

## 2008 Annual Report

### ICUIL Board

#### Chair

*Gerard Mourou*

#### Co-Chairs

*Chris Barty*

*Toshiki Tajima*

#### Secretary

*Terry Kessler*

### International Ultra Intense Laser Initiatives:

- **Establishing a path beyond laser-matter interaction in the relativistic regime to pursue ultra-relativistic sciences**
- **Growing interest in generating high energy particles and radiation on time scales shorter than an attosecond**
- **Construction of Fast Ignition laboratories for Inertial Confinement Fusion**

Over the past year, the ultra-intense laser field continued to flourish as demonstrated by a growing number of scientific and technological applications, by the funded design study for a facility approaching the exawatt power level and by the laser fusion projects dedicated to energy through fast ignition. These activities continue to demonstrate a vigorously expanding field. High field science is transitioning towards the ultra relativistic regime as the available laser intensity increases from  $10^{18}\text{W/cm}^2$  to beyond  $10^{24}\text{W/cm}^2$ . Science involving relativistic electrons, and associated laser matter interaction, will be surpassed by the generation of relativistic protons. In order to explore this regime, exawatt level lasers are being pursued. Several highly visible projects demonstrate the vitality of the high-intensity field.

- Europe's commitment towards ultra-high intensity physics and laser fusion is exemplified in the LASER-LAB EUROPE initiative which is a consortium of 17 laser infrastructures from 9 European countries forming an integrated infrastructure. HIPER, a civilian laser fusion research project and ELI, an exawatt laser facility, are both on the European roadmap for large facilities and have received funds from the European Union, for their concept and design phases. High Power *Laser* Energy Research (HiPER) is an international project that includes partners from Europe, Asia, and North America to explore fast ignition. The mission of the Extreme Light Infrastructure (ELI) involves exploring exotic physics; generating the highest energy particles ( $>100\text{GeV}$  electron) and the shortest coherent pulses available for basic science.
- The many high intensity laser projects within the USA, OMEGA EP, at LLE, NIF ARC and Titan at LLNL, the Z-PW at SNL and Trident at LANL, are at different stages of completion. The OMEGA EP system was completed in May 2008 and is already well above  $10^{18}\text{W/cm}^2$  at over 1KJ energy on target. The remainder of these facilities will be available for experiments over the next few years.
- The field continues to grow with rapid expansion in Asia. The Asian Intense Laser Network (AILN) has emerged strongly while the Asian Symposium on Intense Laser Science (ASILS) has been organized several times. The Asian Intense Laser Network (AILN) is an organization established for the promotion of collaboration in the areas of intense laser science and technology among research groups in Asian countries and



regions. AILN is linked to other international networks on intense laser science and technology, such as ICUIL. In Japan, a national project on laser driven proton therapy was approved and launched. Japan. Fast Ignition Realization EXperiment (FIREX) is an initiative to demonstrate ignition and burn at ILE in Osaka, Japan. In addition, Korea and China are showing explosive growth not only by the number of facilities but also by their experimental programs.

## **ICUIL's Progress Overview**

The International Committee on Ultra-High Intensity Lasers (ICUIL) is an organization actively concerned with the growth and vitality of the whole international field of ultra-high intensity laser science, technology and education. Our goals are to provide a venue for discussions among representatives of high-intensity laser facilities and members of user communities, on international collaborative activities such as the development of the next generation of ultra-high intensity lasers, exploration of new areas of fundamental and applied research, and formation of a global research network for access to advanced facilities by users and to promote unity and coherence in the field by convening conferences and workshops dedicated to ultrahigh intensity lasers and their applications, and to promote and sponsor independent networking initiatives at the regional level. To achieve these stated goals, ICUIL has made significant progress in the following areas.

### ICUIL Member Rotation

Member rotation will continue to take place, in small steps, to maintain continuity and ensure that ICUIL continues to advance while maintaining balance between the various high field science sections of IUPAP. We continue to attract excellent candidates for participation in ICUIL. In order to keep the field vital in a democratic way, the recruitment of new members has been carried out through a broad involvement of the global Ultra-Intense Laser community and coordinated by ICUIL members. ICUIL contacted several hundred individuals in the high intensity laser field to request recommendations for participants. Out of approximately 20 recommendations, eight candidates were chosen and asked to participate in ICUIL annual meeting at Tongli, China in October 2008. A full agenda is planned, including member rotation and board selection.

### Charter Revision

A revision of the ICUIL charter has been drafted and will be democratically ratified at the next ICUIL meeting held in Tongli, China in October 2008. The purpose of this revision is to enhance the effectiveness of ICUIL by removing unworkable constraints regarding meetings and voting procedures, by reducing IUPAP governance of ICUIL rotation and evolution, and by improving functionality of the ICUIL Board. The Board will be increased to five members who play active roles involving periodic newsletters, website development, and corporate fund raising. The Chairman of ICUIL will attend the next IUPAP General Assembly this October 15 in Tokyo and will have the opportunity to discuss the revised charter and our role in the physics community



## ICUIL 2008 Conference

The International Committee on Ultrahigh Intensity Lasers will hold its next bi-annual conference in Tongli, China in October 2008. It is organized by Professor J. Zhang, Shanghai Jiao Tong University. Following the success of both the 2004 (Tahoe) and 2006 (Cassis) conferences, the 2008 (China) conference promises to be another excellent opportunity for researchers in the field to share experiences and new ideas. Increased attendance is anticipated in Shanghai, China due to the continually growing enthusiasm for short pulse, high intensity lasers and applications around the world. The program includes 25 invited talks, 50 oral presentations and 50 poster presentations. Participation is from every part of the world where high intensity lasers are being pursued. The ICUIL Board will decide the location for the 2010 conference at our annual meeting.

## ICUIL Website

The ICUIL website is now managed in France in collaboration with the ELI project. The website has a professional website manager in close proximity to the ICUIL chairman and frequent correspondence with the ICUIL secretary. Additional links are being added as new facilities and journal articles are recommended and made available. The 2008 ICUIL conference is a highlighted event whose schedule and scope has been continually emphasized. The excellent quality of the website should help to attract new ICUIL members, conference attendees, and corporate sponsors.

## Corporate fund raising

ICUIL is planning an expansion of its corporate support program to afford the maintenance of the ICUIL website in the near-term and to organise annual meetings on a regular basis in the long term. We have adopted the strategy that a professional and informative website will attract corporate sponsorship; generosity will be rewarded with website visibility. In addition, we anticipate added benefits to an improved website such as establishing a hub for technological breakthroughs and state-of-the-art equipment. Scientist and vendors can share experiences without having to wait for the bi-annual conferences.

## Workshop Organization

Following the formation of an extended ICUIL Board, workshop organization will be the next targeted growth area for this working group. It is anticipated that ICUIL sponsored workshops will provide opportunities for highly focused interaction between laser scientists and between facility users. The ultra-intense laser field has experienced an explosion of new laser diagnostics to measure wave front, intensity, spectral phase, and pulse width of high intensity, short laser pulses. These techniques are now being used by many laboratories around the world. Specific hardware oriented workshops are envisioned that will take place at individual laboratories and be complemented with rotation of equipment, from lab-to-lab, to obtain performance comparisons.