

Brian Koopman

CONTACT INFORMATION	Yale University Physics Department Wright Laboratory WLC 258A New Haven, CT 06511 USA	(203) 436-1313 brian.koopman@yale.edu briankoopman.com
EDUCATION	Cornell University - Ithaca, NY Ph.D., Physics (Advisor: Prof. Michael Niemack) M.S., Physics	December 2018 June 2015
	Clark University - Worcester, MA B.A., <i>summa cum laude</i> , with highest honors in Physics and Math GPA: 3.96 on a 4.00 scale	May 2012
RESEARCH INTERESTS	Development of data acquisition and control systems for application in modern astronomical observatories, specifically those designed and built for study of the cosmic microwave background (CMB). Recent work focuses on control and monitoring systems for the Simons Observatory, a CMB observatory being built in the Atacama Desert in Chile. This work includes software development, devops engineering, cryogenic sensor calibration, and data analysis.	
EMPLOYMENT	Associate Research Scientist , Yale University, New Haven, CT, USA	April 2020 – Present
	Postdoctoral Researcher , Yale University, New Haven, CT, USA	Aug. 2018 – March 2020
	Graduate Researcher , Cornell University, Ithaca, NY, USA	Dec. 2012 – July 2018
	Student Researcher , Clark University, Worcester, MA, USA	Sept. 2011 – May 2012
	Caltech REU Student , LIGO Livingston, Livingston, LA, USA	Summer 2011
	Student Researcher , Clark University, Worcester, MA, USA	Summer 2009, 2010
HONORS AND AWARDS	NASA Space Technology Research Fellow , NASA	2013 – 2017
	Dean's List - First Academic Honors , Clark University	2008 – 2012
	Roy S. Andersen '43 Award , Clark University	2009
	Albert C. Erickson '30 Summer Research Award , Clark University	2009 – 2010
	Erickson Award for the Academic Year , Clark University	2010 – 2011
TEACHING EXPERIENCE	Teaching Assistant , Cornell University, Ithaca, NY 14850 PHYS2214 - Physics III: Oscillations, Waves, and Quantum Physics PHYS2213 - Physics II: Electromagnetism	Fall 2012 Spring 2013

