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High Power Solid Target for Positron Source at CEBAF

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The progress in the development of a polarized positron injector for the Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Laboratory is presented. The polarized positron beam is generated by a high current polarized electron beam (>1 mA @ 120 MeV) via bremsstrahlung radiation and e^+e^- pair production in the tungsten target. The simulations show that using an optimized target and positron beamline, the positron injector can provide a cw positron beam with a current larger than 50 nA and a polarization as large as 60%. Injected into the North Linac of CEBAF at an energy of 123 MeV, the positron beam can reach a maximum energy of 12 GeV to perform a rich experimental program. The results of the thermal and structural FEA analysis of the heat load in the target are presented, as well as the simulation results of radiation damage in the target. The performed and planned target material fatigue and radiation damage tests are discussed.

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