

Dr. Grace E. Chesmore

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<https://chesmore.github.io/>

EDUCATION	Ph.D. Physics <i>University of Chicago</i> Thesis Advisor: Jeff McMahon	2019-2023
	M.S. Physics <i>University of Michigan</i> Thesis Advisor: Jeff McMahon	2017-2019
	B.A. Physics <i>Santa Clara University</i> Graduation with Honors	2017
SKILLS	<p>Programming: Python, Linux, Bash Scripting, Matlab, HTML, L^AT_EX.</p> <p>Software Skills: GitHub, Zemax, SolidWorks, Adobe Illustrator, AutoCAD, Ansys HFSS, machine learning, ray-tracing, parallelization.</p> <p>Languages: English (fluent), Spanish (fluent), and Italian (B1).</p> <p>Instrumentation: Vector Network Analyzer, Spectrum Analyzer, RF holography, cryogenic measurements, RF-electronics and communication, harmonic mixers, power supplies, general machining.</p> <p>Optics: Zemax, ray-tracing, diffractive optics, Fourier optics.</p>	
HONORS & AWARDS	Department of Energy Science Graduate Student Research Fellow	2022 - present
	National Science Foundation: Graduate Research Fellow	2018 - 2021
	NASA: Space and Technology Research Fellowship Recipient (declined award)	2018
	American Physical Society, Society of Physics Students Travel Grant	2016
	Santa Clara University: John B. Drahmman Prize in Physics	2017
	Santa Clara University: Presidential Scholarship	2016
	Santa Clara University: Hayes Fellowship	2016
	American Physical Society: Women in Physics Grant	2016
	Santa Clara University: University Honors Program	2015-2017
	Santa Clara University: Clare Booth Luce Research Scholar	2015
	Santa Clara University: Roelandts Grant	2014-2015
RESEARCH EXPERIENCE	Graduate Student Researcher 2019 - present	University of Chicago Chicago, IL
	<p>My research focuses on the integration and characterization of optical elements and systematics in the Simons Observatory Large Aperture Telescope, a next-generation cosmic microwave background (CMB) experiment. This includes modelling and measuring the optical performance of optics tubes with radio holography. Further, I develop software to model the propagation of systematic effects into later analysis of the cosmic microwave background. This model uses ray-tracing, machine learning, and parallelization to efficiently predict diffraction effects from the various surfaces within our optical layout.</p> <p>Additional work includes data analysis for the Atacama Cosmology Telescope. I characterize the optical performance of the telescope by co-adding point sources in the map, and can further determine polarization leakage due to imperfections in the telescope's optics. This software pipeline is entirely in Python and is also parallelized for efficient analysis.</p>	
	Graduate Student Researcher 2017 - 2019	University of Michigan Ann Arbor, MI

My work included characterization of optical elements and systematics in the Large Aperture Telescope in Simons Observatory, the next-generation cosmic microwave background experiment. This work completed my Master's Degree in Physics, whereupon my advisor, Jeff McMahon, was hired by the University of Chicago. Following the completion of my Master's degree, I transferred to the University of Chicago, where I continued onto my PhD candidacy.

Undergraduate Researcher University of Michigan
2016 - 2017 Ann Arbor, MI
As a part of the Research Experience for Undergraduates program, funded by the NSF, I assisted in the construction of a Fourier transform spectrometer, which will calibrate the detectors within the Atacama Cosmology Telescope in Chile.

Scientific Technical Author Carbon Design Innovations
2015 - 2017 Burlingame, CA
Reviewed atomic force microscopy technology provided by Carbon Design Innovations, captured publish worthy images and scans, and wrote scientific letters describing new products.

Undergraduate Researcher Department of Physics
2014 - 2017 Santa Clara, CA
Examined the efficiency and lifetime of polymer solar cells by varying a third component in the active layer, study cells under the atomic force microscope and scanning electron microscopes, and managed projects in machine shop.

