Contribution ID: **28** Type: **Oral**

Development of High-density NIR sensitive Silicon photomultipliers at FBK

Tuesday, 27 November 2018 10:35 (20 minutes)

Analog silicon photomultipliers (SiPMs) have obtained growing attention as an alternative to the traditional photomultiplier tubes in detection of scintillation light, e.g., in nuclear medicine and high-energy physics. However, SiPMs are also emerging as very sensitive detectors in many single-photon or few-photons applications, like: LIDAR, optical spectroscopy, Cherenkov radiators and NIR scintillation detection in TPCs. Some of these new applications are based on detection at red and NIR wavelengths. In Fondazione Bruno Kessler, FBK, we developed different technologies in the last years. Recently, we produced a SiPM technology with enhanced sensitivity in NIR wavelength region, called "NIR-HD". The main goal is increasing the PDE at such long wavelengths, where the absorption depth of silicon is typically higher than the epi-layer thickness. There are both technological and design challenges. We used a thick epi-layer of 8µm and we developed different SiPMs and SPADs versions, obtaining good PDE in the NIR. We observed that maximum PDE was limited mainly by the effects of the border region of the SPAD, reducing effective FF. These effects get bigger with thick epi-layer. Therefore, based on TCAD simulations, we further developed the cell structure, improving the edge sensitivity. We present here and compare the performance of standard and improved NIR-HD FBK technologies. For example, with 6V of excess bias, we obtaine a PDE of ~45% at 500nm and ~9% at 900nm for 25µm cell SiPM, and of ~13% at 900nm for 54µm cell SiPM. Noise is around 800kcps/mm2 and direct CT between 15% and 25%.

Primary authors: ACERBI, Fabio (FBK); Dr PATERNOSTER, Giovanni (FBK); Mr CAPASSO, Massimo (FBK); Mr ZORZI, Nicola (FBK); Dr GOLA, Alberto (FBK)

Presenter: ACERBI, Fabio (FBK)

Session Classification: Tuesday morning