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P1.23: Test beam studies of ALICE Forward Calorimeter prototypes

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The ALICE experiment is currently conducting the third round of data-taking at the Large Hadron Collider, LHC Run 3, but is planning an additional detector upgrade for the next data-taking round, LHC Run 4. One of the proposed upgrades contains the extension of the forward physics capabilities of the experiment by including a new high-granularity forward calorimeter (FoCal). This calorimeter is designed to explore the poorly known forward kinematic regime of parton distributions in nuclei and nucleons at high energy [1].

The electromagnetic part of FoCal (FoCal-E) is a 20-layered sandwich sampling calorimeter consisting of 18 low-granularity silicon pad sensor layers and two high-granularity pixel sensor layers, while the hadronic calorimeter (FoCal-H) is a spaghetti calorimeter consisting of copper tubes filled with scintillating fibers.

The pixel layers are equipped with ALICE Pixel Detector (ALPIDE) chips that were developed for the upgrade of the Inner Tracking System (ITS) of the ALICE experiment. These sensors are based on monolithic active pixel sensors (MAPS) and CMOS imaging technology and have a granularity of $30 \times 30 \mu\text{m}^2$ [2]. The combination of pad and pixel sensors achieves excellent energy and pointing resolution, which allows for discrimination between direct photons and photons from π^0 decay.

Different prototypes have been studied and tested in various particle beams at SPS in 2022. This talk will give an overview of the prototypes and show the most recent results from the beam tests conducted at CERN.

[1] ALICE Collaboration. A Forward Calorimeter (FoCal) in the ALICE experiment (2019)

[2] ALICE ITS ALPIDE development team. ALPIDE Operations Manual (2016)

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