

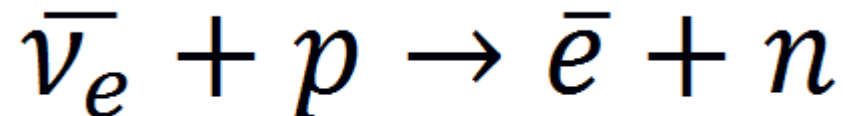
# Cosmic muons measurements in DANSS experiment

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for the DANSS experiment

# Task and idea of experiment

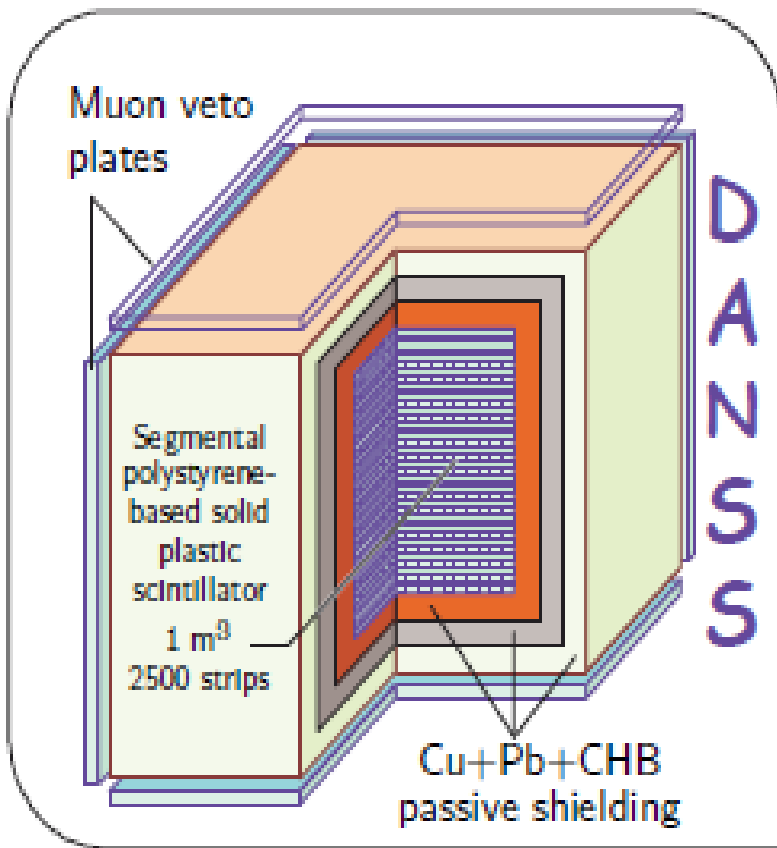
Main task: search for short-range neutrino oscillations

For neutrino registration this reaction is used:



in which positron and neutron are detected

# Location and design of DANSS experiment

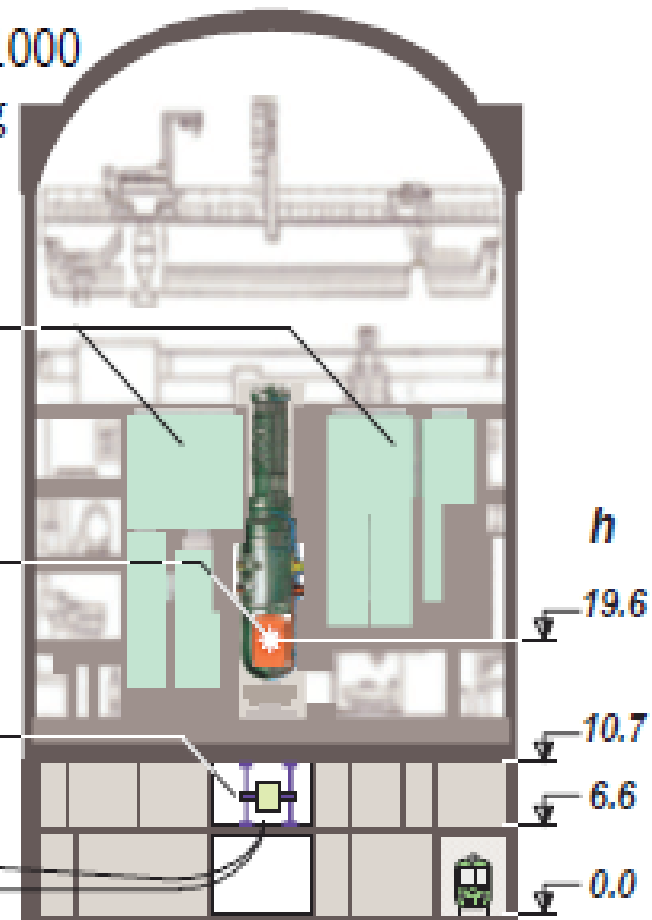


A typical WWER-1000 reactor building

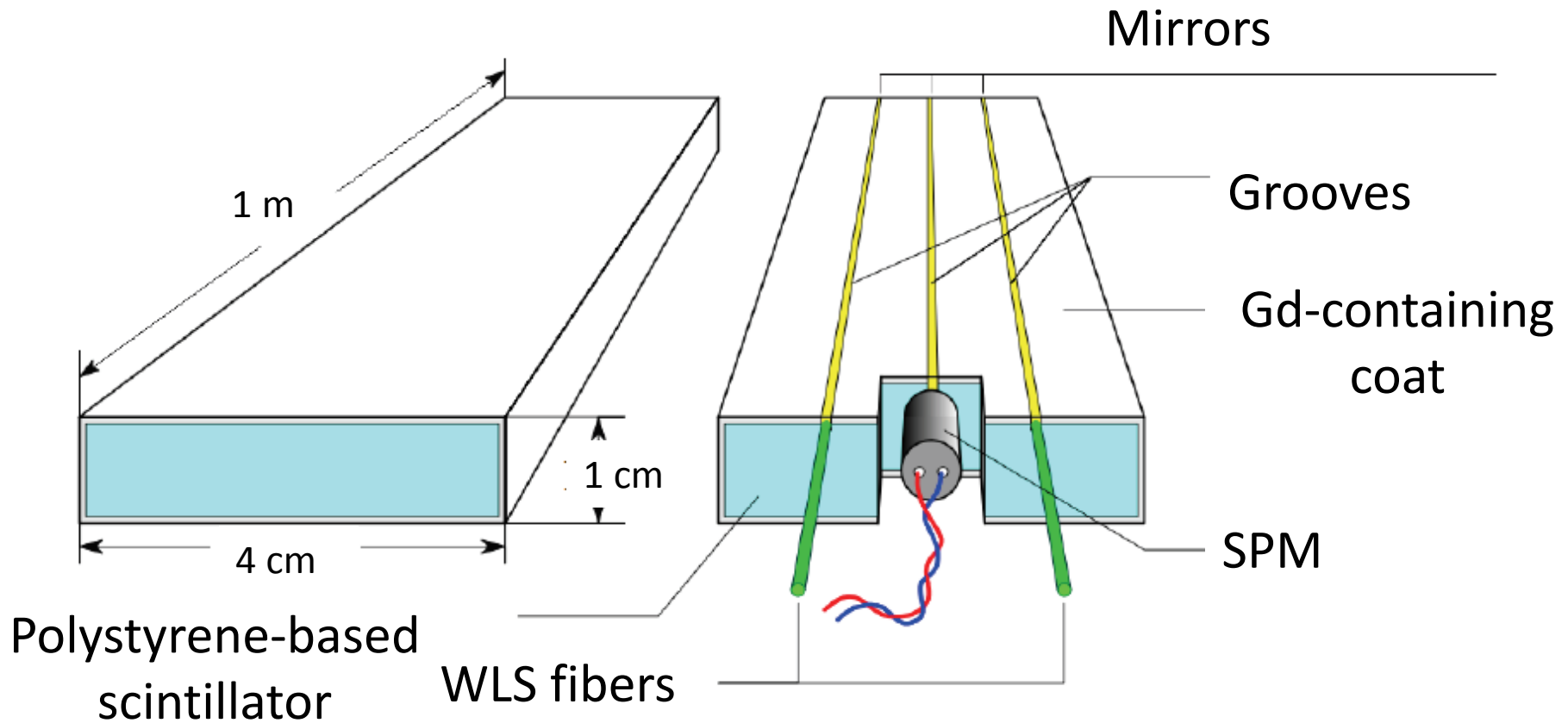
Reservoirs with technological liquids

A core of the reactor:  
∅ 3.12 m h 3.55 m

A movable platform with a lifting gear in a service room



# Strip structure



# Why we study muons in neutrino experiment?

1. Muons are sources of induced noise (n, nuclei  ${}^9\text{Li}$ ,  ${}^8\text{He}$  and others)
2. Calibration
3. Because muons are recorded for 24/7, we could study seasonal variation of the cosmic muon flux

# Algorithm of track reconstruction

1. Energy cut (hits with  $E < 5$  pixels)
2. Time cut ( $\pm 20$  ns)
3. Number of hits cut ( $< 10$  in event or  $< 5$  in plane)
4. Building the line for all hits and cut hits which are located farther than 6 cm from the line
5. Building the line for all not cut hits, and returning all cut hits which are closer than 6 cm from the new line
6. Building the final line
7. Calculation of standard deviation from final line, and cut lines with  $\sqrt{\sigma} > 1.4$  cm

