Bren E. Backhaus · Curriculum Vitae · bren.backhaus@uconn.edu · orcid.org/0000-0001-8534-7502 ·

Bren E. Backhaus CV

- Position: PhD Student at University of Connecticut
- Research: Emission-Line Galaxies, Galaxy Evolution, Broad-Line AGN, High-Redshift Galaxies, Spatially-Resolved Galaxies

Summary

Bren E. Backhaus is a PhD candidate in astronomy at University of Connecticut under Professor Jonathan Trump. Her current work studies emission line galaxies and spatially resolved grisms in the CLEAR (CANDELS Lyman-α Emission at Reionization) survey of the *Hubble Space Telescope*. She will be continuing her studies of emission line galaxies with CEERS (Cosmic Evolution Early Release Science) data from the *James Webb Space Telescope*.

Education

2018 - Present **PhD Physics | 3.55/4.0** University of Connecticut, Storrs

- Advisor: Jonathan Trump
- Associate Advisors: Cara Battersby, Chiara Mingarelli

May 2022 **M.A Physics | 3.55/4.0** University of Connecticut, Storrs

- Advisor: Jonathan Trump
- Associate Advisors: Cara Battersby, Chiara Mingarelli

2014 - 2018 **B.S. Physics | Submajor: Astrophysics | 3.398/4.00** University of Massachusetts, Amherst

- Mathematics and Anthropology Minor
- Dean's List - Fall 2014, Fall 2015, Fall 2017, Spring 2018

Appointments

2018-2024 **Graduate Student** (Advisor: Prof. Jonathan Trump) UConn

2018-2024 **Research Technician** (Advisor: Prof. Jonathan Trump) UConn

Research Experience

2023-Present **Finding and classifying Broad-Line AGN at z>4** UConn

- Advisors: Jonathan R. Trump
- Many Traditional methods at low redshifts are unconfirmed or unusable at redshifts z>4. Using broad-line hydrogen we can work to find other methods to find less extreme AGN, to further our understand on the early universe.

2022-2023 **Emission Line Ratios at the Epoch of Reionization** UConn

- Advisors: Jonathan R. Trump
- Used and compared NIRSpec and NIRCam Grism emission lines such as [O III]/Hβ and [Ne III]/[O II] to observe galaxy evolution. Focusing on the conditions of the Intersellar Medium and galaxy properties.

- B. E. Backhaus, et al., 2023, *CEERS Key Paper VII: Emission Line Ratios from NIRSpec and NIRCam Wide-Field Slitless Spectroscopy at z>2*, ApJ submitted (arXiv:2307.09503)

2021-2022 **Spatially-Resolved Grism Emission Line Ratios** UConn

- Advisors: Jonathan R. Trump
- We investigate the spatially-resolved emission line ratios in a sample of 219 galaxies ($0.6 < z < 1.3$) to search for low-luminosity active galactic nuclei (AGN) not detectable by traditional methods.
- B. E. Backhaus, et al., 2023, *CLEAR: Spatially Resolved Emission Lines and Active Galactic Nuclei at 0.6 < z < 1.3*, ApJ published (ApJ: 10.3847/1538-4357/aca668)

2018-2021 **Emission Line Ratios at Cosmic High Noon** UConn

- Advisors: Jonathan R. Trump
- Defined and analysed the use of the unVO87, $[\mathrm{O\,III}]/\mathrm{H}\beta$ vs $[\mathrm{S\,II}]/(\mathrm{H}\alpha+[\mathrm{N\,II}])$, and OHNO, $[\mathrm{O\,III}]/\mathrm{H}\beta$ vs $[\mathrm{Ne\,III}]/[\mathrm{O\,II}]$, in terms of galaxy classification, redshift evolution and galaxy properties.
- B. E. Backhaus, et al., 2021, *CLEAR: Emission Line Ratios at Cosmic High Noon*, ApJ published (ApJ: 10.3847/1538-4357/ac3919)

2017-2018 **Preparing for Research in Theoretical General Relativity** UMass

- Advisor: Jennie Trashen
- Preparing for a research project, which I looked into the Electromagnetic fields of the Early Universe. Preparation includes: taking extra lessons, which involved “warm up” calculations, and reading research papers on this topic.

