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 – 2024
- **Caltech**
  Ph.D. in Physics
  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
	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

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

Conferences & Schools (continued)

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