# Visualization of the last cuts

First line



Second line



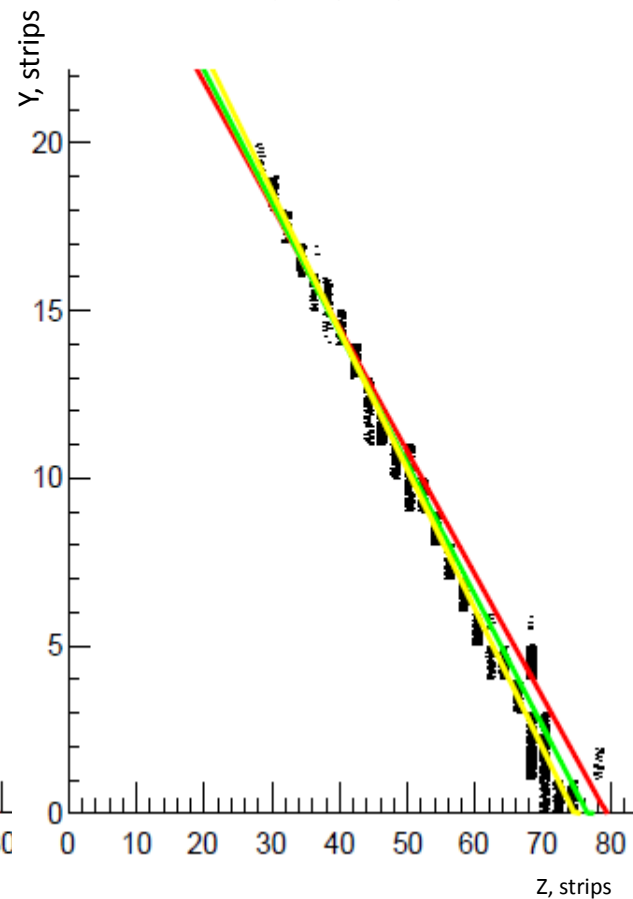
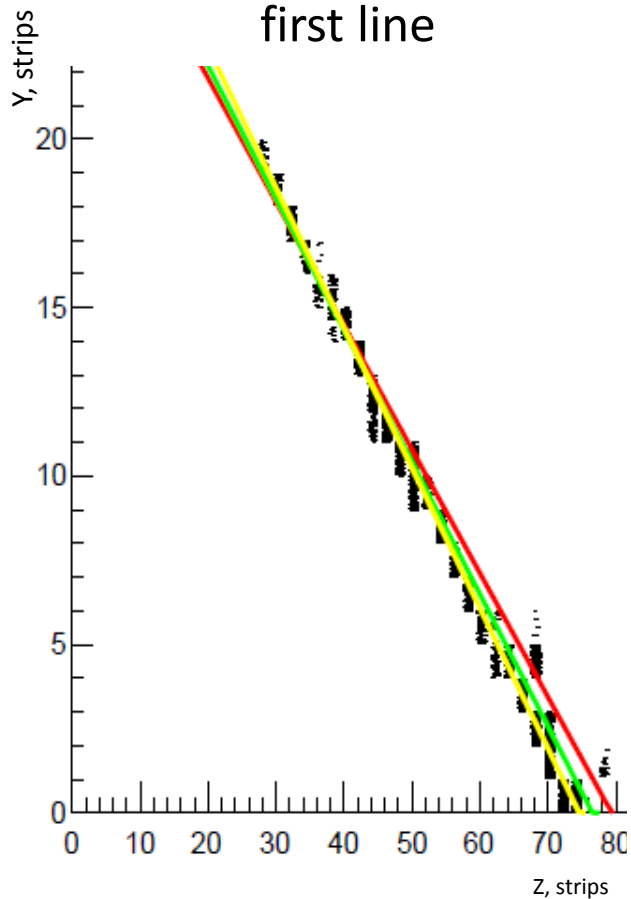
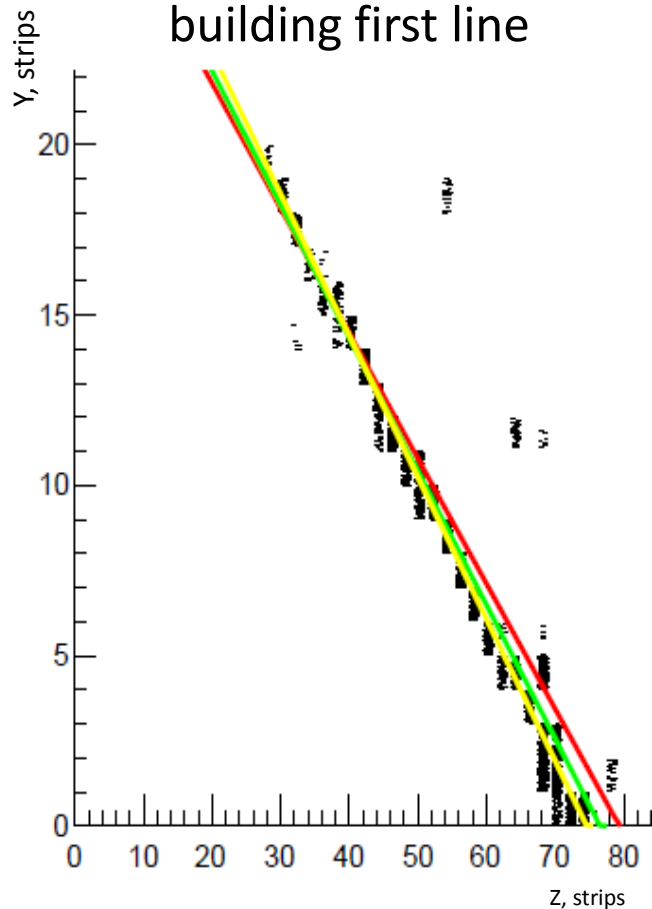
Final line



