

## Manoneeta Chakraborty

Department of Astronomy, Astrophysics  
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Indian Institute of Technology Indore  
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### RESEARCH INTERESTS

Compact objects (neutron stars, black holes); Pulsars; X-ray binaries; Thermonuclear bursts; Burst oscillations; Pulsars; Fast X-ray variability; Time-resolved X-ray spectroscopy; Accretion flows and accretion disk; Multi-wavelength study; Reprocessing of X-rays; Jets from compact stars; Magnetars; Magnetar bursts; Soft-gamma repeaters (SGRs), Anomalous X-ray pulsars (AXP); Ultra-luminous X-ray Sources (ULXs); Fast radio bursts (FRBs); AGNs

### ACADEMIC POSITIONS

**Assistant Professor** **August 2019 – present**  
*Discipline of Astronomy, Astrophysics and Space Engineering, Indore, India*  
*Indian Institute of Technology Indore*

**DST INSPIRE faculty fellow** **June 2017 – July 2019**  
*Discipline of Astronomy, Astrophysics and Space Engineering, Indore, India*  
*Indian Institute of Technology Indore*

**Post-doctoral research fellow** **January 2015 – April 2017**  
*High energy astrophysics group, Sabanci University Istanbul, Turkey*

**Visiting Researcher** **October 2014 – December 2014**  
*Inter-University Centre for Astronomy and Astrophysics Pune, India*  
*INAF-Brera Merate, Italy*

**Research Scholar** **August 2008 – August 2014**  
*Tata Institute of Fundamental Research Mumbai, India*

### EDUCATION

**PhD** **August 2010 – December 2014**  
*Tata Institute of Fundamental Research, Mumbai, India, Mumbai, India*  
Supervisor: Sudip Bhattacharyya  
Thesis: Probing accreting neutron stars using thermonuclear X-ray bursts

**Master of Science** **August 2008 – August 2010**  
Physics; 1<sup>st</sup> Class  
*Tata Institute of Fundamental Research, Mumbai, India, Mumbai, India*

**Bachelor of Science** **August 2005 – June 2008**  
Honours in Physics along with Mathematics and Statistics; 1<sup>st</sup> Class  
*Presidency College, University of Calcutta, Calcutta, India*

### ACHIEVEMENTS AND HONOURS

- Member of International Astronomical Union (IAU)
- Life member of the Astronomical Society of India (ASI)
- Recipient of grant under “AstroSat Data Utilization project” from ISRO (2020)
- INSPIRE Faculty Award under Department of Science and Technology (DST) in the July-2016 Session
- Reviewer for the Monthly Notices of the Royal Astronomical Society (MNRAS)
- Reviewer for the Journal of Astronomy and Astrophysics (JoAA)
- Member of POLIX (X-ray Polarimeter instrument) science teams on LMXBs with low magnetic field neutron stars and on Magnetars (2018)

- Member of Neutron Star international science working group for the Square Kilometre Array - India (2017)
- Reviewer of Astrosat science observing proposals
- Reviewer of uGMRT science observing proposals
- Personal Research Fund of 1400 USD awarded by Sabanci University (2016)
- TUBITAK (The Scientific and Technological Research Council of Turkey) proposal for postdoctoral research fellowship (2015)
- TUBITAK (The Scientific and Technological Research Council of Turkey) 2216 postdoctoral research fellowship for international researchers (2014)
- Presided as a judge at the Initiative for Research and Innovation in Science (IRIS) National Science Fair (2008), held at Science City, Kolkata, India organized by Department of Science and Technology (DST), Confederation of Indian Industry (CII) and Intel
- Scholarship from the Graduate school at TIFR for pursuing M.Sc. and PhD (2008)
- Scholarship for Integrated PhD program at the Indian Institute of Science (2008)
- Scholarship for the “Ingenieur Program” at Ecole Polytechnique, France (2008)
- Placed among the national top 1% in the National Graduate Physics Examination (NGPE 2007-2008), India
- All India 11<sup>th</sup> rank at the Joint Admission test for M.Sc. (JAM), 2008 held by the Indian Institute of Technology (IIT)

