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Large-area Floating Strip Micromegas

Micromegas (MICRO MESH GAS detectors) are high-rate capable, high resolution micro pattern gas detectors. Resistive strip Micromegas with square meters in area are foreseen as replacement of the precision chambers in the small wheel part of the ATLAS muon spectrometer. The resistive material in the active area suppresses the effects of discharges.

As a novel approach a Micromegas with floating strip anode consisting of 1920 copper strips with an active area of 50 cm x 48 cm has been developed. Measurements with high-energy pion beams at SPS/CERN are presented. We report on efficiency, gas gain and spatial resolution as a function of electric field configuration and hit rate and discuss the discharge behavior. The substantial dead time reduction due to the floating strip principle is demonstrated.

Evaluating the arrival time of charge clusters allows for TPC-like operation and thus direct angular resolution in single plane readout. We discuss the achieved resolution as a function of track inclination for high-energy pions and cosmic muons. The timing behavior along the readout strips is investigated and compared to the performance of a 102 cm x 92 cm Micromegas with 2048 resistive strips. Stripline behavior with an effective signal velocity on the strips of (6 ± 1) ns / m is observed.

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