

RAHUL SHARMA, Ph.D.

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 ORCID




Research Interests

X-ray Astronomy, X-ray Binaries, High-energy Astrophysics, Neutron Stars, Cataclysmic Variables, Black Holes, Magnetars, X-ray Pulsars, Ultra-luminous X-ray sources (ULXs), X-ray Polarization, Orbital evolution, X-ray Transients

Employment History

- Dec 2024 – **  **Post-Doctoral Fellow** – Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India.
- Dec 2021 – Nov 2024  **Post-Doctoral Fellow** – Raman Research Institute, Bangalore, India.
- Jan 2021 – Apr 2021  **Research Associate** – IISER, Mohali, India.

Education






- 2014 – 2021  **Ph.D. Physics**, University of Delhi.
Thesis title: *Study of transient X-ray binaries in the time and energy domains.*
Supervisor: *Prof. Anjan Dutta.*
- 2011 – 2014  **M.Sc. Physics**, University of Delhi.
- 2008 – 2011  **B.Sc. (H) Physics**, Ramjas College, University of Delhi.

Awards and Achievements




Grants

- 2023  **AHEAD2020 TNA** – INAF-IAPS, ITALY.
- 2020  **Cospar PCB** – University of Cagliari, ITALY.
- 2016–2019  **UGC-Senior Research Fellowship** – University of Delhi, INDIA.
- 2014–2016  **UGC-Junior Research Fellowship** – University of Delhi, INDIA.

Allocated Observing Time

- PI  *XMM-Newton* – AO16 (20 ks)
-  *AstroSAT* – To3 (80 ks), To5 (40 ks), A14 (60 ks)
-  *NICER* – ToO (2+22 ks)
-  *NuSTAR* – Cycle 10 (60 ks), Cycle 11 (60 ks), ToO (2 x 20 ks)
- Co-I  *AstroSAT* – Ao2 (24+20+20 ks), To3 (50 ks), To5 (40 ks)

Membership

- POLIX  Active member of the POLIX science collaboration (PI – B. Paul). This group works on the science goals of the POLIX instrument (built at RRI) onboard *XPoSat* (X-ray Polarimeter Satellite).
- ASI  Life Member of the Astronomical Society of India (ASI) - [L2552](#)
- IAU  Junior Member of the International Astronomical Union (IAU) - [42522](#)

Research Publications ([ADS Link](#))

Journal Articles

- 1 K. Rikame, B. Paul, **R. Sharma**, and V. Jithesh, "*Thermonuclear X-ray bursts across the eclipse transitions in the LMXBs EXO 0748-676 and XTE J1710-281*", [MNRAS](#), *In press* (2025).
- 2 **R. Sharma**, C. Jain, B. Paul, A. Dutta, and V. Rana, "*Intriguing nature of AM Her-type candidate CXOU J204734.8+300105*", [The Astrophysical Journal](#) **987**, 117 (2025).
- 3 K. Roy and **R. Sharma**, "*Detection of CRSF in Cep X-4 at a low luminosity level*", [New Astronomy](#) **121**, 102435 (2025).
- 4 **R. Sharma**, "*Broadband spectral and emission geometry analysis of XB 1916–053 with Chandra and NuSTAR*", [Journal of High Energy Astrophysics](#) **47**, 100376 (2025).
- 5 **R. Sharma**, C. Jain, B. Paul, and A. Beri, "*Sidebands to mHz QPOs in 4U 1626–67 in the second spin-down state*", [MNRAS](#) **538**, 1046–1054 (2025).
- 6 H. N. Yang, C. Maitra, G. Vasilopoulos, F. Haberl, P. A. Jenke, A. S. Karaferias, **R. Sharma**, and et al., "*Broadband study of the Be X-ray binary RX J0520.5-6932 during its outburst in 2024*", [MNRAS](#) **536**, 1357–1373 (2025).
- 7 M. Kumar, **R. Sharma**, B. Paul, and V. Rana, "*Spectral analysis of Ultra-Luminous X-ray pulsars with models of X-ray pulsars*", [MNRAS](#) **536**, 340–349 (2025).
- 8 **R. Sharma**, M. Mandal, S. Pal, B. Paul, G. K. Jaisawal, and A. Ratheesh, "*Probing the energy and luminosity-dependent spectro-timing properties of RX J0440.9+4431 with AstroSat*", [MNRAS](#) **534**, 1028–1042 (2024).
- 9 H. Manikantan, B. Paul, **R. Sharma**, P. Pradhan, and V. Rana, "*Energy dependence of Quasi-periodic oscillations in accreting X-ray pulsars*", [MNRAS](#) **531**, 530–549 (2024).
- 10 C. Jain, **R. Sharma**, and B. Paul, "*A comprehensive study of orbital evolution of LMC X-4: Existence of a second derivative of the orbital period*", [MNRAS](#) **529**, 4056–4065 (2024).
- 11 K. Rikame, B. Paul, **R. Sharma**, V. Jithesh, and K. T. Paul, "*Flares during Eclipses of High Mass X-ray Binary Systems Vela X-1, 4U 1700-37, and LMC X-4*", [MNRAS](#) **529**, 3360–3371 (2024).
- 12 K. Roy, **R. Sharma**, H. Manikantan, and B. Paul, "*Detection of a cyclotron line in the Be X-ray pulsar IGR J06074+2205*", [A&A](#) **686**, A145 (2024).
- 13 A. Devaraj, **R. Sharma**, S. Nagesh, and B. Paul, "*Insights into the phase-dependent cyclotron line feature in XTE J1946+274: An AstroSat and Insight-HXMT view*", [MNRAS](#) **527**, 11015–11025 (2024).

