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Collimated High-Quality Proton Beam Generation in Laser Tailored-Target Interaction[1] S. KAWATA, M. NAKAMURA, R. SONOBE, N. ONUMA, Y. NODERA, S. MIYAZAKI, T. KIKUCHI, Utsunomiya University, Japan, Q. KONG, Fudan University — A high-quality collimated proton beam generation is demonstrated by using a tailored thin foil target. A robustness of a thin-foil tailored hole target is demonstrated by particle simulations in laser-produced proton generation. The tailored target has holes at the target rear surface. When an intense short pulse laser illuminates the thin foil target with the hole, transverse edge fields of an accelerated electron cloud and an ion cloud are shielded by a protuberant part of the hole so that the proton beam divergence is suppressed [1, 2]. This paper presents the robustness of the hole target against laser parameter changes in a laser spot size and in a laser pulse length, against a contaminated proton source layer and against a laser alignment error. The 2.5-dimensional PIC (particle-in-cell) simulations also present that a multiple-hole target is robust against a laser alignment error and a target positioning error. The multi-hole target may serve a robust target for practical uses to produce a collimated proton beam. [1] R. Sonobe, et al., Phys. Plasmas, 12 (2005) 073104. [2] M. Nakamura, et al., J. Appl. Phys., 101 (2007) 113305.

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