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The Fermilab Muon $g-2$ straw tracking detectors and the muon EDM measurement

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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 $10e-21$ 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 2 straw tracking detectors. The straw tracking detectors are 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 talk, the design of the straw tracking detector and its performance evaluated from an analysis of the 2018/19 $g-2$ data will be described. The role the detector has in determining the systematic uncertainty in the measurement of $g-2$ arising from the beam motion and the beam's momentum and spatial variance will be described and compared with simulation.

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