The E166 Experiment: Undulator-Based Production of Polarized Positrons

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Abstract: A proof-of-principle experiment has been carried out in the Final Focus Test Beam (FFTB) at SLAC to demonstrate production of polarized positrons in a manner suitable for implementation at the ILC. A helical undulator of 2.54 mm period and 1-m length produced circularly polarized photons of 1st harmonic endpoint energy of 8.5 MeV when traversed by a 46.6 GeV electron beam. The polarized photons were converted to polarized positrons in a 0.2-radiation-length tungsten target. The polarization of these positrons was measured at several energies, with a peak value of $\approx$ 80% according to a preliminary analysis of the transmission polarimetry of photons obtained on reconversion of the positrons in a second tungsten target.

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