

# Esha Kundu

Assistant Professor, Grade - I  
Department of Physics  
IIT (ISM) Dhanbad,  
Dhanbad – 826004, Jharkhand, India

email: [eshakundu@iitsim.ac.in](mailto:eshakundu@iitsim.ac.in)  
[Esha.Kundu@anu.edu.au](mailto:Esha.Kundu@anu.edu.au)  
Off. Ph: +91 (0) 3262 235 229  
Phone (Mob): +91 7364083661

Visiting Assistant Professor (Adjunct)  
The Australian National University  
Canberra 2600, ACT, Australia

Homepage: <https://sites.google.com/iitism.ac.in/eshakundu/home>

ORCID ID: 0000-0002-4807-379X

ADS link - <https://rebrand.ly/ADSesha>

Google scholar: <https://scholar.google.com/citations?user=XPxogRoAAAAJ&hl=en>

## Experience

Assistant Professor, Grade – I *Nov 2023 – present*  
*Department of Physics, IIT (ISM) Dhanbad, Dhanbad 826004, Jharkhand, India*

Visiting Assistant Professor (Adjunct) *Jan 2025 – present*  
*The Australian National University, Canberra 2600, ACT, Australia*

Research Associate *August 2021 – Nov 2023*  
*Center for Data Intensive and Time Domain Astronomy, Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824, USA*  
*Postdoc Advisors – Prof. Jay Strader & Prof. Laura Chomiuk*

Research Associate *January 2019 – March 2021*  
*International Center for Radio Astronomy Research, Curtin University, Bentley, WA 6102, Australia*  
*Line manager – Late Prof. Jean-Pierre Macquart*

Ph.D. *September 2014 – December 2018 (Defended 8<sup>th</sup> Feb 2019, awarded 20<sup>th</sup> Feb 2019)*  
*Department of Astronomy, Stockholm University, SE-10691 Stockholm, Sweden*  
*Ph.D. Thesis - Radio emission from supernovae ( <https://rebrand.ly/THESISesha> )*  
*Ph.D. Advisors – Prof. Peter Lundqvist & Prof. Claes Fransson*

Research Scholar *July 2010 – August 2014*  
*Tata Institute of Fundamental Research, Homi Bhabha Road, Colaba, Mumbai 400005, India*  
*Research Topic – Study of gamma ray emission from extragalactic sources.*

## Education

Ph.D. *September 2014 – December 2018 (Defended 8<sup>th</sup> Feb 2019, awarded 20<sup>th</sup> Feb 2019)*  
*Department of Astronomy, Stockholm University, SE-106 91 Stockholm, Sweden*  
*Ph.D. Thesis - Radio emission from supernovae ( <https://rebrand.ly/THESISesha> )*  
*Ph.D. Advisors – Prof. Peter Lundqvist & Prof. Claes Fransson*

Research Scholar *July 2010 – August 2014*  
*Tata Institute of Fundamental Research, Homi Bhabha Road, Colaba, Mumbai 400005, India*  
*Research Topic – Study of gamma ray emission from extragalactic sources.*

M.Sc. in Physics *July 2008- May 2010*  
*Department of Physics, Indian Institute of Technology Bombay, Mumbai 400076, India*  
CPI – 8.95/10  
*Master thesis – Neutrino Oscillations*

B.Sc. (Hons. in Physics) July 2005- May 2008  
St. Xavier's College, University of Calcutta, Kolkata 700013, India  
Hons. Marks – 66.25% (First class)

## Research Interest in brief

---

- Blackhole, neutron star and white dwarf binaries in globular clusters.
- Theoretical modeling of radio emission from supernovae.
- Observations of core collapse and Type Ia supernovae.
- Theoretical modeling of propagation of radio waves from fast radio bursts and investigate their progenitors.
- Hydrodynamic simulations of supernova interaction with the circumstellar medium.

## List of publications

---

ADS link - <https://rebrand.ly/ADSesha>

Google scholar: <https://scholar.google.com/citations?user=XPxogRoAAAAJ&hl=en>

\* Represents corresponding author

### **A). Peer-reviewed Journal publications**

#### **D). As single/first author**

##### **Kundu, Esha\***

Is FRB 191001 embedded in a supernova remnant?, Monthly Notices of the Royal Astronomical Society Letters, Oxford University Press, 512, 1, 2022, L1-L5, <https://doi.org/10.1093/mnrasl/slac003> , Journal Impact Factor- 5.235.

