

# TOMÁS ALBERTO CASSANELLI

## Assistant Professor of Electrical Engineering

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**Spanish** (Español Chile) — Native speaker    **English** — Professional working proficiency.

### EDUCATION

- January 2018–February 2022 **PhD Astronomy & Astrophysics.** University of Toronto, Canada.
- October 2015–October 2017 **MSc Astrophysics.** Universität Bonn and Max-Planck-Institut für Radioastronomie, Germany.
- March 2009–January 2015 **Civil Industrial Engineering with a Major in Mechanics** (Título Profesional). Universidad de La Frontera, Chile.
- August 2010–August 2014 **Applied Physics Bachelors Degree.** Universidad de La Frontera, Chile.

### PROFESSIONAL APPOINTMENTS

- March 2022–Present Assistant Professor, Departamento Ingeniería Eléctrica, Universidad de Chile, Chile.
- November 2017–December 2017 Part time scientist: Out-of-focus holography at the Effelsberg telescope. Max-Planck-Institut für Radioastronomie, Germany.

### AWARDS

- 2020 "Department of Astronomy & Astrophysics Graduate Program Award". University of Toronto, Canada, \$800.
- 2018, 2019, and 2020 "Faculty of Arts & Science Program-Level Fellowship". University of Toronto, Canada, \$1600.
- 2018 "Verein der Freunde und Förderer des Max-Planck-Institut für Radioastronomie e.V." Master of science thesis annual award, Germany, \$600. Three referees delivered the judgement: *excellent*.
- 2017 Becas Chile (Agencia Nacional de Investigación y Desarrollo; ANID): "Becas doctorado en el extranjero 2017" complete funding for up to four years in a foreign PhD program. Government of Chile, \$170000.
- 2010, 2011, and 2012 Academic Excellence Award. Universidad de La Frontera, Chile, \$920.

### THESES

- 2022 **Astronomy & Astrophysics Doctoral thesis:** [Fast Radio Burst localization with Very Long Baseline Interferometry](#). University of Toronto, Canada. Supervisor: Dr. Keith Vanderlinde.
- 2017 **Astronomy & Astrophysics MSc thesis:** [Systematic measurements of the surface of the 100-m radio telescope using the out-of-focus holography method](#). Max-Planck-Institut für Radioastronomie, Germany. Supervisor: Dr. Karl Menten.
- 2015 **Civil Engineering thesis:** [Análisis de las vibraciones en instrumentación de observación astronómica generadas durante operaciones de transporte\\*](#). Atacama Large Millimeter/submillimeter Array (ALMA), Chile. Supervisor: Mechanical Engineer Armin Silber (ESO Cryogenics) and Dr. Juan Möller (Universidad de La Frontera).

\*Vibration analysis of astronomical instrumentation related to transport operations.

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## RESEARCH EXPERIENCE

- September 2016–October 2016 Internship: A new method to determine a pulsar period: the PCA Waterfall. Department of Information Engineering, Università di Padova, Italy. Supervisor: Dr. Giampiero Naletto.
- July 2016–August 2016 Internship: Angular momenta in dark matter subhalos (simulation). Argelander Institut für Astronomie, Universität Bonn, Germany. Supervisor: Dr. Cristiano Porciani.
- January 2015–March 2015 Internship: Photometry of three cataclysmic variables. Cerro Tololo Inter-American Observatory (CTIO), Chile. Supervisor: Dr. Tim Abbott.
- February 2014–March 2014 Internship: Amplitude calibration device graphic user interface. ALMA, Chile. Supervisor: Electronic Engineer Jaime Guarda.
- May 2012–December 2013 Internship: Condensed matter physics and statistical physics: percolation of discrete sites. Universidad de La Frontera, Chile. Supervisor: Dr. Eugenio Vogel.