Teaching Assistant, Clark University, Worcester, MA 01601

PHYS127 - Computer Simulations

Spring 2011

MATH217 - Probability and Statistics

Fall 2010, 2011

CS120 - Introduction to Computing

Fall 2009, 2010

PUBLICATIONS

40. C. Murphy, C., K. Choi, S., Datta, R., et al., *Optical modeling of systematic uncertainties in detector polarization angles for the Atacama Cosmology Telescope*, arXiv pre-print (March 1, 2024); arXiv:2403.00763.
39. Yamada, K., Bixler, B., Sakurai, Y., et al., *The Simons Observatory: Cryogenic Half Wave Plate Rotation Mechanism for the Small Aperture Telescopes*, Rev. Sci. Instrum. 95, 024504 (February 22, 2024); doi:10.1063/5.0178066, arXiv:2309.14803.
38. R. Coulton, W., S. Madhavacheril, M., J. Duivenvoorden, A., et al., *The Atacama Cosmology Telescope: High-resolution component-separated maps across one-third of the sky*, arXiv pre-print (July 3, 2023); arXiv:2307.01258.
37. J. Qu, F., D. Sherwin, B., S. Madhavacheril, M., et al., *The Atacama Cosmology Telescope: A Measurement of the DR6 CMB Lensing Power Spectrum and its Implications for Structure Growth*, arXiv pre-print (April 11, 2023); arXiv:2304.05202.
36. S. Madhavacheril, M., J. Qu, F., D. Sherwin, B., et al., *The Atacama Cosmology Telescope: DR6 Gravitational Lensing Map and Cosmological Parameters*, arXiv pre-print (April 11, 2023); arXiv:2304.05203.
35. J. Hill, C., Calabrese, E., Aiola, S., et al., *The Atacama Cosmology Telescope: Constraints on Pre-Recombination Early Dark Energy*, Phys. Rev. D 105, 123536 (June 30, 2022); doi:10.1103/PhysRevD.105.123536, arXiv:2109.04451.
34. Naess, S., Aiola, S., Battaglia, N., et al., *The Atacama Cosmology Telescope: A Search for Planet 9*, ApJ 923 224 (December 23, 2021); doi:10.3847/1538-4357/ac2307, arXiv:2104.10264.
33. Guan, Y., Clark, S. E., Hensley, B. S., et al., *The Atacama Cosmology Telescope: Microwave Intensity and Polarization Maps of the Galactic Center*, ApJ 920 6 (October 6, 2021); doi:10.3847/1538-4357/ac133f, arXiv:2105.05267.
32. Zhu, N., Bhandarkar, T., Gabriele, C., et al., *The Simons Observatory Large Aperture Telescope Receiver*, ApJS 256 23 (Sept 16, 2021); doi:10.3847/1538-4365/ac0db7, arXiv:2103.02747.
31. Shin, T., Jain, B., Adhikari, S., et al., *The mass and galaxy distribution around SZ-selected clusters*, MNRAS, Vol 507, Issue 4, November 2021, Pages 5758-5779 (September 7, 2021); doi:10.1093/mnras/stab2505, arXiv:2105.05914.
30. Orłowski-Scherer, J., Di Mascolo, L., Bhandarkar, T., et al., *Atacama Cosmology Telescope measurements of a large sample of candidates from the Massive and Distant Clusters of WISE Survey: Sunyaev-Zeldovich effect confirmation of MaDCoWS candidates using ACT*, A&A Volume 653, September 2021 (Sept 23, 2021); doi:10.1051/0004-6361/202141200, arXiv:2105.00068.
29. Vavagiakis, E. M., Gallardo, P. A., Calafut, V., et al. *The Atacama Cosmology Telescope: Probing the baryon content of SDSS DR15 galaxies with the thermal and kinematic Sunyaev-Zel'dovich effects*, Phys. Rev. D 104, 043503 (August 6, 2021); doi:10.1103/PhysRevD.104.043503, arXiv:2101.08373.
28. Calafut, V., Gallardo, P. A., Vavagiakis, E. M., et al. *The Atacama Cosmology Telescope: Detection of the pairwise kinematic Sunyaev-Zel'dovich effect with SDSS DR15 galaxies*, Phys. Rev. D 104, 043502 (August 6, 2021); doi:10.1103/PhysRevD.104.043502, arXiv:2101.08374.
27. Mallaby-Kay, M., Atkins, Z., Aiola, S., et al. *The Atacama Cosmology Telescope: Summary of DR4 and DR5 Data Products and Data Access*, ApJS 255 11 (July 5, 2021); doi:10.3847/1538-4365/abfcc4, arXiv:2103.03154.
26. Naess, S., Battaglia, N., Bond, J. R., et al. *The Atacama Cosmology Telescope: Detection of mm-wave transient sources*, ApJ 915 14 (June 29, 2021); doi:10.3847/1538-4357/abfe6d, arXiv:2012.14347.