##### **Kundu, Esha\*; Zhang, Bing**

Free-free absorption in hot relativistic flows: application to fast radio bursts, Monthly Notices of the Royal Astronomical Society Letters, Oxford University Press, 508, 1, 2021, L48-L52, <https://doi.org/10.1093/mnrasl/slab091> , Journal Impact Factor- 5.235.

##### **Kundu, Esha\*; Ferrario, Lilia**

The impact of the environment of white dwarf mergers on fast radio bursts, Monthly Notices of the Royal Astronomical Society, Oxford University Press, 492, 3, 2020, 3753–3762, <https://doi.org/10.1093/mnras/stz3593> , Journal Impact Factor- 5.235.

##### **Kundu, E.\*; Lundqvist, P.; Sorokina, E.; Perez-Torres, M. A.; Blinnikov, S.; O'Connor, E.; Ergon, M.; Chandra, P.; Das, B.**

Evolution of the Progenitors of SNe 1993J and 2011dh Revealed through Late-time Radio and X-ray Studies, The Astrophysical Journal, American Astronomical Society, IOP Publishing, 875, 1, 2019, 1-13, <https://doi.org/10.3847/1538-4357/ab0d81> , Journal Impact Factor- 5.521.

**Kundu, E.\***; Lundqvist, P.; Perez-Torres, M. A.; Herrero-Illana, R.; Alberdi, A.  
Constraining Magnetic Field Amplification in SN Shocks Using Radio Observations of SNe 2011fe and 2014J, The Astrophysical Journal, American Astronomical Society, IOP Publishing, 842, 1, 2017, 1-10, <https://doi.org/10.3847/1538-4357/aa704c> , Journal Impact Factor- 5.521.

**Kundu, Esha\***; Gupta, Nayantara\*  
Possible proton synchrotron origin of X-Ray & gamma ray emission in large scale jet of 3C 273, Monthly Notices of the Royal Astronomical Society Letters, Oxford University Press, 444, 1, 2014, L16-L19, <https://doi.org/10.1093/mnrasl/slu101> , Journal Impact Factor- 5.235.

**Kundu, Esha\***; Gupta, Nayantara\*  
Photo-Disintegration of Heavy Nuclei at the Core of Cen A, Journal of Cosmology and Astroparticle Physics, IOP Publishing, 2014, April 2014, 030, <https://doi.org/10.1088/1475-7516/2014/04/030> , Journal Impact Factor- 7.280.

## **II). As co-author**

Lundqvist, P.\*; **Kundu, E.**; Perez-Torres, M. A.; Ryder, S. D.; Bjornsson, C-I.; Moldon, Javier; Argo, M. K.; Beswick, R. J.; Alberdi, A.; Kool, E. C.  
The Deepest Radio Observations of Nearby SNe Ia: Constraining Progenitor Types and Optimizing Future Surveys, The Astrophysical Journal, American Astronomical Society, IOP Publishing, 890, 2, 2020, 1-16, <https://doi.org/10.3847/1538-4357/ab6dc6> , Journal Impact Factor- 5.521.

Maeda, K.\*; Chandra, P.; Matsuoka, T.; Ryder, S.; Moriya, T. J.; Kuncarayakti, H.; Lee, S.-H.; **Kundu, E.**; Patnaude, D.; Saito, T.; Folatelli, G.  
The final Months of massive Star Evolution from the circumstellar Environment around SN Ic 2020oi, The Astrophysical Journal, American Astronomical Society, IOP Publishing, 918, 1, 2021, 1-11, <https://doi.org/10.3847/1538-4357/ac0dbc> , Journal Impact Factor- 5.521.

