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Research Interests

Cosmology: the cosmic dawn, reionization, the intergalactic medium, large-scale structure of the Universe, 21-cm line of neutral hydrogen, dark matter, weak gravitational lensing.
Methods: image processing, machine learning, topological data analysis, Bayesian inference using Monte Carlo Markov chain (MCMC).

Academic Employments

After my PhD defence, I have been employed as a postdoctoral researcher at the following research institutes. I also mentioned the future position secured.

- **Nordic Institute for Theoretical Physics (NORDITA)** — **Stockholm, Sweden**
  Nordita fellow — *Oct 2022–present*
- **Institute for Computational Science, University of Zurich** — **Zurich, Switzerland**
  Postdoctoral researcher — *Jan 2020–Sep 2022*
- **Department of Astronomy, Stockholm University** — **Stockholm, Sweden**
  Postdoctoral researcher — *Apr 2019–Dec 2019*

Education

Below I list education in decreasing chronological order.

- **Department of Astronomy, Stockholm University** — **Stockholm, Sweden**
  Doctorate in astronomy, Supervisor: Prof. Garrelt Mellema — *Oct 2015 – Apr 2019*
  Thesis: Tomographic study of the 21 cm signal during reionization
- **Indian Institute of Technology (Banaras Hindu University)** — **Varanasi, India**
  Integrated master of technology, Engineering physics — *Jul 2010 – Oct 2015*
  Gold Medallist, *equivalent to summa cum laude*

  Master's thesis: Study of dynamic events on the solar photosphere
  Bachelor's thesis: Diagnostics of Magnetohydrodynamic (MHD) Waves

Achievements

Scientific

- In total, I have authored **56 publications**, including 49 in international peer-reviewed journals, 4 astrophysics codes and 3 conference papers
- I have made significant contribution to more than 70% of these publication, including **13 as first author, 15 as second author, 6 as third author**
- Among the second and third author contributions, **11 were led by students and junior researchers** whom I had the privilege to mentor

- Citation metrics. h-**index: 21,** m-**index: 3.0,** i**10-index: 28** (retrieved from Google Scholar on 10 May 2024). The most recent citation data and its evolution over the years can be found at the following links: SAO/NASA Astrophysics Data System and Google Scholar.
- Completed my PhD 6 months before the scheduled time
- I have been a **regular reviewer** for the following journals, which shows that I have extensive knowledge of the field to be able to give useful feedback on novel works.
  - Since 2020: Monthly Notices of the Royal Astronomical Society, Journal of Open Source Software
  - Since 2022: Journal of Cosmology and Astroparticle Physics
  - Since 2023: Physical Review Letters

Awards and Fellowships

- Awarded the **Young Scientist Award** by the International Union for Radio Science (URSI) in 2023
- Awarded the **Nordita fellowship** for independent research since 2022
- Awarded gold medal (equivalent to **summa cum laude**) during Integrated Master's degree (2015)
- Summer Research fellowship from Indian Academy of Sciences (2013)
- National Talent Search Examination, scholarship from the Government of India (2008)
- Qualified for the Graduate Aptitude Test in Engineering (GATE), conducted by the Department of Higher Education (Government of India), to receive a scholarship during the master's degree programme

International Collaborations and Memberships

I am a part of the following large international collaborations in the field of astronomy.

- **Square Kilometre Array (SKA)**: I play a key role in the 'Theory/Numerical Simulations', 'Signal Analysis and Interpretation' and 'Synergy' focus groups of the SKA CD/EoR science team. I build numerical simulations and predictions of the expected signal that are used to develop observational strategies for the low-frequency component of SKA. I develop tools to optimally extract information from the expected SKA image data, which are packaged into an open-source code called Tools21cm.
- **Low-frequency Array (LOFAR)**: I am a core member of the LOFAR EoR science team. My simulations are used to develop the data analysis pipeline. I have developed the Bayesian inference framework to interpret the observations.
- **Euclid space mission**: I am involved in the theory and simulations working group. I built a framework for modelling the baryonic feedback process that will affect the Euclid weak lensing observations. I also develop dark matter models that can be constrained with these observations.
- **Nancy Grace Roman Space Telescope**: I am involved in building theoretical models and observation strategies for probing the era of the first stars (Cosmic Dawn) with the upcoming infrared survey telescope.

