

The Mu2e experiment at Fermilab

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The Mu2e experiment, under construction at Fermilab, will search for the neutrinoless coherent conversion of the muon into an electron in the field of an aluminum nucleus. This Charged Lepton Flavor Violating (CLFV) process has a very clear signature, a single monoenergetic electron with energy slightly below the muon rest mass. The Mu2e experiment aims to improve by four orders of magnitude the current best limit on the ratio ($R_{\mu e}$) between the conversion and muon capture rates and reach a single event sensitivity of 3×10^{-17} on $R_{\mu e}$. Another important physics goal would be that of searching for a Lepton Number Violating (LNV) process. Neutrinoless double beta decay ($0\nu\beta\beta$) has set the most stringent limit on this kind of process. The conversion of stopped negative muons to positrons in the field of a nucleus, $\mu^- + N(A, Z) \rightarrow e^+ + N(A, Z-2)$, is an example of both CLFV and LNV.

Mu2e will use an intense, pulsed, negative muon beam sent to an aluminum target for a total number of 10¹⁸ stopped muons. The production and transport of the muons is achieved with a sophisticated magnetic system comprised of a production, a transport and a detector solenoid. The Detector Solenoid hosts the stopping target made of aluminum followed by a straw-tube tracker and electromagnetic calorimeter. The entire detector region is surrounded by a Cosmic Ray Veto system.

Mu2e is under construction at the Muon Campus at Fermilab. Requirements, tests on prototypes, and status of the production will be discussed. The experiment will start in late 2023 and will take 4-5 years of data-taking to reach our goal.

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