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Kicker eddy currents in the Fermilab Muon g–2 experiment

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The measurement of the muon magnetic anomaly, aμ = (gμ - 2)/2, is one of the most accurate tests of the Standard Model (SM).
The measurement of aμ by the E989 Muon g-2 experiment was presented last April and confirmed the E821 BNL experimental result of 2004, increasing the significance of the discrepancy between the measured and SM predicted aμ from 3.7σ to 4.2σ.
In the E989 experiment, positive 3.1 GeV/c muons are injected into a 14m diameter storage ring (SR), where both muon's spin and momentum vectors precede. The difference between the spin frequency and the cyclotron frequency is called *anomalous precession frequency*, related to aμ through ωa = aμ B q/m, where B is the dipole magnetic field inside the SR. Therefore, aμ can be extracted by accurately measuring ωa and B.
A kicker system produces a ˜ 250G magnetic field parallel to the ring dipole field that steers the muon beam onto the designed orbit. The high voltage of ˜ 120kV in the kickers' plates induces *eddy currents* that produce a magnetic field that modifies the main dipole field at the ppm level, thus modifying the measured ωa, if not corrected. I will describe how this field can be measured by a Faraday Magnetometer which I have contributed to build and characterize in the laboratories of the National Optics Institute in Pisa (Italy).

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