In addition to my collaborative work, I am an active member of several prestigious astronomical societies.

- **European Astronomical Society** (2024-Present)
- **International Astronomical Union** (2024-Present)

Grants and Computing Resources

I have successfully applied for several grants. This shows that different funding organisations find my work interesting. The computing times achieved were useful in carrying out useful simulations for current and upcoming astronomical exploration. With this experience, I will be able to gain ample computing time for my project, which help develop new models and data analysis methods. Below I list the approved grants and granted computing time in reverse chronological order.

Grants

- **Nordita's PhD Fellows visitor program** (PI) 2024
  ∼27k SEK (∼2.6k EUR) to host a PhD student, Timothée Schaeffer (University of Zurich), for a 1.5-month-long research visit
- **Wenner-Gren Foundations** (co-I) 2023
  150k SEK (∼1.5k EUR) for organising a 1-week-long conference, namely *Cosmic Dawn at high latitudes Conference*
- **Royal Swedish Academy** (co-I) 2023
  150k SEK (∼1.5k EUR) for organising a 1-week-long conference, namely *Cosmic Dawn at high latitudes Conference*
- **Nordita's PhD Fellows visitor program** (PI) 2023
  ∼35k SEK (∼3.3k EUR) to host a PhD student, Anshuman Acharya (Max Planck Institute for Astrophysics), for a 2-month-long research visit
- **Nordita workshop** (co-PI) 2023
  600k SEK (∼57k EUR) for organising a 4-week-long workshop on studying the era of first stars and galaxies, namely *Cosmic Dawn at high latitudes*
- **Swedish Research Council (VR) Project grant** (co-I) 2021
  3.12M SEK (∼0.3M EUR) for 4-years to develop a data interpretation framework, titled 'Explorations of the Epoch of Reionization'
- **GRC Travel Grants, University of Zurich** (PI) 2020
  2.8k CHF (∼2.8k EUR) for a two-month-long research visit
- **Knut and Alice Wallenberg's Foundation** (PI) 2018
  10k SEK (∼950 EUR) for a research visit
- **Alva and Lennart Dahlmark research grant** (PI) 2019
  4.5k SEK (∼430 EUR) for a research visit
- **Alva and Lennart Dahlmark research grant** (PI) 2018
  10k SEK (∼950 EUR) for attending a winter school
- **C F Liljevalch J:ors travel grant** (as PI) 2018
  6k SEK (∼570 EUR) for attending a conference
- **IAU travel grant** (PI) 2017
  500 EUR for attending IAU symposium 333
- **Stockholm University donation stipend** (PI) 2018
  12k SEK (∼1.1k EUR) for attending a winter school
- **Stockholm University donation stipend** (as PI) 2017
  12k SEK (∼1.1k EUR) for attending a conference
- **Stockholm University donation stipend** (PI) 2016
  11k SEK (∼1.1k EUR) for attending a conference
- **Alva and Lennart Dahlmark research grant** (PI) 2016
  14k SEK (∼1.3k EUR) for a workstation

Computing resources

- **Swedish National Infrastructure for Computing** (co-PI) 2024
  24,000,000 core hours on Dardel for astrophysics projects at NORDITA
  600,000 core hours on Tetralith for astrophysics projects at NORDITA
  12,000,000 core hours on Dardel for running 3D RT comsic reionization simulations
  6,000(GPU)+100,000(CPU) hours on LUMI in Finland to upgrade our simulation framework
- **Swedish National Infrastructure for Computing** (co-PI) 2023

24,000,000 core hours on Dardel for astrophysics projects at NORDITA
600,000 core hours on Tetralith for astrophysics projects at NORDITA
6,000,000 core hours on Dardel for running 3D RT comsic reionization simulations

