
	Dunlap Institute for Astronomy and Astrophysics, University of Toronto 50 St. George Street Toronto, Ontario, Canada M5S 3H4	awk.lau@utoronto.ca https://awklau.github.io/
RESEARCH INTERESTS	Instrumentation and Experimental Astronomy on both radio and optical wavelength. Strength in experimental electronic, hardware, and firmware design. High time-resolution and transient astronomy.	
EMPLOYMENT	Dunlap Postdoctoral Fellow, University of Toronto	Sep 2023 –
EDUCATION	Doctor of Philosophy in Physics The Hong Kong University of Science and Technology Supervised by Prof. George F. Smoot and Prof. Kam-Biu Luk	Sep 2018 – Aug 2023
	Bachelor of Science The Hong Kong University of Science and Technology First Class Honor in Physics (First Major), Computer Science (Second Major), and Astrophysics and Cosmology (Minor)	Sep 2015 – Jun 2018
	Exchange Program in University of Waterloo Physics and Astronomy Department	Dec 2016 – May 2017
RESEARCH	Experiment on SPAD detectors in astronomical research	Nov 2023 –
	<ul style="list-style-type: none"> Working with Prof. Suresh Sivanandam's group on the initial work of utilizing single-photon SPAD detectors for astronomical observation 	
	Experiment on CMOS detectors in astronomical research	Oct 2023 –
	<ul style="list-style-type: none"> Working with Prof. Ting Li's group on the initial work of ultra-low noise CMOS detector for on-sky telescope observation 	
	The Canadian Hydrogen Observatory and Radio-transient Detector (CHORD)	Sep 2023 –
	<ul style="list-style-type: none"> Full member of the CHORD collaboration Developing the analog signal chain, filters, and equalizers for the CHORD array Developing the 1024-channel analog chain power distribution system 	
	Differential analog circuit and low-cost radio over fiber (RFoF) development	Sep 2023 –
	<ul style="list-style-type: none"> Developing low-cost, long-range analog signal transmission scheme for future radio telescope arrays Modifying commercial available digital electronics, including SFP connectors, for analog signal Optical fiber ensures a flat response curve and EMI-free transmission across a wide frequency range Differential signaling enhances robustness and immunity to EMI noise 	
	Ultra Fast Astronomy: Development of Silicon Photomultiplier Based Astronomical Single Photon Imaging Detector	Dec 2018 –
	Supervisors: Prof. George F. Smoot and Prof. Kam-Biu Luk	
	<ul style="list-style-type: none"> Develop the Single-Photon Imager for Nanosecond Astrophysics (SPINA) system 	

- Designed based on position-sensitive silicon photomultiplier (PS-SiPM) technology
- Design and fabricated readout system, mechanical mounting and sensor cooling system for SPINA
- Performed initial On-Sky testing of SPINA system on the Nazarbayev University Transient Telescope at Assy-Turgen Astrophysical Observatory (NUTTelA-TAO)
- Aiming for detection of Ultra-Fast optical transient event in our Universe
- Helped initial construction of the Quantum Optics for Astrophysics and Cosmology Laboratory in HKUST

Develop 2D Luminescence Imaging System

Jun 2017 – Jun 2018

Supervisor: Prof. K. S. Wong

- Develop a laser scanning microscope for luminescence imaging.
- Low cost optical system for microscopy with time and spectral resolution is designed and constructed.
- A data acquisition and scanning control system was developed, together with the driver software and Graphical User Interface.

Space Orbit Design Project

Sep 2015 – Jun 2018

Supervisors: Prof. K. Y. Michael Wong and Dr. C. H. Yam

- Develop Algorithm for fast estimating reachability problem of low thrust spacecraft, with computational cost reduced from $O(N^k)$ to $O(N * k)$.

GRANTS,
AWARDS AND
HONORS

University of Toronto:

Dunlap Postdoctoral Fellowship

Sep 2023 – Aug 2028

HKUST:

The Overseas Conference Travel Grant

Sep 2022

Best Teaching Assistant Award

Sep 2019

Postgraduate Studentship (PGS)

Sep 2018 – Aug 2022

The Overseas Conference Travel Grant

Nov 2017

UROP Research Travel Sponsorship

Oct 2017

HKUST Study Abroad Sponsorship

Dec 2016

Paul Ching Wu Chu Scholarship for Physics Students

Nov 2016

Physics Major Entry Scholarship

Nov 2015

HKSAR Government:

Reaching Out Award 2016/17

Jan 2017

OBSERVATORY
WORK
EXPERIENCE

E.C. Carr Astronomical Observatory

- Visit as a helper for the initial construction of a new research/education telescope for Dunlap Institute

Assy-Turgen Observatory

- Multiple visits to the Observatory for the Ultra-Fast Astronomy Project
- On-sky testing of novel detectors and self-developed systems