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## PUBLICATIONS

### Submitted/Accepted (7)

- 2022 Michilli, D. et al., incl. **Cassanelli, T.** [Sub-arcminute localization of 13 repeating fast radio bursts detected by CHIME/FRB](#), arXiv e-prints.
- 2022 Curtin, A. et al., incl. **Cassanelli, T.** [Limits on Fast Radio Burst-like Counterparts to Gamma-ray Bursts using CHIME/FRB](#), arXiv e-prints.
- 2022 Shin, K. et al., incl. **Cassanelli, T.** [Inferring the Energy and Distance Distributions of Fast Radio Bursts using the First CHIME/FRB Catalog](#), arXiv e-prints.
- 2022 Merryfield, M. et al., incl. **Cassanelli, T.** [An Injection System for the CHIME/FRB Experiment](#), arXiv e-prints.
- 2022 Mckinven, R. et al., incl. **Cassanelli, T.** [A Large Scale Magneto-ionic Fluctuation in the Local Environment of Periodic Fast Radio Burst Source, FRB 20180916B](#), arXiv e-prints.
- 2022 The LIGO Scientific Collaboration et al., incl. **Cassanelli, T.** [Search for Gravitational Waves Associated with Fast Radio Bursts Detected by CHIME/FRB During the LIGO–Virgo Observing Run O3a](#), arXiv e-prints.
- 2021 **Cassanelli, T.** et al. [Out-of-focus holography at the Effelsberg telescope](#), arXiv e-prints.

### Refereed (27)

- 2022 Leung, C. et al., incl. **Cassanelli, T.** [Constraining primordial black holes using fast radio burst gravitational-lens interferometry with CHIME/FRB](#), Physical Review D.
- 2022 Kader, Z. et al., incl. **Cassanelli, T.** [High-time resolution search for compact objects using fast radio burst gravitational lens interferometry with CHIME/FRB](#), Physical Review D.
- 2022 **Cassanelli, T.** et al. [New technique for determining a pulsar period: Waterfall principal component analysis](#), Astronomy and Astrophysics.
- 2022 CHIME/FRB Collaboration, A. et al., incl. **Cassanelli, T.** [Sub-second periodicity in a fast radio burst](#), Nature.
- 2022 Sand, K. et al., incl. **Cassanelli, T.** [Multiband Detection of Repeating FRB 20180916B](#), The Astrophysical Journal.
- 2022 Chawla, P. et al., incl. **Cassanelli, T.** [Modeling Fast Radio Burst Dispersion and Scattering Properties in the First CHIME/FRB Catalog](#), The Astrophysical Journal.
- 2022 Lanman, A. et al., incl. **Cassanelli, T.** [A Sudden Period of High Activity from Repeating Fast Radio Burst 20201124A](#), The Astrophysical Journal.
- 2022 Mena-Parra, J. et al., incl. **Cassanelli, T.** [A Clock Stabilization System for CHIME/FRB Outriggers](#), The Astronomical Journal.
- 2022 **Cassanelli, T.** et al. [Localizing FRBs through VLBI with the Algonquin Radio Observatory 10 m Telescope](#), The Astronomical Journal.

