# Reza Ebadi

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**Citizenship**: Irananian


## Research interests

**Precision measurement tests of fundamental physics**
Dark matter direct detection — Quantum sensing for particle physics
**Early universe cosmology**
Primordial non-Gaussianity — Cosmological Collider physics — Primordial Clocks — Observational tests of alternatives to inflation
**Galactic astrophysics**
Precision astrophysics for particle physics — Pulsars — White dwarfs — Gravitational waves

## Education

**University of Maryland – College Park** — Maryland, USA
Ph.D. in Physics — 2019 – Present
Advisor: Ronald L. Walsworth
*Thesis: TBD*

**Sharif University of Technology** — Tehran, Iran
B.Sc. in Physics — 2014 – 2019
Advisors: Mohammad Hossein Namjoo and Hassan Firouzjahi
*Thesis: Black hole superradiance and axion physics*

## Academic Appointments

**Graduate Research Assistant** — Jun. 2020 – Present
Quantum Technology Center (QTC), University of Maryland, College Park, Maryland, USA

**Research Assistant** — Jun. 2018 – Mar. 2020
School of Astronomy, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran

**Visiting Student** — Jul. 2017 – Jun. 2018
School of Astronomy, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran

## Honors and fellowships

Dean's Fellowship, University of Maryland, College Park, MD — $5,000 — 2019-2020
Distinguished Student Award, Sharif University of Technology, Tehran — 2016

## Publications

6. **"Classical Cosmological Collider Physics and Primordial Features,"**
Xingang Chen, *Reza Ebadi*, and Soubhik Kumar,
JCAP 08 (2022) 083 [arXiv: 2205.01107]

5. **"Directional Detection of Dark Matter Using Solid-State Quantum Sensing,"**
*Reza Ebadi*, Mason C. Marshall, David F. Phillips, Johannes Cremer, Tao Zhou, Michael Titze, Pauli Kehayias, Maziar Saleh Ziabari, Nazar Delegan, Surjeet Rajendran, Alexander O. Sushkov, F. Joseph Heremans, Edward S. Bielejec, Martin V. Holt, and Ronald L. Walsworth,
AVS Quantum Science 4 (4), 044701 [arXiv: 2203.06037]
Highlighted by Scilight at Looking for dark matter with diamonds

4. **"High-precision mapping of diamond crystal strain using quantum interferometry,"**

Mason C. Marshall, *Reza Ebadi*, Connor Hart, Matthew J Turner, Mark J.H. Ku, David F. Phillips, and Ronald L. Walsworth,
Phys. Rev. Applied 17, 024041 (2022) [arXiv: 2108.00304].

3. **"Ultra-Heavy Dark Matter Search with Electron Microscopy of Geological Quartz,"**
*Reza Ebadi*, Anubhav Mathur, Erwin H. Tanin, Nicholas D. Tailby, Mason C. Marshall, Aakash Ravi, Raisa Trubko, Roger R. Fu, David F. Phillips, Surjeet Rajendran, and Ronald L. Walsworth,
Phys. Rev. D**104**, 015041 (2021) [arXiv: 2105.03998]

2. **"Milky Way Accelerometry via Millisecond Pulsar Timing,"**
David F. Phillips, Aakash Ravi, *Reza Ebadi*, and Ronald L. Walsworth,
Phys. Rev. Lett.**126**, 141103 (2021) [arXiv: 2008.13052]

1. **"Resonant instability of axion cloud,"**
*Reza Ebadi* and Mohammad Hossein Namjoo,
Iranian Journal of Physics Research 20 (2020), no.1, 125-137

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## White Papers

3. **"Mineral Detection of Neutrinos and Dark Matter. A Whitepaper,"**
Sebastian Baum, Patrick Stengel *et al.* (including Reza Ebadi), arXiv: 2301.07118

2. **"Snowmass2021 Cosmic Frontier Dark Matter Direct Detection to the Neutrino Fog,"**
D. S. Akerib *et al.* (including Reza Ebadi), arXiv: 2203.08084

