Hossein Rangani Jahromi, PhD in Quantum Information and Quantum Optics

حسین رنگانی جهرمی

دکتری در گرایش اطلاعات کوانتومی و اپتیک کوانتومی

عضو هیات علمی (دانشیار) بخش فیزیک

رتبه اول فارغ التحصیل در مقطع کارشناسی ارشد در گرایش فیزیک نظری   دانشگاه ارومیه،

رتبه اول فارغ التحصیل در دوره دکتری در رشته فیزیک اتمی مولکولی دانشگاه ارومیه. استاد راهنما:

Prof. Mahdi Amniat-Talab

فرصت مطالعاتی در دانشگاه میلان ایتالیا از سپتامبر 2015 تا ژانویه 2016 زیر نظر

Prof. Matteo G. A. Paris

برنده جایزه دکتر کاظمی آشتیانی بنیاد ملی نخبگان

پژوهشگر برگزیده دانشکده علوم پایه دانشگاه جهرم در سال های   96 و 98

استاد نمونه آموزشی دانشکده علوم پایه دانشگاه جهرم در سال ۱۴۰۰

سوابق اجرایی:

رییس گروه نظارت، ارزیابی و تضمین کیفیت دانشگاه از شهریور ۱۴۰۱ تاکنون

رییس دانشکده علوم پایه از آبان ۱۳۹۹ تا دیماه ۱۴۰۰

دبیر هم اندیشی اساتید و نخبگان دانشگاه جهرم از سال ۹۸ تا ۱۴۰۰

عضو شورای تحصیلات تکمیلی دانشگاه از سال ۹۸ تا ۱۴۰۰

عضو کمیته بین الملل دانشگاه جهرم

عضو شورای انضباطی تجدید نظر از آذر 96 تا آذر 97

عضو کمیته ترفیع پایه اعضای هیات علمی دانشگاه از اردیبهشت 96 تا اردیبهشت 98

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Education
Ph.D.: From *2012 to 2016*, Physics, Urmia University, Urmia, Iran.
Subject of Ph.D Thesis: Geometric quantum computation and quantum correlations, Supervised by Prof. M. Amniat-Talab .
M. Sc.: 2010 to 2012, Physics, Urmia University, Urmia, Iran.

Research Experience

Sep 2015 – Jan 2016 Researcher
University of Milan, Department of Physics
Milano, Lombardy, Italy
Supervised by Prof. M. G. A. Paris

Skills

Nonlinear Optics, Quantum Information, Quantum Communication, Quantum Entanglement, Quantum Optics, Geometric quantum computation, Quantum Metrology

Scientific Position

- (Associate) Professor at Physics department of Jahrom University, 2016 to present.

Courses Taught at Urmia and Jahrom University

1 - Elementary Mechanics, B.Sc.
2- Elementary Electricity and Magnetism, B.Sc.
3. Elementary Heat and Optics, B.Sc.
4- Elementary Electricity and Magnetism Lab, B.Sc.
5- Mathematical Physics III, B.Sc.
6- Optics Lab, B. Sc.
7- Spectroscopy, B. Sc.
8. Elementary Heat and Optics, B.Sc.

9. Quantum Mechanics 1,2; B.Sc.

10. Mathematical Physics II, B.Sc.

11.Quantum Information, B.Sc.

12. Modern Physics I, B.Sc.

13. Optics, B. Sc.

14. Analytical Mechanics II, B.SC.

Journal Papers

1. **Hossein Rangani Jahromi**, Samira Ebrahimi Asl Mamaghani, and Rosario Lo Franco: Relativistic quantum thermometry through a moving sensor, Ann. Phys. **448**, 169172 (2023).

2. Seyed Mohammad Hosseiny**, Hossein Rangani Jahromi**, Roya Radgohar, and Mahdi Amniat-Talab: Estimating energy levels of a three-level atom in single and multi-parameter metrological schemes, Phys. Scr. **97**, 125402 (2022).

3. Seyed Mohammad Hosseiny**, Hossein Rangani Jahromi**, and Mahdi Amniat-Talab: Monitoring variations of refractive index via Hilbert-Schmidt speed and applying this phenomenon to improve quantum metrology." arXiv preprint arXiv:2210.10106 (2022).

