Curriculum Vitae

Personal Details

Name:	Majidul Rahaman
Date of birth:	23 June, 1991
Designation:	Research scholar (INSPIRE Fellow)
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Research Interest

Galaxy clusters; Merging activities in a cluster of galaxies; Shock Fronts, Cold fronts, turbulence, and gas sloshing in intra-cluster medium (ICM); Thermodynamic structure of clusters; Investigating the mechanism of the origin of diffuse radio emission (Halo, Mini-Halo, Relic, Radio Phoenix) in the clusters; AGN feedback in clusters; cluster astrophysics and scaling relations; Large scale structure formations.

I am also interested in simulations on how the cluster dynamical states are related to the origin of diffuse radio emission in clusters.

Education

2016-present	PhD in Astronomy at **Indian Institute of Technology Indore (IITI), India.**
2013-2015	Master of Science in Physics from **Aligarh Muslim University (AMU).**
2010-2013	Bachelor of Science in Physics from **Aligarh Muslim University (AMU).**
2008-2010	Higher secondary (12th Standard) from **West Bengal Council of Higher Secondary Education, WB, India** Percentage: 83.6
2006-2008	Higher secondary (12th Standard) from **West Bengal Board of Secondary Education, WB, India** Percentage: 90

Technical skills

- **Observational Astronomy:**
  a) X-ray Observations: *Chandra* (ACIS-I & S), ASTROSAT (SXT, LXPC), *XMM*-Newton,
  b) Radio Observations: GMRT, VLA,
  c) Optical: UVIT (Astrosat), SDSS
- **Scientific Packages:** Chandra Interactive Analysis of Observations (**CIAO**), Science Analysis System (**SAS**) , **Heasoft**, **Xspec**, Common Astronomy Software Applications (**CASA**), The Astronomical Image Processing System (**AIPS**), Source Peeling and Atmospheric Modeling (**SPAM**), **PROFFIT**.

- **Pipeline:** Co-developer of a semi-automated **pipeline** to analyse *Chandra* X-ray observation, which produce thermodynamic maps of Galaxy Clusters.
- **Admin of cluster computer:** I have been admin of several server/cluster computers to operate, configure, and install astronomical packages for common use.
- **Programming Language:** Python, Shell/Bash script, IDL, C, C++, FORTRAN, tcl/Tk
- **Graphics:** Matplotlib, APLpy
- **Web tools :** HTML, CSS
- **Operating Systems:** Linux (CentOs, Ubuntu, Megeia), Mac-OS
- **Text Processing:** LaTeX, Overleaf, MS Office, LibreOffice

Research Experience

2016-present Indian Institute of Technology Indore. Working on merging activities in the cluster of galaxies with Dr. Abhirup Datta. I investigate how diffuse radio emission might be connected with the dynamical state of the cluster. We also developed a semi-automated pipeline to analyse *Chandra* X-ray observations.

2014-2015 As the MSc (Masters' degree) final project, I worked on "Supernova Remnants as a Source of High Energy Particles" under the supervision of Dr. Rafi Alam, Aligarh Muslim University, Aligarh, India. In this project, we have studied how supernovae accelerate particles.

2013-2014 As part of the Masters' degree project, I worked on "Study of Hypernuclei and Neutron Stars" under the supervision of Dr. Zafrul Hasan, Aligarh Muslim University, Aligarh, India. In this project, we have studied how Hypernuclei formed within Neutron stars.

Publications in peer-reviewed journals

1. **Majidul Rahaman**, Ramij Raja, Abhirup Datta, Jack O Burns, Brian Alden, and David Rapetti; *"An X-ray and Radio Study of the Hubble Frontier Field Cluster Abell S1063"*; Accepted for publication in **Monthly Notices of the Royal Astronomical Society**; [arXiv:2104.12872]; DOI: 10.1093/mnras/stab1225
2. **Majidul Rahaman**, Ramij Raja, Abhirup Datta, Jack O Burns, and David Rapetti; "*On the Origin of Diffuse Radio Emission in Abell 85 - Insights from X-ray and Radio Observations*"; Under review in **Monthly Notices of the Royal Astronomical Society**;
3. **Majidul Rahaman**, Ramij Raja, Abhirup Datta; *"Investigating the origin of diffuse radio emission in A1914 using Chandra X-ray observations"*; Under review to **Monthly Notices of the Royal Astronomical Society**;
4. Ramij Raja, **Majidul Rahaman**, Abhirup Datta, Reinout J. van Weeren, Huib T. Intema, Surajit Paul; *"A low-frequency radio halo survey of the South Pole Telescope SZ-selected clusters with the GMRT"*; **Monthly Notices of the Royal Astronomical Society**, Volume 500, Issue 2, January 2021, Pages 2236–2249; [arXiv:2011.01652];

