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Design and development of a tungsten pion production target for the Mu2e experiment

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The Mu2e experiment at Fermilab will search for the neutrino-less conversion of a muon to an electron in the field of a nucleus. Negative muons will be produced from the decay of pions generated by the interaction of an 8 GeV proton beam with a tungsten target. The target will be installed in the bore of a production solenoid within a graded magnetic field so as to maximise the production and capture of low energy negative pions. Pion production is maximised in a dense and compact target material with a high atomic number. For a beam power of 8 kW the refractory metal tungsten is the most suitable material that is able in principle to directly radiate the 560 W heat load to the solenoid shield without the need for a coolant. However, the dimensions that optimise pion production are similar to those of a pencil, and the high operating temperature presents many engineering challenges that need to be overcome for a target to have the required lifetime, combined with significant radiological safety issues. This talk will present the development of the design and some innovative materials testing that has resulted in a potential compromise solution with a realistic chance of a 1-year lifetime.

Working Group

WG3 : Accelerator Physics

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