4. **H. Rangani Jahromi**, and Rosario Lo Franco: Searching for exceptional points and inspecting non-contractivity of trace distance in (anti-) PT−symmetric systems, Quantum Inf. Process. **21**, 155 (2022)**.**

5. Kobra Mahdavipour, Mahshid Khazaei Shadfar, **Hossein Rangani Jahromi** ,Roberto Morandotti, andRosario Lo Franco: Memory Effects in High-Dimensional Systems Faithfully Identified by Hilbert–Schmidt Speed-Based Witness, Entropy. **24**, 395 (2022)**.**

6. **Hossein Rangani Jahromi**, Samira Nazifkar:. Quantum estimation of phase encoded into qubits designed by a lattice defect in diamond. Biquarterly Journal of Optoelectronic, 4(1), 57-66, (2022). doi: 10.30473/jphys.2022.65127.1119

7. **Hossein Rangani Jahromi**, Seyed Mohammad Hosseiny, and Mahdi Amniat-Talab: Sensors which can be used for remote quantum estimation. Iranian Journal of Physics Research, 22(2), 457-469 (2022). doi: 10.47176/ijpr.22.2.11402

8. **H. Rangani Jahromi**: Remote sensing and faithful quantum teleportation through non-localized qubits, Phys, Lett. A **424,** 127850 (2021).

9. **H. Rangani Jahromi**, and Rosario Lo Franco: Hilbert–Schmidt speed as an efficient figure of merit for quantum estimation of phase encoded into the initial state of open n-qubit systems, **Sci. Rep.** **11**, 7128 (2021).

10. **H. Rangani Jahromi**, Kobra Mahdavipour, Mahshid Khazaei Shadfar, and Rosario Lo Franco: Witnessing non-Markovian effects of quantum processes through Hilbert-Schmidt speed, **Phys. Rev. A** **102**, 022221 (2020).

11. **H. Rangani Jahromi**, S. Haseli: Quantum memory and quantum correlations of Majorana qubits used for magnetometry, Quantum Inf. Comput. **20**, 0935 (2020).

12. M. Jafarzadeh, H. Rangani Jahromi, M. Amniat-Talab: Effects of partial measurements on teleportation of quantum resources and quantum Fisher information …. Proc. R. Soc. A **476**, 20200378 (2020)

13. L. Fathi Shadehi, **H. Rangani Jahromi**, and M. Ghanaatian: Adiabatic quantum estimation: A numerical study of the Heisenberg XX model with antisymmetric exchange. **Int.** J. Quant. Inform, 2040001 (2020).

14. S. Haseli, H. Dolatkhah, **H. Rangani Jahromi**, S. Salimi, A. S. Khorashad: The lower bound of quantum memory-assisted entropic uncertainty and secret rate for two topological qubits under environments. Opt. Commun. **461**, 125287 (2020).

15. **H. Rangani Jahromi**: Quantum thermometry in a squeezed thermal bath. Phys. Scr. 95, 035107 (2020).

16. **H. Rangani Jahromi**: Weak measurement effect on optimal estimation with lower and upper bound on relativistic metrology. Int. J. Mod. Phys. D **28,** 1950162 (2019).

17. **H. Rangani Jahromi**, M Amini, M Ghanaatian: Multiparameter estimation, lower bound on quantum Fisher information and non-Markovianity witnesses of noisy two-qubit systems. Quantum Inf. Process **18**, 338 (2019)**.**

18. M. Jafarzadeh, **H. Rangani Jahromi**, M. Amniat-Talab: Teleportation of quantum resources and quantum Fisher information under Unruh effect**.** Quantum Inf. Process **17**, 165 (2018)**.**

19. **H. Rangani Jahromi:** Parameter estimation in plasmonic QED. Opt. Commun. **411**, 119 (2018).

20. B. Farajollahi , M. Jafarzadeh, **H. Rangani Jahromi**, M. Amniat-Talab: Estimation of temperature in micromaser-type systems. Quantum Inf. Process 17, 119 (2018).

21. **H. Rangani Jahromi**: Relation between quantum probe and entanglement in n-qubit systems within Markovian and non-Markovian environments. J. Mod. Opt. **64**, 1377 (2017).