DOI: 10.1093/mnras/staa3432

5. Ramij Raja, **Majidul Rahaman**, Abhirup Datta, Jack O. Burns, Brian Alden, H. T. Intema, R. J. van Weeren, Eric J. Hallman, David Rapetti and Surajit Paul; "*Probing the Origin of Diffuse Radio Emission in the Cool Core of the Phoenix Galaxy Cluster*"; **The Astrophysical Journal**, Volume 889, Issue 2, id.128, 10 pp. (2020); [arXiv:1912.07853]; DOI:10.3847/1538-4357/ab620d

6. Ramij Raja, **Majidul Rahaman**, Abhirup Datta, Jack O. Burns, Huib T. Intema, R. J. van Weeren, Eric J. Hallman, David Rapetti and Surajit Paul; "*Diffuse radio emission in the galaxy cluster SPT-CL J2031-4037: a steep spectrum intermediate radio halo?*"; **Monthly Notices of the Royal Astronomical Society: Letters**, Volume 493, Issue 1, p.L28-L32 (2020); [arXiv:2001.02365]; DOI:10.1093/mnrasl/slaa002

7. Pritpal Sandhu, Ramij Raja, **Majidul Rahaman**, Siddharth Malu, Abhirup Datta; "*Study of diffuse emission in cluster MACSJ0417.5-1154 from 76 MHz to 18 GHz*"; **Journal of Astrophysics and Astronomy**, Volume 40, Issue 2, article id. 17, 7 pp. (2019); DOI:10.1007/s12036-019-9585-2

Accepted Observational Proposals

upgraded Giant Metrewave Radio Telescope:

1. "*Investigating the origin of diffuse radio phoenices with the deep uGMRT observations*" as **Co-PI**, Proposal ID: 39_104

2. "*Spectral study of 5 new radio halo in SZ selected galaxy clusters*" as **Co-PI**, Proposal ID: 40_071

Teaching And Mentoring

2018-2019	Mentored two MSc students for their internship project on thermodynamic structure of galaxy clusters.
2018-2019	Teaching Assistant (TA) at Indian Institute of Technology Indore in MSc Astrostatistics (AA 608, Spring semester).
2018-2019	Teaching Assistant (TA) at Indian Institute of Technology Indore in MSc Astronomy Laboratory-II (Section: Optics) (AA 652, Spring semester).
2017-2018	Teaching Assistant (TA) at Indian Institute of Technology Indore in B-Tech 1st year Physics lab.

National Level Tests

1. **CSIR JRF in Physics, All India Rank (AIR) = 163; December-2015:**
The Council of Scientific and Industrial Research (CSIR) has entrusted the responsibility of conducting CSIR-UGC NET to National Testing Agency (NTA), India. CSIR-UGC NET is a test being conducted to determine the eligibility 'for Junior Research Fellowship (JRF) and for Lectureship/Assistant Professor' in Indian universities and colleges subject to fulfilling the eligibility criteria laid down by The University Grants Commission (UGC).

2. **GATE in Physics AIR-509; SCORE = 512; 2016:**
The Graduate Aptitude Test in Engineering (GATE) is an examination that primar-

ily tests the comprehensive understanding of various undergraduate subjects in engineering and science for admission into the Masters Programs, Doctoral programs, and Job in Public Sector Companies. GATE is conducted jointly by the Indian Institute of Science and seven Indian Institutes of Technologies at Roorkee, Delhi, Guwahati, Kanpur, Kharagpur, Chennai (Madras) and Mumbai (Bombay) on behalf of the National Coordination Board – GATE, Department of Higher Education, Ministry of Education (MoE), Government of India.

3. **JEST in Physics AIR = 560; 2016:**
   Joint Entrance Screening Test (JEST) is conducted by several premier research institutes for admission to PhD and Integrated PhD Program in its different participating institutions.