SERVICE

National Science Foundation REU Program, Mentor

- | | |
|--------------------|-------------|
| 1. Shreya Sutariya | Summer 2018 |
| 2. Julia Robe | Summer 2019 |
| 3. Leticia Reyna | Summer 2022 |

CMB Instrumentation School, Lecturer and Lab Coordinator	August 2022
Optica Publishing Group - Applied Optics: Peer Reviewer	2022 - present
The Simons Observatory: Conference Committee, Member	2021
University of Chicago: Science Policy Group, Vice-President	2020-2021
University of Michigan: AWIS, Co-President of Mentorship	2019 - 2020
University of Michigan: LSA Machine Shop, Machining Instructor	2019
Santa Clara University: Women in Physics, Founder and President	2015-2017
Santa Clara University: Women in STEM, Leadership Board Member	2015-2017
Santa Clara University: Calculus Peer Educator	2013-2014

PROFESSIONAL MEMBERSHIP

CMB-S4 Collaboration
Simons Observatory Collaboration
Atacama Cosmology Telescope Collaboration
Science Policy Group at the University of Chicago
American Women in Science, University of Michigan
Sigma Pi Sigma, The Physics Honor Society
Sigma Xi, The Scientific Research Society
Society of Physics Students, American Physics Society
Women in STEM, Santa Clara University
Women in Physics, Santa Clara University

OUTREACH	<i>CMB-S4 Instrumentation Summer School, University of Chicago</i>	2022
	<i>NSBP + Simons Obs. Undergraduate Program Coordinator</i>	2020
	<i>University of Michigan Department of Physics Graduate Mentor</i>	2018 - 2019
	<i>University of Michigan Society for Women in Physics Mentor</i>	2018 - 2019
	<i>Newport High School Sexual Health Educator, Bellevue, WA</i>	2011-2013

INVITED TALKS AND CONFERENCES “The Simons Observatory: Receiver Characterization with Radio Holography,” NASA Goddard, Optics TNT, virtual (2022).

“The Simons Observatory: Receiver Characterization with Radio Holography,” SPIE Astronomical Telescopes + Instrumentation 2022, Montreal, Canada (2022).

“Modeling (and Measuring) Complex Optical Systems for The Simons Observatory and The Atacama Cosmology Telescope,” Green Bank Observatory Colloquium, Virtual (2022).

“Modeling (and Measuring) Complex Optical Systems for The Simons Observatory and The Atacama Cosmology Telescope,” Stockholm University, Stockholm, Sweden (2022).

69th Lindau Nobel Laureate Meeting (2019).

“Reflectometry Measurements of the Loss Tangent in Silicon at Millimeter Wavelengths,” ESA Workshop, Noordwijk, Netherlands (2018).

“ACTPol Instrumentation: Fourier Transform Spectrometer,” Physics Department Research Colloquium, Santa Clara, CA (2016).

“Evaluation of 3D carbon nanotube composite AFM probes fabricated with ion flux molding,” APS March Meeting, Baltimore, MD (2016).

“Evaluation of 3D carbon nanotube composite AFM probes fabricated with ion flux molding,” (poster), APS Conference for Undergraduate Women in Physics, Corvallis, OR (2016).

“Polymer Solar Cells with Varied Dye Percentages” APS Conference for Undergraduate Women, Santa Cruz, CA (2015).

PUBLICATIONS, MAIN AUTHOR

1. “The Simons Observatory: Characterizing the Large Aperture Telescope Receiver with Radio Holography”, **G.E. Chesmore**, et al. *Applied Optics*, Volume 61 **34**, pp. 10309-10319 (2022), arXiv:2207.07040.
2. “The Simons Observatory: HoloSim-ML: machine learning applied to the efficient analysis of radio holography measurements of complex optical systems”, **G.E. Chesmore**, et al. *Applied Optics*, Volume 60 **29**, pp. 9029-9035 (2021), arXiv:2107.04138.
3. “The Simons Observatory: Metamaterial Microwave Absorber (MMA) and its Cryogenic Applications”, Z. Xu, **G.E. Chesmore**, et al. *Applied Optics*, Volume 60 **4**, pp. 864-874 (2021), arXiv:2010.02233v2.
4. “Reflectometry Measurements of the Loss Tangent in Silicon at Millimeter Wavelengths”, **Grace E. Chesmore**, Tony Mroczkowski, Jeff McMahon, Shreya Sutariya, Alec Josaitis, and Leif Jensen, *Proceedings from the 8th ESA Workshop on Millimetre-Wave Technology and Applications* (2018).
5. “Evaluation of 3D carbon nanotube composite AFM probes fabricated with ion flux molding,” **Grace E. Chesmore** et al., *Journal of Advanced Microscopy Research* (2016).

