ICUIL News N°6

Volume 6 – June 2015

Chief Editor: Alexander Sergeev

- Greetings from the Chairman
- IZEST is Exploring Uncharted Territory in the High Energy Single Cycle Pulse Regime
- 5 PW CPA Amplifier and 1 PW OPCPA Amplifier Demonstrated at SIOM
- Extreme Light Infrastructure – Nuclear Physics (ELI-NP) Project: Status of Implementation
- New Perspectives for Modeling in the Laboratory Extreme Astrophysical Phenomena Using High-power Lasers Coupled to Strong Magnetic Fields
- Topical meetings

The International Committee on Ultra-High Intensity Lasers

Greetings from the Chairman

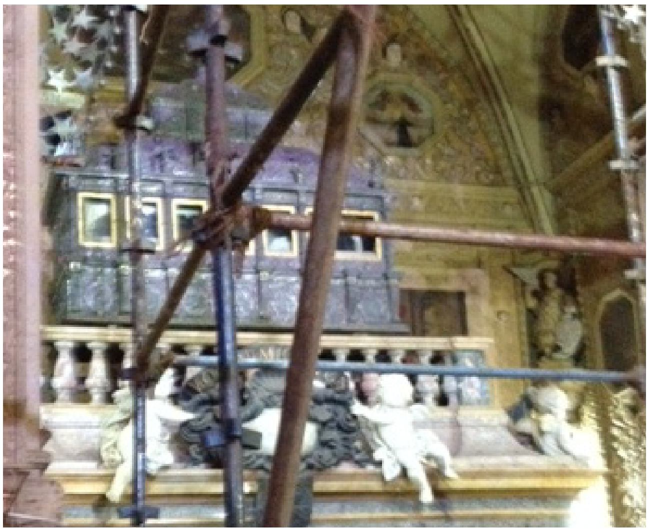
Toshi Tajima, ICUIL Chair

The community of ICUIL has witnessed a host of efforts that pushed the frontier of high intensity lasers in 2014–2015. One of the new phenomena in our community is that the high power of PW lasers has become industrial top birds, whose fruits originated coming out of the national or international research labs but with additional industrial R&D added with healthy collaborative relations between the industry and academia being developing. For example, Thales' PW laser was commissioned at the Lawrence Berkeley National Lab. More such are occurring around the world. In the research labs around world, on the other hand, they began looking at the high power laser far beyond PW, such as SIOM (Shanghai, China)'s 5 PW laser ribbon-cutting this year. Korean IBS's 2 PW lasers are continually producing new results such as laser ion acceleration. At ELI, they have started 10 PW class laser development with a variety of architectures. Some are now looking far beyond this. Such as Chris Barty's "Nexawatt" laser, which tries to utilize LLNL NIF laser architecture for highest power based on large energy laser whose backbone was build as the fusion driver. Similar efforts have been advocated in the past ICUIL efforts such as a proposal to LMJ PETAL, as well as a proposal at ILE, Osaka University and the consideration at LLE at Rochester, all looking at the level of EW, though all these still remain on the drawing board.

These activities were reviewed in the last October (2014)'s ICUIL Conference at Goa, India. This ICUIL meeting was the first in that Indian subcontinent. We all felt that India and its scientists had a very high enthusiasm toward high intensity lasers and high field science. We duly note with fond appreciation that Dr. Ravi Kumar's leadership and heroic devotion along with the entire members of the Program Committee and the Local Organizing Committee in successfully organizing and attracting so many world's talents and superhigh quality talks on the high intensity lasers there. Our heartfelt bravos are due here. A lot of their applications at the cutting edge from the leading groups such as WimLeemans and Mike Downer were very exciting and of high quality, reflecting the exploding applications areas. The social gatherings on the beach of Goa were also unforgettable. For example, we were led to the church visit where still the mummy of Saint Francesco Xavier was shown as if he is still talking to us with the holy man's experience and message emanating in the hall. Some of us after or before the ICUIL Conference gave public speeches to further promote high intensity laser and high field science in India. The next ICUIL Conference was decided to be held near Quebec hosted by Dr. Tsuneyuki Ozaki.

The collaboration between ICUIL and ICFA communities continues. For example, the technology of high rep-rated high efficient laser (CAN) fit for collider applications has been considered at institutions including CERN. The collective decelerator technique sprung out of our community has been considered at KEK's ILC research.

