

Rajeshwari Dutta

Curriculum Vitae

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Employment

- 03/2021 – **Post-Doctoral Researcher** at University of Milano-Bicocca, Italy
11/2019 – 02/2021 **Post-Doctoral Research Associate** at Durham University, UK
11/2017 – 10/2019 **Humboldt Post-Doctoral Research Fellow** at ESO, Garching

Education

- 2012–2017 **Doctorate of Philosophy (Astronomy)**, Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune, India
2010–2012 **Master of Science (Physics)**, University of Pune, India – First class with Distinction
2007–2010 **Bachelor of Science (Physics)**, University of Pune, India – First class with Distinction

Academic Achievements and Awards

- 2019 Selected to participate in the **69th Lindau Nobel Laureate Meeting**, Germany
2018 **Justice Oak Award for Outstanding Ph.D. Thesis in Astronomy**, Astronomical Society of India
2017 **Humboldt Research Fellowship**, Germany
2017 **ESO Fellowship**, Chile (*declined*)
2014 **CSIR-UGC Senior Research Fellowship**, India
2012 **CSIR-UGC Junior Research Fellowship**, India
2007 **Gold medal**, school topper, science stream, Central Board of Secondary Education 10+2 examination

Research Interests

- (1) Galaxy formation and evolution
- (2) Interstellar medium and circumgalactic medium of galaxies
- (3) Quasar absorption line spectroscopy
- (4) Redshift evolution of the cold atomic and molecular gas phases in galaxies
- (5) Cold gas in Active Galactic Nuclei and merging galaxies

Technical Experience

Observation, data reduction and analysis

- Radio/mm* Giant Metrewave Radio Telescope (GMRT), Very Large Array (VLA), Very Long Baseline Array (VLBA), Green Bank Telescope (GBT), Atacama Pathfinder Experiment (APEX), Atacama Large Millimeter/submillimeter Array (ALMA), James Clerk Maxwell Telescope (JCMT)
- Optical* South African Large Telescope (SALT), Very Large Telescope (VLT) - Ultraviolet and Visual Echelle Spectrograph (UVES), Multi Unit Spectroscopic Explorer (MUSE), X-shooter, High Resolution Echelle Spectrometer (HIRES) on Keck telescope, Sloan Digital Sky Survey (SDSS)
- Ultraviolet* Cosmic Origins Spectrograph (COS) on Hubble Space Telescope (HST)

Softwares and tools

- Data* Astronomical Image Processing System (AIPS), Common Astronomy Software Applications (CASA),
reduction Image Reduction and Analysis Facility (IRAF)
Analysis Voigt profile fitting program VPFIT, photoionization simulation code CLOUDY, Ds9
Others Interactive Data Language (IDL), Python, Supermongo (SM), LaTeX, Linux

Publications

Journal Publications (*in reverse chronological order*)