1. **"Snowmass2021 Cosmic Frontier White Paper: Ultraheavy particle dark matter,"**
Daniel Carney, Nirmal Raj *et al.* (including Reza Ebadi), arXiv: 2203.06508

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## Talks

15. **Dark matter detection strategies using diamond and quartz** Oct. 2022
Mineral detection of dark matter and neutrinos, Institute for Fundamental Physics of the Universe, Trieste, Italy [Online]

14. **Cosmological Collider Physic using Primordial Clocks and Clicks** Jul. 2022
K. N. Toosi University of Technology, Tehran, Iran [Online]

13. **Quantum sensing methods for directional dark matter detection** Jun. 2022
DAMOP 2022: The 53rd Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Orlando, Florida, USA

12. **Cosmological Collider Physic using Primordial Clocks and Clicks** May 2022
Sharif University of Technology, Tehran, Iran [Online]

11. **Classical Cosmological Collider Physic** May 2022
School of Astronomy, IPM, Tehran, Iran [Online]

10. **Milky Way Accelerometry via Pulsar Timing to Probe the Distribution of Dark Matter** May 2022
CPT'22: Ninth Meeting on CPT and Lorentz Symmetry, Indiana University, Bloomington, Indiana, USA [Online]

9. **Cosmological Collider Physic using Primordial Clocks and Clicks** May 2022
PHENO 2022: The 2022 Phenomenology Symposium, University of Pittsburgh, Pittsburgh, Pennsylvania, USA

8. **Geological quartz as a detector for ultra-heavy dark matter** Apr. 2022
APS April Meeting 2022, New York, NY, USA

7. **Directional dark matter detection in diamond: principles and experimental progress** Dec. 2021
PIKIMO 11, Pittsburgh, Pittsburgh, Pennsylvania, USA

6. **Classical Cosmological Collider Physics** Nov. 2021
Sharif University of Technology, Tehran, Iran [Online]

5. **Precision NV-Diamond Strain Imaging for Directional Dark Matter Detection** Jun. 2021
DAMOP 2021: The 52nd Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics [Online]

4. **Galactic Acceleration from Pulsar Timing** May 2021
PHENO 2021: The 2021 Phenomenology Symposium, University of Pittsburgh, Pittsburgh, Pennsylvania, USA [Online]

3. **Classical Cosmological Collider Physics** May 2021
PHENO 2021: The 2021 Phenomenology Symposium, University of Pittsburgh, Pittsburgh, Pennsylvania, USA [Online]

2. **Milky Way Accelerometry via Millisecond Pulsar Timing** Aug. 2020
Cosmology Journal Club, Johns Hopkins University, Maryland, USA [Online]

1. **Do Black Holes Talk to Axions?** Feb. 2019
Sharif University of Technology, Tehran, Iran

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## Teaching experience

**Teaching assistant**, University of Maryland – College Park
PHY404 Introduction to Statistical Thermodynamics Fall 2019 & Spring 2020
PHY420 Principles of Modern Physics Fall 2019

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## Services

**Member of scientific advisory board** Fall 2018 & Spring 2019
Zharfa multi-major scientific society of students of Physics, Mathematics and Philosophy of Science, Sharif University of Technology

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## Outreach

**Quantum Lab tour for Montgomery Blair High School students**, as part of Outreach program for The NSF Institute for Robust Quantum Simulation (RQS) UMD, Feb. 2023

**Science writing**
Gravitational Waves: A New Window to Cosmos Sharifdaily, Jun. 2020
Lessons from the Summer Research School "Quantum to Cosmos: Ideas and Applications," Gebze, Turkey Takaneh, Mar. 2020
Primordial Universe: Standard Clocks and the Cosmological Collider Sharifdaily, Jul. 2019
What is Dark Matter? Zharfa, Nov. 2018

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## Mentoring

*Brady Egleston*, Undergraduate Research Assistant, University of Maryland, College Park
*Andrew Gilpin*, Undergraduate Research Assistant, University of Maryland, College Park
*Cate Sturner*, Undergraduate Research Assistant, College of William & Mary

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## Professional memberships

**American Physical Society** 2021 – Present
Student Membership

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## Other interests

Climbing – Running – Hiking – Books – History – Music