## TECHNICAL SKILLS

**Languages :** IDL, Python, C++, C, FORTRAN

**Astronomical Data :** RXTE, Neil Gehrels Swift Observatory, XMM-Newton, Astrosat, Chandra, NuStar, NICER, GMRT, VLA, MWA

**HeaSoft, Xspec, Tcl/Tk for X-ray data analysis**

**Astronomical Image Processing Software (AIPS), Common Astronomy Software Applications (CASA), PRESTO, DSPSR, PSRCRIVE for radio data analysis**

**Plotting :** Gnuplot, matplotlib in python, PGPLOT, Origin

**Numerical :** Mathematica, Numerical recipes, scipy

**Instrumentation :** X-ray, radio

**Operating Systems :** LINUX, WINDOWS

**Text Processing :** LaTeX, MS Office, OpenOffice

**Web tools :** HTML, CSS

**Parallel computation in multi-core machines**

## PUBLICATIONS IN PEER-REVIEWED JOURNALS

1. Tolga Guver, Z. Funda Bostanci, Tugba Boztepe, Ersin Gogus , Peter Bult, Unnati Kashyap, **Manoneeta Chakraborty**, David R. Ballantyne, R. M. Ludlam, C. Malacaria , Gaurava K. Jaisawal, Tod E. Strohmayer, Sebastien Guillot, and Mason Ng, *Burst-Disk Interaction in 4U 1636–536 as observed by NICER*, **ApJ**, 935, 154 (2022)
2. Unnati Kashyap, **Manoneeta Chakraborty**, and Sudip Bhattacharyya, *Probing spectral and temporal evolution of the neutron star low-mass X-ray binary 4U 1724-30 with AstroSat*, **MNRAS**, 512, 6180 (2022)
3. Vinokurov, A.; Atapin, K.; Bordoloi, O. P.; Sarkisyan, A.; Kashyap, U.; **Chakraborty, M.**; Rahna, P. T.; Kostenkov, A.; Solovyeva, Y.; Fabrika, S.; Safonova, M.; Gogoi, R.; Sutaria, F.; and Murthy, J., *Simultaneous X-ray/UV observations of ultraluminous X-ray source Holmberg II X-1 with Indian space mission AstroSat*, Accepted for publication in **Astrophysical Bulletin**, arXiv:2205.05204 (2022)

