JENNIFER SMITH

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EDUCATION

University of California, Santa Barbara *September 2018 - May 2024*
Doctor of Philosophy (Ph.D.), Physics Overall GPA: 3.7

Harvey Mudd College *August 2014 - May 2018*
Bachelor of Science (B.S.), Physics Overall GPA: 3.7
Graduated with high distinction

TECHNICAL SKILLS

Computer Languages	Python, C++, VHDL, Verilog, Tcl, Shell Scripting
Design Software	Vivado/Vitis Design Suite, MATLAB/Simulink, ADS, HFSS
Machining	3D Printing, Mill, Lathe

RESEARCH & WORK EXPERIENCE

SLAC National Accelerator Laboratory September 2024 - Present
Staff Engineer
Technology Innovation Directorate, Instrumentation Division
Electronic Systems Department *Menlo Park, CA*

- Leading Radio Frequency System-on-Chip (RFSoC)-based instrumentation development to meet science goals across cosmology and quantum initiatives through detector research and development program.
- Interfacing with scientists to draft system requirements and plan future high-performance FPGA-based readout systems for data acquisition and analysis.
- Developing FPGA-based firmware and software and custom PCBs to support laboratory science projects.

University of California, Santa Barbara Department of Physics July 2018 - May 2024
Graduate Research
Microwave Kinetic Inductance Detector Readout *Santa Barbara, CA*

- Designed and implemented Microwave Kinetic Inductance Detector (MKID) array digital readout on Xilinx Radio Frequency System-On-a-Chip (RFSoC) using MATLAB/Simulink, Vivado, Vitis HLS, and Python/PYNQ.
- Optimized digital signal processing chain to minimize noise while balancing resource utilization and ensuring timing closure.
- Wrote Python drivers and control program to manage and visualize data flow and system status.
- Used superconducting quantum-noise-limited parametric amplifier (TWPA) to improve photon energy readout fidelity.
- Designed, fabricated, and tested new superconducting cable yielding improved instrument performance.

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 non-linear, high-fidelity 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 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.

SELECT PUBLICATIONS

Smith, J., Bailey, J., Cuda, A., Zobrist, N., Mazin, B. "MKIDGen3: Energy-resolving, single-photon-counting microwave kinetic inductance detector readout on a radio frequency system-on-chip ," in *Review of Scientific Instruments*, vol. 95, no. 11, November 2024, doi: 10.1063/5.0225768.

Smith, J., 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.

Smith, J., 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.

Smith, J., 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.

Smith, J., 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. 2, Jan. 2021, doi: 10.1109/OJCAS.2020.3041208.

Smith, J., 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.

CONFERENCE ATTENDANCE & PRESENTATIONS (*INVITED)

***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.

TEACHING EXPERIENCE

Center for Science and Engineering Partnerships - Instructor June 2019 - Sept. 2019
Summer Institute in Mathematics and Science Scholars Program

· Designed and taught highest 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.

Center for Science and Engineering Partnerships - Instructor Oct. 2018 - Dec. 2018
School for Scientific Thought Program

· Designed summer physics program for advanced local high school students.
· Taught astrophysics and space mission engineering concepts culminating in egg drop challenge.

University of California, Santa Barbara - Teaching Assistant Sept. 2018 - June 2019
Physics

- 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.

Harvey Mudd College - Academic Excellence Facilitator May 2016 - May 2018
Physics

- Tutored Harvey Mudd College core physics classes (Special Relativity, Quantum Mechanics, and Electricity and Magnetism)

COMMUNITY WORK

SLAC Garden - Chair February 2025 - Present
SLAC National Accelerator Laboratory

- Organizing garden socialization and clean up events among members to foster community.
- Evaluating optimal fruit tree varietals for SLAC garden given climate and ground squirrel ecosystem.
- Planning tastings and crop swaps to boost excitement over gardening.

UCSB Physics GradLife - Social Officer June 2019 - June 2021
University of California, Santa Barbara, Department of Physics

- Planned and organized department events to increase sense of community including game nights, trivia, Halloween costume contest, and department-wide talent show.
- Created flyers and pamphlets for events and crafting creative department-wide emails.

UCSB Physics GradLife - Social Officer June 2019 - June 2021
University of California, Santa Barbara, Department of Physics

- Planned and organized department events to increase sense of community including game nights, trivia, Halloween costume contest, and department-wide talent show.
- Created flyers and pamphlets for events and crafting creative department-wide emails.

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

- Planned and organized events for Women in Physics organization including lunches and visits with speakers.

AWARDS AND HONORS

NASA Space Technology Research Fellowship, Fall 2019 - Present

UCSB Physics Department Service Award, Spring 2019 - 2020

NCAA DIII Volleyball National Champion, Fall 2017

SCIAC Volleyball All-Academic Team, Fall 2016-2017

Harvey Mudd College Dean's List, Spring 2015-Spring 2018

Harvey Mudd College Department of Chemistry Stauffer Fellow, Summer 2015