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Simulation and experimental validation of a new type of laser target that produces collimated and accelerated proton bunches. MATTHIEU BARDON, JULIEN MOREAU, MICHEL FERRI, BERTRAND ETCHESSAHAR, NATHALIE BLANCHOT, CEA/CESTA, LORENZO ROMAGNANI, FREDERIC LEFEVRE, LULI, CHRISTOPHE ROUSSEAUX, ISABELLE LANTUEJOUL, WITOLD CAYZAC, SEBASTIEN BAZZOLI, GAETAN SARY, CEA/DIF, DANIEL FARCAGE, CEA/SACLAY, VLADIMIR TIKHONCHUK, CELIA, CEA/CESTA TEAM, LULI TEAM, CEA/DIF TEAM, CEA/SACLAY TEAM, CELIA TEAM — The Target Normal Sheath Acceleration is the most robust and well-known production process of laser driven proton beams, but the application of such a scheme to isochoric heating, isotope production, proton radiography or proton therapy, suffers from two major limits: a broad energy spectrum and a large beam divergence. In order to optimize the properties of the proton beam, a new scheme of post-acceleration proposes to add an helical coil connected at the rear side of the target. The discharge current induced by the electron charge ejection propagates through this helix and generates an electromagnetic pulse which collimates, post-accelerates and energy selects the protons emitted from the rear side of the target. We present the results of the PACMAN1 campaign carried out at the LULI 2000 facility, in March 2019, where the pico2000 laser beam (70J, 1ps) irradiated gold foils attached to helixes of different diameters, lengths or pitches. The experimental data are compared to the results of numerical simulations carried out with the PIC code SOPHIE developed at the CEA.

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