- 14 **R. Sharma**, C. Jain, B. Paul, and T. R. Seshadri, "*AstroSat observation of the magnetar SGR J1830-0645 during its first detected X-ray outburst*", [MNRAS 526, 4877–4884 \(2023\)](#).
- 15 M. Mandal, **R. Sharma**, S. Pal, G. K. Jaisawal, K. C. Gendreau, M. Ng, A. Sanna, C. Malacaria, F. Tombesi, E. C. Ferrara, C. B. Markwardt, M. T. Wolff, and J. B. Coley, "*Probing spectral and timing properties of the X-ray pulsar RX J0440.9 + 4431 in the giant outburst of 2022-2023*", [MNRAS 526, 771–781 \(2023\)](#).
- 16 **R. Sharma**, C. Jain, and B. Paul, "*4U 1626-67 returns to spin-down: timing features toe the line*", [MNRAS 526, L35–L40 \(2023\)](#).
- 17 A. Beri, **R. Sharma**, P. Roy, V. Gaur, D. Altamirano, N. Andersson, F. Gittins, and T. Celora, "*AstroSat and NuSTAR observations of XTE J1739-285 during the 2019-2020 outburst*", [MNRAS 521, 5904–5916 \(2023\)](#).
- 18 **R. Sharma**, A. Sanna, and A. Beri, "*AstroSat observation of the accreting millisecond X-ray pulsar SAX J1808.4-3658 during its 2019 outburst*", [MNRAS 519, 3811–3818 \(2023\)](#).
- 19 **R. Sharma**, C. Jain, K. Rikame, and B. Paul, "*Broad-band mHz QPOs and spectral study of LMC X-4 with AstroSat*", [MNRAS 519, 1764–1770 \(2023\)](#).
- 20 C. Jain, **R. Sharma**, and B. Paul, "*Eclipse Timings of the LMXB XTE J1710-281 : discovery of a third orbital period glitch*", [MNRAS 517, 2131–2137 \(2022\)](#).
- 21 C. Jain, A. Yadav, and **R. Sharma**, "*Change in spin-down rate and detection of emission line in HMXB 4U 2206+54 with AstroSat observation*", [Journal of Astrophysics and Astronomy 43, 101 \(2022\)](#).
- 22 P. Sharma, **R. Sharma**, C. Jain, and A. Dutta, "*Timing and spectral analysis of HMXB OAO 1657-415 with NuSTAR*", [MNRAS 509, 5747–5755 \(2022\)](#).
- 23 P. Sharma, **R. Sharma**, C. Jain, G. C. Dewangan, and A. Dutta, "*Broad-band spectral study of LMXB black hole candidate 4U 1957+11 with NuSTAR*", [Research in Astronomy and Astrophysics 21, 214 \(2021\)](#).
- 24 P. Sharma, **R. Sharma**, C. Jain, and A. Dutta, "*Broad-band spectral analysis of LMXB XTE J1710-281 with Suzaku*", [MNRAS 496, 197–205 \(2020\)](#).
- 25 **R. Sharma**, A. Beri, A. Sanna, and A. Dutta, "*A broad-band look of the accreting millisecond X-ray pulsar SAX J1748.9-2021 using AstroSat and XMM-Newton*", [MNRAS 492, 4361–4368 \(2020\)](#).
- 26 **R. Sharma**, C. Jain, and A. Dutta, "*Study of the reflection spectra of SAX J1748.9-2021*", [MNRAS 482, 1634–1639 \(2019\)](#).
- 27 **R. Sharma**, A. Jaleel, C. Jain, J. C. Pandey, B. Paul, and A. Dutta, "*Spectral properties of MXB 1658-298 in the low/hard and high/soft state*", [MNRAS 481, 5560–5569 \(2018\)](#).
- 28 **R. Sharma**, A. Jaleel, C. Jain, B. Paul, and A. Dutta, "*Thermonuclear X-ray burst of MXB 1658-298 with NuSTAR*", [Journal of Astrophysics and Astronomy 39, 16 \(2018\)](#).
- 29 C. Jain, B. Paul, **R. Sharma**, A. Jaleel, and A. Dutta, "*Indication of a massive circumbinary planet orbiting the low-mass X-ray binary MXB 1658-298*", [MNRAS 468, L118–L122 \(2017\)](#).

