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P4.2027 Progress of the light-ion laser acceleration beamline at the ILIL-PW

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See full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.2027.pdf

A Laser driven Light Ions Acceleration Beamline (L3IA) has been established recently based on the high intensity femtosecond laser system recently upgraded and now routinely operating at >100 TW peak power at the ILIL-PW laser facility at INO. The original concept of the beamline relies on the Target Normal Sheath acceleration mechanism to generate light ions with MeV energy to use for material science and radiobiology applications. In the poster we will describe the most recent experimental results obtained using thin foil targets where accelerated ions were characterized using a wide range of detection techniques, optimized for the severe conditions typical of a laser-plasma acceleration environment. Data show ion energy up to 7 MeV, with significant shot-byshot fluctuations as typical of the TNSA mechanism. The origin of these fluctuations is being investigated including possible role of target imperfections, laser-beam energy, pulse duration and pointing stability. Further enhancement of the ion energy is being pursued via further increase of the laser intensity in the focal region, to be obtained by correction of the residual laser beam phase front distortions to increase the Strehl ratio, currently approaching 70%, and by further increasing the pulse energy, as planned in the next phase of the laser upgrade. At the same time, advanced targets are also being explored with special attention to nanostructured targets, including nano-pillars and porous materials that are used for their role of modifying the laser-target interaction regime, affecting the generation of fast electrons, namely their phase space distribution. This is mainly investigated via characterization the properties of the fast electron and the high energy ions escaping from the target. Preliminary results show that a key role is played in these measurements by the level of interstitial plasma filling gaps and cavities in the target, before the ultrashort laser pulse hits the target. This can be controlled by changing the temporal contrast of the laser pulse. Our approach to these studies will also be described in the poster.

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