

Letter of intent for the continued operation of GANIL

The Laboratory of Irradiated Solids (LSI) conducts fundamental research activities in condensed matter physics and physical-chemistry. Since its creation by Y. Querré in 1973, the laboratory SESI-LSI has been responsible for promoting the use of ion or electron beams for the irradiation of materials in close connection with the CIRIL-CIMAP. This interest continues today as we use radiation, whatever its nature, as a mean for analysing fundamental processes, understanding the physical properties, functionality and structure of materials, monitoring changes and inducing the emergence of innovative mechanisms that can respond to societal challenges for energy and environment.

In this context, over the last 15 years, exploiting Swift Heavy Ions provided by GANIL, numerous research activities have been conducted in the Lab ¹. Important scientific results in a variety of fields (microelectronics, spintronics, nanomagnetism, energy, environment) were reported to the international community. This success is related to the use of beamlines of both GANIL and SIRIUS (2.5 MeV Van de Graaf electron accelerator at LSI) that allows researchers to cross the results and induce properties on the same solid material leading to explore deeper the underneath solid state physics.

Among all these expertise at LSI, applicative researches arised (MRAMs, Polymer Electrolyte Membrane for Fuel Cell, Piezogenerators, Sensors) and new research is upcoming (e.g. Mott insulator). Notably, nanostructured functional polymers have gained a growing interest in high value-added applications such as analytical devices and/or diagnostics. For example, the PCnano LSI team is developing a portable early warning sensor for monitoring toxic metals in natural waters, functionalizing nanopores made by ion track technology in polymer thin films. Pushed by the recent EU policy on environmental norms, important industrial groups in France have already financed the R&D on these sensors such as VINCI Construction for soil leachate ² and TOTAL to control directly on-site the quality of offshore oil platform production water. The list of interested and involved industrials is still growing with BASF, the harbor of Barcelona and Suez Environment. A market study by Erdin Cabinet (2018) revealed that the Business to Business market is around 3.2 Billons euros in the world. Ongoing Business to Client market study is now under evaluation and a startup project is on its way.

GANIL offering Xe or Kr ions sources of irradiation at 10 MeV/mau coupled with the possibility of inert atmosphere irradiation chamber in room D1 (SME beamline) is today the unique way in France to develop these efficient and ultra-sensitive sensors. These examples show how GANIL remains an essential tool to promote all these scientific expertises and societal innovations.

It is worth mentioning that to stay competitive, some more evolution of GANIL industrial beamline is needed to irradiate under inert atmosphere (as it the case for some experimental beamlines). It will advantageously enlarge the offer and undoubtedly drive the attention of many industrials working with materials which are sensitive to radio-oxydation. In addition, concerning legal aspects regulating nuclear waste, a tolerable limit of irradiated material activity should be established to make possible the commercialization of treated materials. In many countries, a threshold of activity exists but not in France. It is a crucial point which acts as a brake on sustainable growth of our research innovations in the long term.

With this letter of intent the LSI wish to strongly sustain for the continued operation of GANIL.



LSI Ecole Polytechnique
Route de Saclay
F – 91128 PALAISEAU Cedex

T. (33) 1 69 33 44 06
UMR 7642

Michèle RAYNAUD
Directrice d'unité

T. (33) 1 69 33 45 20
michele-raynaud.brun@polytechnique.edu

ÉCOLE POLYTECHNIQUE

Michèle RAYNAUD

Directrice

Laboratoire des Solides Irradiés
CNRS UMR 7642 - CEA/DRF/IRAMIS

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¹ G. Rizza, K. Van der Beek, M. Konczykowski, M.-C. Clochard, T. Wade, J.-E. Wegrowe

² «Quick Soil Analysis» CEA project - norm NF-EN-12457-2-