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The Straw-tube Tracker for the Mu2e Experiment at Fermilab

The Mu2e experiment will search for neutrinoless conversion of muons into electrons in the field of an aluminum nucleus. The signature of this process is an electron with energy nearly equal to the muon mass. Precise and robust measurement of the outgoing electron momentum is an essential element to the experiment. We describe the design of a low mass tracking system to meet this requirement. The tracker must operate in a vacuum and a 1 Tesla magnetic field. We have chosen to use about 20,000 thinwalled Mylar straws held under tension to avoid the need for supports within the active volume. In addition to measuring distance from the wire by drift time, subnanosecond measurement of signal propagation time will be used to measure position along the wire. Charge will be measured using ADCs to provide particle identification capability. To minimize the number of vacuum penetrations, digitization will be performed on the detector. Readout will use a triggerless, streaming architecture with data transmitted on optical fiber.

Summary

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