of coupled quantum dots
Chin. Phys. B **29**, 124203 (2020)
- 35) M. S. Ebrahimi, A. Motazedifard, **M. B. Harouni**
Single-quadrature quantum magnetometry in cavity electromagnonics
Phys. Rev. A **103**, 062605 (2021)
- 36) **M. Bagheri Harouni**
Influences of spin-orbit interaction on quantum speed limit and entanglement of spin qubits in coupled quantum dots
Chinese Phys. B **30**, 090301 (2021)
- 37) E. Afsaneh, **M. Bagheri Harouni**
Generation of entanglement between quantum dot molecule with the presence of phonon effects in a voltage-controlled junction
Phys. Lett. A **409**, 127525 (2021)
- 38) E. Aleebrahim, **M. Bagheri Harouni**, E. Amooghorban
Influence of spherical anisotropy on optical mass sensing in plasmonic-molecular optomechanics
Phys. Rev. A **105**, 062609 (2022)
- 39) F. Shojaei Arani, **M. Bagheri Harouni**, B. Lamine, A. Blanchard
Sensing quantum nature of primordial gravitational waves using electromagnetic probes
Phys. Scr. **98**, 055004 (2023)
- 40) A. Al-Hamaidah, M. Rezaee Roknabadi, **M. Bagheri Harouni**, B. Malaekheh-Nikouei, A. Mahmoudi, R. Ghanbari, A. Charmforoushan
Synthesis of multifunctional superparamagnetic mesoporous ZnMnFe₂O₄@ Fe–CaSiO₃ core-shell for medical applications
Materials Chemistry and Physics, 128056 (2023)

- 41) N. Imani, **M. Bagheri Harouni**
Non-Markovian Nature and Quantum Speed Limit in The Spontaneous Emission Dynamics of a Quantum Emitter in The Vicinity of a Plasmonic Core-shell Nanostructure
 Iranian Journal of Applied Physics **13** (3), 48 (2023)
- 42) M. S. Ebrahimi, **M. Bagheri Harouni**
Parity-time symmetry-enhanced simultaneous magnon and photon blockade in cavity magnonic system
 Journal of Physics B: Atomic, Molecular and Optical Physics **56** (23), 235501 (2023)
- 43) N. Imani, **M. Bagheri Harouni**
Geometrical parameter dependency of non-Markovian and quantum speed limit measures in the spontaneous emission dynamics of a qubit near a plasmonic nanodisk
 Quantum Information Processing **23** (4), 120 (2024)
- 44) S. Bayati, **M. Bagheri Harouni**, A. Mahdifar
Magnomechanically induced transparency and tunable slow-fast light via a levitated micromagnet
 Optics Express **32** (9), 14914 (2024)
- 45) S. Bayati, A. Mahdifar, **M. Bagheri Harouni**
Entanglement formation between magnon and center-of-mass motion of a levitated particle in a magnomechanical system
 Physical Review A **110** (1), 013710 (2024)

Conference papers:

