Contribution ID: **53**   Type: **Poster**

Extending the Reach of the Mu2e Experiment through Developing Agnostic Track Reconstruction Algorithms

Friday, 31 May 2024 08:32 (1 minute)

The Mu2e experiment plans to search for neutrinoless muon to electron conversion in the field of a nucleus. Such a process violates lepton flavor conservation. To perform this search, a muon beam is focused on an aluminum target, the muons are stopped in the field of the aluminum nucleus, and electrons emitted from subsequent muon decays in orbit are measured. The endpoint energy for this process is 104.97 MeV; an excess of measured electrons at this energy signifies neutrinoless muon to electron conversion has occurred.Currently under construction at the Fermilab Muon Campus, Mu2e will stop 10^{18} muons on target in 3 years of running, with the goal of reaching a single event sensitivity of #3\times10^{-17}$ on the branching ratio.

In order to reach such a sensitivity, one must write software that efficiently reconstructs the tracks of conversion electrons that pass through the Mu2e tracker. This has been achieved by breaking the reconstruction process down into four successive steps: hit reconstruction, time clustering, helix finding, and a final track fitting. One shortcoming of the current code is that the time clustering and helix finding stages make various assumptions that make them highly tuned to conversion electrons at the endpoint energy. This limits the collaboration's ability to constrain some backgrounds, and search for a larger range of physics.

In addition to that, the trigger and data-acquisition (TDAQ) system makes an extensive use of online track reconstruction based on the same algorithms developed in the Offline software. The events are selected based on the decision of dedicated software filters. To match the Mu2e requirements, the trigger system needs to deliver a signal efficiency $> 90\%$ and a processing time $\leq 5~ms/event$.

The work presented here details the development of agnostic track reconstruction algorithms, and how they fit into the Mu2e trigger system.

Collaboration

Mu2e

Role of Submitter

I am the presenter

Primary authors: PEZZULLO, Gianantonio (Yale University); STORTINI, Matthew (Yale University)

Presenter: STORTINI, Matthew (Yale University)

Session Classification: Electronics and On-Detector Processing - Poster session

Track Classification: T7 - Electronics and On-Detector Processing