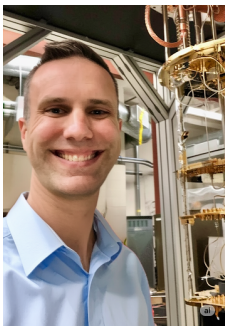
James R. Burgoyne



Department of Physics and Astronomy
University of British Columbia
Victoria, BC, Canada

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Cell: (250) 986 6313

Software engineer and astrophysicist adept at designing, developing, and optimizing solutions for astronomical and cryostat instrumentation and data pipelines, proficient in Python, RFSoC, and Linux environments.

Education

2021 - 2023 **Master of Science in Astronomy**

University of British Columbia

Thesis focused on early Universe galaxy evolution through the observations and analysis of a hyper-luminous quasar at redshift 2. Graduate classes included galactic astronomy, quantum mechanics, observational astronomy, and theory of measurement.

2018 - 2021 **Bachelor of Science in Combined Physics and Astronomy**

University of Victoria

Notable courses include radiative transfer, cosmology, observational astronomy, stellar, galaxy, and planetary astrophysics, mathematical physics, computational physics, and complex analysis.

Academic Research Experience

2023 - **Researcher, University of British Columbia**

CCAT Readout Development

Led software and system development for the Prime-Cam instrument MKID readouts on the Fred Young Submillimeter Telescope (FYST/CCAT), a 6-meter, facility-class observatory. The role required a holistic approach to system design, integrating Linux-based control systems with parallel Xilinx ZCU111 RFSoC boards managing multiple detector arrays. Development was primarily in Python and included technologies such as Redis for messaging and data storage, all within a complex Dockerized

control environment that interfaces with telescope and instrument software.

CCAT Quick-Look Map Maker Development

Conducted performance-optimized development of a quick-look map-making tool for the PrimeCam data pipeline. Work involved detailed analysis of BLAST-TNG MKID data to characterize detector noise and required deep expertise in astronomical map-making methodologies and optimization techniques.

2021 - 2023 **Research Assistant, University of British Columbia**

CCAT Readout System Development Support

Contributed to the development, testing, and analysis of the CCAT readout system through lab work and software support.

Lyman Break Galaxy (LBG) Survey

Reduced and analyzed Hubble Space Telescope (HST) data to perform a Lyman Break Galaxy density survey around SPT0311-58, contributing to high-redshift galaxy population studies.

2020 - 2020 **Term Research Assistant, Herzberg Astronomy and Astrophysics Research Centre**

Submillimeter Galaxy Analysis

Applied a custom-built Python toolkit for spectral data cube reduction and analysis to generate research-driven visualizations. Supported multiple projects using data from observatories including IRAM-NOEMA and ALMA.

2019 - 2019 **Term Research Assistant, Herzberg Astronomy and Astrophysics Research Centre**

GIRMOS Testbed Optical Integration

Developed control software interfaces between the testbed optical table controller computer and various optical elements including the wavefront-sensors and deformable mirrors for the GIRMOS instrument being designed for the Gemini Telescopes, and pathfinder for future Thirty Meter Telescope (TMT) multi-object spectroscopic instrumentation.

Quasar Q2343+125 Data Analysis

Performed reduction and analysis of numerous spectral-cubes of quasar Q2343+125 from various observatories including IRAM-NOEMA, SCUBA2, and ALMA. This included the design and writing of a custom python class and associated functions to perform the data cube reduction, line/source searches, spectral extractions and fitting, and figure production.

Previous Work Experience

2011 - 2017 **Independent Developer, Abur Mobile**

Mobile Application Development	Developed and deployed iOS applications from conception to release, leveraging Swift and Objective-C for robust software development. Proficient in UI/UX design and implementation with Adobe Photoshop, and skilled in full-stack integration for mobile environments.

2005 - 2012 **Co-Founder, AIO Computers**

Full-Stack Web Development	Developed and managed front-end and back-end web platforms and databases. Proficient in HTML, XML, PHP, JavaScript, and SQL.
Custom Computing Systems & Networking	Designed, built, and deployed custom computer systems for diverse corporate and individual clients, including Villeroy & Boch. Managed hardware and networking solutions to meet specific client needs.

Talks & Presentations

2024 **Talk: CCAT Collaboration Meeting 5**

Status Update: primecam readout.

2024 **Poster: SPIE Astronomical Telescopes + Instrumentation**

CCAT: FYST prime-cam readout software: a framework for massively scalable KID arrays. Proc. SPIE. 13101, Software and Cyberinfrastructure for Astronomy VIII

2023 **Talk: UBC PHAS Invited.**

Unveiling the transient evolution of a galaxy through a hyper-luminous quasar, Q2343+125 at $z=2.577$

2023 **Talk: CCAT Collaboration Meeting 4**

The development and status of the PrimeCam readout software.

