

# John C. Groh

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CONTACT INFORMATION	325 Broadway St. National Institute of Standards and Technology Boulder, CO 80305	(717) 497-3966 john.groh@nist.gov
EDUCATION	<b>University of California, Berkeley</b> Ph.D., Physics (Advisor: Prof. Adrian Lee) M.A., Physics	2021 2018
	<b>The Pennsylvania State University</b> B.S., Physics and Mathematics with Honors in Physics	2014
PRESENT POSITION	<b>National Research Council Postdoctoral Fellow</b> <i>NIST Physical Measurement Laboratory, Boulder, CO</i>	2021–present
RESEARCH EXPERIENCE	<b>Postdoctoral Fellow</b> <i>Quantum Sensors Group, National Institute of Standards and Technology</i> <ul style="list-style-type: none"><li>• Developing a 2000-channel microwave SQUID multiplexer for TES bolometer readout, doubling the current state-of-the art and enabling future large-format detector arrays</li><li>• Advancing the status of the Simons Observatory and ALICE telescopes through production, integration, and testing of cryogenic detector and multiplexed readout components</li></ul> <b>Graduate Student Researcher</b> <i>Physics Department, University of California, Berkeley with Prof. Adrian Lee</i> <ul style="list-style-type: none"><li>• Developed large-format detector array electrical and cryomechanical packaging for the Simons Array cosmic microwave background polarization experiment.</li><li>• Developed the multiplexed detector readout electronics for the Simons Array and SPT-3G cosmic microwave background experiments.</li><li>• Integrated and commissioned the 1st Simons Array telescope in the field.</li></ul> <b>Undergraduate Research Assistant</b> <i>Department of Physics, Pennsylvania State University with Prof. Douglas Cowen and Prof. Tyce DeYoung</i> Developed analysis methods to identify track-like neutrino interactions in the Precision IceCube Next Generation Upgrade and investigated alternative electronics infrastructures for its detector modules.  <b>Undergraduate Research Assistant</b> <i>Department of Physics, Pennsylvania State University with Prof. Jorge Sofo</i> Performed Density Functional Theory calculations and Kinetic Monte Carlo simulations of $C_{60}$ monolayers on a Ag(111) substrate.  <b>Undergraduate Research Assistant</b> <i>CERN, with Michele Floris and Alexander Kalweit</i> Performed high-level quality assurance checks of ALICE Pb-Pb collision data and migrated analysis of inclusive charged hadron $p_T$ spectra to more scalable data format.	2021 - present  2015 - 2021  2013 - 2014  2012 - 2013  2012

## Undergraduate Research Assistant

2011 - 2012

*Department of Physics, Pennsylvania State University with Prof. Stephane Coutu*

Assisted with upgrade and commissioning of the CREAM cosmic ray instrument for its 2012 flight, set up an ISO 100,000 clean room for satellite component assembly, and designed and tested components for the Boronated Scintillating Detector on the ISS-CREAM experiment.

REFEREED PUBLICATIONS K. D. Crowley et al. 2022. *The Simons Observatory: design and measured performance of a carbon fiber strut for a cryogenic truss*, Review of Scientific Instruments 93, 05106.

T. Elleflot et al. 2022. *Low noise frequency-domain multiplexing of TES bolometers using SQUIDS at sub-Kelvin temperature*, Journal of Low Temperature Physics 209, 693–701.

J. Montgomery et al. 2022. *Performance and characterization of the SPT-3G digital frequency-domain multiplexed readout system using an improved noise and crosstalk model*, Journal for Astronomical Telescopes, Instruments, and Systems 8(1), 014001.

J. Groh, et al. 2021. *Anomalous frequency noise in superconducting lithographed megahertz resonators*, IEEE Transactions on Applied Superconductivity 31(5), 1–5.

Y. Segawa et al. 2021. *Method for rapid performance validation of large TES bolometer array for POLARBEAR-2A using a coherent millimeter-wave source*, AIP Conference Proceedings 2319, 040019.

T. Elleflot et al. 2020. *Effect of Stray Impedance in Frequency-Division Multiplexed Readout of TES Sensors in POLARBEAR-2b*, Journal of Low Temperature Physics 199, 840–848.

S. Adachi et al. 2020. *A measurement of the CMB E-mode angular power spectrum at subdegree scales from 670 square degrees of POLARBEAR data*, (submitted to the Astrophysical Journal)

S. Adachi et al. 2020. *A Measurement of the Degree-scale CMB B-mode Angular Power Spectrum with POLARBEAR*, The Astrophysical Journal 897:55.

