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Production of Highly Polarized Positrons Using Polarized Electrons at MeV Energies

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The Polarized Electrons for Polarized Positrons (PEPPo) experiment at the injector of the Continuous Electron Beam Accelerator Facility has demonstrated for the first time the efficient transfer of polarization from electrons to positrons produced by the polarized bremsstrahlung radiation induced by a polarized electron beam in a high-Z target.

A dedicated 3m long beam line was installed for the PEPPo experiment which included: the e^+/e^- production target, a quarter-wave solenoid to collect positrons within a large divergence angle, a combined-function spectrometer to select and focus discrete positron momenta slices, a pair of coincidence positron annihilation detectors, and a second solenoid to transport and focus positrons through an Al window to a Compton transmission polarimeter.

Positron polarization up to 82% has been measured for an initial electron beam momentum of 8.19 MeV/c, limited only by the electron beam polarization. This technique extends polarized positron capabilities from GeV to MeV electron beams, and opens access to polarized positron beam physics to a wide community.

Presenter: GRAMES, Joe (Jefferson Lab)

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