

# The Muon $g - 2$ Experiment at Fermilab

D. Flay, University of Massachusetts, Amherst  
on Behalf of the Muon  $g - 2$  Collaboration

## Abstract

Precision measurements of the anomalous magnetic moment of the muon,  $a_\mu \equiv (g_\mu - 2)/2$ , provide an excellent test of the Standard Model with sensitivity to physics beyond the Standard Model. The most recent measurement of  $a_\mu$  at Brookhaven National Laboratory (E821) differs from the Standard Model prediction by roughly 3.5 standard deviations. Currently under construction at Fermilab is a new experiment, E989, with the aim of improving the precision on  $a_\mu$  by a factor of four to 140 parts per billion (ppb). E989 will use a magnetic storage ring into which polarized muons will be injected and two frequencies will be measured: the rate at which the muon polarization rotates relative to its momentum,  $\omega_a$ , and the magnetic field normalized to the free-proton Larmor precession frequency,  $\omega_p$ .

In this talk, a brief overview of the previous  $a_\mu$  measurements and theoretical efforts will be presented. The main discussion will focus on the motivation for E989 along with the details of how the measurements will be conducted, with an emphasis on the magnetic field work to date.