John Auerbach

Aerospace Engineering
The Pennsylvania State University

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Education

The Pennsylvania State University | Aerospace Engineering
August 2024 - Present, University Park
Combined Masters / Ph.D. in Aerospace Engineering
No GPA yet

The Pennsylvania State University | Physics, Mathematics
August 2029 - May 2024, University Park
Bachelor of Science in Physics and Mathematics (2024)
GPA: 3.48/4.00

Skills

Technical: High vacuum / high voltage systems for fusion and plasma research

Software: LaTeX, Mathematica, DeviceNet, LabVIEW, COMSOL Multiphysics, Python (Numpy, MatPlotLib, Pandas, XGBoost, API integration)

Research & Projects

Thermosphere Environments Research | Space Propulsion and Lab at PSU
August 2024 - Present

Simulating thermosphere environments in a large vacuum chamber by exposing materials to neutral atomic oxygen and determining erosion yield. Plasma is characterized using diagnostic techniques including a Faraday probe, retarding potential analyzer, Wien filter, and a carbon-coated quartz crystal microbalance.

Electrostatic Ion Thruster | Space Propulsion Lab at PSU
July 2022 - Present

Built an Inertial Electrostatic Confinement thruster with helical electrodes and investigated performance using magnetic field analysis, beam divergence, I-V characteristics, and a Langmuir probe trace. First-author publication was accepted to the 2024 International Electric Propulsion Conference.

- Modeled parts in AutoCAD
- Simulated field production in COMSOL Multiphysics
- Constructed a compact ion thruster with an internal gas feedthrough
- Constructed Langmuir double probe, derived equations for electron temperature and density, coded I-V trace in LabVIEW

Physics and Astronomy REU | High Energy Physics Group at UMN
June 2023 - August 2023

Applied machine learning algorithms to particle collision data from the Compact Muon Solenoid experiment at the Large Hadron Collider to search for a possible dark matter candidate via deflection or disappearance of probe muon tracks produced in Z-boson decays.

- Generated Monte Carlo simulations in CMSSW / analyzed in C++ and Python

- Built a framework to compare predictive skill of multiple boosted decision tree ensembles over a common cross-validated k-fold split. Successfully identified dark Bremsstrahlung signal events in simulation
- Found bugs in track reconstruction code by manually calculating muon trajectories
- Discovered (previously undetected) defective cells in the detector's drift tubes to be removed from event selection in future studies

Nuclear Fusion Reactor | Systems Design Lab at PSU
September 2021 - October 2022

Built an electrostatic fusor with a graduate student. Achieved fusion from a remote operated LabVIEW interface at a 28kV potential with 2-10mA current and 10-15mTorr pressure in a lensed cathode geometry. Experimental success was confirmed by an isotropic neutron flux of 3.5e4 n/s which was detected in a bubble dosimeter and REM detector.

Fusor Design Project | Senior Year Capstone (High School)
June 2017 - June 2019

Designed an electrostatic fusor with a lensed cathode geometry and explored use of alternating electrical currents to produce periodically oscillating plasma spheres. Assembled a ~40kV high voltage system resulting in a paper and presentation.

Awards

Edward and Patricia Shalis Physics Scholarship in memory of Dr. D.H. Rank
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