A new trend that started in 2014 is to develop a technique to compactify an optical PW laser into a single cycle laser proposed by G. Mourou et al. Once such a technique is established, its impact could be immense, leading to a possible (again) single cycled X-ray laser with the level of EW power. Such a technique should have applications from X-ray wakefield acceleration ("TeV on a chip") to vacuum self-focus toward Schwinger field. I would like to draw your attention to such a potential so that the world can soon harness this technology.



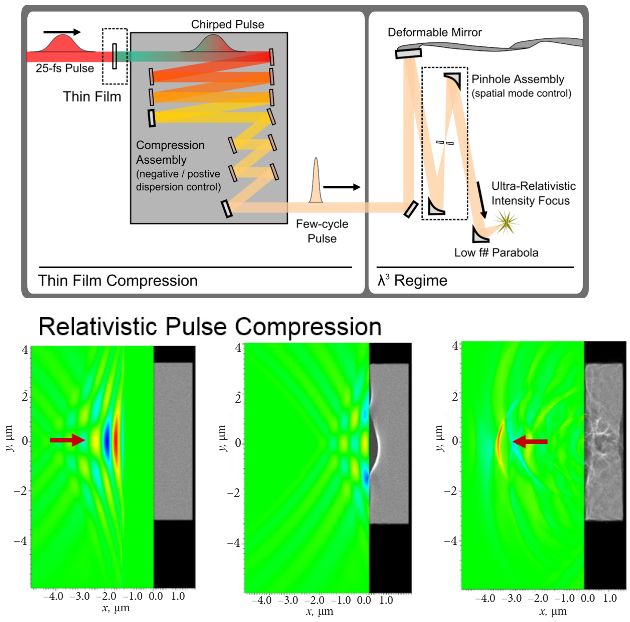
The casket of mummified St. Francesco Xavier at a Goa church

ICUIL is also collaborating with the world or international organizations. It will help launch / send our members (ex officio) to the new toddler of our sister Working Group in Accelerator Science, in addition to the above mentioned ongoing ICUIL-ICFA collaboration. We also collaborate with Asian Intense Laser Network. We sponsor the International School on Ultra-Intense Lasers to be held in Russia in October 2015. It is intended to promote the young generation in furthering the reach of high intensity lasers.

IZEST is Exploring Uncharted Territory in the High Energy Single Cycle Pulse Regime

Gérard Mourou, Jonatan Wheeler, Ecole Polytechnique, France

IZEST (www.izest.polytechnique.edu) is exploring novel horizons for the laser community in amplification to peak intensities (C3), laser efficiencies (ICAN), and applications based on extreme laser fields (100-GeV Ascent, Dark Fields) and, now add to that, timescales. This comes with the addition of a new pillar within the IZEST organization known as ZeptoScience for its concentration on zeptosecond-scale science. Preliminary theoretical models show the possibility to convert single-cycle femtosecond, near-infrared, ultra-relativistic intensity laser pulses to atto or zeptosecond, gamma ray pulses through the interaction with a thin, superdense plasma [1]. This can be considered as an extension of the creation of XUV, attosecond pulses through sub-cycle processes at the femtosecond-scale within the strong-field processes of atomic, molecular and solid target plasmas. With increasing field strength, the subsequent gradients involved within a relativistic laser-plasma interaction create a small sub-cycle window for the photon up-conversion to reach gamma-ray energy scales. The theoretical work is already 10 years in the literature but to date the possibility to compress existing pulses with joules of energy to a single-cycle time duration was believed too cost prohibitive to make an experimental attempt. The recent suggestion [2] of efficiently post-compressing these types of pulses using a thin film of thermoplastic to produce the spectral broadening to support a single-cycle pulse (~250 nm) followed by dispersion controlled chirped mirrors offers the possibility to produce the driving NIR pulses required to produce zeptosecond-scale x-ray pulses within a plasma. In light of this exciting possibility a work group within the ZeptoScience project is performing experiments to test the methods to efficiently compress existing laser technologies to the few-cycle, femtosecond regime with a sufficient intensity to begin pursuing the creation of zeptosecond pulses. This begins with the efficient temporal compression of a femtosecond pulse within a plastic thin-film. This work is being performed by a collaboration of researchers based at Ecole Polytechnique (France), National Institute for Laser, Plasma and Radiation Physics (INFLPR, Romania), and ELI-NP (Romania). As these activities are underway on the NIR compression, theoretical plasma studies are underway to understand and identify the ideal conditions for zeptosecond pulse generation and the relativistic pulse compression and upconversion that might ultimately be achieved. Within another workgroup based at the University of California Irvine (UCI), theoretical studies are already underway to theoretically explore the potential properties and applications of such short gamma-ray pulses [3]. These applications include areas such as laser wakefield acceleration within solid-density plasmas leading to crystal accelerations of TeV/cm, and vacuum QED studies leading to x-ray nonlinear responses through vacuum propagation.