Hosseinzadeh, G.\*; Sand, D.; Lundqvist, P.; Andrews, J.; Bostroem, K.; Dong, Y.; Janzen, D.; Jencson, J.; Lundquist, M.; Meza, N.; Pearson, J.; Valenti, S.; Wyatt, S.; Burke, J.; Howell, D.A.; McCully, C.; Newsome, M.; Padilla Gonzalez, E.; Pellegrino, C.; Terreran, G.; Kwok, L.; Jha, S.; Strader, J.; **Kundu, E.**; Ryder, S.; Haislip, J.; Kouprianov, V.; Reichart, D.  
Constraining the Progenitor System of the Type IaSupernova 2021aefx, The Astrophysical Journal Letters, American Astronomical Society, IOP Publishing, 933, 2, 2022, 1-14, <https://doi.org/10.3847/2041-8213/ac7cef> , Journal Impact Factor- 8.811.

Maeda, K.\*; Chandra, P.; Moriya, T. J.; Reguitti, A.; Ryder, S.; Matsuoka, T.; Michiyama, T.; Pignata, G.; Hiramatsu, D.; Bostroem, K. A.; **Kundu, E.**; Kuncarayakti, H.; Bersten, M. C.; Pooley, D.; Lee, S-H.; Patnaude, D.; Rodriguez, O.; Folatelli, G.  
A Multi-Wavelength View on the Rapidly-Evolving Supernova 2018ivc: An Analog of SN Iib 1993J but Powered Primarily by Circumstellar Interaction, The Astrophysical Journal, American Astronomical Society, IOP Publishing, 942, 1, 2023, 1-18, <https://doi.org/10.3847/1538-4357/aca1b7> , Journal Impact Factor- 5.521.

## **B. In conference proceeding**

**Kundu, E.\***, Lundqvist, P., Pérez-Torres, M. A.  
Constraints on environs around SN 2011fe and SN 2014J from radio modeling and observations, Proceedings of the International Astronomical Union, Symposium S331, 12, 2017, 69-74, <https://doi.org/10.1017/S1743921317005300>

### **C. Book Published**

**Kundu, Esha.**

Radio emission from supernovae.

Stockholm: Department of Astronomy, Stockholm University , 2019. , p. 68

ISBN: 978-91-7797-548-9 (print)

ISBN: 978-91-7797-549-6 (electronic)

<https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1270440&dswid=9326>

### **D. Manuscripts under preparation**

**Kundu, E.\***, et al. *The nature of compact objects in M22 and M4.*

**Kundu, E.\***, et al. *The radio, optical and X-ray evolution of Type II<sub>n</sub> SNe.*

**Kundu, E.\***, et al. *Constraining the progenitors of three SNRs type Ia.*

### **E. Astronomer's Telegrams (ATels)**

**Kundu, E.\***, Lundqvist, P. Ryder, S. D., et al.

Mass-loss rate constraint on the Type Ia SN 2021aefx from ATCA radio observations. ATel, 15077, 2021,

<https://www.astronomersteletgram.org/?read=15077>

**Kundu, E.\***, Ryder, S. D., Filipovic, M.D., et al.

Radio observations of SN 2020zbv. ATel, 14226, 2020, <https://www.astronomersteletgram.org/?read=14226>

**Kundu, E.\***, Ryder, S. D., Filipovic, M.D., et al.

Radio observations of SN 2020llx. ATel, 13805, 2020, <http://www.astronomersteletgram.org/?read=13805>

**Kundu, E.\***, Ryder, S. D., Filipovic, M.D., et al.

Radio detection from SN 2020ad. ATel, 13477, 2020, <http://www.astronomersteletgram.org/?read=13477>

**Kundu, E.\***, Ryder, S. D.

Radio observations of SN 2019mhm. ATel, 13040, 2019, <http://www.astronomersteletgram.org/?read=13040>

+ 17 other ATels as a coauthor.