25. Naess, S., Aiola, S., Battaglia, N., et al., *The Atacama Cosmology Telescope: A search for Planet 9*, arXiv preprint (April 20, 2021); arXiv:2104.10264.
24. Xu, Z., Adachi, S., Ade, P., et al., *The Simons Observatory: the Large Aperture Telescope (LAT)*, Res. Notes AAS 5 100 (April 19, 2021); doi:10.3847/2515-5172/abf9ab, arXiv:2104.09511.
23. Knowles, K., Pillay, D. S., Amodeo, S., et al., *MERGHERS Pilot: MeerKAT discovery of diffuse emission in nine massive Sunyaev-Zel'dovich-selected galaxy clusters from ACT*, Monthly Notices of the Royal Astronomical Society, Volume 504, Issue 2, June 2021, Pages 1749–1758 (April 5, 2021); doi:10.1093/mnras/stab939, arXiv:2012.15088.
22. Amodeo, S., Battaglia, N., Schaan, E., et al. *The Atacama Cosmology Telescope: Modeling the Gas Thermodynamics in BOSS CMASS galaxies from Kinematic and Thermal Sunyaev-Zel'dovich Measurements*, Phys. Rev. D 103, 063514 (March 15, 2021); doi:10.1103/PhysRevD.103.063514, arXiv:2009.05558.
21. Schaan, E., Ferraro, S., Amodeo, S., Battaglia, N., et al. *The Atacama Cosmology Telescope: Combined kinematic and thermal Sunyaev-Zel'dovich measurements from BOSS CMASS and LOWZ halos*, Phys. Rev. D 103, 063513 (March 15, 2021); doi:10.1103/PhysRevD.103.063513, arXiv:2009.05557.
20. Hilton, M., Sifón, S., Naess, S., et al. *The Atacama Cosmology Telescope: A Catalog of > 4000 Sunyaev-Zel'dovich Galaxy Clusters*, ApJS 253 3 (February 16, 2021); doi:10.3847/1538-4365/abd023, arXiv:2009.11043.
19. Madhavacheril, M. S., Sifón, S., Battaglia, N., et al. *The Atacama Cosmology Telescope: Weighing distant clusters with the most ancient light*, arXiv preprint (Sept 16, 2020); arXiv:2009.07772.
18. The CMB-S4 Collaboration, et al. *CMB-S4: Forecasting Constraints on Primordial Gravitational Waves*, arXiv preprint (Aug 27, 2020); arXiv:2008.12619.
17. Aiola, S., Calabrese, E., Maurin, L., et al. *The Atacama Cosmology Telescope: DR4 Maps and Cosmological Parameters*, arXiv preprint (July 14, 2020); arXiv:2007.07288.
16. Choi, S. K., Hasselfield, M., Ho, S. P., **Koopman, B.**, Lungu, M., et al. *The Atacama Cosmology Telescope: A Measurement of the Cosmic Microwave Background Power Spectra at 98 and 150 GHz*, arXiv preprint (July 14, 2020); arXiv:2007.07289.
15. Darwish, O., Madhavacheril, M. S., Sherwin, B., et al. *The Atacama Cosmology Telescope: A CMB lensing mass map over 2100 square degrees of sky and its cross-correlation with BOSS-CMASS galaxies*, Monthly Notices of the Royal Astronomical Society, Volume 500, Issue 2, January 2021, Pages 2250–2263 (Nov 10, 2020); doi:10.1093/mnras/staa3438, arXiv:2004.01139.
14. Namikawa, T., Guan, Y., Darwish, O., et al. *The Atacama Cosmology Telescope: Constraints on Cosmic Birefringence*, Phys. Rev. D 101, 083527 (April 17, 2020); doi:10.1103/PhysRevD.101.083527, arXiv:2001.10465.
13. Madhavacheril, M. S., Hill, J. C., Naess, S., et al. *The Atacama Cosmology Telescope: Component-separated maps of CMB temperature and the thermal Sunyaev-Zel'dovich effect*, Phys. Rev. D 102, 023534 (July 22, 2020); doi:10.1103/PhysRevD.102.023534, arXiv:1911.05717.
12. The Simons Observatory Collaboration, et al. *The Simons Observatory: Science goals and forecasts*, JCAP 1902 (2019) 056 (February 27, 2019); doi:10.1088/1475-7516/2019/02/056, arXiv:1808.07445.
11. Miyatake, H., Battaglia, N., Hilton, M., et al. *Weak-Lensing Mass Calibration of ACTPol Sunyaev-Zel'dovich Clusters with the Hyper Suprime-Cam Survey*, arXiv preprint (April 16, 2018), submitted to ApJ; arXiv:1804.05873.
10. Hilton, M., Hasselfield, M., Sifón, C., et al. *The Atacama Cosmology Telescope: The Two-Season ACTPol Sunyaev-Zel'dovich Effect Selected Cluster Catalog*, arXiv preprint (September 17, 2017), submitted to ApJS; arXiv:1709.05600.