D. Kaneko et al. 2020. *Deployment of Polarbear-2A*, Journal of Low Temperature Physics 199, 1137–1147.

A. N. Bender et al. 2020. *On-Sky Performance of the SPT-3G Frequency-Domain Multiplexed Readout*, Journal of Low Temperature Physics 199, 182–191.

A. Nadolski et al. 2020. *Broadband, millimeter-wave antireflection coatings for large-format, cryogenic aluminum oxide optics*, Applied Optics 59, 3285–3295.

P.A.R. Ade et al. 2018. *The Simons Observatory: Science goals and forecasts*, Journal of Cosmology and Astroparticle Physics 1902:056.

T. Elleflot et al. 2018. *Detector and Readout Assembly and Characterization for the Simons Array*, Journal of Low Temperature Physics 193, 1094–1102.

- A. J. Anderson et al. 2018. *SPT-3G: A Multichroic Receiver for the South Pole Telescope*, Journal of Low Temperature Physics 193, 1057–1065.
- J. S. Avva et al. 2018. *Design and Assembly of SPT-3G Cold Readout Hardware*, Journal of Low Temperature Physics 193, 547–555.
- B. Westbrook et al. 2018. *The POLARBEAR-2 and Simons Array Focal Plane Fabrication Status*, Journal of Low Temperature Physics 193, 758–770.
- M. Silva-Feaver et al. 2018. *Comparison of NIST SA13a and SA4b SQUID Array Amplifiers*, Journal of Low Temperature Physics 193, 600–610.
- F. W. Carter et al. 2018. *Tuning SPT-3G Transition-Edge-Sensor Electrical Properties with a Four-Layer Ti–Au–Ti–Au Thin-Film Stack*, Journal of Low Temperature Physics 193, 695–702.
- C. M. Posada et al. 2018. *Fabrication of Detector Arrays for the SPT-3G Receiver*, Journal of Low Temperature Physics 193, 703–711.
- Z. Pan et al. 2018. *Optical Characterization of the SPT-3G Camera*, Journal of Low Temperature Physics 193, 305–313.
- J. Ding et al. 2018. *Thermal Links and Microstrip Transmission Lines in SPT-3G Bolometers*, Journal of Low Temperature Physics 193, 712–719.
- W. Everett et al. 2018. *Design and Bolometer Characterization of the SPT-3G First-Year Focal Plane*, Journal of Low Temperature Physics 193, 1085–1093.
- P.A.R. Ade et al. 2017. *A Measurement of the Cosmic Microwave Background B-Mode Polarization Power Spectrum at Sub-Degree Scales from 2 years of POLARBEAR Data*, The Astrophysical Journal 848:141.
- A. Suzuki et al. 2016. *The Polarbear-2 and the Simons Array Experiments*, Journal of Low Temperature Physics 184, 805–810.
- M. G. Aartsen et al. 2015. *The IceProd framework: Distributed data processing for the IceCube neutrino observatory*, Journal of Parallel and Distributed Computing 75, 198–211.
- M. G. Aartsen et al. 2014. *Observation of High-Energy Astrophysical Neutrinos in Three Years of IceCube Data*, Physical Review Letters 113, 101101.
- M. G. Aartsen et al. 2014. *Search for Non-Relativistic Magnetic Monopoles with IceCube*, The European Physical Journal C 74, 2938.
- M. G. Aartsen et al. 2014. *Search for neutrino-induced particle showers with IceCube-40*, Physical Review D 89, 102001.
- M. G. Aartsen et al. 2014. *Search for a diffuse flux of astrophysical muon neutrinos with the IceCube 59-string configuration*, Physical Review D 89, 062007.

M. G. Aartsen et al. 2014. *Energy Reconstruction Methods in the IceCube Neutrino Telescope*, Journal of Instrumentation 9, P03009.

M. G. Aartsen et al. 2013. *Probing the origin of cosmic-rays with extremely high energy neutrinos using the IceCube Observatory*, Physical Review D 88, 112008.

NON-REFEREEDM. Silva-Feaver et al. 2022. *Phase drift monitoring for tone tracking readout of superconducting microwave resonators*, Proceedings of SPIE 12190:121900U.

