FEMTO - Newsletter 3

FEMTO (Interaction of superintense, femtosecond laser fields with atoms, solids and plasmas) is a program of the European Science Foundation in the Physical and Engineering Sciences. For more information see the web site: http://www.esf.org/FEMTO/
Contributions are welcome from all the groups working in the field. Any news or material to be included in this newsletter should be sent to Dimitri Batani at the e-mail address batani@mib.infn.it or fax + 39 02 6448 2585
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SUMMARY

PHYSICAL & ENGINEERING SCIENCES

FEMTO in brief

The Programme on "Interaction of superintense, femtosecond laser fields with atoms, solids and plasmas" (short name: FEMTO) is a programme of the European Science Foundation in the Physical and Engineering Sciences. Its chairman is Prof. Charles Joachain from the Université Libre in Brussels.
One goal of the programme is to bring together the scientific communities of atomic and plasma physics.

Research focuses on the following areas at the forefront of the rapidly expanding domain of femtosecond laser interactions:

1. Multiphoton ionisation of atoms in strong fields.
2. Dynamics of small molecules intense laser fields.
3. New physical mechanisms and novel applications for high-order harmonic generation.
4. Generation of pulses in the attosecond range.
5. Relativistic effects in laser-atom and laser-plasma interactions.
6. Physics related to the "fast ignitor" approach to inertial confinement fusion (ICF).
7. Study of exotic states of matter for basic physics and astrophysics.

The contributing organisations are:

Belgium:
Fonds National de la Recherche Scientifique

Germany:
Max-Planck-Gesellschaft (MPG); Hermann v.Helmholtz-Gemeinschaft Deutscher Forschungszentren (HGF)

Italy:
Istituto Nazionale per la Fisica della Materia (INFM); Consiglio Nazionale delle Ricerche (CNR)

France:
Centre National de la Recherche Scientifique (CNRS); Commissariat à l'Energie Atomique (CEA)

Portugal:
Instituto de Cooperaçao Ciêntifica e Tecnológica Internacional

Sweden:
Naturvetenskapliga Forskningsradet

Czech Republic:
Academy of Sciences of the Czech Republic.

Spain:
Consejo Superior de Investigaciones Cientificas; Oficina de Ciencia y Tecnologia; Universidad Politecnica de Madrid

Austria:
Fonds zur Förderung der Wissenschaftlichen Forschung; Österreichische Akademie der Wissenschaften

Most of the activities of the programme are coordinated by a "Core Committee" whose members are D. Batani, C.J. Joachain, M. Koenig and W. Sandner. ESF Contacts are Mrs. Catherine Werner or Dr. N. Williams. Email: cwerner@esf.org Fax: +33 (0) 3 88 37 05 32

The programme includes the following activities:
1. EURESCO Conferences and SUMMER SCHOOLS
2. WORKSHOPS
3. GRANTS and SHORT VISITS.
For grants and short visits see the information the web site. These are funded respectively up to the amount of 5000 and 10000 French Francs. Applications are required at least two weeks in advance.

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announcement

Workshop on "Recent developments and opportunities in ultra-high pressure in physics. Applications to planetary physics" Cargese, April 19-22, 2001

The Institut D'Etudes Scientifiques of Cargese will host a workshop on recent developments and opportunities in ultra-high pressures in physics. The meeting is supported by the European Science Foundation in the framework of the "Exploratory Workshops" scheme and by the FEMTO programme, and will deal with the new opportunities to generate high pressures by laser-heated diamond cells or laser-generated shock waves.
Aim of the workshop is to discuss some open questions in the field of high pressure physics, i.e. precise equation of state determinations, constraints on elastic constants and acoustic wave velocities, better knowledge of high-pressure melting points, kinetic effects on melting and other phase transitions, evaluation of mechanical and thermal transport properties in warm dense matter.
Topics will include:
1) Molecular systems. Applications to giant planets and brown dwarfs.
2) Iron. Current state of the art: experiments and calculations.
3) Future.

For more information please contact
michel.koenig@polytechnique.fr

See also the web site:
http://www.luli.polytechnique.fr/wmk/index.html

A view of Cargese

WORKSHOP PROGRAMME

Day 1		
9.00-9.15	E. Biemont	ESF presentation
9.15-9.30	D. Batani & M. Koenig	Welcome, Workshop presentation
9.30-10.10	R. Boelher	The laser-heated diamond cell: past and present
10.10-10.40	P. Loubeyre	Dense hydrogen and other simple molecular systems at very high static pressures
10.40-11.10		COFFEE BREAK
11.10-11.40	D. Batani	EOS measurements using high power lasers
11.40-12.10	T. Guillot	Equation Of State and Giant planets structures
12.10-12.30	R. Cauble	Equation of State Measurements along the Compression Isentrope to 50 GPa using Magnetic Pressure
12.30-14.00		LUNCH
14.00-14.40	S. Bernard	Quantum calculations for matter at extreme conditions
14.40-15.00	E. Henry	Water EOS and conductivity measurements using a high power laser
15.00-15.20	D. Riley	X-ray Scattering as a dense plasma diagnostic
15.50-16.10		COFFEE BREAK
16.30-17.30		DISCUSSION
Day 2		
9.00-9.40	V. Fortov	Intense Shock Waves and Non-ideal Plasmas
9.40-10.00	J. Clerouin	Overview of hydrogen calculations at extreme conditions
10.00-10.20	D. Andrault	Iron structure using DAC
10.20-10.40	G. Fiquet	Acoustic waves in iron
10.40-11.00		COFFEE BREAK
11.00-11.40	N. Holmes	Making an impact on condensed matter physics-gas guns for fun and PRL's
11.40-12.00	R. Bini	Molecular transformations in the 'red phase' of oxygen
12.00-12.20	R. Cauble	Shock Compression of Diamond into the Metallic Phase
12.20-13.30		LUNCH
14.00-17.30		EXCURSION
Day 3		
9.00-10.40		POSTER SESSION
10.40-11.00		COFFEE BREAK
11.00-11.20	C. Cavazzoni	Ab-initio study of high pressure dissociated water
11.20-11.40	J. Badro	Future of synchrotron studies
11.40-12.30		DISCUSSION
12.30-14.00		LUNCH
14.00-14.20	M. Koenig	Laser facilities in Europe
14.20-14.40	R. Cauble	Future of laser-driven shocks experiments
14.40-15.00	N. Holmes	Future impact experiments at modest pressures and lukewarm temperatures
15.00-15.20	N. Tahir	Study of Heavy-Ions induced high pressures in solid matter
15.20-15.40	D. Price	Future of Quantum Mechanic calculations
15.40-16.00		COFFEE BREAK
16.00-17.30		DISCUSSION AND FINAL CONCLUSIONS