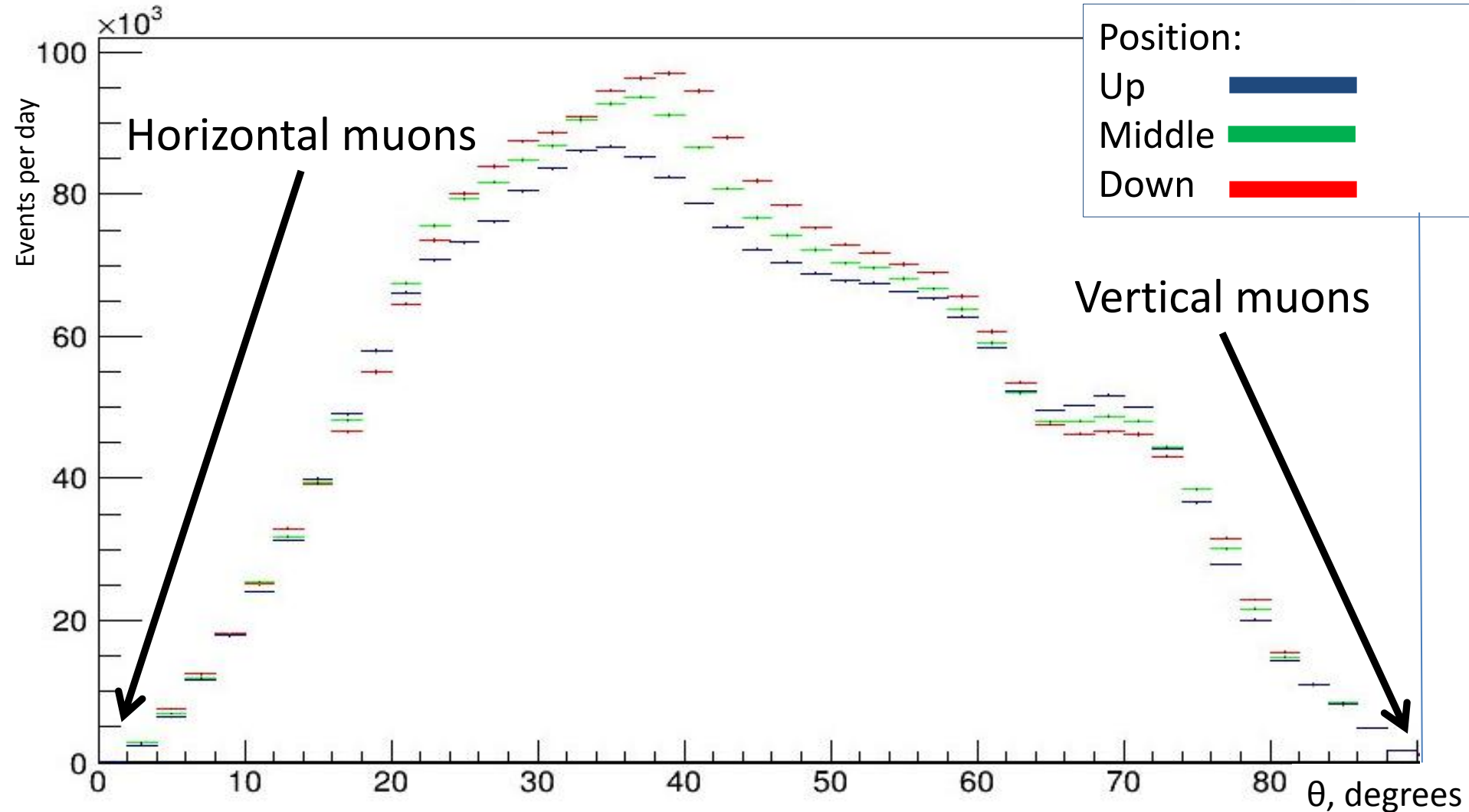
Event before building first line

Event after building first line

Final event

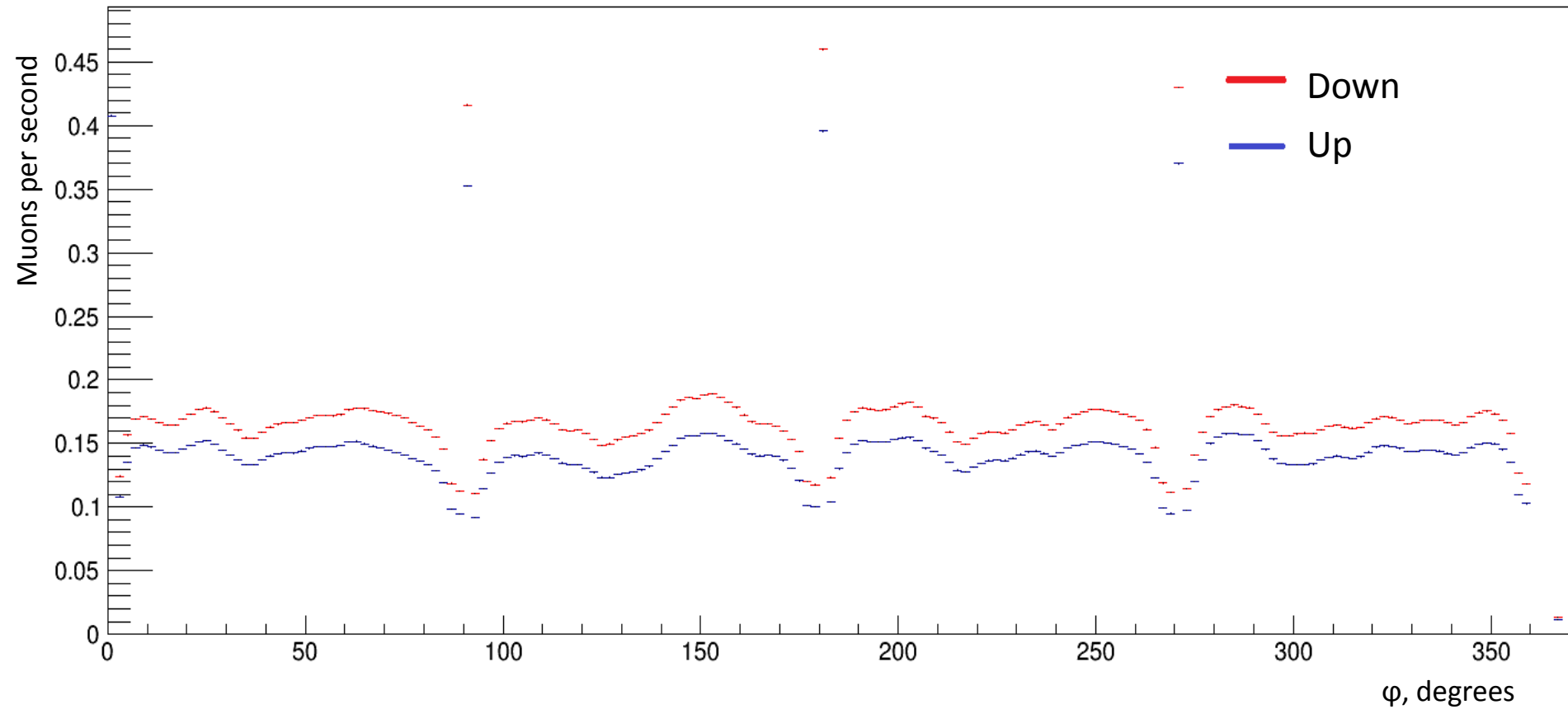


