

Samir Choudhuri

CONTACT INFORMATION	Samir Choudhuri Department of Physics Indian Institute of Technology Madras Chennai - 600036 India	<i>Telephone:</i> +91 (0) 44 2257 4865 (office) +91 (0) 9732038058 (Mobile) <i>E-mail:</i> samir@iitm.ac.in, samir.svc@gmail.com https://physics.iitm.ac.in/samir
NATIONALITY	Indian	
RESEARCH INTERESTS	Cosmic Dawn and Epoch of Reionization, 21-cm Cosmology, Low Frequency Radio Interferometry, Statistical Inference, Diffuse Synchrotron Emission	
ACADEMICS	Assistant Professor, Indian Institute of Technology Madras Post Doctoral Fellow, Queen Mary University of London Post Doctoral Fellow, National Centre for Radio Astrophysics-TIFR, India Ph.D., Indian Institute of Technology Kharagpur, India M.Sc. in Physics, Jadavpur University, Kolkata-India, Performance: 1st Class B.Sc. in Physics, Suri Vidyasagar College, India, Performance: 1st Class	2022-present 2019-2022 2016-2019 2011-2016 2009-2011 2006-2009
FUNDED PROJECTS	SERB Start-up Research Grant (SRG): Measuring the Cosmological 21-cm Signal using the Square Kilometre Array (INR 31.7 Lakhs) SERB MATRICS: Study of the Galactic synchrotron radiation using Murchison Widefield Array (INR 6 Lakhs) Royal Astronomical Society Undergraduate Summer Bursary: Project student - Shashank Ramesh (GBP 450)	
FELLOWSHIPS AWARDS AND MEMBERSHIPS	<ul style="list-style-type: none">• Fellow of the Royal Astronomical Society (FRAS) (since Feb, 2021)• Member of the Hydrogen Epoch of Reionization (HERA) collaboration (since 2021)• Royal Astronomical Society Undergraduate Summer Bursary (project student- Romain Pioch, Paris) (2020)• South African Radio Astronomy Observatory (SARAO) Fellowship 2018 (not accepted)• Member of the Square Kilometre Array (SKA)-International EoR science working group (since 2021)• Member of the SKA-India “Epoch of Reionization and Cosmology” science working group (since 2015)• CSIR-UGC, India, Junior Research Fellowship, 2011• Qualified in Graduate Aptitude Test (GATE), 2011• CSIR-UGC, India, Junior Research Fellowship, 2010	
REFEREED PUBLICATIONS	Total Publications:38, First author:10, As a co-author:25, Conference proceedings:3 Total Citations:500, h-index:13, i10-index:16 <ol style="list-style-type: none">1. <i>Patterns of primary beam non-redundancy in close-packed 21 cm array observations</i> S. Choudhuri, P. Bull, H. Garsden. 2021, MNRAS, 506, 20662. <i>Angular power spectrum of supernova remnants: effects of structure, geometry and diffuse foreground</i> S. Choudhuri, P. Saha, N. Roy, S. Bharadwaj, J. Dey. 2021, MNRAS, 501, 3364	

3. *All sky angular power spectrum: I. Estimating brightness temperature fluctuations using TGSS 150 MHz survey*
S. Choudhuri, Abhik Ghosh, Nirupam Roy et al. 2020, MNRAS, 494, 1936
4. *An Image-based Tapered Gridded Estimator (ITGE) for the angular power spectrum*
S. Choudhuri, P. Datta, S. Bharadwaj 2019, MNRAS, 483, 3910
5. *Turbulent power spectrum in warm and cold neutral medium using the Galactic H I 21 cm emission*
S. Choudhuri, N. Roy 2019, MNRAS, 483, 3437
6. *Validating a novel angular power spectrum estimator using simulated low frequency radio-interferometric data*
S. Choudhuri, N. Roy, S. Bharadwaj, Sk. S. Ali, A. Ghosh, P. Dutta, 2017, New Astronomy, 57, 94
7. *The angular power spectrum measurement of the Galactic synchrotron emission in two fields of the TGSS survey*
S. Choudhuri, S. Bharadwaj, Sk. S. Ali, N. Roy, H. T. Intema, A. Ghosh, 2017, MNRAS Letters, 470, L11
8. *The visibility based Tapered Gridded Estimator (TGE) for the redshifted 21-cm power spectrum*
S. Choudhuri, S. Bharadwaj, S. Chatterjee, Sk. S. Ali, N. Roy, A. Ghosh, 2016, MNRAS, 463, 4093
9. *Tapering the sky response for angular power spectrum estimation from low-frequency radio-interferometric data*
S. Choudhuri, S. Bharadwaj, N. Roy, A. Ghosh, Sk. S. Ali, 2016, MNRAS, 459, 151
10. *Visibility-based angular power spectrum estimation in low-frequency radio interferometric observations*
S. Choudhuri, S. Bharadwaj, A. Ghosh, Sk. S. Ali, 2014, MNRAS, 445, 4351

