

# 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, Early Universe Physics, Cosmic Microwave Background, Millimeter-wave Line Intensity Mapping
RESEARCH	<b>Probing Inflation from Measurements of B-mode Polarization in Cosmic Microwave Background (CMB)</b> <ul style="list-style-type: none"><li>• BICEP/Keck Collaboration (2015–present). Building small aperture telescopes to measure degree-scale B-modes at the Amundsen-Scott South Pole Station.</li><li>• <i>Analysis</i>: data reduction lead (2019–2022); rewrote the pipeline for BICEP Array; completed the “BK18” analysis (science results with new data from 2016–2018) — the strongest constraint to date on the tensor-to-scalar ratio <math>r</math>.</li><li>• <i>Instrument</i>: BICEP Array telescope mount and cryostat development team.</li><li>• <i>Deployment</i>: deployed Keck Array 270 GHz receiver in 2017/18; deployed BICEP Array mount and 30/40 GHz receiver (first light) in 2019/20.</li></ul> <b>Searching for Primordial Gravitational Waves with CMB-S4 experiment</b> <ul style="list-style-type: none"><li>• CMB-S4 Collaboration (2021–present). Conducting foreground studies for large-scale B-mode observation strategy.</li></ul> <b>Constraining the Epoch of Reionization via [CII] Line Intensity Mapping</b> <ul style="list-style-type: none"><li>• TIME Collaboration (2023–present). Performing cryogenic and detector tests and developing an analysis pipeline for the deployment of TIME receiver in the winter</li></ul>

of 2024, the first scientific observation season at the Arizona Radio Observatory 12m telescope.

## TEACHING

### **Student Mentoring**

- Aaron Steiger (Caltech graduate student, advisor: James Bock), BICEP analysis, 2023–present

### **University of Minnesota**

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

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

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

## SERVICE

Caltech Observational Cosmology Seminar Organizer, 2024–present

## TALKS

### **Invited Presentations**

- “Constraining Inflation Models with BICEP/Keck B-mode Experiment”, SLAC CMB group, Virtual, Feb 10 2023

### **Contributed Conference Talks**

- “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

Solar Eclipse Viewing Event, Caltech Campus, Apr 8 2024

Adopt-a-Physicist Program (3-week online forum for high school students), Fall 2023

BICEP Array Telescope Open House, Martin A. Pomerantz Observatory, Feb 2 2020

BICEP Array Mount Open House, University of Minnesota, May 5 2019

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

1. 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)

2. 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)
3. 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)
4. 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)
5. 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)
6. S. Yeung, **K. Lau** and M.-C. Chu, “Relic Neutrino Degeneracies and Their Impact On Cosmological Parameters”, [JCAP \*\*04\*\*, 024](#) (2021)
7. 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)
8. 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)
9. 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)
10. 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. S. Fatigoni *et al.*, “Results and Limits of Time-Division Multiplexing for the BICEP Array High-Frequency Receivers”, [J. Low Temp. Phys.](#) (2024)
2. A. Schillaci *et al.*, “BICEP Array: 150 GHz detector module development”, [J. Low Temp. Phys. \*\*213\*\*, 317](#) (2023)
3. M. Dierickx *et al.*, “Plastic Laminate Antireflective Coatings for Millimeter-wave Optics in BICEP Array”, [J. Low Temp. Phys. \*\*211\*\*, 366](#) (2023)
4. 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)
5. 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)
6. 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)

7. K. Abazajian *et al.*, “Snowmass 2021 CMB-S4 White Paper”, [arXiv:2203.08024](#) (2022)
8. C. Chang *et al.*, “Snowmass 2021 Cosmic Frontier: Cosmic Microwave Background Measurements White Paper”, [arXiv:2203.07638](#) (2022)
9. **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)
10. 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)
11. 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)
12. 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)
13. 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)
14. A. Schillaci *et al.*, “Design and Performance of the First BICEP Array Receiver”, [J. Low Temp. Phys.](#) **199**, 976 (2020)
15. C. Zhang *et al.*, “Characterizing the Sensitivity of 40 GHz TES Bolometers for BICEP Array”, [J. Low Temp. Phys.](#) **199**, 968 (2020)
16. 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)
17. 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)
18. A. Cukierman *et al.*, “Microwave multiplexing on the Keck Array”, [J. Low Temp. Phys.](#) **199**, 858 (2020)
19. 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)
20. 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)
21. 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)
22. M. Crumrine *et al.*, “BICEP Array cryostat and mount design”, [Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX](#); 107082D (2018)

23. 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)
24. 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. Clement Pryke, [cspryke@umn.edu](mailto:cspryke@umn.edu)