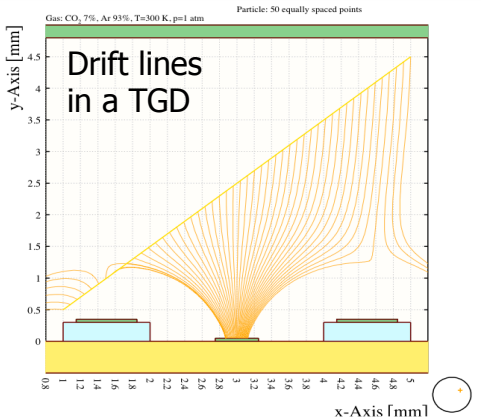
Development of a novel Micro Pattern Gaseous Detector for cosmic ray muon tomography

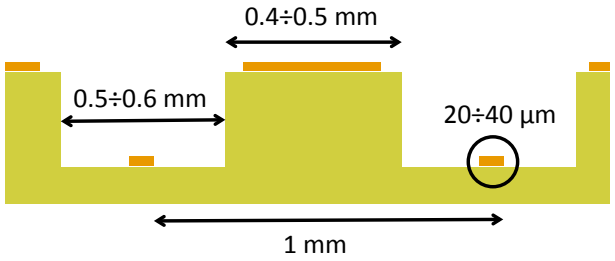
The use of cosmic ray tomography on a large scale is still disfavored because of the high cost and complexity of the detectors.

We propose a novel detector:
Thick Groove Detector (TGD)
with a single-layer spatial resolution of the order of 500 μm.

Main goals:
① Construction simplicity → limited costs;
② Potential for industrial mass production;

The TGD has a thin (<1 mm) amplification gap formed by alternate anode/cathode microstrips layers at different heights and a larger drift region. Its structure recalls the micro-groove detector [R. Bellazzini, et al., NIM A424 (1999) 444]





The first TGD prototype at CERN. It has a 10x10cm^2 active surface and it is divided in 4 different regions (25 strips each) with different test geometry.

M.Biglietti, V.Canale, S.Franchino, P.Iengo, M.Iodice, ***F.Petrucci***

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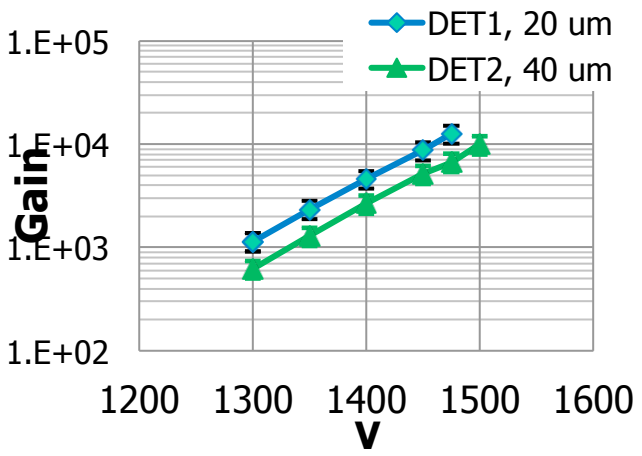
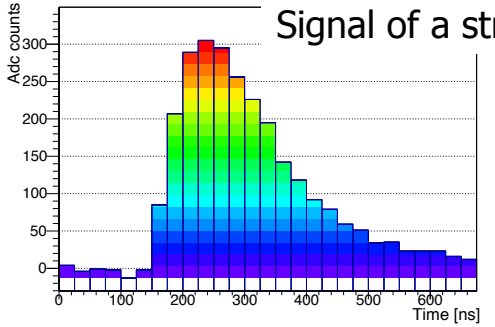
The preliminary tests and the characterization of the detectors were performed using a Fe^{55} source. Ar:CO_2 70:30 gas mixture was used. Anodic strips were connected to ground with a 100 kOhm resistor and the signal was sent to a preamplifier, a shaper and eventually to a multichannel analyzer. The currents were also measured to compute the gain.

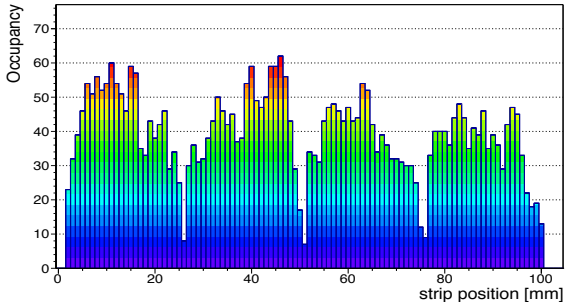


Signal of a strip.



The TGD prototype was exposed to cosmic rays. The detector was read-out with 2 APV-25 chips and operated with an Ar:CO_2 93:7 gas mixture.

The occupancy of the 100 strips of the detector is fairly uniform, showing that all four regions are working. The drop of efficiency for the strips at the edges of each region is due to a distortion in the amplification field (edge effects).



For more details...have a look at the poster!

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