

Laser-Driven Proton Sources Using Low-Density Foam Targets And Their Applications to Alpha Particle Generation

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In a recent experiment at the PHELIX facility (GSI), we investigated proton generation via the interaction of high-intensity picosecond laser pulses with low-density foam targets. A primary objective was to study the process of super-ponderomotive acceleration of electrons in plasmas with very long scale length and the effect they have on proton acceleration in laser-produced plasmas. This talk presents the results on the evaluation of laser-accelerated proton energy spectra and simulation alpha particle yields produced by a boron nitride target. We discuss the estimated reaction rates based on data from multiple diagnostics, considering the interaction probabilities and target parameters. Our findings suggest that cold foams near the critical density regime increase the generation of proton beams in the low-energy range which is well-suited for triggering p–¹¹B fusion reactions. These results highlight the potential of this approach for producing high-brightness α-particle sources and advancing aneutronic fusion research.

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