Contribution ID: **45** Type: **not specified**

Development of the FoCal PAD prototype and its test results

Tuesday 26 November 2019 11:00 (20 minutes)

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We are planning to realize a forward calorimeter (FoCal) as part of a detector upgrade of the ALICE experiment at LHC. The installation of and data taking with FoCal are expected during Long Shutdown 3 (in 2024 - 2026) and Run-4 (in 2026 - 2028), respectively.

FoCal will consist of the Si+W electromagnetic calorimeter and a conventional sampling hadronic calorimeter. The electromagnetic calorimeter has 18 lower-granularity layers using silicon pad sensors (PAD) and 2 higher-granularity layers using silicon pixel sensors (MAPS).

The thickness, width and height of one PAD layer are approximately 5.5mm, 280mm and 93mm, respectively,while the front-end electronics are mounted on top of the PAD layer.

We have developed the prototype, called “mini-FoCal”, which has 20 PAD layers with 3840 silicon pad cells in total. FoCal will be 48 times larger than mini-FoCal.

In order to measure the energy resolution and S/N, we tested mini-FoCal at CERN PS and SPS complexes during 2018. Following these tests, we temporarily installed mini-FoCal in the ALICE cavern and studied its performance under realistic experimental conditions over one month. Finally, we could confirm the better energy resolution and the electromagnetic shower development in mini-FoCal.

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Session Classification: Calibration, R&D, test beams