

Efficient production and diagnostics of MeV proton beams from

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A solid hydrogen thin ribbon, produced by the cryogenic system ELISE (Experiments on Laser Interaction with Solid hydrogEn) target delivery system, was for the first time experimentally used at the PALS kJ-laser facility to generate intense proton beams with energies in the MeV range. This sophisticated target system operating at cryogenic temperature (~ 10 K) continuously producing a $62\mu\text{m}$ thick target was combined with a 600 J sub-nanosecond laser pulse to generate a collimated proton stream. Both the hydrogen plasma and the accelerated proton beam were fully characterized by a number of diagnostics. High conversion efficiency of laser to energetic protons is of great interest for future potential applications in non-conventional proton therapy and fast ignition for inertial confinement fusion.

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