

**Joint thematic Workshop of Institut Lasers Plasmas,
and LaserLab-Europe NA3 networking activity :
Thematic Network on High Energy Lasers**

**Next generation high energy lasers for basic research :
Need for versatile high rep rate facilities**

Bordeaux University, September 3rd, 2010

1. RATIONALE

The French government has issued a call for medium-size Research Infrastructures, which may represent a major opportunity to boost High Energy Density research, both at French and European levels. Under the aegis of Institut Lasers Plasmas (France), and LaserLab-Europe 2 , a dedicated workshop should unravel the general needs and scientific cases for a next generation HED laser facility of high repetition rates (one shot per few minutes) but moderate energies, and discuss how such a facility can be coordinated with other HED facilities and programs at French and European levels.

2. SCIENTIFIC CONTEXT

The physics of laser-matter interaction in the domain of High Energy Density (HED) matter requires large scale laser facilities with laser pulses of many kilojoules. The technological frontier is now provided by such lasers systems as the National Ignition Facility (NIF), USA, and Laser MegaJoule (LMJ) near Bordeaux, or by Petawatt high energy lasers such as Omega-EP, Rochester University, USA, LFEX, Osaka University, Japan, or PETAL, Bordeaux. However, because of their extremely high operational cost and relatively low number of shots available, smaller sized facilities, so called "intermediate", are absolutely crucial to all scientific and technological developments in the field. The French national taskforce on the development of powerful lasers, ILP/GRALE, has identified four classes of high energy lasers:

- Lasers of megajoule level;
- Lasers of large but intermediate scale with a pulse energy larger than 10 kJ;
- Lasers of kilojoule scale, such as LULI2000;
- Sub-kilojoule scale lasers providing a combination of accessibility and flexibility of use.

At European level, one should acknowledge a significant decrease of the beam time available and an absence of new laser projects for HED physics. The ALISE laser at CEA/CESTA will be shut down in September 2010. More generally, a major effort at a European level is directed to the Ultra High Intensity laser projects. The Extreme Light Infrastructure (ELI) is to be hosted in the Czech Republic, and probably in Hungary and Romania (combined endowments exceeding 800 M€). One must include also the projects Gemini and Vulcan 10 PW in Great Britain and the Apollon project in the Ile-de-France. Concerning the HED physics, most of the attention is currently focused on the HiPER project aiming at a very high-rep rate demonstrator of the laser driver for inertial confinement fusion, through DPSSL technology, and on the Petawatt laser PETAL to be installed on the LMJ in 2015.

These very large projects might leave pending the need for smaller HED facilities, which however, are essential for normal healthy development of the scientific community, permitting one to tackle fundamental issues and benefiting from a substantial beam time. In addition, these small scale facilities are flexible, allowing training of new generations of physicists and engineers, and provide an essential link with high average power laser facilities required for industrial or medical applications, which the civil society expects out of large scale scientific projects.

3. PRELIMINARY PROGRAM

- Contextual elements : situation of HED lasers, national call for infrastructures
Introduction Ph. Balcou, general discussion

- Synergy between LMJ/PETAL and smaller scale HED lasers
Introduction H. Hutchinson, general discussion

- Scientific case for a high repetition rate, 300 J laser: general elements
Introduction V. Tikhonchuk, general discussion

- User requirements : present and future
Introduction : tba, general discussion

4. GENERAL INFORMATION & SCHEDULE

Schedule : from 10 am to 5 pm, September 3rd, 2010.

Location : Salle Badiane, Bordeaux 1 University, C4 building, Domaine du Haut Carré, 43 rue Pierre Noailles, 33400 Talence, France.

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