All of my past education and research has prepared me to develop Skipper CCDs for astronomy. I have taken several courses directly related to this project: instrumentation, optics, electronics, and semiconductors. I have conducted self-directed studies, including reading relevant textbooks and current papers. This experience directly prepares me for the individual components that culminate in this Skipper CCD project. Bi-weekly or more frequent meetings with my advisor, Dr. Erika Hamden, who is a UV detector expert [1, 2, 3, 6, 9, 8, 7], gives me opportunities to ask questions and brainstorm ideas. These meetings will are complimented with monthly large-group meetings with faculty members, post-docs, and older graduate students in our UV group. This includes a detector electronics expert, Steve Kaye, and multiple other electronics engineers who work at Steward Observatory.

On top of this, I am proficient in Python, Solidworks, and IDL, and am familiar with C and C++. I have experience with photon transfer curves (PTCs)—invaluable for calculating detector gains, read noises, and full wells—quantum efficiency analysis, read noise calculations, and dark current analysis through my previous work on EMCCDs and commercial silicon detectors. To become proficient with the readout control software, I spent a week visiting FermiLab, the producers of the Low Threshold Acquisition (LTA) controller. While there, I learned all of the intricacies of running the LTA and developing and optimizing readout sequences. Our group has a collaboration with the Skipper Team at FermiLab, who are able to help as we run into problems.

Our lab is uniquely positioned to complete this Skipper CCD project. We have an existing vacuum UV monochromator with high spectral resolution and calibrated photodiodes. This setup, already proven through past quantum efficiency (QE) measurements [4], will enable fast and accurate calculation of QEs for UV optimized CCDs. Our lab is already setup as a dark room low light measurements [5], allowing us to fully characterize detectors with infrastructure setup to easily copy the current setups. All of the graduate students and post-docs who setup and maintain our setups are still available for training and advice. Our group has collaborations with several other CCD groups around the country, including JPL in order to UV process our detectors, and Fermilab to operate the LTAs. The collaborations with both JPL and Fermilab are supported by NASA SATs and funding from the Heising-Simons Foundation. All technical costs will be supported by those existing grants.

Graduate Study Timeline: I am currently a second year doctorate student studying astronomy, enrolled since Fall of 2023. I expect to advance to Ph.D. candidacy before Fall of 2025 after completing my preliminary written and oral exam, and expect to graduate in 2028 with a typical 5-year graduation timescale.

References

[1] Hamden, E. T., et al. 2011, Applied Optics, 50, 4180, doi: 10.1364/AO.50.004180
[2] —. 2016, JATIS, 2, 036003, doi: 10.1117/1.JATIS.2.3.036003
[3] —. 2020, ApJ, 898, 170, doi: 10.3847/1538-4357/aba1e0
[4] Khan, A., et al. 2024, 26, doi: 10.1117/12.3021039
[5] Khan, A. R., et al. 2024, arXiv:2407.15392, doi: 10.48550/arXiv.2407.15392
[6] Kyne, G., et al. 2020, JATIS, 6, 011007, doi: 10.1117/1.JATIS.6.1.011007
[7] Nikzad, S., et al. 2012, Appl. Opt., 51, 365, doi: 10.1364/AO.51.000365
[8] Nikzad, S., et al. 2017, JATIS, 3, 036002, doi: 10.1117/1.JATIS.3.3.036002
[9] Tuttle, S., et al. 2024, arXiv:2408.07242, doi: 10.48550/arXiv.2408.07242

BioSketch: Brock Parker

Identifying Information

Name: Brock A. Parker
Persistent Identifier (PID): 0000-0001-9307-8170
Position Title: Graduate Researcher, Steward Observatory, University of Arizona

Organization and Location

Name: University of Arizona, Steward Observatory
Location: Tucson, Arizona, USA

Professional Preparation:

- University of Arizona, Tucson, AZ — Ph.D., 8/2023-5/2028
  Astronomy
- University of Wyoming, Laramie, WY, USA — B.S., 8/2019-5/2023
  Astronomy and Astrophysics

Appointments and Positions

- University of Arizona, Tucson, AZ — 8/2023-Present
  Graduate Researcher
- University of Wyoming, Laramie, WY, USA — 5/2023-8/2023
  Post-Baccalaureate Researcher
- University of Wyoming, Laramie, WY, USA — 7/2020-3/2021
  STEP Tutor
- University of Wyoming, Laramie, WY, USA — 3/2020-5/2023
  Wyoming Research Scholars Program (WRSP) Researcher

Products

- "Extensive characterization of the noise performance of delta-doped UV enhanced skipper CCDs". **B. Parker**, E. Hamden, S. Kaye, A. R. Khan. SPIE Presentation, 13093, August 2024. https://github.com/brockparker/Research/blob/main/CCDs/Skipper_Noise/spie_2024.pdf
- "Advancing ultraviolet detector technology for future missions: investigating the dark current plateau in silicon detectors using photon counting EMCCDs". A. R. Khan, E. Hamden, G. Kyne, A. D. Jewell, J. Henessey, S. Nikzad, V. Picouet, O. Jones, H. Bradley, N. Kerkeser, Z. Lin, **B. Parker**, G. West, J. Ford, F. Gacon, D. Beaty, J.