PUBLICATIONS, COLLABORATION

1. “The Atacama Cosmology Telescope: Measurement and Analysis of 1D Beams for DR4”, M. Lungu, et al. *Journal of Cosmology and Astroparticle Physics*, Volume 2022 **5** pp. 044 (in progress).
2. “The Simons Observatory Large Aperture Telescope Receiver”, N. Zhu, et al. *The Astrophysical Journal Supplement Series*, Volume 257 **2**, pp. 71 (2021).
3. “The Simons Observatory: The Large Aperture Telescope (LAT)”, Z. Xu, et al. *Research Notes of the AAS*, Volume 5 **4**, pp. 100 (2021).
4. “The Atacama Cosmology Telescope: Summary of DR4 and DR5 Data Products and Data Access”, M. Mallaby-Kay, et al. *The Astrophysical Journal Supplement Series*, Volume 225 **1** (2021).
5. “The Simons Observatory: modeling optical systematics in the large aperture telescope”, J.E. Gudmundsson, P.A. Gallardo, R. Puddu, S.R. Dicker, et al. *Applied Optics*, Volume 60 **4**, pp. 823-837 (2021), arXiv:2010.02233v2.
6. “The integration and testing program for the Simons Observatory Large Aperture Telescope optics tubes”, K. Harrington, C. Sierra, G.E. Chesmore, et al. *SPIE: Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy*, Volume 11453, pp. 1145318 (2020).
7. “The Atacama Cosmology Telescope: A Measurement of the Cosmic Microwave Background Power Spectra at 98 and 150 GHz”, S.K. Choi, M. Hasselfield, S.P.P. Ho, B. Koopman, M. Lungu, M.H. Abitbol, et al. (2020), arXiv:2007.07289.
8. “The Atacama Cosmology Telescope: DR4 Maps and Cosmological Parameters”, S. Aiola, E. Calabrese, L. Maurin, S. Naess, B.L. Schmitt, M.H. Abitbol, et al. (2020), arXiv:2007.07288.
9. “Atacama Cosmology Telescope: Constraints on cosmic birefringence”, T. Namikawa, Y. Guan, O. Darwish, B.D. Sherwin, S. Aiola, N. Battaglia, et al. *Physical Review D*, Volume 101 **8**, (2020).
10. “Broadband, millimeter-wave anti-reflection coatings for large-format, cryogenic aluminum oxide optics”, A. Nadolski, J. D. Vieira, J. A. Sobrin, A. M. Kofman, Grace E. Chesmore et al. *Applied Optics*, submitted, in progress (2019).
11. “Wideband 67-116 GHz receiver development for ALMA Band 2”, Pavel Yagoubov, Tony Mroczkowski, Grace E. Chesmore et al. *Astronomy and Astrophysics*, Volume 634, article id A46, 22 pp. (2020).
12. “The Simons Observatory collaboration”, Ade, P., et al. *Journal of Cosmology and Astro-Particle Physics* 056, (2019).
13. “The Simons Observatory: Astro2020 decadal project whitepaper”, The Simons Observatory Collaboration, arXiv:1808.07445.
14. “The Simons Observatory: Science Goals and Forecasts”, The Simons Observatory Collaboration (2018).
15. “The Simons Observatory: Instrument Overview”, The Simons Observatory Collaboration, *Proceedings of SPIE*, Volume 10708 (2018).
16. “Time-dependent efficiency measurements of polymer solar cells with dye additives: unexpected initial increase of efficiency,” K. J. Bandaccari et al., *European Physical Journal Photovoltaics*, (2018).
17. “Structure-function relationships of fullerene esters in polymer solar cells: Unexpected structural effects on lifetime and efficiency” Michael Tro, et al., *International Journal of Energy Research* (2015).
18. “Effect of electron acceptor structure on stability and efficiency in polymer solar cells: a combinatorial approach,” Michael Tro, et al., *International Journal of Energy Research* (2015).