9. Sherwin, B. D., van Engelen, A., Sehgal, N., et al. *The Atacama Cosmology Telescope: Two-Season ACTPol Lensing Power Spectrum*, Phys. Rev. D 95, 123529 (June 21, 2017); doi:10.1103/PhysRevD.95.123529, arXiv:1611.09753.
8. Louis, T., Grace, E., Hasselfield, M., et al. *The Atacama Cosmology Telescope: Two-Season ACTPol Spectra and Parameters*, Journal of Cosmology and Astroparticle Physics, 6, 31 (June 15, 2017); doi:10.1088/1475-7516/2017/06/031, arXiv:1610.02360.
7. Gallardo, P. A., **Koopman, B.**, Cothard, N., et al. *Deep Reactive Ion Etched Anti-Reflection Coatings for Sub-millimeter Silicon Optics*, Applied Optics, 56, 2796-2803 (April 1, 2017); doi:10.1364/AO.56.002796, arXiv:1610.07655.
6. De Bernardis, F., Aiola, S., Vavagiakis, E. M., et al. *Detection of the pairwise kinematic Sunyaev-Zel'dovich effect with BOSS DR11 and the Atacama Cosmology Telescope*, Journal of Cosmology and Astroparticle Physics, 3, 8 (March 7, 2017); doi:10.1088/1475-7516/2017/03/008, arXiv:1607.02139.
5. Thornton, R. J., Ade, P. A. R., Aiola, S., et al. *The Atacama Cosmology Telescope: The polarization-sensitive ACTPol instrument*, ApJ, 227, 21, (December 9, 2016); doi:10.3847/1538-4365/227/2/21, arXiv:1605.06569.
4. Erdenemunkh, U., **Koopman, B.**, Fu, L., et al. *Suppression of Superfluid Density and the Pseudogap State in the Cuprates by Impurities*, Physical Review Letters 117, (2016); doi:10.1103/PhysRevLett.117.257003, arXiv:1607.05238.
3. Schaan, E., Ferraro, S., Vargas-Magaña, M., et al. *Evidence for the kinematic Sunyaev-Zel'dovich effect with ACTPol and velocity reconstruction from BOSS*, Phys. Rev. D 93, 082002 (April 11, 2016); doi:10.1103/PhysRevD.93.082002, arXiv:1510.06442.
2. van Engelen, A., Sherwin, B. D., Sehgal, N., et al. *The Atacama Cosmology Telescope: Lensing of CMB Temperature and Polarization Derived from Cosmic Infrared Background Cross-Correlation*, ApJ, 808, 7 (July 20, 2015); doi:10.1088/0004-637X/808/1/7, arXiv:1412.0626.
1. Naess, S., Hasselfield, M., McMahon, J., et al. *The Atacama Cosmology Telescope: CMB Polarization at $200 < \ell < 9000$* , Journal of Cosmology and Astroparticle Physics, 10, 7 (October 3, 2014); doi:10.1088/1475-7516/2014/10/007, arXiv:1405.5524.

