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Characterization and Calibration of Large Area Resistive Strip Micromegas Detectors

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Resisitve strip Micromegas detectors behave discharge tolerant. They have
been tested extensively as smaller detectors of about 10 x 10 cm^2 in size and they work reliably at high rates of 100 kHz/cm^2 and above. Tracking resolutions well below 100 um have been observed for 100 GeV muons and pions. Micromegas detectors are meanwhile proposed as large area muon precision trackers of 2-3m^2 in size. To investigate possible differences between small and large detectors, a 1m^2 detector with 2048 resistive strips at a pitch of 450 um was studied in the LMU Cosmic Ray Facility (CRF) using two 4 x 2.2 m^2 large Monitored Drift Tube (MDT) chambers for cosmic muon reference tracking. Segmentation of the resistive strip anode plane in 57.6mm x 95mm large areas has been realized by the readout of 128 strips with one APV25 chip each and by 11 95mm broad trigger scintillators placed along the readout strips.
This allows for mapping of homogenity in pulse height and efficiency, determination of signal propagation along the 1m long anode strips and, very important, calibration of the position of the anode strips. Additionally, we report on studies of the charge-up behavior of the resistive strip anodes and related simulations of mesh-transparency, a non-trivial aspect, as thicker meshes than usual have to be used for the large area application.

Collaboration

ATLAS Muon Collaboration

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