Kenny Lau

School of Physics and Astronomy,
Physics and Nanotechnology Building,
115 Union St SE,
Minneapolis, MN 55455

Email: kennylau@umn.edu
Office: (612) 625 1802
kennykinglau.github.io

EDUCATION

University of Minnesota, 2015-Present
- Ph.D candidate, Physics
- Advisor: Prof. Clem Pryke

The 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

The Chinese University of Hong Kong, B.Sc., Physics, 2011
- with Honours, First Class
- Minor: Mathematics

AWARDS

Antarctica Service Medal, 2021

RESEARCH

Probing Inflation from Measurements of B-mode Polarization in Cosmic Microwave Background (CMB)
- BICEP/Keck Collaboration member (2015-present), Caltech visiting student researcher (Jul 2021-Sep 2021). Using small aperture telescopes to measure degree-scale B-modes at Amundsen-Scott South Pole Station.
- *Analysis work*: 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 work*: key member of the BICEP Array mount and cryostat development team.
- *Deployment work*: deployed Keck Array 270 GHz receiver in 2017/18; deployed BICEP Array mount and 30/40 GHz receiver (first light) in 2019/20.
- *Ongoing research*: developing a pipeline for BICEP/Keck+South Pole Telescope delensing analysis; acting as an analysis pipeline consultant.

Searching for Primordial Gravitational Waves with CMB-S4 experiment
- Conducting foreground studies for large-scale B-mode observation strategy.

Investigating Impacts of Relic Neutrino Degeneracies on CMB
- Studied the impacts of neutrino degeneracies in CMB data fitting, particularly for the constraint of Hubble parameter H_0 and spectral index n_s.

TEACHING

Teaching Assistant, School of Physics and Astronomy, University of Minnesota
- Intro. Physics for Science and Engineering I/II (Spring 2017, Fall 2016, Spring 2016), Intro. Physics I (Fall 2015)

Teaching Assistant, Physics Department, The Chinese University of Hong Kong

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

OUTREACH

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 people of the School of Physics and Astronomy.

LANGUAGES

- Native proficiency in Cantonese
- Native proficiency in written Chinese
- Full professional proficiency in English

COMPUTER LANGUAGES

Python, MATLAB, HTML, JavaScript, FORTRAN, LaTeX

PUBLICATIONS

Peer-reviewed Papers:

1. 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)
2. 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)
3. 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)
4. 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)
5. S. Yeung, **K. Lau** and M.-C. Chu, "Relic Neutrino Degeneracies and Their Impact On Cosmological Parameters", JCAP **04**, 024 (2021)
6. 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)
7. 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)
8. 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)

9. 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. 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", arXiv:2210.08038 (2022)
2. 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)
3. 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)
4. 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)
5. K. Abazajian *et al.*, "Snowmass 2021 CMB-S4 White Paper", arXiv:2203.08024 (2022)
6. C. Chang *et al.*, "Snowmass 2021 Cosmic Frontier: Cosmic Microwave Background Measurements White Paper", arXiv:2203.07638 (2022)
7. **K. Lau** *et al.*, "The Latest Constraints on Inflationary B-modes from the BICEP/Keck Telescopes", Proceedings of the 56$^{\text{th}}$ Rencontres de Moriond on Cosmology (2022)
8. A. Schillaci *et al.*, "BICEP Array: 150 GHz detector module development", arXiv:2111.14785 (2021)
9. M. Dierickx *et al.*, "Plastic Laminate Antireflective Coatings for Millimeter-wave Optics in BICEP Array", arXiv:2111.14751 (2021)
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 53rd 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)

TALKS

1. "BICEP/Keck Constraints on Primordial Gravitational Waves", CMB-S4 Summer Collaboration Meeting, Chicago, IL, Aug 17 2022
2. "Searching for Inflation Signals with the BICEP/Keck Telescopes", 240th AAS Meeting, Pasadena, CA, Jun 16 2022
3. "The Latest Constraints on Inflationary B-modes by the BICEP/Keck Telescopes", 56th Rencontres de Moriond on Cosmology, La Thuile, Italy, Jan 25 2022