Universiteit Leiden
The Netherlands

Prying eyes on radio skies: pushing the high-resolution low-frequency frontier with LOFAR

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Citation

Sweijen, F. (2024, April 18). *Prying eyes on radio skies: pushing the high-resolution low-frequency frontier with LOFAR*. Retrieved from https://hdl.handle.net/1887/3732040

Version:	Publisher's Version
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Note: To cite this publication please use the final published version (if applicable).

List of publications

First-author publications

Sweijen, **F.**, R. J. van Weeren, H. J. A. Röttgering, L. K. Morabito, N. Jackson, A. R. Offringa, S. van der Tol, B. Veenboer, J. B. R. Oonk, P. N. Best, M. Bondi, T. W. Shimwell, C. Tasse, and A. P. Thomson (Jan. 2022a). "Deep Sub-Arcsecond Wide-Field Imaging of the Lockman Hole Field at 144 MHz". In: *Nature Astronomy*, pp. 1–7. ISSN: 2397-3366. DOI: 10.1038/s41550-021-01573-z. (Visited on 01/28/2022).

Sweijen, **F.**, L. K. Morabito, J. Harwood, R. J. van Weeren, H. J. A. Röttgering, J. R. Callingham, N. Jackson, G. Miley, and J. Moldon (Feb. 2022b). "High-Resolution International LOFAR Observations of 4C 43.15. Spectral Ages and Injection Indices in a High-z Radio Galaxy". In: *Astronomy and Astrophysics* 658, A3. ISSN: 0004-6361. DOI: 10.1051/0004-6361/202039871. (Visited on 02/28/2024).

Sweijen, **F.**, Y. Lyu, L. Wang, F. Gao, H. J. A. Röttgering, R. J. van Weeren, L. K. Morabito, P. N. Best, K. Małek, W. Williams, I. Prandoni, M. Bonato, and M. Bondi (Mar. 2023). "Piercing the Dusty Veil of Hyper-Luminous Infrared Galaxies: Sub-arcsecond 144 MHz ILT Observations of HLIRGs in the Lockman Hole". In: *Astronomy and Astrophysics* 671, A85. ISSN: 0004-6361. DOI: 10.1051/0004-6361/202244378. (Visited on 02/28/2024).

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Bonnassieux, Etienne, **Frits Sweijen**, Marisa Brienza, Kamlesh Rajpurohit, Christopher John Riseley, Annalisa Bonafede, Neal Jackson, Leah K. Morabito, Gianfranco Brunetti, Jeremy Harwood, Alex Kappes, Huub J. Rottgering, Cyril Tasse, and Reinout van Weeren (Feb. 2022). "Spectral Analysis of Spatially Resolved 3C295 (Sub-Arcsecond Resolution) with the International LOFAR Telescope". In: *Astronomy and Astrophysics* 658, A10. ISSN: 0004-6361. DOI: 10.1051/0004-6361/202141731. (Visited on 02/28/2024).

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Curriculum Vitae

I was born on November 14, 1994 in the Frisian village Drachten[6]. After primary school, I went to high school at the CSG Liudger, where I followed the VWO (Gymnasium). In the final year we had to choose the university track we were going to follow. This is the point where I am supposed to say I finally got to pursue my life-long dream of becoming an astronomer... except that would be a lie. As a child I was convinced my career would be a surgeon, always enjoying episodes of "Ingang Oost"; a Dutch TV show following happenings in the emergency room of various hospitals. In high school my interests moved more towards the physical sciences. A big driver for this were a great teacher for chemistry, whose name I do not remember at the time of writing, and my physics teacher Mr. Couperus, who always had time after school to show some more fun experiments. Throughout high school I was reasonbly convinced I would pick something in the direction of chemistry. When the list of available studies came in, however, I saw astronomy on there. On a whim I decided that I was going to study astronomy; because why not?

My university studies took me to the next province over: Groningen. I started my three-year BSc. Astronomy at the *Rijksuniversiteit Groningen* (RUG; University of Groningen) there in 2012. In my first year I did follow an optional chemistry course "just in case", but alas here I am writing my astronomy thesis. At the end of the three years I teamed up with three other fellow students for a bachelor research project with dr. John McKean. It was a practically oriented radio-astronomy project with an ambitious scope: build a radio telescope and measure the temperature of the CMB. In true experimental fashion we made the ground-breaking finding of the CMB actually having a sub-zero absolute temperature... Suffice to say accounting for all instrumental effects is not straightforward. In 2015 I started the two-year MSc. Astronomy. My first foray into radio astronomy had peaked my interest, so for the research project in the final year I once again ended up with John, but this time for a more data-oriented project involving observations from the *Very Large Array*. This is where I realised my love for programming and data reduction problems.

