

Analysis of the magnetic field in the Fermilab muon g-2 experiment

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The muon g-2 experiment at Fermilab seeks to confirm or deny the $\sim 3.5 \sigma$ discrepancy between the Standard Model prediction of the muon anomalous magnetic moment, a_μ , and its experimental value. The experiment measures a_μ directly from the ratio of the muon precession frequency in a uniform storage ring magnetic field to the Larmor frequency of free protons in the same field. Every few days, an NMR 'trolley' maps out the storage ring field. Field drifts between trolley runs are tracked by 'fixed' NMR probes embedded in the vacuum chamber walls. These measurements are interpolated to determine the field in the storage region, which is convolved with the muon beam distribution to determine the effective magnetic field, $\langle B \rangle$. A precise determination of $\langle B \rangle$ is crucial; half of the error budget is attributed to the magnetic field uncertainty. The magnetic field analysis techniques and a summary of the results will be presented.

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