With significant contribution:

11. *A demonstration of the effect of fringe-rate filtering in the Hydrogen Epoch of Reionization Array delay power spectrum pipeline*
H. Garsden, P. Bull, M. Wilensky,, **S. Choudhuri** et al. , 2024, arXiv:2402.08659
12. *Hydrogen Epoch of Reionization Array (HERA) Phase II Deployment and Commissioning*
L. M. Berkhout, D. C. Jacobs,, **S. Choudhuri** et al., 2024, arXiv:2401.04304
13. *matvis: A matrix-based visibility simulator for fast forward modelling of many-element 21 cm arrays*
P. Kittiwisit, S. G. Murray, H. Garsden,, **S. Choudhuri** et al. , 2024, arXiv:2312.09763
14. *Towards 21-cm intensity mapping at $z=2.28$ with uGMRT using the tapered gridded estimator III: Foreground removal*
A. Elahi, S. Bharadwaj, A. Ghosh, S. Pal, A. Ghosh, Sk. S. Ali, **S. Choudhuri**, et al. , 2023, MNRAS, 525, 3439
15. *Statistical recovery of 21cm visibilities and their power spectra with Gaussian constrained realisations and Gibbs sampling*
F. Kennedy, P. Bull, M. Wilensky, Jacob Burba, **S. Choudhuri**, 2023, The Astrophysical Journal Supplement Series, 266, 23
16. *SKA Science Data Challenge 2: analysis and results*
P. Hartley, A. Bonaldi, R. Braun,....., **S. Choudhuri** et. al., 2023, MNRAS, 523, 1967
17. *Improved Constraints on the 21 cm EoR Power Spectrum and the X-Ray Heating of the IGM with HERA Phase I Observations*
The HERA Collaboration including **S. Choudhuri**, 2023, The Astrophysical Journal, 945, 124

18. *Towards 21-cm intensity mapping at $z=2.28$ with uGMRT using the tapered gridded estimator II: Cross-polarization power spectrum*
A. Elahi, S. Bharadwaj, A. Ghosh, S. Pal, Sk. S. Ali, **S. Choudhuri**, et al. , 2023, MNRAS, 520, 2094
19. *The tracking tapered gridded estimator for the power spectrum from drift scan observations*
S.Chatterjee, S. Bharadwaj, **S. Choudhuri**, S. Sethi, A. K. Patwa, 2022, MNRAS, 519, 2410
20. *Probing early universe through redshifted 21-cm signal: Modelling and observational challenges*
A. K. Shaw, A. Chakraborty, M. Kamran, R. Ghara, **S. Choudhuri** et. al., 2023, JoAA, 44, 4
21. *Detecting galaxies in a large HI spectral cube*
A. K. Shaw, M. Jagannath, A. Mazumder, A. Chakraborty, N. N. Patra, R. Mondal, **S. Choudhuri** , 2022, JoAA, 43, 99
22. *Improved Constraints on the 21 cm EoR Power Spectrum and the X-Ray Heating of the IGM with HERA Phase I Observations*
HERA Collaboration, 2022, accepted in The Astrophysical Journal, arxiv:2210.04912
23. *Towards 21-cm intensity mapping at $z = 2.28$ with uGMRT using the tapered gridded estimator I: Foreground avoidance*
S. Pal, A. Elahi, S. Bharadwaj, S. Ali, **S. Choudhuri**, A. Ghosh, A. Chakraborty, A. Datta, N. Roy, M. Choudhury, P. Dutta, 2022, MNRAS, 516, 2851
24. *Calibration requirements for Epoch of Reionization 21-cm signal observations - II. Analytical estimation of the bias and variance with time-correlated residual gains*
J. Kumar, P. Dutta , **S. Choudhuri** , N. Roy, 2022, MNRAS, 512, 186
25. *The auto and cross angular power spectrum of the Cas A supernova remnant in radio and X-ray*
P. Saha, S. Bharadwaj, S. Chakravorty, N. Roy, **S. Choudhuri**, H. M. Gunther, R. K. Smith , 2021, MNRAS, 502, 5313
26. *Stringent constraint on the radio signal from dark matter annihilation in dwarf spheroidal galaxies using the TGSS*
A. Basu, N. Roy, **S. Choudhuri**, K. K. Datta, D. Sarkar , 2021, MNRAS, 502, 1605
27. *First multi-redshift limits on post-Epoch of Reionization (post-EoR) 21 cm signal from $z = 1.96 - 3.58$ using uGMRT*
A. Chakraborty, A. Datta, N. Roy, S. Bharadwaj, T. R. Choudhury, K. K. Datta, S. Pal, M. Choudhury, **S. Choudhuri**, P. Dutta, D. Sarkar, 2021, Astrophysical Journal Letters, 907, L7
28. *Demonstrating the Tapered Gridded Estimator (TGE) for the Cosmological HI 21-cm Power Spectrum using 150 MHz GMRT observations*
S. Pal, S. Bharadwaj, A. Ghosh, **S. Choudhuri**, 2021, MNRAS, 501, 3378
29. *Characterizing EoR foregrounds: A study of the Lockman Hole Region at 325 MHz*
A. Mazumder, A. Chakraborty, A. Datta, **S. Choudhuri** et al. 2020, MNRAS, 495, 4071
30. *A study of Kepler's supernova remnant: angular power spectrum estimation from radio frequency data*
P. Saha, S. Bharadwaj, N. Roy, **S. Choudhuri** et al. 2019, MNRAS, 489, 5866
31. *Detailed study of ELAIS N1 field with the uGMRT - II. Source properties and spectral variation of foreground power spectrum from 300-500 MHz observations*
A. Chakraborty, N. Roy, A. Datta, **S. Choudhuri** et al. 2019, MNRAS, 490, 243
32. *Detailed study of ELAIS N1 field with the uGMRT - I.Characterizing 325 MHz foreground for redshifted 21 cm observation*
A. Chakraborty, A. Datta, **S. Choudhuri** et al. 2019, MNRAS, 487, 4102

