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The Mu2e Experiment - Searching for Charged Lepton Flavor Violation

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The Mu2e experiment will search for a Standard Model violating rate of neutrinoless conversion of a muon into an electron in the presence of an aluminum nucleus. Observation of this charged-lepton flavor-violating process would be an unambiguous sign of new physics. Mu2e aims to improve upon previous searches by four orders of magnitude. This requires the world's highest-intensity muon beam, a detector system capable of efficiently reconstructing the 105 MeV/c conversion electrons, and minimizing sensitivity to background events. A pulsed 8 GeV proton beam strikes a target, producing pions that decay into muons. Beam outside the pulse must be suppressed to $< 10^{-10}$ to reduce beam-related backgrounds. The muon beam is guided from the production target along the transport system and onto the aluminum stopping target. Conversion electrons leave the stopping target and propagate to the tracker and electromagnetic calorimeter. The tracker is a system of straw tube panels filled with Ar/CO2 at 1 atm that tracks particles inside of a solenoidal B-field and measures their momenta with ˜100 keV/c resolution to resolve signal events from decay-in-orbit backgrounds. The CsI calorimeter provides E/p and is used to seed the track reconstruction algorithm with $\sigma_E/E \sim 10\%$ and $\sigma_t < 500$ ps. Additionally, a novel cosmic ray veto with greater than 99.99% efficiency brings the expected number of background events to fewer than one over three years of running.

Primary experiment

Mu2e

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