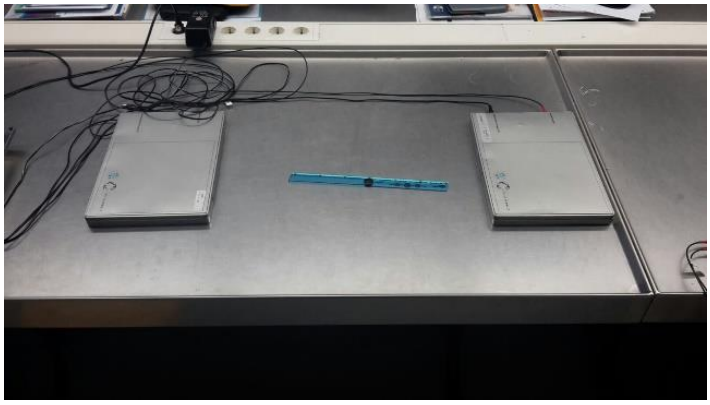
CosMO – Detection of Cosmic Muons

Leonard Biedermann*, Pieter Hartwig*, Marc Heinemeyer*, Niklas Hütten*, Max Kuhn*, Tina Latz*, Nele Lehmann*, Lena Rusdorf*, Leon Seide*, Sung Woo Yi*, Leonard Wasserkampf*, Hans-Peter Bretz[#], Moritz Hütten[#], Stefan Bläß. * Gymnasium Villa Elisabeth, Wildau; [#] DESY Zeuthen, Germany

Materials and Methods

PC + Muonic software, 1 DAQ card, 2 muon detectors (scintillator plates), power supply (5 V), cable connections.



1. Laptop with Muonic software, 2. DAQ box, 3. scintillator plate (channel 0), 4. scintillator plate (channel 1), 5. 5 VDC power adapter, 6. Lemo BNC cable, 7. USB cable, 8. 5 VDC splitter

The two detectors were arranged in different positions in relation to each other, calibrated, varying thresholds were set and frequencies of coinciding events were measured (fig. 1). At optimum thresholds for each detector, varying distances (fig. 2) and varying angles against a horizontal support of the detectors aligned in parallel and a distance of 0,4 m (fig. 3) coincidence measurements were performed.

Results and Discussion

We observed that muon detection decreased with higher thresholds (set in mV) (fig. 1). Further, the frequency of coinciding muon detection events was highest with both detector plates arranged in parallel to the horizontal support (table surface) and lowest with both detector plates arranged perpendicularly to the table surface. Also muon detection was highest the closer the distance of the detector plates and lower the farther they were arranged apart (fig. 2).

With lower thresholds particles able to trigger an event require less energy than at higher thresholds. Thus, high thresholds bias for high-energy particles. – The majority of muons originate from particle collisions in the higher atmosphere – predicted to shower in a $\cos^2(\Theta)$ dependency – which we could nicely demonstrate (fig. 3).

Fig. 1. Trigger rate as a function of threshold

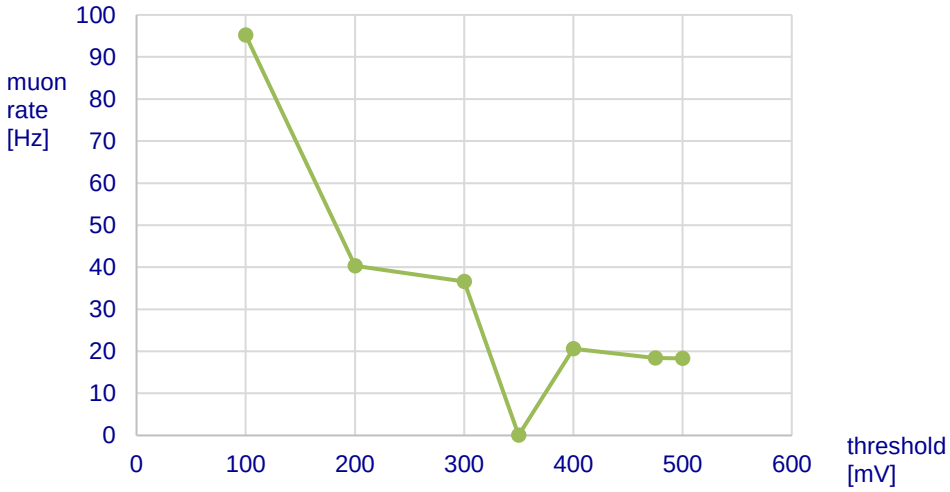


Fig. 2. Airshower coincidence as a function of distance

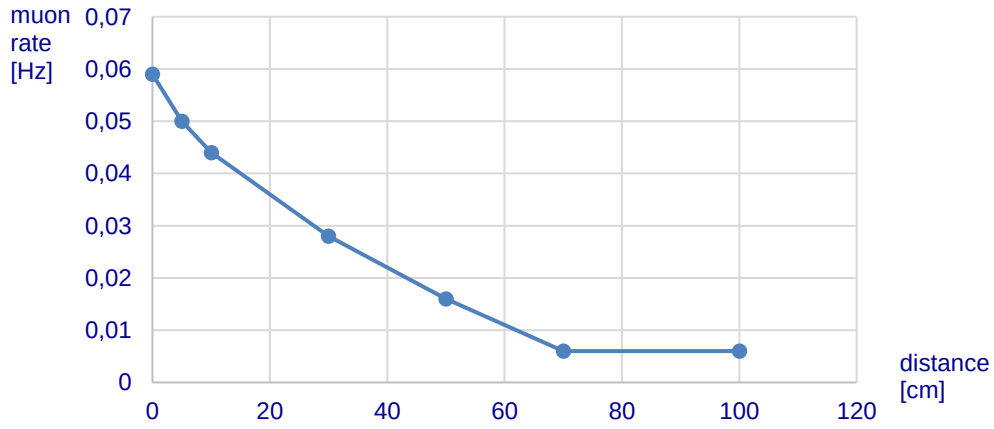


Fig. 3. Muon frequency as a function of zenith angle