

# Vinay Baid

baid@ucsb.edu

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## EDUCATION

**University of California, Santa Barbara** **GPA:** 3.88/4.00  
Bachelor of Science in Physics, Creative Studies Honors Program Sep 2021 – Expected Jun 2025  
**Graduate Coursework:** Quantum Mechanics, Statistical Physics, Electromagnetism

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## RESEARCH EXPERIENCE

**Undergraduate Researcher, Andrew Jayich Lab, UCSB** Jan 2022 – Present  
*Measuring  $Sr^{88+}$  Motional Heating Rates over Surface Traps (in progress)* Jun 2023 – Present

- Characterizing surface ion traps microfabricated at MIT Lincoln Laboratory.
- Conducted experiments to laser cool Strontium-88 ions to their motional ground state.
- Collected and analyzed ion motional heating rate data across various trap frequencies.
- Assisted graduate students in debugging systematics, laser alignment & locking, and data analysis.

*674 nm Laser Injection Lock* Aug 2024 – Sep 2024

- Successfully injection-locked a bare Fabry-Pérot diode, tripling strontium clock laser power.
- Contributed to breakthroughs in long sideband cooling scans during heating rate experiments.
- Developed active stabilization methods for the injection lock.

*Double-Ended RF Resonator for  $Sr^{88+}$  Wheel Trap* Jun 2023 – Jul 2024

- Designed and developed an LC resonator operating at 14.4 MHz to mitigate micromotion shifts in  $Sr^{88+}$  for an integrated photonics clock experiment.
- Enhanced resonator design to include DC biases, lifting quadrupole trapping potential degeneracy.
- Analyzed resonator designs including meander, helical, and various toroidal configurations.
- Machined a resonator housing for magnetic isolation and facilitated convenient RF and DC inputs.
- Created a 3D-printed CAD model of a toroidal resonator mount & utilized LTSpice for circuit simulations and optimization.

*Upgraded Imaging System Design* Feb 2023 – Jun 2024

- Used Zeemax simulation to propose/design new imaging system for resolution and control of multiple ions.
- Features objective that can resolve ions with cooling light and address with clock light.
- Designed 40x magnification telescope to improve photon counts signal to noise ratio.
- Integrated qubit laser addressing into the imaging system.

*Compact Double-Pass AOM Setups* Jun 2023 – Oct 2024

- Assembled five compact double-pass acousto-optic modulator (AOM) setups on custom-machined aluminum breadboards for spectroscopy in strontium experiments.
- Gained experience with AOMs across the visible to infrared spectrum.

*Pulsed Laser Intensity Stabilization* Feb 2023 – Jun 2023

- Stabilized the intensity of a pulsed Thorlabs laser module, achieving a coefficient of variation of 4.4% of photodiode output over a 6-hour period.

*Environmental Monitoring System* Mar 2022 – Aug 2022

- Developed a cost-effective, Wi-Fi Arduino-based system to monitor temperature, humidity, pressure, and magnetic field.
- Created a Python wrapper for the monitoring system with real-time data plotting, integrating it into Rockdove—the Jayich Lab’s instrument control software.

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## AWARDS

- **College of Creative Studies Summer Undergraduate Research Fellowship** 2024
- **USA Physics Olympiad Semifinalist** 2020

## CONFERENCES AND PRESENTATIONS

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- **Talk:** *"A Cryogenic System for 3D Printed Ion Traps"*  
KITP Undergraduate Research Symposium 2024
- **Poster:** *"Trapping Sr 88+ in Scalable Traps"*  
CCS Summer Undergraduate Research Symposium 2024
- **Poster:** *"3D-Printed Micro Ion Trap for Quantum Information Processing"*  
Noyce Quantum Initiative Symposium, UC Irvine 2024

## MENTORSHIP AND OUTREACH

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- **Author:** "Modern Physics in the Classroom"—a handbook introducing AP Physics students to concepts such as time dilation and the Michelson–Morley experiment. Taught a week-long crash course based on the handbook to high school students.
- **Wikipedia Editor:** Participated in Jayich lab Wikipedia editing sessions 3-4 times a year since 2022.

## TECHNICAL SKILLS

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**Programming:** Python, C++, FPGA Interfacing (Arduino IDE, Artiq)

**CAD Tools:** Eagle PCB Design, Autodesk Fusion 360, Autodesk Inventor

**Laboratory Skills:** Laser systems (Pound–Drever–Hall cavity locking, saturated absorption locking, injection locking), AOM setups, analog electronics

**Simulation Software:** LTSpice, Zeemax

**Languages:** English, Hindi