

# LAPLACE LABORATORY ON PLASMA AND CONVERSION OF ENERGY UNIVERSITY OF TOULOUSE

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## Brief presentation

Headed by Christian Laurent, Senior Researcher at the National Center for Scientific Research (CNRS), assisted by two Deputy Directors, Professor Maurice Fadel and Professor Georges Zissis, LAPLACE has 11 research groups gathering 266 people including:

- 106 full-time and part time researchers from the CNRS and the University of Toulouse;
- 48 engineers, technicians and administrative staff;
- 112 PhD and trainees.

## General description

### Scientific domains

Electrical technology, power electronics, plasmas, non equilibrium phenomena, energetics, complex system modelling, renewable energy, durable development, materials for energy, diagnostics, control, design methodology.

### Application domains

Generation, transport, management, conversion and utilization of electrical energy, aeronautics and space, embedded systems, transports, health and environment.

## Structure of the laboratory

### Research groups

*Research Group in Energetics, Plasma, and Non-Equilibrium Phenomena*

**Jean-Pierre Boeuf, CNRS Senior researcher**

Non-equilibrium plasma sources, transport phenomena (radiation, plasma, phase transitions), instability and self-organization, diphasic systems, Monte Carlo, PIC, Fluid modelling and experimental validation.

### Non-Equilibrium Reactive Plasma

**Mohammed Yousfi, CNRS Senior researcher**

Basic data for plasma physics and chemistry, particle simulation and fluid modelling, reactive plasma flows, biotechnology and sterilization, air pollution control, dielectric barrier discharges, radiation-matter interactions.

### Electric Arc and Thermal Plasma Processes

**Jean-Jacques Gonzalez, CNRS Senior researcher**

Calculation of the thermo-dynamical properties of pure and mixed gases, study of the phenomena and characterization of the media: within electric arc processes by modelling (fluid/solid), and experiments (optical, inverse methods).

### Materials and Plasma Processes

**Patrice Raynaud, CNRS Researcher**

Low and atmospheric pressure cold plasma, plasma-fluidized bed, dusty plasma, plasma deposition processes, deposits and surface treatments. Diagnostics and physico-chemical studies of plasmas and surfaces.

*Light and Matter*

**Pierre Destruel, Professor**

From photon to electron, from electron to photon, the Light and Matter group studies the problems associated with the energy conversion in the electroactive devices: organic photovoltaic cells, discharge lamps, organic electroluminescent diodes.

*Solid Dielectrics and Reliability*

**Gilbert Teyssedre, CNRS Senior researcher**

Characterization, understanding and modelling of charge generation phenomena in insulators (under electrical stress or radiation), and identification of the mechanisms leading to ageing and breakdown.

*Dielectric Materials in the Energy Conversion*

**Thierry Lebey, CNRS Senior researcher**

Material processing, characterization, modeling, ageing, in view of: 3D hybrid integration in power electronics; high temperature, and high voltage component and electrical systems.

*Research Group in Electrodynamics*

**Bertrand Nogarede, Professor**

Study of electromechanical coupling phenomena in electromagnetic fields and electroactive materials, optimal design, piezoactuators, innovative electrical machines, "intelligent" structures (aerospace, medical...).

*Static Converters*

**Philippe Ladoux, Professor**

New topologies of high power converters, 3D integration for power conversion. Safety and reliability of converters, CVD Diamond for power electronics.

*Research Group in Energy, Electricity & Systemics*

**Xavier Roboam, CNRS Senior researcher**

Integrated design methods (synthesis, analysis, optimization), transport and embedded networks, alternative energies and new technologies of electrical energy, power converters for electrical discharge.

*Electrical System Control and Diagnostics*

**Pascal Maussion, Assistant professor**

Control, performance and reliability of electrical systems improvement, including converters, electrical machines, batteries, embedded actuators, alternators, fuel cells in railways, aviation, automobile and other industries.

*Transversal actions*

*Source – Discharge – Process Optimization*

**Hubert Piquet, Professor**

Design and optimization of a treatment or a process in its overall context, thereby taking into consideration all the source-object interactions.

*Reliability and Diagnostics in Energy Conversion*

**Frédéric Richardeau, CNRS Researcher**

Understanding the causes of ageing and failure under functional stresses, managing their effects on the surrounding system and developing methods for the detection and the management of failure.

*Electromagnetism, Electrodynamics, Energetics and Plasmas*

**Jean-Pierre Boeuf, CNRS Senior researcher**

Improve the relevance of complex physical models, to develop the synergy between specialists in electromagnetism, electrodynamics, energetics and plasmas, at the interface between the physics and the engineering.

