

Proposal for SRAO-funded Postgraduate Research in 2025

Details of Research Project:

Section A: Overview of the Research Project:

1. **Title of the research project:** Exploring MeerKAT and LOFAR synergies: A wideband characterisation of the lives of radio galaxies
2. **Broad Area of the research:** Science
3. **Academic level of research project:** PhD
4. **Abstract of research project:** Over the past few years, SKA precursors and pathfinder instruments have produced paradigm-shifting results for various populations of radio sources. The South African MeerKAT and the European LOFAR (the Low Frequency Array) are two such telescopes. Operating at different frequencies, they provide invaluable, complementary views of the radio sky. Combining the relatively high frequency coverage of MeerKAT (going from UHF bands to S-band) and the lower frequency coverage allows unprecedented spectral characterisation of radio source populations, their life-cycles and the interactions between the environments and the radio sources themselves. Using both archival and new observations from MeerKAT and LOFAR where needed, this project seeks to understand the lives of radio galaxies in a variety of environments.

5. Primary Supervisor's details:

- a. Full name of primary supervisor: Dr. Kshiti Thorat
- b. Primary supervisor's email address: kshiti@astro@gmail.com
- c. University where primary supervisor is employed: University of Pretoria

6. Co-supervisor/ Research Supervisor's details:

First Co-supervisor:

- a. Full name of the co-supervisor/research supervisor: Dr Etienne Bonnassieux
- b. University where co-supervisor/research supervisor is employed: University of Wurzburg, Wurzburg, Germany

Second Co-supervisor:

- a. Full name of the co-supervisor/research supervisor: Prof. Tiziana Venturi
- b. University where co-supervisor/research supervisor is employed: Istituto di Radioastronomia, INAF, Bologna, Italy

Section B: Details of the Research Project:

1. **Scientific/Engineering merit:** The Cosmic Web, which includes the largest organised structures in our Universe, clusters, groups and filaments of galaxies is of extreme astronomical interest. Detection of radio synchrotron emission associated with radio sources living in such environs and in many cases caused by such environs reveals key physical attributes of the

matter within. In many cases such diffuse emission is difficult to detect at higher frequencies due to typically high spectral indices. Such objects include continuum tails of bent-tailed sources (Rudnick et al 2017, Burns 1990), detailing their history within galaxy clusters, remnant, fading and restarted radio galaxies (Jurlin et al 2021, Morganti 2017, Schoenmakers et al 2000), hybrid morphology (HyMors, Kapinska et al 2017) radio sources and possible radio emission from the filamentary structures of various kinds, tracing lower-density, lower-temperature gas and magnetic fields, giving access to rich astrophysics, the estimation of which in many cases is dependent on reliable spectral indices.

The almost continuous spectral coverage offered by combined LOFAR (van Haarlem, M. P. et al. 2013) and MeerKAT (Camilo et al 2018) observations can therefore prove invaluable when used in tandem; the frequency coverage of LOFAR & MeerKAT, ranging from ~100 MHz to 4 GHz, is the most adequate to study radio galaxies, due to the synchrotron nature of the radio emission. It covers both the aged emission associated with the most diffuse components, and the more recent emission associated with the central AGN and the inner jet regions. A key benefit of using LOFAR is access to LOFAR-VLBI, which helps us probe inner jet regions and details of the substructure of the radio galaxies.

The plan of the project is to target archival MeerKAT and LOFAR data of selected fields down to -5 degrees in declination (see section 2 for details), to carry out detailed spectral characterisation of radio sources within, which will be supplemented by new observations for both MeerKAT and the LOFAR 2.0 depending on the availability. This will allow us to:

- Measure wideband spectral indices and polarisation of the jets, lobes and other filamentary structures in radio galaxies, which is essential for the understanding of the properties of the environment and how they shape the radio galaxy evolution.
- Find compact components of radio galaxies at low frequencies using the LOFAR-VLBI.
- Characterise the life-cycles and histories of jetted radio galaxies within different environments which helps us understand how different environments produce different evolution in radio galaxies.
- Estimate the statistical properties of radio galaxies in different environments.

This project is expected to start in 2025 and with the arrival of MeerKAT+ during the project, it would be possible to use the MeerKAT+ array in a mode which provides double its current resolution. The experience obtained and the techniques developed would be directly applicable and transferable to the high resolution studies carried out using the MeerKAT + at southern declinations.

2. Feasibility: The project relies on the availability of MeerKAT and LOFAR data; for which we have identified currently existing archival MeerKAT and LOFAR datasets which will serve to initiate the project. These will be supplemented by further MeerKAT and LOFAR 2.0 proposals. The MeerKAT Open Time call for 2024 will contain the first of these, followed by the LOFAR 2.0 proposal in mid-late 2025.

