

## Education

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### Doctor of Philosophy - Astronomy

Mar 2026 – Sep 2028

**Janusz Gil Institute of Astronomy, University of Zielona Góra, Poland**

**Advisor:** dr hab. Wojciech Lewandowski, prof. UZ.

**Thesis:** *Probing Anisotropy and Inhomogeneity in Interstellar Medium with Long Term Radio Pulsar Observations*

### Integrated Master of Science in Physics (Dual-Degree)

Jul 2017 – May 2022

**Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India**

**Advisor:** Prof. Paramasivan Arumugam, Department of Physics, IIT Roorkee.

**Thesis:** *Equation of State based on phenomenological relativistic mean field theory for single and double fluid Neutron Stars*

## Current Scientific Activities

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Doctoral research with focus on:

- Analyzing pulsar profiles to understand the long term spectral and temporal evolution of dispersion measure and scattering parameters to better understand the anisotropy and inhomogeneity in the ionized interstellar medium.
- Characterizing the distinction between intrinsic pulsar emission and propagation effects.

## Professional and Scientific Experience

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### Visiting Researcher, Nicolaus Copernicus Astronomical Center, Toruń, Poland.

Mar 2025 - Feb 2026

- Developed an open-source web application for analysis of polarisation properties of radio pulsars using MeerKAT single-pulse data (with Dr. habil. Jarosław Dyks).
- Visited Prof. Harish Vedantham (ASTRON, The Netherlands) to collaborate on the observability of coherent radio emission from pulsar planets; contribution to a manuscript in preparation.

### Visiting Scientist, International Space Science Institute, Bern, Switzerland.

Mar-Apr 2023

- Contributed to a white paper on lunar gravitational-wave detection, including analysis of tidal disruption of white dwarfs.
- Developed Python simulations for phase-resolved spectra and frequency-resolved light curves of magnetic cataclysmic variables in the X-ray regime, including interstellar medium effects.
- Analyzed the theoretical implications of the Gertsenshtein-Zel'dovich effect in the context of pulsar magnetospheres.
- Assisted late Prof. Dr. Maurizio Falanga (Dir. ISSI.) in graduate-level teaching activities and grant proposal preparation.

### ThinkSwiss Research Scholar, University of Bern, Switzerland.

Sep-Nov 2022

- Derived and implemented radial velocity models for spectroscopic binaries; developed scripts to simulate their astrodynamics and velocity profiles.
- Conducted a theoretical analysis on the fractional changes to pulsar spin induced by gravitational waves leading to quadrupolar oscillations.
- Developed a python script to understand the effect of magnetospheric radii on accretion luminosities in neutron stars and rotating black-holes.

### Associate Research Fellow, Indian Pulsar Timing Array Consortium, India.

May 2021 - Dec 2022

- Co-authored five peer-reviewed publications with contributions to uGMRT pulsar observations, data reduction, Cyber infrastructure management and web development.
- Developed the early stage simulations for time and frequency evolution of dispersion measure and scattering parameters.

### Remote Intern, National Centre for Radio Astrophysics, Pune, India.

Apr 2020 - Mar 2021

- Developed a Python and PSRCHIVE based script to analyze scintillation spectra of pulsars observed with ORT and uGMRT.

### Head Secretary, Physics and Astronomy Club-IIT Roorkee, India.

Jul 2019 - Apr 2021

- Served as the joint and then head secretary leading a team of 40+ undergrad students, supervising several learning projects, organizing several events including seminars by distinguished scientists worldwide.
- Participated in [IIT Kanpur Hyperion Case Study Challenge](#) (Oct 2021), led a team of 3, secured 1st position nationally; [problem involved galactic dark-matter density modeling and applied analysis](#).
- Participated in the [9th Inter-IIT Tech-Meet, IIT Guwahati](#) (Mar 2021) with a team of 8 and won a silver medal representing the institution at national level. We developed a web-based catalog for observations made through the ISRO's AstroSat.