Teaching Experience

2025 - 2025 **Supervisor**

Undergraduate COOP supervisor. Topics: MKID-based narrow-field map maker research and development; MKID array LED mapper circuit board design.

2024 - 2025 **Mentor**

Secondary school science fair project mentorship. Topic: Neutrino Hunting: Nu Horizons for Cosmology.

2024 - 2024 **Supervisor**

Undergraduate COOP supervisor. Topic: MKID-based narrow-field map maker research and development.

2022 - 2022 **Teaching Assistant**

Undergraduate level course teaching assistant, 2 in-person tutorial sections. Course: UBC PHYS 131, Energy and Waves. Responsibilities included leading and teaching weekly tutorials and grading labs and tests.

2021 - 2021 **Teaching Assistant**

Undergraduate level course teaching assistant, 1 online tutorial section. Course: UBC PHYS 311, Exploring the Universe: Stars and Galaxies. Responsibilities included leading and teaching weekly tutorials and grading labs and tests.

Awards, Recognitions, and Honours

2019 **University of Victoria Faculty of Science Dean's List 2018-2019**

This is an honour awarded only to the top 10% of students of each academic year in the Faculty of Science.

2019 **Don Ingham Memorial Scholarship**

Best Student in the Honours Astronomy program.

2018 **Vancouver Island University Dean's Honour List 2017-2018**

This is an honour awarded to students who have demonstrated outstanding academic achievement.

Publications

2025 **High-Density Photon-Noise-Limited Multi-Octave Submillimeter Kinetic Inductance Detectors for the Prime-Cam 850 GHz Module**

IEEE Transactions on Applied Superconductivity, vol. 35, issue 5, id. 3518461

Huber, Anthony I.; Austermann, Jason; Beall, James A.; Burgoyne, James;

Chapman, Scott; Henke, Douglas; Hubmayr, Johannes; Van Lanen, Jeffrey; Sinclair, Adrian; Vaskuri, Anna K.; Vissers, Michael R.; Wheeler, Jordan

2025

CCAT: LED Mapping and Characterization of the 280 GHz TiN KID Array

IEEE Transactions on Applied Superconductivity, vol. 35, issue 5, id. 3517564

Middleton, Alicia; Choi, Steve K.; Walker, Samantha; Austermann, Jason; Burgoyne, James R.; Butler, Victoria; Chapman, Scott C.; Crites, Abigail T.; Duell, Cody J.; Freundt, Rodrigo G.; Huber, Anthony I.; Huber, Zachary B.; Hubmayr, Johannes; Keller, Ben; Lin, Lawrence T.; Niemack, Michael D.; Patel, Darshan; Sinclair, Adrian K.; Smith, Ema; Vaskuri, Anna; Vavagiakis, Eve M.; Vissers, Michael; Wang, Yuhan; Wheeler, Jordan

2024*

CCAT: FYST Prime-Cam Readout Software: A framework for massively scalable KID arrays

Proceedings of the SPIE, Volume 13101, id. 131013C 17 pp. (2024).

Burgoyne, James R., Sinclair, Adrian K., Chapman, Scott C., Choi, Steve K., Duell, Cody J., Huber, Anthony I., Huber, Zachary B., Keller, Ben, Lin, Lawrence, Niemack, Michael D., Scott, Douglas, Vavagiakis, Eve M., Walker, Samantha, Xie, Matt, Collaboration, the CCAT

2024

CCAT: A status update on the EoR-Spec instrument module for Prime-Cam

Proceedings of the SPIE, Volume 13102, id. 131020U 10 pp. (2024).

Freundt, Rodrigo; Li, Yaqiong; Henke, Doug; Austermann, Jason; Burgoyne, James R.; Chapman, Scott; Choi, Steve K.; Duell, Cody J.; Huber, Zach; Niemack, Michael; Nikola, Thomas; Lin, Lawrence; Riechers, Dominik A.; Stacey, Gordon; Vaskuri, Anna K.; Vavagiakis, Eve M.; Wheeler, Jordan; Zou, Bugao

2024

CCAT: Nonlinear effects in 280 GHz aluminum kinetic inductance detectors

Proceedings of the SPIE, Volume 13102, id. 131021O 10 pp. (2024).

