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Large Area Picosecond Photodetector for the Upgrade II of the LHCb RICH

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The LHCb experiment is one of the four large detectors at the Large Hadron Collider (LHC) accelerator at CERN, performing searches for new physics through studies of CP-violation and decays of heavy-flavour hadrons.
The RICH (Ring Imaging Cherenkov) detectors play a key role in particle identification.
An intense R&D programme to look for suitable candidates for the planned LHCb Upgrade II has been launched.
A good photon detector candidate should be capable of imaging single photons with outstanding time resolution, high granularity and low dark count rate, in order to achieve the required particle identification performance in the radiation environment of the High-Lumi LHC Era.
One of the possible candidates under investigation is the Large Area Picosecond Photon Detector (LAPPD), fabricated by industrial partner Incom (US).
The Generation-II LAPPD is equipped with a capacitively coupled backplane. The first performance results are presented testing the LAPPD with the backplane supplied directly by the company with a pixel size of 24×24 mm^2. Furthermore, the LAPPD has been characterised with a custom backplane with improved granularity, with a readout pixel size of 3×3 mm^2.
This helped to enhance the spatial resolution of the detector, allowing at the same time the connection of this board to a FastIC based fast electronic readout that has been developed and tested by the LHCb RICH group, in collaboration with the University of Barcelona.
The LAPPD coupled to the fast electronics was tested at CERN SPS in September 2023. The setup and measurements performed with the particle beam will be presented.

Collaboration

LHCb RICH Collaboration

Role of Submitter

I am the presenter

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