CONFERENCE
PROCEEDINGS

36. Saunders, L. J., Hasselfield, M., **Koopman, B. J.**, et al., *The Simons Observatory: Antenna control software integration and implementation*, Proc. SPIE 12190 Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI, 121902P (31 August 2022); doi:10.1117/12.2629724, arXiv:2207.08949.
35. Li, Y., Austermann, J. E., Beall, J. A., et al., *In situ Performance of the Low Frequency Array for Advanced ACTPol*, IEEE Transactions on Applied Superconductivity, vol. 31, no. 5, pp. 1-4, Aug. 2021, Art no. 2101104; doi:10.1109/TASC.2021.3063334, arXiv:2101.02658.
34. Harrington, K., Sierra, C., Chesmore G., et al., *The integration and testing program for the Simons Observatory Large Aperture Telescope optics tubes*, Proc. SPIE 11453, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy X, 1145318 (31 December 2020); doi:10.1117/12.2562647, arXiv:2102.02129.
33. **Koopman, B.**, Lashner, J., Saunders, L. J., et al., *The Simons Observatory: overview of data acquisition, control, monitoring, and computer infrastructure*, Proc. SPIE 11452, Software and Cyberinfrastructure for Astronomy VI, 1145208 (16 December 2020); doi:10.1117/12.2561771, arXiv:2012.10345.
32. Xu, Z., Bhandarkar, T., Coppi, G., et al., *The Simons Observatory: the Large Aperture Telescope Receiver (LATR) integration and validation results*, Proc. SPIE 11453, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy X, 1145315 (14 December 2020); doi:10.1117/12.257615, arXiv:2012.07862.
31. Gallardo, P. A., Cothard, F. N., Puddu, R., et al. *Far Sidelobes from Baffles and Telescope Support Structures in the Atacama Cosmology Telescope*, Proc. SPIE 10708, Millimeter,

- Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, 107082L (15 August 2018); doi:10.1117/12.2313005, arXiv:1808.05101.
30. Gallardo, P. A., Gudmundsson, J., **Koopman, B.**, et al. *Systematic uncertainties in the Simons Observatory: optical effects and sensitivity considerations*, Proc. SPIE 10708, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, 107083Y (6 August 2018); doi:10.1117/12.2312971, arXiv:1808.05152.
 29. Li, Y., Austermann, J. E., Beall, J. A., et al. *Performance of the advanced ACTPol low frequency array*, Proc. SPIE 10708, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, 107080A (24 July 2018); doi:10.1117/12.2313942.
 28. Crowley, K. T., Austermann, J. E., Choi, S. K., et al. *Advanced ACTPol TES Device Parameters and Noise Performance in Fielded Arrays*, Journal of Low Temperature Physics (July 19, 2018); arXiv:1807.07496.
 27. Cothard, N. F., Abe, M., Nikola, T., et al. *Optimizing the efficiency of Fabry-Perot interferometers with silicon-substrate mirrors*, Proc. SPIE 10706, Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation III, 107065B (10 July 2018); doi:10.1117/12.2313483, arXiv:1807.06019.
 26. Bryan, S. A., Simon, S. M., Gerbino, M., et al. *Development of calibration strategies for the Simons Observatory*, Proc. SPIE 10708, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, 1070840 (9 July 2018); doi:10.1117/12.2313832.
 25. Parshley, S. C., Niemack, M., Hills, R., et al. *The optical design of the six-meter CCAT-prime and Simons Observatory telescopes*, Proc. SPIE 10700, Ground-based and Airborne Telescopes VII, 1070041 (6 July 2018); doi:10.1117/12.2314073, arXiv:1807.6679.
 24. Vavagiakis, E. M., Ahmed, Z., Ali, A., et al. *Prime-Cam: A first-light instrument for the CCAT-prime telescope*, Proc. SPIE 10708, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, 107081U (29 June 2018); arXiv:1807.00058.
 23. Simon, S. M., Beall, J. A., Cothard, N. F., et al. *The Advanced ACTPol 27/39 GHz Array*, Journal of Low Temperature Physics (May 21, 2018); doi:10.1007/s10909-018-1963-7.
 22. **Koopman, B.**, Cothard, N. F., Choi, S. K., et al. *Advanced ACTPol Low Frequency Array: Readout and Characterization of Prototype 27 and 39 GHz Transition Edge Sensors*, Journal of Low Temperature Physics (May 11, 2018); doi:10.1007/s10909-018-1957-5, arXiv:1711.02594.
 21. Coughlin, K. P., McMahon, J. J., Crowley, K. T., et al. *Pushing the Limits of Broadband and High Frequency Metamaterial Silicon Antireflection Coatings*, Journal of Low Temperature Physics (April 23, 2018); arXiv:1804.08368.
 20. Choi, S. K., Austermann, J., Beall, J. A., et al. *Characterization of the Mid-Frequency Arrays for Advanced ACTPol*, Journal of Low Temperature Physics (November 13, 2017); doi:10.1007/s10909-018-1982-4, arXiv:1711.04841.
 19. Vavagiakis, E. M., Henderson, S. W., Zheng, K., et al. *Magnetic Sensitivity of AlMn TESes and Shielding Considerations for Next Generation CMB Surveys*, Journal of Low Temperature Physics (October 23, 2017); arXiv:1710.08456.
 18. Ho, S. P., Austermann, J., Beall, J. A., et al. *Highly uniform 150 mm diameter multichroic polarimeter array deployed for CMB detection*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 991418 (July 20, 2016); doi:10.1117/12.2233113.
 17. Crowley, K. T., Choi, S., Kuan, J., et al. *Characterization of AlMn TES impedance, noise, and optical efficiency in the first 150 mm multichroic array for Advanced ACTPol*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 991431 (July 20, 2016); doi:10.1117/12.2231999.
 16. Li, Y., Choi, S., Ho, S. P., et al. *Assembly and integration process of the first high density detector array for Atacama Cosmology Telescope*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 991435 (July 20, 2016); doi:10.1117/12.2233470.

