Contribution ID: **118** Type: **not specified**

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

*Friday 1 December 2023 09:00 (20 minutes)*

Low Gain Avalanche Diodes (LGADs) represent the state-of-art technology in fast timing measurement for charged minimum ionizing particles (MIPs). LGADs are initially developed for future Timing Detectors in the ATLAS and CMS experiments at the High-Luminosity LHC. One of LGADs'key features is the gradient-doped multiplication layer providing intrinsic gain. The intrinsic gain enables the detection of low energy X-rays with good energy resolution and precise timing capabilities. We extensively tested LGADs from HPK and BNL with varying thicknesses ranging from 20µm to 50µm at room temperature. These tests utilized X-ray energies from 5 keV to 70 keV at the Stanford Synchrotron Radiation Lightsource (SSRL) with 10ps pulsed X-ray bunches separated by 2ns interval. In this contribution, we will show that LGADs has better energy sensitivity and timing resolution for low energy X-ray than PiN devices under finely-tuned operational conditions. Moreover, we will demonstrate the high frame-rate capability of LGADs (with at least 500MHz). Additionally, we investigated the gain suppression effect resulting from point-like large charge deposition along with the aid of TCAD simulation. Lastly, we made a crude attempt to assess the feasibility of reliable Compton scattering detection with LGADs, which aim to employ LGADs as pass-through beam monitoring device for high-energy X-ray beams using Compton interaction.

**Authors:** SEIDEN, Abraham (University of California,Santa Cruz (US)); Prof. SCHUMM, Bruce Andrew (University of California,Santa Cruz (US)); SADROZINSKI, Hartmut (SCIPP, UC santa Cruz); SADROZINSKI, Hartmut (University of California,Santa Cruz (US)); Dr OTT, Jennifer (University of California,Santa Cruz (US)); Dr NIZAM, Mohammad (University of California Santa Cruz); Dr MAZZA, Simone Michele (University of California,Santa Cruz (US)); ZHAO, Yuzhan (University of California,Santa Cruz (US)); ZHAO, Yuzhan (University of California Santa Cruz)

**Presenters:** Dr OTT, Jennifer (University of California,Santa Cruz (US)); Dr MAZZA, Simone Michele (University of California,Santa Cruz (US))

**Session Classification:** LGAD