

# Kenny Lau

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POSITIONS HELD	California Institute of Technology, 2023–present <ul style="list-style-type: none"><li>• Postdoctoral Scholar in Physics</li></ul>
EDUCATION	University of Minnesota, Ph.D., Physics, 2023 <ul style="list-style-type: none"><li>• Advisor: Prof. Clement Pryke</li><li>• Thesis: Constraining Inflation Models with the BICEP/Keck B-mode Experiment</li></ul> Chinese University of Hong Kong, MPhil, Physics, 2013 <ul style="list-style-type: none"><li>• Advisors: Prof. Ming Chung Chu and Dr. Lap Ming Lin</li><li>• Thesis: Constraints on Tensor-to-scalar Ratio from Planck Measurement</li></ul> Chinese University of Hong Kong, BSc, Physics, 2011 <ul style="list-style-type: none"><li>• First Class Honours. Minor: Mathematics</li></ul>
AWARDS	Antarctica Service Medal, 2021 Physics Prize, CUHK, 2011 Deans List, Faculty of Science, CUHK, 2009
RESEARCH INTERESTS	Experimental Cosmology, Cosmic Microwave Background, Millimeter-wave Line Intensity Mapping
RESEARCH	<b>Probing Inflation through Measurements of B-mode Polarization in Cosmic Microwave Background (CMB)</b> <ul style="list-style-type: none"><li>• BICEP/Keck Collaboration (2015–present). Develops and operates small-aperture telescopes at the Amundsen-Scott South Pole Station to measure degree-scale B-mode polarization.</li><li>• <i>Analysis</i>: Served as data reduction lead (2019–2022); led the “BK18” analysis (2018 data set), achieving the strongest constraint to date on the tensor-to-scalar ratio <math>r</math>; led the South Pole Observatory (SPO) 2034 science forecast.</li><li>• <i>Instrument</i>: Member of the BICEP Array telescope mount and cryostat development team.</li><li>• <i>Deployment</i>: deployed the Keck Array 270 GHz receiver in 2017/18; deployed the BICEP Array mount and 30/40 GHz receiver (first light) in 2019/20.</li></ul> <b>Refining Galactic Foreground Models for Precision CMB Cosmology</b> <ul style="list-style-type: none"><li>• Pan-Experiment Galactic Science Group (2022–present) and CMB-S4 Collaboration (2021–present). Conducting foreground modeling and analysis to optimize large-scale B-mode observation strategies.</li></ul>

### **Constraining the Epoch of Reionization via [CII] Line Intensity Mapping**

- TIME Collaboration (2023–present). Performing cryogenic and detector characterization and developing an analysis pipeline for TIME observations at the ARO-12m telescope.

## **TEACHING**

### **Student Mentoring**

- Suvinay Goyal (UIUC undergraduate), TIME & BICEP instrument, SURF 2025
- Saina Nikmehr (Caltech undergraduate), BICEP analysis, Research course & SURF 2025
- Nilo Rivera (Caltech undergraduate), BICEP analysis, Research course 2024

### **University of Minnesota**

- Introductory Physics for Science and Engineering I/II, Teaching Assistant, Spring 2016, Fall 2016, Spring 2017
- Introductory Physics I, Teaching Assistant, Fall 2015

### **Chinese University of Hong Kong**

- Quantum Physics II, Teaching Assistant, Spring 2012, Spring 2013
- Mechanics, Teaching Assistant, Fall 2012
- Physics Laboratory I, Teaching Assistant, Fall 2011

## **SERVICE**

Caltech Student-Faculty Programs, Poster Judge, Fall 2025  
Caltech Observational Cosmology Seminar, Organizer, 2024–present

## **TALKS**

### **Invited Presentations**

- “Probing Inflation Physics at South Pole”, Caltech Postdocs Launch Seminar, Pasadena, CA, Aug 8 2025
- “Constraining Inflation Models with BICEP/Keck B-mode Experiment”, SLAC CMB group, Virtual, Feb 10 2023

### **Contributed Talks**

- “Advancing Galactic Foreground Modeling for CMB Studies”, mm Universe 2025, Chicago, IL, Jun 24 2025
- “Full-sky Galactic Microwave Emission and Polarization Models”, Caltech ObsCos Seminar, Pasadena, CA, Jun 12 2025
- “Probing the Epoch of Reionization with TIME: an Overview and Update”, Line Intensity Mapping 2024 Meeting, Urbana, IL, Jun 13 2024
- “BICEP/Keck Constraints on Primordial Gravitational Waves”, CMB-S4 Summer Collaboration Meeting, Chicago, IL, Aug 17 2022
- “Searching for Inflation Signals with the BICEP/Keck Telescopes”, 240<sup>th</sup> AAS Meeting, Pasadena, CA, Jun 16 2022
- “The Latest Constraints on Inflationary B-modes by the BICEP/Keck Telescopes”, 56<sup>th</sup> Rencontres de Moriond on Cosmology, La Thuile, Italy, Jan 25 2022

