

Zachary Atkins

Education

2019 – 2025* (*Anticipated)	PhD in Physics <i>Advisor: Prof. Jo Dunkley</i> Honors: EDI Initiative Award	Princeton University
2019 – 2021	MA in Physics	Princeton University
2012 – 2016	AB in Physics <i>Magna Cum Laude</i> Honors: Phi Beta Kappa, Kusaka Memorial Prize in Physics, Allen G. Shenstone Prize in Physics, Pyka Memorial Prize in Physics, Shapiro Prize for Academic Excellence	Princeton University

Positions and Employment

2019 – Present	Graduate Research Assistant Dept. of Physics	Princeton University
2021 – 2022	Graduate Teaching Assistant Dept. of Physics	Princeton University
2018 – 2019	Post-baccalaureate Research Assistant Dept. of Physics	Princeton University
2016 – 2018	Analyst Foreign Exchange Options Trading	Barclays Investment Bank
2013 – 2016	Writing Center Fellow Princeton University Writing Center	Princeton University

Collaboration Membership and Activities

2020 – Present	Atacama Cosmology Telescope (NSF) <i>Full member</i> Lead the development of the Cosmic Microwave Background (CMB) power spectrum covariance matrix, as well as a new approach to testing for residual systematic effects in the power spectrum, for the upcoming 2017 – 2022 (“DR6”) cosmological results. Lead the development of noise simulations used across DR6 analyses.
2019 – Present	Simons Observatory (Simons Foundation, NSF) <i>Full member</i> Lead development of SO power spectrum covariance matrix for Large Aperture Telescope (LAT). Key contributor to “map-based simulations” group: simulation products used by SO analysis working groups to calibrate pipelines. Helped design and build cryogenic readout and detector testbeds for SO detector module validation.

Teaching and Mentorship

2024 – Present	Graduate Student Supervision Oversee University of Pennsylvania graduate student Karen Perez Sarmiento on differentiable implementation of ACT/SO LAT power spectrum likelihood code (together with Prof. Mathew Madhavacheril).	University of Pennsylvania
2024	ACT/SPT CMB Data School Organized and taught three-day Python-notebook-based course to ~60 undergraduates and graduate students from the US and Chile with members of ACT and the South Pole Telescope (SPT) collaborations. Emphasis on understanding core CMB analysis techniques and exposure to real data and tools.	University of Chicago
2024	Undergraduate Student Supervision Met weekly with Princeton undergraduate Nicholas Hope on junior independent work, exploring sampling techniques for CMB power spectra (together with Prof. Jo Dunkley).	Princeton University
2021 – 2022	Advanced Mechanics Laboratory (PHY 105) Teaching assistant for first-year undergraduate course.	Princeton University
2021	ACT CMB Data School Organized and taught two-day, remote Python-notebook-based course to ~80 undergraduates and graduate students with members of ACT collaboration. Emphasis on understanding core CMB analysis techniques and exposure to real data and tools.	Remote

Service and Outreach

- 2024 – Present **Princeton Cosmology Lunch** Princeton University
Co-organize weekly lunch talks with Princeton cosmology post-docs.
- 2023 **Warrior-Scholar Project** Princeton University
Delivered three physics lectures during the 2023 program. The Project brings veterans to University campuses nationwide for intensive, pre-college preparatory coursework. Met with Scholars to discuss my research and give a preview of life on campus and within an academic career path.
- 2023 **Astronomy on Tap** Philadelphia, PA
Public lecture on my research, where I discussed the fundamentals of Big-Bang cosmology and the CMB with members of my local community.
- 2021 – 2022 **Physics EDI Coordinator** *Undergraduate-Matters Working Group* Princeton University
Helped manage projects proposed by group members, the majority of whom were undergraduates, as well as liaise with the Physics dept. and University administration to secure necessary resources. Developed a mentoring program that matches post-doc and graduate mentors with undergraduate mentees.
- 2020 – 2021 **Physics EDI Member** *Undergraduate-Matters Working Group* Princeton University
Contributed to group activities, such as streamlining and advertising summer research opportunities.

Public Software and Tools

- Main developer **Noise simulation packages for ACT and SO** *Core analysis codes for SO*
 - `mnms` (<https://github.com/simonsobs/mnms>)
 - `sofind` (<https://github.com/simonsobs/sofind>)
- Contributing developer **Power spectrum pipeline for ACT and SO LAT** *Core analysis codes for SO*
 - `PSPipe` (<https://github.com/simonsobs/PSPipe>)
 - `pspipe_utils` (https://github.com/simonsobs/pspipe_utils)
- Contributing developer & maintainer **ACT data release notebooks**
 - `DR4_DR5_Notebooks` (https://github.com/ACTCollaboration/DR4_DR5_Notebooks)
 - `DR6_Notebooks` (https://github.com/ACTCollaboration/DR6_Notebooks)

