Vincent Sze Him Lee

Postdoctoral Scholar, UC Berkeley

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Positions

2024 – present
- **University of California, Berkeley**
  Postdoctoral Scholar
- **University of California, San Diego**
  Visiting Scholar

Education

2019 – 2025
- **Caltech**
  Ph.D. in Physics
  Thesis defended in 05/2024, degree coferred in 06/2025
  Advisor: Prof. Kathryn M. Zurek

2015 – 2019
- **The Chinese University of Hong Kong**
  B.Sc in Physics (Enrichment Stream in Theoretical Physics)
  Minor in Mathematics
  Advisors: Prof. Ming Chung Chu, Prof. Kenneth Young
  First Class Honors

2018
- **University of California, Berkeley**
  UCEAP exchange student

Publications

[Collaboration papers are labeled by an asterisk.]

Peer-reviewed Published Articles

1. L. Badurina, Y. Du, **V. S. H. Lee**, Y. Wang, and K. M. Zurek, "Signatures of linearized gravity in atom interferometers: A simplified computational framework," *Phys. Rev. D*, vol. 111, no. 4, p. 042 002, 2025. DOI: 10.1103/PhysRevD.111.042002. arXiv: 2409.03828 [gr-qc].

2. **V. S. H. Lee** and K. M. Zurek, "Proper time observables of general gravitational perturbations in laser interferometry-based gravitational wave detectors," *Phys. Rev. D*, vol. 111, no. 12, p. 124 037, 2025. DOI: 10.1103/6q7d-jz26. arXiv: 2408.03363 [hep-ph].

3. S. M. Vermeulen *et al.*, "Photon-Counting Interferometry to Detect Geontropic Space-Time Fluctuations with GQuEST," *Phys. Rev. X*, vol. 15, no. 1, p. 011 034, 2025. DOI: 10.1103/PhysRevX.15.011034. arXiv: 2404.07524 [gr-qc].

4. **V. S. H. Lee**, K. M. Zurek, and Y. Chen, "Astronomical image blurring from transversely correlated quantum gravity fluctuations," *Phys. Rev. D*, vol. 109, no. 8, p. 084 005, 2024. DOI: 10.1103/PhysRevD.109.084005. arXiv: 2312.06757 [gr-qc].

5. * A. Afzal *et al.*, "The NANOGrav 15 yr Data Set: Search for Signals from New Physics," *Astrophys. J. Lett.*, vol. 951, no. 1, p. L11, 2023. DOI: 10.3847/2041-8213/acdc91. arXiv: 2306.16219 [astro-ph.HE].

6. Y. Du, **V. S. H. Lee**, Y. Wang, and K. M. Zurek, "Macroscopic dark matter detection with gravitational wave experiments," *Phys. Rev. D*, vol. 108, no. 12, p. 122 003, 2023. DOI: 10.1103/PhysRevD.108.122003. arXiv: 2306.13122 [astro-ph.CO].

7. M. I. Gresham, **V. S. H. Lee**, and K. M. Zurek, "Astrophysical observations of a dark matter-Baryon fifth force," *JCAP*, vol. 02, p. 048, 2023. DOI: 10.1088/1475-7516/2023/02/048. arXiv: 2209.03963 [astro-ph.HE].

8. S. Gukov, **V. S. H. Lee**, and K. M. Zurek, "Near-horizon quantum dynamics of 4D Einstein gravity from 2D Jackiw-Teitelboim gravity," *Phys. Rev. D*, vol. 107, no. 1, p. 016 004, 2023. DOI: 10.1103/PhysRevD.107.016004. arXiv: 2205.02233 [hep-th].

9. D. Li, **V. S. H. Lee**, Y. Chen, and K. M. Zurek, "Interferometer response to geontropic fluctuations," *Phys. Rev. D*, vol. 107, no. 2, p. 024 002, 2023. DOI: 10.1103/PhysRevD.107.024002. arXiv: 2209.07543 [gr-qc].

10. * Z. Arzoumanian *et al.*, "Searching for Gravitational Waves from Cosmological Phase Transitions with the NANOGrav 12.5-Year Dataset," *Phys. Rev. Lett.*, vol. 127, no. 25, p. 251 302, 2021. DOI: 10.1103/PhysRevLett.127.251302. arXiv: 2104.13930 [astro-ph.CO].

11. **V. S. H. Lee**, A. Mitridate, T. Trickle, and K. M. Zurek, "Probing Small-Scale Power Spectra with Pulsar Timing Arrays," *JHEP*, vol. 06, p. 028, 2021. DOI: 10.1007/JHEP06(2021)028. arXiv: 2012.09857 [astro-ph.CO].

12. **V. S. H. Lee**, S. R. Taylor, T. Trickle, and K. M. Zurek, "Bayesian Forecasts for Dark Matter Substructure Searches with Mock Pulsar Timing Data," *JCAP*, vol. 08, p. 025, 2021. DOI: 10.1088/1475-7516/2021/08/025. arXiv: 2104.05717 [astro-ph.CO].

Manuscripts Submitted for Peer-review

1. L. Badurina, Y. Du, **V. S. H. Lee**, Y. Wang, and K. M. Zurek, "Detecting gravitational signatures of dark matter with atom gradiometers," May 2025. arXiv: 2505.00781 [hep-ph].

