Maxwell Freeman

PHYSICS PH.D. STUDENT

(414) 204-7156 | freeman.maxwell@outlook.com

Summary

Full-time research intern, who will be starting my PhD in Physics in fall of 2023 at Caltech. Currently splitting my time between a scanning probe microscopy lab and a neutral-atom quantum computing lab. Interested in using scanning probe microscopy and spectroscopy techniques to research solid-state quantum information science.

Education

California Institute of Technology *Pasadena, CA*

PhD in Physics *Sept 2023*

University of Wisconsin - Madison *Madison, WI*

BS in Physics, Astronomy, and Philosophy, with a minor in Mathematics *Sept 2018 - May 2022*

- GPA: 3.98/4 via 147 credits
- Graduated with Distinction

Research Experience

Victor Brar's SPM Lab *Madison, WI*

Research Assistant *April 2021 - current*

- Designed/simulated a novel quasi-zero stiffness vibrational damping system in order to isolate a scanning tunneling microscope from dilution refrigerator pump noise, facilitating low-temperature, cryogen-free scanning probe microscopy (SPM).
- Developed a haptic pen controller for a scanning tunneling/atomic force microscope, such that the sub-nanometer features of an atomic surface could be intuitively felt/manipulated by the user. Programmed an open-source LabVIEW library in C/C++, which interfaced the haptic device with the microscope. Supervised two high school students for the duration of the Haptic-SPM project, delegating them tasks and teaching them the necessary skills to become valuable project contributors. (publication pending)

Mark Saffman's Neutral Atom Quantum Computing Lab *Madison, WI*

Research Assistant *Sep 2022 - current*

- Assisted in running experiments in an effort to create a hybrid superconductor-atom-photon quantum interface. Used CAD to model a complete redesign of the experimental setup, using principles of UHV and cryogenic design. Also ran numerical simulations to optimize the thermodynamic properties the system.
- Gained experience working with free space optics through designing a microscopic imaging system, also employed the use of PCB/analog circuit design for various applications.

Publications & Talks

1. Maxwell Freeman et al., *Haptic Sensation-Based Scanning Probe Microscopy: Exploring Perceived Forces for Optimal Intuition-Driven Control.* arXiv:2207.10197 (submitted).
2. Maxwell Freeman, *A Fully-Passive, Quasi-Zero Stiffness Vibrational Isolator for Cryogen-Free Scanning Probe Microscopy.* Bulletin of the American Physical Society (2023).

Skills

Programming	C/C++, LabVIEW, Mathematica, MATLAB, Python.
Technical Software	CAD (SolidWorks, KiCad, AutoCAD), SPICE (Multisim), Nanonis SPM Control Software
Miscellaneous	Circuit/PCB Design and Fabrication, Machine Shop Skills & Metals Fabrication, Free Space & Fiber Optics, Arduino, Raspberry Pi.

Teaching & Work Experience

Goff's Enterprises, Inc. *Pewaukee, WI*

Metal Shop Technician *May 2020 - September 2020*

- Worked in the metal shop cutting, forming, and finishing metal components. Gained proficiency using hand tools, CNC mills, and hydraulic presses.

Greater University Tutoring Service (GUTS) *Madison, WI*

Physics Tutor *September 2019 - May 2020*

- Involved working closely with undergraduate students each week, practicing and reviewing key concepts from Physics I and Physics II.
- Assisted with drop-in tutoring, where students could stop by and ask for additional math and physics help.

Retlaw Industries, Inc. *Hartland, WI*

Assembly Technician *May 2019 - September 2019*

- Worked with plastic injection molding machines, assembling and finishing the resultant plastic parts. Gained experience with assembly and plastic manufacturing techniques.

Achievements

2021 **Inducted into the Phi Beta Kappa Honor Society**, UW Madison Chapter

2018 **3rd place**, UW - La Crosse Calculus Competition

References

Victor Brar

Principle Investigator

University of Wisconsin - Madison

vbrar@wisc.edu

Mark Saffman

Principle Investigator

University of Wisconsin - Madison

msaffman@wisc.edu