4. Parul Janagal, **Manoneeta Chakraborty**, N. D. Ramesh Bhat, Bhaswati Bhattacharya, and Samuel J. McSweeney, *Revisiting the sub-pulse drifting phenomenon in PSR J1822–2256: Drift Modes, Sparks, and Emission Heights*, **MNRAS**, 509, 4573 (2022)
5. Unnati Kashyap, Biki Ram, Tolga Guver, and **Manoneeta Chakraborty**, *Broad-band time-resolved spectroscopy of thermonuclear X-ray bursts from 4U 1636–536 using AstroSat*, **MNRAS**, 509, 3989 (2022)
6. Guver, Tolga; Boztepe, Tugba; Gogus, Ersin; **Chakraborty, Manoneeta**; Strohmayer, Tod E.; Bult, Peter; Altamirano, Diego; Jaisawal, Gaurava K.; Kocabiyik, Tugce; Malacaria, Christian; Kashyap, Unnati; Gendreau, Keith C.; Arzoumanian, Zaven; and Chakraborty, Deepto, *Thermonuclear X-ray Bursts with late secondary peaks observed from 4U 1608–52*, **ApJ**, 910, 37 (2021)
7. Vikas Chand, Jagdish C. Joshi, Rahul Gupta, Yu-Han Yang, Dimple, Vidushi Sharma, Jun Yang, **Manoneeta Chakraborty**, Jin-Hang Zou, Lang Shao, Yi-Si Yang, Bin-Bin Zhang, Shashi Bhushan Pandey, Ankush Banerjee, and Eman Moneer, *Magnetar giant flare originating from GRB 200415A: transient GeV emission, time-resolved  $E_p-L_{iso}$  correlation and implications*, **RAA**, 21, 9 (2021)
8. Yunus Emre Bahar, **Manoneeta Chakraborty**, and Ersin Göğüş, *Search for intermittent X-ray pulsations from neutron stars in low-mass X-ray binaries*, **PASA**, 38, e011 (2021)
9. Pattnaik, R., Sharma, K., Alabarta, K., Altamirano, D., **Chakraborty, M.**, Kembhavi, A., Mendez, M., and Orwat-Kapola, J. K., *A Machine Learning Approach For Classifying Low-mass X-ray Binaries Based On Their Compact Object Nature*, **MNRAS**, 501, 3457 (2021)
10. Yang, Jun, Chand, Vikas, Zhang, Bin-Bin, Yang, Yu-Han, Zou, Jin-Hang, Yang, Yi-Si, Zhao, Xiao-Hong, Shao, Lang, Xiong, Shao-Lin, Luo, Qi, Li, Xiao-Bo, Xiao, Shuo, Li, Cheng-Kui, Liu, Cong-Zhan, Joshi, Jagdish C., Sharma, Vidushi, **Chakraborty, Manoneeta**, Li, Ye, and Zhang, Bing, *GRB 200415A: A Short Gamma-Ray Burst from a Magnetar Giant Flare?*, **ApJ**, 899, 106 (2020)
11. Eda Vurgun, **Manoneeta Chakraborty**, Tolga Guver and Ersin Gogus, *Variable Absorption Line of XTE J1810–197*, **New Astronomy**, 67, 45 (2019)
12. N. Degenaar, D.R. Ballantyne, T. Belloni, **M. Chakraborty**, Y.P. Chen, P. Kretschmar, E. Kuulkers, L. Ji, T.J. Maccarone, J. Malzac, S. Zhang and S.N. Zhang, *Accretion disks and coronae in the X-ray flashlight*, **Space Science Reviews**, 214, 15 (2018)
13. **Manoneeta Chakraborty**, Yunus Emre Bahar and Ersin Gogus, *Time and energy dependent characteristics of thermonuclear burst oscillations*, **ApJ**, 851, 79 (2017)
14. Ersin Gogus, Lin Lin, Oliver J. Roberts, **Manoneeta Chakraborty**, Yuki Kaneko, Ramandeep Gill, Jonathan Granot, Alexander J. van der Horst, Anna L. Watts, Matthew Baring, Chryssa Kouveliotou, Daniela Huppenkothen, and George Younes, *Burst and Outburst Characteristics of Magnetar 4U 0142+61*, **ApJ**, 835, 68 (2017)
15. Ersin Gogus, Lin Lin, Yuki Kaneko, Chryssa Kouveliotou, Anna L. Watts, **Manoneeta Chakraborty**, M. Ali Alpar, Daniela Huppenkothen, Oliver J. Roberts, George Younes, and Alexander J. van der Horst, *Magnetar-like X-Ray Bursts from a Rotation-powered Pulsar, PSR J1119–6127*, **ApJL**, 829, 25 (2016)
16. **Manoneeta Chakraborty**, Ersin Gogus, Sinem Sasmaz Mus and Yuki Kaneko, *Variation of spectral and timing properties in the extended burst tails from the magnetar 4U 0142+61*, **ApJ**, 819, 153 (2016)
17. **Manoneeta Chakraborty** and Ersin Gogus, *An Extraordinary Outburst of the Magnetar Swift J1822.3–1606*, **ApJ**, 809, 152 (2015)