Prague ASTERIX Laser System (PALS) - the Femto Connection

K. Rohlena, B. Rus, K. Jungwirth, J. Ullschmied

Institute of Physics and Institute of Plasma Physics of Academy of Sciences of the Czech Republic

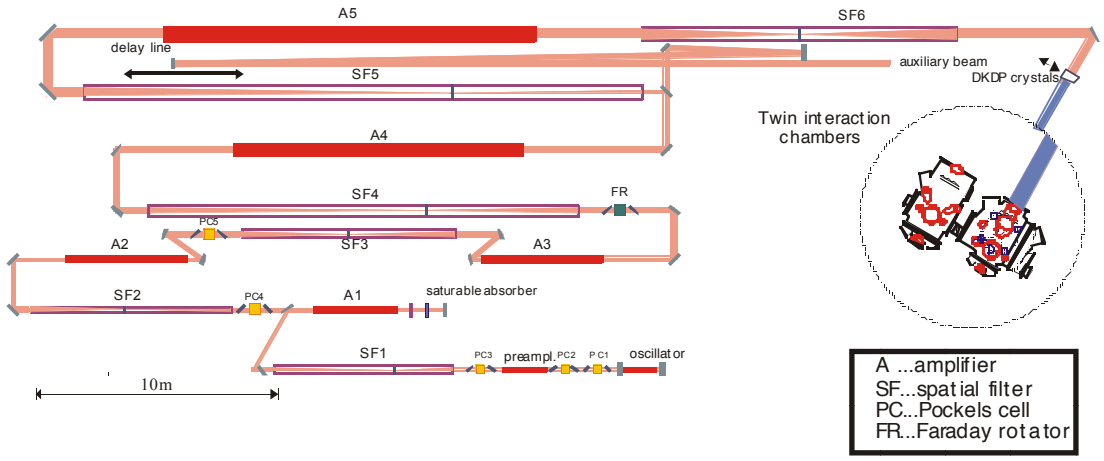
PALS building

The new PALS laboratory became operational for external users under the EU 5th FP IHP "Access to Research Infrastructures" scheme in Prague in September 2000. It is based on the iodine laser Asterix IV, which was moved from its original site at the MPQ Garching. The last shot in Garching occurred in the Spring 1997, the first full energy shot in Prague almost exactly 3 years later. A new, dedicated laser hall and an innovative interaction chamber were constructed while the laser components were being moved from Germany.
The system is characterised by the following parameters, familiar to those who profited from their visits to Garching,

Number of beams	1 (2nd auxiliary diagnostic beam available)
Fundamental wavelength:	1.315 μm
Maximum output energy:	1 kJ
Pulse duration:	400 ps
Maximum pulse power:	3 TW
Output beam diameter:	29 cm
Conversion efficiency in the DKDP crystals into 3rd harmonics (438 nm):	70%
Laser shot rate:	1 shot per 20 min, typically 200 shots per month

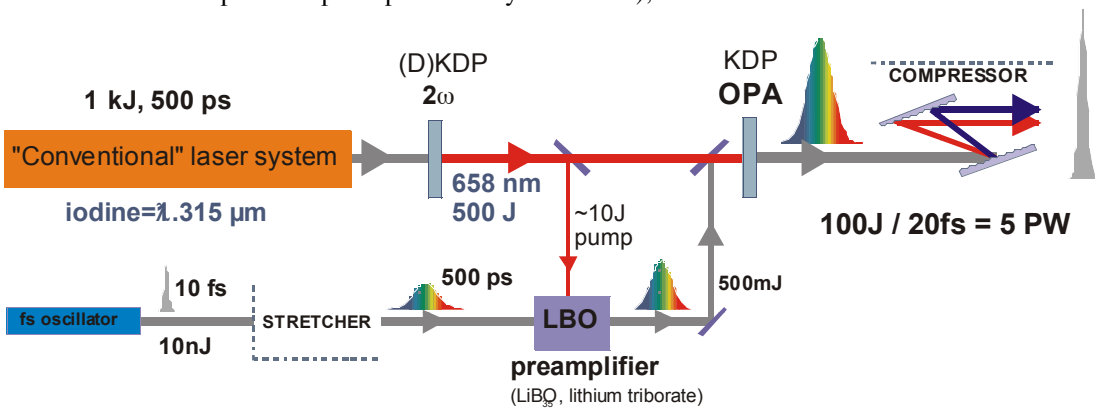
The original ambition for the newly installed system was, besides the "classical" laser plasma experiments, to be used as driver for a routine x-ray laser operation and to pursue the frontier research in the domain of very short wave length using the coherent x-ray laser beam. The twin interaction chamber was constructed (J.-C. Lagron, LSAI) exactly for this purpose. For more information on the PALS programme see e.g. *(Rus B., et al., 1998)*.
It was generally accepted that the iodine lasers with a narrow fluorescent line are inherently incapable of generating in a stable way below ~100 ps. However, still before the laser components had been fully moved to Prague, a new indirect femtosecond pulse generation scheme called OPCPA (Optical Parametric Chirped Pulse Amplification) was discovered and successfully tested at RAL *(Ross I.N et al., 1997)*. This new method opened a way for energy transfer from a narrow spectrum laser pulse to a spectrally much broader chirped pulse through the parametric amplification in the optical region using non-linear crystals as parametric amplifiers. The amplified chirped pulse spectrum is broad enough to be shortened down to a femtosecond range making thus possible with a suitable arrangement to achieve high values of pulse energy at the pulse length of 10-100 fs. In fact, there is a reasonable chance of setting a record in the achievable peak laser power, which may lie in the petawatt range.