## OUTREACH

Hong Kong Astro Teacher Programme (Caltech Session), Invited Lecturer, Jul 2025  
Caltech Stargazing Lecture, Q&A Panelist, Spring 2025  
Solar Eclipse Viewing Event at Caltech Campus, Outreach Assistant, Apr 2024  
Adopt-a-Physicist Program (3-week online forum for high school students), Teacher, Fall 2023, 2024  
BICEP Array Telescope Open House at Martin A. Pomerantz Observatory, Co-organizer, Feb 2020  
BICEP Array Mount Open House at University of Minnesota, Co-organizer, May 2019

## PUBLICATIONS **Peer-reviewed Papers:**

1. J. Borrill *et al.* (The Pan-Experiment Galactic Science Group), “Full-sky Models of Galactic Microwave Emission and Polarization at Subarcminute Scales for the Python Sky Model”, [Astrophys. J. \*\*991\*\*, 23](#) (2025)
2. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XVIII: Measurement of BICEP3 polarization angles and consequences for constraining cosmic birefringence and inflation”, [Phys. Rev. D \*\*111\*\*, 063505](#) (2025)
3. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XVII: Line of Sight Distortion Analysis: Estimates of Gravitational Lensing, Anisotropic Cosmic Birefringence, Patchy Reionization, and Systematic Errors”, [Astrophys. J. \*\*949\*\*, 43](#) (2023)
4. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XVI: Characterizing Dust Polarization Through Correlations with Neutral Hydrogen”, [Astrophys. J. \*\*945\*\*, 72](#) (2023)
5. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XV: The BICEP3 Cosmic Microwave Background Polarimeter and the First Three-year Data Set”, [Astrophys. J. \*\*927\*\*, 77](#) (2022)
6. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XIV: Improved constraints on axionlike polarization oscillations in the cosmic microwave background”, [Phys. Rev. D \*\*105\*\*, 022006](#) (2022)
7. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XIII: Improved Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season”, [Phys. Rev. Lett. \*\*127\*\*, 151301](#) (2021)
8. S. Yeung, K. Lau and M.-C. Chu, “Relic Neutrino Degeneracies and Their Impact On Cosmological Parameters”, [JCAP \*\*04\*\*, 024](#) (2021)
9. P.A.R. Ade *et al.* (BICEP/Keck Collaboration), “BICEP/Keck XII: Constraints on Axion-like Polarization Oscillations in the Cosmic Microwave Background”, [Phys. Rev. D \*\*103\*\*, 042002](#) (2021)
10. P.A.R. Ade *et al.* (BICEP/Keck and SPTpol Collaborations), “A Demonstration of Improved Constraints on Primordial Gravitational Waves with Delensing”, [Phys. Rev. D \*\*103\*\*, 022004](#) (2021)
11. P.A.R. Ade *et al.* (Keck Array and BICEP2 Collaborations), “BICEP2/Keck Array XI: Beam Characterization and Temperature-to-Polarization Leakage in the BK15 Data Set”, [Astrophys. J. \*\*884\*\*, 114](#) (2019)

12. P.A.R. Ade *et al.* (Keck Array and BICEP2 Collaborations), “Constraints on Primordial Gravitational Waves Using Planck, WMAP, and New BICEP2/Keck Observations through the 2015 Season”, *Phys. Rev. Lett.* **121**, 221301 (2018)