Fellowship and Awards

1. CSIR JRF in Physics (From 2016 onward).
2. Awarded the DST-INSPIRE Fellowship by DST on 19th October, 2016 for pursuing PhD in India.
3. DST-INSPIRE scholarship during bachelor and master degree. DST-INSPIRE Scholarship is awarded to the top 1% of the students for excellent performance in the board examinations (12th standard) and who pursue higher studied in basic or natural sciences. The scholarship is continued for a period of 5 years (BSc and MSc) based on the evaluation of their academic performance annually.
4. WEST BENGAL GOVT. MERIT-CUM-MEANS SCHOLARSHIP SCHEME (WBG M-C-M): For securing top 1% in the 12th standard board exam.
5. POST MATRIC SCHOLARSHIP (2009, 2010, 2011, 2012, 2013, 2014, 2015=7 times) - Govt. of West Bengal.

Workshop, Conference, and Meetings attended:

1. "*International Conference on Computational Mathematics in Nanoelectronics and Astrophysics*" hosted by Indian Institute of Technology Indore, Indore, during 1-3 November, 2018.
2. "*The 36th Annual Meeting of the Astronomical Society of India (ASI)*", hosted by Osmania University at Hyderabad, during 5 - 9 February, 2018.
3. "*Workshop on AstroSat Data Analysis*" sponsored by ISRO, hosted by AstroSat Science Support Cell (ASSC) at IUCAA, Pune, during 13th-26th November, 2017.
4. "*Chandra/CIAO Workshop*" Jointly organized by The National Centre for Radio Astrophysics, Tata Institute of Fundamental Research (NCRA-TIFR), Pune, and the Chandra X-Ray Center (CXC) in Cambridge, MA, during 23-27 October 2017.
5. Workshop On "*Data Intensive Science*", jointly organized by Inter-University Centre for Astronomy & Astrophysics (IUCAA) and Persistent Systems Ltd. (PSL), during 13 - 18th February, 2017.

Talks

1. "*Lesson from high fidelity temperature map of Abell 85 cluster of galaxies*" at the **37th Annual Meeting of the Astronomical Society of India (ASI)** hosted by Christ (Deemed to be University), Bengaluru during 18 - 22 February, 2019.

2. "*Temperature structure and merging activities in A85 cluster of galaxies*" at the **International Conference on Computational Mathematics in Nanoelectronics and Astrophysics**, hosted by Indian Institute of Technology Indore, Indore, during November 1-3, 2018.
3. "*Supernova Remnants as a Source of High Energy Particles*" at the **Department of Physics, A.M.U., Aligarh**, as part of M.Sc. thesis in 2nd June, 2015.
4. "*Study of Hypernuclei and Neutron Stars*" at the **Department of Physics, A.M.U., Aligarh**, as part of M.Sc. thesis in 27th Dec, 2014.

Poster Presentations

1. "*Investigating the origin of diffuse radio emission in galaxy clusters - using radio and X-ray observations*" at the **236th Virtual Meeting of the American Astronomical Society**, 1–3 June 2020.
2. "*Search for diffuse radio emission in cool core clusters*" at the **2019 URSI Asia-Pacific Radio Science Conference**, hosted by India Habitat Centre, New Delhi, India during 9-15 March, 2019.
3. "*Study of Galaxy Cluster Mergers - Lessons from High Fidelity X-ray Temperature Maps*" at **the 36th Annual Meeting of the Astronomical Society of India (ASI)**, hosted by Osmania University at Hyderabad during 5 - 9 February, 2018.
4. "*Study of Galaxy Cluster Mergers*" at the **Young Astronomers' Meet** SEPTEMBER 24-28, 2018 PRL, AHMEDABAD.

Languages

- Bengali (Mother tongue), English (Fluent), Hindi (Fluent), Urdu (beginner).

Science outreach

- 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 or 300 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

References

Dr. Abhirup Datta — Associate professor
Discipline of Astrophysics, Astronomy and Space Engineering (DAASE), IIT-Indore, India
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Webpage: http://iiti.ac.in/people/ abhirup.datta/

Dr. David Rapetti — Assistant Director of the NASA SSERVI team
Center for Astrophysics and Space Astronomy, University of Colorado, 389 UCB Boulder, Colorado 80309-0389, USA
E-mail: David.Rapetti@colorado.edu
Webpage: https://www.slac.stanford.edu/ drapetti/index.html

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