



Medical Applications Detector Engineering

Code	HSE8104
Programme	FCT
Department	HSE
Responsible	35609 - Dr. Marco Silari

Title

Medical Applications Detector Engineering

Description

The GEMPix detector combines two existing CERN-developed technologies - GEM (Gas Electron Multiplier), a type of gaseous ionisation detector and Medipix, a family of photon-counting pixel detectors. When combined, the features of each technology are enhanced and the resultant technology is a hybrid device able to detect all types of radiation with a high spatial resolution. Over the last few years, CERN has been exploring and enhancing GEMPix main features, with focus on the measurement and visualisation of the low-energy deposits in gas or tissue equivalent samples (e.g. medical phantoms). The GEMPix has proof-given potential to expand the recent methodologies on hadron therapy active dosimetry. However, the current active detection area of the GEMPix detector is a limitation for some medical applications (e.g. conventional radio-therapy).

The aim of the this internship is to implement a larger detection area upgrade on the GEMPix detector by making use of the recent technologies improvements obtained, either on CERN pixel detectors family (Medipix), either on GEM technology. To reach the upgrade milestone, the detector will be redesigned from the hardware to the data acquisition firmware. After a prototype is built, the detector will be characterized at CERN calibration facilities. In the final stage, the detector will be validated in a radiation therapy facility and the results compared with images obtained by standard techniques.

Skills

Networks and Systems: Integrated circuits. Theory of Electrical Engineering: Modeling and simulation, Signal processing
Core skills:; Low and High Frequency Engineering: Active and passive elements, Electrical materials, Measurement techniques
Core Electrical Engineering: Modelling and simulation, PCB design, firmware and software design. Integrated circuits, Sensors, LabView. Oscilloscope and electronic lab proficiency

Data processing skills: Montecarlo Simulations and image reconstruction
; Preference given to candidates with experience on silicon and gas detectors

Soft skills: This project requires a problem solver, hands-on engineer; Good communication skills

Disciplines

Electronic Engineering

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