- **Swiss National Supercomputing Centre** (co-PI) 2022
  70,000 node hours for developing a deep learning algorithm for SKA image data
- **Swedish National Infrastructure for Computing** (Named collaborator) 2018
  450,000 core hours on Beskow for running 1D RT simulations
- **Swedish National Infrastructure for Computing** (Named collaborator) 2016
  3,600,000 core hours on Beskow for running 3D RT simulations
- **Swedish National Infrastructure for Computing** (Named collaborator) 2015
  4,800,000 core hours on Beskow for running 3D RT simulations

Teaching and Supervision

I was involved in the supervision of numerous student projects (supervised **3 master's thesis and 2 bachelor's theses**, co-supervised **3 PhD theses, 5 master's theses and 2 bachelor's theses**). In multiple cases, the work led to journal publications. These experiences show that I will be able to supervise students. To date, I have **taught 1 course at the university level** and acted as a teaching assistant for multiple courses. Below I list the supervision and teaching experiences in decreasing chronological order.

Teaching

- **Cosmology** — **Stockholm University**
  Primary teacher; 7.5 ECTS — *Oct 2022–Jan 2023*
- **Advanced simulation methods in Natural Sciences** — **University of Zurich**
  Teaching assistant; 5 ECTS — *Feb 2022–Apr 2022*
- **Upgrading the laboratory materials of Astronomy Lab** — **Stockholm University**
  Teaching assistant — *Sep 2019–Dec 2019*
- **Mechanics Lab** — **Indian Institute of Technology (BHU)**
  Teaching assistant — *Jan 2015–Apr 2015*
- **Electromagnetic Theory & Wave Guides** — **Indian Institute of Technology (BHU)**
  Teaching assistant — *Aug 2014–Nov 2014*

Supervision

- **Co-supervision of PhD students:**
  - Olof Nebrin (Stockholm University; Jan 2023–Dec 2026)
  - Jozef Bucko (University of Zurich; Sep 2020–Mar 2024)
  - Timothée Schaeffer (University of Zurich; Jan 2020–Aug 2024)
- **Supervision of visiting PhD students:**
  - Timo P. Schwandt (Sussex University; Sep 2023–Mar 2024)
  - Anshuman Acharya (Max Planck Institute for Astrophysics; Apr 2023–Jul 2023)
- **Supervision of master's students:**
  - Abdullah Sheriff (Stockholm University; Oct 2023–Jun 2024)
  - Karin Kjellgren (Stockholm University; Jan 2023–Jun 2023)
  - Chrishon Nilanthan (ETH Zurich; Oct 2020–May 2021)
- **Supervision of bachelor's students:**
  - Felix Vecchi (ETH Zurich; Mar 2022–Aug 2022)
  - Christina Fakiola (ETH Zurich; Mar 2022–Aug 2022)
- **Supervision of visiting master's students:**

  - Aniket Nath (National Institute of Science Education and Research, India; May 2024–Sep 2024)
- **Co-supervision of master's students:**
  - Michael Kovac (ETH Zurich; Nov 2021–Jun 2022)
  - Fabian Hervas Peters (University of Zurich; Aug 2021–Jun 2022)
  - Zhongnan Cai (University of Zurich; Aug 2020–Apr 2021)
  - Jonathan Hubert (ETH Zurich; Jan 2020–Jun 2020)
  - Ancel Larzul (École Normale Supérieure - Paris; Mar 2019–Aug 2019)
- **Co-supervision of bachelor's students:**
  - Eric Fredriksson (Stockholm University; Aug 2018-Dec 2018)
  - Thomas Aldheimer (Stockholm University; Aug 2018-Nov 2017)

Organisation and Institutional Responsibilities

I have been actively engaged in various administrative responsibilities alongside my research endeavours. Below, I outline some of the key roles I have undertaken.

