

JENNIFER SMITH

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EDUCATION

University of California, Santa Barbara

Sixth Year Ph.D. Student

Department of Physics

September 2018 - Present

Overall GPA: 3.7

Harvey Mudd College

Bachelor of Science, Physics

Graduated with High Distinction

August 2014 - May 2018

Overall GPA: 3.7

RESEARCH EXPERIENCE

University of California, Santa Barbara Department of Physics

Graduate Research

Microwave Kinetic Inductance Detector Readout

July 2018 - present

Santa Barbara, CA

- Designing high-speed MKID readout on Xilinx RFSoc platform using Vivado, Vitis HLS, and MATLAB/Simulink, to decrease weight, volume, and power of readout electronics.
- Writing Python drivers using PYNQ framework and ZMQ-backed server control program to simplify device setup and data taking operations.
- Designing radio frequency packaging for integration of quantum-noise-limited parametric amplifier to improve detector performance.
- Designed, fabricated, and tested new superconducting cable yielding improved instrument performance.

City of Hope Cancer Research Hospital

Harvey Mudd College Clinic Program

Surface Enhanced Raman Spectroscopy (SERS) for Breast Cancer Detection

Aug 2017 - May 2018

Claremont, CA

- Worked with a team of four engineering students to design, simulate, and prototype a system capable of detecting breast cancer in real time during surgery.
- Used scanning electron microscope to characterize different SERS substrates.
- Tested SERS substrates on model tissue using 785 nm Raman Spectroscopy system.
- Used sputter-coater and 3D printer to create gold coated fiber optic compatible with Raman system.

University of Washington Center for Experimental Nuclear Physics and Astrophysics (CENPA)

NSF Research Experience for Undergraduates (REU)

Axion Dark Matter eXperiment

May 2017 - Aug 2017

Seattle, WA

- Performed noise temperature calibration on ADMX receiver chain using the Y-factor (hot-load) method and spectrum analyzer.
- Installed and biased Low Noise Factory (LNF) amplifier and measured S-parameters using a network analyzer.
- Machined mounting stages, wired liquid-He cryogenic test-dewar, and performed 4K LNF amplifier measurements with spectrum analyzer and network analyzer.
- Characterized and installed new radio frequency components in the Superconducting QUantum Interference Device (SQUID) housing in the ADMX experiment.

SLAC National Accelerator Laboratory

May 2016 - Aug 2016

DOE Science Undergraduate Laboratory Internship
Noise Characterization and Elimination in a Microwave
SQUID Multiplexing CMB Readout System

Menlo Park, CA

- Performed noise power spectral density measurements and analysis on a microwave SQUID multiplexing system using homodyne setup and oscilloscope.
- Wrote MATLAB code to create power spectral density plots and identify noise sources.
- Wrote Python program to remotely control function generator over GPIB.
- Designed and manufactured magnetic shield for SQUID module and copper heat strap for cryogenic system.

Harvey Mudd College Department of Biochemistry

May 2015 - Aug 2015

Summer Research Fellow
Human 8-Oxoguanine Glycosylase as a Risk Factor for Cancer

Claremont, CA

- Optimized DNA Glycosylase biological assay with new laser imager and IR-Dye label.
- Discovered and corrected flaws in previous work through detailed DNA sequence data analysis.
- Collected and analyzed protein kinetics data through biochemical laboratory procedure.
- Performed safety inspections as student lab safety officer.

WORK EXPERIENCE

Google Quantum AI

June 2023 - January 2024

Student Researcher

Santa Barbara, CA

- Worked on control electronics responsible for reading out superconducting qubits.
- Used quantum computer to prototype qubit demodulation schemes to improve readout error.
- Implemented maximum likelihood demodulation algorithm in RTL using Xcelium Logic Simulator.
- Developed FPGA models in MATLAB and Python to verify digital signal processing performance.
- Demonstrated 20% reduction in 1-state readout error using real data and fixed-point model.