2. K. V. Berghaus, Y. Du, **V. S. H. Lee**, *et al.*, "Physics beyond the Standard Model with the DSA-2000," May 2025. arXiv: 2505.23892 [hep-ph].

Awards, Grants & Honors

Postgraduate

2023 — James A. Cullen Memorial Fellowship
— David and Barbara Groce Travel Fund

Undergraduate

2018 — Professor and Mrs. Yau Wa Chan Scholarship
— Professor Charles K. Kao Scholarship
2017 — University Exchange Scholarship
2016, 2017 — Scholarship for Physics Student
— The KY Young & CK Ma Memorial Scholarship
2015, 2016 — Dean's Honor's List
— CN Yang Scholarship
2015, 2016, 2017 — HKSAR Government Scholarship
— Undergraduate Research Experience Grant
2015 — Physics Admission Scholarship

Awards, Grants & Honors (continued)

- Honors at Entrance

Invited Talks

April 2025
- **Lawrence Berkeley National Laboratory**: Theory Seminar
  Quantum Gravity Signals in 4D Einstein gravity from 2D JT gravity
- **University of California, Berkeley**: Astrochat
  Detecting Gravitational Signatures of Dark Matter with Atom Interferometers

March 2025
- **University of California, San Diego**: STRAND Seminar
  Probing Dark Matter with Pulsar Timing Arrays and Gravitational Wave Detectors

February 2025
- **Harvard University**: GRASP/Particle Theory Seminar
  Quantum Gravity Signals in 4D Einstein gravity from 2D JT gravity

September 2024
- **Fermi National Accelerator Laboratory (Fermilab)**: Theory Seminar
  Proper Time Observables and Laser/Atom Interferometers as Probes of BSM Physics

April 2024
- **The Chinese University of Hong Kong**: Theory Seminar
  Probing Dark Matter with Pulsar Timing Arrays and Gravitational Wave Detectors

December 2023
- **Lawrence Berkeley National Laboratory**: Theory Seminar
  Probing Dark Matter with Pulsar Timing Arrays and Gravitational Wave Detectors

October 2023
- **Princeton University**: Dark Cosmos Seminar
  Probing Dark Matter with Pulsar Timing Arrays and Gravitational Wave Detectors
- **University of California, Los Angeles**: TEPAPP Seminar
  Probing Dark Matter with Pulsar Timing Arrays and Gravitational Wave Detectors

September 2023
- **SLAC National Accelerator Laboratory**: EPP Seminar
  Probing Dark Matter with Pulsar Timing Arrays and Gravitational Wave Detectors

March 2021
- **Caltech**: Radio Group Journal Club
  Probing Small-Scale Power Spectra with Pulsar Timing Arrays

Teaching Positions

Caltech (TA)

Spring 2024
- **Ph237**: Gravitational Radiation

Spring 2023
- **Ph1c (Practical)**: Classical Mechanics and Electromagnetism

Fall 2022
- **Ph230a**: Elemental Particle Theory

Spring 2021
- **Ph1c (Practical)**: Classical Mechanics and Electromagnetism

Fall 2021
- **Ph230a**: Elemental Particle Theory

Spring 2020
- **Ph139**: Introduction to Particle Physics

Winter 2020
- **Ph121b**: Computational Physics Lab

Conferences & Schools

Conferences

May 2025 — **Berkeley Axion Workshop 2025**: Lawrence Berkeley National Laboratory
Participant

January 2025 — **Observables in Quantum Gravity: From Theory to Experiment**: Aspen Center for Physics
Participant

November 2024 — **Discovering Continuous GW with Nuclear, Astro and Particle Physics**: Institute of Nuclear Theory (INT), University of Washington
Participant

Bay Area Strings, Information & Cosmology Symposium: University of California, Berkeley
Participant

September 2024 — **Unraveling the Particle World and the Cosmos at Berkeley**: University of California, Berkeley
Participant

May 2023 — **Phenomenology 2023 Symposium**: University of Pittsburgh
Parallel session speaker

March 2023 — **UCLA Dark Matter 2023**: University of California, Los Angeles
Participant

Schools

July 2025 — **N3AS Summer School in Multi-Messenger Astrophysics**: University of California, Santa Cruz
Participant

July 2024 — **N3AS Summer School in Multi-Messenger Astrophysics**: University of California, Santa Cruz
Participant

June 2024 — **Theoretical Advanced Study Institute in Elementary Particle Physics (TASI) 2024 - "The Frontiers of Particle Theory"**: University of Colorado, Boulder
Participant

July 2023 — **N3AS Summer School in Multi-Messenger Astrophysics**: University of California, Santa Cruz
Participant

Service

Reviewer of Academic Journals

Physical Review Letters	2 reviews
Physical Review D	5 reviews
Journal of High Energy Physics	4 reviews
Physics Letters B	1 review

Codes

Python — Dark Matter - Pulsar Timing Array Monte Carlo (https://github.com/szehiml/dm-pta-mc)

Skills

Coding — Python, IDL, Bash, Mathematica, LaTeX