Kenny Lau

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POSITIONS HELD

California Institute of Technology, 2023–present
- Postdoctoral Scholar in Physics

EDUCATION

University of Minnesota, Ph.D., Physics, 2023
- Advisor: Prof. Clement Pryke
- Thesis: Constraining Inflation Models with the BICEP/Keck B-mode Experiment

Chinese University of Hong Kong, MPhil, Physics, 2013
- Advisors: Prof. Ming Chung Chu and Dr. Lap Ming Lin
- Thesis: Constraints on Tensor-to-scalar Ratio from Planck Measurement

Chinese University of Hong Kong, BSc, Physics, 2011
- First Class Honours. Minor: Mathematics

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

Probing Inflation from Measurements of B-mode Polarization in Cosmic Microwave Background (CMB)
- BICEP/Keck Collaboration (2015–present). Building small aperture telescopes to measure degree-scale B-modes at the Amundsen-Scott South Pole Station.
- *Analysis*: 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 r.
- *Instrument*: BICEP Array telescope mount and cryostat development team.
- *Deployment*: deployed Keck Array 270 GHz receiver in 2017/18; deployed BICEP Array mount and 30/40 GHz receiver (first light) in 2019/20.

Searching for Primordial Gravitational Waves with CMB-S4 experiment
- CMB-S4 Collaboration (2021–present). Conducting foreground studies for large-scale B-mode observation strategy.

Constraining the Epoch of Reionization via [CII] Line Intensity Mapping
- TIME Collaboration (2023–present). Performing cryogenic and detector tests and developing an analysis pipeline for the deployment of TIME receiver in the winter

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

OUTREACH

Adopt a Physicist Program, Fall 2023

- Engaged high school students and teachers in frontier physics research in a three-week online forum discussion.

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

- Exhibited the fully functional BICEP Array telescope to support personnel of the Amundsen-Scott South Pole station.

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

- Demonstrated the scanning of the BICEP Array receivers on its mount to members of the School of Physics and Astronomy.

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. A. Schillaci *et al.*, "BICEP Array: 150 GHz detector module development", J. Low Temp. Phys. **213**, 317 (2023)
2. M. Dierickx *et al.*, "Plastic Laminate Antireflective Coatings for Millimeter-wave Optics in BICEP Array", J. Low Temp. Phys. **211**, 366 (2023)
3. 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)
4. 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)
5. 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)
6. K. Abazajian *et al.*, "Snowmass 2021 CMB-S4 White Paper", arXiv:2203.08024 (2022)
7. C. Chang *et al.*, "Snowmass 2021 Cosmic Frontier: Cosmic Microwave Background Measurements White Paper", arXiv:2203.07638 (2022)
8. **K. Lau** *et al.*, "The Latest Constraints on Inflationary B-modes from the BICEP/Keck Telescopes", Proceedings of the 56th Rencontres de Moriond on Cosmology (2022)
9. 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)

10. 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)
11. 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)
12. 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)
13. A. Schillaci *et al.*, "Design and Performance of the First BICEP Array Receiver", J. Low Temp. Phys. **199**, 976 (2020)
14. C. Zhang *et al.*, "Characterizing the Sensitivity of 40 GHz TES Bolometers for BICEP Array", J. Low Temp. Phys. **199**, 968 (2020)
15. 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)
16. 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)
17. A. Cukierman *et al.*, "Microwave multiplexing on the Keck Array", J. Low Temp. Phys. **199**, 858 (2020)
18. B. Racine *et al.*, "Measurements of Degree-Scale B-mode Polarization with the BICEP/Keck Experiments at South Pole", Proceedings of the 53rd Rencontres de Moriond on Cosmology (2018)
19. 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)
20. 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)
21. M. Crumrine *et al.*, "BICEP Array cryostat and mount design", Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX; 107082D (2018)
22. 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)
23. 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)

TALKS

1. "Constraining Inflation Models with BICEP/Keck B-mode Experiment", SLAC CMB group, Virtual, Feb 10 2023
2. "BICEP/Keck Constraints on Primordial Gravitational Waves", CMB-S4 Summer Collaboration Meeting, Chicago, IL, Aug 17 2022

3. "Searching for Inflation Signals with the BICEP/Keck Telescopes", 240th AAS Meeting, Pasadena, CA, Jun 16 2022
4. "The Latest Constraints on Inflationary B-modes by the BICEP/Keck Telescopes", 56th Rencontres de Moriond on Cosmology, La Thuile, Italy, Jan 25 2022

REFERENCES

Prof. James Bock, jjb@astro.caltech.edu
Prof. Clement Pryke, cspryke@umn.edu