Maybell Quantum Industries

Jan 2022 - June 2023

Research and Development Consultant

Denver, CO

- Worked with Maybell team to win DARPA SBIR award to commercialize superconducting cabling technology for quantum computing industry.
- Used 3D E&M Solver (HFSS) to simulate connector transition to inform manufacturing tolerance.
- Used HFSS and KiCad to design and manufacture new transition board with enhanced tuning leading to 3x improvement in transmission.
- Performed calibrated measurements using Dilution Refrigerator and VNA to evaluate prototype cable performance.

Xilinx Inc. - PYNQ Team

May 2021 - August 2021

Internship

Santa Barbara, CA

- Created first open-source example demonstrating 100 Gigabit Ethernet internal and external loop-back using the Xilinx Integrated 100G Ethernet Subsystem on an RFSoc.
- Tested and verified new Xilinx Run Time (XRT)-backed memory allocation technique in preparation for upcoming PYNQ image release.
- Packaged example tutorial and published blog post to help researchers in other fields leverage RFSoc devices for high-speed data applications.

PUBLICATIONS

J. Smith, Mazin, B., Boaventura, A., Thompson, K., Daal, M. “Improved Flexible Coaxial Ribbon Cable for High-Density Superconducting Arrays,” in *IEEE Transactions on Applied Superconductivity*, vol. 34, no. 2, pp. 1-6, March 2024, doi: 10.1109/TASC.2024.3350516.

J. Smith, Bailey, J., Mazin, B. “Highly-Multiplexed Superconducting Detector Readout: Approachable High-Speed FPGA Design,” in *IEEE 30th Annual International Symposium on Field-Programmable Custom Computing Machines (FCCM)*, pp. 1-2, May 2022, doi: 10.1109/FCCM53951.2022.9786140.

J. Smith, Bailey, J., Tuthill, J., Stefanazzi, L., Cancelo, G., Treptow, K., Mazin, B. “A High-Throughput Oversampled Polyphase Filter Bank using Vivado HLS and PYNQ on a RFSoc,” in *IEEE Open Journal of Circuits and Systems*, vol. 1, no. 1, Feb. 2021, doi: 10.1109/OJCAS.2020.3041208.

J. Smith, Mazin, B., Walter, A., Daal, M., Bailey, J., Bockstiegel, C., Zobrist, N., Swimmer, N., Steiger, S., Fruitwala, N., “Flexible Coaxial Ribbon Cable for High-Density Superconducting Microwave Device Arrays,” in *IEEE Transactions on Applied Superconductivity*, vol. 31, no. 1, pp. 1-5, Jan. 2021, doi: 10.1109/TASC.2020.3008591.

Walter, A., Fruitwala, N., Steiger, S., Bailey, J., Zobrist, N., Swimmer, N., Lipartito, I., **Smith, J.**, Meeker, S., Bockstiegel, C., Coiffard, G., Dodkins, R., Szypryt, P., Davis, K., Daal, M., Bumble, B., Collura, G., Guyon, O., Lozi, J., Vievard, S., Martinache, F., Currie, T., Mazin, B. “The MKID Exoplanet Camera for Subaru SCEXAO,” in *Publications of the Astronomical Society of the Pacific*, vol. 132, no. 1018, Dec. 2020, doi: 10.1088/1538-3873/abc60f.

Kothari, R., Jones, V., Mena, D., Bermudez, V., Shon, Y., **Smith, J.**, Schmolze, D., Cha, P., Fong, Y., Storrie-Lombardi, M. “Raman Spectroscopy and Artificial Intelligence to Predict the Bayesian Probability of Breast Cancer,” in *Biophysical Journal*, vol. 118, no. 3, Feb. 2020, doi: 10.1016/j.bpj.2019.11.355.

OUTREACH AND MENTORSHIP

UCSB Womxn in Science and Engineering - Outreach Officer September 2021 - June 2023
University of California, Santa Barbara

- Coordinated and consolidated outreach opportunities for graduate womxn in science and engineering.
- Co-organized quarterly trivia and bagel hour to foster community.
- Co-reviewed applications and selected finalists for Decolvenaere Research Accelerator Award (\$7,000) and Karl Storz Research Accelerator Award (\$7,000).