First-author publications

1. "MUSE Analysis of Gas around Galaxies (MAGG) - II: metal-enriched halo gas around $z \sim 1$ galaxies"
Dutta, Rajeshwari; Fumagalli, Michele; Fossati, Matteo; Lofthouse, Emma; Prochaska, J. Xavier; Arrigoni-Battaia, Fabrizio; Bielby, Richard; Cantalupo, Sebastiano; Cooke, Ryan; Murphy, Michael; O'Meara, John
2020, *MNRAS*, 499, 5022 ([arXiv:2009.14219](#))
2. "uGMRT search for cold gas at $z \sim 1 - 1.4$ towards red quasars"
Dutta, Rajeshwari; Srianand, Raghunathan; Gupta, Neeraj; Joshi, Ravi
2020, *MNRAS*, 491, 838 ([arXiv:1910.14054](#))
3. "Prevalence of neutral gas in centres of merging galaxies-II: nuclear H I and multi-wavelength properties"
Dutta, Rajeshwari; Srianand, Raghunathan; Gupta, Neeraj
2019, *MNRAS*, 489, 1099 ([arXiv:1908.02291](#))
4. "Prevalence of neutral gas in centres of merging galaxies"
Dutta, Rajeshwari; Srianand, Raghunathan; Gupta, Neeraj
2018, *MNRAS*, 480, 947 ([arXiv:1807.04298](#))
5. "H I 21-cm absorption from $z \sim 0.35$ strong Mg II absorbers"
Dutta, Rajeshwari; Srianand, Raghunathan; Gupta, Neeraj; Joshi, Ravi
2017, *MNRAS*, 468, 1029 ([arXiv:1703.00457](#))
6. "Incidence of H I 21-cm absorption in strong Fe II systems at $0.5 < z < 1.5$ "
Dutta, Rajeshwari; Srianand, Raghunathan; Gupta, Neeraj; Joshi, Ravi; Petitjean, Patrick; Noterdaeme, Pasquier; Ge, Jian; Krogager, Jens-Kristian
2017, *MNRAS*, 465, 4249 ([arXiv:1611.07034](#))
7. "H I 21-cm absorption survey of quasar-galaxy pairs: Distribution of cold gas around $z < 0.4$ galaxies"
Dutta, Rajeshwari; Srianand, Raghunathan; Gupta, Neeraj; Momjian, Emmanuel; Noterdaeme, Pasquier; Petitjean, Patrick; Rahmani, Hadi
2017, *MNRAS*, 465, 588 ([arXiv:1610.05316](#))
8. "Mapping kiloparsec-scale structures in the extended H I disc of the galaxy UGC 00439 by H I 21-cm absorption"
Dutta, Rajeshwari; Gupta, Neeraj; Srianand, Raghunathan; O'Meara, John M.
2016, *MNRAS*, 456, 4209 ([arXiv:1601.00971](#))
9. "Cold parsec-scale gas in a $z_{abs} \sim 0.1$ sub-damped Lyman α with disparate H₂ and 21-cm absorption"
Dutta, Rajeshwari; Srianand, Raghunathan; Muzahid, Sowgat; Gupta, Neeraj; Momjian, Emmanuel; Charlton, Jane
2015, *MNRAS*, 448, 3718 ([arXiv:1502.01354](#))
10. "A study of low-metallicity DLAs at high redshift and C II* as a probe of their physical conditions"
Dutta, Rajeshwari; Srianand, Raghunathan; Rahmani, Hadi; Petitjean, Patrick; Noterdaeme, Pasquier; Ledoux, Cedric
2014, *MNRAS*, 440, 307 ([arXiv:1402.2975](#))

Co-author publications

11. "MUSE Analysis of Gas around Galaxies (MAGG) - III: The gas and galaxy environment of $z = 3-4.5$ quasars"
Fossati, Matteo; Fumagalli, Michele; Lofthouse, Emma K.; **Dutta, Rajeshwari** and 8 co-authors
2021, *MNRAS*, accepted ([arXiv:2103.01960](#))
12. "PKS1830-211: OH and HI at $z=0.89$ and the first MeerKAT UHF spectrum"
Combes, Françoise and 22 co-authors including **Dutta, Rajeshwari**
2021, *A&A*, accepted ([arXiv:2101.00188](#))

13. "Blind HI and OH absorption line search: first results with MALS and uGMRT processed using ARTIP"
Gupta, Neeraj and 34 co-authors including **Dutta, Rajeshwari**
[2021, ApJ, 907, 11](#) ([arXiv:2007.04347](#))
14. "ALMACAL VII: first interferometric number counts at 650 μm "
Klitsch, Anne and 12 co-authors including **Dutta, Rajeshwari**
[2020, MNRAS, 495, 2332](#) ([arXiv:2005.01733](#))
15. "ALMACAL VI: Molecular gas mass density across cosmic time via a blind search for intervening molecular absorbers"
Klitsch, Anne and 14 co-authors including **Dutta, Rajeshwari**
[2019, MNRAS, 490, 1220](#) ([arXiv:1909.08624](#))
16. "Multicomponent H₂ in DLA at $z_{\text{abs}} = 2.05$: physical conditions through observations and numerical models"
Rawlins, Katherine; Srianand, Raghunathan; Shaw, Gargi; Rahmani, Hadi; **Dutta, Rajeshwari**; Chacko, Sajeev
[2018, MNRAS, 481, 2083](#) ([arXiv:1808.07906](#))
17. "Composite Circumstellar Dust Grains"
Gupta, Ranjan; Vaidya, Dipak B.; **Dutta, Rajeshwari**
[2016, MNRAS, 462, 867](#) ([arXiv:1607.06253](#))