On the quest for a PhD, I saw a position advertised at Leiden observatory by prof. Huub Röttgering, dubbed "Exquisite LOFAR Images to Study the Distant Universe", which caught my attention. It felt like a natural continuiation of my interest in radio astronomy. Under the supervision of both Huub and dr. Reinout van Weeren, I started this PhD in 2017 where we worked on calibration of and imaging with LOFAR's international stations to produce detailed images of the 144 MHz radio sky. Near the end of 2022 I joined the *Netherlands Institute of Radio Astronomy* (ASTRON) as a part-time software developer, while in the mean time finishing up my PhD. Starting April 2024 I will be joining dr. Leah Morabito in Durham as a postdoc, once again continuing along the line of high-resolution imaging with LOFAR.

[6] Although it can be called a city by modern means, it never obtained borough rights and thus failed to become one of "the eleven cities".

Acknowledgements

Acknowledgements; probably the hardest chapter of this work. What do you say? Who do you thank first? Have you forgotten anybody? We may never know, but here it goes.

Firstly, a word of thanks has to be given to my supervisors, despite hearing through the grapevine that one shouldn't. Huub, you are quite the character. I remember your phone call to tell me you would like to offer me the position, where (if memory serves me right) you were in a bit of a hurry, because you were about to board the SOFIA observatory. The sky was also the limit for the aspirations we wrote in our *Education and Supervision Plan* that we ambitiously drafted at the start which we in hindsight could not possibly have met. You gave me plenty of freedom, probably too much, but that did allow me to follow my interests. Reinout, your technical insight and know-how were invaluable to the success of the works in this thesis. I don't think we have ever had a regularly scheduled meeting, because you always made time for a "quick" question about a problem or radio astronomical concept even though they often did not end up being all that quick.

Alright, on to the most dangerous part. Patrick, thank you for introducing me to some DnD together with Hiddo, Kirsty, Niloo, Omar and Sanjana. It was fun learning about it and we had some good times. Erik: we will always have Sfinx. Thank you for introducing me to kapsalon. I don't know how I managed to live without it until now. Martijn and Rafaël: we had some great dinners together. Jurjen and Roland: what can I say, ABBA is not the only dancing queen. I also need to thank the many people in or around the Leiden LOFAR group over the years both at work and outside of that — Alex, Andrea, Anniek, Christian, Duy, Gabriella, George, HaoYang, Huib, Ian, Jit, Joe, Josh, Ken, Kim, Maolin, Maria, Raymond, Sai, Tong, Sarah, Xuechen, Wendy and many students — for contributing to a vibrant atmosphere. Yipeng, I hope your career is going well. The results of your MSc project that I helped supervised led to the paper in Chapter 5.

Then I should mention the people in the VLBI working group: Emmy, thank you for introducing us the phenomenon that is Nando's, and together with James showing us the Durham night life; and thank you Alex, Deepika, Etiènne, James, Jonny, Leah, Marco, Matthijs, Neal all for making the busyweeks fun and interesting. This extends, of course, to the wider LOFAR collaboration as well: Cyril, thank you for showing us Paris; Marco, I'm glad I got an Italian to try pizza Hawaii; Bohan, Corey, Francesco, Nika, Pranav, Rohit, Vijay and many others I have met along the way, you have all contributed to the experience one way or another.

Of course I should not forget the people at Leiden observatory: Andrés, Bas, Dario, Dilovan, Evgenii, Fraser, Gijs, Ivana, Jeroen, Josh, Jelle (surviving the "LOFAR office" was not easy), Jeroen, Joey, Lýdia, Mantas, Marta, Martijn, Matus, Mihal, Nicco, Piyush, Roi, Stella, Stijn, Thijs, Thomas, Turgay, Willeke (the resident pastry chef; I will miss your cakes dearly). You all contributed to a bustling atmosphere, always ready to finish the same puzzle for the however many-th time. If you are not in this list, don't take it personally. There are just too many of you. Big Dipper, thank you for dutifully organising the vrijmibo's. Finally I thank the right coffee machine for making the better coffee.