33. *A Tapered Gridded Estimator (TGE) for the Multi-Frequency Angular Power Spectrum (MAPS) and the Cosmological HI 21-cm Power Spectrum*
S. Bharadwaj, S. Pal, **S. Choudhuri** et al. 2019, MNRAS, 483, 5694
34. *Imaging the redshifted 21-cm pattern around the first sources during the cosmic dawn using the SKA*
R. Ghara, T. Roy Choudhury, K. K. Datta, **S. Choudhuri**, 2017, MNRAS, 464, 2234
35. *The prospects of measuring the angular power spectrum of the diffuse Galactic synchrotron emission with SKA1 Low*
Sk. S. Ali, S. Bharadwaj, **S. Choudhuri**, A. Ghosh, N. Roy, 2016, JOAA, 37, 35

Publications in Conference Proceedings

36. *The angular power spectrum measurement of the Galactic synchrotron emission using the TGSS survey*
S. Choudhuri, S. Bharadwaj, Sk. S. Ali, N. Roy, H. T. Intema, A. Ghosh, 2018, Proceedings of the International Astronomical Union, 333, 157
37. *Prospects of detection of the first sources with SKA using matched filters*
R. Ghara, T. R. Choudhury, K. K. Datta,....., **S. Choudhuri**,....., Sambit K. Giri, 2018, Proceedings of the International Astronomical Union, 333, 122
38. *Foreground simulation and power spectrum estimation for 610 MHz GMRT observations*
S. Choudhuri, S. Bharadwaj, Sk. S. Ali, 2014, ASI Conference Series, 13, 315

MEMOS

1. #081: *1D Beam Expansion Models for the HERA Primary Beam*
S. Choudhuri, P. Bull, N. Kern, 2020
http://reionization.org/wp-content/uploads/2013/03/HERA081_HERA_Primary_Beam_Chebyshev_Apr2020.pdf