Invited Reviews

18. "Cold neutral hydrogen gas in galaxies"
Dutta, Rajeshwari
[2019, JApA, 40, 41](#) ([arXiv:1910.06334](#))

Conference Proceedings

19. "The MeerKAT Absorption Line Survey (MALS)"
Gupta, Neeraj and 43 co-authors including **Dutta, Rajeshwari**
[2017, Proceedings of Science](#), Proceedings of MeerKAT Science: On the Pathway to the SKA ([arXiv:1708.07371](#))

Observational Proposals

Successful Proposals as Principal Investigator (*total 743 hrs*)

- JCMT* "Investigating Molecular Gas Properties in Low- z Radio-loud Galaxy Mergers", 35 hrs (M19BP034), 15 hrs (M21AP014)
- GMRT* "Prevalence of neutral gas in double-peaked emission line AGNs", 43 hrs (36_016), 7 hrs (ddtC091)
"GMRT search for cold gas towards red quasars", 16 hrs (33_100), 8 hrs (34_034)
"HI 21-cm absorption associated with major mergers", 12 hrs (33_027), 8 hrs (32_038), 40 hrs (35_030), 4 hrs (ddtC034)
"uGMRT search for OH absorption towards highly reddened quasars", 25.5 hrs (32_050), 25 hrs (34_022)
"Probing small-scale structures in the extended HI disk of a $z \sim 0.02$ galaxy", 24 hrs (31_081)
"HI 21-cm absorption from strong Mg II systems", 32 hrs (30_032), 76 hrs (29_035)
"HI 21-cm emission and absorption from a low- z galaxy", 6 hrs (ddtB167)
"CHITALS: Cold HI 21-cm absorption line survey", 20 hrs (28_008), 100 hrs (27_015), 100 hrs (26_029)
- VLBA* "Gas flows in circumnuclear regions of merging galaxies using HI 21-cm absorption", 20 hrs (18A-026)
"Connecting H₂ and 21-cm absorption with parsec-scale structure in $z \sim 0.1$ sub-DLA", 1 hr (14B-460)
- VLA* "OH 18-cm absorption associated with merging galaxy pair", 5.6 hrs (17B-130)
"Mapping the extended diffuse HI gas in a $z \sim 0.02$ galaxy", 3 hrs (17A-180)
"Cold HI 21-cm absorption line survey (CHITALS)", 6 hrs (15A-176)
- GBT* "A mini survey for detecting cold HI gas in strong Fe II absorbers", 20 hrs (16A-257)
- SALT* "Ionized gas distribution across low- z galaxy merger", 9 hrs (2018-2-SCI-024)

"Probing the host galaxies of ultra-strong Mg II absorption line systems", 18 hrs (2015-2-SCI-031), 14 hrs (2015-1-SCI-021)

"Optical preparatory survey of QSO Galaxy pairs to probe the high z ISM", 12.5 hrs (2014-2-SCI-017), 14.5 hrs (2014-1-IUCAA-001), 19 hrs (2013-2-IUCAA-001)

"High Resolution Study of Low- z sub-DLAs", 4 hrs (2014-2-SCI-019)

Successful Proposals as Co-Investigator (total 894 hrs)

VLT/MUSE "On which scales are metals mixed?", 18.9 hrs (105.203U)

VLT/HAWKI "A deep near-IR view of the MUSE Ultra Deep Field", 27 hrs (105.2073)

JCMT "A Systematic Search for Dusty Starbursts around $z \sim 3 - 4$ Quasars", 30 hrs (M19BP048)

