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The Muon g-2 experiment at Fermilab

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The Fermilab Muon g-2 Experiment aims to search for evidence of new physics by measuring the anomalous magnetic moment of muons, represented by the quantity (g-2)/2. The experiment injects muons into a storage ring, where the precession frequency is measured to determine (g-2)/2.

The analysis of the experiment involves two main components: measuring the difference frequency (ωa) between the muon spin precession and cyclotron frequencies and measuring the magnetic field in the storage ring (ω'p) using nuclear magnetic resonance probes calibrated in terms of the equivalent proton spin precession frequency in a water sample.

In the run-1 stage, precise measurements of ωa and ω'p were performed, and the combined result with the previous BNL measurement determined (g-2)/2 to be (116592061 ± 41) × 10ˆ-11, which is 4.2 standard deviations greater than the standard model prediction based on dispersion relation.

Improvements have been made in subsequent runs, including improvements in the stability of storage ring components and data analysis techniques, which are expected to reduce further the uncertainty in the measurement of (g-2)/2.

This talk will cover the published run-1 results and the latest improvements made in the run-2 and run-3 stages of the experiment.

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