## Publications

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1. Jaikhomba Singha, Bhal Chandra Joshi, . . . , Piyush Marmat et al. Improving DM estimates using low-frequency scatter-broadening estimates, *Monthly Notices of the Royal Astronomical Society*, Volume 535, Issue 1, November 2024, Pages 1184–1192, <https://doi.org/10.1093/mnras/stae2405>.
2. Branchesi, M., Falanga, M., Harms, J., . . . , Piyush Marmat et al. Lunar Gravitational-Wave Detection. *Space Sci Rev* 219, 67 (2023). <https://doi.org/10.1007/s11214-023-01015-4>.
3. Joshi, B.C., Gopakumar, A., Pandian A., . . . , Piyush Marmat et al. Nanohertz gravitational wave astronomy during SKA era: An InPTA perspective. *J Astrophys Astron* 43, 98 (2022). <https://doi.org/10.1007/s12036-022-09869-w>.
4. Tarafdar, P., Nobleson, K., Rana, P., Singha, J., Krishnakumar, M., Joshi, B., . . . , Piyush Marmat, . . . Pathak, D. (2022). The Indian Pulsar Timing Array: First data release. *Publications of the Astronomical Society of Australia*, 39, E053. <https://doi.org/10.1017/pasa.2022.46>.
5. K Nobleson, Nikita Agarwal, . . . , Piyush Marmat et. al. Low-frequency wideband timing of InPTA pulsars observed with the uGMRT, *Monthly Notices of the Royal Astronomical Society*, Volume 512, Issue 1, May 2022, Pages 1234–1243, <https://doi.org/10.1093/mnras/stac532>.
6. Jaikhomba Singha, Mayuresh P Surnis, . . . , Piyush Marmat et. al. Evidence for profile changes in PSR J1713+0747 using the uGMRT, *Monthly Notices of the Royal Astronomical Society: Letters*, Volume 507, Issue 1, October 2021, Pages L57–L61, <https://doi.org/10.1093/mnrasl/slab098>.

## Conference Contributions

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1. *How magnetospheric propagation affects the polarised radio emission from pulsars*, Conference Presentation, 27th RAGTIME, Silesian University in Opava, Czech Republic, Nov 2025.
2. *Testing Polarization Models on the Radio Pulsar PSR J1900-2600: Birefringent Filtering, Angular Mode Separation, and Mode Coupling*, Conference Presentation, 42nd Congress of the Polish Astronomical Society, University of Warsaw, Poland, Sep 2025.
3. The Glitch Rise Times of Rotating Neutron Stars. J Singha, H Grover, P Marmat, P Arumugam, *Proceedings of the DAE Symp. on Nucl. Phys* 66, 798. (2022)
4. Neutron Star Equation of state in single and two fluid formalism. B Bhat, P Marmat, H Grover, J Singha, A Kumar, P Arumugam, *Proceedings of the DAE-BRNS symposium on nuclear physics*. V. 66, 2-2. (2022)
5. A python based pipeline to analyse Interstellar scintillation of radio pulsars observed with ORT and uGMRT. P Marmat, J Singha, BC Joshi, Poster - 40th Meeting of ASI 2022.
6. Building a 5m aperture small radio-telescope at IIT Roorkee. Vanshaj Kerni, Piyush Marmat et. al. Conference Poster, 40th Meeting of ASI 2022.
7. Using low frequency scatter-broadening measurements for precision estimates of DM. Jaikhomba Singha, Bhal Chandra Joshi, P. Arumugam, Piyush Marmat, et. al. Conference Poster, 40th Meeting of ASI 2022.

## Training / Workshops / Schools

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- REBOUND N-body simulation workshop at the Institute of Astronomy, University of Zielona Góra, Mar 2026.
- 25th Relativistic Astrophysics Group Meeting, Silesian University in Opava, Czech Republic Nov 2023
- Forum on Lunar Gravitational-Wave Observation, ISSI-Bern, Switzerland, Oct 2022
- HPC Workshop on Radio Astronomy Data Analysis in the SKA Era, IIT Roorkee, India, Mar 2022.
- 40th Meeting of the Astronomical Society of India, IIT-Roorkee, India, Mar 2022.
- Second Chennai Symposium on Gravitation and Cosmology - Online, Feb 2022.
- Online IR Astronomy School organised by SOFIA-NASA, Feb 2022
- TIFR-ICTS CSGP Online Meeting, Dec 2021.
- GBO and Arecibo Online Single Dish School, September 2021.
- IPTA Online Student Week, Jun 2021.

## Scientific Outreach and Engagement

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- Delivered an invited online colloquium on career in space science at the St. Paul's Elementary School in Akola, Maharashtra in India on 23rd of August 2025 (Indian Space Day).
- Presented my works on the interactions of high-frequency gravitational waves with neutron stars and pulsars in a student-colloquium organized by Prof. Martin Urbanec at the Silesian University of Opava, Czech Republic, Dec 2023.
- Presented a brief review of the Betelgeuse's dimming in late 2019 which suspected its untimely supernova explosion in a student-colloquium organized by [Indian Physics Association-Roorkee Chapter](#), Feb 2020.
- Hosted a workshop on the basics of observational astronomy and using the Stellarium open-source planetarium software, organized by the Student Technical Council of IIT Roorkee, Dec 2020.