Institut des Nanotechnologies de Lyon UMR CNRS 5270
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PhD position

36 months doctoral funding (October 2023 to September 2026)

New Single photon avalanche photodiode architecture for near-infrared detection

Project Description

Single photon avalanche photodiodes (SPADs - Single Photon Avalanche Diode) have become the most-used photodetectors for so-called "time of flight" measurement in the near infrared thanks to their high sensitivity and high speed. SPADs are easily integrated into CMOS technologies to cover wavelengths from 500 to 950nm, particularly for facial recognition and telemetry applications. For higher wavelengths (1000-1500nm) for example for navigation aid systems (LIDAR) and optical telecommunications, the use of materials that are more photosensitive in the near infrared wavelengths (SiGe, Ge, materials III- V) becomes necessary in a complex architecture (junction engineering, lens etc.), leading to a substantial increase of the technology complexity.
The objective of the thesis is to design, fabricate and characterize a SPAD with co-integration of an absorbing layer in III-V material on a silicon substrate.
The expected contributions are in the field of design, fabrication and characterization of these SPADs :

- The proposal of a SPAD architecture
- The development of an associated TCAD model
- The choice of an optimal architecture, based on a simulated device parametric study
- The proposal of a manufacturing process flow, in collaboration with LTM Lab in Grenoble-France.
- Clean room device fabrication
- Electro-optical characterization

The main challenges addressed by this research are :

- The quality of the heterojunction
- Electro-optical simulation of multi-material devices

Skills & qualifications

- Master degree in microelectronics or nanoscience or nanotechnology
- Experience in semiconductor device fabrication, simulation or characterization will be appreciated

Contact and Applications

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Application before April 16th 2023

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