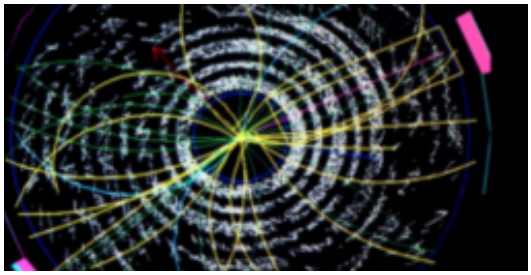

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Precision Magnetic Field Calibration for the Muon $g-2$ Experiment at Fermilab

Tuesday, 6 June 2017 16:45 (15 minutes)

The Muon $g-2$ Experiment at Fermilab (E989) has been designed to determine the muon anomalous magnetic moment to a precision of 140 parts per billion (ppb), a four-fold improvement over the Brookhaven E821 measurement. Key to this precision goal is the determination of the magnetic field of the experiment's muon storage ring to better than 100 ppb.

The magnetic field will be measured and monitored by nuclear magnetic resonance (NMR) probes, which are mounted on a trolley and pulled through the muon storage region when muons are not being stored. These trolley probes will be calibrated in terms of the free-proton Larmor precession frequency ω_p by a specially-constructed NMR calibration probe. In E821, the uncertainty in the field measurement was 170 ppb, of which 50 ppb was due to the calibration probe. In E989, these uncertainties will be reduced to 70 ppb and 35 ppb, respectively. To meet these stringent requirements, a new specially-designed probe called the "plunging probe" has been built which will be used to calibrate the trolley probes. This talk will present the design, fabrication, and testing of the plunging probe, along with the calibration procedure to be conducted during the experiment.

Primary author: Dr FLAY, David (University of Massachusetts, Amherst)

Presenter: Dr FLAY, David (University of Massachusetts, Amherst)

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