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Improved detectors for the new muon g-2 measurement GREGORY DAMHORST, University of Illinois Urbana–Champaign — A precision measurement of the muon anomalous magnetic moment (g-2) is one of the most promising efforts for the detection of new physics beyond the standard model. A new proposal to perform the measurement at Fermi National Accelerator Laboratory promises to reduce uncertainty in the measurement from 0.54 ppm to 0.14 ppm, improving the measurement's power in discriminating various extensions to the standard model. To accomplish this greater precision, the new g-2 measurement will require improved detectors and data acquisition techniques. Calorimeters made of tungsten and scintillating fiber (SciFi) will be used for the detection of weak decay electrons. This design is preferred over the grooved lead/SciFi calorimeters used in past g-2 measurements for its simple assembly and smaller radiation length. Photons produced in the scintillation process will be directed to photomultipliers for electronic readout through foil-lined acrylic light guides which must concentrate photons with minimal loss within a limited available space. The challenge of developing an optimal detector design is being addressed by the University of Illinois Nuclear Physics Group through Monte Carlo simulations and tests of prototype calorimeters and light guides. Significant aspects of this project include determining optimal calorimeter module size, light guide geometry, and photomultiplier style.

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