The process of energy transfer is based on the mechanism of three wave interaction in a non-linear crystal with a suitable degree of non-linearity in its susceptibility tensor. The practical way how to obtain an OPCPA amplification is to overlap the chirped pulse and a narrow spectrum energetic pumping pulse in a crystal fulfilling the resonant condition at a slightly non-collinear propagation. If the length of the optical path inside the crystal is suitably adjusted a large part of the energy of the pumping pulse is transferred to the chirped pulse and to a residual "idler" wave at the difference frequency, which must be dumped on each OPCPA amplifier exit. The existence of the idler wave, which carries away a certain amount of pumping pulse energy, is the price to be paid for the non-linear amplification mechanism, however, it does not represent a serious drawback. Indeed, if a broad spectrum pulse is amplified by a linear mechanism such as in conventional broad band solid state laser amplifiers the cross section of the stimulated emission is inversely proportional to the spectral width and the gain is thus reduced. On the other hand, the non-linear gain of an OPCPA amplifier may be much higher than what would be attained by a linear amplification. Also the amplification band of the OPCPA amplifier is given by the ability of the crystals to act as a transparent non-linear medium in the frequency band of the seed chirped wave. This is usually fairly broad.



Scheme of the PALS system with the twin interaction chamber as installed in the new hall in Prague.

It was soon realised that the OPCPA mechanism will be able to cure the above mentioned handicap of the iodine lasers in the ultra short domain.. As soon as a frequency doubled or tripled laser beam of an iodine laser is used as the pumping pulse to drive the OPCPA amplifiers its energy can be transferred to a weak chirped seed pulse produced by an alien Ti:S oscillator followed by a stretcher and gradually amplified to a record level. Based on the PALS parameters a simulation of OPCPA implementation on PALS was performed. The upgrade may be arranged e.g. according to the following scheme *(Matousek et al., 1998; Matousek et al., 2000)*,



A possible arrangement of OPCPA upgrade on PALS to generate a record femto second pulse.

Although clearly very promising, the implementation of scheme is a more distant future for the PALS laboratory than the more advanced development of the coherent XUV beam. Moreover, the present OPCPA line at RAL is not a prove of principle of a good performance in the petawatt range. When pursuing this goal all kinds of difficulties may emerge. In addition to the notorious limitations given by the compressor diffraction gratings, it is obvious that with the high amplification OPCPA chain it will be difficult to keep the contrast ratio on an acceptable level. In spite of that the femto upgrade has been integrated in the plans of PALS laboratory future development as a task, which, if successful, will be highly rewarding.

Rus B., Rohlena K., Skála J., Králiková B., Jungwirth K., Ullschmied J., Witte K.J.,. Baumhacker H., A new high-power laser facility PALS – prospects for laser-plasma research, Laser&Part.Beams **17** 179-194 (1999)

Ross I.N., Matousek P., Towrie M., Langley A.J., Collier J.L., The prospects for ultrashort pulse duration and ultrahigh intensity using optical parametric chirped pulse amplifiers, *Optics Commun.* **144** 125-133 (1997)

Matousek P., Rus B., Ross I.N., "Assessment of Asterix/PALS upgrade to petawatt peak powers", internal CLF RAL Report, (1998)

Matousek P., Rus B., Ross I.N., Design of multi-petawatt optical parametric chirped pulse amplifier for the iodine laser ASTERIX IV, IEEE J.Quant.Electron. **36** 158-163 (2000)

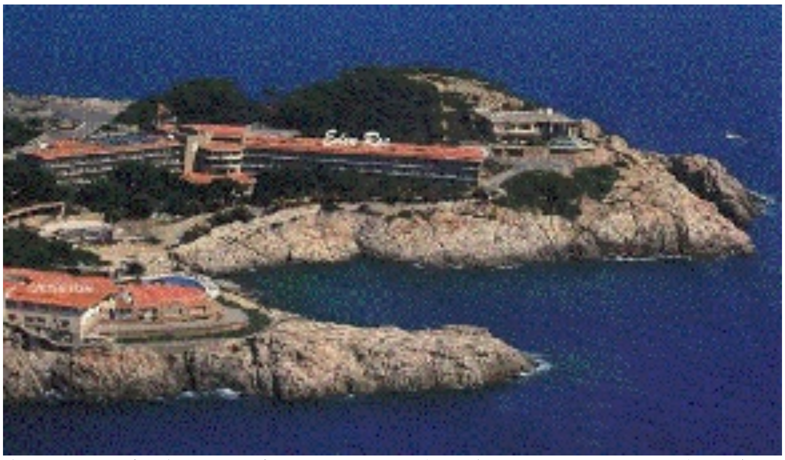
announcement

S.Feliu, SPAIN
29 September – 4 October 2001

Matter in Super-Intense Laser Fields: Short Pulse, Superstrong Laser-Plasma Interactions

Chairman: D.Batani (Università di Milano-Bicocca, Italy)
Vice-Chairmen: P.Agostini (CEA Saclay, France), M.Koenig (LULI, Ecole Polytechnique, France)

The recent development of high-energy short-pulse lasers has led to the discovery of new phenomena in laser interactions with matter and has opened new perspectives in plasma physics allowing completely new regimes to be investigated. Relativistic plasmas and Strongly-coupled Degenerate Plasmas have become experimentally accessible. Numerical, theoretical and diagnostics improvements have progressed at the same time. Applications like particle sources, X-rays and High harmonics generation, Fast ignition are foreseen. At the same time astrophysically relevant experiments and equation of state experiments in the Multimegabar regime have been realised helping our comprehension of the universe.