The supervising team contains expertise on both MeerKAT and LOFAR data reduction and analysis. Dr Thorat is one of the developers of the CARACal pipeline for MeerKAT data which we expect to use for data reduction; Dr Bonnassieux is an expert in LOFAR data, especially

long-baselines reduction and Prof Venturi is a leading expert in astrophysics of galaxy clusters and groups with extensive experience in both MeerKAT and LOFAR studies.

The candidate will also gain LOFAR-VLBI expertise, through guidance by Dr. Bonnassieux, to apply novel technical methods allowing for the use of LOFAR down to low declinations (> -5 deg). While these methods have already been validated on such low-declinations fields, the candidate will be the first to exploit them for MeerKAT-LOFAR synergy. This may be complemented with European VLBI Network coverage, which now includes the uGMRT; the research groups at University of Pretoria as well as Dr. Bonnassieux are heavily involved in these collaborations. Links between VLBI groups and SKA pathfinders are still being built, and will be extremely valuable for both the PhD candidate and the overall SKA landscape.

A tentative timeline of the project is:

i) Year 1: The student is expected to spend the first three months familiarising themselves with the relevant literature and finalising the selection of the source sample. For the next 6 months or so the student is expected to focus on MeerKAT data reduction as well as basic LOFAR data reduction tools; aided by the CARACal pipeline and the pipeline developed by the LOFAR-VLBI working group, which Dr Bonnassieux is an active member of. The remaining three months of the year will be spent in the start of the source characterisation using wideband images from LOFAR as well as MeerKAT. During the first year the student is also expected to participate in the LOFAR 2.0 proposal and any new MeerKAT proposals.

ii) Year 2: The student is expected to complete the basic wideband source characterisation for the selected source sample during the first half of the year. A publication is expected based on the work carried out so far. The latter part of the year will be devoted to establishing statistical properties of radio galaxies in a variety of environments.

iii) Year 3: The first 5 months of the final year are expected to be given to wrapping up work with the statistical properties of sources, diffuse emission associated with radio galaxies and any remaining items. The remaining time is reserved for the writing of the second publication and the thesis.

The computational resources for this project are expected to be provided by ilifu, to which the student will have access to as a member of the University of Pretoria. If needed, the UP-Astro server will be used.

3. Link with the SRAO research priority areas: The project will directly use MeerKAT data and explore its synergies with LOFAR. Given the upcoming MeerKAT+ and LOFAR 2.0 facilities, this project comes at a crucial time to mark the path ahead of collaborations with global VLBI facilities.

4. Qualifications needed: The qualifications needed from the student include a Masters degree in astrophysics/physics. Familiarity with galaxy cluster and AGN radio astronomy would be highly useful. Programming experience and reasonable proficiency in python is necessary.

Bibliography:

1. Rudnick L., Owen F. N., 1976, *ApJ*, 203, L107 [10.1086/182030](https://doi.org/10.1086/182030)
2. Burns J. O., 1990, *AJ*, 99, 14 [10.1086/115307](https://doi.org/10.1086/115307)
3. Morganti, R. 2017, *Nat. Astron.*, 1, 596

4. Schoenmakers, A. P., de Bruyn, A. G., Röttgering, H. J. A., van der Laan, H., & Kaiser, C. R. 2000, MNRAS, 315, 371
5. Kapinska et al, 2017, The Astronomical Journal, Volume 154, Issue 6, id.253
6. Jurlin, N. et al, 2021, Astronomy & Astrophysics, Volume 653, id.A110, 22 pp.
7. van Haarlem, M. P., Wise, M. W., Gunst, A. W., et al. 2013, A&A, 556, A2
8. Camilo, F., Scholz, P., Serylak, M., et al. 2018, ApJ, 856, 180

Section C and D: See Next Pages

KSHITIJ THORAT | CURRICULUM VITAE



- › **Current Status:** Senior Lecturer, University of Pretoria South Africa
- › **Research Interests:** Radio Galaxies, Multiwavelength extragalactic astronomy, Synergies between Machine Learning techniques and radio astronomy
- › **Address:** 5-70, Department of Physics, University of Pretoria, Hatfield, Pretoria, 0028, South Africa
- › **Nationality:** Indian

»»» Research Experience

June 2021 -	Senior Lecturer	University of Pretoria
	<ul style="list-style-type: none">› MeerKAT Exploration of Extragalactic Radio Sources› Development of Machine learning methods for radio astronomy	
2019-present	IDIA Postdoctoral Research Fellow	University of Pretoria
	<ul style="list-style-type: none">› MeerKAT Exploration of Extragalactic Radio Sources› Development of Machine learning methods for radio astronomy	
2014 - 2019	Postdoctoral Research Fellow	Rhodes University & SKA
	<ul style="list-style-type: none">› Development of Machine Learning Techniques for Classification and Characterisation of Radio Sources› Development of an end-to-end imaging and calibration pipeline for MeerKAT and other telescopes	
2006-2013	Research Scholar	IISc and RRI, India
	<ul style="list-style-type: none">› Implementation of Imaging and Calibration Pipeline of ATLBS radio survey› Estimating interactions of Extragalactic Radio Sources with ambient large-scale environs	

