Kira Hart **Shanks**

Optical Engineering · Image Science · Computational Physics

Tucson, AZ, USA

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Summary

Doctoral student approaching graduation seeking full-time positions where I can combine my creative and technical skills in optical science and computational physics to take on impactful , fast-paced, large-scale, and collaborative projects

Work Experience

Polarization Lab, University of Arizona *Tucson, AZ*

Graduate Research Assistant *Jul. 2017 - PRESENT*

- Performed polarization ray tracing analysis of optical systems
- Designed polarization critical optics including waveplates, polarizers, and thin films
- Sourced specialized optical components to meet system requirements
- Programmed instrument control software of complex laboratory equipment in python and Matlab
- Implemented a data management protocol for storing polarimetric data using HDF5 files and SQL
- Analyzed large polarimetric data sets to infer physical properties of materials and atmospheres
- Created and maintained a Polarization-Lab GitHub account with 5+ repositories
- Mentored undergraduate students including a senior capstone team

Facebook Reality Labs *Redmond, USA*

Research Intern *May. 2019 - Aug. 2019*

- Wrote FDTD simulations of optoelectronic devices using MEEP in python
- Formulated bash scripts to execute large computational jobs in parallel on multiple servers
- Stored and then sorted computational results generated from many locations in HDF5 files
- Analyzed large data sets to explain the physical phenomena affecting device performance
- Coupled FDTD results with Bayesian optimization methods to reduce computational expense

Ozcan Research Group , UCLA *Los Angeles, USA*

Undergraduate Researcher *Aug. 2015 - Jun. 2017*

- Contributed to the development of a lost cost, high throughput, isotropic florescent microscope
- Designed and assembled prototype 3D printed opto-mechanics
- Wrote program to simulate x-ray scattering from nano-scale structures in Matlab
- Integrated multi-detector systems for synchronized operation in Labview

Education

University of Arizona, Wyant College of Optical Science *Tucson, USA*

Ph.D. in Optical Science, 3.9/4.0 GPA *Sep. 2017 - Exp. May. 2022*

- *Selected Coursework* : IR Systems · Polarization in Optical Design · Beam Propagation Method · Polarized Light and Polarimetry · Radiometry · Physical Optics · Solid State Optics · Principles of Image Science · Geometrical Optics

University of California, Los Angeles *Los Angeles, USA*

B.S. Physics , 3.7/4.0 GPA *Sept. 2013 - June 2017*

- College Honors, Dean's List (2014 - 2017)
- *Selected Coursework* : Computational Physics · Atomic Physics · Thermal Physics · Electricity and Magnetism · Quantum Mechanics · Radio Astronomy and Signal Analysis · Particle Physics · Programming in Computing (C++) · Analytic Mechanics

Skills

Advanced (⋆) *Intermediate* (◇) *Basic* (∘)

Programming & Data Science	Python ⋆ , Mathematica ⋆ , Matlab ⋆ , C++ ◇ , SQL ∘ , Bash ∘ , Git ◇
Computational Physics	Finite Difference Time Domain (MEEP) , Rigorous Coupled Wave Analysis
Optical Design	Polarization Ray Tracing (Polaris -M) ⋆ , Zemax ◇ , CODE-V ◇
OS & Tools	Linux, macOS, Windows, LaTeX, Microsoft Office
Equipment	Mueller Matrix Polarimeters, Channeled Polarimetry, Spectrometers, IR Systems
Soft Skills	Leadership, Project Planning , Proposal Writing, Science Communication

Projects

Submm-Wave and IR Polarimeters (SWIRP) *Tucson, AZ*

Polarization Lab · NASA Goddard Spaceflight Center *Jul. 2017 - PRESENT*

- Designed and demonstrated a LWIR channeled spectro-polarimeter
- Generated radiometric models to optimize system performance and determine component tolerances
- Implemented non-uniformity corrections for uncooled microbolometers in python
- Developed calibration procedure and code for LWIR instrument
- Coordinated with Goddard team to produce interface control documents for software and mechanics

High-Altitude Balloon Deployment of IR Polarimeter *Tucson, AZ*

Polarization Lab · NASA Goddard Spaceflight Center *Sep. 2020 - PRESENT*

- Programmed a finite state machine in C++ for a single board computer running linux (Debian ARM)
- Collaborated with interdisciplinary team to complete and pass NASA safety and science reviews
- Oversaw successful payload deployment on a NASA Columbia Scientific Balloon in August 2021

Stepper Mueller Matrix Polarimeter *Tucson, AZ*

Polarization Lab *Jan. 2020 - PRESENT*

- Wrote automated instrument control software in Matlab to control rotation stages, shutters, sources, and detectors
- Analyzed Mueller matrix measurements of optical components to determine impacts on system performance

UCLA SETI Project *Los Angeles, USA*

Earth, Planetary, and Space Sciences *Sept. 2016 - Jun. 2017*

- Generated and analyzed SQL databases sourced from the Green Bank Radio telescope using time-frequency methods
- Refined a python algorithm to flag internet up and down-link signals from commercial aircraft

Select Publications

Shanks, Kira A. Hart et al. "Stokes resolved differential temperature: an important metric of polarimetric precision in the long-wave infrared." Polarization Science and Remote Sensing X. Vol. 11833. International Society for Optics and Photonics, (2021).

Hart, Kira A. , Meredith K. Kupinski, Dong L. Wu, and Russell A. Chipman. "First results from an uncooled LWIR polarimeter for cubesat deployment." Optical Engineering 59.7 (2020): 075103.

Hart, Kira A, et al. "Linear Stokes measurement of thermal targets using compact LWIR spectropolarimeter." Polarization: Measurement, Analysis, and Remote Sensing XIV. Vol. 11412. International Society for Optics and Photonics, (2020).

Hart, Kira A. Russell A. Chipman, and Dong L. Wu. "Compact LWIR polarimeter for cirrus ice properties." Polarization: Measurement, Analysis, and Remote Sensing XIII. Vol. 10655. International Society for Optics and Photonics, (2018).

Select Presentations

2020	**Arizona Academic Small/CubeSat Symposium** CubeSat sized LWIR spectro-polarimeter for ice cloud measurement	*Tucson, USA*
2019	**American Meteorological Society 99th Annual Meeting** LWIR Spectro-Polarimeter for Cloud-Induced Polarization Measurements	*Phoenix, USA*
2019	**SPIE Optics + Photonics** Demonstration of LWIR channeled spectro-polarimeter	*San Diego, USA*

Honors & Awards

2021 **Scholarship** , SPIE Educational Scholarship in Optics and Photonics
2020 **Fellowship** , NASA Future Investigators in Earth and Space Science (FINESST), Earth Science
2019 **2nd Place** , American Meteorological Society Student Oral Presentation Competition
2017 **Scholarship** , Roland V. Shack Endowed Scholarship

Service and Professional Affiliations

Women in Optics *University of Arizona* · President (2018-2019) · Board Member (2017-Present)
Optics Ambassador *University of Arizona* · Ambassador (2019 - present)
Professional Orgs. SPIE (2018 - Present) · Optica (2018 - present)· American Physical Society (2014-present)