1. Naumova, N. M., Nees, J. A., Sokolov, I. V., Hou, B., and Mourou, G. A. Relativistic Generation of Isolated Attosecond Pulses in a λ^3 Focal Volume, Physical Review Letters 92, no. 6 (2004): 3–6. doi:10.1103/Phys. Rev. Lett. 92.063902, Available at http://link.aps.org/doi/10.1103/Phys. Rev. Lett. 92.063902.

2. Mourou, G., Mironov, S., Khazanov, E., and Sergeev, A. Single Cycle Thin Film Compressor Opening the Door to Zeptosecond-Exawatt Physics. The European Physical Journal Special Topics 223, no. 6 (2014): 1181–1188. doi:10.1140/epjst/e2014-02171-5, Available at http://link.springer.com/10.1140/epjst/e2014-02171-5.

3. Tajima, T. Laser Acceleration in Novel Media. The European Physical Journal Special Topics 223, no. 6 (2014): 1037–1044. doi:10.1140/epjst/e2014-02154-6, Available at http://link.springer.com/10.1140/epjst/e2014-02154-6.

5 PW CPA Amplifier and 1 PW OPCPA Amplifier Demonstrated at SIOM

Ruxin Li, State Key Laboratory of High Field Laser Physics, Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences, Shanghai 201800, China

In 2013 the output energy of the Ti:sapphire CPA laser system at SIOM reached 72.6 J at a pump energy of 140 J, corresponding to a peak power of 2.0 PW. At the end of 2014, a high gain chirped pulse amplifier based on a Ti:sapphire crystal 150 mm in diameter was demonstrated, with the highest output pulse energy of 192.3 J at the pump laser energy of 312 J, corresponding to a pump-laser efficiency of 50.4%. The amplified chirped pulse had a bandwidth of 53 nm at 800 nm central wavelength. With the grating compressor efficiency of 72% and the 27.0 fs compressed pulse width obtained with part of the energy, this Ti:sapphire laser system could support a peak power of 5.13 PW. Meanwhile, a CPA/OPCPA hybrid laser system has achieved the peak power of 1.0 PW, where an LBO 100 mm in diameter was used in the final OPCPA, and the output energy of 45.3 J was obtained.

1. The 5 PW CPA laser amplifier

The laser system is a typical CPA Ti:sapphire laser with the front-end at a repetition rate of 5 Hz with an output energy of 3.5 J. The laser pulse is then amplified by two large aperture Ti:sapphire amplifiers pumped by an Nd:glass laser system operating on single shot basis. A Ti:sapphire crystal with a diameter of 80 mm was used in the first amplifier, which is a 4-pass structure and can provide sufficient laser energy to seed into the final 4-pass booster amplifier. To get a high energy output, the Ti:sapphire crystal used in the final booster amplifier is 150 mm in diameter with a thickness of 46.7 mm. The parasitic lasing (PL) in these two amplifiers is a major issue of concern. The active PL control technique, where the time delays between the signal laser pulses at different passes and the pump laser pulse are optimized, is implemented with the passive method of PL suppression based on an index-matching cladding of crystal. However, for the 150 mm-Ti:sapphire amplifier, the injected signal energy has to be improved to effectively suppress PL.

Figure 1 shows the output laser energy as a function of the pump energy at two different injection laser energies. With the injected laser energy of 28 J, the maximum output energy is 155 J at a pump energy of 260 J. When the pump energy is higher, serious PL occurs and the output decreases significantly. For the injected laser energy of 35 J, the output laser energy achieves 192.3 J at a pump energy of 312 J. Meanwhile, the conversion efficiency of pump-signal is 50.4%. The spectral bandwidth of the output laser pulse from the 150 mm-Ti:sapphire amplifier is 53 nm (FWHM). Due to the lack of large aperture gratings, only part of laser energy is compressed in a four-grating compressor. The measured autocorrelation trace demonstrates that the compressed pulse is 27.0 fs in length, as shown in Fig. 2, and the compressor efficiency is 72%.

