Contribution ID: **3497** Type: **not specified**

P4.2019 Target curvature influence on particle beam characteristics resulting from laser ion acceleration with microstructured enhanced targets at ultra-high intensity

Thursday, 11 July 2019 14:00 (2 hours)

See full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.2019.pdf

With the latest advances in laser science, the need to produce superior quality ion and electron beams has been a hot research field in the past decade. The hot electron density and temperature in the rear vacuum depend on the target geometrical and composition properties such as target curvature, pulse focusing structures and microdots for enhanced proton acceleration [1-10]. This paper studies the effects of different target density profiles on the spatial distribution of the accelerated particles, the maximum energies achieved, and the characteristics of the photon distribution using the same laser pulse parameters. The study expands the work done in the past [11] describing a curved foil target which presents a proton-rich microdot on its backside, and the effects of the variation of the target curvature while using a cone structure for laser focusing. This work has been done in order to determine which is the optimal target curvature at which the accelerated particle bunch is best collimated while still achieving optimal particle energy. For this purpose, we have investigated the proton energy and angular distributions by means of two-dimensional (2D) particle-in-cell (PIC) simulations of the interaction of ultra-short laser pulses with several microstructured target geometries using the PICLS code [12].

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Session Classification: Poster P4

Track Classification: BPIF