Awarded Proposals and and Grants - Total Value:

2022 **GMOS Cycle 2023A** - AR 16609: *Optical Spectroscopy of JWST ERO galaxies* 21.3 hrs

Teaching Experience

2022-Present **Undergraduate Mentor** - UConn

- Jessica Wessner and

2023 **Guest Lecturer** - PHYS 4720/6720: Galaxies and the Interstellar Medium UConn

- Mentored a class of 20+ for
- Create class material and led lecture on the new results of the JWST

2018-2021 **TA** - PHYS 1501: Physics for Engineers I - Cumulative Enrollment: 253 UConn

- Mentored a class of 50+ for 6 semesters
- Preformed assistant teaching duties such as: lead labs, lead discussions, lead review, lead tutoring sessions, grading, tested labs and edited homeworks for class use,
- Mentored and Led as Lab Lead supervising all Labs for a two classes of 18 students for 2 semesters

Publications - Primary Author (3)

- **B. E. Backhaus**, et al., 2023, *CEERS Key Paper VII: Emission Line Ratios from NIRSpec and NIRCam Wide-Field Slitless Spectroscopy at z>2*, ApJ submitted (arXiv:2307.09503)
- **Backhaus, B.E.**, Trump, J.R., Cleri, N.J., et al. 2021, *CLEAR: Emission Line Ratios at Cosmic High Noon*, ApJ published (arXiv:arXiv:2109.08147)
- **Backhaus, B.E.**, Cleri, N.J., Bridge J.S., Trump, J.R., et al. in prep., *CLEAR: Detecting Low-Luminosity Active Galactic Nuclei at $0.6 < z < 1.3$ via Spatially Resolved Hubble Space Telescope Grism Emission Line Ratios*, ApJ published (ApJ: 10.3847/1538-4357/aca668)
- Cleri, N. J., Trump, J. R., **Backhaus, B. E.** et al. 2020, *CLEAR: Paschen-β Star Formation Rates and Dust Attenuation in Low Redshift Galaxies*, ApJ published (arXiv:2009.00617)

- Trump, Jonathan R.; Arrabal Haro, Pablo; Simons, Raymond C.; **Backhaus, B. E.** et al. 2023, *The Physical Conditions of Emission-line Galaxies at Cosmic Dawn from JWST/NIRSpec Spectroscopy in the SMACS 0723 Early Release Observations*, ApJ published (arXiv:2207.12388)
- Cleri, Nikko J.; Yang, Guang; Papovich, Casey; Trump, Jonathan R.; **Backhaus, B. E.** et al. 2022, *CLEAR: High-Ionization [Ne V] λ3426 Emission-line Galaxies at 1.4<z<2.3*, ApJ published (arXiv: arXiv:2209.06247)

Publications - Co-Author (13)

