

Pion-production target for Mu2e-II: simulation design and prototype

Friday, August 5, 2022 12:30 PM (25 minutes)

Mu2e-II will probe new physics mass scales up to 105 TeV by utilizing an 800-MeV 100-kW proton beam with an upgraded Mu2e beamline and detector, to obtain a sensitivity of $\sim 10^{-17}$ in measurements of mu to electron conversion. This sensitivity is enabled by the PIP-II SRF Linac, which can accelerate a 2-mA proton beam to a kinetic energy of 800 MeV (1.6 MW of beam power); Mu2e-II will use a fraction of that potential. The higher beam intensity will require a substantially more advanced target design. In this talk, we will discuss our recent advances in design R&D for a Mu2e-II target station, based on energy deposition and radiation damage simulations (using MARS15, G4beamline, and FLUKA), as well as thermal and mechanical ANSYS analyses to estimate the survivability of the system. We considered rotated targets, fixed granular targets and a novel conveyor target with tungsten or carbon spherical elements that are circulated through the beam path. The motion of the spheres can be ensured either mechanically or both mechanically and by a He-gas flow. The simulations identified the conveyor target as the preferred approach, and that approach has been developed into a prototype. We describe this first prototype for the Mu2e-II target and report on its mechanical tests performed at Fermilab that indicate the feasibility of the design, discuss its weaknesses as well as suggested the directions of its further improvement.

Attendance type

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