CONFERENCES, WORKSHOPS, PROFESSIONAL TALKS AND POSTERS

- Workshop on Advanced 21-cm Cosmology, NISER Bhubaneswar (**Invited talk**) Dec 2023
- 7th Physics In-house Symposium 2023, IIT Madras (**Invited talk**) Oct 2023
- Summer Training Programme in Physics, University of Madras (**Invited talk**) July 2023
- Frontiers in Cosmology, RRI-Bangalore (**Invited talk**) Feb 2023
- Mini School on Gravitation and Cosmology, IIT Madras (**Invited talk**) Nov 2022
- Workshop on 21-cm Cosmology in the SKA Era, ISI-Kolkata (**Invited talk**) Oct-Nov 2022
- A precursor view of the SKA Sky International Webinar (**Oral**) Mar 2021
- SKA International EoR Science Working Group monthly meeting (**Oral**) Feb 2021
- SKA India Cosmic Dwan and EoR Online seminar, India (**Oral**) Jan 2021
- Online seminar at “Packed Ultra-wideband Mapping Array (PUMA)”, USA (**Oral**) Jan 2021
- URSI National Radio Science Meeting, Univ. of Colorado, Boulder, USA (**Oral**) Jan 2021
- Hydrogen Epoch of Reionization Array (HERA) Datacon, USA (**Oral**) Dec 2020
- International webinar on “A Journey from Quark to Universe”
Balarampur College, India (**Oral-Invited**) Sept 2020
- One-day International webinar, BB College, Asansol - India (**Oral-Invited**) June 2020
- The First Billion Years of the Universe, IIT Indore - India (**Oral-Invited**) Jan 2020
- HERA Annual Meeting, Institute of Astronomy, Cambridge, UK Sept 2019
- 21-cm Cosmology Meeting, University of Cambridge - UK (**Oral**) April 2019
- Astronomy Coffee Seminar, University of Cambridge - UK (**Oral**) April 2019
- London Relativity and Cosmology Seminar, Queen Mary, London - UK (**Oral**) April 2019
- SKA Key Science Workshop, Jodrell Bank, Macclesfield - UK (**Oral**) April 2019
- SKA General Science Meeting, Jodrell Bank, Macclesfield - UK (**Poster**) April 2019
- The Metrewavelength Sky Conference - II, NCRA, India (**Poster**) March 2019
- Frontiers in 21 cm Cosmology, Kodaikanal Solar Observatory -India (**Oral**) Dec 2018
- Lecture course on Optical/Infrared Interferometry, IUCAA-India April 2018
- ASI Annual Meeting, Osmania University -India (**Oral, Thesis Presentation**) Feb 2018

- Universe after the first 200 million years, Presidency University-India (**Oral-Invited**) Dec 2017
- IAU Symposium: Peering towards Cosmic Dawn, Dubrovnik-Croatia (**Oral**) October 2017
- School on EoR and 21 cm Cosmology, NCRA-India July 2017
- Astronomy Colloquium, National Centre for Radio Astrophysics (**Oral**) April 2017
- SKA 2016: Science for the SKA generation, Goa-India (**Poster**) Nov 2016
- Workshop on Epoch of Reionization, CTS, IIT Kharagpur (**Oral**) July 2016
- National Workshop on Cosmology with the HI 21-cm Line, RRI-Bangalore (**Oral**) June 2015
- Astronomy Seminar, Oskar Klein Centre, Stockholm University (**Oral**) May 2015
- The Olympian Symposium 2015, Greece (**Poster**) May 2015
- Cosmological Structures from Reionization to Galaxies, ICTP-Italy (**Oral**) May 2015
- Statistical Applications to Cosmology and Astrophysics, ISI-Kolkata (**Oral**) Feb 2015
- Workshop on Galaxies and Cosmology, NCRA-India July 2014
- 32nd Meeting Astronomical Society of India, IISER-Mohali (**Poster**) Mar 2014
- The Metrewavelength Sky Conference, NCRA-India (**Poster**) Dec 2013
- Radio Astronomy School, NCRA-India Aug 2013
- Workshop on Cosmology, Delhi University-India Jan 2013

STUDENT
SUPERVISION AND
MENTORING

PhD Supervision

- Shouvik Sarkar, PhD at Indian Institute of Technology Madras, India (2022-present)

PhD Mentorship

- Srijita Pal, PhD at Indian Institute of Technology Kharagpur, India (2023)
- Preetha Saha, PhD at Indian Institute of Technology Kharagpur, India (2021)

M.Sc Project Supervision

- Santanu Das at IIT Madras, (June 2023 -)
- Shashank Ramesh at IIT Madras, (June 2023-) Royal Astronomical Society Undergraduate Summer Bursary
- Asha B. Modan, IISER Bhopal M.Sc project Student (Ongoing) August 2022 -
- Sandra Jaison (Summer Fellowship Programme) at IIT Madras July-August 2022
- Dimos Zografos, at Queen Mary University of London (QMUL) (2021)
- Alex Reedy, at Queen Mary University of London (QMUL) (2020)
- Romain Pioch (ENSTA Paris) (2020), Royal Astronomical Society Undergraduate Summer Bursary
- Ankur Dev at Queen Mary University of London (QMUL) (2019-2020): Now PhD at Argelander Institute for Astronomy (AIfA), Germany
- Jyotirmoy Dey at IIT Kharagpur (2015-2016): Now PhD at IIST-Trivandrum, India