»»» Education

2006 - 2013	Ph. D. degree in Physics	Indian Institute of Science
	<ul style="list-style-type: none">› PhD Thesis: The Cosmic Population of Extended Radio Sources: A Radio-Optical Study› Imaging and Calibration of ATLBS survey radio and optical data, Characterization of radio source large scale environs	
2006 - 2004	M. Sc. degree in Physics	University of Pune
	<ul style="list-style-type: none">› Subjects include Quantum Mechanics, Mathematical and Statistical Methods of Physics etc› Elective subject of Astronomy at IUCAA, Pune	
2001-2004	B.Sc. degree	St. Xavier's College, University of Mumbai
	<ul style="list-style-type: none">› Subjects include Physics, Mathematics, Statistics› Participated in extra-curricular classes to study advanced topics in physics	

»» Student Supervision

2015-2019	K. Iheanetu, Rhodes University	PhD Student
	<ul style="list-style-type: none"> » Modelling and investigating primary beam effects of reflector antenna arrays » Co-supervisor 	
2019-2021	Sydil Kupa, SARA0/Rhodes University	Masters Student
	<ul style="list-style-type: none"> » Image segmentation and source classification with Machine Learning Techniques » Co-supervisor 	
2020-2021	Fernando Ventura, University of Pretoria	Masters Student
	<ul style="list-style-type: none"> » Unsupervised learning algorithms for the identification and classification of exotic radio sources » Co-supervisor 	
2020-2022	Leon Mtshweni, University of Pretoria	Masters Student
	<ul style="list-style-type: none"> » MeerKAT observations of M87 » Co-supervisor 	
2021-2023	William Rasakanya, University of Pretoria	Masters student
	<ul style="list-style-type: none"> » MeerKAT study of NGC 326 » Co-supervisor 	
2020-2022	Issac Magolego, University of Pretoria	Masters Student
	<ul style="list-style-type: none"> » MeerKAT observations of NGC 6240 » Co-supervisor 	
2022-present	Toivo Samuel Mabote, University of Pretoria	Master's Student
	<ul style="list-style-type: none"> » Association of Bent tailed sources with galaxy clusters in the MGCLS survey » Primary supervisor 	
2021-present	Precious Katlego Sejake, University of Pretoria	PhD student
	<ul style="list-style-type: none"> » Optical spectra of radio galaxy hosts from SALT telescope » Co-supervisor 	
2023-present	William Rasakanya, WITs	PhD student
	<ul style="list-style-type: none"> » Observational radio astronomy » Co-supervisor 	
2023-current	Issac Magolego, WITs	PhD Student
	<ul style="list-style-type: none"> » Observational Radio Astronomy » Co-supervisor 	
2023-present	Leon Mtshweni, University of Pretoria	PhD Student
	<ul style="list-style-type: none"> » HI in hosts of restated radio galaxies » Primary Supervisor 	
2023-present	Fernando Ventura, University of Pretoria	PhD Student
	<ul style="list-style-type: none"> » Application of ML techniques to radio data » Primary supervisor 	
2023-present	Thando Mothogoane, University of Johannesburg	PhD Student

- › Star-forming galaxies and radio-active galactic nuclei in the faint radio sky
- › Co-supervisor

››› Tutoring and Teaching Experience

2020-present **Instructor for PHY 210 course at University of Pretoria** University of Pretoria

- › Astronomy for Physicists
- › Main instructor

2019 **National Astrophysics and Space Science Programme** University of Cape Town

- › Radio Interferometry Masters Course Contributing Lecturer
- › Radio Science Lectures

2018 **National Astrophysics and Space Science Programme** University of Cape Town

- › Radio Interferometry Masters and Honours Course, Contributing Lecturer: Radio Science and Radiation fundamentals and Emission Mechanisms Lectures
- › Tutor in Practical Sessions for CASA

2017 **National Astrophysics and Space Science Programme** University of Cape Town

- › Radio Interferometry Masters and Honors Course, Contributing Lecturer: Radio Science and Radiation fundamentals and Emission Mechanisms Lectures
- › Tutor in Practical Sessions for CASA

2016 **3GC-4 Workshop** Port Alfred

- › Tutor for PyBDSM source finder software
- › Technical lecture on source finding in astronomical images

2016 **National Astrophysics and Space Science Programme** University of Cape Town

- › Contributor for Lecture Notes
- › Contributor and Editor for ipython-based book

