

High sensitivity particle tracker based on optically readout GEM

GEM-based detectors have had a noticeable development in last years and have successfully been employed in different fields from High Energy Physics to imaging applications.

Light production associated to the electron multiplication allows to perform an optical readout of these devices. The big progress achieved in CMOS-based photosensors make possible to develop a high sensitivity, high granularity and low noise readout.

In this work we present the results obtained by reading out the light produced by a triple-GEM structure by means of a 4 mega-pixel CMOS sensor with a noise level lesser than 2 photons per pixel.

The choice of a CF₄ rich gas mixture (He/CF₄ 60/40) and a detailed optimization of the electric fields allowed to reach a high-yield enough high to obtain, for the first time, very visible signals of cosmic ray muons.

About 600 photons/mm were collected in average along the muon tracks and about 40 pixels/mm gave a response three sigmas large than the pedestal.

Tracks due to electrons produced in natural radioactivity were also acquired and a light yield 10 times larger than cosmics was measured.

A test beam is foreseen for November 2015. More quantitative evaluations of the detector performance (e. g. space resolution, tracking efficiency, light yield, energy released resolution) are expected.

These results will also be presented at the conference.

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Track Classification: Gaseous Detectors