# Histogram of zenith angle in different positions of detector

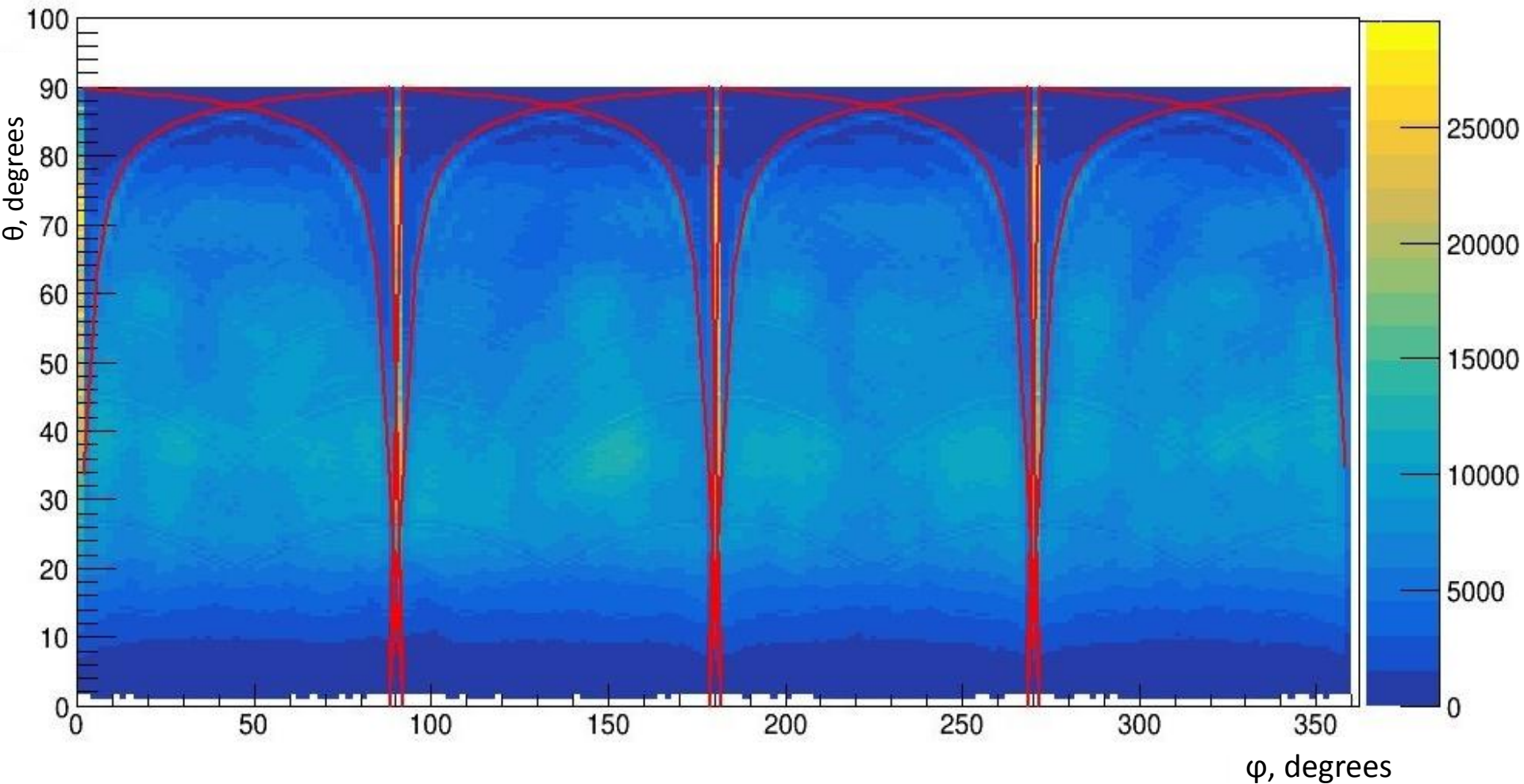




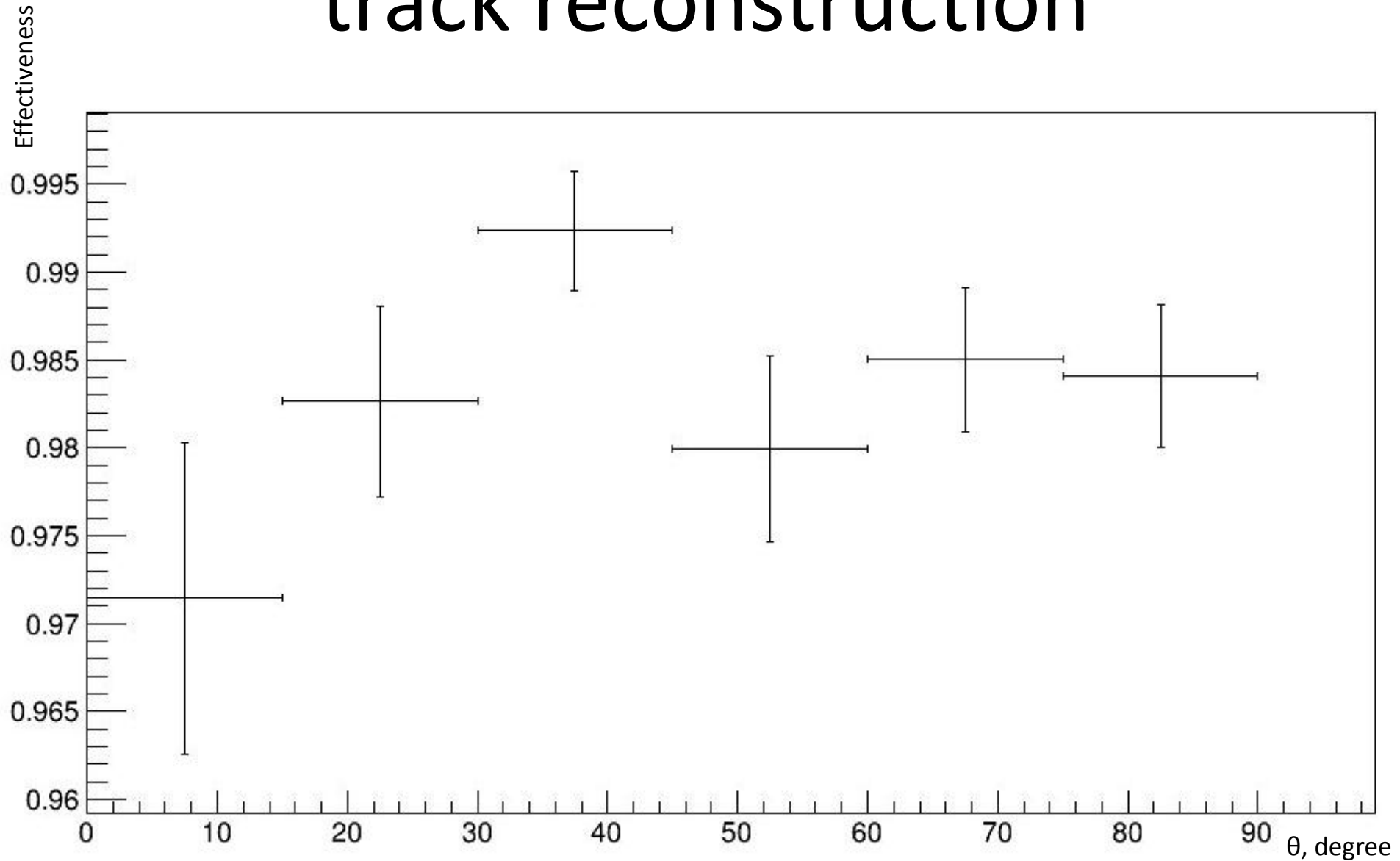
# Histogram of polar angle $\varphi$ in two positions