**Other Selected Publications (Conference Proceedings and arXiv Papers):**

1. C. Giannakopoulos *et al.*, “Calibration measurements of the BICEP3 and BICEP array CMB polarimeters from 2017 to 2024”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII*; 1310219 (2024)
2. Y. Nakato *et al.*, “Development of the 220/270 GHz BICEP Array CMB receiver”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII*; 1310207 (2024)
3. V. Butler *et al.*, “TIME: the Tomographic Ionized-carbon Mapping Experiment: an update on design, characterization, and data from the 2022 commissioning observations”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII*; 131022G (2024)
4. S. Fatigoni *et al.*, “Results and Limits of Time-Division Multiplexing for the BICEP Array High-Frequency Receivers”, *J. Low Temp. Phys.* **216**, 29 (2024)
5. A. Schillaci *et al.*, “BICEP Array: 150 GHz detector module development”, *J. Low Temp. Phys.* **213**, 317 (2023)
6. M. Dierickx *et al.*, “Plastic Laminate Antireflective Coatings for Millimeter-wave Optics in BICEP Array”, *J. Low Temp. Phys.* **211**, 366 (2023)
7. D. Goldfinger *et al.*, “Thermal Testing for Cryogenic CMB Instrument Optical Design”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*; 121901V (2022)
8. A. Soliman *et al.*, “2022 Upgrade and Improved Low Frequency Camera Sensitivity for CMB Observation at the South Pole”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*; 1219014 (2022)
9. J. Cornelison *et al.*, “Improved Polarization Calibration of the BICEP3 CMB Polarimeter at the South Pole”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*; 121901X (2022)
10. K. Abazajian *et al.*, “Snowmass 2021 CMB-S4 White Paper”, [arXiv:2203.08024](https://arxiv.org/abs/2203.08024) (2022)
11. C. Chang *et al.*, “Snowmass 2021 Cosmic Frontier: Cosmic Microwave Background Measurements White Paper”, [arXiv:2203.07638](https://arxiv.org/abs/2203.07638) (2022)
12. K. Lau *et al.*, “The Latest Constraints on Inflationary B-modes from the BICEP/Keck Telescopes”, *Proceedings of the 56<sup>th</sup> Rencontres de Moriond on Cosmology* (2022)
13. L. Moncelsi *et al.*, “Receiver development for BICEP Array, a next-generation CMB polarimeter at the South Pole”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy X*; 1145314 (2020)
14. T. St. Germaine *et al.*, “Analysis of Temperature-to-Polarization Leakage in BICEP3 and Keck CMB Data from 2016 to 2018”, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy X*; 114532E (2020)

15. J. Cornelison *et al.*, “Polarization calibration of the BICEP3 CMB polarimeter at the South Pole”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy X; 1145327](#) (2020)
16. J. Kang *et al.*, “Observing low elevation sky and the CMB Cold Spot with BICEP3 at the South Pole”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 114532D](#) (2020)
17. A. Schillaci *et al.*, “Design and Performance of the First BICEP Array Receiver”, [J. Low Temp. Phys. \*\*199\*\*, 976](#) (2020)
18. C. Zhang *et al.*, “Characterizing the Sensitivity of 40 GHz TES Bolometers for BICEP Array”, [J. Low Temp. Phys. \*\*199\*\*, 968](#) (2020)
19. T. St. Germaine *et al.*, “Optical Characterization of the Keck Array and BICEP3 CMB Polarimeters from 2016 to 2019”, [J. Low Temp. Phys. \*\*199\*\*, 824](#) (2020)
20. A. Soliman *et al.*, “Optical Design and Characterization of 40 GHz Detector and Module for the BICEP Array”, [J. Low Temp. Phys. \*\*199\*\*, 1118](#) (2020)
21. A. Cukierman *et al.*, “Microwave multiplexing on the Keck Array”, [J. Low Temp. Phys. \*\*199\*\*, 858](#) (2020)
22. B. Racine *et al.*, “Measurements of Degree-Scale B-mode Polarization with the BICEP/Keck Experiments at South Pole”, [Proceedings of the 53<sup>rd</sup> Rencontres de Moriond on Cosmology](#) (2018)
23. A. Soliman *et al.*, “Design and performance of wide-band corrugated walls for the BICEP Array detector modules at 30/40 GHz”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 107082G](#) (2018)
24. D. Barkats *et al.*, “Ultra-Thin Large-Aperture Vacuum Windows for Millimeter Wavelengths Receivers”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 107082K](#) (2018)
25. M. Crumrine *et al.*, “BICEP Array cryostat and mount design”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 107082D](#) (2018)
26. H. Hui *et al.*, “BICEP Array: a multi-frequency degree-scale CMB polarimeter”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 1070807](#) (2018)
27. J. Kang *et al.*, “2017 upgrade and performance of BICEP3: a 95 GHz refracting telescope for degree-scale CMB polarization”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 107082N](#) (2018)

REFERENCES    Prof. James Bock, [jjb@astro.caltech.edu](mailto:jjb@astro.caltech.edu)  
                     Prof. Abigail Crites, [atc72@cornell.edu](mailto:atc72@cornell.edu)  
                     Prof. Clement Pryke, [cspryke@umn.edu](mailto:cspryke@umn.edu)