Y. Wang et al. 2022. *Simons Observatory focal plane module: detector re-biasing with bias-step measurements*, Proceedings of SPIE 12190:121901I.

H. Nishino et al. 2020. *Data acquisition and management system for the CMB polarization experiment: Simons Array*, Proceedings of SPIE 11453:1145329.

J. Montgomery et al. 2020. *Performance and characterization of the SPT-3G digital frequency multiplexed readout system using an improved noise and crosstalk model*, Proceedings of SPIE 11453:114530X.

J. Ito et al. 2020. *Detector and readout characterization for POLARBEAR-2b*, Proceedings of SPIE 11453:1145320.

A. N. Bender et al. 2020. *Year two instrument status of the SPT-3G cosmic microwave background receiver*, Proceedings of SPIE 10708:1070803.

L. Howe et al. 2018. *Design and characterization of the POLARBEAR-2b and POLARBEAR-2c cosmic microwave background cryogenic receivers*, Proceedings of SPIE 10708:107083W.

J. A. Sobrin et al. 2018. *Design and characterization of the SPT-3G receiver*, Proceedings of SPIE 10708:107081H.

N. Stebor et al. 2016. *The Simons Array CMB polarization experiment*, Proceedings of SPIE 9914:99141H.

A. N. Bender et al. 2016. *Integrated performance of a frequency domain multiplexing readout in the SPT-3G receiver*, Proceedings of SPIE 9914:99141D.

M. G. Aartsen et al. 2014. *Letter of Intent: The Precision IceCube Next Generation Upgrade (PINGU)*, arXiv:1401.2046.

TALKS AND  
PRESENTA-  
TIONS

*Development of a 1,820 channel microwave SQUID multiplexer for large-format TES bolometer array readout*, Applied Superconductivity, Honolulu, HI, October 2022

Invited talk: *Microwave multiplexed readout for large Transition-Edge Sensor arrays*, 15th International Workshop on Low Temperature Electronics, Matera, Italy, June 2022

Poster presentation: *Microwave SQUID multiplexing of TES bolometer arrays*, NASA IRSTIG Workshop, Boulder, CO, March 2022

*Fundamental physics from the cosmic microwave background with the Simons Array*, LEPP Journal Club, Cornell University, February 2021

*First year status and performance of the POLARBEAR-2a cosmic microwave background instrument*, SPIE Astronomical Telescopes + Instrumentation, San Diego, CA, December 2020

*Anomalous frequency noise in superconducting lithographed megahertz resonators*, Applied Superconductivity, Virtual, October 2020

*Electronics for precision cosmology: Scaling up the multiplexed detector readout for the Simons Array CMB polarization experiment*, KIPAC Tea Talk, Stanford University, October 2019

*Status of the POLARBEAR-2a CMB Telescope*, APS Meeting, Denver, CO, April 2019

*Status of the POLARBEAR-2a experiment*, CMB Lunch Talk, Lawrence Berkeley National Laboratory, February 2019

*So you want to measure B-modes?*, Graduate Student Seminar, UC Berkeley, October 2018

SUCCESSFUL CO-AUTHORED GRANTS	<i>Next generation bolometric microwave SQUID multiplexer</i> PI: John Mates, NIST Boulder Agency: NASA Proposal No.: 21-APRA21-0066 Total budget: \$1.3M	2023–2026
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HONORS AND AWARDS	Finalist, Postdoctoral and Early-career Association of Researchers Accolade	2022
	National Research Council RAP Postdoctoral Fellowship	2021 - 2023
	NSF Graduate Student Research Fellowship	2015 - 2020
	Paul Axt Prize	2014
	Douglas and Regina Evans Award for Research Achievement	2014
	Student Marshall, Pennsylvania State University Department of Physics	2014
	Barry M. Goldwater Scholarship	2013 - 2014
	Phi Beta Kappa	2014
	Sigma Pi Sigma	2012 - 2014
	John and Elizabeth Holmes Teas Scholarship	2011 - 2014
Schreyer Academic Excellence Scholarship	2010 - 2014	
Summer Discovery Grant, Pennsylvania State University	2013	

TEACHING	<b>University of California, Berkeley</b>	
	<i>Graduate Student Instructor</i> , Physics 111: Basic Semiconductor Circuits	2014 - 2015
	<b>Pennsylvania State University</b>	
	<i>Tutor</i> , Introductory Physics and Calculus	2012
	<i>Volunteer Tutor</i> , High School Calculus	2011 - 2012