Submitted

- 1 **R. Sharma**, A. Beri, B. Paul, A. Sanna, C. Maitra, and H. Yang, "Probing Accretion Dynamics and Spin Evolution in the X-ray Pulsar RX J0520.5–6932 during its 2024 Outburst", A&A, submitted (2025).
- 2 M. Kumar, **R. Sharma**, and B. Paul, "Reprocessing of X-rays emission in Ultra-Luminous X-ray sources", [ApJ](#), submitted (2025).
- 3 N. Aftab, **R. Sharma**, and B. Paul, "Pulsations in Eclipse: A Reassessment of the Narrow Partial Eclipse in IGR J16393–4643 with AstroSat", A&A, submitted (2025).
- 4 **R. Sharma**, A. Sanna, and P. Sharma, "Broad-band timing and spectral study of accreting millisecond X-ray pulsar SAX J1808.4–3658 during its 2022 outburst", [ApJ](#), submitted (2025).
- 5 K. Roy, H. Manikantan, **R. Sharma**, A. Balu, and B. Paul, "Changes in emission pattern with quasi-periodic oscillations in transient XTE J0111.2–7317 (SXP 31.0) in SMC", MNRAS, submitted (2025).

Thesis

- 1 **R. Sharma**, "Study of transient X-ray binaries in the time and energy domains", in [PhD Thesis, UNIVERSITY OF DELHI, INDIA](#) (2021).

Non-refereed Article

- 1 **R. Sharma**, "Timing analysis of intermittent millisecond X-ray pulsar SAX J1748.9–2021", in [Space research today](#), Vol. 208 (2020), pp. 60–64.
- 2 **R. Sharma**, K. Gendreau, Z. Arzoumanian, E. C. Ferrara, P. S. Ray, and A. Sanna, "NICER confirms outburst of RX J0520.5–6932 and detects coherent pulsations", in [The astronomer's telegram](#), Vol. 16569 (2024).
- 3 M. Mandal, G. K. Jaisawal, S. Pal, K. Gendreau, **R. Sharma**, J. B. Coley, and C. Malacaria, "NICER observation of Be/X-ray binary pulsar 2S 1553–542 during its 2024 outburst", in [The astronomer's telegram](#), Vol. 16846 (2024).
- 4 M. Mandal, G. K. Jaisawal, S. Pal, and **R. Sharma**, "Probing the cyclotron resonant scattering feature in the X-ray pulsar 2S 1553–542 with NuSTAR during the 2024 outburst", in [The astronomer's telegram](#), Vol. 16859 (2024).
- 5 K. Roy, **R. Sharma**, H. Manikantan, and B. Paul, "Detection of mHz QPOs in BeXRB pulsar XTE J0111.2–731 (SXP 31.0) in SMC", in [The astronomer's telegram](#), Vol. 17204 (2025).

Talks & Posters

- Talks
- APM 2025, Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune – 11 Feb, 2025
 - Raman Research Institute, Bangalore – 30 Nov, 2024
 - National Space Science Symposium 2024, Goa University – 26 Feb - 01 Mar, 2024
 - 42nd Meeting of Astronomical Society of India (ASI 2024), IISc Bangalore – Feb 2024
 - SPASE, IIT Kanpur, India – November 2023
 - INAF-OAR, Rome, Italy – September 2023

Talks & Posters (continued)