- 1) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi
Spatial confinement effects on quantum optical properties of nano-structures
 14th Conference of Optics& Photonics, Rafsanjan, Iran (2007)
- 2) A. Carmele, **M. Bagheri Harouni**, M. Richter, A. Knorr
Photon statistics as a probe for exciton correlations in Coulomb-coupled quantum dots
 DPG-2009, Dresden, Germany
- 3) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi
Phonon effects on optical properties of a semiconductor quantum dot
 2nd Iran-India joint conference on nanotechnology (IJCIN-2009), Isfahan, Iran
- 4) H. Nosouhian, M. Soltanolkotabi, **M. Bagheri Harouni**, A. Zargari
Solution of heat equation in process of laser welding of polymer thin films: Green's function approach
 Annual physics conference of Iran, Isfahan, Iran (2009)
- 5) **M. Bagheri Harouni**, R. Roknizadeh, M. H. Naderi, A. Carmele, A. Knorr
Wetting layer effects on generating polarization-entangled photons from a single quantum dot
 16th Conference of Optics& Photonics, Yazd, Iran (2010)
- 6) M. Davoudi Darareh, **M. Bagheri Harouni**, M. H. Naderi, M. Soltanolkotabi
Quantum Statistics and Dynamics of a Particle in a Finite Range Potential: Nonlinear Coherent State Approach
 16th Conference of Optics& Photonics, Yazd, Iran (2010)
- 7) Z. Harsij, **M. Bagheri Harouni**, M. H. Naderi, R. Roknizadeh
Luminescence spectrum and photon statistics emitted from a quantum dot inside a microcavity
 Annual physics conference of Iran, Hamedan, Iran (2010)
- 8) Z. Harsij, **M. Bagheri Harouni**, M. H. Naderi, R. Roknizadeh
Phonon effects on optical properties of a quantum dot system inside a microcavity: Zeroth order approximation
 10th Conference of condensed matter, Shiraz, Iran (2011)
- 9) S. M. M. Seyed Khamoushi, R. Roknizadeh, and **M. Bagheri Harouni**
Even and odd nonlinear coherent states of an exciton in a wide quantum dot
 17th Conference of Optics& Photonics, Mahan, Kerman, Iran (2011)
- 10) Z. Harsij, **M. Bagheri Harouni**, M. H. Naderi, R. Roknizadeh

Optical properties of a semiconductor quantum dot in the presence of phonons

17nd Conference of Optics& Photonics, Mahan, Kerman, Iran (2011)

- 11) S. A. A. Ghorashi, **M. Bagheri Harouni**

Decoherence in the noncommutative space

Annual physics conference of Iran, Yazd, Iran (2013)

- 12) S. A. A. Ghorashi, R. Roknizadeh, **M. Bagheri Harouni**

Generalized coherent state approach in deformed quantization theory

Annual physics conference of Iran, Yazd, Iran (2013)

- 13) M. J. Faghihi, M. K. Tavassoly, **M. Bagheri Harouni**

Squeezing of position-momentum entropy in the interaction of a three-level atom with a bimodal cavity field

20nd Conference of Optics& Photonics, Shiraz, Iran (2014)

- 14) M. Saberi, **M. Bagheri Harouni**, R. Roknizadeh

Dynamics of excitation energy transport in a photosynthesis structure in interaction with non-Markovian random noise

20nd Conference of Optics& Photonics, Shiraz, Iran (2014)

- 15) **M. Bagheri Harouni**

Influences of phonons on photon emission from a semiconductor quantum dot and their quantum correlation

12nd Conference of condensed matter, Shiraz, Iran (2015)

- 16) M. Rafian Najafabadi, **M. Bagheri Harouni**

Impacts of surface plasmons on spontaneous emission rate of a semiconductor quantum dot

Annual physics conference of Iran, Zahedan, Iran (2015)

- 17) Z. Karimi, **M. Bagheri Harouni**

Influences of temperature and magnetic field on the quantum speed limit in a coupled quantum dots

21nd Conference of Optics& Photonics, Tehran, Iran (2014)

- 18) M. Vaseghi, **M. Bagheri Harouni**

Preparation of canonical coherent states in the graphene resonator

21nd Conference of Optics& Photonics, Tehran, Iran (2014)

- 19) M. Saberi, R. Roknizadeh, **M. Bagheri Harouni**

Theoretical study of quantum entanglement dynamics in a photosynthesis structure

21nd Conference of Optics& Photonics, Tehran, Iran (2014)

- 20) M. Saberi, R. Roknizadeh, **M. Bagheri Harouni**

Influence of non-Markovian random noise on quantum entanglement in a photosynthesis system

21nd Conference of Optics& Photonics, Tehran, Iran (2014)

- 21) M. Abdollahi, **M. Bagheri Harouni**, M. J. Hekmat, M. Fakhari, N. Shahriari, M. Kanani and H. Normohamadi

Simulation and measurement of threshold pump powers for the stimulated Brillouin scattering (SBS) and stimulated Raman scattering (SRS) in Ytterbium-doped double-clad CW fiber amplifiers

Second IEEE Asia Photonics, Beijing China (2016).