GMRT "Relationship between radio emission and extended Ly α halos in WISE color selected quasars at $z > 2.7$ ", 10 hrs (34_080)

"Blind search of H I 21-cm and OH 18-cm absorbers using uGMRT", 85 hrs (33_067), 60 hrs (32_082)

"uGMRT search for 21-cm absorption in an extremely strong and dusty DLA at $z \sim 4$ ", 8 hrs (31_115)

"uGMRT Search for 21-cm in H₂ bearing systems at $z \sim 2.0 - 2.6$ ", 31 hrs (30_084)

"Search for H I 21-cm absorption in outer disks/halos of Local Volume Galaxies", 64 hrs (30_071)

"H I 21-cm absorption associated with major mergers", 20 hrs (29_079)

"A pilot survey for detecting cold H I gas in strong Fe II absorbers", 57 hrs (29_051)

"H I 21-cm absorption follow-up of DLAs from SDSS BOSS", 24 hrs (27_054), 40 hrs (25_058)

VLBA "Resolving an Extremely Powerful Radio-Loud Quasar at $z \sim 5.1$ ", 20 hrs (19A-106)

"VLBA observations of radio loud quasars with DLAs from SDSS BOSS", 6 hrs (14B-084)

VLA "Physical conditions in a molecular hydrogen bearing sub-DLA at $z \sim 0.1$ ", 24.5 hrs (15A-265)

SALT "Nature of galaxies associated with strong Mg II absorbers", 42 hrs (2017-1-SCI-011)

"A dust-unbiased sample of $z > 1.5$ quasars for the MeerKAT Absorption Line Survey", 45 hrs (2016-2-SCI-017), 102 hrs (2016-1-SCI-022), 32.5 hrs (2015-2-SCI-030), 63.5 hrs (2015-1-SCI-012)

"Investigating the C IV BAL emergence/disappearance phenomena in a sample of BAL QSOs", 20 hrs (2015-2-SCI-026), 18 hrs (2015-1-SCI-005), 10 hrs (2014-2-SCI-023)

"Redshift measurements of strong radio sources for absorption line searches", 11 hrs (2014-2-SCI-027)

NTT "Cold ISM at $z \leq 0.3$ probed by QSO-Galaxy pairs", 3 nights (093.A-0255(A))

Conferences/Workshops and Presentations

28 oral and 3 poster presentations

Jan 2021 Fundamentals of Gaseous Halos, KITP, *virtual workshop*

Sep 2020 Keck Science Meeting 2020, *virtual meeting*, **contributed talk**

Jul 2020 EAS 2020 Special Session: Radio-loud AGN: Advances in observations and theory driven by next generation surveys, *EAS Virtual Meeting*, **contributed talk**

Jul 2020 EAS 2020 Symposium: Linking gas and star formation throughout cosmic time, *EAS Virtual Meeting*, **contributed talk**

Jul 2020 EAS 2020 Symposium: The circumgalactic medium, *EAS Virtual Meeting*, **contributed talk**

Dec 2019 30th Texas Symposium on Relativistic Astrophysics, *Portsmouth*, **contributed talk**

Aug 2019 Galaxy Evolution in a New Era of H I Surveys, *MIAPP, Garching*, **contributed talk**

Jul 2019 Nine Billion Years of Neutral Gas Evolution, *ESO, Garching*, **contributed talk**

Jul 2019 69th Lindau Nobel Laureate Meeting, *Lindau*, **e-poster**

Jun 2019 **Lunch talk** at Ogden Centre for Fundamental Physics, *Durham University*