››› Publications

This is the link to my most current record of Publications

››› Software and Pipelines

- **CARACal**: Containerised **R**adio **A**stronomy **Cal**ibration pipeline: Meerkat HI data pipeline - core developer
- **Toothless**: Morphological classifier of radio galaxies using machine learning techniques - major contributor
- **Stimela**: Dockerized Radio Interferometry Scripting Framework - minor contributor

Etienne BONNASSIEUX

DATE OF BIRTH: 19/10/1991 | EMAIL: etienne.bonnassieux@uni-wuerzburg.de
PLACE OF BIRTH: Noisy-le-Sec | PHONE: +49 17 83 46 40 75

ACTIVE INTERNATIONAL COLLABORATIONS

FEB 2022 PRESENT	DFG Research Unit: “Relativistic Jets in Active Galaxies” Specifically working on the project to study “Large-Scale Blazar Jets: Clues on High-Energy Emission from Low-Frequency Radio Observations”.
OCT 2018 PRESENT	LOFAR-IT Collaboration working to meet the requirements of the Italian LOW Frequency ARray (LOFAR) community. I was the scientific point of contact to elaborate its national computational infrastructure and LOFAR software deployment.
OCT 2017 PRESENT	NenuFAR French low- ν extension of LOFAR; I head its “Cluster Filaments & Cosmic Magnetism” early key science project ES09. I also participate in the commissioning of the instrument’s standalone imaging mode.
OCT 2017 PRESENT	LOFAR-VLBI Working group tasked with developing the capabilities of the International LOFAR Telescope with Very Long Baseline Interferometry. I bring my expertise in direction-dependent calibration and statistical methods.
OCT 2015 PRESENT	LOFAR Surveys KSP Working group tasked with creating large-scale surveys of the LOFAR radio sky. LOFAR is the Northern-sky precursor to the Square Kilometer Array, which will be located in the Southern sky: this group therefore aims to ultimately image the entire Northern sky to the instrument’s best ability.

EDUCATION & QUALIFICATIONS

JAN 2020	Obtained CNU (Conseil National des Universités) Qualification Obtained CNU Qualification under Section 34, which makes me eligible to hold lecturer positions in French universities.
2015-2018	PhD in Astrophysics - <i>Observatoire de Paris & Rhodes University</i> Supervisors: Philippe Zarka, Oleg Smirnov, Cyril Tasse “Statistical Analysis of the Radio-Interferometric Measurement Equation, a derived adaptive weighting scheme, and applications to LOFAR-VLBI observation of the Extended Groth Strip” The adaptive weighting scheme developed as part of this thesis is routinely deployed by the LOFAR Surveys KSP, and has made LOFAR-VLBI achievable in certain cases. Partnership: LESIA at the Observatoire de Paris (ED127) & RATT-RU, SKA-SA
2013-2015	M1 & M2R Astronomie, Astrophysique et Ingénierie Spatiale Equivalent to Masters of Science. I graduated in Astronomy & Astrophysics. Partnership : Observatoire de Paris, PSL, UPMC, Diderot, Orsay, ENS Ulm
2009-2013	Bsc (2:2, Hons) in Astrophysics - <i>University of Edinburgh</i> Bachelors of Science, graduated with Honours.
2008-2009	IB Diploma - <i>Bahrain School</i>

RESEARCH POSITIONS

FEB 2022 PRESENT	Post-doctoral Fellowship studying relativistic blazar jets at low frequencies at the Julius-Maximilians-Universität in Würzburg, Germany, under the supervision of Matthias Kadler as part of a joint DFG grant with the University of Hamburg.
OCT 2018 FEB 2022	Post-doctoral Fellowship studying galactic cluster science at low frequencies at the University of Bologna, Italy, under the supervision of Annalisa Bonafede as part of the DRANOEL ERC grant.

TEACHING & SCIENTIFIC OUTREACH

JUN 2019	Lectured at the First Italian LOFAR School Taught a workshop on using modern direction-dependent calibration & imaging suites DDF and killMS to participants. Helped tutor in the courses of colleagues.
	Tutored in the Paris Observatory DU-LU course
SEP 2017 JUL 2018	Supervised four students as part of an online course, usually teachers or amateur scientists in the workforce.
SEP 2015 JUL 2016	Of my six students, four successfully carried on to other programs in the DU; two dropped during the year for personal reasons.
	Lectured for NASSP
SEP 2017	Interferometry course: two 1-hour lectures on visibilities, UV-plane, PSF, and ZVC theorem. Course was aimed at honours astrophysics students at UCT.
SEP 2016	As above, but aimed at masters astrophysics students at UCT: content was at a higher level. This also entailed writing and marking a homework question.
SEP 2017	Wrote and organised a pyrap tutorial during 3GC4 Wrote an ipython notebook tutorial on pyrap, a python library. Easily converted into scripts, it has been a very popular tutorial with colleagues over the years. It can be found at https://github.com/ebonnassieux/Scripts/blob/master/PyrapTutorial.ipynb
SEP 2017	Editing “Visibility Space” chapter of <i>Fundamentals of Interferometry</i> This is an online coursebook written in multiple ipython notebooks, fruit of years of labour from many contributors. It remains an exceptional educational resource for new scientists, and the one I use as a point of reference for students. I edited Julien Girard’s work for clarity in the second year of my PhD, and taught the contents to others during my time in South Africa. Link here: https://github.com/ratt-ru/fundamentals_of_interferometry.
	Lectured Physics 101
JAN 2017 APR 2017	Introductory undergraduate course in basic mechanics, aimed non-physicist undergraduates. Of 60-odd students, 15 were also in my tutorial group.
	Paris Observatory “Parrainage”
SEP 2016 JUL 2015	Paris Observatory’s outreach program, organised by Alain Doressoundiram. I helped teachers (primary-school, middle-school) organise scientific demonstrations.

