

European Science Foundation
Standing Committee for Physical and Engineering Sciences (PESC)

ESF PESC EXPLORATORY WORKSHOP

PARTICLE SOURCES WITH HIGH INTENSITY LASERS



**Paris, France
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Convened by: Victor Malka¹, Dimitri Batani² and Peter Norreys³

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Objectives:

Recent advancements in laser technology such as the CPA allowed the development of short-pulse high-intensity laser systems. Based on this it has been demonstrated in the last two years that such “table top” lasers can generate and accelerate particles by laser-plasma interactions. Interestingly, these bright sources of electrons, protons, neutrons and γ rays are easily adaptable for applications. Whilst furthermore their generation compared to nowadays techniques is of lower cost the possibility is given to establish this new and exciting field in physics in many laboratories – permitting to combine different fields in science such as medicine, chemistry and nuclear physics. To enhance this prosperous opportunity, the objective of this workshop is to specify *concrete near future* applications. Building a bridge between these fields will be of great interest for science in general, and interdisciplinary is therefore a key aspect of this workshop.

The workshop will be divided into two main sections.

Section I

will be dedicated over 1.5 days to *state of the art* presentations on particle sources generated with compact table top lasers. Each particle will be discussed in experimental and theoretical presentations. In order to see what will be possible “tomorrow” this Section will be concluded by talks on the evolution of compact table top laser systems.

Section II

will stress over 1 day their applications in any scientific field. Since interdisciplinary is our main goal, various scientists from any of these fields as well as representatives from industry will be invited.

To maintain a rather informal but progressive environment, we will save enough time for discussions. This should encourage participants to start new and interdisciplinary collaborations. For those interested we can offer at the end of the workshop a visit of the 100 TW *salle jaune* laser at LOA.

V. Malka



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Objectives of the ESF Standing Committee for Physical and Engineering Sciences (PESC)

The **ESF Standing Committee for Physical and Engineering Sciences (PESC)** covers a broad number of fields from physics, chemistry, mathematics, informatics and computer sciences, to engineering, material and technical sciences. PESC has the following responsibilities and tasks:

- to develop scientific initiatives within the ESF operational framework;
- to make proposals for 'a la carte' scientific initiatives;
- to undertake studies on large research facilities and assist in the evaluations and assessments and other special reviews requested by Member Organisations;
- to provide specialist advice and input on a wide range of ESF actions and contribute to the development of the ESF science policy agenda and take a strategic view of the scientific area for which it has responsibility; and
- where appropriate, to work with other Committees and groups in promoting multidisciplinary and interdisciplinary activities.

PESC supports a limited number of **Exploratory Workshops** each year. These workshops allow leading European scientists to explore novel ideas at the European level with the challenging aim to "spearhead" new and preferably inter-disciplinary areas of research. <http://www.esf.org/workshops>

One outcome of an ESF Exploratory Workshop may be that participants decide to submit an ESF scientific **Programme, Network** or **Euroconference** proposal, possibly to be financed by, and coordinated through, the European Science Foundation. If this is the case, it is expected that participants of the workshop follow the relevant procedures.

In the case of **Programmes**, PESC launches (usually in September) an annual call for proposals. In the first stage of PESC's call the "programme ideas" are refereed. Those that are highly rated are invited to submit a full proposal and subsequently undergo further external refereeing and, if successful in obtaining PESC's scientific recommendation, will be submitted to ESF Member Organisations for funding on a voluntary basis. Further details are available on the internet at www.esf.org/pesc.

In the case of a **Network** the proposal is submitted to the ESF Network Secretariat. The results of the refereeing process and PESC's scientific recommendations are provided to the Network Group. This is the body that decides whether or not to recommend a proposal for launching. More details are available at www.esf.org/networks.

In the case of **Euroconferences**, the proposal is submitted to the ESF Euresco Secretariat. A Committee (assisted by Advisory Panels) takes full responsibility for the selection of conference subjects and chairmen. More details are available at www.esf.org/euresco.



Tentative Agenda:

- *Compact TW-PW Lasers in the near Future*
Jean-Paul CHAMBARET, LOA, Palaiseau (France)
- *Overview on Simulations on Proton and Neutron Generation*
Alexander PUKHOV, University of Düsseldorf (Germany)
- *Electron and γ Ray Generation: A Review of Theoretical Studies''*
Erik LEFEBVRE, CEA, Bruyères-le-Châtel (France)
- *Electron Beams generated with TW Lasers*
to be announced
- *Radiotherapy*
Pierre SCALLIET, Université de Louvain (Belgium)
- *Experimental Studies on Charged Particle Beams*
Karl KRUSCHELNICK, Imperial College, London (UK)
- *Applications for Charged Particle Beams in Nuclear Physics*
Ken LEDINGHAM, University of Strathclyde (Scotland)
- *Experimental Observations of $^{\circ}$ Rays*
Peter NORREYS, RAL, Chilton (UK)
- *Possibilities for Protontherapy*
Regis FERRAND, CPO, Orsay (France)
- *Positron Emission Tomography*
Wilfried PILLOY, General Hospital (Luxembourg)
- *Accelerator Physics*
Pascal SORTAIS, IN2P3, Grenoble (France)
- *Ultrarapid Chemistry*
Yann GAUDUEL, LOA, Palaiseau (France)
- *X Ray Generation with Compact Laser Systems*
Antoine ROUSSE, LOA, Palaiseau (France)
- *Nuclear Astrophysics with High Intensity Lasers*
Peter MOHR, University of Darmstadt (Germany)
- *Cancer Treatment*
Laurent SCHWARTZ, LPTP, Palaiseau (France)
- *Future Prospects for OPCPA in Compact High Average and Peak Power (CHAPP) Lasers*
Ian ROSS, RAL, Chilton (UK)
- *Neutron Generation with Solid Targets*
Stefan KARSCH, MPQ, Munich (Germany)
- *Clusters for Neutron Generation*
Roland SMITH, Imperial College, London (UK)



