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The Muon g-2 experiment at Fermilab: Overview and status update

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The Muon g-2 experiment E989 at Fermilab will measure the anomalous magnetic moment of muon, a_μ , with a precision goal of 140 part-per-billion (ppb). The experiment is aiming to resolve the discrepancy of more than 3 standard deviations between the previous measurements dominated by the Brookhaven E821 result and the Standard Model calculation of a_μ .

The experimental concept uses a polarized muon beam at the magic momentum which is stored in the extremely homogeneous magnetic field of the storage ring. Parity violation in the weak decay is used as a spin analyzer; the detected rate of the decay electrons oscillates with the frequency, ω_a , in the magnetic field expressed in terms of the free proton Larmor frequency, ω_p . Since a_μ is derived from the ratio of ω_a and ω_p , both are equally important and systematic uncertainties must be kept below 70 ppb for each observable.

The experiment has just finished its second data collection period and has acquired more than two times the BNL statistics. In this presentation, the experimental concept and new improvements will be discussed along with an update on the ongoing data analysis and an outlook for the upcoming Run-3 starting in October 2019.

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