Power Management ASIC for Low Power Cryogenic Photodetection Module

Record number : OPR-574

Overview

RESEARCH DIRECTION

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ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie électrique et de génie informatique
Institut interdisciplinaire d'innovation technologique (3IT)

LEVEL(S)

2e cycle
3e cycle
Stage postdoctoral

LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique

Project Description

3D Photon-to-Digital Converters (3DPDC) are a single photon detector technology developed at Sherbrooke that incorporates digital signal processing in 3D under the single photon detector. The goal with this technology is to achieve a level of integration between the photosensor and the readout electronics in a way that most of the detector performance (e.g. timing jitter, power consumption, noise, etc.) will be improved. This is especially critical in particle physics experiments where the photodetectors are at cryogenic temperatures in noble liquid. These experiments require a very large photosensitive area (from 4m2 up to hundreds of m2). To obtain such photosensitive areas, we build tiles of 8 × 8 3DPDCs with a master tile controller to control the 3DPDCs, and a silicon photonic ASIC to transmit data through optical links. All of these circuits need to be powered by a power management system that will produce the required voltages (at least 1.8V, 5V and a negative high voltage).

This project will require to design and send to fabrication the power management system in a 180 nm BCD (Bipolar-CMOS-DMOS) process. Multilayer Printed Circuit Boards (PCB) will need to be designed as well. The ASIC will be tested in our facility at Interdisciplinary Institute for Technological Innovation (3IT) where the required specialized equipments (e.g. 13 GHz oscilloscope, PCB assembly line, cryogenic chambers, etc.) will be available.

This project will allow the interested person to develop knowledge in complex integrated circuits. 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

Funding offered

Yes

sector

Sciences naturelles et génie

Génie électrique et génie électronique

The last update was on 12 March 2024. The University reserves the right to modify its projects without notice.