8. KEEP-IN-TOUCH ACTIVITIES ON INERTIAL CONFINEMENT

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8.1. INTRODUCTION

This project has been carried out by "Grupo de Lasers e Plasmas" of "Centro de Física de Plasmas".

8.2. MAIN ACTIVITIES

The following main activities were carried out in 2000:

- Implementation of a triple beam scheme

In order to carry on with the experimental programme the delivery beam system was modified to allow the delivery of three beams on the target chamber. The beam 1 (main beam) is a high power beam with pulse characteristics E_{max}=2 J, t_{min}=600 fs. The beam 2 (secondary beam) can be another high power beam similar to beam 1 or a non-compressed pulse beam (t_{min}>60 ps). The beam 3 (probe beam) is actually a leak of the beam 1 with E<10 mJ. All the three beams are synchronised and the delays between each other can be adjusted with a precision better than 1 fs.

- Implementation of an all-optical-fibre based triggering system

The triggering system of the laboratory and in particular of the laser system was up-graded to this all-optical-fibre based system, in order to resist to strong electromagnetic noise.

- Implementation of a new control system for the L2I laboratory

This new system allows for the centralized control of all the experimental sub-systems and diagnostics, as well as of the laser system.

- Design of the next laser system up-grade

The next laser system up-grade consists in the energy increase of the main beam pulses to the 10 J level. This up-grade will consist on the introduction of a new 45 mm diameter rod Nd:Glass amplifier, a spatial filter, a faraday rotator, up-grade of the actual pulse diagnostics and the installation of the actual pulse compressor in a 2 m diameter vacuum chamber.

- Development of a compact single-shot auto-correlator for high power pulse width control.

In order to verify the quality of a single pulse, which is of fundamental importance to accept or reject the data resulting from that shot, it was developed a second order single-shot auto-correlator capable of measuring the pulse width with 100 fs precision.

- Modelling of a frequency-resolved optical gating (FROG) pulse diagnostic

The next step in laser pulse diagnostics will be a FROG. This device will allow the measurement of pulse phase characteristics, which is fundamental to control the laser system and to optimise the pulse compressor.

- Development of a plasma density diagnostic

A space and time resolved diagnostic for the plasma density was developed. This diagnostic is based on Moiré interferometry using two Ronchi gratings and the probe beam.

- Installation of an electron spectrometer

An electron spectrometer designed at GoLP-IST was developed and installed. This spectrometer, which consists in a 4 T magnet and a scintillator-CCD detection system, has an effective range of 2.5 - 200 MeV.

- Implementation in the vacuum chamber of three-dimensional triple beam focusing geometry

As explained in 1.1 is was implemented in the L2I a triple beam scheme, at the target area level this implied the up-grade of the experiment alignment system and the setup in the interior of the vacuum chamber, as well as the development of the delay control between the three pulses.

- Development of fast electronic of the target area data acquisition and control system:

In order to synchronise the laser shots with all systems in the target area it was necessary to develop a fast electronic for the control and data acquisition. This system is based on a laboratory reference clock and adjusts the laser system regenerative amplifier frequency to the video frequency of a master CCD camera, it also synchronously fires the Nd:Glass amplifiers (and other equipment like a gas jet) and sends trigger signals to the image acquisition system.