MENTORING & SUPERVISION

2021 PRESENT	Supervising a PhD student, Hrishikesh Shetgaonkar, in general interferometry, data reduction, and LOFAR-VLBI methods specifically. This is my first full supervision, including the scientific project in addition to the usual techniques and methods.
202 2021	Co-supervised a PhD student at the University of Bologna, Giada Pignatora, with direction-dependent reduction of LOFAR data. This included teaching basic principles of debugging. We remain in contact, and she is expected to publish at least 1 paper on our work together.
2018 2020	Co-supervised a PhD student at the University of Bologna, Nadia Biava, with reducing data using the LOFAR-Surveys pipeline and with the basics of interferometry, as well as some basics of working on Linux. This involved about an hour of work a week over a period of a few months, as well as 1 paper accepted by Astronomy & Astrophysics.
2018 2020	Co-supervised a PhD student at INAF, Nicola Locatelli, reducing data using the LOFAR-Surveys pipeline and with some basics of interferometry. This involved about an hour of work a week over a period of a few months, and the publication of 1 paper in A&A.
2019	Supervised an MSc student at the University of Bologna, Noemi La Bella, including teaching the basics of working with bash on Linux as well as reducing LOFAR data. This did not result in a publication, though one is in preparation.

Publications & Communications

Etienne Bonnassieux

1 First-Author Refereed Papers

- FEB 2022 | A&A: Spectral analysis of spatially-resolved 3C295 (sub-arcsecond resolution) with the International LOFAR Telescope ([Bonnassieux et al. 2022](#))
- NOV 2021 | Galaxies: Pilot Study and Early Results of the Cosmic Filaments and Magnetism Survey with Nenufar: The Coma Cluster Field ([Bonnassieux et al. 2021](#))
- MAY 2020 | A&A: Decoherence in LOFAR-VLBI beamforming ([Bonnassieux et al. 2020](#))
- JUL 2018 | A&A: The variance of radio interferometric calibration solutions. Quality-based weighting schemes ([Bonnassieux et al. 2018](#))

2 Other Refereed Papers

- OCT 2023 | MNRAS: A MeerKAT-meets-LOFAR study of Abell 1413: a moderately disturbed non-cool-core cluster hosting a 500 kpc 'mini'-halo ([Riseley et al. 2023](#))
- JAN 2023 | A&A: Deep low-frequency radio observations of Abell 2256. II. The ultra-steep spectrum radio halo ([Rajpurohit et al. 2023](#))
- SEP 2022 | MNRAS: Radio fossils, relics, and haloes in Abell 3266: cluster archaeology with ASKAP-EMU and the ATCA ([Riseley et al. 2022a](#))
- SEP 2022 | A&A: Diffuse radio emission from non-Planck galaxy clusters in the LoTSS-DR2 fields ([Hoang et al. 2022](#))
- JUL 2022 | ApJ: The Coma Cluster at LOFAR Frequencies. II. The Halo, Relic, and a New Accretion Relic ([Bonafede et al. 2022](#))
- JUL 2022 | A&A: Subarcsecond view on the high-redshift blazar GB 1508+5714 by the International LOFAR Telescope ([Kappes et al. 2022](#))
- MAY 2022 | MNRAS: A MeerKAT-meets-LOFAR study of MS 1455.0 + 2232: a 590 kiloparsec 'mini'-halo in a sloshing cool-core cluster ([Riseley et al. 2022b](#))
- MAY 2022 | A&A: The galaxy group NGC 507: Newly detected AGN remnant plasma transported by sloshing ([Brienza et al. 2022](#))
- APR 2022 | MNRAS: Spectral study of the diffuse synchrotron source in the galaxy cluster Abell 523 ([Vacca et al. 2022](#))

MAR 2022 | ApJ: Deep Low-frequency Radio Observations of A2256. I. The Filamentary Radio Relic ([Rajpurohit et al. 2022](#))

3 Posters

JUN 2017 | [Broad Impact of Low-Frequency Observing](#). Poster on quality-based weighting scheme.

