13th International "Hiroshima" Symposium on the Development and Application of Semiconductor Tracking Detectors (HSTD13), Vancouver, Canada

Contribution ID: **66** Type: **Oral**

Design, fabrication, and preliminary test results of a new inverse-LGAD for soft X-ray detection

Tuesday, 5 December 2023 12:20 (20 minutes)

The Low Gain Avalanche Detector (LGAD) is becoming increasingly a promising and important technology for soft X-ray imaging at the next generation light sources as well as for particle tracking applications in the demanding future high energy physics experiments. Different versions of LGAD have been under investigation to address specific needs for different applications. Particularly, in order to exploit the unique scientific imaging opportunities at the new XFELs, finely segmented detectors that can detect soft X-rays with energies as low as 250 eV are needed. The sensors must be able to provide an internal gain of ˜10 to amplify the generated small signal to be above the noise floor of the readout electronics and must have an extremely shallow entrance window to allow the absorption of soft X-rays in the active volume of the sensor. In addition, due to the fine segmentation, the charge multiplication structure must be accommodated not on the segmented side of the sensor but on the opposite side, which would otherwise lead to extremely low fill-factors. We demonstrate a new inverse LGAD structure implemented in a sensor with n-on-n configuration as a strong candidate to fulfil these requirements. We will present the design, simulation and fabrication of the sensors as well as the preliminary characterization, including I-V and gain measurements.

Submission declaration

Original and unplublished

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Session Classification: Day 2 - Session 2

Track Classification: Avalanche-based sensors