18. Sinem Sasmaz Mus, Ersin Gogus, Yuki Kaneko, **Manoneeta Chakraborty** and Berk Aydin, *Burst Tails from SGR J1550-5418 Observed with the Rossi X-Ray Timing Explorer*, **ApJ**, 807, 42 (2015)
19. **Manoneeta Chakraborty** and Sudip Bhattacharyya, *Evidence of Thermonuclear Flame Spreading on a Neutron Star from Burst Rise Oscillations*, **ApJ**, 792, 4 (2014)
20. **Manoneeta Chakraborty** and Sudip Bhattacharyya, *Thermonuclear X-ray bursts from the 401 Hertz accreting pulsar IGR J17498-2921: indication of burning in confined regions*, **MNRAS**, 422, 2351 (2012)
21. **Manoneeta Chakraborty**, Sudip Bhattacharyya and Arunava Mukherjee, *Terzan 5 transient IGR J17480-2446: variation of burst and spectral properties with spectral states*, **MNRAS**, 418, 490 (2011)
22. **Manoneeta Chakraborty** and Sudip Bhattacharyya, *X-ray bursts from the Terzan 5 transient IGR J17480-2446: nuclear rather than gravitational*, **ApJL**, 730, L23 (2011)

#### CONFERENCE PROCEEDINGS

1. Sudip Bhattacharyya, **Manoneeta Chakraborty**, Sudip Chakraborty, Nilam Navale, and Ajay Ratheesh, *Spectral and timing properties of the black hole X-ray binary MAXI J1820+070*, **cosp**, 43, 1556 (2021)
2. Sudip Bhattacharyya and **Manoneeta Chakraborty**, *A study of rising phases of thermonuclear X-ray bursts*, **cosp**, 40, 316 (2014)
3. **Manoneeta Chakraborty**, Arunava Mukherjee, and Sudip Bhattacharyya, *Frequent bursts from the 11 Hz transient pulsar IGR J17480-2446*, **ASInC**, 8, 97 (2013)

#### NON-REFEREED PUBLICATIONS

1. **Manoneeta Chakraborty** and Sudip Bhattacharyya, *Astrosat broadband characterization of the 2018 outburst of Swift J1756.9-2508*, **Astronomer's Telegram**, 11566 (2018)
2. **Manoneeta Chakraborty** and Sudip Bhattacharyya, *Thermonuclear burst oscillations from the 401 Hz pulsar IGR J17498-2921*, **Astronomer's Telegram**, 3643 (2011)
3. **Manoneeta Chakraborty** and Sudip Bhattacharyya, *Terzan 5 transient IGR J17480-2446: return of thermonuclear bursts or were they always there?*, **Astronomer's Telegram**, 3044 (2010)

#### OBSERVING PROPOSALS

1. *Soft X-ray observations of X-ray bursts from selected Low Mass X-ray Binaries with NICER*, accepted **NICER** proposal, 2020
2. *Spectro-timing studies of the continuum and burst emission from LMXB 4U 1608-52 using AstroSat*, accepted **Astrosat** ToO proposal, 2020
3. *Investigation of sub-pulse drifting properties for three pulsars*, accepted **MWA** proposal, 2020
4. *Investigation of sub-pulse drifting properties for five pulsars*, accepted **GMRT** proposal, 2020
5. *UVIT Observations on Radio Deep Field of ELAIS-N1*, accepted **Astrosat** proposal, 2020
6. *Multiwavelength spectral variability in ultra-luminous X-ray source Holmberg II X-1: testing the irradiated disk and the donor star*, accepted **Astrosat** AO proposal, 2019
7. *ASTROSAT ToO observations of the newly detected outburst of AMXP Swift J1756.9-2508*, accepted **Astrosat** ToO proposal, 2018
8. *Radio monitoring of the recent outburst of the transient low mass X-ray binary neutron star Aquila X-1*, accepted **GMRT** DDT proposal, 2017

**STUDENTS  
MENTORED /  
CO-MENTORED**

**Graduate students**

- *Unnati Kashyap* (since July 2018 - ongoing)
- *Parul Janagal* (since July 2018 - ongoing)
- *Biki Ram* (since December 2021 - ongoing)

