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Track Fitting with the Kalman Filter algorithm for the Muon $g-2$ Experiment at Fermilab

The Fermilab Muon $g-2$ Experiment (E989) has successfully started data taking for Run-3, with the analysis of Run-1 and Run-2 data currently ongoing. The main goal of the experiment is to measure the muon magnetic anomaly a_μ to an unprecedented precision of 140 ppb.

The straw tracking detectors contribute to reduce the experimental systematic uncertainty on a_μ : the positrons reconstructed trajectories allow to obtain accurate muon beam distributions, and to perform track extrapolation forwards to the calorimeters.

The Kalman Filter (KF) algorithm implementation in the $g-2$ offline software is presented as a track-fitting method, alternative to the current global least-squares minimization procedure. The KF technique is proposed to obtain higher-quality residual at every hit and an optimal estimator along the full trajectory, thus enabling better tracking refinement, alignment and calibration.

Consider for young scientist forum (Student or postdoc speaker)

No

Second most appropriate track (if necessary)

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