Hydrodynamic simulations of laser-generated plasma with MULTI-fs code

J.M. Rojas-Artuñedo [1], M.D. Barriga-Carrasco [1], J. Vázquez-Moyano[1] and L. González-Gallego [1]
[1] *E.T.S.I. Industrial, Universidad de Castilla-La Mancha, E-13071 Ciudad Real, Spain*

Developments in laser technology have allowed scientists to broaden the range of regimes for laser matter interaction research. Characterization of laser-generated plasmas becomes essential to understand the physics involved, while at the same time providing the necessary resources to ease future works and enable a wide range of applications. The aim of this study is to support further theoretical models providing useful data -i.e., electron temperature, density, ionization degree, etc.- regarding plasma warm dense matter regime (WDM) to lay down solid bases to future works. For this purpose, hydrodynamic simulations have been carried out using Lagrangian MULTI-fs hydrodynamic code [1]. An experiment conducted in CLPU facilities by S. Malko et al. [2] has been considered to validate the simulations, test the versatility of the code and enlighten its limitations.

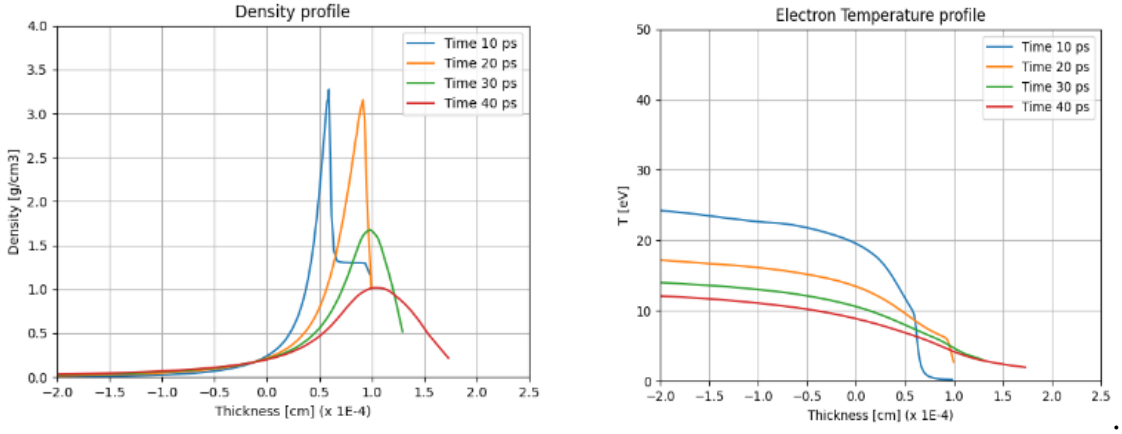

Fig 1. Simulation results of density and electron temperature profiles of the experiment [2].

The experiment goal was providing new insights close to the Bragg peak by means of stopping power measurements. To achieve this objective 1 um carbon foil plasma was studied in the WDM regime produced by laser pulses in the femtosecond regime with peak intensity of 10^{15} W/cm^2 using the VEGA II facility at CLPU.

References

[1] R. Ramis, et al. Computer Physics Communications 183, 637-655 (2011).
[2] S. Malko, et al. APS Division of Plasma Physics Meeting, abstract id.VO05.001 (2020).