- 24-28 Jun 2024: **Scientific and Local Organising Committee** member - *Cosmic Dawn at high latitudes Conference*; I am involved in preparing the full program of scientific talks and organising the local bookings required for the conference.
- 10 Jun-5 Jul 2024: **Organising Committee** member - 4-week long Nordita workshop on *Cosmic Dawn at high latitudes*; I am involved in finalising the participants for each week and the programme schedule.
- Jan 2023–present: **Nordita Astrophysics seminar organiser**, Nordic Institute for Theoretical Physics (Nordita), Sweden; I am currently responsible for the international speaker selection process, inviting and arranging their visit and organising the talk at the institute.
- Oct 2022–present: **Cosmology journal club organiser**, Department of Astronomy, Stockholm University, Sweden; I am responsible for organising weekly meetings dedicated to discuss recent publications.
- 02 Feb 2023: **Local organising committee** member - '1st National SKA Science Day Sweden'; I was part of the team responsible for organising the meeting, which involved tasks such as coordinating lunch arrangements and providing technical support during the presentations.
- 02–04 Feb 2022: **Primary conference organiser** - 'Learning the high-redshift Universe'; organised an online conference during the COVID-19 pandemic, providing early career scientists with a platform to share their work and foster meaningful interactions.
- Jun 2021–Jun 2022: **Cosmology seminar organiser**, Institute for Computational Science, University of Zurich, Switzerland; I was responsible for the international speaker selection process, inviting and arranging their visit and organising the talk at the institute.
- Sep 2020–Jun 2021: **Student seminar organiser**, Institute for Computational Science, University of Zurich, Switzerland; I was responsible for interacting with doctoral students at the institute and helping them prepare their presentations and speak in front of an audience.
- Sep 2019–Dec 2019: **Upgrading the laboratory materials of Astronomy Lab**, Stockholm University, Sweden; I was responsible for developing a student-friendly software package that give them hands-on experience in calculating the astronomical processes.

Presentations

I have presented my work in numerous forums, which shows that I have the capability to properly communicate the findings of my research work. Here I list my invited and contributed talks.

Invited

- **2nd National Sweden SKA Science Day** — **Gothenburg, Sweden**
  Exploring the epoch of reionization with SKA — *10-11 Sept 2024*
- **Kapteyn Astronomical Institute, University of Groningen** — **Groningen, Netherlands**
  On the use of machine learning for understanding cosmic reionization — *8 May 2023*
- **Understanding the epoch of cosmic Reionization** — **Sesto, Italy**
  Simulating the large-scale signal during reionization and cosmic dawn — *6-10 March 2023*
- **Nordita astrophysics seminar** — **Stockholm, Sweden**
  Can baryonic feedback processes resolve the S_8 tension? — *25 Jan 2023*
- **Laboratory of Astrophysics, EPFL** — **Lausane, Switzerland**
  Knowing cosmic reionization with images — *31 May 2022*
- **Kapteyn Astronomical Institute, University of Groningen** — **virtual/online**
  Modelling baryonic effects in weak lensing observations — *28 Feb 2022*
- **Tata Institute of Fundamental Research, Mumbai** — **virtual/online**
  Interpreting the high-redshift 21-cm signal observations — *14 Jan 2022*
- **Indian Institute of Technology, Hyderabad** — **virtual/online**
  Modelling baryonic effects in cosmological surveys — *1 Sept 2021*
- **RISU (Reionizing-Indore-Stockholm-Uppsala) meeting** — **virtual/online**
  Characterising the topology of ionized regions with the Betti numbers — *18 Jan 2021*
- **Institute for computational science, UZH** — **Zurich, Switzerland**
  Probing cosmic reionization with the 21-cm signal — *27 Mar 2020*
- **Institute for Particle Physics and Astrophysics, ETH Zurich** — **Zurich, Switzerland**
  Tomographic study of 21-cm signal during reionization — *10 Feb 2020*
- **Next-Generation Cosmology with Next-Generation Radio Telescopes: II** — **Sesto, Italy**
  Parameter inference from 21-cm images during reionization — *27-31 Jan 2020*
- **Observing the First Billion Years of the Universe** — **Indore, India**
  Image analysis techniques for 21-cm tomography of the CD-EoR — *20-24 Jan 2020*