TEACHING
EXPERIENCE

- **PH1020 Physics II**, IIT Madras, Jan-May 2024
- **PH1010 Physics I**, IIT Madras, July-Nov 2023
- **PH1020 Physics II**, IIT Madras, Jan-May 2023
- **PH5060 Physics Lab I (PG)**, IIT Madras, July-Nov 2022
- **Tutor for Radio Astronomy Data Analysis**, The First Billion Years of the Universe, IIT Indore, 27-32 Jan, 2020
- **AIPS Tutorial for Radio Data Analysis**, Radio Astronomy School 2019 at NCRA-TIFR,Pune, 19th to 30th August, 2019
- **Lectures on Power Spectrum Estimation Techniques**, School on 21-cm Cosmology at Kodaikanal Solar Observatory, 10th to 15th December, 2018
- **CASA Tutorial for radio data analysis**, School on 21-cm Cosmology at Kodaikanal Solar Observatory, 10th to 15th December, 2018
- **Computational Physics Lab**, M.Sc. Physics (1st year), IIT Kharagpur, 2013 - 2015, 3 semesters

- **Electrodynamics I**, M.Sc. Physics (1st year), IIT Kharagpur, 2013, 1 semesters
- **Preparatory Lab Class**, B.Tech. (1st year), IIT Kharagpur, 2012 - 2015, 5 semesters

PUBLIC SCIENTIFIC
CODE

I make most of the scientific code public-available for the community. The projects are:

- **VisSim (C)**: The visibility simulator for radio interferometric observations .
- **Bare Estimator (C)**: The visibility based estimator for measuring the power spectrum from radio interfereometric data.
- **TGE (C)**: The Tapered Gridded Estimator for angular power spectrum measurements.
- **3D-TGE (C)**: The Tapered Gridded Estimator for measuring the cylindrical and spherical power spectrum for 21cm observations.
- **I-TGE (C)**: The Image-based Tapered Gridded Estimator for angular power spectrum measurements.
- **Non-redundant pipeline (Python)**: Pipeline for simulating, calibrating, and analysing data from non-redundant arrays, based on the HERA stack.

See <https://github.com/samirchoudhuri> for details.

CONFERENCE AND
MEETING
ORGANIZATION

- Workshop on 21-cm Cosmology & Reionization, Main organizer, April 2021
<https://sites.google.com/view/eorcosmology21/home>
- School on 21-cm Cosmology & Reionization, Main organizer, June 2021
<https://sites.google.com/view/eorcosmology21/home>
- Royal Astronomical Society Specialist Discussion Meeting on First results from the Hydrogen Epoch of Reionization Array, Main organizer, 10th December 2021
<http://philbull.com/heraras/>

REVIEWER

- Monthly Notices of the Royal Astronomical Society (MNRAS)
- GMRT Time Allocation Committee (GTAC) Scientific Proposal

COMPUTING
SKILL

- **Operating Systems**: Linux, WINDOWS
- **Programming Language**: C, Python
- **Application Packages**: Numerical Recipes in C, AIPS (Astronomical Image Processing Software), CASA (Common Astronomy Software Applications), MATLAB

REFERENCES

Available on request.

Prof. Somnath Bharadwaj, Department of Physics, Indian Institute of Technology Kharagpur, Kharagpur-721302, India, E-mail: somnath@phy.iitkgp.ernet.in, somnathbharadwaj@gmail.com

Dr. Phil Bull, School of Physics and Astronomy, Queen Mary University of London, Mile End Road, London E1 4NS, UK, E-mail: p.bull@qmul.ac.uk, philbull@gmail.com

Dr. Nirupam Roy, Department of Physics, Indian Institute of Science, Bangalore 560012, India, E-mail: nroy@iisc.ac.in, roy.nirupam@gmail.com

Prof. Tirthankar Roy Choudhury, NCRA-TIFR, Pune University Campus, Post Bag 3, Ganeshkhind, Pune-411007, India, E-mail: tirth@ncra.tifr.res.in

Prof. Jayaram N. Chengalur, NCRA-TIFR, Pune University Campus, Post Bag 3, Ganeshkhind,
Pune-411007, India, E-mail: chengalur@ncra.tifr.res.in