22. **H. Rangani Jahromi**, M. Amniat-Talab: Precision of estimation and entropy as witnesses of non-Markovianity in the presence of random classical noises. Ann. Physics 360, 446 (2015).

23. **H. Rangani Jahromi**, M. Amniat-Talab: Geometric phase, entanglement, and quantum Fisher information near the saturation point. H. Rangani Jahromi, M. Amniat-Talab, Ann. Physics 355, 299 (2015).

24. **H. Rangani Jahromi**, M. Amniat-Talab: Noncyclic geometric quantum computation and preservation of entanglement for a two-qubit Ising model. Quantum Inf. Process 14, 3739 (2015).

25. M. Amniat-Talab, **H. Rangani Jahromi**: Design of geometric phase gates and controlling the dynamic phase for a two-qubit Ising model in magnetic fields. Proc. R. Soc. A. 469, 20120743 (2013).

26. M. Amniat-Talab, **H. Rangani Jahromi**: On the entanglement and engineering phase gates without dynamical phases for a two-qubit system with

Dzyaloshinski-Moriya interaction in magnetic field. Quantum Inf. Process 12, 1185 (2013).

27. M. Amniat-Talab, **H. Rangani Jahromi**, S. Golkar: Berry Phases and Entanglement of a Two Spin-1/2 Model with Dzyaloshinski-Moriya Interaction in Magnetic Fields. Int. J. Theo. Phys. 52, 163 (2013).

28. M. Amniat-Talab, **H. Rangani Jahromi**: Relation between Berry phases and entanglement besides convergence of levels for two entangled spin-1/2 particles in magnetic fields. Eur. Phys. J. D 66, 211 (2012).

Conference Papers

1- Berry phase and entanglement of a two-qubit model with Dzyaloshinki-Moriya interaction in magnetic fields, M. Amniat-Talab, **H. Rangani-Jahromi**, S. Golkar, Annual Iranian Conference of Physics, Yazd University, Yazd, Iran, 2012.
2- Detection of quantum phase transitions with geometric phases, M. Amniat-Talab, **H. Rangani-Jahromi**, M. Amini, and Leila Hasanzadeh, Annual Iranian Conference of Physics, Birjand University, Birjand, Iran, 2013.
3- Creation of long distance entanglement between two spin 1/2 particles in external magnetic fields, Mahdi Amniat-Talab, **H. Rangani Jahromi** and Amir Parnian, 20th Iranian Conference on Optics and Photonics, Shiraz University of Technology, Iran, 2014.
4- Geometric quantum computation for a spin-1 particle by Floquet theory, M. Amniat-Talab, **H. Rangani-Jahromi**, and S. Mirzazadeh, Annual Iranian Conference of Physics, Zahedan University, Zahedan, Iran, 2014.
5- Studying the geometric phase for a two-qubit model in terms of distance, M. Amniat-Talab, **H. Rangani-Jahromi**, and L. Abbasi, 21th Iranian Conference on Optics and Photonics, Iran, 2015.
6- Geometric quantum discord for a two-qubit system in the Heisenberg model, E. Rezazadeh Dizaji, **H. Rangani Jahromi**, M. Jafarzadeh, M. Amniat-Talab, Annual Iranian Conference of Physics, Ferdowsi University, Mashhad, Iran, 2015.
7- Quantum Discord Teleportation in the Presence of Classical Phase Noisy Laser, M. Jafarzadeh, M. Amniat-Talab, **H. Rangani-Jahromi**, and, Annual Iranian Conference of Physics, Shiraz University, Shiraz, Iran, 2016.
8- Teleportation of Quantum Fisher Information Under the CPNL Noise Channel, Jafarzadeh Mahnaz, Amniat-Talab Mahdi, **H. Rangani-Jahromi**, The First National Conference and

Workshop on Quantum Information and Open Quantum systems, Shahid Madani University, Tabriz, Iran, 2018.

9- Investigating entanglement and geometric phase of a two qubit system in the presence of non-orthogonal magnetic fields, **H. Rangani Jahromi**, M. Ghanaatian, L. Fathi Shadehi, M. Sepehr, Annual Iranian Conference of Physics, Ghazvin University, Ghazvin, Iran, 2018.