Duell, Cody J.; Austermann, Jason; Burgoyne, James R.; Chapman, Scott C.; Choi, Steve K.; Crites, Abigail T.; Freundt, Rodrigo G.; Huber, Anthony I.; Huber, Zachary B.; Hubmayr, Johannes; Keller, Ben; Lin, Lawrence T.; Middleton, Alicia M.; Murphy, Colin C.; Niemack, Michael D.; Nikola, Thomas; Patel, Darshan; Sinclair, Adrian K.; Smith, Ema; Stacey, Gordon J.; Vaskuri, Anna; Vavagiakis, Eve M.; Vissers, Michael; Walker, Samantha; Wheeler, Jordan

2024

CCAT: multirate DSP for sub-mm astronomy: polyphase synthesis filter bank on FPGA for enhanced MKID readout

Proceedings of the SPIE, Volume 13102, id. 1310213 16 pp. (2024).

Xie, Ruixuan (Matt); Sinclair, Adrian K.; Burgoyne, James; Chapman, Scott; Huber, Anthony

2024

CCAT: design and performance of densely packed, high-frequency, dual-polarization kinetic inductance detectors for the Prime-Cam 850 GHz module

Proceedings of the SPIE, Volume 13102, id. 1310203 13 pp. (2024).

Huber, Anthony I.; Austermann, Jason; Beall, James; Burgoyne, James; Chapman, Scott; Choi, Steve K.; Henke, Doug; Huber, Zachary B.; Hubmayr, Johannes; van Lanen, Jeff; Sinclair, Adrian; Vaskuri, Anna; Vavagiakis, Eve M.; Vissers, Michael; Wheeler, Jordan

2024

CCAT: Detector Noise Limited Performance of the RFSoC-based Readout Electronics for mm/sub-mm/far-IR KIDs

Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII. Vol. 13102. SPIE, 2024.

Sinclair, Adrian K., Burgoyne, James, Huber, Anthony I., Murphy, Colin, Choi, Steve K., Duell, Cody J., Huber, Zachary B., Li, Yaqiong, Chapman, Scott C., Niemack, Michael D., Nikola, Thomas, Vavagiakis, Eve M., Walker, Samantha, Wheeler, Jordan D., Austermann, Jason, Lin, Lawrence, Xie, Ruixuan, Zou, Bugao, Mauskopf, Philip D.

2024

CCAT: Comparisons of 280 GHz TiN and Al Kinetic Inductance Detector Arrays

Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII. Vol. 13102. SPIE, 2024.

Duell, Cody J., Austermann, Jason, Beall, James, Burgoyne, James R., Chapman, Scott C., Choi, Steve K., Freundt, Rodrigo G., Gao, Jiansong, Groppi, Christopher, Huber, Anthony I., Huber, Zachary B., Hubmayr, Johannes, Keller, Ben, Li, Yaqiong, Lin, Lawrence T., Matthewson, Justin, Mauskopf, Philip, Middleton, Alicia, Murphy, Colin C., Niemack, Michael D., Nikola, Thomas, Sinclair, Adrian K., Smith, Ema, van Lanen, Jeff, Vaskuri, Anna, Vavagiakis, Eve M., Vissers, Michael, Walker, Samantha, Wheeler, Jordan, Zou, Bugao

2024

Extended Lyman-α emission towards the SPT2349-56 protocluster at $z=4.3$

Astronomy & Astrophysics 683 (2024): A64

Apostolovski, Yordanka, Aravena, Manuel, Anguita, Timo, Bethermin, Matthieu, Burgoyne, James, Chapman, Scott, De Breuck, Carlos, Gonzalez, Anthony, Gronke, Max, Guaita, Lucia, Hezaveh, Yashar, Hill, Ryley, Jarugula, Sreevani, Johnston, Evelyn, Malkan, Matt, Narayanan, Desika, Reuter, Cassie, Solimano, Manuel, Spilker, Justin, Sulzenauer, Nikolaus, Vieira, Joaquin, Vizgan, David, Weiß, Axel

2024

Brightest Cluster Galaxy Formation in the $z=4.3$ Protocluster SPT2349-56: Discovery of a Radio-Loud AGN

The Astrophysical Journal 961.1 (2024): 120.