The site of the Conference: Hotel Eden Roc at S.Feliu (near Barcelona)

Topics:

- **Astrophysics in the laboratory**
- **Equation of State**
- **Particle sources from high-intensity lasers**
- **Numerical simulations**
- **Advancement in ICF and fast ignition**
- **Atomic Physics in Dense Plasmas**
- **Atomic Physics in Strong Fields**
- **Advanced Plasma Diagnostics, X-ray laser, High Harmonics**

The S.Feliu conference is especially conceived as a forum for young people (Ph.D. students and Post-Docs). Grants will allow their participation covering the conference fee and/or accomodation. A series of short talks will give young people the possibility of presenting their latest research results. In addition poster sessions are also planned.

The conference is co-sponsored by the ESF Programme "Interaction of superintense, femtosecond laser fields with atoms, solids and plasmas" (FEMTO) (www.efs.org/femto)

The list of invited speakers includes:

B.Remington (Lawrence Livermore National Laboratory, USA)
J.P.Chieze (CEA, Saclay, France)
C. Chenais-Popovics (LULI, Ecole Polytechnique, France)
M.Borghesi (Queen's University of Belfast, UK)
C. Cornaggia(DSM/DRECAM/SPAM, CEA, Centre d'Etudes de Saclay, France)
M. Koenig (LULI, Ecole Polytechnique, France)
J.Honrubia (Universidad Politecnica, Madrid, Spain)
A.Benuzzi-Mounaix (LULI, Ecole Polytechnique, France)
S. Bouquet (CEA, Bruyères-le-Châtel, France)
J. Davies (GOLP, Instituto Superior Tecnico, Lisbon, Portugal)
J.C. Gauthier (LULI, Ecole Polytechnique, France)
V.Malka (LULI, Ecole Polytechnique, France)
L.F. Di Mauro (Brookhaven National Laboratory, USA)
T.Hall (University of Essex, UK)
K.Eidmann (Max Planck Institut fur Quantenoptik, Garching, Germany)
T. Guillot (Observatoire de la Côte d'Azur, France)
P. Agostini (DSM/DRECAM/SPAM, CEA, Centre d'Etudes de Saclay, France)
C. Rousseaux (CEA, Bruyères-le-Châtel, France)
A. Giulietti (IFAM, CNR, Pisa, Italy)
J.F. Hergott (DSM/DRECAM/SPAM, CEA, Centre d'Etudes de Saclay, France)
R. Teyssier (CEA, Saclay, France)
C.Joachain (Universite' Libre Bruxelles, Belgium)

Contact: Dimitri Batani, E-address: batani@mib.infn.it
Dipartimento di Fisica "G.Occhialini" and INFM, Università degli Studi di Milano - Bicocca
Piazza della Scienza 3 , 20126 Milano ITALY, tel 39-02-64482313, fax 39-02-64482585

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announcement

5th Fast Ignitor Workshop, Madeira, June 18-22, 2001 - satellite of **EPS2001**

http://www.cfn.ist.utl.pt/EPS2001

All information on PARTICIPATION, ORGANISATION, PROGRAMME is now available at http://www.mpq.mpg.de/5th-FI-Workshop
Follow the instructions given there for Participation and Abstract Submission.

Please note that all administration issues (registration, conference fee, travel and hotel reservation) are dealt with by EPS2001. The corresponding web site http://www.cfn.ist.utl.pt/EPS2001 is presently updated to include all necessary information. Check this page during the next two weeks to see the update and then follow the instructions.

Concerning the workshop, all information given at www.mpq.mpg.de/5th-FI-workshop is also given here below.

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WORKSHOP PARTICIPATION

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Workshop secretary:

R. Weise-McKnight
Max-Planck-Institute for Quantum Optics
Hans-Kopfermann-Str.1
D-85748 Garching, Germany
Tel: +4989-32905-736
Fax: +4989-32905-200

<e-mail to> rwm@mpq.mpg.de

REGISTRATION

VERY IMPORTANT:
YOU HAVE TO REGISTER AS PARTICIPANT OF EPS2001 FOLLOWING THE INSTRUCTIONS AT http://www.cfn.ist.utl.pt/EPS2001.
Use the Registration Form found at this web site.

Notice that all administration (registration, conference fee, etc.,) is dealt with by EPS2001, while the scientific programme of the satellite workshop is organized separately and requires the Participation Form.

CONFERENCE FEE

Notice that, different from previous workshops, which were organized by institutes in their own buildings, a fee is due on Madeira to cover the workshop costs. As a special offer, the fee for workshop participants is only 40% of the regular fee of EPS2001.

The actual fee depends on whether you are a member of EPS and on whether you pay before April 15, 2001. Check the information given at
http://www.cfn.ist.utl.pt/EPS2001.
For students (showing enrolment at a university), the flat fee is 40 EURO.

TRAVEL and HOTELS

Information on travel to Funchal (Madeira), on hotel accommodation, and on the location of the conference site will be found on the update of
http://www.cfn.ist.utl.pt/EPS2001.
Hotel reservation should be made as early as possible, certainly **before April 15, 2001**, to take advantage of block reservations. Use the Hotel Registration Form found at the web site.

