# ISOCHORIC HEATING OF DT FUELS THROUGH PW-LASER PRODUCED NON RELATIVISTIC ION BEAMS*

G. Maynard, M. D. Barriga-Carrasco, LPGP, CNRS-UMR8578, Université Paris XI, 91405 Orsay, France

Y. Kurilenkov, Institute for High Temperatures of Russian Academy of Sciences, 13/19 Izhorskaya, Str., 125412 Moscow, Russia

Several experiments have demonstrated that a short pulse of a high current well collimated proton beam can be generated by irradiation of a thin solid target by a high intensity sub-picosecond laser. Due to the large proton/electron mass ratio, a proton beam is much less affected by instabilities. It has lead M. Roth et al. [1]) to propose a proton beam Fast Ignitor Scenario (FIS). This scenario is quite attractive, in particular because the Laser generated Proton Source (LPS) is put outside the indirect driven target and so has no interference with the evolution of the target during the main pulse irradiation. To investigate this scenario in more details, and also for application such that the proton imaging of plasma targets, we have constructed a numerical code that describes the transport and energy deposition of high current energetic proton beams, as those generated by a LPS, through complex targets. Energy loss and dispersion together with angular diffusion due to multiple scattering have been included in our model.

For ion beams generated by standard accelerators, the transverse dispersion is not of fundamental importance to predict the interaction of the beam with dense targets, so more efforts have been put previously on the determination of the longitudinal force (stopping) induced mainly by the interaction of the beam with the plasma electron. However, due to the specific properties of LPS, the transverse dispersion becomes a central quantity to accurately determine the density of deposited energy by the proton beam.

Inside a target, the transverse spreading of a beam generated by a LPS is related mainly to the low frequency (ionic) part of the microfield, whereas the high frequency (electronic) part produces the longitudinal force. We are thus here in a quite stimulating case, from a theoretical point of view, where a large domain of frequencies of the fluctuating field inside a dense plasma has to be investigated. Together with our code results for FIS applications we will describe at the conference the present state of our modeling on this field.

*This work was support by CEA-EURATOM (under grant V.3094.003). M. D. B-C thanks Fundacion Séneca for a post-doctoral grant.

1. M. Roth *et al*. Phys. Rev. Lett., **86**, 436, 2001