Abstract Submitted
for the APR11 Meeting of
The American Physical Society

Design of the 12 GeV MOLLER Spectrometer JULIETTE MAMMEI, University of Massachusetts, Amherst, MOLLER COLLABORATION — The MOLLER experiment is an ultra-precise low-energy measurement of the weak mixing angle, $\sin^2\theta_W$, which will run in Hall A of Jefferson Lab after the 12 GeV upgrade. It will measure the parity-violating asymmetry in elastic electron-electron (Møller) scattering which arises due to the interference of scattering via a Z boson with that of single photon exchange. The expected precision of the measurement is comparable to that of the two highest-energy measurements, making it a low-energy standard model test complementary to measurements at the Large Hadron Collider. In order to achieve the design goals of high ($\geq$120 GHz) scattered electron rate and small ($\leq$10%) contributions from backgrounds, it will employ two high-power resistive toroidal magnets. Their design is constrained by the small scattering angles (5.5 - 19 mrad) as well as the requirement that the coils fill less than half of the azimuth. In order to focus the Møller electrons 28m downstream of the 150cm long liquid hydrogen target, a novel hybrid toroid with multiple current returns was proposed. A more conventional magnet is placed upstream in order to provide azimuthal prefocusing and also to provide some separation between the signal Møller electrons and the electrons which scatter elastically from the proton. I will present the results of TOSCA and GEANT4 simulations used to achieve a buildable magnet system which meets our design criteria.

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Date submitted: 13 Jan 2011 Electronic form version 1.4