OPTIMIZING MUON INJECTION FOR THE MUON g-2 EXPERIMENT
Grace Roberts, Purdue University, West Lafayette, IN 47906 USA

Methodology

This work was conducted using the Geant4beamline program in the National Energy Research Scientific Computing Center (NERSC). Muons were tracked through separate simulations for each hardware item: the output of the M4/M5 simulation would become the input for the inflector, and so on. The efficacy of variables would be assessed by the number of muons within ~2% of the MM.

Assessments of the Wedge and Beam Offsets, Energy Increases, and the Inflectors

Wedge Offset and Raised Energy: 
Simulations of beams with raised energies were tracked through the inflectors and 50 turns around the SR in order to attempt to restore the beam momentum to the MM. However, this study revealed that improvements in experimental yield would mostly result from the use of the new inflector, and not wedge use, as optimizing both wedge offset and energy increase only yields a maximum muon gain of ~4%.

Beam Offset: 
It was found that a -67.1 mm offset optimized the performance of both inflectors for the wedge-out case, while -65.1 mm optimized performance for the wedge-in (0mm) case.

Wedge Offset and Raised Energy: 
Simulations of beams with raised energies were tracked through the inflectors and 50 turns around the SR in order to attempt to restore the beam momentum to the MM. However, this study revealed that improvements in experimental yield would mostly result from the use of the new inflector, and not wedge use, as optimizing both wedge offset and energy increase only yields a maximum muon gain of ~4%.

This manuscript has been authored by Fermi Research Alliance, LLC under Contract No. DE-AC02-07CH11359 with the U.S. Department of Energy, Office of Science, Office of High Energy Physics.