SHORT PULSE LASER GENERATED ION BEAMS FOR FAST IGNITION *

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The generation of highly collimated, ultra-intense ion beams at laser intensities beyond 10^{19} W/cm^2 is proposed as an alternative driver for fast ignition of compressed fuel pellets in Inertial Fusion Energy scenarios. The energy deposition characteristics and the ability to propagate through plasmas exceeding the critical density of common high intensity lasers are the major beneficial properties of ion beams to enhance the energy density in the hot and compressed core of a fuel pellet.

A series of experiments at the 100 TW laser facility of the Laboratoire pour l'Utilisation des Lasers Intenses (LULI) in Palaiseau, France, was performed to investigate the generation mechanisms and to shape the properties of laser generated ultra-intense ion beams. It could be shown that ions in the MeV regime are created by "Target Normal Sheath Acceleration" (TNSA), which is an effect of a space charge layer on the back surface of a foil, caused by Laser-target-interaction electrons, which penetrate the target[1]. Furthermore, the geometrical properties of the target back surface strongly influence the resulting ion beam[2].

A summary of the results achieved in Palaiseau will be presented along with an outlook on upcoming experiments at Sandia National Laboratories, which will address this interesting research field.

1. J. Fuchs, et al., *Phys. Rev. Lett*. 91 (2003), p. 255002.
2. M. Roth, et al., *Phys. Rev. ST- AB* 5 (2002), p. 061301.

* This work was supported by the European Union program HPRI CT 1999-0052.

† Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.