

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

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| 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

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| 2014 – 2021 |  Ph.D. Physics , University of Delhi.
Thesis title: <i>Study of transient X-ray binaries in the time and energy domains</i> .
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

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| 2023 |  AHEAD2020 TNA – INAF-IAPS, ITALY. |
| 2020 |  Copar 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

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| PI |  <i>XMM-Newton</i> – AO16 (20 ks)
 <i>AstroSAT</i> – To3 (80 ks), To5 (40 ks), A14 (60 ks)
 <i>NICER</i> – ToO (2+22 ks)
 <i>NuSTAR</i> – Cycle 10 (60 ks), Cycle 11 (60 ks), ToO (2 x 20 ks) |
| Co-I |  <i>AstroSAT</i> – 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. Jaiswal, 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. Jaiswal, 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

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| Talks | <ul style="list-style-type: none"> ■ 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 |
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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 SNBNCBS, 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, L ^A T _E X, ... |
| Instruments | ■ RXTE, NuSTAR, Suzaku, XMM-Newton, Chandra, NICER, Swift, AstroSAT, IXPE, XPoSat, ... |
| Misc. | ■ Academic research, teaching, training, consultation, L ^A T _E X typesetting and publishing. |

Miscellaneous

Referee

- 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

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| DST | <ul style="list-style-type: none">■ https://dst.gov.in/coherent-pulsation-measured-high-energy-luminous-binary-star-system-cloud-orbiting-milky-way-can■ https://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.ece■ https://timesofindia.indiatimes.com/india/astrosat-detects-unique-neutron-stars-milli-seconds-bursts/articleshow/106209052.cms?from=mdr■ https://government.economictimes.indiatimes.com/news/technology/milli-second-burst-detected-by-astrosat-to-help-understand-stellar-entities/106282252■ https://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*" orginized by IUCAA, Pune