- Feb 2019 **Talk** at Centre for Astrophysics and Supercomputing, *Swinburne University of Technology, Australia*
- Feb 2019 Linking galaxies from the epoch of initial star formation to today, ESO-Australia Joint Conference, *Sydney*, **SOC member**
- Feb 2019 12th Square Kilometre Array (SKA) Pathfinder HI Survey Coordination Committee (PHISCC) workshop, *ICRAR/UWA, Perth*, **invited talk**
- Nov 2018 **Invited talk** at Gas Matters Club, *ESO, Garching*
- Aug 2018 HI Absorption Workshop, *ASTRON*, **contributed talk**
- Jul 2018 EUCLID JWST Synergy, *ESA/ESTEC, Noordwijk*, **contributed talk**
- Dec 2017 Galaxies in Absorption, *IUCAA*, **contributed talk**
- Nov 2017 **Lunch talk** at *ESO, Garching*
- Sep 2017 Young Astronomers Meet, *IUCAA*
- Jun 2017 HI Absorption Workshop, *ASTRON*, **contributed talk**
- May 2017 **Lunch talk** at *Leiden Observatory*
- Feb 2017 PHISCC Workshop: Exploring First Light, *NCRA*, **contributed talk**
- Jan 2017 Training School in Optical Astronomy with Large Telescopes, *IUCAA*
- Jan 2017 Computational statistics and astrostatistics workshop, *IUCAA*, **talk**
- Nov 2016 SKA 2016: Science for the SKA generation, *Goa, India*, **contributed talk**
- Feb 2016 Workshop on Large Scale Structure, *IUCAA*, **contributed talk**
- 2015, 2016 Annual review **talk** at *IUCAA*
- Nov 2015 Indo-French Astronomy School for Optical Spectroscopy, *IUCAA*, **talk**
- Sep 2015 CLOUDY workshop, *IUCAA*, **invited talk**
- Jun 2015 SALT Science Conference, *Stellenbosch*, **contributed talk**
- Mar 2015 PHISCC Workshop: HI Surveys Get Real, *Rutgers University*, **contributed talk**
- Mar 2015 **Seminar** at Department of Astronomy & Astrophysics, *Penn State University*
- Feb 2015 Astronomical Society of India 33rd Meeting, *NCRA*, **poster presentation**
- Nov 2014 SALT Science Meeting, *IUCAA*, **contributed talk**
- Jun 2014 Intergalactic Matters Workshop, *MPIA, Heidelberg*, **poster presentation**
- Mar 2014 Workshop on Radio Studies of Galaxies and Galaxy Systems, *IUCAA*
- Feb 2014 Python Programming in Astronomy, *IUCAA*
- Aug 2013 Radio Astronomy School, *NCRA*

Selected Professional Services

- 2020 **External Reviewer** of observational proposals, Hubble Space Telescope (HST)
- 2019 **LOC member** of Nine Billion Years of Neutral Gas Evolution workshop, *Garching*
- 2019 **SOC member** of ESO-Australia Joint Conference, *Sydney*
- 2018 **Scientific Assistant** at ESO's Observing Programmes Committee (OPC) meeting
- 2018 **Scientific Assistant** at ESO's Scientific Technical Committee (STC) meeting
- 2018 **Volunteer** for ESO's service-mode observations at APEX, *Chile*
- 2018– **Reviewer** of manuscripts, *Journal of Astrophysics and Astronomy (JOAA)*
- 2017– **Reviewer** of observational proposals, *Giant Metrewave Radio Telescope (GMRT)*
- 2014– **Reviewer** of manuscripts, *Monthly Notices of the Royal Astronomical Society (MNRAS)*
- 2013–2017 **Volunteer** for poster presentation, organisation of science quiz, essay and poetry competition for school students, as part of National Science Day programmes, *IUCAA*
- 2013 **Tutor** for IUCAA-NCRA Graduate School course "Introduction to Astronomy & Astrophysics - II"
- 2013 **Mentor** for School Students' Summer Programme, *IUCAA*

References

- (1) **Michele Fumagalli** (*michele.fumagalli@unimib.it*)
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Piazza dell'Ateneo Nuovo, 1, 20126 Milano MI, Italy
- (2) **Martin Zwaan** (*mzwaan@eso.org*)
European Southern Observatory
Karl-Schwarzschild-Str. 2, 85748 Garching bei München, Germany
- (3) **Raghunathan Srianand** (*anand@iucaa.in*)
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- (6) **Pasquier Noterdaeme** (*noterdaeme@iap.fr*)
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