Contributed

- **Euclid Cosmological Simulations SWG meeting 2023** — **Barcelona, Spain**
  Validation of baryonic feedback modelling methods — *15-17 Nov 2023*
- **First Nordic Cosmilogy Meeting** — **Stockholm, Sweden**
  Probing Cosmological Models Through the Era of First Galaxies — *23-25 Oct 2023*
- **OKC@15: Celebrating 15 years of Oskar Klein Centre** — **Stockholm, Sweden**
  Is the JWST Hinting Towards a Cosmological Model Beyond the Standard? — *17-19 Oct 2023*
- **Cosmology from Home** — **virtual/online**
  Detecting Beyond Standard Model Cosmology through EoR Observations — *3-14 Jul 2023*
- **Reionisation in the Summer** — **Heidelberg, Germany**
  Constraining the nature of dark matter with high-redshift observations — *26-30 Jun 2023*
- **National SKA Science Day Sweden** — **Stockholm, Sweden**
  Constraining cosmology with the 21-cm signal during reionization — *02 Feb 2023*
- **SKACH Kick-off Meeting, ETH Zurich** — **Zurich, Switzerland**
  Interpretation framework for SKA observations — *24 May 2022*
- **Advances in cosmology through numerical simulations (MIAPbP)** — **Garching, Germany**
  Simulating cosmic reionization at very large-scales — *10 May 2022*

- **LOFAR EoR KSP meeting** — **Paris, France**
  Fast 21-cm signal modelling framework — *28 Apr 2022*
- **4th Global 21-cm Workshop** — **virtual/online**
  Imprints of mixed dark matter in the 21-cm signal — *11 Oct 2021*
- **Swiss SKA Days, EPFL** — **Lausanne, Switzerland**
  Tools21cm: a user-friendly package to create mock SKA observations — *8 Sept 2021*
- **SKA Science Meeting (Breakout session)** — **Manchester, UK**
  Constructing emulators for reionization simulations — *12 Apr 2019*
- **PhD defence** — **Stockholm, Sweden**
  Tomographic study of the 21-cm signal during reionization — *03 Apr 2019*
- **Friday seminar (Department of astronomy)** — **Stockholm, Sweden**
  Tomographic study of the 21-cm signal during reionization — *08 Mar 2019*
- **Rise and shine: galaxies in the epoch of reionization** — **Strasbourg, France**
  Squeezed-limit bispectrum of 21-cm observations — *18 Jun 2018*
- **LOFAR EoR KSP meeting** — **Groningen, Netherlands**
  Astrophysical parameter estimation from 21-cm signal — *01 Feb 2018*
- **Licentiate defence** — **Stockholm, Sweden**
  Tomographic study of the 21-cm signal during reionization — *20 Jan 2018*
- **IAU Symposium 333** — **Dubrovnik, Croatia**
  Constraining the Lyman Continuum escape using machine learning — *02 Oct 2017*
- **LOFAR EoR KSP meeting** — **Haifa, Israel**
  Position dependent 21-cm power spectra during reionization — *04 Apr 2017*
- **SKA CD/EoR ST meeting** — **Pisa, Italy**
  Bubble identification in 21-cm tomography — *14 Mar 2017*

Experience of outreach activities

I am motivated to inspire the next generation of scientists to pursue a career in astronomy. In addition to engaging in informal conversations with high school students to address their curiosity about complex concepts, I have actively pursued formal opportunities, which I list below.

- Nordita Day of Open Doors (2023): I represented the Astrophysics division of Nordita during this event, which hosted first-year university students from Stockholm and Uppsala county. I delivered an overview seminar followed by an informal discussion on the methods and objectives of astrophysical research. I utilised animations generated from my simulations to elucidate the intricate process of early galaxy formation during the discussion.
- I created a new rendition of the 'Flammarion engraving' with the help of Dr Hannah Ross. The Flammarion engraving is an allegory representing humanity's curiosity and fascination with the universe, as well as the desire to explore and understand it. Our version presented how the Square Kilometre Array (SKA) will aid in this pursuit of understanding the cosmos. This creation was featured in SKA observatory's magazine, Contact issue 01.

