

AC-LGADS in 4D-Tracking

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Introduction

In experimental particle physics, the measurement of the trajectory of a charged particle is called tracking. With the trajectory information, we can obtain the momentum and energy of the particle.

Current technology, measures two or three-dimensional space trajectories. We present an in-development particle detection device called AC-coupled Low Gain Avalanche Diodes (AC-LGADs). These are a leap forward in tracking technology since they measure the trajectory and time of the charged particle with excellent resolution in the order of microns and picoseconds, respectively. Hence, they are known as *4D-Trackers*.

This technology will improve many areas of experimental particle physics, such as particle identification, particle detection rate, and kinematical variables resolution. It also provides a valuable bridge to collaborate with prestigious scientific institutions like the Fermi National Accelerator Laboratory (Fermilab), and the California Institute of Technology (Caltech), among others.

Description

The research about AC-LGADs has two components: the *abroad work* which involves many institutions and has been working for some time now testing AC-LGADs manufactured by different labs[1], and the *local work* which has been recently formed (beginning of 2022) and has been working in the characterization of the readout board which is the circuit to which the AC-LGADs are wire bonded. The readout board is connected to an oscilloscope to measure the signals collected by the AC-LGADs.

Acknowledgments

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References

- [1] R. Heller, *et al.*, Characterization of BNL and HPK AC-LGAD sensors with a 120 GeV proton beam (2022)