Marc-Olivier Lalonde

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Research Interests

My main research area is instrumentation for cosmology and astrophysics during the epoch of reionization using the 21cm Hydrogen line.

My area of technical expertise is the design and development of low frequency antennas for the use in interferometer and global signal experiments. My current work involves the development of low mutual coupling antennas to limit uncertainties and systematics in future 21 cm interferometers through the use of electromagnetic simulation software such as Altair FEKO.

I have also been involved with field work in the canadian high arctic as well as at observatories in the US for interferometer deployment and testing. I have done work with drone-based antenna calibration projects and student-led cube-satellite development and testing.

Education

PhD Astrophysics	**Arizona State University**	2023 - present
MSE Electrical Engineering	**Arizona State University**	2023 - present
BSc Honours Physics	**McGill University**	2019 - 2023

Work Experience

Graduate Student, Astrophysics August 2023 - present

- Antenna Design for low frequency 21 cm cosmology interferometer and global signal experiments.
- Electrical and Systems engineering and integration testing for CubeSat avionics.
- Testing and integration of radio payload for antenna drone calibration efforts.
- Field work involving the drone calibration of LWA antennas in Soccoro, NM for the ECHO project.
- Teaching assistant for introductory laboratories for science major undergraduates.

Student Researcher, Observational Cosmology Mar 2021 - July 2023

- Field work for two summers in the Canadian High Arctic. Work included deployment and testing autonomous antenna stations for year long data collection.
- Assembled and tested the back-end electronics for antennas used in 21cm cosmology experiments.
- Back-end electronics PCB design for small sub-systems such as RTC and temperature sensors.

McGill Rocket Team Project Lead Sep 2020 - July 2023

- Research and development of the antennas on board the rocket and in our ground station.
- Designed and tested antennas, circuits and printed circuit boards.
- Supervised and helped fellow students in my project.

Project Involvement

Long Wavelength Array – Meteor Crater	loco.lab.asu.edu/LWA-AZ
Deployable Optical and Radio Array (DORA)	loco.lab.asu.edu/dora
External Calibrator for Hydrogen Observatories (ECHO)	danielcjacobs.com/echo
Array of Long Baseline Antennas for Taking Radio Observations from the Sub-antarctic/Seventy-ninth parallel (ALBATROS)	physics.mcgill.ca/chiang/work

Mentoring Experience

Teaching Assistant (ASU) August - December 2025

Earth, Solar System and Universe Laboratory (SES 123)

BJJ Assistant Kids Coach June 2025 - September 2025

Assistant coach for kids and teens class at GD Jiu-Jitsu Academy, Tempe, AZ.

MRT Project Lead 2020 - 2023

Responsible for advising undergraduate students on their projects for the antenna sub-team.

McGill Physics Outreach Program Volunteer 2020-2022

Help organise and deliver presentations about physical phenomenon to elementary school students.

Skills

Antenna Design	I have extensive experience in antenna design using the Electromagnetic simulation software Altair FEKO. This includes design of resonant antennas, travelling wave antennas as well as microstrip and leaky wave antennas. I have experience utilizing optimization extensions and using LUA files for design automation.
PCB Design	I have experience in printed circuit board design for applications in microstrip antennas, I2C devices, RF circuits and interface boards for cube-satellite integration. I have extensive experience using KiCAD, Altium and RF circuit simulation software such as Keysight Advanced Design System (ADS)
CAD Desing	I have done multiple CAD models for proposed 21 cm experiments using CADing software such as SolidWorks andf Fusion360. One of these projects involved CADing a gondola and antenna systems for a balloon-based global signal experiment.

Publications

Lalonde, Marc-Olivier R. et al. (2025). "Integration and Delivery of the Deployable Optical Receiver Aperture (DORA) Cubesat". In: *2025 IEEE Aerospace Conference*, pp. 1–12. DOI: 10.1109/AERO63441.2025.11068721.

Zhao, Yifan et al. (2025). "Pathfinding Low Frequency Radio Astronomy with the DORA Radio Background Experiment". In: *2025 IEEE Aerospace Conference*, pp. 1–10. DOI: 10.1109/AERO63441.2025.11068787.

Talks

Lalonde, Marc-Olivier R. et al. (2025). "Development of a Low Mutual Coupling Antenna for Future 21 cm Interferometers". In: *2025 United States National Committee of URSI National Radio Science Meeting (USNC-URSI NRSM)*, pp. 278–278. DOI: 10.23919/USNC-URSINRSM66067.2025.10906848.

In Submission

Herman, Lawrence et al. (2024). *Drone-Based Antenna Beam Calibration in the High Arctic*. arXiv: 2407.00856 [astro-ph.IM]. URL: https://arxiv.org/abs/2407.00856.

Zhao, Yifan et al. (2024). *An Update on the External Calibrator for Hydrogen Observatories (ECHO)*. arXiv: 2407.03462 [astro-ph.IM]. URL: https://arxiv.org/abs/2407.03462.