

Optimization of Positron Source Layout for High-Intensity and High-Polarization at JLab

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This work focuses on developing optimized layouts for generating polarized and unpolarized positron beams at the Thomas Jefferson National Accelerator Facility (JLab) using the continuous-wave (cw) electron beam at CEBAF. The JLab positron source aims to produce either a low-intensity (≥ 50 nA), highly polarized (60%) positron beam or a high-intensity ($\geq 3\mu\text{A}$), unpolarized positron beam using a high-intensity (1 mA) and highly polarized (90%) continuous electron beam of moderate energy (120 MeV).

The main objective of this study was to produce and transport high-duty-cycle and high-intensity polarized positron beams. To achieve this goal, the layout and performance of the positron source were optimized, including implementing a specialized second injector that collects, transports, accelerates, and compresses the positron beams. The layouts of the injector were designed to be compatible with acceleration at CEBAF and optimized for polarized and unpolarized production. The effectiveness of this approach is demonstrated in the investigation results presented in this workshop talk.

Keywords: High duty-cycle positron beams, high positron beam polarization, PEPPo polarization transfer technique, CW beams.

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