- 2022 Kirsten, F. et al., incl. **Cassanelli, T.** [A repeating fast radio burst source in a globular cluster](#), *Nature*.
- 2022 Nimmo, K. et al., incl. **Cassanelli, T.** [Burst timescales and luminosities as links between young pulsars and fast radio bursts](#), *Nature Astronomy*.
- 2021 Josephy, A. et al., incl. **Cassanelli, T.** [No Evidence for Galactic Latitude Dependence of the Fast Radio Burst Sky Distribution](#), *The Astrophysical Journal*.
- 2021 Pleunis, Z. et al., incl. **Cassanelli, T.** [Fast Radio Burst Morphology in the First CHIME/FRB Catalog](#), *The Astrophysical Journal*.
- 2021 CHIME/FRB Collaboration et al., incl. **Cassanelli, T.** [The First CHIME/FRB Fast Radio Burst Catalog](#), *The Astrophysical Journal Supplement Series*.
- 2021 Rafiei-Ravandi, M. et al., incl. **Cassanelli, T.** [CHIME/FRB Catalog 1 Results: Statistical Cross-correlations with Large-scale Structure](#), *The Astrophysical Journal*.
- 2021 Mckinven, R. et al., incl. **Cassanelli, T.** [Polarization Pipeline for Fast Radio Bursts Detected by CHIME/FRB](#), *The Astrophysical Journal*.
- 2021 Bhardwaj, M. et al., incl. **Cassanelli, T.** [A Nearby Repeating Fast Radio Burst in the Direction of M81](#), *The Astrophysical Journal*.
- 2021 Pleunis, Z. et al., incl. **Cassanelli, T.** [LOFAR Detection of 110-188 MHz Emission and Frequency-dependent Activity from FRB 20180916B](#), *The Astrophysical Journal*.
- 2021 Michilli, D. et al., incl. **Cassanelli, T.** [An Analysis Pipeline for CHIME/FRB Full-array Baseband Data](#), *The Astrophysical Journal*.
- 2021 Leung, C. et al., incl. **Cassanelli, T.** [A Synoptic VLBI Technique for Localizing Nonrepeating Fast Radio Bursts with CHIME/FRB](#), *The Astronomical Journal*.
- 2020 CHIME/FRB Collaboration et al., incl. **Cassanelli, T.** [A bright millisecond-duration radio burst from a Galactic magnetar](#), *Nature*.
- 2020 Scholz, P. et al., incl. **Cassanelli, T.** [Simultaneous X-Ray and Radio Observations of the Repeating Fast Radio Burst FRB 180916.J0158+65](#), *The Astrophysical Journal*.
- 2020 Chawla, P. et al., incl. **Cassanelli, T.** [Detection of Repeating FRB 180916.J0158+65 Down to Frequencies of 300 MHz](#), *The Astrophysical Journal*.
- 2020 Fonseca, E. et al., incl. **Cassanelli, T.** [Nine New Repeating Fast Radio Burst Sources from CHIME/FRB](#), *The Astrophysical Journal*.
- 2020 Marcote, B. et al., incl. **Cassanelli, T.** [A repeating fast radio burst source localized to a nearby spiral galaxy](#), *Nature*.
- 2019 CHIME/FRB Collaboration et al., incl. **Cassanelli, T.** [CHIME/FRB Discovery of Eight New Repeating Fast Radio Burst Sources](#), *The Astrophysical Journal*.
- 2019 CHIME/FRB Collaboration et al., incl. **Cassanelli, T.** [A second source of repeating fast radio bursts](#), *Nature*.

#### Conference Proceedings

- 2016 **Cassanelli, T.** and Abbott, Tim. [Photometry of the old nova HZ Pup](#), American Astronomical Society Meeting Abstracts 227.

#### Research notes

- 2021 Cary, Savannah et al, incl. **Cassanelli, T.** [Evaluating and Enhancing Candidate Clocking Systems for CHIME/FRB VLBI Outriggers](#). Research Notes of the American Astronomical Society.

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## TEACHING

### Courses taught

- August 2022–December 2022 Applied electromagnetism (EL3103). Departamento Ingeniería Eléctrica. Universidad de Chile, Chile.
- April 2015–August 2015 Mechanics lecturer at the Departamento de Ciencias Físicas (Physics Department), Universidad de La Frontera, Chile.
- April 2015–August 2015 Dynamics lecturer at the Departamento de Ingeniería Mecánica (Mechanical Engineering Department), Universidad de La Frontera, Chile.

### Summer schools taught

- 26–30 July 2021 [Dunlap Instrumentation Summer School](#). Facilitator for the radio fundamentals laboratory (online format). Dunlap Institute, University of Toronto, Canada.
- 7–12 July 2019 [Dunlap Instrumentation Summer School](#). Lead lecturer and facilitator in the interferometry laboratory. Dunlap Institute, University of Toronto, Canada.

