

Jackson Ricketts

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Education

University of Tennessee at Chattanooga

BS, Physics, May 2024, GPA: 3.55/4.00

Thesis: "Simulation and Analysis of Charged Particle Activity and Detector Efficiency for the Nab Experiment."

Advisor: Dr. Josh Hamblen

Fellowships and Awards

Dean's List, UT Chattanooga College of Arts and Sciences, 2020-24.

Westbrook Scholarship, UT Chattanooga Department of Chemistry and Physics, 2020-24.

William E. Brock, Jr. Scholarship, UT Chattanooga Honors College, 2020-24.

Lawrence and Jane Akers Physics Award, UT Chattanooga Department of Chemistry and Physics, 2023-24.

Cádiz International Research Program, UT Chattanooga Office of Undergraduate Research and Creative Endeavors, 2023.

Science Undergraduate Laboratory Internship Program, United States Department of Energy, 2022.

Karel and Harriet Hujer Physics Award, UT Chattanooga Department of Chemistry and Physics, 2022.

Summer Undergraduate Research Program, UT Chattanooga Department of Chemistry and Physics, 2021.

Presentations

"Data Analysis of Supernova Light Curves with Python," 2024 UTC Spring Research and Arts Conference", Chattanooga, Tennessee, April 2024.

"LabVIEW Development for Monitoring Slow Controls of the Nab Spectrometer at ORNL," 2023 National Collegiate Honors Council Conference, Chicago, Illinois, November 2023.

"Simulation Testing of Different Variables of Silicon Detector Equipment for the Nab Experiment at ORNL," 2022 National Collegiate Honors Council Conference, Dallas, Texas, November 2022.

"A Lego Model of the Kibble Watt Balance for Physics Education and Outreach," 89th Annual Meeting of the Southeastern Section of the American Physical Society, University, Mississippi, October 2022.

"Testing Silicon Detector Characteristics and Simulating Charged Particle Activity for the Nab Experiment," 2022 Fall Meeting of the APS Division of Nuclear Physics, New Orleans, Louisiana, October 2022.

“Constructing C++ Simulations for the Nab Experiment at ORNL,” 2022 Southern Regional Honors Council Conference, Birmingham, Alabama, March 2022.

“Humans and Quantum,” 2021 National Collegiate Honors Council Conference, Orlando, Florida, October 2021.

“Simulation of Silicon Detector Performance for the Nab Experiment,” 2021 Fall Meeting of the APS Division of Nuclear Physics (virtual), October 2021.

Research Experience

University of Tennessee at Chattanooga

Undergraduate Researcher with Dr. Josh Hamblen 2021-2023

- Developed and enhanced simulations of particle detection to quantify efficiency upon changing detector setup variables of the Nab Experiment apparatus with C++.
- Navigated the Unix-based simulation framework with Bash and ensured relevant code was maintainable.
- Analyzed simulations of electron energy loss through application of a Gaussian position function across 1,000,000 generated electrons at an emission energy of cerium-139, resulting in relative uncertainties of <1%.

Universidad de Cádiz

Puerto Real, Andalucía, Spain

Undergraduate Researcher with Dr. Antonia Morales Garoffolo 2023

- Analyzed and compared light intensities of supernova 2017eaw using Python (NumPy, SciPy, Matplotlib), combining linear regression and Fermi-Dirac statistics to achieve fit functions with relative uncertainties of <10%.
- Established a one-to-one relationship between the amateur and published data in three out of five fit parameters, demonstrating readiness of amateur data for future polarimetry studies.

Oak Ridge National Laboratory

SULI Intern with Dr. Frank Gonzalez 2022

- Curated and analyzed C++ simulations of electron energy loss through application of a flat position distribution across 1,000,000 generated electrons at an emission energy of tin-113.
- Utilized Python (NumPy, SciPy, Matplotlib, Pandas, Dask) and real-time detector data to identify 13 additional faulty components of the Nab data acquisition system.
- Developed a LabVIEW program to ensure steady flow of nitrogen gas into the Nab apparatus, optimizing experimental conditions.
- Conducted various tests with data acquisition computers, mass flow meters, oscilloscopes, and multimeters.

Technical Skills

- Simulation development and analysis with C++
- Unix system navigation and file edition and execution with Bash
- Real-time data analysis with Python (NumPy, SciPy, Matplotlib, Pandas, Dask)
- System creation with LabVIEW for the purpose of monitoring experiment slow-controls
- Testing with data acquisition computers, mass flow meters, oscilloscopes, and multimeters

Projects

Qiskit CHSH Inequality Violation, Quantum Teleportation, and Quantum Algorithms

- Successfully implemented Qiskit in accordance with compatibility requirements with Google CoLab.
- Generated a two-qubit entangled state and necessary circuitry to violate the CHSH inequality computing an S -value of 2.7895 (CHSH inequality criterion: $-2 \leq S \leq 2$) using Python (NumPy, Matplotlib, Qiskit).
- Implemented the same entangled state to teleport a single-qubit superposition, resulting in an output of 948 measurements with a nearly equal distribution of states.
- Simulated and executed the Deutsch-Jozsa algorithm to assume a constant function on three qubits (all measurements resulted in the same outcome).