Bruno Pollarolo

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Summary

Senior undergraduate student in Electrical Engineering and Astronomy at Universidad de Chile, with two years of research experience in radio astronomy and a focus on instrumentation and transient phenomena. I am a member of the AstroLab research group, where my work bridges engineering and astrophysics through digital signal processing, field programmable gate array (FPGA) development on Xilinx AMD RFSoC platforms, and interferometer design, from analog front-end construction to digital correlation and data analysis. I am currently part of the Canadian–Chilean array for radio transient studies (CHARTS) project, a 256-element interferometer in the 300-500 MHz passband aimed to detect fast radio bursts (FRBs) in the Southern Hemisphere.

Education

Universidad de Chile 2020–Present
Facultad de Ciencias Físicas y Matemáticas (FCFM)

B.Sc. in Electrical Engineering 2020–2024
B.Sc. in Astronomy 2020–2025
Civil Electrical Engineering (*título profesional*) 2024–Present
Thesis: Design and implementation of the F-engine for the CHARTS project

Research and Work Experience

Undergraduate Thesis, AstroLab, Universidad de Chile Dec 2024 – Present

- Developing the F-engine (digitization and Fourier transform) for CHARTS.
- Implementing custom field programmable gate array (FPGA) firmware for Xilinx RFSoC 4x2 to process multiple antennas on a single digitizer through demultiplexing.
- Key innovation: simultaneous demodulation of several antennas from a single analog-to-digital converter (ADC), enabling wide-bandwidth digitization of up to 8 antennas of 200 MHz bandwidth.
- This system is central to CHARTS scalability, allowing a single digitizer to acquire data from up to 32 antennas within the 256-element array.

Guided Research (EL7850), AstroLab, Universidad de Chile Mar 2024 – Jul 2024

- Extended a previous RFSoC-based transmission system to handle arrays up to 4 GB, enabling the generation and analog injection of synthetic FRBs for end-to-end system testing.
- Modeled FRB time-domain voltages using inverse Fourier transforms of dynamic spectra generated with `fitburst`.
- Conducted complete signal-chain validation from waveform synthesis to analog transmission, ensuring the stability and reproducibility of injected FRB-like signals.

Internship, AstroLab, Universidad de Chile Dec 2023 – Feb 2024

– Designed and implemented a PYNQ overlay in Vivado to generate arbitrary waveform signals (up to 64 MB of data).

– Programmed and transmitted waveforms through the DAC on the RFSoC 4x2, laying the groundwork for a programmable waveform generation module later integrated into CHARTS.

– Gained hands-on experience in FPGA design and radio frequency (RF) instrumentation.

Publications

- Lau, A. W. K., Burgos, G., **Pollarolo, B.**, Manosalva, S., Brecht, F., Cassanelli, T., Mena-Parra, J., Vanderlinde, K., & Finger, R. (2026). "Differential active planar antenna and frequency-division multiplexing with commercial electronics for CHARTS interferometer". In: *2026 20th European Conference on Antennas and Propagation (EuCAP)* (submitted).
- Lau, A. W. K., Manosalva, S., Burgos, G., **Pollarolo, B.**, Cassanelli, T., Finger, R., Mena-Parra, J., & Vanderlinde, K. (2026). "System architecture and deployment of the CHARTS pathfinder wide-field radio transient interferometer". In: *SPIE Astronomical Telescopes + Instrumentation 2026* (abstract submitted; in preparation).

Workshops

Dunlap Institute Summer School 2025, University of Toronto Jul 2025

– Built a two-element radio interferometer from scratch, including antenna construction, RF analog chain, and data processing, successfully detecting interferometric solar fringes.

– Strengthened international collaboration experience and practical understanding of low-frequency interferometry.

Awards and grants

2020, 2021, 2022, 2023, 2024, 2025 – Outstanding student at FCFM, Universidad de Chile. A distinction awarded annually to students with a GPA above 5.7 (on the Chilean 1.0 - 7.0 scale).

2025 – Dunlap Summer School 2025 registration and travel waiver ($1500 CAD)

Language Certifications

2024 – C1 TOEFL ITP.
2025 – 104/120 (C1) TOEFL iBT

Teaching Assistantships

- **Applied Electromagnetism (EL3103)** — 3 semesters (2024–2025). Teaching assistant responsible for preparing and grading evaluation exercises, including wave guides, antenna and transmission lines problems.
- **Advanced Calculus and Applications (MA2002)** — 5 semesters (2022–2025). Exercises lecturer conducting weekly problem-solving sessions on vector calculus, complex integration, Fourier series and transforms, and partial differential equations.
- **Analysis and Design of Electrical Circuits (EL3101)** — 1 semester (2023). Teaching assistant leading weekly sessions focused on circuit analysis and problem solving.

Outreach Activities

- AstroLab Outreach Event (Aug 2025). Presented the digital development of CHARTS during an event organized by the AstroLab research group and ElectroTutores at FCFM, Universidad de Chile.
- Telescope Observation Monitor – *Día de la astronomía* (astronomy day, Mar 2022). Facilitated telescope sessions at the Centro Cultural Montecarmelo, Municipality of Providencia.
- Telescope Observation Monitor – *Peñaflor y sus Estrellas* (Nov 2021, Jan 2023). Participated in public outreach activities, guiding telescope observations. Contributed as a deep-sky astrophotographer.

Hobbies

- Astrophotographer – Deep sky and planetary photography at @franquis_astro.
- Member of Club Andino Universitario – Active in mountaineering and outdoor exploration @club_andino_universitario.

Computing Skills

Operating Systems	Windows, Linux
Programming Languages	Python (NumPy, Matplotlib, AstroPy, PyTorch, Pandas, fitburst), Matlab, Verilog
Markup Languages	LaTeX, TikZ, HTML
Software	Vivado, HFSS, Simulink (CASPER toolbox), LTspice

References

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