**Postgraduate students (as thesis supervisor)**

- *Ansh Chopra*, Postgraduate student under the M.Sc. in Astronomy program at DAASE, IIT Indore, July 2022-
- *Amit Poonia*, Postgraduate student under the M.Sc. in Astronomy program at DAASE, IIT Indore, July 2022-
- *Hemanth Bommireddy*, Postgraduate student under the M.Sc. in Astronomy program at DAASE, IIT Indore, August 2020-July 2021
- *Vikrant Londhe*, Postgraduate student under the M.Sc. in Astronomy program at DAASE, IIT Indore, August 2020-July 2021
- *Biki Ram*, Postgraduate student under the M.Sc. in Astronomy program at DAASE, IIT Indore, May 2019-July 2020

**Project students**

- *Aryan Agrawal*, Summer intern student at IIT Indore, May-July 2022
- *Antariksha Mitra*, IAS summer project student at IIT Indore, Funded by the Summer Research Fellowship from the Indian Academy of Sciences, May-July 2021
- *Aniket Prasad*, IAS summer project student at IIT Indore, Funded by the Summer Research Fellowship from the Indian Academy of Sciences, May-July 2021
- *Vatsala Srivastava*, Undergraduate student at Stephen's College, Delhi (IAS summer project student at IIT Indore, Funded by the Summer Research Fellowship from the Indian Academy of Sciences), May-July 2019
- *Rohan Pattnaik*, Undergraduate student at IIIT Bhubaneswar, 2018 - ongoing
- *Bimlesh Kumar Yadav*, Integrated BS-MS, INSPIRE Research fellow at IISER Kolkata (Summer project student at IIT Indore), May-July 2018
- *Anirban Chakraborty*, Undergraduate student at University of Delhi (IAS summer project student at IIT Indore, Funded by the Summer Research Fellowship from the Indian Academy of Sciences), May-July 2018
- *Yunus Emre Bahar*, Undergraduate student at Sabanci University (co-mentored with Dr. Ersin Gogus), 2016-2017
- *Ozan Toyran*, Postgraduate student at Sabanci University (co-mentored with Dr. Ersin Gogus), 2016

**TEACHING**

**Indian Institute of Technology Indore, India**

- Detectors and Sensors for Space observations, PhD and postgraduate level, Autumn 2022
- Relativity and Cosmology, PhD and postgraduate level, Autumn 2022
- Advanced topics in Astronomy and Astrophysics, PhD and postgraduate level, Spring 2022
- Radio Astronomy, PhD and postgraduate level, Spring 2022
- Detectors and Sensors for Space observations, PhD and postgraduate level, Autumn 2021
- Relativity and Cosmology, PhD and postgraduate level, Autumn 2021
- Introduction to Astronomy, Undergraduate level, Autumn 2021

- Advanced topics in Astronomy and Astrophysics, PhD and postgraduate level, Spring 2021
- Radio Astronomy, PhD and postgraduate level, Spring 2021
- Introduction to Astronomy, B.Tech (2nd year), Autumn 2020
- Advanced topics in Astronomy and Astrophysics, PhD and postgraduate level, Spring 2020
- Radio Astronomy, PhD and postgraduate level, Spring 2020
- Introduction to Astronomy, Undergraduate level, Autumn 2019
- Electrodynamics, PhD and postgraduate level, Autumn 2019
- Galactic and Extra-galactic Astronomy, PhD and postgraduate level, and B.Tech. (4th year), Spring 2019
- Astrostatistics, PhD and postgraduate level, Spring 2019
- Introduction to Astronomy, Undergraduate level, Autumn 2018
- Astronomy laboratory, Postgraduate level, Spring 2019, Autumn 2018

