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# Synchrotron light source X-ray detection with Low-Gain Avalanche Diodes

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Low Gain Avalanche Diodes (LGADs) represent the state-of-the-art in timing measurements and will instrument the future Timing Detectors of ATLAS and CMS for the High-Luminosity LHC. While initially conceived as a sensor for charged particles, the intrinsic gain of LGADs makes it possible to detect low-energy X-rays with good energy resolution and excellent timing (tens of picoseconds). Using the Stanford Synchrotron Radiation Lightsource (SSRL) at SLAC, several LGADs designs were characterized with energies from 5 to 70 keV. The SSRL provides 10 ps pulsed X-ray bunches separated by 2 ns intervals with an energy dispersion (ΔE/E) of 10−4. LGADs from Hamamatsu Photonics (HPK) and Brookhaven National Laboratory (BNL) with different thicknesses ranging from 20 μm to 50 μm and different gain layer designs were read out using fast amplification boards and digitized with a high bandwidth and high sampling rate oscilloscope. PiN devices from HPK and AC-LGADs from BNL were characterized as well. The feasibility of reliable Compton scattering detection with LGADs was probed. The end goal is to utilize LGADs as a pass-through beam monitoring device for high-energy X-ray beams using Compton interaction. The charge collection and multiplication mechanism were simulated using Geant4 and TCAD Sentaurus, providing an important handle for interpreting the data. In this contribution, the results of the data analysis and simulation will be shown.

## Submission declaration

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