### Teaching Assistantships

- September 2021–December 2021 The Sun and Its Neighbours (AST101) fall term. University of Toronto, Canada.
- September 2020–December 2020 Practical Astronomy (AST326) fall term. University of Toronto, Canada.
- August 2020 Practical Astronomy (AST326). Redesign course for online delivery (due to COVID-19 pandemic).
- May 2020–June 2020 Life on Other Worlds (AST251) summer term. University of Toronto, Canada.
- May 2020–June 2020 Great Moments in Astronomy (ASTB03) summer term. University of Toronto Scarborough, Canada.
- January 2020–April 2020 Astrophysics of Planetary Systems (ASTC25) winter term. University of Toronto Scarborough, Canada.
- January 2020–April 2020 Advanced Computational Methods in Physics (PHYD57) winter term. University of Toronto Scarborough, Canada.
- January 2020–April 2020 Stars and Galaxies (AST201) winter term. University of Toronto, Canada.
- September 2019–April 2020 Practical Astronomy (AST326) fall and winter terms. University of Toronto, Canada.
- September 2019–December 2019 Introduction to Practical Astronomy (AST325) fall term. University of Toronto, Canada.
- May 2019–June 2019 Great Moments in Astronomy (ASTB03) summer term. University of Toronto Scarborough, Canada.
- May 2019–June 2019 The Sun and Its Neighbours (AST101) summer term. University of Toronto, Canada.
- January 2019–April 2019 Stars and Galaxies (AST201) winter term. University of Toronto, Canada.
- May 2018–June 2018 The Sun and Its Neighbours (AST101) summer term. University of Toronto, Canada.
- January 2018–April 2018 Stars and Galaxies (AST201) winter term. University of Toronto, Canada.
- May 2010–December 2014 Teaching Assistant for civil engineering students in Calculus I, Calculus II, Calculus III, Differential Equations, General Physics, Physics II, Modern Physics, Fundamental Mathematics, Complex Variable and Mechanics. Universidad de La Frontera, Chile.

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## SUPERVISION

### Graduate research



- August 2022–Present Sebastián Manosalva, Universidad de Chile. Research: CHIME/FRB Outriggers and development of FRB detection in Chilean soil.

## Undergraduate research

- January 2023–Present Marcelo Gatica, Universidad de Chile. Research: Signal processing for fast photon counters.
- August 2022–Present Fabiola Norambuena, Universidad de La Frontera. Research: Exoplanet atmosphere characterization.
- September 2020–April 2021 Mitchell Barret, University of Toronto. Research: Algonquin 10-m radio dish, telescope characterization.

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## CONTRIBUTED PUBLIC SOFTWARE

- 2022–Present [PyWPF: Waterfall Principal Component Analysis Folding](#), primary author,  [pywpf](#).
- 2017–Present [PyOOF: Out-of-focus holography](#), primary author,  [pyoof](#).

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## GRANTS AND ALLOCATIONS

### Research grants

- January 2022 Commissioning of the CHIME/FRB Outrigger Green Bank Observatory (GBO) telescope, \$3000. Vicerectoria de Investigación y Desarrollo, Universidad de Chile.

### Telescope allocations

- 2022B Chemical gradients & heat transport in an Ultra-Hot Jupiter Atmosphere. MAROON-X/Gemini North. 4 hours (Fast Turnaround).
- 2021 [Precise Pulsar Positions for CHIME/FRB Outrigger Calibration](#). Very Large Baseline Array. 42 hours (regular).
- 2020 [Precise Pulsar Positions for CHIME/FRB Outrigger Calibration](#). Very Large Baseline Array. 60 hours (regular).

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## ACADEMIC SERVICE

- 2022 Referee. Proyectos de exploración (ANID).
- 2022B Referee. Gemini Fast Turnaround program.

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## RESEARCH PRESENTATIONS

### Seminars and Colloquia

- 17 May 2022 Colloquia at the Max-Planck-Institut für Radioastronomie. *Special Colloquium*: Out-of-focus holography at the Effelsberg telescope.
- 14 February 2022 Brown Bag Lunch talk at MIT. *Invited talk*: FRB Localization with CHIME/FRB Outriggers.
- 20–21 February 2018 Effelsberg Science Workshop Max-Planck-Institut für Radioastronomie, Germany. Systematic measurements of the surface of the 100-m radio telescope using the Out-of-focus holography method.
- 23–24 January 2014 Third Cycle of Cosmology, Gravitation and Quantum Field Theory. Universidad de La Frontera, Chile. Presenting Gross-Neveu model.
- 5–6 December 2013 Magnetism and Statistical Physics. Universidad de La Frontera, Chile. Presenting percolation through silver nano-particles.