4 Conferences & Workshops

AUG 2023 | [FRANCI meeting](#) in Bamberg. Presented an overview of the DFG project which I work on as part of my post-doctoral position, and for which I lead the LOFAR efforts.

JUN 2023 | [LOFAR Family Meeting](#) in Cologne. Gave a talk on the benefits of integrating NenuFAR as a superstation into the International LOFAR Telescope for the purposes of calibration and closure measurements, as well as the benefits of further extension of the ILT.

JAN 2022 | ADASS XXXI: A distributed computing infrastructure for LOFAR Italian community ([Taffoni et al. 2022](#)). Conference paper for which I was a key scientific adviser for the collaboration.

MAR 2021 | [6th LOFAR data school](#). Talk on direction-dependent calibration, organised hands-on workshop.

MAR 2021 | [RGCW Meeting](#). Gave talk on progress of NenuFAR Cosmic Filaments & Magnetic Fields Pilot Surveys.

APR 2018 | Invited lecturer at [the first Italian LOFAR School](#). Organised a hands-on workshop on direction-dependent calibration, and helped tutor in the workshops of colleagues.

SEP 2018 | [5th LOFAR data school](#). Talk on direction-dependent calibration, tutoring hands-on tutorial.

DEC 2017 | [SALF IV](#). Gave talk on quality-based weighting schemes.

OCT 2016 | [3GC4](#). Organised hands-on workshop on [using pyrap](#), a python wrapper for casacore. This allows scientists to interact with interferometric datasets in an efficient manner.

References

Bonafede, A., Brunetti, G., Rudnick, L., et al. 2022, ApJ, 933, 218

Bonnassieux, E., Edge, A., Morabito, L., & Bonafede, A. 2020, A&A, 637, A51

Bonnassieux, E., Sweijen, F., Brienza, M., et al. 2022, A&A, 658, A10

Bonnassieux, E., Tasse, C., Smirnov, O., & Zarka, P. 2018, A&A, 615, A66

Bonnassieux, E., Tremou, E., Girard, J. N., et al. 2021, *Galaxies*, 9, 105

Brienza, M., Lovisari, L., Rajpurohit, K., et al. 2022, *A&A*, 661, A92

Hoang, D. N., Brügggen, M., Botteon, A., et al. 2022, *A&A*, 665, A60

Kappes, A., Burd, P. R., Kadler, M., et al. 2022, *A&A*, 663, A44

Rajpurohit, K., Osinga, E., Brienza, M., et al. 2023, *A&A*, 669, A1

Rajpurohit, K., van Weeren, R. J., Hoeft, M., et al. 2022, *ApJ*, 927, 80

Riseley, C. J., Biava, N., Lusetti, G., et al. 2023, *MNRAS*, 524, 6052

Riseley, C. J., Bonnassieux, E., Vernstrom, T., et al. 2022a, *MNRAS*, 515, 1871

Riseley, C. J., Rajpurohit, K., Loi, F., et al. 2022b, *MNRAS*, 512, 4210

Taffoni, G., Becciani, U., Bonafede, A., et al. 2022, arXiv e-prints, arXiv:2201.11526

Vacca, V., Shimwell, T., Perley, R. A., et al. 2022, *MNRAS*, 511, 3389

VENTURI TIZIANA

Place and Date of Birth: Bologna (IT), 25/01/1961

Nationality: Italian

CURRICULUM VITAE (January 2022)

Since 1 February 2024 Director of the Osservatorio di Astrofisica e Scienza dello Spazio, INAF

July 2017 – June 2023 – Director of INAF, Istituto di Radioastronomia

EDUCATION AND POSITIONS

- Since 1 September 2017 – Dirigente di Ricerca (equivalent to full professor), Istituto di Radioastronomia, INAF
- From 1 January 2002 to 31 August 2017 - Primo Ricercatore, Istituto di Radioastronomia, INAF
- From 31 December 1988 to 31 December 2001 - Ricercatore III Livello, Istituto di Radioastronomia, INAF
- From 15 January 1989 to 30 March 1990 - Visiting Astronomer at the California Institute of Technology, Pasadena, USA

- Eligible for the position of University Full Professor (FIS/05) after the Abilitazione Scientifica Nazionale 2012

- 1989 – PhD in Astronomy at the University of Bologna
- 1985 – Laurea cum laude in Astronomy at the University of Bologna

CURRENT NATIONAL RESPONSIBILITIES

- Since Spring 2021 – INAF Scientific representative in the MeerKAT+ science group
- Since September 2017 – Chair of the VLBI Working Group WG02 in the INAF Radio Astronomy Office (UTG-II)
- Since April 2019 – Member of the SKA Pathfinders Working Group WG04 in the INAF Radio Astronomy Office (UTG-II)
- Since November 2018 – Member of the Italian SKA Board WG06 in the INAF Radio Astronomy Office (UTG-II)