- Kocevski, Dale D., et al. (incl. **Backhaus, Bren**) 2023, ApJ published, ApJ: 10.3847/2041-8213/ace5a0, *Hidden Little Monsters: Spectroscopic Identification of Low-mass, Broad-line AGNs at z > 5 with CEERS*
- Simons, Raymond C., et al. (incl. **Backhaus, Bren**) 2023, ApJ published, ApJ: 10.3847/1538-4365/acc517, *CLEAR: Survey Overview, Data Analysis, and Products*
- Jung, Intae, et al. (incl. **Backhaus, Bren**) 2023, arxiv eprint ,arXiv:2304.05385, *CEERS: Diversity of Lyman-Alpha Emitters during the Epoch of Reionization*
- Pérez-González, Pablo G., et al. (incl. **Backhaus, Bren**) 2023, ApJ published, ApJ: 10.3847/2041-8213/acb3a5, *CEERS Key Paper. IV. A Triality in the Nature of HST-dark Galaxies*
- Kartaltepe, Jeyhan S., et al. (incl. **Backhaus, Bren**) 2023, ApJ published, ApJ: 10.3847/2041-8213/acad01, *CEERS Key Paper. III. The Diversity of Galaxy Structure and Morphology at z = 3-9 with JWST*
- Kocevski, Dale D., et al. (incl. **Backhaus, Bren**) 2023, ApJ published, ApJ: 10.3847/2041-8213/acad00, *CEERS Key Paper. II. A First Look at the Resolved Host Properties of AGN at 3 < z < 5 with JWST*
- Guo, Yuchen, et al. (incl. **Backhaus, Bren**) 2023, ApJ published, ApJ: 10.3847/2041-8213/acacfb, *First Look at z > 1 Bars in the Rest-frame Near-infrared with JWST Early CEERS Imaging*
- Zavala, Jorge A., et al. (incl. **Backhaus, Bren**) 2022, ApJ published, ApJ: 10.3847/2041-8213/acacfe, *Dusty Starbursts Masquerading as Ultra-high Redshift Galaxies in JWST CEERS Observations*
- Finkelstein, Steven L., et al. (incl. **Backhaus, Bren**) 2022, ApJ published, ApJ: 10.3847/2041-8213/ac966e, *A Long Time Ago in a Galaxy Far, Far Away: A Candidate z ∼ 12 Galaxy in Early JWST CEERS Imaging*
- Papovich, Casey, et al. (incl. **Backhaus, Bren**) 2022, ApJ published, ApJ: 10.3847/1538-4357/ac8058, *CLEAR: The Ionization and Chemical-enrichment Properties of Galaxies at 1.1 < z < 2.3*
- Matharu, J.K. et al. (incl. **Backhaus, Bren**) 2022, ApJ published, ApJ: 10.3847/1538-4357/ac8471, *CLEAR: The evolution of inside-out growth via star formation between $0.5 \leq z \leq 1.7$ from spatially resolved Hα maps*
- Jung, I., et al. (incl. **Backhaus, Bren**) 2021, ApJ published, ApJ: 10.3847/1538-4357/ac6fe7.*CLEAR: Boosted Lyα Transmission of the Intergalactic Medium in UV bright Galaxies*
- Simons, R. C., Papovich, C., Momcheva, I., et al. (incl. **Backhaus, Bren**) 2020, arXiv e-prints, arXiv:2011.03553 *CLEAR: Gas-Phase Metallicity Gradients of $0.6 < z < 2.6$ Star-Forming Galaxies*

Presentations (6)

26 May 2022	*Emission Lines AGN Identification at Cosmic Noon* at NERQUAM 30th Meeting	Talk
9 Jan. 2023	*Emission Line Ratios through Cosmic Time* at AAS 241th Meeting	Talk
8 Feb. 2023	*Emission Lines through Cosmic Time* University of Connecticut	Seminar
10 May 2023	*Emission Line Ratios through Cosmic Time* at CEERS Meeting	Talk
25 May 2023	*Emission Lines: Identifying AGN with OHNO* at NERQUAM 31th Meeting	Talk
08 June 2023	*Emission Line Ratios through Cosmic Time* at First Light MIT	Poster

References

PhD Advisor **Prof. Jonathan R. Trump** UConn

- University of Connecticut Department of Physics, 2152 Hillside Road, Unit 3046A, Storrs, CT, 06269-3046
- jonathan.trump@uconn.edu

Collaboration Lead **Prof. Casey J. Papovich** Texas A&M

- Mitchell Institute for Fundamental Physics and Astronomy, 4242 TAMU, College Station, TX 77843-4242
- papovich@tamu.edu

Collaboration Lead **Prof. Steven L. Finkelstein** XX

- Department of Astronomy, The University of Texas at Austin, Austin, TX, USA
- stevenf@astro.as.utexas.edu