CSU PHYSICS COLLOQUIUM

The Muon g-2 Experiment at Fermilab

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Colorado State University
4:00PM, Monday; October 12, 2015
Refreshments at 3:45PM
Location: 120 Engineering (Hammond Auditorium)

Abstract

A new experiment at Fermilab, E989, will measure the anomalous magnetic moment of the muon with a precision of 140 parts per billion (ppb). This measurement is motivated by the results of the Brookhaven E821 experiment that were first released more than a decade ago, which reached a precision of 540 ppb. As the corresponding Standard Model predictions have been refined, the experimental and theoretical values have persistently differed by about 3 standard deviations. If the Brookhaven result is confirmed at Fermilab with this improved precision, it will constitute definitive evidence for particles or interactions beyond the Standard Model. The experiment observes the muon spin precession frequency in flight in a well-calibrated magnetic field; the improvement in precision will require both 20 times as many recorded muon decay events as in E821 and a reduction by a factor of 3 in the systematic uncertainties. In this presentation, I will describe the theoretical background, the current experimental status, and the plans for the upgraded magnet, detector and storage ring systems that are being prepared for the start of beam data collection in 2017.

Biographical Sketch

Frederick Gray is an Associate Professor of Physics at Regis University in Denver, Colorado. He started working on the muon’s anomalous magnetic moment as a graduate student at the University of Illinois in 1998; his dissertation was the final result from E821 for the positive muon. As a postdoc at the University of California, Berkeley, he worked on the MuCap measurement of the rate of muon capture in hydrogen at the Paul Scherrer Institute and also on a calibration system for the KamLAND antineutrino detector. He taught at Pomona College as a visiting faculty member for a year before moving to Regis. His position there is focused on teaching, and he has assembled an undergraduate research group that has made significant contributions to the MuSun measurement of the muon capture rate in deuterium and now to g-2.