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Type: Nuclear and Particle Physics

Microelectronic Simulations of the Proton in Silicon Using Geant4 for Beam Lifetime 3 Experiment

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The Beam Lifetime 3 (BL3) experiment at the National Institute of Standards and Technology, USA, aims to improve the precision of neutron lifetime measurements and we hopefully resolve the inconsistency by improving the precision. In the BL3 experiment, a Geant4 based simulation has been used to model, develop, and optimize the experimental setup. The physics list, which is used to simulate particle transportation and interactions, was derived from one of the advanced examples of Geant4 and extended with a screened nuclear recoil model appropriate for low energy proton-nucleus scattering. This will allow many applications of the SRIM (Stopping and Range of Ions in Matter) software to be expanded into a much more general Geant4 framework where nuclear and other effects can be included.

In this project, the detection of proton hitting into a Silicon detector is simulated by microelectronics simulation in Geant4. Physics lists from Geant4 are applied to study energy deposition and backscattering of 35 keV protons in a 500 nm Silicon detector. The simulation was compared against Pysrim, a python wrapper for SRIM. I will demonstrate a benchmark comparison between Geant4 and Pysrim using the example of Boron implantation in silicon. Finally, I will discuss my comparison between Pysrim and Geant4 for the case of proton scattering in silicon.

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Please select: Experiment or Theory

Experiment

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