

# JENNIFER SMITH

Broida Hall University of California Santa Barbara  $\diamond$  Santa Barbara, CA 93106

(+1) 206-715-4133  $\diamond$  jennifer.smith@ucsb.edu

## 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**, Ruiez, M., Schelle, G. “100 Gigabit Ethernet for RFSoc-PYNQ Overlays,” in *PYNQ: Python Productivity Learn, AMD Xilinx*, 20 Sept. 2021, <https://discuss.pynq.io/t/100-gigabit-ethernet-for-rfsoc-pynq-overlays/3053/5>. Accessed 2024.

**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 Exoplanets, 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