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Precision Calibration of Large Area Micromegas Detectors Using Cosmic Rays (12' + 3')

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Currently m^2 large Micromegas detectors with a spatial resolution better than 100 μm are of big interest for many experiments.
Due to their size the construction of these detectors is highly sophisticated and needs to fulfill strict mechanical tolerances.
We developed a method to survey working detectors on potential deviations of the micro pattern readout structures from design value
as well as deformations of the whole detector, using cosmic muons in a tracking facility.

The LMU Cosmic Ray Facility consists of two 8\,m^2 ATLAS Monitored Drift Tube chambers (MDT) for precision muon tracking
and two segmented trigger hodoscopes for 10 cm position information along the wires of the MDTs with sub-ns time-resolution.
It provides information on homogeneity in efficiency and pulse height of one or several Micromegas installed in between the MDTs.
With an angular acceptance of -30° to +30° the comparision of the MDT muon tracking with centroidal position
determination or TPC-like track reconstruction of the Micromegas allows for calibration in three dimensions.

We investigate presently a telescope consisting of a 1 m^2 and three 100 cm^2 resistive strip Micromegas, with emphasis on the
differences in performance between large and small detectors. The small detectors behave dimensionally stable,
whereas the large detector seems to show deviations from the readout strip staightness and global deformation due to the small
overpressure coused by the Ar:CO_2 gas flux.
We introduce the alignment and calibration procedure, report on homogeneity in efficiency and pulse height and present results
on deformation and performance of the 1 m^2 Micromegas. The same maesurement will be performed with a 4-layer Micromegas
quadruplet of 2 m^2 size, as soon as its construction is finished.

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