

# Performance of HPK Prototype LGAD sensors for the ATLAS High-Granularity Timing Detector HGTD

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We report on the layout and performance of Low-Gain Avalanche Detectors (LGAD) produced by HPK as prototypes for the HGTD in ATLAS. The HGTD is a multi-layer upgrade of the ATLAS detector of total area of 6.4m<sup>2</sup> covering the pseudo-rapidity region between 2.4 and 4.0 with timing sensors with time resolution of 50 ps, representing the first large scale application of the LGAD.

Sensors with an active thickness of 50  $\mu\text{m}$  and 35  $\mu\text{m}$  were produced with common masks and different combinations of doping profile of the gain layer. The power dissipation and breakdown voltage are determined from I-V measurement, doping profile of the gain layer and the bulk from C-V data. The dynamic properties of the LGAD were determined by charge collection measurements using laser and charged particles. Samples of the sensors are irradiated with neutrons, protons and gammas to study the radiation-hardness. The dependence of the gain and of the time resolution on bias voltage and fluences will be presented.

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**Authors:** STENZEL, Hasko (Justus-Liebig-Universitaet Giessen (DE)); NIKOLIC, Irena (LPNHE Paris)

**Presenter:** NIKOLIC, Irena (LPNHE Paris)

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