2. The 1 PW OPCPA laser amplifier

The CPA/OPCPA hybrid laser system was first demonstrated in 2013 with a peak power of 0.61 PW. The conversion efficiency from pump to signal in OPCPA and the final pulse compression to get transform limited short pulse output are important issues of concern. Therefore, optimizing both the pump and the signal pulse intensities for a given-size crystal, is particularly important. Based on the theoretical simulation and experimental optimization of the main parameters, the amplified energy from the final OPCPA reached 45.3 J with a 100×100×17 (mm^3) LBO, corresponding to a conversion efficiency of 26.3% at a pump energy of 169.1 J. The peak power of the CPA/OPCPA hybrid laser system was upgraded to 1.02 PW with a pulse duration of 32.0 fs after pulse compression.

3. Conclusion

The output energy of 192.3 J was obtained from a 150 mm Ti:sapphire chirped pulse amplifier, showing that the parasitic lasing can be effectively suppressed in a Ti:Sapphire crystal 150 mm in diameter. Due to the lack of meter size compressor gratings, only part of laser energy has been compressed with the compressed pulse duration of 27.0 fs and the compressor efficiency of 72%, indicating the capability of generating potentially a 5.13 PW peak power laser pulse. Additionally, the output energy of 45.3 J was obtained by the CPA/OPCPA hybrid system with the 100-mm size LBO crystal as the final amplifier, and the peak power of 1.02 PW with a pulse duration of 32.0 fs after pulse compression. The above experimental results (5 PW CPA amplifier and 1 PW OPCPA amplifier) are a notable progress on the road towards a 10 PW laser system.

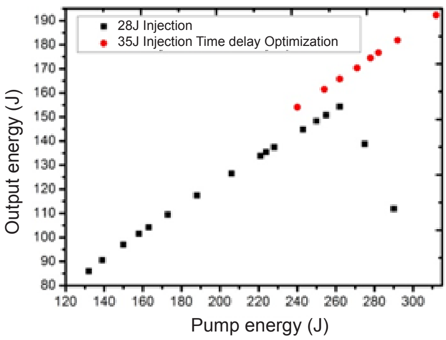


Fig. 1 Output laser energy vs pump energy

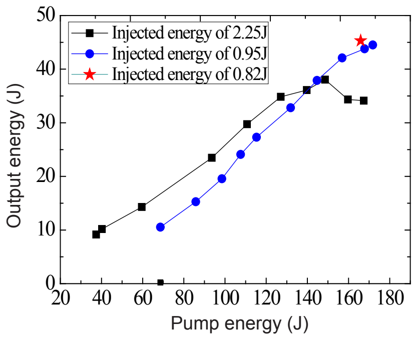


Fig. 3 Output vs pump energy at different injection

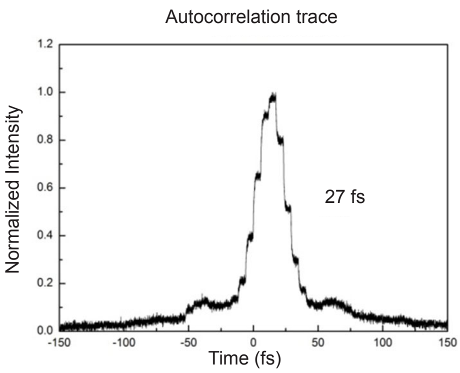


Fig. 2 Measured autocorrelation trace of the pulse

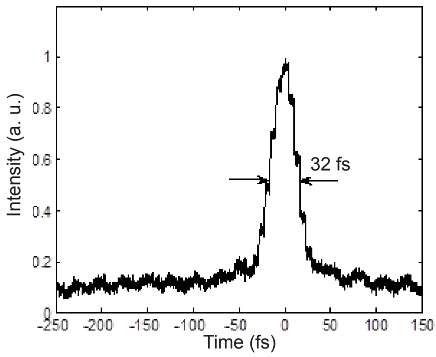


Fig. 4 Measured autocorrelation trace of the pulse

Extreme Light Infrastructure – Nuclear Physics (ELI-NP) Project: Status of Implementation

Victor Zamfir, ELI-NP, IFIN-HH, Bucharest-Magurele, Romania

The project Extreme Light Infrastructure – Nuclear Physics (ELI-NP) [1] will be an European research centre to study ultra-intense lasers interaction with matter and nuclear science using gamma and laser driven radiation beams. The new research centre will be located in Magurele, a town a few kilometres away from Bucharest, Romania.The total cost of the facility will be 300 million Euros. Commissioning is expected to take place in 2018.

