

FINAL SCIENTIFIC REPORT

SILMI - Exchange - 3335

Beneficiary: Prof. Dimitri Batani, Università di Milano Bicocca
Host: Prof. Vladimir Tikhonchuk, CELIA, Université de Bordeaux

Period: Monday, 28 February 2011 - Friday, 15 April 2011

Purpose of the visit

I planned to stay at CELIA, Bordeaux, for a period of 3 months starting in February 2011. After acceptance of the grant, I began my stay at CELIA on February 28. The SILMI grants covered a period of 4 weeks but indeed, after coming back to Milan on April 15, I went back to Bordeaux where I will stay in Bordeaux up to the end of May as initially planned, the rest of the stay being covered by funds from CELIA.

The goals of the stay were:

- 1) to interact with CELIA researchers both on the interpretation and analysis of some experimental data collected in previous experimental campaigns,
- 2) to prepare new experiments concerning the physics of laser produced plasmas.

Description of the work carried out during the visit

During the visit, we developed several themes.

1) Concerning the study of extreme states of matter (HED), we focused on the analysis of recent experimental results, which we obtained at ILE, Osaka, in collaboration with the group of K. Shigemori (publication submitted). We have also studied the possibility of realising such kind of experiments on the LIL facility at CEA/CESTA Bordeaux.

2) We also continued the analysis of an experiment conducted at RAL concerning the propagation of fast electrons in cylindrically imploded targets. In that experiment we have shown that, depending on details of target implosion, one can create a resistive gradient in the target, which may induce strong magnetic fields collimating the fast electron beam. Together with CELIA researchers (Ph. Nicolai, J. Santos, et al.) we have submitted a proposal for realising a similar experiment on a larger scale at ILE using the Gekko laser facility. This will allow getting closer to conditions of direct interest for inertial Fusion.

The following figure shows a study of the uniformity of laser irradiation obtained using 6 ns-laser beams focused onto the cylindrical target.

The proposal has been selected by the Joint Research Technical Committee of ILE and will be performed in February 2012.

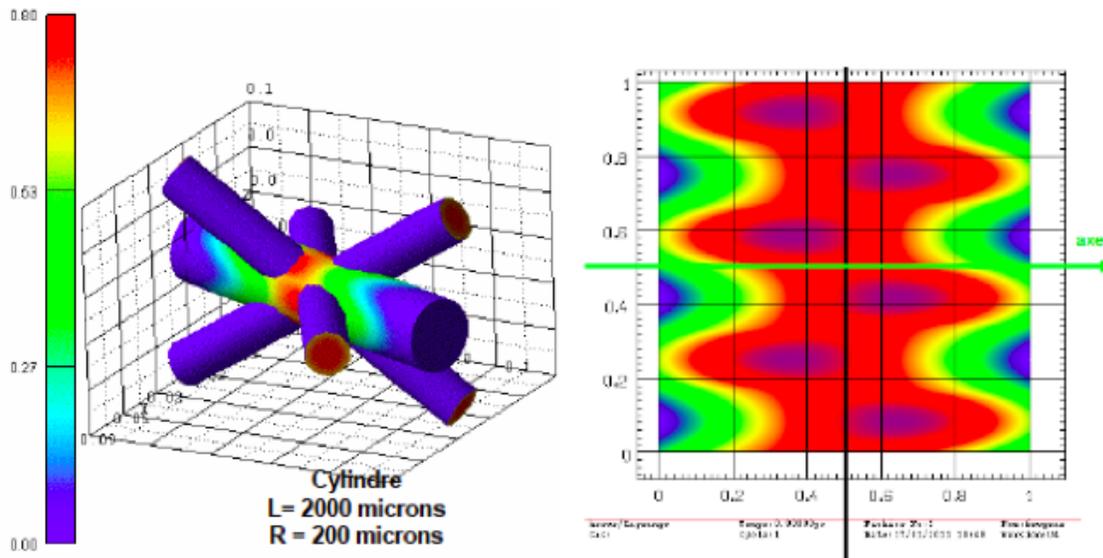


Fig. 1: degree of uniformity of laser irradiation on a cylindrical target (calculations with the Code Ceclad by Gabriel, J.-L.Feugeas, and Ph.Nicolai of CELIA)

3) We also worked on the shock ignition approach to ICF, studying laser-plasma interactions in the regime of intensities around 10^{16} W/cm². In this framework we have first analysed the data obtained in an experiment, which my group has realised at PALS. Together with CELIA researchers (G.Schurtz, X. Ribeire) we have analysed the data and prepare a paper, which is going to be submitted for publication soon.

We worked on the preparation of a follow-up experiment, already scheduled for August-October 2011, at PALS, which will be jointly performed by the CELIA and Bicocca group together with the groups of IPPLM, Warsaw, and INO CNR, Pisa.

Finally we did begin to prepare a proposal for a shock ignition experiment to be performed on the LIL laser in CEA/CESTA Bordeaux.

Description of the main results obtained

The main results obtained consist in preparation of experimental proposals (ILE, LIL, PALS) and in the analysis of 3 experiments (the RAL cylindrical experiment, the PALS shock ignition experiment, the ILE carbon experiment)

Future collaboration with host institution

The perspective of collaboration between the laser-plasma group at Bicocca and CELIA seem to be optimal (indeed at the moment I came back again to Bordeaux)

Dimitri Batani

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Bordeaux, April 27, 2011