### **Courses Taught/Teaching**

---

- Winter 2023-2024 (Jan 2024 – May 2024): Research Methodology & Statistics (PHD 571) Student Strength: 36 (Ph.D students)
- Monsson 2024-2025 (July 2024 – Nov 2024): Introduction to Astrophysics and Astronomy (PHO 302) Student Strength: 105 (5 and 7<sup>th</sup> Semester B.Tech students)
- Winter 2024 – 2025 (Jan 2025 – present): Astrophysics & Cosmology (PHD 511/NPHD 517) Student Strength: 17 (8<sup>th</sup> Sem B.Tech Students + Ph.D Students)

## Successful Observing Proposals

---

### As Principal Investigator (PI)

- *Dynamical evidence for a stellar-mass black hole in the globular cluster M22: a pilot*  
At MUSE, European Southern Observatory, cycle P115 (April 2025 - )
- *Investigating the progenitors of core-collapse supernova*  
at Australia Telescope Compact Array, Australia (Semester 2019OCTS - present)
- *Investigating the progenitors of Type Ia supernovae with the uGMRT*  
at Upgraded Giant Meterwave Radio Telescope (April 2018 semester)

### As Co-PI

- *Napa Observations of Core-Collapse Supernovae*  
at Australia Telescope Compact Array (Semester 2019OCTS - present)
- *Rapid ToO observations of Nearby Supernovae: Probing The Final Evolution of Massive Stars*  
at Atacama Large Millimeter Array (Cycle 8, 2022)
- *Investigating A Diversity in The Final Evolutions of Massive Stars toward Supernovae*  
at Atacama Large Millimeter Array (Cycle 7, 2019)
- *Probing Type Ia supernova progenitors with ACTA*  
at Australia Telescope Compact Array (Semester 2017OCTS – Semester 2020OCTS )
- *Unveiling the progenitor scenario of Type Ia supernovae*  
at European VLBI Network (Semester 2016, Semester 2020)
- *Probing Type Ia supernova progenitors with eMERLIN*  
at eMERLIN (January 2017 – 2020 )

## Academic activities

---

- Referee for Science Advances Journal.
- Referee for The Astrophysical Journal.
- Referee for the upgraded Giant Meter Radio Telescope (uGMRT) proposals.
- Referee for the European Southern Observatory (ESO) proposals.
- Scientific organizing committee member of Michigan State University Astronomy seminar (Jan 2022 – present).
- Ph.D. review panel member of Mr. Alexandar Williamson at ICRAR/Curtin University, Australia (2019 –2021).
- Master thesis review panel member of Mr. Keegan Smith at ICRAR/Curtin University, Australia (2019 –2021).
- Recruitment panel member for new Ph.D. students in 2017 in the Department of Astronomy, Stockholm University.
- Scientific organizer of biweekly supernova theory meeting in the Department of Astronomy, Stockholm University between September 2016 - December 2018.

## Conference organizer

---

- Scientific Organizing Committee member of the conference “Bridging the final stages of massive stars to supernovae and transients” (<https://mssn-iau2024.utu.fi/>) at the International Astronomical Union (IAU) general assembly. Will take place between August 13<sup>th</sup> and 14<sup>th</sup> 2024 in Cape Town, South Africa.
- Scientific Organizing Committee member of the conference ICRAR-CON 2019, took place in Bunkar Bay, Australia between September 24<sup>th</sup> - 26<sup>th</sup>, 2019.
- Local Organizing Committee member of the conference “Shocking Supernova” held in Stockholm, Sweden between May 28<sup>th</sup> - June 1<sup>st</sup>, 2018.

## Student supervising (Ph.D)

---

- July 2024 – present: Mr. Tanuj Dutta (Indian Institute of Technology (ISM) Dhanbad, India): Thesis Topic: Investigating black holes and compact objects in dense environment
- July 2024 – present: Mr. Aditya Pandey (Indian Institute of Technology (ISM) Dhanbad, India); Thesis topic: Fast radio bursts in the local universe.