Vider. Proceedings of the SPIE, 13093, August 2024. https://www.spiedigitallibrary.org/conference-proceedings-of-spie/13093/130930O/Advancing-ultraviolet-detector-technology-for-future-missions–investigating-the/10.1117/12.3021039.short?tab=ArticleLinkCited

- "Probing the Properties of Interstellar Dust toward the Hot Star Zeta Ophiuchi". **B. Parker**, H. Kobulnicky. American Astronomical Society, AAS Meeting 243, 56, February 2024. https://ui.adsabs.harvard.edu/abs/2024AAS...24336508P/abstract

Certification

I certify that the information provided is current, accurate, and complete. This includes but is not limited to information related to domestic and foreign appointments and positions.

I also certify that, at the time of submission, I am not a party to a malign foreign talent recruitment program. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729-3733 and 3802.

Signature:

Date: February 20, 2025

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OMB control number for this collection is 3145-0279 and this information collection expires on October 31, 2026. We estimate that it will take two (2) hours to read the instructions, gather the facts, and answer the questions. Send only comments relating to our time estimate to: christiane.diallo@nasa.gov.

BioSketch: Erika Hamden

Identifying Information

Name: Erika Hamden
Persistent Identifier (PID): 0000-0002-3131-7372
Position Title: Associate Professor and Director, University of Arizona Space Institute

Organization and Location

Name: University of Arizona, Steward Observatory
Location: Tucson, Arizona, USA

Professional Preparation

- **Postdoctoral Fellow,** California Institute of Technology, Pasadena, CA, USA 2014–2018
  Department of Physics, Math, and Astronomy

  R.A. & G.B. Millikan Prize Postdoctoral Fellowship in Experimental Physics

  NSF Astronomy and Astrophysics Postdoctoral Fellowship
- **Columbia University**, New York,, New York, NY, USA PhD, 5/2014
  Astronomy
- **Columbia University**, New York, NY, USA M.Phil, 5/2010
  Astronomy
- **Columbia University**, New York, NY, USA M.A., 5/2009
  Astronomy
- **Harvard College**, Cambridge, MA, USA A.B., 5/2006
  Astronomy and Astrophysics

Appointments and Positions

- **University of Arizona Space Institute**, Tucson, AZ, USA
  Director 2023–Present
- **University of Arizona, Steward Observatory**, Tucson, AZ, USA
  Associate Professor 2023–Present
- **University of Arizona, Steward Observatory**, Tucson, AZ, USA
  Assistant Professor 2018–2023

Products

1. “Eos: a FUV spectroscopic mission to observe molecular hydrogen in molecular clouds”. E. T. Hamden. D. Schiminovich, N. Turner, Neal et al. Proceedings of the SPIE, 13093, August 2024. https://ui.adsabs.harvard.edu/abs/2024SPIE13093E..0CH/abstract

2. "Hyperion: the origin of the stars. A far UV space telescope for high-resolution spectroscopy over wide fields". E. T. Hamden. D. Schiminovich, N. Turner, Neal et al. Journal of Astronomical Telescopes, Instruments, and Systems, 8(4), 044008, December 2022. https://ui.adsabs.harvard.edu/abs/2022JATIS...8d4008H/abstract

3. "FIREBall-2: The Faint Intergalactic Medium Redshifted Emission Balloon Telescope." E. T. Hamden, et. al. The Astrophysical Journal, Volume 898, Issue 2, id.170, 2020. https://ui.adsabs.harvard.edu/abs/2020ApJ...898..170H/abstract

4. "Multi-filament gas inflows fueling young star-forming galaxies". D. C. Martin, D.O. Sullivan, M. Matuszewski, E. T. Hamden, A. Dekel, P. Morrissey, J. D. Neill, S. Cantalupo, J. X. Prochaska, C. Steidel, R. Trainor, A. Moore. Nature, Volume 3, p. 822-831, 2019. https://ui.adsabs.harvard.edu/abs/2019NatAs...3..822M/abstract

5. "The Diffuse Galactic Far-ultraviolet Sky". E. T. Hamden, D. Schiminovich, and M. Seibert. Astrophysical Journal, 799:180H, Dec. 2013. https://ui.adsabs.harvard.edu/abs/2013ApJ...779..180H/abstract

6. "Ultraviolet anti-reflection coatings for use in silicon detector design". E. T. Hamden, F. Greer, M. E. Hoenk, J. Blacksberg, M. R. Dickie, S. Nikzad, D. C. Martin, and D. Schiminovich. Applied Optics, 50:4180–4188, July 2011. https://ui.adsabs.harvard.edu/abs/2011ApOpt..50.4180H/abstract

Certification

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I also certify that, at the time of submission, I am not a party to a malign foreign talent recruitment program.

Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729-3733 and 3802.

Signature: Date: January 28, 2025

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1 Current and Pending Support

2 Budget and narrative