Areas in which pumping to the “choosing angles” is happened

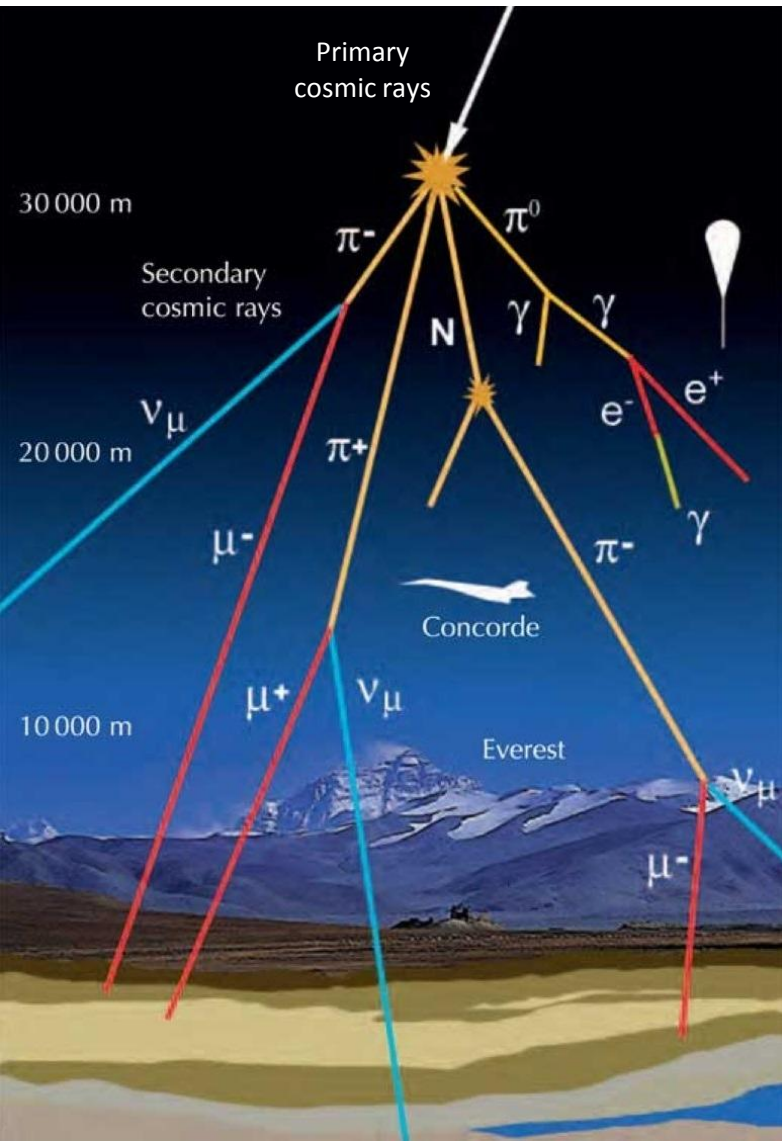


# Estimate of effectiveness of track reconstruction



# Seasonal variation of the cosmic muon flux

