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Calibration of the PEPPo polarimeter

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The PEPPo (Polarized Electrons for Polarized Positrons) experiment at Jefferson Lab (JLab) investigated a new approach of developing polarized positron source. The PEPPo concept relies on the production of polarized e^-/e^+ pairs from the bremsstrahlung radiation of a longitudinally polarized electron beam interacting within a high Z conversion target. PEPPo measured the positron polarization with a Compton transmission polarimeter, where the incoming longitudinally polarized positrons transfer their polarization into circularly polarized photons subsequently analyzed by a thick polarized iron target and upon exiting the iron target. The photons are detected in at 3×3 CsI crystal arrays. The experimental asymmetry was measured with respect to the orientation of the target polarization (\pm) or the helicity (\pm) of the incoming leptons provided the measurement of their polarization. Similar measurements with a known electron beam were also performed for calibration purposes. A model of the PEPPo Compton polarimeter was created in Geant4 to simulate the positron analyzing power. This model was tested by benchmarking the simulation for electrons with a directly measured analyzing power for electrons. This presentation will describe the experimental procedure and the layout of the PEPPo experiment with emphasis on the reconversion target, the analyzing magnet and the polarimeter. Additionally, the Geant4 modelling of the PEPPo Compton polarimeter, some sensitivity studies and the results of the simulations are also discussed.

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