Contribution ID: 203

Type: Contributed talk

3D digital SiPM for large area and low background experiments

Wednesday 26 July 2017 13:00 (15 minutes)

Large area and low background experiments such as nEXO (next Enriched Xenon Observatory, a proposed 5 tonne-scale detector) are looking for new and innovative ways to improve the sensitivity of their detectors. Installing the photodetectors and their electronic readout directly in the detector active medium is among promising approaches. In turn, this introduces new constraints on the radioactivity background and on the power consumption of the electronics. While the common baseline is to use silicon photomultipliers (SiPM), the Sherbrooke radiation instrumentation team is proposing a vertically integrated and digitally controlled SiPM (3D-dSiPM). The digital readout takes advantage of the inherently binary nature of the Geiger-mode avalanche photodiode, provides fast in-chip processing and overcomes the output capacitance challenge. Moreover, the 3D structure allows for an independent optimization of the photosensing layer and the electronic readout layer. This talk presents Sherbrooke's 3D-dSiPM technology and its first prototype results. The work done shows no systematic degradation compared to its 2D equivalent architecture. Furthermore, the readout and trigger algorithm is presented as well as the current work underway to develop a 3D integration process with industrial partners. This last effort aims at providing high yield capability for large area tiles production.

Author: Prof. CHARLEBOIS, Serge (Université de Sherbrooke)

Co-authors: VACHON, Frederic (UdeS); PARENT, Samuel (Université de Sherbrooke); CÔTÉ, Maxime (Université de Sherbrooke); ROSSIGNOL, Tommy (Université de Sherbrooke); NOLET, Frédéric (Université de Sherbrooke); ROY, Nicolas (Université de Sherbrooke); BOURQUE, Frédéric (Université de Sherbrooke); RETIERE, Fabrice (TRIUMF); PRATTE, Jean-Francois

Presenter: Prof. CHARLEBOIS, Serge (Université de Sherbrooke)

Session Classification: New Technologies

Track Classification: New Technologies