G2ELAB: GRENOBLE ELECTRICAL ENGINEERING LAB

Research axes

A wide variety of research projects cover most areas of **electrical energy, materials, novel processes, innovative devices,** as well as **simulation, modelling** and **optimised design.**
Our goals are to generate and disseminate new knowledge in these areas, while keeping in mind ever-evolving major societal topics such as:

- Optimal management of transport and conversion (Power Electronics) of electricity, aimed at improving energy efficiency and reliability, taking into account new energy resources ;
- Energetic efficiency and Environmental issues ;
- System miniaturisation and integration, "smart" devices and systems ;

G2Elab is associated with Grenoble-INP, UJF and CNRS. It pilots the "Institut Carnot Energies du Futur" which enhances the links between basic research, R&D and industry in this domain. Our research incorporates a strong partnership with major companies.
We contribute to research training through the supervision of 30 PhD students per year working on industrial contracts or national, European and international projects.
Key words: Power Electronics, Magnetism, Power MEMS, Electromagnetism modelling and optimisation, actuators, materials characterization.

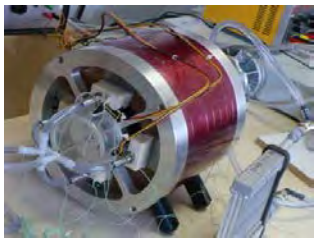
Actions within LANEF

Magnetic MEMS.

Fig. 1: a 5 µm thick magnet in levitation above graphite (G2Elab-NEEL)

- Micro-actuators/Micro engines,
- Hybridization between Magnetism/Piezoelectricity,
- Micro-sources of energy,
- Diamagnetic levitation…

Magnetic Materials and actuators/sensors:
- Functional materials for electronic engineering,
- Electromagnetic device innovation for the conversion and the treatment of energy,
- Electromagnetic device innovation for conversion and data processing.



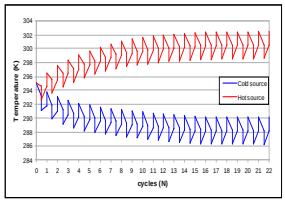


Fig 2: Magneto Caloric device for air conditioning without gas emission (G2Elab-NEEL)

Power Electronics:
- Integration technologies, both monolithic and hybrid, from the chip to the converter and its cooling system,
- Modeling and design tools for passive components and electromagnetic systems,
- Power converter design and promotion for non-conventional energies and power grids.

Models, Methods and Methodologies Applied to Electrical Engineering:
- Extending computing capabilities by focusing on methods of computational electromagnetism in continuous media, on models of materials for electrical engineering and on multi-physics and multi-methods coupling,
- Assisting in the evaluation and the design of devices addressing the themes of innovation, sizing and capitalization and management of knowledge.

Dielectric Materials and Electrostatics:
- Physical mechanisms resulting from the application of an electric field on dielectric solids, liquids, gases,
- Materials used for the electric insulation of devices for Electronic engineering and Electronic use,
- Processes based on electrostatic forces,

Systems and Electrical Networks:
- The integration of renewable and non-conventional energies to the network,
- The security of electric architectures and critical infrastructures.

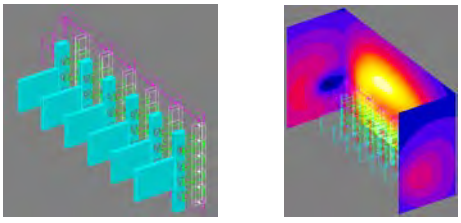


Fig. 3: modeling a power conversion substation using hybrid numerical methods

Key figures:

46 faculty members (Université de Grenoble), 13 CNRS scientists
40 engineers and technicians
120 PhD students
R&D, industry: Carnot Energies du Futur; Schneider Electric, Alstom, EDF, Airbus, PSA, Renault, SAFRAN, THALES…

CONTACT
http://www.g2elab.grenoble-inp.fr