

# 3D Integration Process for Imagers AND Single Photon Avalanche Diode Array

Record number : OPR-41

## Overview

### RESEARCH DIRECTOR

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### ADMINISTRATIVE UNIT(S)

Faculty of Engineering  
Department of Electrical and Computer Engineering  
Department of Mechanical Engineering  
Interdisciplinary Institute for Technological Innovation

### LEVEL(S)

Master's degree  
Ph.D.  
Postdoctoral Fellowship

### LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique  
C2MI - Centre de Collaboration MiQro Innovation  
TDSI - Teledyne Dalsa Semiconductor Inc

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## Project Description

There is a common denominator between medical imaging, such as positron emission tomography, and the conquest of our knowledge of the composition of our universe: ultra-sensitive photon sensors, capable of counting photons one by one and having the ability to digitize the time of arrival of these photons with a precision on the order of tens of picoseconds.

In our approach, an array of single-photon avalanche diodes is vertically integrated in 3D on top of the CMOS microelectronic circuit responsible for reading the array of sensors and performing signal processing.

We are looking for a mechanical/electrical engineering or physics student to further develop the 3D integration process as well as the design and characterization of photodiodes. This project is being carried out in close collaboration with Teledyne-Dalsa (Bromont), where the candidate will spend 50% of his/her time (to be confirmed).

In addition to the microelectronic 3D encapsulation process, the project includes the mechanical, electrical and optical characterization of samples at 3IT and C2MI. As the detectors are immersed in noble liquids such as xenon ( $-108\text{ }^{\circ}\text{C}$ ) and argon ( $-186\text{ }^{\circ}\text{C}$ ), finite element simulations with ANSYS are to be expected to ensure structural integrity.

This project will allow the interested person to develop knowledge at the cutting edge of technology in encapsulation and 3D integration. 100% of our students found a job before or at the end of their studies. The working environment at 3IT provides the experts, infrastructure and a motivated team required for the project.

Discipline(s) by sector

Funding offered

Partner(s)

**Natural Sciences and Engineering**

Yes

Teledyne DALSA Semiconductor Inc.

Electrical Engineering and Electronic Engineering, Mechanical Engineering

The last update was on 29 April 2021. The University reserves the right to modify its projects without notice.