The port of Funchal

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WORKSHOP ORGANISATION

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The 5th Workshop on Fast Ignition of Fusion Targets will be held on the island of Madeira as a satellite meeting of the 28th EPS Conference on Controlled Fusion and Plasma Physics. Joint morning sessions will include broad overviews on Fast Ignitor Research and IFE in general, while workshop sessions are organized separately and run in parallel to the main conference. Workshop participants register as participants of EPS2001; however, all scientific matters are dealt with by the Workshop Programme Committee:

J. Meyer-ter-Vehn (chairman, Germany),
T. Mendonca (local chairman, Portugal),
D. Batani (Italy) , J.C. Gauthier (France),
J. Honrubia (Spain), S. Karttunen (Finland),
P. Norreys and O. Willi (UK),
M. Campbell (USA), K. Mima (Japan).

GOAL OF THE WORKSHOP

The intention is to attract all people actively working on fast ignitor research worldwide to present the recent progress and to discuss the future perspectives. Beside the basic areas
(1) IFE targets and fast ignition,
(2) simulation of relativistic laser plasma interaction,
(3) channels and beams,
(4) electron transport and magnetic fields,

the Madeira workshop wants to emphasize the nuclear fusion context and will address in particular:

(5) experiments with compressed targets,
(6) ultra-high current transport and filamentation,
(7) laser-driven ion beams for fast ignition,
(8) new ideas on full target designs,
(9) new concepts of laser amplification,
(10) alternative ignition concepts.

STRUCTURE OF THE WORKSHOP

To provide ample space for discussion, oral contributions will be limited to 10 minutes; speakers are asked to use posters in addition for more detailed presentation of their results. 50 poster boards will be available for full week presentation. Groups may submit several contributions (just use ABSTRACT SUBMISSION several times).

There will be 10 sessions of 90 minutes each. Each session will have a coordinator to lead the discussion on a particular topic and a review speaker who has to summarize in 30 minutes his own results and those of others. The organizing committee will select topics, coordinators and review speakers on the basis of submitted abstracts.

WORKSHOP VIEWGRAPH COLLECTION

Each participant will receive a collection of viewgraphs presented at the workshop after the conference. For this purpose, everybody should make paper copies of his viewgraphs in advance and bring them to the workshop.

Workshop participants are also invited to submit written contributions to be included in the EPS2001 Proceedings. This is optional. Follow the instructions at http://www.cfn.ist.utl.pt/EPS2001.

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WORKSHOP PROGRAMME

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A first break-down of topics is given below.
Suggestions for improvement are welcome.

FAST IGNITION CONCEPTS (1 session):
The Tabak scheme of 1994 and what have we learned since?
Parameter studies of fast ignition
Ignition of T-poor and non-DT fuels

LASER PROPAGATION IN UNDERDENSE PLASMA
(1 session):
Laser plasma channels and electron beams
Wakefield vs direct electron acceleration

INTERACTION WITH OVERDENSE PLASMA
(2 sessions):
Diffusive transport of electrons
Magnitized transport and filamentation
Collective energy deposition and plasma heating
Transmission experiments

X-RAYS AND NUCLEAR PROCESSES (1 session):
Observed bremsstrahlung and K_alpha radiation
Nuclear processes: neutrons, fission, positrons, pions

LASER-INDUCED ION BEAMS (1 session):
Observed proton and heavy ion beams from irradiated foils
Acceleration mechanism, scaling, dependence on surface geometry

EXPERIMENTS WITH COMPRESSED TARGETS
(1 session):
Laser interaction with shock-compressed targets
Interaction with spherically imploded targets conical implosion schemes

NUMERICAL SIMULATION (1 session)
Progress in PIC simulation
Hybrid simulations
Strategies for full fast ignition simulation

DESIGN OF FAST IGNITION TARGETS (1 session):
Fast ignition of direct and indirect imploded fuel
Parameter studies
Fast ignition with ion beams
Cylindrical implosion and injected entropy

LASERS AND NEW CONCEPTS (1 session):
New facilities for fast ignitor research
OPA scheme
Experiments on superradiant amplification

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BACKGROUND

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`Fast Ignition (FI)´ stands for a new option to ignite compressed fusion fuel by petawatt laser pulses. This may reduce substantially overall driver requirements for Inertial Fusion Energy (IFE). The idea is still in an exploratory phase. It involves relativistic laser plasma interaction, channeled ultra-high current transport and magnetic fields. It may ignite non-DT fuels.

Previous workshops have been held at UC Berkeley (1997), MPQ Garching (1997), RAL Oxford (1998), LULI Paris (2000).

In choosing the EPS Conference on Controlled Fusion and Plasma Physics as the platform for the next workshop on Madeira, we want to highlight the potential of high-power lasers for controlled fusion research in general, and in particular the new impact of ultra-short laser pulses at relativistic intensities. I hope that many of you understand this meeting as a challenge and will come to Madeira.

J. Meyer-ter-Vehn, chairman

The Praça do Municipio (Town Hall Square) in Funchal

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announcement

"PIERO CALDIROLA" INTERNATIONAL CENTRE FOR THE PROMOTION OF SCIENCE
AND INTERNATIONAL SCHOOL OF PLASMA PHYSICS

INTERNATIONAL CONFERENCE ON

ADVANCED DIAGNOSTICS FOR MAGNETIC AND INERTIAL FUSION

VILLA MONASTERO, VARENNA, ITALY
SEPTEMBER 3 - 7, 2001

ORGANIZED BY
International School of Plasma Physics "Piero Caldirola", Italy
Istituto di Fisica del Plasma "Piero Caldirola", CNR, Italy

PURPOSE
This conference will focus on future diagnostic requirements for fusion energy research and will emphasise advanced diagnostics, new techniques and areas where further progress is required. A principle aim is to bring together experts from the magnetic and inertial confinement programs to stimulate ideas and establish links between researchers in both fields. The program will include invited and contributed oral presentations and posters.

