

Soft X-ray detection with single photon resolution using LGAD sensors

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Hybrid X-ray single photon-counting and charge integrating detectors developed at the Paul Scherrer Institute perform outstandingly in many hard X-ray experiments, both at synchrotrons and XFELs, but they show limitations in the soft X-ray energy region. The main factors that limit the detection of soft X-rays are the poor quantum efficiency, due to the short attenuation length of soft X-rays, which are absorbed in the inefficient region of the sensor, and the low signal-to-noise ratio (SNR), due to the small charge created by low energy photons.

In the present work, we present the developments carried out at PSI in collaboration with Fondazione Bruno Kessler to optimize the quantum efficiency and improve the SNR adapting the Low Gain Avalanche Diode (LGAD) technology to soft X-ray detection. We report an improvement on the quantum efficiency to above 60 % for 250 eV X-rays and the measurement of single photons with energies down to 400 eV.

Summary

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