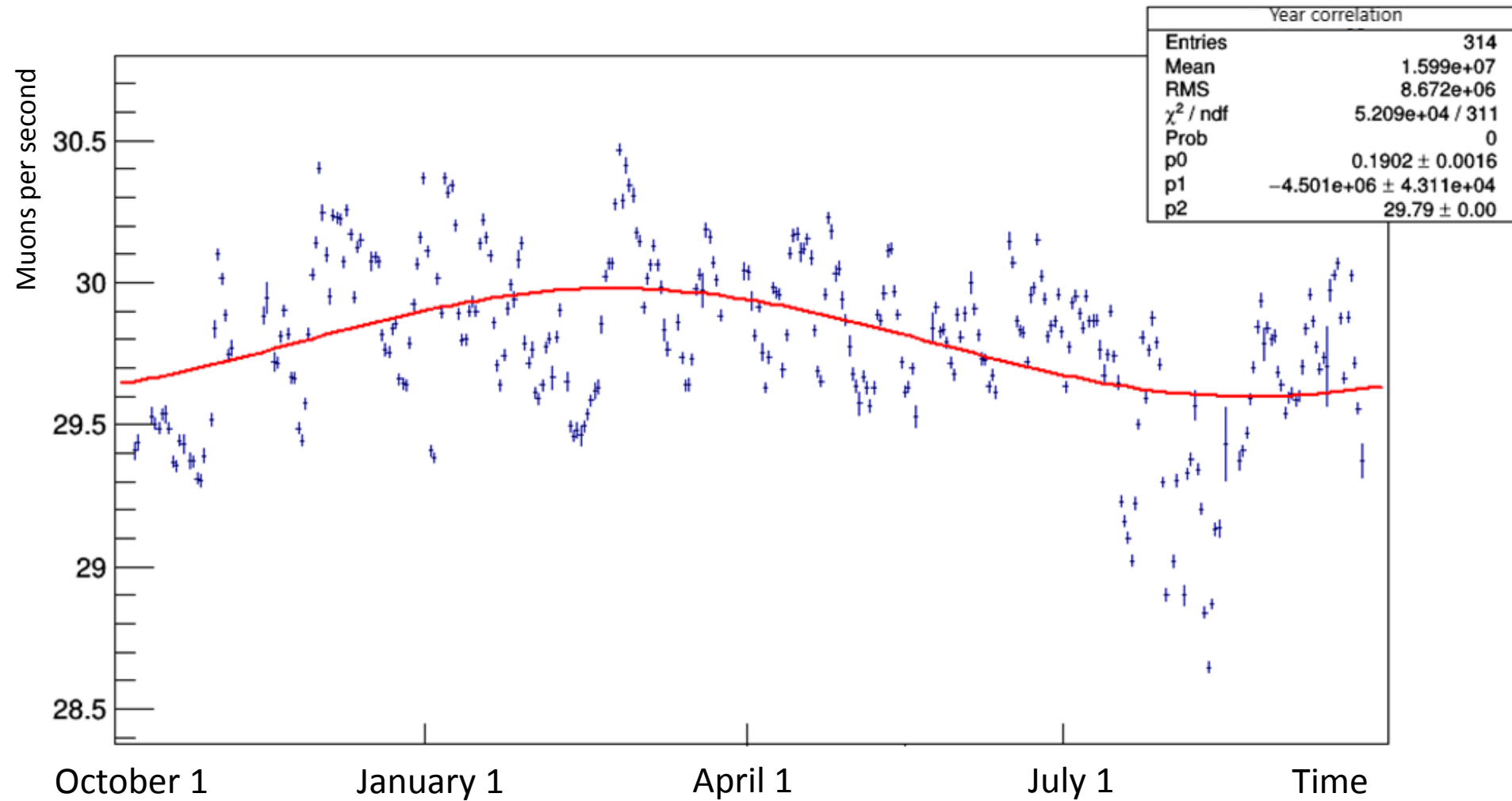
# How cosmic muon flux depends from atmosphere?



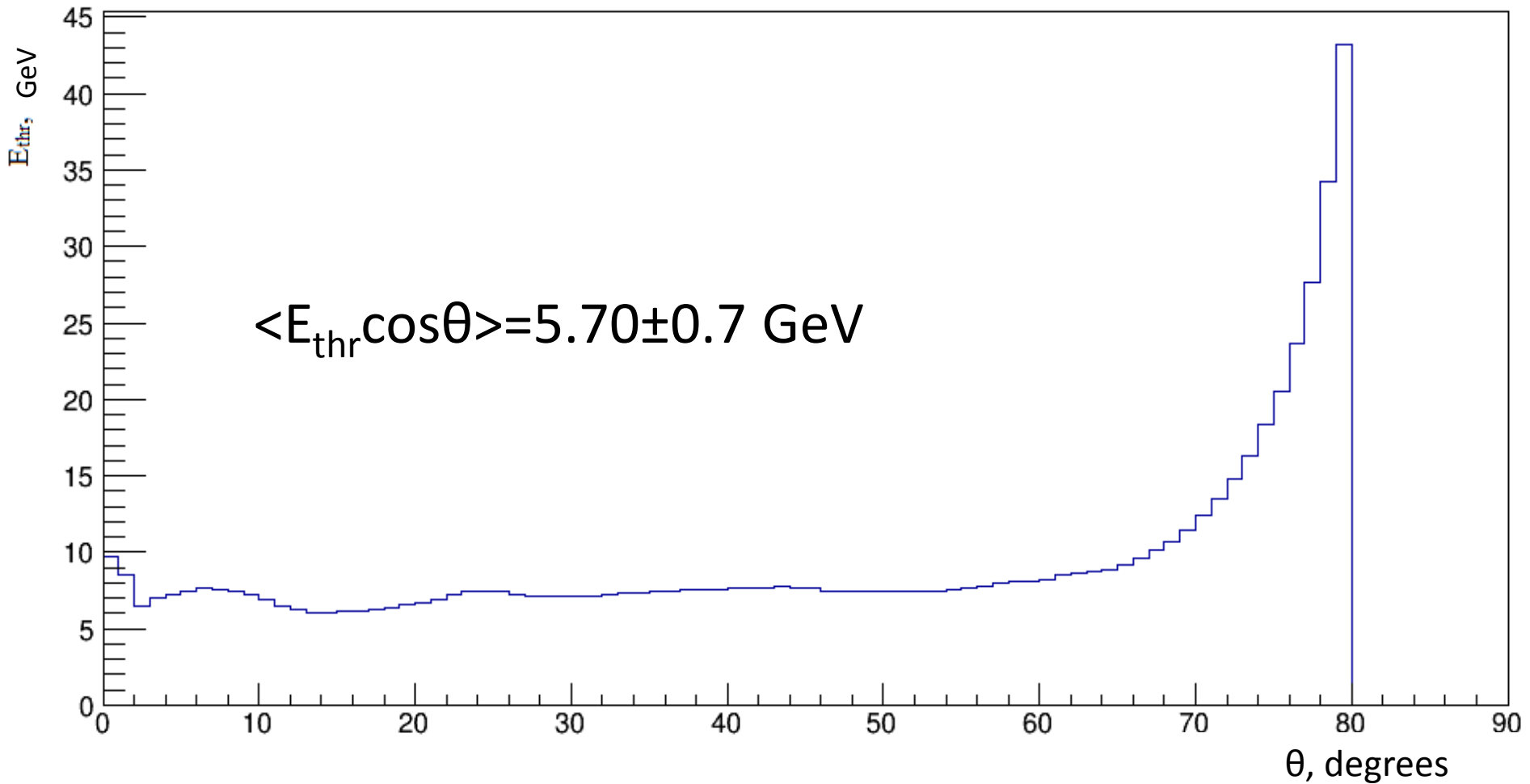
$$\alpha = \frac{T_{eff}}{I_\mu} \frac{\partial I_\mu}{\partial T_{eff}}$$