## CONFERENCES AND SCHOOLS

### Invited Talks and Posters

- X-ray analysis lecture and hands-on session conducted as a part of AstroSprint Discovery Meeting (21-31 August 2021), an IAU–OAD project
- Invited talk given on “Investigations of magnetar flares and their implications” at the Stars, ISM and Galaxy session of Astronomical Society of India (ASI) 2021 meeting in February 18-23, 2021
- Invited talk given on “Positional Astronomy” at the Winter School in Observational Astronomy organized by MPCST, IIT Indore, and IIA held during February 1-12, 2021
- Invited lecture given on “Statistics Overview - II” at QIP course on GNSS and Space Weather held at IIT Indore in September, 2021
- Invited talk given on “Applications of ML in Astronomy and Astrophysics” at the Artificial Intelligence and Machine Learning NPIU/TEQIP-III meeting held at IIT Indore during December 7-17, 2020
- Lecture given on “Extreme Energies and Densest objects” at Winter School in Observational Astronomy at Varahamir Astronomical Observatory, Dongla Ujjain held from 29th January to 4th February 2020 organized by MPCST
- Given an invited colloquium at NCRA, Pune, India in 2019
- Participated and presented a talk “Observations by Indian multi-wavelength mission Astrosat” at the “Recent Advances in Space Science (RASS)” international workshop held at IIT Indore in 2019
- Talk given at the RETCO-IV (Recent Trends in the Study of Compact Objects: Theory and Observation) held at IUCAA, Pune, India in 2019
- Tutored in the international Cospar capacity building workshop - “Broadband Spectral and Timing Studies with Astrosat, Chandra and XMM-Newton” held at IISER, Mohali in 2019
- Talk given at TIFR, Mumbai, India in 2018
- Talk given at Multi-Wavelength Neutron Star Workshop held at BITS Pilani, Hyderabad campus, India in 2018
- Talk given at Saha Institute of Nuclear Physics (SINP), Kolkata, India in 2017
- Talk given at JINA-CEE International Symposium on “Neutron Stars in the Multi-Messenger Era: Prospects and Challenges” held at Ohio University, Athens, Ohio, USA in 2016

- Talk given at the Coronae in the X-ray flashlight international meeting organized at the International Space Science Institute – Beijing (ISSI-BJ), Beijing, China in 2015
- Talk given at Anton Pannekoek Institute, Amsterdam, Netherlands in 2014
- Talk given at SRON, Utrecht, Netherlands in 2014
- Talk given at Kapteyn Institute, Groningen, Netherlands in 2014
- Talk given at INAF - Osservatorio Astronomico di Brera , Italy in 2014
- Talk given at INAF - Osservatorio Astronomico di Bologna , Italy in 2014
- Talk given at INAF - Osservatorio Astronomico di Roma, Italy in 2014
- Poster presented at the Transients and Timing: A Multiwavelength Approach meeting held at Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India in 2013
- Talk given at X-ray View of Cosmos, Physical Research Laboratory (PRL), Ahmedabad, India in 2012
- Talk given at the Neutron Stars: Inside and Outside organized by the Astroparticle Physics and Cosmology Division of the Saha Institute of Nuclear Physics, Kolkata, India in 2012

#### **Contributed talks and posters**

- Participated in the virtual mini-conference titled “Compact Objects and Energetic Phenomena in the Multi-Messenger Era” held in 2020
- Participated and presented short talks on collaborative ideas in the Australia-India Research & Development in Radio Astronomy Meeting (ARDRA) meeting held at Lonavala, India during November, 2019
- Given a talk at the DST INSPIRE Faculty Fellows Review Meeting held at Visakhapatnam, India during in 2019
- Participated in discussion and planning in the Workshop on developing Astronomy themed experiments held in IUCAA, Pune, India in 2018
- Talk at the 2018 annual meeting of the Astronomical Society of India (ASI2018) held at Osmania University, Hyderabad, India in 2018
- Participated in the TMT science forum 2017 held at the Infosys campus, Mysore, India in 2017
- Talk at the WE-Heraeus Seminar on “Neutron Stars: A Cosmic Laboratory for Matter under Extreme Condition” held at Physikzentrum Bad Honnef, Germany in 2016
- Talk at the Annual NewCompStar Conference 2016 held at Bogazici University, Istanbul, Turkey in 2016
- Participated in the Neutron Star Workshop held at NCRA-TIFR, Pune, India in 2014
- Talk at the The Structure and Signals of Neutron Stars, from Birth to Death conference held at Florence, Italy in 2014
- Participated in the Indo-UK SXT Discussion Meeting held at TIFR, Mumbai, India in 2013 on the topic Multi-wavelength Astrophysics with Astrosat with SXT as the prime science driver
- Poster at the scientific event E1.3: Multi-wavelength Studies of Compact Objects with Focus on ASTROSAT of the 39th COPSAR Scientific Assembly held at Mysore, India in 2012
- Talk at the High Energy Astrophysics Winter School (HEAP12) held at Harishchandra Research Institute (HRI), Allahabad, India in 2012