DIRECTORS
P. Stott, Association Euratom-CEA, Cadarache, France
A. Wootton, Lawrence Livermore National Laboratory, USA

SCIENTIFIC ORGANIZING COMMITTEE
A. Costley, ITER JCT, Naka, Japan
A. Donné, FOM Institute for Plasma Physics, The Netherlands
J.-C. Gauthier, LULI, Ecole Polytechnique, Palaiseau, France
H.-J. Hartfuss, IPP Greifswald, Germany
D. Hoffmann, GSI Darmstadt, Germany
R. Leeper, Sandia National Laboratory, Albuquerque, USA
W. Morris, UKAEA Culham, UK
T. Murphy, Los Alamos National Laboratory, USA
M. Pergament, Triniti, Troitsk, Russia
J. Sanchez, CIEMAT, Spain
D. Schirmann, CEA/DAM/DIF, Bruyeres le Chatel, France
W. Seka, LLE, Rochester University, USA
R. Snider, General Atomics, San Diego, USA
V. Strelkov, Kurchatov Institute of Atomic Energy, Moscow, Russia
S. Sudo, NIFS, Toki, Japan
T. Sugie, JAERI, Naka, Japan
V. Tereshin, Kharkov Institute of Physics & Technology, Ukrainia
O. Willi, Imperial College, London, UK
T. Yamanaka, ILE, Osaka University, Japan
K. Young, Plasma Physics Laboratory, Princeton University, USA

SCIENTIFIC SECRETARIAT
D. Batani, Milano-Bicocca University, Italy
G. Gorini, Milano-Bicocca University and ISPP, Italy

LOCAL ORGANIZING COMMITTEE
D. Batani, Milano-Bicocca University, Italy
G. Gorini, Milano-Bicocca University and ISPP, Italy
G. Grosso, Istituto di Fisica del Plasma, CNR, Italy
E. Sindoni, Milano-Bicocca University and ISPP, Italy

SPONSORED BY
International School of Plasma Physics "Piero Caldirola"

Istituto di Fisica del Plasma, CNR
Dipartimento di Fisica, Università di Milano
Ente per le Nuove Tecnologie, l' Energia e l' Ambiente (ENEA)
Consiglio Nazionale delle Ricerche (CNR)
Application for Support within the High-Level Scientific Conferences Programme of EU has been submitted.

APPLICATIONS
Application/Hotel reservation forms can be obtained from: D.Pifferetti, ISPP, e-mail isplasma@tin.it, Fax +39-0341-732490
Deadline for hotel reservation: June 15, 2001

CONTRIBUTED PAPERS
Contributed papers for the workshop will be selected on the basis of a one page abstract. These abstracts should be sent by **June 15, 2001** to:
D. Batani, Fax +39-02 64482585, e-mail batani@mi.infn.it
G. Gorini, Fax +39-02 66173239, e-mail gorini@ifp.mi.cnr.it

REGISTRATION FEE
A registration fee of 700,000 Italian Lire (€ 362) should be paid in Varenna **at the registration desk**. The fee covers admission to the Workshop, social events and Proceedings.
Alternatively, the same fee can be paid by **August 1, 2001**, by bank transfer to: Banca Popolare di Lecco, Division of the Deutsche Bank, via IV Novembre, 23829 Varenna (Lc), Italy, account n. c/c 9500/E, ABI 03104, CAB 51830 in favour of International School of Plasma Physics. All bank expenses are at participants' charge.

FURTHER INFORMATION CAN BE OBTAINED FROM:
D. Batani, e-mail batani@mi.infn.it
G. Gorini, e-mail gorini@ifp.mi.cnr.it

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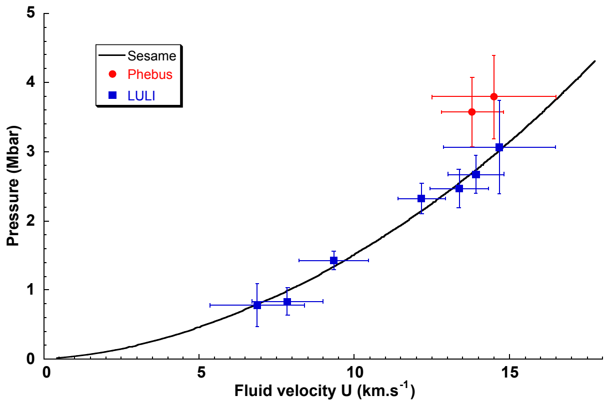
New experimental results on the EOS of Water

Laser-driven shock wave experiments have been conducted to study the equation of state (EOS) of water in the Megabar range, where no results were available so far. This range of pressure is of great importance in astrophysics for the modelling of the interior of planets such as Uranus and Neptune; for instance, the high magnetic field of these planets can be explained by dynamo effect if the conductivity of the mantle is greater than 200 $(\Omega\ \mathrm{cm})^{-1}$. Preliminary experiments were performed at the Commissariat à l'Energie Atomique in Limeil, France, using the Phébus laser facility. They were completed later on by a second series of experiments using the laser of the LULI laboratory, which delivers up to 100 J in a 600 ps square pulse at a wavelength λ = 532 nm.
The beams are focused on a target consisting of an aluminium step, where a shock of known velocity is created. Interferometric diagnostics (VISAR) are used to measure the velocity of the shock that is transmitted into water. The EOS points for water are then obtained by the impedance mismatch method, relatively to the well-known EOS of aluminium. The resulting points are shown in the figure, and compared to the Sesame EOS.



Under such a great compression, water is metallised and reflects the light of a probe beam. Measuring the reflectivity of metallised water also allows evaluating its electronic conductivity, which was found of the order of 10^3 $(\Omega\ \mathrm{cm})^{-1}$.
The experiment has been supported by the E.U. Programme "Access to Large Scale Facilities", and has been jointly conducted by the teams of LULI (M. Koenig), the University of Essex (T. Hall), the University of Milano-Bicocca (D. Batani), the CEA (I. Masclet) and the LLNL (P. Celliers).

