

Fundamental Nuclear Physics Research with the Nab Experiment at Oak Ridge  
National Laboratory  
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The Nab experiment (<http://nab.phys.virginia.edu/>) is a proposed nuclear physics experiment at Oak Ridge National Laboratory. It will be installed at the Fundamental Neutron Physics Beamline at the Spallation Neutron Source at ORNL. The goal of the experiment is to conduct measurements of the neutron beta decay reaction  $n \rightarrow p + e^- + \bar{\nu}_e$  at previously unachieved precision levels. The Spallation Neutron Source (SNS) at ORNL is a world-class facility for neutron physics research and currently provides the most intense beam of neutrons in the world. The Nab experiment will trap the proton and electron produced in the beta decay process, and a spectrometer will measure their energy and momentum. Correlation measurements between the electron energy and proton momentum will provide key tests of the standard model of particle physics and yield a deeper understanding of the weak nuclear force.

The experiment is currently in the construction phase for the next year. Interested students will have the unique opportunity to participate in the installation and testing of the experiment as well as collecting preliminary data at ORNL. At the same time, data analysis and simulation of the detector using the GEANT4 software package will occur at UTC. Overall, students will gain first-hand experience working with a collaboration of scientists from around the world on a cutting-edge nuclear physics experiment.