

**Call for expressions of interest – Junior Professorship
Model project sheet**

Lead institution/organization: Université Grenoble Alpes
Name of head of institution/organization: Yassine Lakhnech
Academic region: Auvergne Rhône Alpes

Partner institutions/organizations envisaged : CNRS, CEA

Project title: Development and integration of sustainable processes for microelectronic devices

Keywords: processes, integration, materials, etching, plasma

Target duration: 4-5 years

Scientific theme: Microelectronics

Corresponding CNU/CoNRS/CSS section(s): CNU 63

Institution/corporate strategy: describe how recruitment is in line with corporate strategy

Today, we live in a connected world, surrounded by technologies that serve humanity. An ever-increasing number of connected objects, grouped together under the term “Internet of Things” (IoT), are improving our daily lives. To meet these needs, the semiconductor industry has adapted to provide increasingly high-performance, feature-rich devices. These components can be found in a wide range of fields, including energy, healthcare, transport, multimedia, logistics and industry. With the current development of artificial intelligence, autonomous cars and the energy transition, the need for components is becoming ever greater.

Several programs have been launched at national level, including “Electronics 2030”, and at European level, “ChipAct”, to ensure our sovereignty. According to European Commissioner Thierry Breton, “We have become too dependent on Asia for supplies, and this can penalize the entire chain, as we have seen with the automotive industry. We absolutely must strengthen our autonomy and sovereignty in this area”. Europe will therefore allocate 42 billion euros to this program in order to reposition itself in the global technological race. French President Emmanuel Macron was on hand to launch the French program at the Crolles site near Grenoble. UGA's strategic vision is to reinforce its position as a leading university in microelectronics research, in particular through its UGA Microelectronics LabEx project, the PTA and CIME-Nanotech platforms, and its strong partnership with LETI.

Host laboratory's strategy: describe how the recruitment is in line with the host laboratory's strategy

The current position of the Microelectronics Technologies Laboratory (LTM) is unique in France, since we conduct research into microelectronics technological processes developed on a fleet of ultra-high-performance, quasi-industrial machines installed in CEA-Leti's cleanroom environment.

At the same time, the pooling of financial resources enables us to develop autonomously more upstream projects, which are essential to the laboratory's scientific resources.

Our scientific strategy, which combines upstream and downstream research, enables us to :

- develop technological processes that can be integrated into 300 mm silicon microelectronics chains,
- work on upstream subjects requiring lighter resources and bring them to industrial development on a 200 or 300 mm pilot line (transfer from the PTA to CEA-Leti's 200 and 300 mm lines),
- develop highly forward-looking and innovative independent research into the development of technologies that break with microelectronics "standards" (nano-assembly and colloidal manipulation, new materials, thin films, 2D materials, nano-object integration, soft lithography, new plasma etching technologies, etc.).
- transfer LTM's expertise in micro-nanotechnologies to new, multidisciplinary applications (IoT, healthcare, energy, etc.),
- transfer innovation to industry.

Summary of the scientific project :

LTM is one of the few microelectronics laboratories in France that has been able to maintain cutting-edge technological research in silicon microelectronics. However, the manufacture and use of these microelectronic components is costly in terms of energy, water and raw materials. One of the major challenges facing the microelectronics industry is therefore to find innovative solutions that will enable it to continue to develop its technologies in a responsible and sustainable way, by limiting the consumption of critical materials and products with a high carbon footprint. At the same time, we need to take a holistic approach to this research, integrating a dimension of reducing the energy consumed by components. In this context, a number of paths could be explored: (i) reducing the consumption of critical materials, (ii) studying technological processes with reduced impact, (iii) developing components and technologies to reduce energy consumption, etc.

In this context, LTM is looking to recruit a CPJ in the field of sustainable microelectronics technology development.

Summary of the teaching project :

UGA's strategy is to play a leading role in establishing national and European autonomy in the field of microelectronics. This also means being able to quantitatively and qualitatively train the technicians, engineers and PhDs who will be operational in our industries in future years.

The proposed project covers the entire university curriculum, from bachelor's degree to doctorate. The Grenoble area is a complete ecosystem, with players in the fields of education, academic research, R&D and industry. These links enable us to welcome students to companies and laboratories for projects and internships, as well as to develop work-study programs to train technicians in University Institute of Technology and engineers in engineering programs.

The focus of microelectronics training will be on the bachelor's degree level, where students begin to think about their specialization. In particular, introductory courses in semiconductor physics and MOSFET transistors will be integrated into electronics bachelor's degrees to build a solid theoretical foundation. Cross-disciplinary modules will be introduced to address societal and environmental issues. At Master's level, the project involves reinforcing the actions carried out by the SUMMIT thematic program of the UGA Graduate School in the field of sustainability and eco-innovation in microelectronics.