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Tests of a polarimeter for laser-driven proton beams at the 45-MeV cyclotron JULIC

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A novel method of laser-plasma acceleration employing dynamically polarized gas-jet targets (HCl/HBr gas) has been proposed to generate 100-MeV polarized proton beams. To achieve the beam polarization measurement in laser-plasma experiments at multi-Petawatt lasers, we have developed a polarimeter based on p -Carbon scattering, detected with the help of solid-state nuclear track detectors, and tested it with 45 MeV polarized proton beams at JULIC. The most demanding part of the data analysis was to identify protons and carbon ions on top of strong background of secondary particles.

In this paper we compare the performance of the proton polarimeter to a similar one for ${}^3\text{He}$ ion beams, based on the d - ${}^3\text{He}$ fusion reaction, and applied successfully at the PHELIX laser facility, GSI-Darmstadt. Some alternative reactions for analyzing the polarization of proton beams are considered for using the polarimeter in laser-plasma experiments.

Category

Polarimetry

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