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Conceptual Design of a High-Power Target for Positron Production at CEBAF

Content

A positron injector at the Thomas Jefferson National Accelerator Facility is currently designed for accelerating polarized positron beams with the Continuous Electron Beam Accelerator Facility (CEBAF). The Polarized Electrons for Polarized Positrons (PEPPo) concept is used to produce polarized e^+e^- -pairs from the bremsstrahlung radiation of a longitudinally polarized electron beam interacting within a high-Z conversion target. The present scheme involves a 4 mm thick tungsten target which should absorb up to 17 kW deposited by a 1 mA continuous-wave electron beam of 120 MeV. The concept of a rotating tungsten rim mounted on a water-cooled copper disk was investigated to keep the peak temperature in tungsten below 350 °C. The results of ANSYS thermal and mechanical analyses are discussed together with FLUKA evaluations of the radiation damages. The target geometry, the velocity of the rotating target, and the water flow rate were optimized to keep a small target size and maintain the thermal load and radiation damages at acceptable levels.

Footnotes

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