10-Relation between quantum coherence and coherence in the presence of spin environment, M.Ghanaatian, **H. Rangani Jahromi**, M. Amini, 9th National Conference Payame Noor University, Kerman, Iran, 2018.

11- Enhanced teleportation fidelity without violating Bell's inequality in a relativistic scenario, **H. Rangani Jahromi**, M. Jafarzadeh, M. Amniat-Talab, International Conference and Workshop on Quantum Information and Open Quantum systems, Shahid Madani University, Tabriz, Iran, 2019.

12- Noisy metrology for amplitude damping maps, **H. Rangani Jahromi**, N. Majd, International Conference and Workshop on Quantum Information and Open Quantum systems, Shahid Madani University, Tabriz, Iran, 2019.

13- Estimating black hole mass by weak measurements, **H. Rangani Jahromi**, International Conference and Workshop on Quantum Information and Open Quantum systems, Shahid Madani University, Tabriz, Iran, 2019.

14. Comparing trace distance discord with quantum entanglement for two superconducting qubits, **H. Rangani Jahromi**, Fariba Abedi Soufiani, and Mahdi Amniat-Talab, 11th National Conference Payame Noor University, Tehran, Iran, 2022.

15. Probing the initial phase of teleportation channel through teleported qubit, **H. Rangani Jahromi**, S. M. Hosseiny, M. Amniat-Talab, 7th Iranian Conference on Mathematical Physics, Qom University of Technology, Qom, Iran, 2023.

16. Quantum estimation of Rabi frequencies in a Λ-type three-level atomic system in the presence of electromagnetically induced transparency, S. M. Hosseiny, **H. Rangani Jahromi**, M. Amniat-Talab, 7th Iranian Conference on Mathematical Physics, Qom University of Technology, Qom, Iran, 2023.

Book Chapter

1. K., Mahdavipour, M. Khazaei Shadfar, **H. Rangani Jahromi**, R. Morandotti, and R. Lo Franco. "Memory Effects in High-Dimensional Systems Faithfully Identified by Hilbert–Schmidt Speed-Based Witness." Entropy 24, no. 3 (2022): 395. In *Quantum Information Concepts in Open Quantum Systems*, edited by Bassano Vacchini , Andrea Smirne , and Nina Megier , 65–87 . Basel : MDPI Books , 2023 . https://doi.org/10.3390/books978-3-0365-6498-2 .

My PhD Students

1. **Mahnaz Jafarzadeh**, Graduated, 2019 (Moved to Xanadu).
2. **Seyed Mohammad Hosseiny**

My M.Sc. Students

1- **Elhameh Rezazadeh**, Graduated 2016

2- **Babak Farajollahi**, Graduated 2018

3- **Leila Fathi Shadehi**, Graduated, 2019

4- **Mansoureh Amini**, Graduated, 2019

5- **Marzieh Sepehr** Graduated, 2019

International Collaboration

Dipartimento di Ingegneria, Università di Palermo, Palermo, Italy

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Institut Quantique - Université de Sherbrooke, Canada

in the following papers:

Hossein Rangani Jahromi, and Rosario Lo Franco, Hilbert–Schmidt speed as an efficient figure of merit for quantum estimation of phase encoded into the initial state of open n-qubit systems, Sci. Rep. **11**, 7128 (2021).

Hossein Rangani Jahromi, Kobra Mahdavipour, Mahshid Khazaei Shadfar, and Rosario Lo Franco, **Phys. Rev. A 102**, 022221 (2020).

H. Rangani Jahromi, and Rosario Lo Franco: Searching for exceptional points and inspecting non-contractivity of trace distance in (anti-)PT−symmetric systems, Quantum Inf. Process. **21**, 155 (2022)**.**

Kobra Mahdavipour, Mahshid Khazaei Shadfar, **Hossein Rangani Jahromi** ,Roberto Morandotti, andRosario Lo Franco: Memory Effects in High-Dimensional Systems Faithfully Identified by Hilbert–Schmidt Speed-Based Witness, Entropy. **24**, 395 (2022)**.**