## Student supervising (M.Sc/internship)

---

- July 2024 – present: Mr. Ajeet Singhal (Indian Institute of Technology (ISM) Dhanbad, India); M.Sc Thesis topic: Investigation radio emission from supernova.
- July 2024 – present: Mr. Ritik Gupta (Indian Institute of Technology (ISM) Dhanbad, India); M.Sc Thesis topic: X-ray radiation from supernovae.
- Jan 2025 – present: Santhosh J (Central University of Tamil Nadu): M.Sc Thesis Title: Optical emission from Type Ia supernovae
- Feb 2024 – June 2024: Shubham Pathy (Central University of Haryana): M.Sc Thesis Title: Exploring LMXBs in Globular Clusters through interstellar scintillation
- May 2024 – July 2024; December 2024 - present: Samarth V (IISER Thiruvananthapuram): Summer Internship Topic: Exploring progenitors of fast radio bursts
- May 2024 – July 2024; December 2024 - present: Pragyan Mohapatra (IISER Thiruvananthapuram): Summer Internship Topic: Understanding polarization properties of fast radio bursts
- May 2024 – July 2024; Gagan Arora (HRI, Allahabad): Summer Internship Topic: Radio emission from supernovae.
- May 2024 – July 2024; Saptarshi Pandey (IISER Pune): Summer Internship Topic: Investigating compact objects dense clusters.
- May 2024 – July 2024; Shreya Chaudhury (IISER Mohali): Summer Internship Topic: Radio emission from

compact objects.

- May 2024 – July 2024; Ayush Kumar (NIT Rourkela): Summer Internship Topic: Radiative transfer in astrophysics
- May 2024 – July 2024; Sparsha Roy (IISER Mohali): Summer Internship Topic: Scintillation in Radio wavelengths
- May 2023 – August 2023: Emma Dugan (Michigan State University); Summer internship Project title: Fast radio bursts from low-mass X-ray binaries in the local universe.

## Colloquiums and Invited talks

---

- Seminar: *Compact objects in Globular Clusters*. On 19<sup>th</sup> June 2024 at Raman Research Institute, India
- Michigan State University Astronomy Seminar: *Compact objects in Globular Clusters*. On Jan 25 2023, at Michigan State University, USA.
- ICRAR/Curtin University Colloquium: *Radio emission from SNe Ia*. On June 25 2019, at Curtin Institute of Radio Astronomy, Curtin University, WA, Australia.
- Macquarie University Astroseminar: *SNe I Ib in radio*. On April 12, 2019 at Macquarie University, NSW, Australia.
- The Australia Telescope National Facility (ATNF) Colloquium: *Radio emission from SNe Ia*. On April 10, 2019 at CSIRO, Marshfield, NSW, Australia.

## Contributed talks

---

- “*The MAVERIC survey: Nature of compact objects in globular clusters M22 and M4*” in the conference MODEST 23: Star Clusters In the Post-Pandemic Era. Will hold between August 28<sup>th</sup> and September 1<sup>st</sup>, 2023, at Northwestern University, Evanston, IL, USA.
- “*The MAVERIC survey: Nature of compact objects in globular clusters M22 and M4*” in the conference Timing and Imaging of compact sources with SKA pathfinders and precursors. Held between 12<sup>th</sup> and 18<sup>th</sup> June 2023 at Kerastari, Tripolis, Greece.
- “*The MAVERIC survey: Nature of compact objects in globular clusters M22 and M4*” in Compact Object meeting. Will hold on 12<sup>th</sup> May 2023 at Wayne State University, USA.
- “*Propagation of Fast Radio Bursts through White Dwarf Merger Ejecta*” in Fast Radio Bursts 2020 Thailand meeting. Held online between July 6<sup>th</sup> –9<sup>th</sup>, 2020 due to COVID 19. Originally planned to be held on March 23-27, 2020, in Phuket, Thailand.
- “*Detailed modeling of late time radio emission from SNe 2011dh and 1993J*” in the conference on Shocking Supernova. Held between May 28<sup>th</sup> – June 1<sup>st</sup>, 2018 in Stockholm, Sweden.
- “*Constraining magnetic field magnification in SN shocks using radio observations of SNe 2011fe and 2014J*” in the conference SN 1987A, 30 years later- Cosmic Rays and Nuclei from Supernovae and their aftermaths, IAU Symposium 331. Held between February 20<sup>th</sup> – 24<sup>th</sup>, 2017 in Saint-Gilles-Les-Bains, La Réunion Island, France.

- “*Constraining magnetic field magnification in SN shocks using radio observations of SNe 2011fe and 2014J*” in Stockholm-Uppsala Ph.D. Workshop. Held between November 18<sup>th</sup> – 19<sup>th</sup>, 2016 in Fursund, Sweden.

## Invited Talks at Astronomy Journal clubs

---

- “*Is FRB 191001 embedded in a supernova remnant?*” at Michigan State University on 20<sup>th</sup> Jan, 2022.

