

## **PhD offer: Opto-microfluidic system for ultra-sensitive quantitative analysis in cardiovascular diseases**

Location: CEA Leti – Grenoble

Duration: 3 years

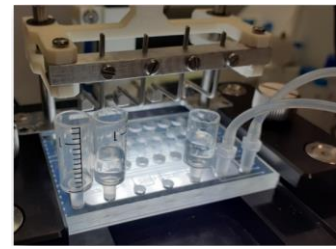
Start: October 2023

### **About CEA-Leti and host laboratory**

At the heart of the Minatec campus for innovation in micro and nanotechnologies, CEA-LETI is an applied research center in microelectronics and information and health technologies. One of his core mission is to ensure technological transfer from research to industries. In collaboration with public hospitals and universities, the Department of Micro and Nano technologies for healthcare and biology develops new technologies to invent tomorrow's medical diagnostic and therapeutic innovations. Inside this department, the lab of Microfluidic Systems and Bioengineering gathers a multidisciplinary team to design and produce microfluidic systems for healthcare and biology applications, from biological protocol integration to sample preparation for the future of medicine.

### **Position description**

The LSMB, in collaboration with researchers from the Institut de Recherche Interdisciplinaire de Grenoble (IRIG) at CEA, developed an innovative method for biomarkers detection (oligonucleotides, proteins, ...) based on aptamers and/or antibodies coupled on magnetic beads with LAMP isothermal amplification. This method integration for cardiac biomarkers detection is currently on going using a digital microfluidic chip developed in the lab. Observed limits of detection are sufficient for specific applications. Nevertheless, pM threshold required for cardiac biomarkers (e.g. troponin, NTproBNP) is not achieved yet. Therefore, a novel integrated detection approach is required. To answer this, various microfluidic technologies will be coupled to perform blood sample preparation on one hand and realise amplification of the captured targets using LAMP in droplets inside a digital microfluidic chip on the other hand. Automated microscopy will ensure detection with real time amplification follow up, including signal analysis and is integrated inside a compact device.



The doctoral work programme proposes to achieve the following milestones:

1. Coupling various digital microfluidic technologies. Microfluidic chips dimensioning associated to the protocol to be set up will be critical.
2. Quantification using real time follow up. Optical dimensioning will be design and realised. Signal analysis is also essential for this quantitative analysis, with adapted mathematical approach. Integrated compact device design and fabrication will meet these needs.
3. Multiplex to detect simultaneously several targets. To answer this challenge, relevant reagents design will be necessary.

All the laboratories involved have the appropriate skills and experience to ensure multidisciplinary supervision of the project.

#### **Profile and skills**

- Engineering/Master student with a major in physics, instrumentation and microsystems for health
- Knowledge or experience in microfluidics (applied to biology)
- Knowledge in signal and image analysis
- Design of 3D systems (SolidWorks)
- Motivated by experimental work
- Attracted by a multidisciplinary environment and technological innovation
- Attracted by biological applications of microsystems
- Good communication skills to share information and results within different teams

#### **Contact**

Please send your application to

[myriam.cubizolles@cea.fr](mailto:myriam.cubizolles@cea.fr)

[arnaud.buhot@cea.fr](mailto:arnaud.buhot@cea.fr)