The ELI-NP facility combines two major research equipment with beyond state-of-the-art parameters, namely:

• A high power laser system (HPLS), with two arms of 10 PW and intensities on the target in the range of 10^{23} W/cm^2. The HPLS is being built by Thales Optronique France and Thales Romania.

• A gamma beam system (GBS) to deliver up to 19 MeV photons with extremely good brilliance and bandwidth, based on Compton scattering of a high repetition pulsed laser beam on a relativistic electron beam produced by a warm linac of 720 MeV. The GBS is being constructed by EuroGammaS, a European Consortium of academic and research institutions and industrial partners with expertise in the field of electron accelerators and laser technology from 8 European countries, the consortium led by INFN Italy.

The ELI-NP buildings complex, covering more than 30000 m^2, comprises the experimental building hosting the main research equipment, the experimental areas, laboratories, workshops, control rooms and user area, the office building, a guest house and a canteen. The figure below shows the status of the construction in May 2015.

The scientific program for ELI–NP [2, 3, 4] was elaborated by an international collaboration of more than 100 scientists from 30 countries.

The main research topics of interest are: laser driven nuclear physics experiments, characterization of the laser–target interaction by means of nuclear physics methods, photonuclear reactions, exotic nuclear physics and astrophysics. In addition to fundamental themes, applications of HPLS and GBS are also considered.

The ELI-NP team together with their collaborators from the international scientific community shaped the future scientific program of ELI-NP in a series of workshops and defined ten development directions for the facility. The Technical Design Reports (TDRs) are being finalized and in June 2015 will be approved by ELI-NP International Scientific Advisory Board, chaired by Toshiki Tajima.

1. www.eli-np.ro
2. Dietrich Habs, Toshiki Tajima, Victor Zamfir, Extreme Light Infrastructure – Nuclear Physics (ELI-NP): New Horizons for Photon Physics in Europe, Nuclear Physics News vol.21 No. 1 (2011) p.23-29.
3. N.V. Zamfir, EPJ Web of Conferences, 66, 11043 (2014).
4. N.V. Zamfir, EPJ Special Topics, vol. 223, 1221-1227 (2014).

New Perspectives for Modeling in the Laboratory Extreme Astrophysical Phenomena Using High-power Lasers Coupled to Strong Magnetic Fields

Julien Fuchs, LULI, Ecole Polytechnique, France

Remarkable progress in the understanding of our universe has been made in the 20th century, partly due to significant advances in astronomical observations, leading to a new vision of its formation and evolution. However, major scientific questions still stay open since spatial measurements still allow access, with limited resolution, only to “snapshots” of the systems and not to their full evolution. This has led to founding of the domain of “Laboratory Astrophysics”, a way to locally, in the laboratory and using plasma machines, investigate fundamental processes pertaining to the understanding of the Universe. With this approach, major successes have been achieved, mostly in planetary science, studying the thermodynamics of compressed and hot plasmas. A new possibility has been recently emerging, i.e. coupling of plasmas produced by high-power lasers with tunable, external and strong magnetic field systems (see Fig. 1). This offers new and wide perspectives to investigate in the laboratory astrophysical phenomena where magnetic fields are thought to be a crucial ingredient and have profound effects. A key aspect, compared to what could be achieved with Z- or X-pinches machines, of such new platforms is that they allow decoupling of plasma generation and magnetization. This is an essential point since this allows to arbitrarily vary plasma magnetization in magnitude or direction.