INTERNATIONAL RESPONSIBILITIES

Responsibilities in the European VLBI Network

- INAF member in the EVN Consortium Board of Directors since 2017
- July 2021 – December 2022– Chairperson of the JIVE Council

- January 2021 – December 2022– Chairperson of the Consortium Board of Directors of the European VLBI Network
- Since January 2021- Legal Representative of Italy in the JIV ERIC, nominated by the Italian Ministry of Research and University

Participation in Time Allocation Committees

- MeerKAT allocation time panel for A03 and A04 (2022 and 2023)
- Chairperson of the European VLBI Network (EVN) Programme Committee from 1 June 2008 to 31 May 2011
- Scientific representative of Istituto di Radioastronomia in the EVN Programme Committee from 1 June 2005 to 31 May 2008 and from 1 June 2011 to 31 May 2012
- Member of the NRAO Peer Review Committee from 01 January 2009 to 31 December 2010
- External referee of GMRT Time Allocation Committee since 2005
- Member of the Chandra Peer Review for A014 (2012)

Participation in the EC Infrastructure Framework Programmes

RadioNet

- 2017 to May 2019 – Chairperson of the H2020 RadioNet Board
- 2017-2018 – Chairperson of the WP *Science Dissemination* in the H2020-RadioNet project
- 2012 – 2015 - Board member of the FP7 RadioNet3 Project (2012-2015)
- 2012 – 2015 Chairperson of the Science Working Group in FP7-RadioNet3
- From 1 January 2009 to 31 December 2011 - Chairperson of the Science Working Group in FP7-RadioNet2
- From 1 January 2004 to 31 December 2008 - Chairperson of the Science Working Group in FP6-RadioNet

JUMPING JIVE

- 2017-2021 – Chairperson of the WP The VLBI Roadmap in the H2020-JUMPINGJIVE Project
- Coordinator of the White Paper “The Future of VLBI” – Deliverable of JUMPING JIVE submitted to the EC in August 2020

Bilateral projects, EC projects of international scientific collaborations, and Projects of National Interest

- 2017-2021 – Coordinator of the MAECI-RSA Progetto di Grande Rilevanza *RADIO SKY 2020: Fostering the cooperation between Italy and South Africa through Radio Astronomy*

- 2014 – 2017 – Coordinator of the MAECI-RSA project Mobilita' “*Synergy between Italy and South Africa. Galaxy Clusters: a pivotal case for SKA precursor telescopes*”
- 2011 - 2015– Italian coordinator of the EC IRSES Project *CAFEGroups* (FP7)
- 2009 – 2010 – Coordinator of the Project of National Interest (PRIN-INAF), *Low Frequency Extragalactic Radio Astronomy in the LOFAR Era*
- 2005 – 2007: Italian coordinator of the Collaboration Italy-India (MAE – DST), *Investigation of the evolution of clusters, galaxy groups and active galaxies using low radio-frequency instruments*
- 2001 – 2003 and 2004 – 2006: Italian coordinator of the Collaboration Italy-Australia (CNR-CSIRO), *Studio a lunghezze d'onda radio di oggetti galattici ed extragalattici*
- 2001 – 2004: Italian coordinator of the Collaboration Italy-China (CNR-CAS) *VLBI. Sviluppo tecnologico di strumentazione e studio di radiosorgenti compatte*

INTERNATIONAL PANELS

- Since 2021 – Member of the ngEHT Project Advisory Committee;
- 2018-2022 – Member of the ASTRON Science Advisory Committee;
- 2019-2020 – Member of the ASTRON Apertif Review.

REVIEW PANELS FOR FUNDING OPPORTUNITIES

- 2022 – Panel reviewer for the SARAO Research Group Grants in Areas relevant to Radio Astronomy and Engineering
- 2021 – Reviewer for the Update of the Map of Unique Scientific and Technical Infrastructures 2021-2024 – Ministerio de Ciencia e Innovacion (Spagna)
- 2018 – Panel reviewer for the Nottingham Research Fellowship 2018
- 2017 – Panel reviewer for the Agence Nationale de la Recherche (France) for the proposal grant *A low-frequency radio imager for NenuFAR* (P.I. Zarka);
- 2017 – Panel reviewer for the NOW proposal grant *One facet of the LOFAR Sky Survey: feeding habits of the black holes hosted by multiple-cored nearby galaxy clusters* (P.I. A. Shulevski).

PARTICIPATION IN SCIENTIFIC ORGANIZING COMMITTEES

International meetings and conferences

SOC member in 24 conferences and workshops since 2004, 20 of them international.

