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Simulation and analysis of novel detectors to search for new physics

Beam dump experiments have become of particular interest in the search for new physics beyond the standard model of particle physics. High-energy electrons, protons, or photons are dumped on a solid target where new particles could be produced. In the new physics model we are testing, these particles can be scalar or pseudo-scalar, and photons offer the cleanest way of performing such a search.

We developed a novel lead-glass calorimeter to measure the flux of the incoming high-energy photons "post-mortem". Our detector uses the electromagnetic shower leakage from the beam dump, where the photons are disposed of at the beamline's end. A prototype of such a calorimeter was set up at the beam dump of the FLASHForward facility at DESY. The calorimeter consists of eight lead-glass rods with photomultiplier tubes mounted around the dump.

The second detector being developed is a high-granularity silicon-tungsten calorimeter. We plan to use such a system's extraordinary spatial, angular, and time resolution to measure the decay products of the new particles that could have been produced in the dump.

The goal for the summer student is to participate in studying these calorimeters. This could include the Monte Carlo simulation of the shower leakage, the analysis of the data taken at the electron beam dump of FLASHForward, and the integration of the new physics calorimeter in a modern simulation framework.

Group

FH-FTX

Project Category

B1. Physics Data Analysis and Performance (software-oriented)

Special Qualifications

Basic programming skills (C++, Python)

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