Computer Skills

- **Programming**
  - Extensive knowledge of Python, C, C++, IDL, Matlab, Fortran, Javascript and HTML
  - Well-versed with the image processing and machine learning techniques
  - Experienced in using version control software such as GitHub and GitLab

- **Code development**
  - Developed a publicly available numerical simulation code, pyC^{2}Ray, to simulate cosmic reionization using Graphics processing units (GPUs)
  - Developed a publicly available fast simulation code, BEoRN, to easily explore the parameter space of cosmic reionization for data interpretation
  - Developed a publicly available python package, Tools21cm, for analyzing and understanding 21 cm signal data, which provides several sophisticated techniques from the field of data science, such as feature identification and Betti numbers
  - Developed a publicly available machine learning framework-based emulator, BCemu, for fast modelling of baryonic physics relevant to weak lensing observations
  - Developed a machine learning framework to identify extreme Lyman continuum leaking early photon sources or galaxies at high redshifts
  - Developed a Bayesian framework coupled with machine learning-based surrogate model (or emulator) trained on state-of-the-art simulations to interpret 21 cm signal data
  - Developed a package to model the impact of baryonic feedback processes on the matter power spectrum, which is incorporated into the Euclid end-to-end pipeline
- **Parallel computing**
  - Experience running massively parallel code: pyC^{2}Ray (radiative transfer), Pkdgrav3 (N-body).
  - Experience in computing with MPI (Message Passing Interface) and OpenMP.
  - Experience with utilising GPUs for both cosmological simulations and training machine learning models.

References

- **Prof. Garrelt Mellema**, The Oskar Klein Centre, Department of Astronomy, Stockholm University; Email: garrelt.mellema@astro.su.se; Phone: +46 8553 785 52
- **Prof. Aurel Schneider**, Institute for Computational Science, Center for Theoretical Astrophysics and Cosmology, University of Zurich; Email: aurel.schneider@uzh.ch; Phone: +41 78 735 5180
- **Prof. Axel Brandenburg**, Nordic Institute for Theoretical Physics (Nordita), Stockholm University; Email: brandenb@nordita.org; Phone: +46 8 5537 8707

Publications

Here I list all my research publications.

Published (Journals)

1. **Giri S. K.**, Mellema G., Dixon K. L. and Iliev I. T., 2018. Bubble size statistics during reionization from 21-cm tomography. *Monthly Notices of the Royal Astronomical Society*, 473(3), 2949-2964.
2. Ghara R., Mellema G., **Giri S. K.**, Choudhury T. R., Datta K. K. and Majumdar S., 2018. Prediction of the 21-cm signal from reionization: comparison between 3D and 1D radiative transfer schemes. *Monthly Notices of the Royal Astronomical Society*, 476(2), 1741-1755.
3. **Giri S. K.**, Mellema G. and Ghara R., 2018. Optimal identification of HII regions during reionization in 21-cm observations. *Monthly Notices of the Royal Astronomical Society*, 479(4), 5596-5611.
4. Watkinson C. A., **Giri S. K.**, Ross H. E., Dixon K. L., Iliev I. T., Mellema G. and Pritchard J. R., 2019, The 21cm bispectrum as a probe of non-Gaussianities due to X-ray heating. *Monthly Notices of the Royal Astronomical Society*, 482(2), 2653-2669.
5. **Giri S. K.**, D'Aloisio A., Mellema G., Komatsu E., Ghara R. and Majumdar S., 2019. Position-dependent power spectra of the 21-cm signal from the epoch of reionization. *Journal of Cosmology and Astroparticle Physics*, 2019(02), 058.
6. **Giri S. K.**, Mellema G., Aldheimer T., Dixon K.L. and Iliev I.T., 2019. Neutral island statistics during reionization from 21-cm tomography. *Monthly Notices of the Royal Astronomical Society*, 489(2), 1590–1605.