UCSB Physics GradLife - Social Officer June 2019 - Jan 2022
University of California, Santa Barbara, Department of Physics

- Planned and organized department events to foster positive department culture including game nights, Halloween costume contest, and department-wide talent show.
- Organized weekly graduate student happy hour (HBar).

University of California, Santa Barbara Women in Physics - Officer Oct. 2018 - Jan 2022
University of California, Santa Barbara, Department of Physics

- Organized department-wide brunch to discuss issues surrounding women in physics.
- Led Women in Physics visit day panel event.
- Led weekly lunches with Women in Physics members to foster inclusive community.

PYNQ Bootcamp - Technical Advisor June 2021
Xilinx University Program

- Served as technical advisor for middle-school students participating in hackathon featuring PYNQ boards.

- Sat on women in technology panel discussion.

TEACHING EXPERIENCE

School for Scientific Thought - Lead Instructor

March 2022

Center for Science and Engineering Partnerships

- Designed and taught course on space engineering concepts to advanced local high school students.
- Produced course introductory video and materials for students.
- Guided students through rocket design challenge and introduced college-level computer-engineering concepts.

Summer Institute in Math and Science Scholars Program - Lead Instructor June 2019 - Sept. 2019

Center for Science and Engineering Partnerships

- Designed and taught college-level math and physics course to incoming UCSB freshmen to help prepare them for success in technical majors at UCSB.
- Presented my own research and mentored students on how to get involved with research opportunities on campus.

School for Scientific Thought Program - Co-Instructor

Oct. 2018 - Dec. 2018

Center for Science and Engineering Partnerships

- Worked with five physics graduate students to design summer physics program for advanced local high school students.
- Taught astrophysics and space mission engineering concepts culminating in egg drop challenge.

Department of Physics - Teaching Assistant

Sept. 2018 - June 2019

University of California, Santa Barbara

- Assisted students in programming and debugging a Raspberry Pi embedded system using Unix and Python.
- Helped students interface with their Raspberry Pi's using basic circuits including jumper cables, breadboards, and sensors.

RECENT PRESENTATIONS

SLAC Fundamental Physics Directorate Seminar

Feb 2024

Menlo Park, California

- Presented "Searching for Aliens, One Microwave Kinetic Inductance Detector at a Time" to conference attendees.

IEEE Quantum Computing: Devices, Cryogenic Electronics, and Packaging

Nov 2023

Milpitas, California

- Presented "Understanding and Addressing Challenges in Superconducting Qubit Scale" to conference attendees.

Low Temperature Detectors

July 2023

Daejeon, South Korea

- Presented "MKID Gen3: Scalable, RFSoc-based readout for energy-resolving, single-photon-counting MKIDs" to conference attendees.
- Presented "Flexible, Coaxial Ribbon-Cable for High-Density Superconducting Detector Arrays" to conference attendees.

APS March Meeting

March 2023

Las Vegas, Nevada

- Presented “Scalable Flexible Coaxial Ribbon Cables for High-Density Quantum Wiring (Part I)” to conference attendees.

The 30th IEEE International Symposium On Field-Programmable Custom Computing Machines

May 2022

New York, New York

- Presented “Highly-Multiplexed Superconducting Detector Readout: Approachable High-Speed FPGA Design” to conference attendees.
- Ran “RFSoc PYNQ Custom Superconducting Detector Readout” interactive demo at conference demo night.

Xilinx What’s New in the Labs

August 2021

Virtual

- Presented “RFSoc-PYNQ for Custom Scientific Instrumentation” to Xilinx technical executives.

AWARDS AND HONORS

Zonta International Amelia Earhart Fellowship Award, Spring 2021

NASA Space Technology Research Fellowship, Fall 2019-Present

UCSB Physics Department Service Award, Spring 2019 - 2020

NCAA DIII National Champion, Women’s Volleyball, 2017

SCIAC All-Academic Team, Fall 2016-2017

Dean’s List, Spring 2015-Spring 2018

HMC Department of Chemistry Stauffer Fellow, Summer 2015