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Collimation of a Positron Beam Using an Externally Applied Magnetic Field D.H. BARNAK, P.-Y. CHANG, R. BETTI, Laboratory for Laser Energetics and Fusion Science Center, U. of Rochester, G. FIKSEL, D.D. MEYERHOFER, Laboratory for Laser Energetics, U. of Rochester, G.J. WILLIAMS, S. KERR, H. CHEN, LLNL — Positron beam collimation using externally applied magnetic fields has been demonstrated on the OMEGA EP Laser System at the University of Rochester's Laboratory for Laser Energetics and the Titan laser at Lawrence Livermore National Laboratory. A positron jet with a divergence of $\sim 20^\circ$ is produced by irradiating a high-Z target with an infrared short-pulse (10-ps) laser. The beam is then collimated into an electron–positron spectrometer by an 8-T magnetic field produced with a small (12-mm-diam) coil powered by a pulsed magnetic-field device. The positron density in the collimated beam is increased by a factor of ~ 40, measured 0.6 m from the source. At a given target-to-coil distance, the collimation depends on the beam energy and the magnetic-field strength. Experiments show higher peak energies in the positron spectrum than simulation for a given field strength; several potential causes will be discussed. Target and coil alignment is critical to the collimation, and the effects of misalignment are calculated numerically. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944, the Office of Fusion Energy Sciences Number DE-FG02-04ER54786, and by LLNL under Contract DE-AC52-07NA27344.

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