7. **Giri S. K.**, Zackrisson E., Binggeli C., Pelckmans K. and Cubo R., 2020. Identifying reionization-epoch galaxies with extreme levels of Lyman continuum leakage in James Webb Space Telescope surveys. *Monthly Notices of the Royal Astronomical Society*, 491(4), 5277-5286.
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9. Ghara R., **Giri S. K.**, Mellema, G., Ciardi, B., Zaroubi S., Iliev I. T., Koopmans L. V. E., Chapman E., Gazagnes S., Gehlot B. K., Ghosh, A., Jelić, V., Mertens F. G., Mondal R., Schaye, J., Silva M. B., Asad K. M. B., Kooistra R., Mevius M., Offringa A. R., Pandey V. N., Yatawatta S., 2020. Constraining the intergalactic medium at $z \approx 9.1$ using the LOFAR epoch of reionization observation. *Monthly Notices of the Royal Astronomical Society*, 493(4), 4728-4747.
10. Mertens F. G., Mevius M., Koopmans L. V. E., Offringa A. R., Mellema G., Zaroubi S., Brentjens M. A., Gan H., Gehlot B. K., Pandey V. N., Sardarabadi A. M., Vedantham H. K., Yatawatta S., Asad K. M. B., Ciardi B., Chapman E., Gazagnes, S., Ghara R., Ghosh A., **Giri S. K.**, Iliev I. T., Jelić V., Kooistra R., Mondal R., Schaye J., Silva M. B., 2020. Improved upper limits on the 21-cm signal power spectrum of neutral hydrogen at $z \approx 9.1$ from LOFAR. *Monthly Notices of the Royal Astronomical Society*, 493(2), 1662-1685.
11. **Giri S. K.**, Mellema G. and Jensen H., 2020. Tools21cm: A python package to analyse the large-scale 21-cm signal from the Epoch of Reionization and Cosmic Dawn. Journal of Open Source Software, 5(52), 2363, https://doi.org/10.21105/joss.02363.
12. Mondal R., Fialkov A., Fling C., Iliev I. T., Barkana R., Ciardi B., Mellema G., Zaroubi, S., Koopmans L. V. E., Mertens F. G., Gehlot B. K., Ghara R., Ghosh A., **Giri S. K.**, Offringa A., Pandey V. N., 2020. Tight Constraints on the Excess Radio Background at $z = 9.1$ from LOFAR. *Monthly Notices of the Royal Astronomical Society*, 498(3), 4178-4191.
13. Ross H. E., **Giri S. K.**, Mellema G., Dixon K. L., Ghara R. and Iliev I. T., 2021. Redshift-space distortions in simulations of the 21-cm signal from the cosmic dawn. *Monthly Notices of the Royal Astronomical Society*, 506(3), 3717-3733.
14. Schneider A., **Giri S. K.** and Mirocha J., 2021. A halo model approach for the 21-cm power spectrum at cosmic dawn. *Physical Review D*, 103(8), 083025.
15. **Giri S. K.** and Mellema G., 2021. Measuring the topology of reionization with Betti numbers. *Monthly Notices of the Royal Astronomical Society*, 505(2), 1863-1877.
16. Hothi I., Chapman E., Pritchard J. R., Mertens F. G., Koopmans L. V. E., Ciardi B., Gehlot B. K., Ghara R., Ghosh A., **Giri S. K.**, Iliev I. T., Jelić V., Zaroubi, S., 2021. Comparing Foreground Removal Techniques for Recovery of the LOFAR-EoR 21cm Power Spectrum. *Monthly Notices of the Royal Astronomical Society*, 500(2), 2264-2277.
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19. Bianco M., **Giri S. K.**, Iliev I.T. and Mellema G., 2021. Deep learning approach for identification of HII regions during reionization in 21-cm observations. *Monthly Notices of the Royal Astronomical Society*, 505(3), 3982-3997.
20. Ghara R., **Giri S. K.**, Ciardi B., Mellema G. and Zaroubi S., 2021. Constraining the state of the intergalactic medium during the Epoch of Reionization using MWA 21-cm signal observations. *Monthly Notices of the Royal Astronomical Society*, 503(3), 4551-4562.
21. Hubert J., Schneider A., Potter D., Stadel J., and **Giri S.K.**, 2021. Decaying dark matter: simulations

and weak-lensing forecast. *Journal of Cosmology and Astroparticle Physics*, 2021(10), 040.

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