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Workshop on "Particle Sources with High Intensity Lasers", Milan, Italy, 1-3 March 2001.

A workshop on the generation of fast particles by means of high intensity lasers has been hosted by the Department of Physics of the Università di Milano-Bicocca from the 1st to the 3rd of March 2001.
Scope of the workshop was to investigate the possibility to exploit the high intensity laser systems nowadays available as possible sources for particle acceleration and for applications in high energy

physics, nuclear physics and as a medical tool e.g. in hadron therapy.
The workshop has been attended by about seventy persons belonging to different communities (laser, laser-plasmas and nuclear physics), establishing a starting point for cooperation between not-so-neighbouring fields of research.

Workshop program

Thursday the 1st

The laser tool:
G. Mourou: "Ultraintense laser field and its applications: present and future"
P. Norreys: "Developments in ultra-intense laser systems"

Fast electrons 1 (and positrons):
G. Tsakiris: "Generation of MeV electrons and positrons using femtosecond laser pulses"
A. Pukhov: "Intense electron and ion beams from relativistic laser-plasma interactions"

Fast electrons 2:
F. Pegoraro: "Particle injection into the wave acceleration phase due to nonlinear wave-breaking"
P. Mulser: "Fast coronal ignition and the problem of energy transport"
D. Batani: "Relativistic electron currents in solids beyond the Alfven limit"
V. Malka: "Electron beams production by ultra-short (30 fs) laser pulse"

Friday the 2nd

Ions 1:
M. Roth: "Experimental results on ion acceleration"
O. Willi: "Plasma imaging with laser-produced multi-MeV protons"
T.V. Liseikina: "High density collimated beams of relativistic ions produced by Petawatt laser pulses in plasmas"
V. Veniard: "Signatures of relativistic effects in laser-atom interactions"

Ions 2:
N. Lisi: "Ion generation from CO_2 laser produced plasmas"
T.E. Cowan: "Laser generation of low-emittance, accelerator quality proton beams"
M. Crescenti: "The TERA project and the perspectives of Adron-therapy"

Applications:
F. Chemin: "Nuclear excitation by electron transition by laser in Uranium^{235} and Tantale"
H. Merdji: "High order harmonic generation: application to ultrafast pump-probe experiments in the X-UV range"
P. McKenna: "Laser generation of proton beams for the production of positron emitting isotopes"
S. Karsch: "Spectroscopy of fusion neutrons from relativistic laser plasmas"
M. Hegelich:"Spectroscopy of laser driven MeV-ion jets"

Clusters, diagnostics, etc…
T.E. Cowan : "Fusion neutron production by Coulomb explosion of clusters and with laser-accelerated ions"
S. Moustaizis: "Neutron, fast ignition and gamma ray production by ultrashort, high intensity laser interaction with solid and cluster targets"
G. Vives: "X-ray spectra from high intensity laser experiments with argon cluster targets"

Saturday 3rd

P. Tomassini: "High resolution analysis of laser-plasma interferograms: a useful tool to control the intense pulse propagation"
A. Sjögren "Laser Generated X-rays and Relativistic Self-focusing"
E. Gaul: "Plasma waveguiding for laser wakefield acceleration"
T. Desai:"Ion emission from clusters and fast ignition"
A.A. Aliverdiev: "The new principles of the photon structure with applications to strong laser fields"

The medieval "Bicocca degli Arcimboldi"

Workshop organisers:

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Erice Summer School on "ATOMS, SOLIDS AND PLASMAS IN SUPER-INTENSE LASER FIELDS"

The Ettore Majorana Centre in Erice (Sicily) has hosted the 30th Course of the International School of Quantum Electronics on "Atoms, Solids and Plasmas in Superintense Laser Fields" from July the 8th to 14th, 2000.
The school has been attended by several students and lecturers coming from twelve countries (see the appended statistics).
The purpose of the Course was to provide an overview of the interaction of intense lasers with matter, where the border between solids and plasmas tends to vanish. Lectures and specialised seminars have offered a panorama of the current state of the art of both theory and experiments dealing with laser-plasma physics, dense and relativistic plasmas, multiphoton ionisation, high order harmonic generation, particle acceleration.
The announcement of the forthcoming publication of the proceedings of the school, including the lectures and some works related to posters presented during the course is at the end of this article.
The Course has been part of the activities of the Programme "FEMTO" of the European Science Foundation.

PHOTO GALLERY

The photographs shown in the following witness the atmosphere of intellectual activity and relaxing moments during the days of the Course. We begin, however, with a tribute to the "Ettore Majorana" Centre which hosted the school. The door is the entrance to the main building of the Centre, the San Rocco complex, which includes the Directorat, the Secretariat, and the "R. P. Feynman" Lecture hall.

The entrance of the "Ettore Majorana" Centre (San Rocco)

Open discussions were following each lecture, but they were sometimes invading also other moments, such as coffee breaks, where details could be investigated in a deeper way.
The debates between scientists are well illustrated by this snapshot captured during a pause.

Deep thoughts during the school: Francesco Pegoraro (second from right) meditates with Klaus Eidmann, Mike Key, Dimitri Batani and Stefano Atzeni

Charles Joachain, Aurelia Cionga,Mrs. Joachain, Sandro Martellucci and Dimitri Batani

The large number of participants is well represented by the group photo taken in the San Domenico monastery during a coffee break. The directors of the Course, Prof. J.C. Joachain Dr D. Batani, and Prof. S. Martellucci are in the first row, close to the centre of the group.
The P.A.M. Dirac Lecture Hall in the San Domenico monastery has often been used instead of the Richard P. Feynman Lecture Hall in San Rocco due to the larger space available for the audience. In these occasions coffee breaks took place in a wide room just above the hall, from which a wonderful sight of the surroundings of Erice could be enjoyed.