- “*Free-free absorption in hot relativistic flows: application to fast radio bursts*” at Michigan State University on 7<sup>th</sup> Dec, 2022.

- “*Repeating fast radio bursts detected by CHIME*” at International Center for Radio Astronomy Research, Curtin University on 20<sup>th</sup> April, 2020.

## Supercomputer time award

---

Project Title: *Supernova interaction with ambient media*.

Award: 371,000 processor hours on Beskow at Swedish National Infrastructure for Computing (SNIC) for the duration 17<sup>th</sup> December 2017 – 30<sup>th</sup> November 2018.

## Academic achievements

---

- Obtained TIFR Mumbai Ph.D research scholar position in 2010 through TIFR entrance test.
- All India Rank 69 (obtained 98.27 percentile) in the Joint Entrance Screening Test (JEST) 2010.
- All India Rank 51 in CSIR National Eligibility Test (CSIR-NET) 2010.
- All India Rank 203 in Graduate Aptitude Test in Engineering (GATE) 2010.
- All India Rank 75 in Joint Admission Test for M.Sc (JAM) 2008.

## Computational Skills

---

Programming language: C++, Fortran, ROOT, Python

Astronomy analysis software: CASA, Miriad

Astronomical visualization and tabulation applications: SAOImageDS9, TOPCAT

Simulation code: FLASH

Plotting software: Python, ROOT, Gnuplot

## Poster presentations

---

- “*The impact of the environment of white dwarf mergers on fast radio bursts*” in CASS Radio Astronomy School. Held between September 30<sup>th</sup> - October 4<sup>th</sup>, 2019 at CSIRO Narrabri, NSW, Australia.

-Poster + 2 mins talk on “*Modeling of radio and X-ray emission from Type Ia SNe*” in European Week of Astronomy and Space Science (EWASS) meeting. Held between June 22<sup>th</sup> – 26<sup>th</sup>, 2015 in Tenerife, Spain.



## Workshops attended

---

- *CASS Radio Astronomy School*. Held between September 30<sup>th</sup> - October 4<sup>th</sup>, 2019 at CSIRO Narrabri, NSW, Australia.
- *Stockholm-Uppsala Ph.D. Workshop*. Held between November 18<sup>th</sup> – 19<sup>th</sup>, 2016 in Fursund, Sweden.
- *Workshop on Future of Dark Matter Astro-Particle Physics: Insights and Perspectives*. Held between October 8<sup>th</sup> – 11<sup>th</sup>, 2013 in ICTP, Trieste, Italy.
- *International school on Cosmic Accelerators*. Held between April 29<sup>th</sup> – May 8<sup>th</sup>, 2013 at Institut d'Etudes Scientifiques de Cargese, Corsica, France.

## Rewards/Funding

---

- Travel funding from IIT (ISM) Dhanbad and accommodation & local expenses from the Australian National University (ANU) to visit ANU in December 2024.
- Rewarded full travel grant from ICTP, Italy to attend the workshop on the *Future of Dark Matter Astro-Particle Physics: Insights and Perspectives*. Held between October 8 – 11, 2013 in ICTP, Trieste, Italy.
- Rewarded 600 Euros to attend the *International school on Cosmic Accelerators*. Held between April 29<sup>th</sup> – May 8<sup>th</sup>, 2013 in Institut d'Etudes Scientifiques de Cargese, Corsica, France.

## Key research collaborators

---

Jay Strader (MSU, USA), Laura Chomiuk (MSU, USA), Lilia Ferrario (ANU, Australia), Bing Zhang (UNLV, USA), Sebastian Kamann (LJMU, UK), Ryan Urquhart (MSU, USA), Arash Bahramian (ICRAR/CU, Australia), Stuart Ryder (MU, Australia), Rami Alsaberi (WSU, Australia), Miroslav Filipovic (WSU, Australia), Keiichi Maeda (KU, Japan), Lucas Guillemot (CNRS, France).

## Science Outreach

---

- 2011 TIFR Mumbai Open Day outreach
- 2012 TIFR Mumbai Open Day outreach
- 2013 TIFR Mumbai Open Day outreach
- 2017 Stockholm University Science outreach