Selected Talks

- 07-25-2024 **University of Chicago** *Invited talk at annual SO meeting*
Power Spectrum and Two-point Likelihood: Covariance Matrices
- 11-09-2023 **KICP Seminar**
The Atacama Cosmology Telescope: Map-Based Noise Modeling for DR6
- 10-27-2023 **UC Berkeley Cosmology Group Meeting**
The Atacama Cosmology Telescope: Map-Based Noise Simulations for DR6
- 09-18-2023 **University of Pennsylvania Cosmology Group Meeting**
Exploring Pseudo-CI Covariance Matrices for ACT/SO
- 04-28-2023 **CITA Toronto Cosmology Group Meeting**
The Atacama Cosmology Telescope: Map-Based Noise Simulations for DR6
- 10-20-2022 **Princeton University** *Invited talk at annual ACT meeting*
DR6 noise simulations
- 10-07-2022 **Princeton University Gravity Group Seminar**
The Atacama Cosmology Telescope: Map-Based Noise Simulations for DR6
- 07-15-2022 **UC San Diego** *Invited talk at annual SO meeting*
Map-based simulations
- 04-30-2021 **Princeton University Gravity Group Seminar**
Map-based Noise Simulations for ACT Data
- 08-10-2020 **Remote Webinar** *Co-presenter*
ACT DR4 Data Products

Publications

In each section, I highlight publications for which I am a primary author first. Publications for which I am not a primary author made essential use of my general work.

Publications in Peer Review

- 2412.07068 **The Atacama Cosmology Telescope: Semi-Analytic Covariance Matrices for the DR6 CMB Power Spectra**
Z. Atkins et al., submitted to JCAP
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- 2410.19046 **The Atacama Cosmology Telescope: A measurement of galaxy cluster temperatures through relativistic corrections to the thermal Sunyaev-Zeldovich effect**
W. R. Coulton et al., submitted to PRD
- 2401.13033 **The Atacama Cosmology Telescope: Detection of Patchy Screening of the Cosmic Microwave Background**
W. R. Coulton et al., submitted to Science

Peer-reviewed Publications

- 2303.04180 **The Atacama Cosmology Telescope: Map-Based Noise Simulations for DR6**
Z. Atkins et al., 2023, JCAP, 11, 73
- 2103.03154 **The Atacama Cosmology Telescope: Summary of DR4 and DR5 Data Products and Data Access**
M. Mallaby-Kay, Z. Atkins, et al., 2021, ApJS, 255, 11
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- 2309.05659 **The Atacama Cosmology Telescope: Cosmology from cross-correlations of unWISE galaxies and ACT DR6 CMB lensing**
G. S. Farren et al., 2024, ApJ, 966, 157
- 2307.06352 **The Atacama Cosmology Telescope: Galactic Dust Structure and the Cosmic PAH Background in Cross-correlation with WISE**
R. Córdova Rosado et al., 2024 ApJ, 960, 96
- 2307.01258 **The Atacama Cosmology Telescope: High-resolution component-separated maps across one-third of the sky**
W. R. Coulton et al., 2024, PRD, 109, 6
- 2304.05203 **The Atacama Cosmology Telescope: DR6 Gravitational Lensing Map and Cosmological Parameters**
M. S. Madhavacheril et al., 2024, ApJ, 962, 113
- 2304.05202 **The Atacama Cosmology Telescope: A Measurement of the DR6 CMB Lensing Power Spectrum and its Implications for Structure Growth**
F. J. Qu et al., 2024, ApJ, 962, 112
- 2201.04507 **The Simons Observatory 220 and 280 GHz Focal-Plane Module: Design and Initial Characterization**
E. Healy et al., 2022, JLTP, 209, 815
- 2112.13839 **The Simons Observatory: a new open-source power spectrum pipeline applied to the Planck legacy data**
Z. Li et al., 2023, JCAP, 9, 48
- 2112.01458 **The 90 and 150 GHz universal focal-plane modules for the Simons Observatory**
H. McCarrick et al., submitted to JLTP
- 2111.11301 **Simons Observatory Focal-Plane Module: In-lab Testing and Characterization Program**
Y. Wang et al., JLTP, 2022, 209, 944
- 2106.14797 **The Simons Observatory microwave SQUID multiplexing detector module design**
H. McCarrick et al., 2021, ApJ, 922, 38

- 2105.05267 **The Atacama Cosmology Telescope: Microwave Intensity and Polarization Maps of the Galactic Center**
Y. Guan et al., 2021, ApJ, 920, 6
- Assembly and Integration Process of the High-Density Detector Array Readout Modules for the Simons Observatory**
Y. Li et al., 2020, JLTP, 199, 985
- 1907.08284 **The Simons Observatory: Astro2020 Decadal Project Whitepaper**
The Simons Observatory Collaboration et al., 2019, BAAS, 51, 147
- 1407.1434 **Highly-tunable formation of nitrogen-vacancy centers via ion implantation**
S. Sangtawesin et al., 2014, APL, 105, 6