Group photo of the participants to the Erice School

SOME STATISTICS

Laboratory of Origin	Lecturers	Participants M	Participants F	Participants total (participants)	**total**
Italy	2	8	8	16	**18**
Belgium	-	1	1	2	**2**
France	6	9	1	10	**16**
UK	3	4	-	4	**7**
Germany	8	11	2	13	**21**
USA	2	-	-	-	**2**
the Netherlands	1	-	-	-	**1**
Russia	-	2	1	3	**3**
Czech Republic	-	1	-	1	**1**
Israel	-	-	1	1	**1**
Romania	-	-	2	2	**2**
Sweden	-	1	-	1	**1**
total	**22**	**37**	**16**	**53**	**75**

SOON APPEARING:

Atoms, Solids and Plasmas in Super-Intense Laser Fields

Charles Joachain, Dimitri Batani Editors.

CONTENT OF THE BOOK:

G.Mourou	ULTRAINTENSE LASERS AND THEIR APPLICATIONS
N.J.Kylstra	THEORY OF MULTIPHOTON IONISATION OF ATOMS
H.Rottke	MULTIPHOTON DISSOCIATION AND IONISATION OF MOLECULES
P.Agostini	TWO-COLOR AND SINGLE-COLOR ABOVE THRESHOLD IONISATION
P.Salieres	HIGH-ORDER HARMONIC GENERATION
J.W.G.Tisch	CLUSTERS IN INTENSE LASER FIELDS
S.Atzeni	INTRODUCTION TO LASER-PLASMA INTERACTION AND ITS APPLICATIONS
M.Key	EXPERIMENTAL STUDY OF PETAWATT LASER PRODUCED PLASMAS
J.Meyer-Ter-Vehn	RELATIVISTIC LASER PLASMA INTERACTIONS DENSE ULTRAFAST PLASMAS
J.C.Gauthier	MAGNETIC FIELDS AND SOLITONS IN RELATIVISTIC PLASMAS
F.Pegoraro	R-MATRIX-FLOQUET THEORY OF TWO-ELECTRON ATOMS IN INTENSE LASER
M.Dorr	FIELDS
F.Faisal	INTENSE-FIELD MANY-BODY S-MATRIX THEORY
Y.I.Salamin	ELECTRONS AND IONS IN RELATIVISTIC LASER FIELDS
G.G.Paulus	THE CLASSICAL AND THE QUANTUM FACE OF ABOVE-THRESHOLD IONISATION
K.Eidmann	PLASMAS AT SOLID STATE DENSITY GENERATED BY ULTRA-SHORT LASER PULSES
M.Koenig	SHOCK WAVE EXPERIMENTS AND EQUATION OF STATE OF DENSE MATTER
J.R.Marques	LASER PARTICLE ACCELERATION IN PLASMAS
V.Veniard	RELATIVISTIC EFFECTS IN NON-LINEAR ATOM-LASER INTERACTIONS AT ULTRAHIGH INTENSITIES

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Spanish participation in FEMTO

The Spanish *Interuniversity Group for Inertial Fusion* (*GIF*) has just started to participate in the FEMTO programme. This group was created in 1998 by 10 professors of the Polytechnic University of Madrid (UPM), the University of Castilla-La Mancha and the Open University to investigate Inertial Fusion Energy (IFE) target physics. The group works on theory and computer simulation of experiments, IFE target design, analysis of hydrodynamic instabilities, and studies of fast ignition. The participation of the *GIF* in FEMTO will be devoted for the moment to the analysis of electron propagation in solid matter and compressed plasmas, and to the design of directly and indirectly driven high gain targets for fast ignition. Both tasks will be done in collaboration with the Max-Planck-Institut für Quantenoptik (Prof. J. Meyer-ter-Vehn) and the University of Milano-Bicocca (Prof. D. Batani). The sponsor institutions are the UPM, the Office of Science and Technology, and the Spanish Research Council. The Spanish representative in the Steering Committee of FEMTO is Prof. J. Javier Honrubia from the UPM.

The first activity of the FEMTO programme co-ordinated by the Spanish group will be the organisation of a workshop on simulation of IFE targets and fast ignition physics that will be held in Madrid in the spring of 2002. Those who are interested in participating and/or attending to this workshop, please send a mail to honrubia@etsii.upm.es.

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EURESCO-EUROCONFERENCE on "Atoms and Molecules in Super-Intense Laser Fields"

Maratea, September 9-14, 2000

The FEMTO programme has received support from the European Commission (Human Potential Programme, High-Level Scientific Conferences) and from the European Science Foundation (EURESCO Conferences Programme) to organize two conferences on the subject of "Matter in Super-Intense Laser Fields".

The first conference, entitled "Atoms and Molecules in Super-Intense Laser Fields", took place in Maratea (Italy), from September 9 to 14, 2000. The Chairman of the conference was Professor Charles Joachain and the Vice-Chairman was Professor Dimitri Batani. The conference was attended by 76 participants from 19 nationalities. The scientific programme included 31 invited lectures of 40 minutes, covering the following topics:

- Multiphoton ionization of atoms.

- Multiphoton ionization and dissociation of molecules.

- Harmonic generation.

- Relativistic effects in laser-atom interactions.

- Laser interactions with solids and plasmas.

- Generation and applications of ultra-intense laser pulses.

Ten of the invited lectures were given by young researchers. Poster sessions were also organized.

The second conference, entitled "Short Pulse, Superstrong Laser-Plasma Interactions" will be held in San-Feliu de Guixols (Spain) from September 29 to October 4, 2001.

The church of Santa Maria Maggiore