

Measurement of the muon anomalous precession frequency ω_a in the Fermilab muon g-2 experiment

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The Fermilab Muon g-2 experiment was designed to measure the muon's anomalous magnetic moment $a_\mu = (g - 2)/2$ to 140 parts per billion. The value of a_μ is proportional to the difference frequency $\omega_a = \omega_s - \omega_c$ between the muon's cyclotron frequency and spin precession frequency in the uniform magnetic field of the g-2 storage ring. The frequency ω_a is extracted from the time distribution of the mu-decay positrons recorded by 24 electromagnetic calorimeters positioned around the inner circumference of the storage ring. We will discuss the various approaches to the frequency determination including the reconstruction and fitting of time distributions, fitting of time distributions, and procedures for handling the effects of gain changes, positron pileup and beam dynamics. We also discuss the data consistency checks and the strategy for the averaging of the ω_a across the different analyses.

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