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The Muon g-2 Experiment at Fermilab (20' + 5')

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The Muon g-2 Experiment at Fermilab has been designed to determine the anomalous magnetic moment of the muon (a_mu) to a precision of 140 parts per billion (ppb). This four-fold improvement over the previous Brookhaven E821 measurement will provide significant insight into the resilient 3.5 standard deviation discrepancy between measurement and the Standard Model prediction. Determination of a_mu at the design precision requires measurement of both the spin precession rate and the magnetic field strength, each with a 70 ppb systematic uncertainty, with projected equal statistical and systematic uncertainties of 100 ppb. The factor of 25 increase in delivered muons from the Fermilab complex drives the gain in statistical precision. The first of this two-part talk will provide an overview of the experiment, and will then detail the methodology, and resulting detector design, for measurement of the anomalous spin precession rate. The second part will discuss the storage ring magnet (transported 3200 miles from Brookhaven over land and sea), the features of the magnet that will allow this experiment to achieve an average field uniformity of one part per million. We will also describe the methodology and status of the shimming process, and provide an overview of the absolute calibration procedure and field monitoring system.

Primary author: POLLY, Chris (Fermilab)

Co-author: GIBBONS, Lawrence (Cornell University)

Presenter: POLLY, Chris (Fermilab)

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