# LNCMI: LABORATOIRE NATIONAL DES CHAMPS MAGNETIQUES INTENSES

## Research axes

The LNCMI is the French partner of the European Magnetic Field Laboratory. It consists of two sites, one in Toulouse for pulsed magnetic fields (100 T) and one in Grenoble for steady magnetic fields (35 T, the highest steady field in Europe). It is devoted to basic research in the domains of physics and chemistry and to innovation in the domain of energy (levitation, superconductivity) or nanotechnology (optics, transport). LNCMI is a CNRS large scale facility, associated with UJF in Grenoble. It has three main missions: i) to generate the highest magnetic fields and the corresponding infrastructure for research. ii) to use these fields and infrastructures for in-house research iii) to provide access to qualified French and European users to these high magnetic fields. About 100 projects are carried out each year. They focus on new phenomena induced by large magnetic fields (like the Quantum Hall Effect discovered in 1980, Nobel Prize in 1985) in the domains of semiconductors, superconductors and magnetism. It contributes to the training of students, PhDs, and post-docs by both its basic research and technical activities.

## Actions within LANEF

**High field, high resolution NMR experiments.** High field and low temperature experiments are used to study weak local magnetic interactions in superconductors or magnetic materials. Recent improvements in the field stability and homogeneity have extended the NMR possibilities to solid state physics, at room temperature**.**

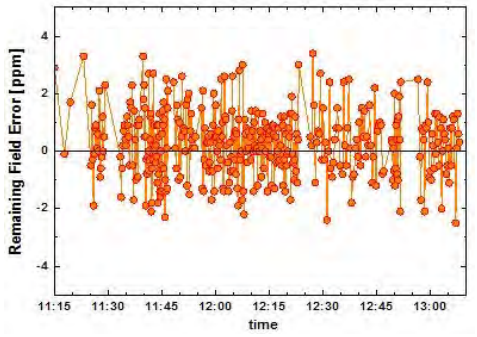


*Fig. 1: Long term field stabilization with an NMR lock at 30 T.*

**Magneto-optics** is used to study the electronic properties of quantum dots and quantum wells, of carbon nanotubes and graphene.

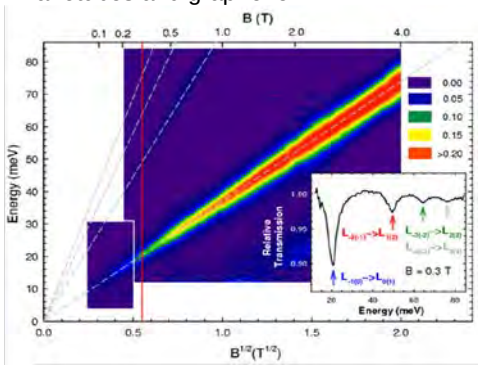


*Fig. 2: Magneto-absorption of graphene.*

**Low temperature physics (15 mK)** in high magnetic fields is commonly used to study **quantum effects**: molecular magnetism by EPR, quantum magnetism in new model systems by NMR, the competition between magnetism, superconductivity and/or field induced superconductivity.

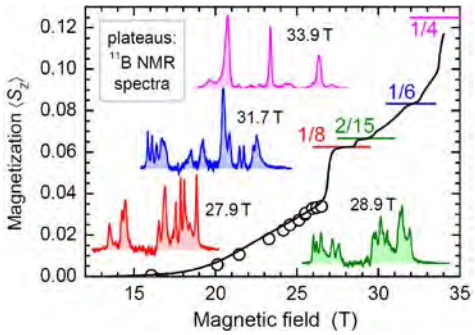


*Fig. 3: Example of field induced quantum magnetism.*

**Electromagnetic or magneto-hydrodynamic forces** are studied to get the equilibrium properties of new materials (levitation) of liquids or of plasmas in large fields. The performances of superconducting cables are determined in high field before the construction of new standard or specific magnets (ITER, hybrid magnets for neutrons, synchrotrons, high energy physics)

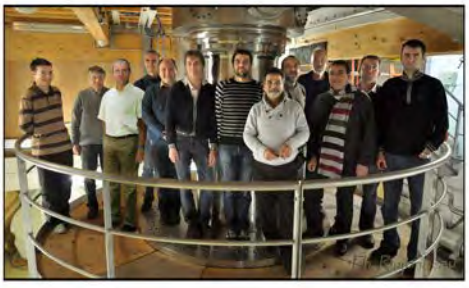

*Fig. 4 Resistive part of the future 43 T hybrid magnet of the LNCMI.*

## Key figures for LNCMI-Grenoble:

4 faculty members (Université de Grenoble)
10 CNRS scientists
45 Engineers and technicians
10 PhD students and postdocs

CONTACT
http://lncmi.cnrs.fr/