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The track reconstruction software and performance studies of the Fermilab Muon g-2 straw tracking detectors

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The Fermilab Muon g-2 experiment will measure the anomalous magnetic moment of the muon to a precision of 140 parts per billion, which is a factor of four improvement over the previous E821 measurement at Brookhaven. The experiment will also extend the search for the muon's electric dipole moment (EDM) by approximately two orders of magnitude with a sensitivity down to 10^{-21} e.cm. Both of these measurements are made by an analysis of the modulation of the decay rate of the higher-energy positrons from the (anti-)muon decays recorded by 24 calorimeters and 3 straw tracking detectors. The straw tracking detectors will be used to cross-calibrate the calorimeter, identify pileup and muons lost from the storage region, and to measure the beam-profile. A tracker measurement of the up-down modulation of positrons will be used in the EDM analysis.

In this poster the methodology and algorithms being used to reconstruct tracks from the straw hits will be described and the physics performance of the algorithms will be demonstrated using Monte-Carlo generated data. The performance evaluated through an analysis of testbeam data taken with a prototype detector in 2015 will also be described. In this analysis the hit resolution of the detector was determined through a comparison with the hits recorded in an auxiliary silicon detector and is shown to be comfortably below the resolution required to reconstruct the trajectory of positrons with the accuracy required for the experiment.

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