



## INTERNATIONAL SCHOOL OF QUANTUM ELECTRONICS

*30th Course: ATOMS, SOLIDS AND PLASMAS IN  
SUPER-INTENSE LASER FIELDS*

ERICE-SICILY: 8 - 14 JULY 2000

Sponsored by the: • Italian Ministry of Education • Italian Ministry of University and Scientific Research • Sicilian Regional Parliament  
• Italian Research Group on Quantum Electronics and Plasma Physics (G. N. E. Q. P.) of the National Research Council •  
University of Rome "Tor Vergata" • University of Milano-Bicocca • Istituto Nazionale Fisica della Materia (I.N.F.M.)  
• European Science Foundation

## PROGRAMME AND LECTURERS

- P. Agostini, CEA, Saclay, France
- F. Amiranoff, LULI, Ecole Polytechnique, Palaiseau, France
- S. Atzeni, Università di Roma "La Sapienza", Italy
- P. Burke, Queen's University, Belfast, UK
- M. Dörr, Max Born Institut, Berlin, Germany
- K. Eidmann, Max Planck Institut für Quantenoptik, Garching, Germany
- F. Faisal, University of Gielesfeld, Germany
- J. C. Gauthier, LULI, Ecole Polytechnique, Palaiseau, France
- M. Gavrilin, FOM, Amsterdam, The Netherlands
- C. Keitel, University of Freiburg, Germany
- M. Key, Lawrence National Laboratory Livermore, USA
- M. Koenig, LULI, Ecole Polytechnique, Palaiseau, France
- N. J. Kylstra, University of Durham, UK
- J. Meyer-ter-Vehn, Max Planck Institut für Quantenoptik, Garching, Germany
- G. Mourou, University of Michigan, USA
- G. Paulus, Max Planck Institut für Quantenoptik, Garching, Germany
- F. Pegoraro, Università di Pisa, Italy
- A. Pukhov, Max Planck Institut für Quantenoptik, Garching, Germany
- H. Rottke, Max Born Institut, Berlin, Germany
- P. Salieres, CEA, Saclay, France
- J. Tisch, Imperial College, London, UK
- V. Veniard, Université Pierre et Marie Curie, Paris, France

### PURPOSE OF THE COURSE

The advent of laser systems capable of delivering very short pulses and very high intensities has made accessible new regimes to experimental investigations and has opened new horizons in the interaction of laser fields with atoms, solids and plasmas. In these extreme conditions, electrons are accelerated at velocities close to the velocity of light and the electromagnetic fields are much bigger than the atomic electric fields, so that strongly non-linear and relativistic interactions take place. The traditional distinction between solids and atoms on one side and plasmas on the other side tends to vanish and exotic states of matter are created. A large variety of applications is expected, from novel light and X-ray sources from high harmonics emission, to new particle acceleration techniques and the new "fast ignition" approach to Inertial Confinement Fusion. The Course will cover areas of interest to the atomic physics and to the plasma physics scientific communities and is opened in particular to students and researchers wishing to enter this new field. Lectures and specialised seminars will cover current developments in theory and experiments but are also intended to give the basics of the field. The course falls among the activities of the Programme "FEMTO" (Interaction of superintense, femtosecond laser fields with atoms, solids and plasmas), a program of the European Science Foundation in the Physical and Engineering Sciences.

Experiments of multiphoton ionisation of atoms  
Laser acceleration of electrons  
Introduction to laser produced plasmas  
Theory of multiphoton dissociation and ionisation of molecules  
R-matrix-Floquet theory of two-electrons atoms in intense laser fields  
Plasmas at solid state density  
Double ionisation in intense laser fields  
Dense plasmas  
Stabilisation of atoms in super-intense laser fields  
Relativistic dynamics in super-intense laser fields  
Experiments on intense laser produced plasmas  
Shock wave experiments and equation of state of dense matter  
Theory of multiphoton ionisation of atoms  
Relativistic plasmas  
Basics of short, super-intense laser pulses  
Classical and quantum strong-field ionisation  
Magnetic fields and solitons in relativistic plasmas  
PIC simulations of laser-plasma interactions  
Experiments of multiphoton dissociation and ionisation of molecules  
High Order Harmonic Generation  
Interaction of clusters with laser fields  
Relativistic effects in laser-atom interactions

