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# An 8-Straw Prototype Tracker for Mu2e

*Monday 8 August 2016 18:30 (2 hours)*

We will describe the design, construction, operational experience, and performance results from an 8-straw prototype of the Mu2e tracker. The Mu2e experiment will search for muon to electron conversion in the field of a nucleus with 4 orders of magnitude more sensitivity than previous experiments. The Mu2e experiment relies on a precision (˜1/1000) measurement of the daughter electron momentum to separate signal from background. Achieving this precision at the relevant scale of 105 MeV/c requires a very low-mass tracker. Mu2e has chosen a straw chamber tracker with approximately 20,000 5 mm diameter thin-walled straws arranged sparsely in a roughly 3 m long by 0.7 m radius cylinder, operated in vacuum and a magnetic field of 1 T. To test the novel design features and measure the performance of the straws and associated electronics, we built an 8-straw prototype tracker. This prototype follows the geometry of the outermost 8 straws of the full Mu2e tracker. Many construction and design issues were explored and resolved in constructing the prototype. The prototype has been tested using radioactive sources, particle beams from accelerators, and cosmic rays. The prototype operated stably for gains up to 1.7 e5. The prototype achieved the design goal position resolution of < 200 um perpendicular to the wire, and about 3 cm along the wire, with efficiencies > 95%, for signals and operating conditions similar to those expected in Mu2e. Results of tests for cross-talk, long-term stability, gas gain properties, and total dose aging effects on the chamber will be presented. We will also describe the models used to simulate the straw physics and electronics in the Mu2e Monte Carlo that have been tuned to these results.

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