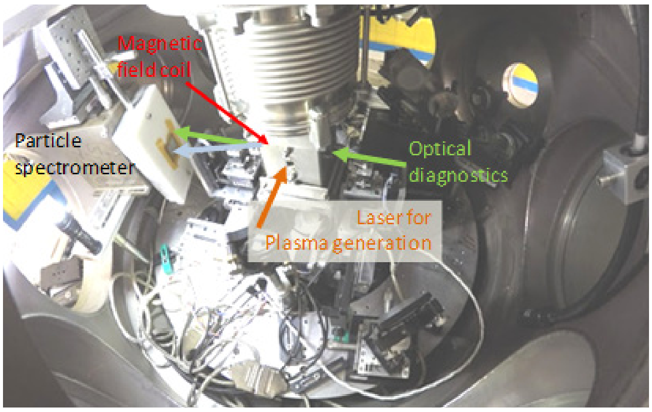
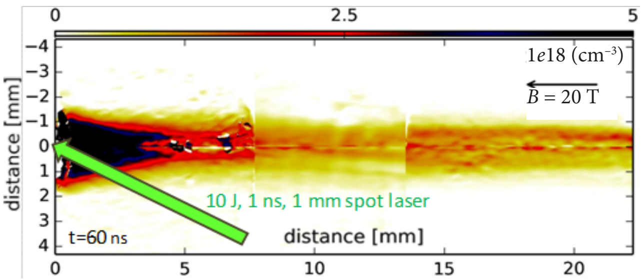
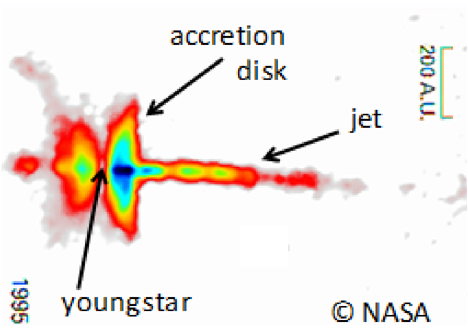


Fig. 1. *Picture of a magnetized plasma shaping experiment as setup in the target chamber of the ELFIE laser facility at LULI (France)*

Quantitative investigations are possible taking advantage of the fact that laser-produced plasmas are scalable in space and time to astrophysical flows. A concrete example of a recent study is illustrated in Fig. 2. Narrow plasma outflows ejected from a young star have quite well known parameters, although the mechanism of the formation of stable, long-range outflows was debated. They are embedded in extremely large scale ~1 μT magnetic fields that are perpendicular to the disk. Taking advantage of dimensionless MHD equations, this



a



b

Fig. 2. *(a) Experimental image [B. Albertazzi et al., Science, 2014] (recomposed from 3 images) of a long, stable plasma jet produced by irradiating a Teflon target by a high-power laser. The jet is magnetically confined by the homogeneous 20 T magnetic field, (b) Hubble space-telescope image of the object HH30*

flow, and a magnetized plasma flow produced by a high-power laser can be formally scaled to each other, e.g. 20 ns of the laboratory flow are equivalent to 6 years for the astrophysical flow; 1 mm is equivalent to 300 AU, or $4.5\cdot10^{13}$ m; and 20 T is equivalent to 1 μT. This scaling allowed understanding the source of the collimation of the astrophysical outflow by its deciphering in the laboratory: the compression, near the source of the plasma flow, of the magnetic field aligned with the jet axis induces a shock that redirects the plasma flow axially, inducing the strong observed collimation. Without magnetization, the laboratory plasma is completely dissimilar: it expands hemispherically.

Similar scaling can be established for other systems for which the underlying physics is still debated. Figure 3 illustrates a possible setup that should allow soon to investigate colliding relativistic plasmas, in view of addressing the formation of collisionless shocks, a subject of intense debate. Such shocks can result from the interaction of relativistic, magnetized outflows stemming from astrophysical sources (e.g. following a supernova explosion) with ambient magnetic field and matter, and are predicted to lead to particle energization (cosmic-rays) and high-energy radiation via reflections of ions on high amplitude electric or magnetic fields. Therefore, laboratory investigations are a great opportunity to bring new significant results to compare with existing observations and to simulations of these phenomena. To investigate colliding relativistic plasmas of relevance for high-energy cosmic rays, the emerging process of radiation pressure acceleration of plasmas could be exploited using the extreme light pressure that will be accessible with the next generation multi-PW laser facilities like "Apollon" (France) or the ELI facilities in Eastern Europe.

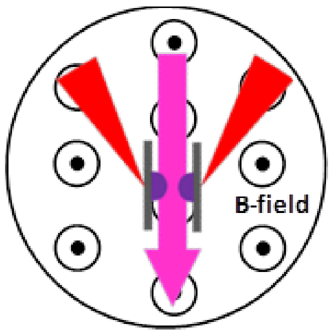


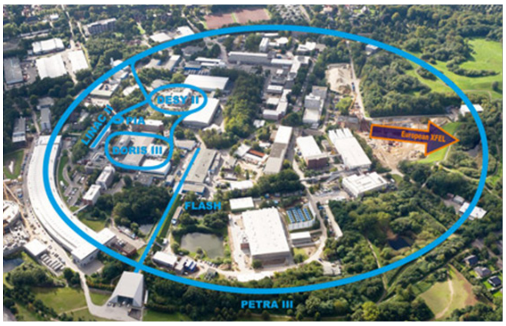
Fig. 3. *Schematic of a possible experiment using two ultraintense laser beams (in red) driving relativistic plasmas (in blue) colliding in a transverse magnetic field, probing laser light (purple)*