- 22) M. Abdollahi, **M. Bagheri Harouni**, M. J. Hekmat, M. Fakhari, N. Shahriari, M. Kanani and H. Normohamadi

Systematic analysis of nanosecond pulse amplification in Ytterbium-doped double-clad fiber amplifiers by considering inelastic scatterings and different operation regimes

Second IEEE Asia Photonics, Beijing China (2016).

- 23) T. Moradi, **M. Bagheri Harouni**, M. H. Naderi

Generation of entangled photon-pairs from a single quantum dot located in near field of metal nano-sphere

23rd Conference of Optics& Photonics, Tehran, Iran (2016)

- 24) Z. Farzanegan, **M. Bagheri Harouni**

Influence of surface Plasmons on spontaneous emission of a two-level quantum dot: Beyond dipole approximation

- 23rd Conference of Optics& Photonics, Tehran, Iran (2016)
- 25) H. Ahmadi, **Malek Bagheri Harouni**
Quantum entanglement of two atoms via surface acoustics waves
 3rd national conference on quantum information and computation, NCQIC, Shahroud, Iran (2017)
- 26) E. Afsaneh, **M. Bagheri Harouni**
Phononic Entanglement of Quantum Dot Molecule under the Bias Voltage Control
 3rd national conference on quantum information and computation, NCQIC, Shahroud, Iran (2019)
- 27) N. Imani, **M. Bagheri Harouni**
Non-Markovian nature and the quantum speed limit of a hybrid plasmonic system
 29nd Conference of Optics& Photonics, Shiraz, Iran (2023)
- 28) A. AL-Hamaidah , M. Rezaee Roknabadi , **M. Bagheri Harouni** , R. Charmforoushan , R. Ghanbari
Synthesis and characterization of superparamagnetic zinc-manganese ferrite nanoparticles using hydrothermal-sonochemical method for medical applications
 10th International Conference on Science and Development of Nanotechnology, Tbilisi, Georgia (2023)
- 29) A. AL-Hamaidah , M. Rezaee Roknabadi , **M. Bagheri Harouni** , R. Charmforoushan , R. Ghanbari
Synthesis and characteristics of a superparamagnetic multifunction core-shell, ZnMnFe₂O₄@SiO₂, for use in medicine applications
 10th International Conference on Science and Development of Nanotechnology, Tbilisi, Georgia (2023)

Invited talk and presentation:

- 1) *Photon statistics of emission from semiconductor quantum dots*
 Second joint Iran-India conference on nanotechnology, Isfahan, Iran (2010)
- 2) *Quantum optics: Radiation and quantum systems, future and applications*
 Workshop on photonics, Isfahan University of Technology, Iran (2016)
- 3) *Quantum optical properties of nanostructures (Quantum dots)*
 First Isfahan-Freiburg Meeting on Quantum Science, Isfahan, Iran (2016)
- 4) *Quantum optics and semiconductor nanostructures*
 First national conference on quantum technologies, Tehran, Iran (2017)
- 5) *Quantum plasmonics*
 25nd Conference of Optics& Photonics, Shiraz, Iran (2019)
- 6) *Quantum plasmonics and its application in quantum technologies*
 First national conference on new technologies in quantum optics, Isfahan University of Technology, Iran (2019)

Teaching experience:

University of Isfahan, Iran (2008 until now):
 Elementary Physics (Mechanics, Electricity, waves)
 Thermodynamics
 Statistical Mechanics
 Mathematical Physics
 Quantum Mechanics
 Optical Properties of Semiconductor Nanostructures

Advanced Statistical Mechanics
Advanced Quantum Mechanics

University of Shahrekord, Iran (2007-2008):
Elementary Physics (Mechanics)

Skills and Qualifications:

- Microsoft Office, Latex, Mathematica,
- Programming ability with Fortran and C
- Fluent in English

Interest:

Music: Iranian traditional music

Sport: Soccer, Swimming, Mountain Climbing

Movie