$$T_{eff} = \frac{\int_0^\infty dX * T(X) * W(X)}{\int_0^\infty dX * W(X)} \cong \frac{\sum_i \Delta X_i * T(X_i) * W(X_i)}{\sum_i \Delta X_i * W(X_i)}$$

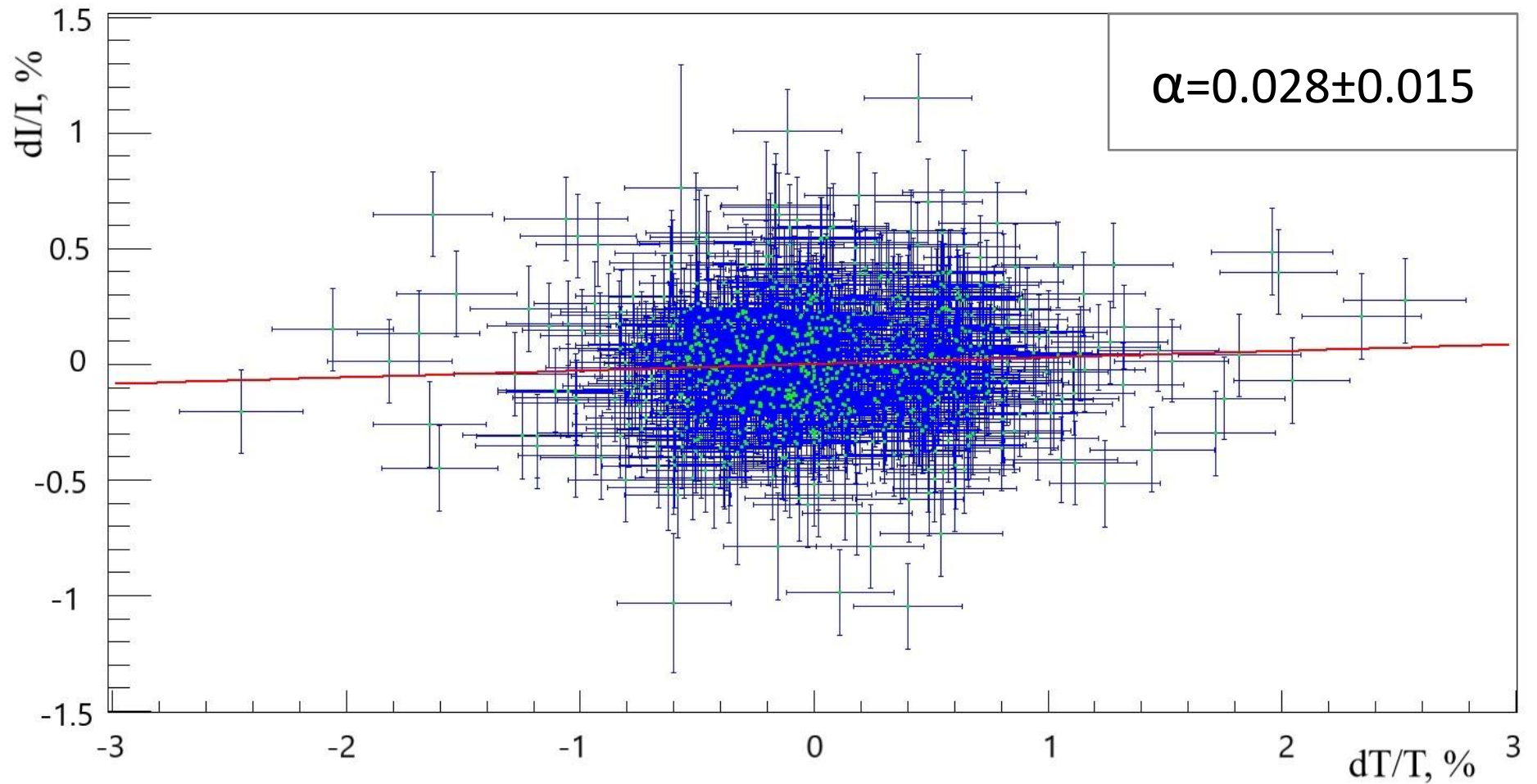
# Seasonal variation of the cosmic muon flux



# $E_{thr}$ value at different zenith angle



# Correlation coefficient





# Comparison with other experiments and theory