15. Henderson, S. W., Stevens, J. R., Amiri, M., et al. *Readout of two-kilopixel transition-edge sensor arrays for Advanced ACTPol*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 99141G (July 19, 2016); doi:10.1117/12.2233895, arXiv:1607.06064.
14. Rojas, P. A. F., Planella, R. D., Maurin, L., et al. *Far sidelobe effects from panel gaps of the Atacama Cosmology Telescope*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 99142Q (July 19, 2016); doi:10.1117/12.2231421.
13. Simon, S., Austermann, J., Beall, J. A., et al. *The design and characterization of wideband spline-profiled feedhorns for Advanced ACTPol*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 991416 (July 19, 2016); doi:10.1117/12.2233603.
12. Ward, J. T., Austermann, J., Beall, J. A., et al. *Mechanical designs and development of TES bolometer detector arrays for the Advanced ACTPol experiment*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 991437 (July 19, 2016); doi:10.1117/12.2233746.
11. De Bernardis, F., Stevens, J. R., Hasselfield, M., et al. *Survey strategy optimization for the Atacama Cosmology Telescope*, Proc. SPIE 9910, Observatory Operations: Strategies, Processes, and Systems VI, 991014 (July 7, 2016); doi:10.1117/12.2232824, arXiv:1607.02120.
10. **Koopman, B.**, Austermann, J., Cho, H.-M., et al. *Optical modeling and polarization calibration for CMB measurements with ACTPol and Advanced ACTPol*, Proc. SPIE 9914, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 99142T (July 6, 2016); doi:10.1117/12.2231912, arXiv:1607.01825.
9. Duff, S. M., Austermann, J., Beall, J. A. et al. *Advanced ACTPol Multichroic Polarimeter Array Fabrication Process for 150 mm Wafers*, Journal of Low Temperature Physics 184, 634 (March 22, 2016); doi:10.1007/s10909-016-1576-y.
8. Ho, S. P., Pappas, C. G., Austermann, J. et al. *The First Multichroic Polarimeter Array on the Atacama Cosmology Telescope: Characterization and Performance*, Journal of Low Temperature Physics 184, 559 (March 15, 2016); doi:10.1007/s10909-016-1573-1.
7. Pappas, C. G., Austermann, J., Beall, J. A., et al. *High-Density Superconducting Cables for Advanced ACTPol*, Journal of Low Temperature Physics, 184, 473 (January 11, 2016); doi:10.1007/s10909-015-1454-z.
6. Datta, R., Austermann, J., Beall, J. A., et al. *Design and Deployment of a Multichroic Polarimeter Array on the Atacama Cosmology Telescope*, Journal of Low Temperature Physics, 184, 568 (October 27, 2015); doi:10.1007/s10909-016-1553-5, arXiv:1510.07797.
5. Henderson, S. W., Allison, R., Austermann, J., et al. *Advanced ACTPol Cryogenic Detector Arrays and Readout*, Journal of Low Temperature Physics, 184, 772 (October 9, 2015); doi:10.1007/s10909-016-1575-z, arXiv:1510.02809v1.
4. Hubmayr, J., Austermann, J., Beall, J., et al. *Feedhorn-Coupled transition-edge superconducting bolometer arrays for cosmic microwave background Polarimetry*, 26th International Symposium on Space Terahertz Technology, ISSTT 2015. (March 2015); <https://www.nrao.edu/meetings/isstt/papers/2015/2015000030.pdf>.
3. Stacey, G.J., Parshley, S., Nikola, T., et al. *SWCam: the short wavelength camera for the CCAT Observatory*, Proc. SPIE 9153, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 915310L (August 19, 2014); doi:10.1117/12.2057101.
2. Grace, E., Beall, J., Bond, J.R., et al. *ACTPol: on-sky performance and characterization*, Proc. SPIE 9153, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 915310 (July 23, 2014); doi:10.1117/12.2057243.
1. Wheeler, J.D., **Koopman, B.**, Gallardo, P., et al. *Antireflection coatings for submillimeter silicon lenses*, Proc. SPIE 9153, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, 91532Z (July 23, 2014); doi:10.1117/12.2057011.

