Carol Yan-Yan Chan

Baltimore, MD | 667-910-2988 | ychan19@jhu.edu | LinkedIn | Portfolio

Summary

Astrophysics PhD Candidate transferring rigorous problem-solving and advanced analytical, modeling, and simulation skills from physics research to complex mechanical design and engineering challenges. Offers 3+ years of hands-on expertise in 3D/2D CAD, FEA, thermal/structural simulation and DFM. Seeking to leverage hardware development experience in a Mechanical Engineering role.

Skills

Engineering Design: 3D/2D CAD, SolidWorks, Assembly design, DFM, Prototyping, GD&T
Simulation & Analysis: SolidWorks Simulation, COMSOL Multiphysics, FEA, Thermal Analysis, Structural Analysis, Root cause analysis, Data analysis and visualization, Statistical modeling
Fabrication: 3D Printing, Manual machining (mill, lathe, band saw, drill press), Soldering, Woodworking
Programming: Python (NumPy, SciPy, Pandas), C/C++, MATLAB, Arduino, LabVIEW, Linux, Git, HTML
Languages: Mandarin (Fluent), Cantonese (Native), English (Fluent)

Education

Candidate for PhD in Astronomy and Astrophysics   2027 (expected)
Johns Hopkins University, Baltimore, MD

BSc. in Physics, Minor in Robotics, Astrophysics and Cosmology   2022
Hong Kong University of Science and Technology, Hong Kong S.A.R.

Relevant courses: Introduction to Robotics; Aerodynamics; System Modeling, Analysis and Control; Gas Turbines and Jet Propulsion; Introduction to Embedded System; Engineering Optics

Experience

PhD Researcher   Aug 2022 – Present
The Cosmology Large Angular Scale Surveyor (CLASS) Collaboration, JHU

- Engineered and modeled complex scientific instruments (200+ parts) for CLASS telescopes using **SolidWorks**, translating scientific requirements into manufacturable designs
- Managed the production lifecycle of 100+ custom parts (CNC, weldment, laser cut) by liaising directly with 4 different manufacturers internationally, reducing production cost by over 30%
- Fabricated custom parts for CLASS telescopes using 3D printing and manual machining (milling and drilling), achieving over 50% cost savings
- Performed comprehensive **structural and thermal FEA** using SolidWorks and COMSOL Multiphysics to validate instrument designs under operational loads and optimize thermal efficiency of cryogenic receiver
- Automated scientific data acquisition and hardware control systems using LabView and Arduino, leading to an 80% reduction in manual operation time
- Led a team (7 graduate students + scientists) for the field deployment, assembly and commissioning of the fourth CLASS telescope in the highly challenging Atacama Desert environment
- Managed operation and troubleshooting of an ultra-low temperature (<100mK) dilution-refrigerator-based cryogenic receiver of the CLASS telescope, maintaining temperature stability within 5mK essential for highly-sensitive astronomical detectors
- Analyzed large observational datasets (3+ years $\times$ 300 detectors) from CLASS using Python to identify and characterize instrument systematic effects, improving data quality for scientific analysis

Mechanical Engineering Researcher   Sep 2020 – Aug 2021
Department of Mechanical and Aerospace Engineering, HKUST, Hong Kong

- Applied time-series analysis techniques (Multifractal Detrended Fluctuation Analysis) in MATLAB to analyze data and accurately forecast impending thermoacoustic instability in a solid rocket motor

Summer Engineering Intern, GP Electronics, Hong Kong   Jun 2020 – Aug 2020
- Designed and modeled acoustic speaker optical components utilizing SolidWorks and ray-tracing software to improve light uniformity

Astronomy Researcher   Nov 2019 – May 2022
Department of Physics, HKUST, Hong Kong
- Designed a 3D printed enclosure for an astronomical detector using SolidWorks
- Automated detector temperature measurement, data acquisition and visualization using LabVIEW and Arduino

Project

Robotics Team Mechanical Engineer, HKUST, Hong Kong   Sep 2018 – Aug 2019
- Designed and assembled 400+ custom mechanical parts and actuators for a quadruped robot using **SolidWorks**
- Collaborated closely with a cross-functional team (20+ students in electronics and software) to integrate complex mechanical, electrical, and control systems
- Awarded Hong Kong Robocon Best Design Award and Second-runner up (2019) for this work

Teaching

Teaching Assistant, Department of Physics and Astronomy, JHU, Baltimore, MD   Aug 2022 – Present
- Led tutorials and review sessions on complex physics concepts to a total of over 100 students at graduate and advanced undergraduate levels

Fellowships & Awards

Joseph Needham Merit Scholarship (2022-2025) | HSBC Scholarship (2022) | Innovation and Technology Scholarship (2020) | Hong Kong Robocon Best Design Award and Second-runner up (2019) | Physics Entry Scholarship (2019) | The Women's Foundation Sheen Hok WISE Scholarship (2018 - 2021)

Selected Publications

1. Shi, R., Brewer, M. K., **Chan, C. Y. Y.**, Chuss, D. T., et al. (2024). **Design and characterization of a 60-cm reflective half-wave plate for the CLASS 90 GHz band telescope**. In Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII (Vol. 13102, pp. 688-710). SPIE.

2. Barlis, A., Guo, H., Helson, K., Bennett, C., **Chan, C. Y. Y.**, et al. (2024). Fabrication and characterization of optical filters from polymeric aerogels loaded with diamond scattering particles. Applied Optics, 63(22), 6036-6051.

3. Lau, A. W. K., **Chan, C. 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.