Gustav Bakos Observatory

- Practice experimental astronomy during exchange at the University of Waterloo

RESEARCH
COMPUTER
SKILLS

Data and Image Processing/Analysis Languages

Python, Matlab, SAOImage DS9, PixInsight

General Programming Languages

C and C++, LabVIEW, MIPS Assembly Language

FPGA development tools

Verilog based FPGA programming (Xilinx Vivado)
Linux on embedded FPGA MPSoC (Petalinux)
Baremetal program on FPGA MPSoC (Vitis)

Computer Aided Circuit Design and Simulation

Cadence AWR Microwave Office, Autodesk Eagle, Fusion 360, Altium Designer

Computer Aided 3D Design

Autodesk Inventor, AutoCAD, Fusion 360, SolidWork, Google Sketchup

VOLUNTEER
SERVICES

Helper in Hong Kong Astronomical Society(HKAS) Jun 2016 – Jun 2019

- Helper to organize Summer Astronomical Camps for secondary students.
- Hold public talks about astrophotography.

Academic Secretary, Student Astronomy Club, HKUSTSU Jun 2015 – Jun 2016

- Control, Maintenance and Upgrade of society's telescopes.
- Hold popular science talks to promote Astronomy in HKUST.

OTHER
ACTIVITIES

Co-founder of Centauri Optics Limited

- Develop low cost, portable microscopes for research and educational usage

DISTINCT
PUBLICATIONS

1. **Lau, A. W. K.**, Shaimoldin, N., Maksut Z., Chan, Y. Y., Shafiee, M., Grossan, B., Smoot, G. F. (2023). *Initial On-Sky Performance Testing of the Single-Photon Imager for Nanosecond Astrophysics (SPINA) System*, in IEEE Transactions on Instrumentation and Measurement, vol. 72, pp. 1-11, 2023, Art no. 7007911, doi: 10.1109/TIM.2023.3324342.
2. Fung, L.W.H., **Lau, A. W. K.**, Chan, K.H., Shing, M.T. (2023). *WTH! Wok the Hydrogen: Measurement of Galactic Neutral Hydrogen in Noisy Urban Environment Using Kitchenware*, arXiv:2309.15163 [astro-ph.IM]
3. **Lau, A. W. K.**, Chan, Y. Y., Shafiee, M., Smoot, G. F., & Grossan, B. (2022). *Development of position-sensitive photon-counting imager for Ultra-Fast Astronomy*, in X-Ray, Optical, and Infrared Detectors for Astronomy X (Vol. 12191, pp. 312-329). SPIE.
4. **Lau, A. W. K.**, Chan, Y.Y. , Shafiee, M., Smoot, G. F., & Grossan, B. (2022). *A SiPM photon-counting readout system for Ultra-Fast Astronomy*, in The Open Journal of Astrophysics (2022), astro.2108.07526
5. **Lau, A. W. K.**, Mitra, A., Shafiee, M., & Smoot, G. F.). *Constraining HeII reionization detection uncertainties via fast radio bursts*. New Astronomy(2021), 89: 101627.
6. **Lau, A. W. K.**, Shafiee, M., Smoot, G. F., Grossan, B., & Maksut Z.(2020). *On-sky silicon photomultiplier detector performance measurements for millisecond to sub-microsecond optical source variability studies*, in Journal of Astronomical Telescopes, Instruments, and Systems 6.4 (2020): 046002
7. Li, S., Smoot, G. F., **Lau, A. W. K.**, Bekbalanova, M., Shafiee, M., & Stezelberger, T. (2019). *Program objectives and specifications for the Ultra-Fast Astronomy observatory*. Proceedings Volume 11341, AOPC 2019: Space Optics, Telescopes, and Instrumentation; 113411Y (2019).
8. **Lau, A.W.K.**, Yam, C.H. & Ming, T.S. *Searching Reachable Region of Low-Thrust Trajectories by Superposition and Greedy Optimization*, IAC-17,C1,IP,33,x37794.
9. Ming, T.S., Yam, C.H. & **Lau, A.W.K.** *Approximate Two-Point Boundary Value Problem Solutions to Low Thrust Trajectory by Superposition*, ISTS2017

PRESENTATION

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|---|----------|
| Exploring the Energetic Universe 2022 | Sep 2022 |
| Energetic Cosmo Laboratory, Nazarbayev University, Kazakhstan
Online Oral Presentation | |
| SPIE Astronomical Telescopes + Instrumentation 2022 | Jul 2022 |
| Montreal, Canada
X-Ray, Optical, and Infrared Detectors for Astronomy X
Oral Presentation | |
| ECL19: Exploring the Energetic Universe 2019 | Jun 2019 |
| Energetic Cosmo Laboratory, Nazarbayev University, Kazakhstan
Oral Presentation | |
| 2018 Joint Annual Conference of Physical Societies
in Guangdong-Hong Kong-Macao Greater Bay Area | Jul 2018 |
| Macau, China
Oral Presentation | |
| 68 th International Astronautical Congress (IAC2017) | Oct 2017 |
| Adelaide, Australia
Poster Presentation | |