CONTRIBUTED
TALKS

11. *The Simons Observatory: overview of data acquisition, control, monitoring, and computer infrastructure*, SPIE Astronomical Telescopes and Instrumentation 2020, December 2020; doi:10.1117/12.2561771.
10. *Advanced ACTPol: Telescope Systems and Project Status*, SPIE Astronomical Telescopes and Instrumentation 2018, June 2018; doi:10.1117/12.2314078.
9. *Advanced ACTPol Low Frequency Array: Readout and Characterization of Prototype 27 and 39 GHz TESes*, Low Temperature Detectors 17, July 2017 (poster)
8. *The CCAT-prime Extreme Field-of-View Submillimeter Telescope on Cerro Chajnantor*, 229th American Astronomical Society Meeting, January 2017 (poster)
7. *Optical modeling and polarization calibration for CMB measurements with ACTPol and Advanced ACTPol*, University of California San Diego, September 13, 2016
6. *Optical modeling and polarization calibration for CMB measurements with ACTPol and Advanced ACTPol*, SPIE Astronomical Telescopes and Instrumentation 2016, June 2016 (poster)
5. *Atacama Cosmology Telescope: Polarization calibration analysis for CMB measurements with ACTPol and Advanced ACTPol*, APS April Meeting 2015, April 2015
4. *Deep reactive ion etching of silicon anti-reflection coatings for sub-millimeter optics*, SPIE Astronomical Telescopes and Instrumentation 2014, June 2014 (poster)
3. *ACTPol: Status and preliminary CMB polarization results from the Atacama Cosmology Telescope*, APS April Meeting 2014, April 2014
2. *Development of Optics and Detectors for Advanced CMB Polarization Measurements*, Cornell Graduate Student Seminar, November 2013
1. *Scanning Tunneling Microscopy of Fe Doped $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$* , APS March Meeting 2012, February 2012

OUTREACH AND
SERVICE

Cornell Physics Graduate Society (PGS) Communications Officer	2013 – 2014
Organized PGS Outreach at Dragon Boat Festival	Summer 2013
Organized PGS Outreach at Ithaca Festival	Summer 2013
Expanding Your Horizons Conference Volunteer	2013