

## Study of time resolution of low-gain avalanche detectors

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We are conducting research on Low-Gain Avalanche Detector (LGAD), a semiconductor detector with excellent time resolution, which has a signal amplification function inside the sensor and can obtain a sufficiently large signal even with a thin detector. LGAD is currently researching applications for future accelerator experiments and PET-CT sensors for medical use, etc. We measured the electronic characteristics and evaluated the time resolution, and confirmed that the radiation resistance and that there was a time resolution of about 30 ps. However, it is known that there is position dependency depending on the incident position of the signal particle, and there is a possibility that there is a difference in the time resolution of the incident signal due to the difference in the amplification factor.

In this study, we conducted a beam test using Fermilab's 120 GeV proton beam, and evaluated the time resolution and the relationship between the signal amplification factor and the incident position of the signal particle. Until now, the time resolution was evaluated using the beam from the accelerator, but an amplifier for evaluating the time resolution of LGAD using a beta source was created, and the time resolution was evaluated using the beta source. ACLGAD has been devised as a sensor with a structure that improves the non-uniformity of the amplification factor for the practical application of LGAD. For ACLGAD, we verified whether a uniform amplification factor could actually be obtained using TCAD simulation.

### Submission declaration

Original and unpublished

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