Chapman, Scott C., Hill, Ryley, Aravena, Manuel, Archipley, Melanie, Babul, Arif,

Burgoyne, James, Canning, Rebecca E. A., Deane, Roger P., De Breuck, Carlos, Gonzalez, Anthony H., Hayward, Christopher C., Kim, Seon Woo, Malkan, Matt, Marrone, Dan P., McIntyre, Vincent, Murphy, Eric, Pass, Emily, Perry, Ryan W., Phadke, Kedar A., Rennehan, Douglas, Reuter, Cassie, Rotermund, Kaja M., Scott, Douglas, Seymour, Nick, Solimano, Manuel, Spilker, Justin, Stark, Anthony A., Sulzenauer, Nikolaus, Tothill, Nick, Vieira, Joaquin D., Vizgan, David, Wang, George, Weiss, Axel, Chapman, Scott C., Hill, Ryley, Aravena, Manuel, Archipley, Melanie, Babul, Arif, Burgoyne, James, Canning, Rebecca E. A., Deane, Roger P., De Breuck, Carlos, Gonzalez, Anthony H., Hayward, Christopher C., Kim, Seon Woo, Malkan, Matt, Marrone, Dan P., McIntyre, Vincent, Murphy, Eric, Pass, Emily, Perry, Ryan W., Phadke, Kedar A., Rennehan, Douglas, Reuter, Cassie, Rotermund, Kaja M., Scott, Douglas, Seymour, Nick, Solimano, Manuel, Spilker, Justin, Stark, Anthony A., Sulzenauer, Nikolaus, Tothill, Nick, Vieira, Joaquin D., Vizgan, David, Wang, George, Weiss, Axel

2023

Spatial variations in aromatic hydrocarbon emission in a dust-rich galaxy

Nature 618.7966 (2023): 708-711.

Spilker, Justin S., Phadke, Kedar A., Aravena, Manuel, Archipley, Melanie, Bayliss, Matthew B., Birkin, Jack E., Bethermin, Matthieu, Burgoyne, James, Cathey, Jared, Chapman, Scott C., Dahle, Hakon, Gonzalez, Anthony H., Gururajan, Gayathri, Hayward, Christopher C., Hezaveh, Yashar D., Hill, Ryley, Hutchison, Taylor A., Kim, Keunho J., Kim, Seonwoo, Law, David, Legin, Ronan, Malkan, Matthew A., Marrone, Daniel P., Murphy, Eric J., Narayanan, Desika, Navarre, Alex, Olivier, Grace M., Rich, Jeffrey A., Rigby, Jane R., Reuter, Cassie, Rhoads, James E., Sharon, Keren, Smith, J. D. T., Solimano, Manuel, Sulzenauer, Nikolaus, Vieira, Joaquin D., Weiss, Axel, Whitaker, Katherine E.

2023

The ISM in the z= 6.9 Interacting Galaxies of SPT0311-58.

The Astrophysical Journal 949.2 (2023): 87.

Litke, Katrina C., Marrone, Daniel P., Aravena, Manuel, Archipley, Melanie, Béthermin, Matthieu, Burgoyne, James, Cathey, Jared, Chapman, Scott C., Gonzalez, Anthony H., Greve, Thomas R., Gururajan, Gayathri, Hayward, Christopher C., Malkan, Matthew A., Phadke, Kedar A., Reuter, Cassie A., Rotermund, Kaja M., Spilker, Justin S., Stark, Antony A., Sulzenauer, Nikolaus, Vieira, Joaquin D., Vizgan, David, Weiß, Axel

2023

Breaking the 10 mW/pixel Limit for Kinetic Inductance Detector Readout Electronics

arXiv preprint arXiv:2305.00928 (2023)

Sinclair, Adrian K., Burgoyne, James R., Li, Yaqiong, Duell, Cody, Chapman, Scott C., Huber, Anthony I., Xie, Ruixuan, Sinclair, Adrian K., Burgoyne, James R., Li, Yaqiong, Duell, Cody, Chapman, Scott C., Huber, Anthony I., Xie, Ruixuan

2022

CCAT-prime: RFSoC based readout for frequency multiplexed kinetic inductance detectors.

Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI. Vol. 12190. SPIE, 2022.

Sinclair, A., Stephenson, R.C., Roberson, C., Weeks, E.L., Burgoyne, J., Huber, A.I., Mauskopf, P.D., Chapman, S.C., Austermann, J., Choi, S.K. and Duell, C.J.

2022

CCAT-prime: the 850 GHz camera for prime-cam on FYST.

Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI. Vol. 12190. SPIE, 2022.

Chapman, S.C., Huber, A.I., Sinclair, A.K., Wheeler, J.D., Austermann, J.E., Beall, J., Burgoyne, J., Choi, S.K., Crites, A., Duell, C.J. and Devina, J.

2022

Chaotic and Clumpy Galaxy Formation in an Extremely Massive Reionization-era Halo.

The Astrophysical Journal Letters 929.1, 2022: L3.

Spilker, J.S., Hayward, C.C., Marrone, D.P., Aravena, M., Béthermin, M., Burgoyne, J., Chapman, S.C., Greve, T.R., Gururajan, G., Hezaveh, Y.D. and Hill, R.