### GENERAL INFORMATION

Advanced research papers by participants of the Course are welcome for presentation, and will be considered for publication in the Proceedings of the Course together with the invited lectures. A poster session is planned for such contributions. Persons wishing to attend the Course, and those wishing to present a contribution, should apply in writing to:

Prof. Giovanni Petrocelli  
Dipartimento di Scienze e Tecnologie Fisiche ed Energetiche  
Università di Roma "Tor Vergata"  
Via di Tor Vergata n. 110  
I-00133 ROME (Italy)  
tel.: +39 06 7259 7211 or 7246  
fax: +39 06 7259 7145  
e-mail: petrocelli@uniroma2.it

They should specify:

- i) full name(s), address, age, nationality;
- ii) academic qualifications and degree;

## POETIC TOUCH

According to legend, Erice, son of Venus and Neptune, founded a small town on top of a mountain (750 metres above sea level) more than three thousand years ago. The founder of modern history - i.e. the recording of events in a methodic and chronological sequence as they really happened without reference to mythical causes - the great Thucydides (~500 B.C.), writing about events connected with the conquest of Troy (1183 B.C.), says: "*After the fall of Troy some Trojans on their escape from the Achaei arrived in Sicily on boats and as they settled near the border with the Sicanians all together they were named Elymi: their towns were Segesta and Erice*". This inspired Virgil to describe the arrival of the Trojan royal family in Erice and the burial of Anchise, by his son Enea, on the coast below Erice. Homer (~ 1000 B.C.). Theocritus (~300 B.C.), Polybius (~200 B.C.), Virgil (~50 B.C.), Horace (~20 B.C.) and others have celebrated this magnificent spot in Sicily in their poems. During seven centuries (XIII-XIX) the town of Erice was under the leadership of a local oligarchy, whose wisdom assured a long period of cultural development and economic prosperity which in turn gave rise to the many churches, monasteries and private palaces which you see today.

In Erice you can admire the Castle of Venus, the Cyclopean Walls (~800 B.C.) and the Gothic Cathedral (~1300 A.D.). Erice is at present a mixture of ancient and medieval architecture. Other masterpieces of ancient civilization are to be found in the neighbourhood: at Motya (Phoenician), Segesta (Elymian), and Selinunte (Greek). On the Aegadian Islands - theatre of the decisive naval battle of the first Punic War (264-241 B.C.) - suggestive neolithic and paleolithic vestiges are still visible: the grottoes of Favignana. the carvings and murals of Levanzo.

Splendid beaches are to be found at San Vito Lo Capo, Scopello, and Cornino, and a wild and rocky coast around Monte Cofano: all at less than one hour's drive from Erice.

**C. J. JOACHAIN - D. BATANI**  
**DIRECTORS OF THE COURSE**

**A. N. CHESTER - S. MARTELLUCCI**  
**DIRECTORS OF THE SCHOOL**

**A. ZICHICHI**  
**DIRECTOR OF THE CENTRE**

- iii) present position and place of work;
- iv) current research activity;
- v) list of publications

Junior scientists should enclose a letter of recommendation from the head of their research group or from another senior scientist active in the field.

The total fee, which includes full board, a copy of the proceedings and lodging (arranged by the School), is US \$400. Thanks to the generosity of the sponsoring Institutions, a special support can be granted to some deserving students who need financial help. Request to this effect must be specified and justified in the letter of application, which, in this case, must be received before **May 1st**.

**Closing date for application: June 26, 2000**

**No special application form is required**

Admission to the Course will be decided in consultation with the Advisory Committee of the School comprising Professors C.J.Joachain, D.Batani, A.N.Chester, S.Martellucci, and A. Zichichi. Participants must arrive in Erice on July 8, no later than 5 pm and leave no earlier than July 14 at 1 pm.

The scientific committee of the school is composed by Professors C.J.Joachain, D.Batani, A.N.Chester, S.Martellucci, P.Knigh, A.Maquet, W.Sandner and H.Walther. Detailed information and the final programme of the Course, including timetable of lectures, will be sent to successful applicants together with the letter of acceptance.

**More information about the activities of the Ettore Majorana Centre  
can be found on the WWW at the following address:  
<http://www.ccsem.infn.it>**

**More information about the programme FEMTO can be found at  
[ht://www.esf.org/physical/pp/FEMTO/](http://www.esf.org/physical/pp/FEMTO/)  
or by writing to D.Batani (batani@mi.infn.it)**