Provisional List of Participants

Last update : 22 October 2002

<u>Name</u>	<u>Institute</u>	<u>Speciality</u>
Marie-Madeleine ALEONARD	CENBG Bordeaux	<i>Nuclear Physics</i>
Dimitri BATANI	University Milano-Bicoca	<i>Laser-Plasma Interactions</i>
François BORNE	CEA, Bruyères-le-Châtel	<i>Radiation Protection</i>
Erik BRAMBRINK	GSI, Darmstadt	<i>Nuclear Physics</i>
Jean-Paul CHAMBARET	LOA, Palaiseau	<i>Laser Physics</i>
Jean-François CHEMIN	CENBG, Bordeaux	<i>Nuclear Physics</i>
John COLLIER	RAL, Chilton	<i>Laser Physics</i>
Brigitte CROS	LPGP, Orsay	<i>Laser-Plasma Interactions</i>
Emmanuel D'HUMIERES	CEA, Bruyères-le-Châtel	<i>PIC Simulations</i>
Muriel van der DONCKT	IBA, Louvain-la-Neuve	<i>Particle Physics</i>
Bernhard ERSFELD	University of Strathclyde	<i>Particle Sources</i>
Jean ETCHEPARE	LOA, Palaiseau	<i>Solid State Physics</i>
Regis FERRAND	CPO, Orsay	<i>Protontherapy</i>
Sven FRITZLER	LOA, Palaiseau	<i>Particle Physics</i>
Yann GAUDUEL	LOA, Palaiseau	<i>Chemistry</i>
Danilo GIULIETTI	University of Pisa	<i>Plasma Physics</i>
George GRILLON	LOA, Palaiseau	<i>Neutron Physics</i>
Fazzia HANNACHI	CENBG, Bordeaux	<i>Nuclear Physics</i>
Manuel HEGELICH	MPQ, Munich	<i>Ion Physics</i>
Danièle HULIN	LOA, Palaiseau	<i>Solid State Physics</i>
Dino JAROSZYNSK	University of Strathclyde	<i>Accelerator Physics</i>
David JONES	University of Strathclyde	<i>Particle Sources</i>
Stefan KARSCH	MPQ, Munich	<i>Neutron Physics</i>
Michel KOENIG	LULLI, Palaiseau	<i>Plasma Physics</i>
Karl KRUSCHELNICK	Imperial College London	<i>Laser-Plasma Interactions</i>
Ken LEDINGHAM	University of Strathclyde	<i>Nuclear Physics</i>
Wim LEEMANS	LBNL, Berkeley	<i>Beam Physics</i>
Erik LEFEBVRE	CEA, Bruyères-le-Châtel	<i>PIC Simulations</i>
Filip LINDAU	University of Lund	<i>Laser-Plasma Interactions</i>
Victor MALKA	LOA, Palaiseau	<i>Laser-Plasma Interactions</i>
Johan MAURITSSON	University of Lund	<i>Laser-Plasma Interactions</i>
Paul McKENNA	University of Strathclyde	<i>Ion Acceleration</i>
Peter MOHR	University of Darmstadt	<i>Nuclear Physics</i>
Patrick MORA	CPHT, Palaiseau	<i>Theoretical Physics</i>
Peter NORREYS	RAL, Chilton	<i>Laser-Plasma Interactions</i>
Matteo PASSONI	Polytechnic of Milan	<i>Laser-Plasma Interactions</i>
Guillaume PETITE	SESI, Palaiseau	<i>Solid States Physics</i>
Wilfried PILLOY	General Hospital Luxembourg	<i>Medicine</i>
Alexander PUKHOV	University of Düsseldorf	<i>PIC Simulations</i>
Albert REITSMA	University of Strathclyde	<i>Particle Sources</i>
Ian ROSS	RAL, Chilton	<i>Laser Physics</i>
Antoine ROUSSE	LOA, Palaiseau	<i>X Ray Generation</i>
Pierre SCALLIET	University of Louvain	<i>Radiotherapy</i>
Laurent SCHWARTZ	LPTP, Palaiseau	<i>Cancer Treatment</i>
Roland SMITH	Imperial College, London	<i>Laser-Plasma Interactions</i>
Pascal SORTAIS	IN2P3, Grenoble	<i>Accelerator Physics</i>
Federico STRATI	University Milano-Bicoca	<i>Laser Physics</i>
Sune SVANBERG	University of Lund	<i>X Ray Physics</i>
Vladimir TIKHONCHUK	University of Bordeaux	<i>Theoretical Physics</i>
Paolo TOMASSINI	University of Pisa	<i>Laser-Plasma Interactions</i>
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