European Radio Interferometry Schools (ERIS) – SOC member and lecturer

SOC member and lecturer in five European Radi Interferometry Schools (2005 – 2013)

INVITED TALKS AT INTERNATIONAL AND NATIONAL CONFERENCES

25 invited talks.

UNIVERSITY AND TEACHING DUTIES

Teaching Duties at the Department of Astronomy, University of Bologna

- 15 hours of Radio Laboratory for the Master Degree in Astrophysics and Cosmology of the University of Bologna in the Academic Years: 2005/2006, 2006/2007, 2009/2010, 2010/2011
- Tutor of 18 master thesis at the Department of Astronomy of the University of Bologna (1996-2016)
- Tutor of three PhD Thesis at the Department of Astronomy at the University of Bologna (2005-2012)
- Examiner of two PhD Thesis (Bologna University and Victoria University of Wellington, Zew Zealand).

International roles and duties

16 September 2022 – 31 December 2024 – Visiting Professor in the Department of Physics & Electronics, Rhodes University (South Africa)

- Currently co-supervisor of three PhD thesis: L. Frans (UVA, INAF, Univ. of Namibia, first year); Portia Legodi (SARAO, Rhodes University, co-supervisor O. Smirnov, second year); Keegan Trehaeven (SARAO/Rhodes University, co-supervisor O. Smirnov); Lwandile Gebushe (SARAO/Rhodes University, co-supervisor O. Smirnov, to start in Spring 2024); Samuel Toivo Mabote (SARAO/Rhodes University, co-supervisor O. Smirnov, to start in Spring 2024).
- Referee for several Master and PhD thesis of students in Australia, India, New Zealand, South Africa.

NATIONAL COMMITTEES

- Member of six national committees at CNR and INAF for the selection of staff members at the Istituto di Radioastronomia and at the Osservatorio Astronomico di Cagliari (2001), at the Osservatorio Astronomico di Cagliari (2008) and at the Osservatorio Astronomico di Bologna (2012), and several staff members in the MA1 sector (2016 and 2017).
- Member of the selection panel for PhD students in Astrophysics at the University of Bologna in 2004 and 2016.
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VISITING SCIENTIST

- California Institute of Technology (Pasadena, USA) in 1991, 1992, 1993, 1994, 1995
- Chinese Academy of Sciences, Beijing Astronomical Observatory (China) in 1991
- Instituto de Astrofísica de Andalucía (Granada, Spain) in 1992
- Australia Telescope Compact Array (Epping, Australia) in 1994, 1995, 1996, 1999, 2000
- Chinese Academy of Sciences (Shanghai, China) in 2002, 2004, 2018
- National Centre for Radio Astrophysics (Pune, India) in 2003, 2004, 2005, 2006, 2008, 2013, 2014, 2019
- Italian Embassy in Pretoria (Pretoria, South Africa) in 2017, 2018 and 2019.

SCIENTIFIC ACTIVITY

Research in the field of

- galaxy clusters
- thermal/nonthermal interaction
- radio galaxies on all scales.

Referee for Astronomy & Astrophysics, The Astronomical Journal, Monthly Notices of the Royal Astronomical Society, JOAA (India).

PUBLICATIONS

- 193 papers on refereed international journals as of today (see ADS)
[https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Daqp%20v%3D%24fq_database%7D&fq=%7B!type%3Daqp%20v%3D%24fq_property%7D&fq_database=database%3A%20astronomy&fq_property=property%3A%20refereed&q=author%3A\(%22Venturi%2Ct%22\)&sort=date%20desc%2C%20bibcode%20desc&p=0](https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Daqp%20v%3D%24fq_database%7D&fq=%7B!type%3Daqp%20v%3D%24fq_property%7D&fq_database=database%3A%20astronomy&fq_property=property%3A%20refereed&q=author%3A(%22Venturi%2Ct%22)&sort=date%20desc%2C%20bibcode%20desc&p=0)

- 2 review papers
- 170 conference proceedings (see ADS)

[https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Daqp%20v%3D%24fq_database%7D&fq_database=database%3A%20astronomy&q=author%3A\(%22Venturi%2Ct%22\)&sort=date%20desc%2C%20bibcode%20desc&p_0](https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Daqp%20v%3D%24fq_database%7D&fq_database=database%3A%20astronomy&q=author%3A(%22Venturi%2Ct%22)&sort=date%20desc%2C%20bibcode%20desc&p_0)

- Editor of 6 volumes (conference proceedings)
- Editor of the white paper VLBI20-30: a scientific roadmap for the next decade. The future of the European VLBI Network. Editors: T. Venturi, Z. Paragi, M. Lindqvist <https://arxiv.org/pdf/2007.02347.pdf>.

Bologna, 28 February 2024

A handwritten signature in grey ink that reads "Tiziana Venturi". The signature is written in a cursive style with a horizontal line at the end.