### Conference talks

- 14–18 February 2022 VLBI in the SKA Era. Online format. *Invited talk*: FRB Localization with CHIME/FRB Outriggers.

- 28 July–5 August 2021 Fast Radio Bursts 2021 (FRB2021). Online format. *Breaking news session: First VLBI localization of a single-burst FRB with the CHIME/FRB Outrigger testbed ARO 10-m.*
- 6–9 July 2020 Fast Radio Bursts 2020 (FRB2020). Online format. *Technical developments session: FRB localization efforts with VLBI in collaboration with CHIME/FRB.*
- 9–11 December 2019 Science at Low Frequencies (SALF). Arizona State University, Tempe, Arizona, USA. Fast Radio Burst Localization with VLBI.
- 17–20 June 2019 Canadian Astronomical Society (CASCA) Annual Meeting. McGill University, Montreal, Canada. VLBI Efforts in support of CHIME/FRB.

### Conference posters

- 26–28 November 2014 Sociedad Chilena de Física (Chilean Physics Society). Universidad de Concepción, Chile. Presenting percolation through silver nano-particles.
- 27–29 October 2013 Chile-Mexico V Workshop on Magnetism, Nanosciences and their applications. Los Ándes, Chile. Presenting percolation through silver nano-particles.

## COMPUTING SKILLS

- Operating systems Linux, Mac and Windows.
- Languages Arduino, bash, C++, CASA, Git, IRAF, OpenMPI, Matlab, and Python (astropy).
- Markup languages HTML,  $\LaTeX$ ,  $\TeX$ , Gnuplot and TikZ.
- Productive tools Abaqus, Ansys, CATIA, LibreOffice and Office.

## WORKSHOPS

- 3–12 July 2017 1<sup>st</sup> OPTICON Instrumentation School. University of Copenhagen, Denmark.
- 14–19 August 2016 Dunlap Summer School: Introduction to Astronomical Instrumentation. University of Toronto, Canada.
- 10–20 May 2016 International Max Planck Research School for Astronomy and Astrophysics. Max-Planck-Institut für Radioastronomie, Germany. Statistics and Data Modeling by Dr. Douglas Applegate.

## OUTREACH AND PRESS

### Public lectures

- 26 November 2020 Public talk at Universidad de La Frontera, Temuco, Chile. *Introducción a la radio astronomía de Fast Radio Bursts\**.
- \*Introduction to the astronomy of Fast Radio Bursts.
- 8 July 2020 Public talk at Universidad de La Frontera, Temuco, Chile. *El radio universo desconocido, fundamentos en radio astronomía\**.
- \*The unknown radio universe, radio astronomy principles.
- January 2019 Public Talk at Universidad de La Frontera, Temuco, Chile. *Fast Radio Bursts, el último misterio astronómico\**.
- \*Fast Radio Bursts the latest astronomical mystery.
- 2018–Present Outreach events: Astronomy on Tap, Space Time, Doors Open TO, and [Skype a Scientist](#). Toronto, Canada.
- December 2012–December 2013 President and founder of ASTROUFRO, a group orientated in promoting public knowledge of astronomy. Universidad de La Frontera, Chile.

### **Media appearances**

- September 2021 [Dunlap Institute Graduate student of the month](#). Institution web page.
- November 2020 [Titulado UFRO forma parte de importante hito astrofísico](#). Institution web page.
- November 2020 [Detection of a radio burst in Milky Way could resolve origins of mysterious phenomenon](#). Institution web page.
- January 2019 Interview Bio-Bio La Radio, Chile. Científicos detectan por segunda vez misteriosas ondas de radio desde una galaxia lejana. Radio.
- May 2015 A Successful Year for the CTIO Undergraduate Internship Programs in Chile. Institution web page.