- Talk at the international Advanced Workshop on X-ray Timing held at Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India in 2012
- Participated in the International Conference on Gravitation and Cosmology (ICGC) organized by the International Centre of Theoretical Sciences (ICTS) at Goa, India in 2011
- Participated in the Radio Astronomy School 2011 (RAS2011) held at National Centre for Radio Astrophysics (NCRA), TIFR, Pune, India
- Participated in the international conference Wide-band X-ray Astronomy: Frontiers in Timing and Spectroscopy on multi-wavelength Astronomy aiming at Astrosat held at Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India in 2011
- Participated in the SERC School on Astronomy and Astrophysics held at National Centre for Radio Astrophysics (NCRA), TIFR, Pune, India in 2010

## VISITS

- Visited NCRA for discussion colloquium and collaborative interactions in 2019
- Visited TIFR for a collaborative project in 2018
- Visited Professor Tomaso Belloni at INAF-Brera, Merate, Italy and Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India in 2014 under the project Probing General Relativity in the vicinity of Black Holes using ASTROSAT. This project was within the frame of the Executive Programme of Scientific and Technological Cooperation between the Italian Republic and the Republic of India
- Visited Dr. Didier Barret at IRAP, Toulouse, France in November, 2012 for two weeks under the Indo-French project Probing dense matter and strong gravity funded by the Indo-French Centre for the Promotion of Advanced Research (IFCPAR/ CEFIPRA)

## INSTRUMENTATION

- Setting-up of a X-ray/Gamma-ray detector (NaI scintillator) laboratory for carrying out postgraduate level experiments
- Calibration And performance study Of Astrosat CZTI prototype semiconductor X-ray detectors

## SCIENCE OUTREACH

- Member of SKA-India Working Group on Education and Outreach, 2021-ongoing
- ASI POEC associate, 2020-2022
- Outreach coordinator of DAASE, 2017-2022
- Outreach talk given as a part of **Nakshatra, IIT Indore's first Astronomy fest** on June 20, 2021
- Outreach Lecture given as a part of **Astro Adda** organized by Nehru planetarium, Nehru Memorial Museum and Library, and Public Outreach and Educational Committee, Astronomical Society of India on April 24, 2021
- **National Science Day**, February 28, 2021, co-organizer of day-long event organized at IIT Indore
- **Solar Eclipse Observation** event, June 21, 2020
- **National Science Day**, February 28, 2020, co-organizer of day-long event organized at IIT Indore
- **Celestial Silhouette**, December 26, 2019, solar eclipse observation event
- Astronomy outreach and night skywatch event for school students, October 18, 2019
- Organized astronomy sessions under IIT Indore outreach event for students from local villages and government schools under **Unnat Bharat Abhiyan**, 05, July 2019.



- Given invited introductory talk for high school students at the ‘**Telescope Making Workshop**’ organized by Vigyan Prasar at Kendriya Vidyalaya-I, Bhopal in 2019
- Organizing chair of **Multi-wavelength Sky Observations - AstroSat and Beyond** workshop and symposium focusing on Astrosat data analysis and hands-on training in 2019
- Organized outreach event **Reaching for the Stars** as a part of **100 Hours Of Astronomy Global Project** conducted by the International Astronomical Union (IAU)
- Organized an astronomy outreach event for 100 school students and IIT Indore family in 2018 as a part of the **Bapu Khagol Mela**
- Organized a **lunar eclipse/Super moon** event for 150 school students and IIT Indore family in 2017
- Actively participated in the TIFR **Frontiers of Science** outreach program for high school students from 2008-2010 and presented poster explaining various astrophysical aspects