As a witness of the emerging importance of this area of magnetized plasmas, it has become one of three focus topics this year of the Department of Energy (USA) for the development of High-Energy-Density science. A forum was also created a few years ago to discuss the possibilities it offers: The "LaB" series of workshops. Three meetings already took place: in 2012 and 2013, in the USA and in France. The two next ones will be held in the USA, at Princeton, in Nov. 2015, and in the summer of 2017, in Russia to strengthen the collaborative exchanges between the USA, Europe, Russia and Asia.

ICFA Meeting at DESY in Hamburg

Thomas Kuehl, DSI, Germany

An important achievement of ICUIL over the last years was to foster a closer connection with the traditional accelerator community. This was documented with dedicated meetings in Darmstadt 2011 and Berkeley 2013, and also includes a general invitation from the ICFA chair to have ICUIL representatives participating to the ICFA meetings. In February 2014, the regular board meeting of ICFA took place at DESY in Hamburg. ICUIL was represented by Toshiki Tajima with a SKYPE presentation, and by Thomas Kuehl, who participated in this meeting. ICFA is leading a concerted international effort to coordinate and support world-wide activities, aiming to define the future of high-energy physics in the next twenty-to-thirty years. The agenda included reports and discussion on a number of future accelerator projects. Ideas for large scale facilities were presented which will be proposed to be installed in Japan, Europe, China and Korea. In his short Skype presentation, which was attended by all representatives, ICUIL chairman Toshiki Tajima explained the latest progress in laser technology towards an improvement of average power, as needed for a wide application of laser drivers for high energy accelerators. The connection between the ICFA and ICUIL communities was further documented in the report of Brigitte Cros, Univ. Paris-Sud, chair of the ICFA Panel on Advanced and Novel Accelerators. Although the main line of discussions was centred on the extension of classical accelerator schemes, the importance of novel laser acceleration approaches is well recognized. It was emphasized that a next dedicated meeting on laser acceleration would be a timely step to encourage a close interplay between international developments towards novel acceleration schemes.



1st Workshop on Laser Solutions to Orbital Space Debris

Mark N. Quinn, IZEST, Ecole Polytechnique, France

The first international workshop on the topic of «Laser Solutions to Orbital Space Debris» was held recently in Paris.

Organised by Ecole Polytechnique researchers including Dr. Mark N. Quinn and Prof. Gerard Mourou from the IZEST group, the workshop was held from the 27–28 of April, hosted with collaborators at the Astro Particle Cosmology (APC) Laboratory at the University of Diderot Paris.

Over 30 million kg of debris including small fragments, rocket bodies and whole satellites have accumulated in Earth's orbit since the beginning of the space age. The more numerous fragments are the main threat of impacting larger satellites both functional and derelict. With large relative velocities in orbit surpassing 10 km/s, even small cm size debris can impact and explode large multi-ton bodies creating many more additional fragments. This increasingly leads to the chain reaction known as the Kessler Syndrome. Potentially, the very useful orbits containing the majority of communications satellites could be lost in a few decades unless strong mitigation and active remediation are introduced.

Lasers of different technologies and sizes have many applications to this increasing problem including the detection and tracking of small debris that are rarely catalogued to the removal using short picosecond pulses to ablate and push the debris to burn up in the atmosphere. Development of new efficient laser technologies such as the XCAN laser at Ecole Polytechnique opens the doors to exciting applications of higher powered lasers for space based science where energy-saving, low cost, compact and robust systems are required. Indeed, in the past few weeks there has been much international attention focused on the recent work involving French and Japanese scientists from the IZEST collaboration on using such a laser system situated on the International Space Station to begin testing applications for visualizing and eventually actively pushing space debris fragments from useful earth orbits [1].

This workshop brought together over 60 researchers from many different fields and nationalities, including Japan, Australia, Europe and the USA together with representatives from aerospace companies, including ESA, NASA and Airbus. During the two days many topics were presented including laser tracking of debris from Earth, space-based and ground based removal of debris, novel laser technologies and laser-plasma interactions.

