

Antonella Caldarelli - Curriculum Vitae

Address

Mobile Phone

Email

Work Experience

June 2024 - Postdoctoral Research Fellow

Current *Department of Industrial Engineering / Alma Mater Studiorum – Università di Bologna*

Development and testing of plasma propulsion systems, and the relevant testing facilities within the project Horizon Europe RIA Lump Sum GA n. 101135216 *Building blOcks for iOdine thruSTer BOOST*

Oct 2023 - Research Assistant

April 2024 *Department of Physics / The University of Auckland*

Experimental research on radio-frequency plasma thrusters, with focus of plasma generation and acceleration mechanisms.

Feb 2021 - Teaching Assistant

July 2023 *Department of Physics / The University of Auckland*

Laboratory demonstrator and tutor for different Physics courses.

Feb 2019 - Avio

Sep 2019 *Project Intern / Department of Liquid Propulsion*

Preliminary fuelling system design of the Vega E cryogenic upper stage:

- Sizing and insulation design of the ground support equipment for cryogenic propellants, including storage tanks, transfer lines and control valves.
- Computational model of the two-phase thermo-fluid dynamics of the loading sequence of liquid oxygen and liquid methane using the ESA software EcosimPro.

Education

2020-2024 PhD in Physics - The University of Auckland, New Zealand

“Radio-Frequency Plasma Expansion in Different Magnetic Nozzle Configurations”

Experimental study of plasma expansion and acceleration in a RF plasma thruster with varying magnetic nozzle strength and orientation.

2017-2019 MSc in Space Science and Technology - Luleå University of Technology, Sweden

Spacecraft Design Project - system and propulsion engineer role and trajectory analyst for a cargo return mission to the ISS.

Major in: spacecraft design, space instruments, plasma physics, flight orbit and attitude dynamics.

Master Thesis - “Dimensioning of the Vega E Cryogenic Stage Fuelling System”

2014-2017 BEng in Aerospace Engineering - The University of Manchester, United Kingdom

Graduation grade: First Class Honours (GPA 4.0)

Major in: thermodynamics, fluid dynamics, aerospace propulsion and aerodynamics.

Third Year Project - “Application of Plasma Propulsion Engines for Manned Interplanetary Missions”

2009-2014 Diploma di Maturità - Liceo Scientifico Mafredi Azzarita, Roma

Final grade: 100/100

Project Work

- Oct 2018** 2018 Concurrent Engineering Challenge
European Space Agency
Responsible for the trajectory analysis and propulsion system design of a space mission involving a polar constellation of satellites for ships and aeroplanes tracking.
- Oct 2017 -
Aug 2018** Red Eagle International Student Engineering Contest
The Mars Society
Responsible for the mission analysis, orbital mechanics and re-entry aerodynamics of the preliminary design of a 10 ton Mars lander.
- Oct 2017 -
Feb 2018** FloatSat Vehicle – Floating Satellite System
University of Würzburg
Mechanical and control engineer role of a 2-D floating vehicle to simulate the attitude of satellites in micro-gravity.

Awards

- 2022** AUEA Braithwaite-Thompson Graduate Research Award
The University of Auckland - *Auckland, NZ*
- 2018** 1st place at the Red Eagle International Student Engineering Contest
The Mars Society - *Pasadena, USA*
- 2016** The Aerospace Engineering Top Student Award
The University of Manchester - *Manchester, UK*

Technical Skills

- **Laboratory Research**
Vacuum systems design, plasma discharges & diagnostics, data acquisition & processing
- **Modelling and Simulation**
ANSYS Electronics, EcosimPro, STK, GMAT, Excalibur Flight Simulator Software, Simulink
- **Computer Aided Design**
Solidworks, Inventor
- **Programming Language**
Matlab

Publications

Peer-Reviewed Journals

A. Caldarelli, F. Filleul, K. Takahashi, R. W. Boswell, C. Charles, J. E. Cater, and N. Rattenbury, "Detection of a low-frequency ion instability in a magnetic nozzle," *Plasma Sources Science and Technology*, *Under review* (2024).

F. Filleul, A. Caldarelli, K. Takahashi, R. W. Boswell, C. Charles, J. E. Cater, and N. Rattenbury, "Helicon waves in a converging-diverging magnetoplasma," *Plasma Sources Science and Technology* 32, 115015 (2023).

A. Caldarelli, F. Filleul, C. Charles, R. W. Boswell, J. E. Cater, and N. Rattenbury, "Effects of magnetic nozzle strength and orientation on radio-frequency plasma expansion," *Plasma Sources Science and Technology* 32, 075002 (2023).

A. Caldarelli, F. Filleul, C. Charles, R. W. Boswell, N. Rattenbury, and J. E. Cater, "Data processing techniques for ion and electron energy distribution functions," *Physics of Plasmas* 30, 040501 (2023).

A. Caldarelli, F. Filleul, C. Charles, R. W. Boswell, N. Rattenbury, and J. E. Cater, "Radial characterization of an ion beam in a deflected magnetic nozzle," *Journal of Electric Propulsion* 1, 10 (2022).

F. Filleul, A. Caldarelli, R. W. Boswell, C. Charles, N. Rattenbury, and J. E. Cater, "The role of ion magnetization on plasma generation in a magnetic nozzle RF device," *Journal of Electric Propulsion* 1, 20 (2022).

F. Filleul, A. Caldarelli, C. Charles, R. W. Boswell, N. Rattenbury, and J. E. Cater, "Characterization of a new variable magnetic field linear plasma device," *Physics of Plasmas* 28, 123514 (2021).

Conference Proceedings

A. Caldarelli, R. Andriulli, F. Ponti, J. E. Cater, and N. Rattenbury, "Dependence of Input Power on Plasma Expansion in a Magnetic Nozzle RF Thruster," in 38th International Electric Propulsion Conference, IEPC-2024-322 (2024).

A. Caldarelli, F. Filleul, C. Charles, R. W. Boswell, N. Rattenbury, and J. E. Cater, "Effects of magnetic nozzle strength on a supersonic ion beam in a RF electrode-less plasma thruster," in Aerospace Europe Conference 2023 - 10th EUCASS - 9th CEAS, 282 (2023).

A. Caldarelli, F. Filleul, C. Charles, N. Rattenbury, and J. E. Cater, "Radial characterization of an ion beam in a deflected magnetic nozzle," in 37th International Electric Propulsion Conference, IEPC-2022-505 (2022).

F. Filleul, A. Caldarelli, R. W. Boswell, C. Charles, N. Rattenbury, and J. E. Cater, "Ion magnetization effects on plasma generation in a magnetic nozzle RF device," in 37th International Electric Propulsion Conference, IEPC-2022-501 (2022).

A. Caldarelli, F. Filleul, C. Charles, N. Rattenbury, and J. E. Cater, "Preliminary measurements of a magnetic steering system for RF plasma thruster applications," in AIAA Propulsion and Energy 2021 Forum, p. 3401 (2021).

Languages

- Italian (native), English (fluent/native), Spanish (intermediate)

Referees

Name Ass. Prof. Nicholas Rattenbury
University University of Auckland
Position Associate Professor
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Name Prof. Rod Boswell
University Australian National University
Position Professor
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