Contribution ID: **958** Type: **Parallel**

High Precision Magnetic Field Measurement for the Muon g-2 Experiment

Friday, 6 July 2018 20:15 (15 minutes)

The Muon g-2 Experiment (E989) at Fermilab will measure the anomalous magnetic moment of the muon, a_μ with a precision of 140 part-per-billion (ppb), aiming at resolving the >3 standard deviations between the previous measurement at Brookhaven (E821) and the Standard Model calculation of a_μ.
The experimental concept uses a polarized muon beam stored in an extremely homogeneous storage ring magnetic field. Parity violation in the weak decay is used as a spin analyzer; the detected rate of the decay electrons oscillates with the frequency, ω_a, in the magnetic field expressed in terms of the free proton Larmor frequency, ω_p. Since a_μ is derived from the ratio of ω_a and ω_p, both are equally important and systematic uncertainties must be kept below 70 ppb for each observable.
A magnetic field measurement system was developed to measure the magnetic field experienced by the muons with an ultimate precision of 70 ppb. 378 new Nuclear Magnetic Resonance (NMR) probes and readout electronics were developed and installed to constantly monitor the field. An upgraded in-vacuum field mapping system scans the muon storage region over the full azimuth of the magnet. A special water-based NMR probe which has a well-measured geometry and low magnetic perturbation was designed to calibrate the probes of the field mapping system. All systems were successfully commissioned, and are currently in full operation for the first physics data taking run that started in February 2018. In this presentation, we will present an overview of the entire field measurement system and show preliminary results from the ongoing physics data taking.

Primary author: WINTER, Peter (Argonne National Laboratory)

Presenter: WINTER, Peter (Argonne National Laboratory)

Session Classification: POSTER

Track Classification: Posters