- INAF-IAPS, Rome, Italy – September 2023
 - X-ray Universe 2023 Symposium, Athens, Greece – 13-16 June 2023
 - National Conference on REcent Trends in the study of Compact Objects (RETCO-V): Theory and Observation, Kodaikanal, India – 03-05 April 2023
 - 7-years of AstroSat Conference – September 28-29, 2022 [Invited]
 - Istanbul University Observatory Astrophysics talks series (online) – April 2022 [Invited]
 - Conference on 5 years of AstroSat – January 19-21, 2021
 - Department of Physics, University of Cagliari, Italy – 18 February 2020
 - Exploring the Universe: Near Earth Space Science to Extra-Galactic Astronomy (EXPUNIV-2018) at SBNBCBS, Kolkata – 14-17 November 2018
 - Recent Trends in the Study of Compact Objects (RETCO-III) 2017 at IIST Thiruvananthapuram – June 2017
- Poster
- X-ray Universe 2023 Symposium, Athens, Greece – 13-16 June 2023
 - XXXVI Meeting of Astronomical Society of India (ASI 2018)
 - XXXV Meeting of Astronomical Society of India (ASI 2017)

Skills

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|-------------|---|
| Languages | ■ Strong reading, writing and speaking competencies for English, Hindi. |
| Coding | ■ HEASOFT, XSPEC, Bash, Python, Gnuplot, C, \LaTeX , ... |
| Instruments | ■ <i>RXTE, NuSTAR, Suzaku, XMM-Newton, Chandra, NICER, Swift, AstroSAT, IXPE, XPoSat, ...</i> |
| Misc. | ■ Academic research, teaching, training, consultation, \LaTeX typesetting and publishing. |

Miscellaneous

Referee

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|-------|---|
| MNRAS | ■ Provided peer-review of manuscripts submitted to the MNRAS journal. |
| uGMRT | ■ Reviewer of observation proposals for upgraded Giant Meterwave Radio Telescope (uGMRT). |
| ESO | ■ Reviewer of observation proposals for the European Southern Observatory (ESO). |

Teaching/Mentorship

- Teaching Assistant (TA) for the course "Introduction to Astronomy and Astrophysics" at IUCAA, Pune
- X-ray Astronomy and Data Analysis lecture for the course "Astronomy Techniques" at IUCAA, Pune

Miscellaneous (continued)

- Advised Undergraduate student during Summer Project at the University of Delhi, Delhi, India (May-August 2016)
- Mentored Undergraduate student for Visiting Student Program (VSP) at RRI, Bangalore (May-June 2023)
- Advising PhD students about X-ray Astrophysics, data analysis and techniques

Press Releases/media outreach

- | | |
|---------------|---|
| DST | <ul style="list-style-type: none">https://dst.gov.in/coherent-pulsation-measured-high-energy-luminous-binary-star-system-cloud-orbiting-milky-way-canhttps://dst.gov.in/milli-second-burst-detected-astrosat-new-high-magnetic-field-neutron-star-can-help-understand-such |
| News Article | <ul style="list-style-type: none">https://www.thehindu.com/sci-tech/science/eclipses-of-binary-star-shed-light-on-orbiting-exoplanet/article17757774.ecehttps://timesofindia.indiatimes.com/india/astrosat-detects-unique-neutron-stars-milli-seconds-bursts/articleshow/106209052.cms?from=mdrhttps://government.economictimes.indiatimes.com/news/technology/milli-second-burst-detected-by-astrosat-to-help-understand-stellar-entities/106282252https://www.wionews.com/science/astrosat-detects-millisecond-bursts-from-new-magnetar-to-unveil-concealed-secrets-within-673435 |
| NICER Nuggets | <ul style="list-style-type: none">https://heasarc.gsfc.nasa.gov/docs/nicer/science_nuggets/20240404.html |
| Others | <ul style="list-style-type: none">https://phys.org/news/2022-12-explore-properties-x-ray-binary-lmc.html |

Services/Outreach

- Resource person at the ASTROCOSMOCON 2023, SGT University
- Coordinator of Weekly Journal Club “Very Sirius Meeting (VSM)” at Raman Research Institute (RRI), Bangalore
- Volunteer – Open Science Day at RRI and IUCAA for public outreach
- Evaluator at the National Children’s Science Congress (NCSC 2023) and provided guidance to students
- Tutor and co-organizer of High-Energy Data Analysis Workshop at Raman Research Institute, Bangalore, from Aug–Sep 2022
- Volunteered and assisted in organizing the Visitor’s Programme 2016 held at the University of Delhi in March 2016.
- LOC member of conference “*Stellar Variability*” organized by IUCAA, Pune