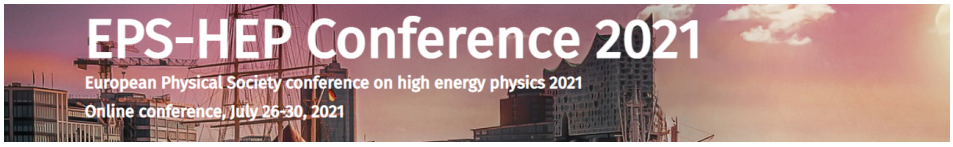

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Status of the Mu2e experiment at Fermilab

Thursday, 29 July 2021 11:00 (15 minutes)

The Mu2e experiment at Fermilab aims to measure the charged-lepton flavour violating (CLFV) neutrino-less conversion of a negative muon into an electron in the field of a nucleus. The conversion process results in a monochromatic electron with an energy slightly below the muon rest mass (104.97 MeV). The Goal of the experiment is to improve by four orders of magnitude the previous measurement and reach a single event sensitivity of 3 x 10^{-17} on the conversion rate with respect to the muon capture rate.

Although the SM is very well tested in many regimes, it appears likely to be incomplete. In many of the Beyond the Standard Model (BSM) scenarios, rates for CLFV processes are within the reach of the next generation of experiments. In particular, if SUSY particles have masses and couplings within the discovery reach of the LHC, CLFV rates will be observable. On the contrary, many CLFV searches have a sensitivity to new physics that exceeds the LHC, bringing the reach of new mass scales up to 10^4 TeV. In this pursuit, indirect measurements of CLFV will be crucial evidence of new physics.

The experiment goal is achieved by sending a very intense pulsed negative muon beam to an Aluminium target to collect a total of 10^{18} stopped muons in a few years of running. Production and transport of the muons are accomplished by means of a large (25 m length) and sophisticated magnetic system composed of production, transport, and detector solenoids. The magnetic systems allows the very intense beam to be directed on target with a low request on power.

The improvements with respect to previous conversion experiments are based on four elements: the higher muon intensity, the pulsed beam structure, the extinction of out of time particles and the precise electron identification in the detector solenoid. The conversion electron will be reconstructed and separated from the Decay in Orbit (DIO) background by a very high resolution tracking system based on straw technology. The crystal calorimeter system will confirm that the candidates are indeed electrons by performing a powerful mu/e rejection while granting a tracking-independent HLT filter. A Cosmic Ray Veto system surrounds the detector solenoid to make the cosmic based background negligible.

The Mu2e experiment is under construction at the Muon Campus of Fermilab, having received CD-3 approval in July 2016. The construction of the magnetic system is still dominating the critical path of the experiment. In the current schedule, after a long installation and commissioning phase with cosmic rays in the position extracted from the solenoid, the experiment start is foreseen for the beginning of 2024 and will be organised in two phases, a first one at low and a second one at full beam intensity.

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Collaboration / Activity

Mu2e experiment

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