Recent Results Of PALS Experiment On Laser-Plasma Interaction For Planar Target At Conditions Relevant To Shock Ignition

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The main purpose of the experiment at the PALS laser facility in Prague was to study the laser-matter interaction at the physical conditions of Shock Ignition (SI). Indeed, we investigated the generation and propagation of a shock wave. We also characterized the generation of supra-thermal electrons in order to investigate their role in the generation of the shock wave.

We used two beams: an auxiliary beam, for pre-plasma creation, of intensity of around 10^{14}W.cm^{-2} (250ps, 1ω=1315nm) and a main beam, around 10^{16}W.cm^{-2} (250ps) either at 1ω (1315nm) or upconverted to 3ω (438nm), to launch a shock. The main beam can be delayed with respect to the other by up to 1200ps. The first part of the experiment was dedicated to the study of the backscattering energy at 3ω outside the cone of the lens using an integrating sphere, whereas the second part to study the shock created by the first harmonic and compare to results obtained with 3ω.

We used three kinds of targets. All the targets were multilayer with 10µm of titanium and 10µm of copper at the backside. In the frontside, there was a plastic layer doped with chlorine of 3 different thicknesses: 3, 10 or 25µm. The shock produced by the ablation of the plastic layer was studied through the shock breakout chronometry. The population of fast electrons was analyzed through Kα emission spectroscopy and imaging. The pre-plasma was characterized with 3-frames interferometry, X-ray spectroscopy and ion diagnostics. Backscattered radiation information has been obtained by spectroscopy and calorimetry.

These diagnostics permitted to evaluate the shock breakout time, the quantity of fast electrons, the thickness and the temperature of the pre-plasma and backscattered emission inside and outside the cone of the lens. We compared the results with CHIC 2D simulations in order to infer the maximum pressure inside the target.