Afterwards, it has become clear that these different pursuits can collaborate together, and a key outcome of the workshop is the building of links in this world-wide community. There have already been invitations from Japan and Australia to host the next workshops on «Laser Solutions to Orbital Space Debris».

All of the presentations of the workshop are available online on the Ecole Polytechnique/IZEST website [2].

1. T. Ebisuzaki et al., Demonstration designs for the remediation of space debris from the International Space Station, Acta Astronautica, Vol. 112, p. 102-113 (2015).
2. http://www.izest.polytechnique.edu/

The International School on Ultra-Intense Lasers

Artem Korzhimanov, Institute of Applied Physics RAS, Russia

The International School on Ultra-Intense Lasers will be held in the Hotel@Resort "Yunost" 40 km from Moscow, Russia, from 4 to 9 October, 2015.

The School is organized by the International Committee on Ultra-Intense Lasers (ICUIL), Institute of Applied Physics of the Russian Academy of Sciences (IAP RAS), National Research Nuclear University MEPhI and Russian Federal Nuclear Center (RFNC-VNIIEF).

This event is primarily aimed at providing postgraduate students and other early career researchers working in ultra-intense laser science with a thorough pedagogical grounding in high power laser physics, laser-matter interaction physics, laser-plasma accelerators, laser-based x-ray sources and inertial confinement fusion.

The lectures will be given by distinguished experts in the field representing world leading research centers from around the world, including *Sergey Belkov* (RFNC-VNIIEF, Russia,"Problems of laser fusion"); *Dimitrios Charalambidis* (the Univ. of Crete, FORTH-IESL, Greece, "Attosecond science"); *Eric Cormier* (CELIA, France, "Metrology of ultrashort laser pulses"); *Julien Fuchs* (LULI, France, "Laboratory astrophysics with ultra intense lasers"); *Mikhail Kalashnikov* (ELI-HU, Hungary, "CPA at petawatt level"); *Igor Kostyukov* (IAP RAS, Russia, "Electron acceleration with ultra-intense lasers"); *Thomas Kuehl* (GSI, Germany, "At the interface between ultra-intense lasers and nuclear and high-energy physics"); *Gérard Mourou* (Ecole Polytechnique, France, "Horizons of exa-zepto physics"); *Nikolay Narozhny* (MEPhI, Russia, "Extreme light physics"); *Alexander Pukhov* (University of Duesseldorf, Germany, "Particle-in-cell codes for plasma-based particle acceleration", "High intensity laser interaction with solid density targets: novel sources of x rays and energetic ions"); *Vladimir Tikhonchuk* (CELIA, France, "Physics of laser-plasma interaction in application to ICF").

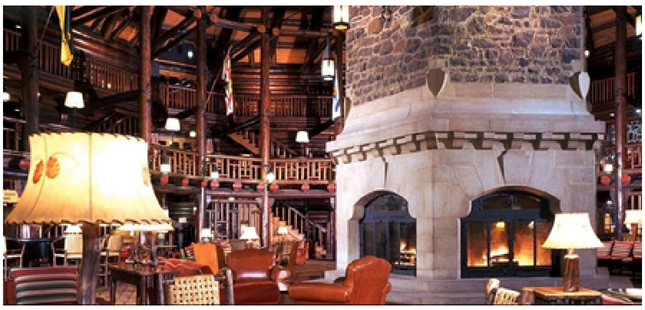
The organizers believe that quite a wide scope of topics and the brilliant lecturers will attract more young researchers to this promising field of modern science. This is really one of the key goals and the intrinsic stimulus to hold the school.

School website www.isuil.iapras.ru

2016 ICUIL Conference: 11–16 September 2016, Montebello, Canada

Tsuneyuki Ozaki, Institut National de la Recherche Scientifique, Canada

The 2016 ICUIL Conference will be held at the Fairmont le Château Montebello, situated within a 65,000 acre forested wildlife sanctuary and 70 lakes, on the shore of the Ottawa River. The hotel is located between Ottawa and Montreal, about 80 minutes by car from both international airports. The conference will be held in the hotel's newly renovated congress centre, with plenty of adjacent space for participants and vendors to discuss. Following past successful conferences, this biennial meeting will focus on the generation, amplification, compression, and measurement of ultra-high-intensity lasers as well as their applications.



Contacts Editor: Alexander Sergeev, ams@ufp.appl.sci-nnov.ru
Toshiki Tajima, toshiki.tajima@physik.uni-muenchen.de