

A visualization of cosmic rays, showing a dense field of blue and white streaks radiating from a central point, set against a background of a colorful galaxy with orange, yellow, and blue hues. The streaks represent the paths of high-speed particles traveling through space.

# Cosmic Rays

The cosmic rays are high particles and atomic nuclei that move at almost the speed of light and hit the Earth after passing through the atmosphere.

Work of Izzo Francesco Paolo,  
Malafrente Emanuele and  
Solimeno Luigi.

# The Muon

A muon is an elementary particle similar to the electron but that has a mass 200 times greater than it.

Muons are indicated with the greek letter  $\mu$ , very penetrating and originate both from Space and Cosmic Showers (originated from cosmic rays' interactions with Earth's atmosphere).



# How do we observe muons?



We are able to observe muons thanks to the cosmic rays cube, a telescope that reveals only the muons that pass through all of its four levels.



The collected data can be seen and analysed in real time using the cosmicrayslive app.



## The activity: measuring muons' rate in relation to the angle of the telescope.

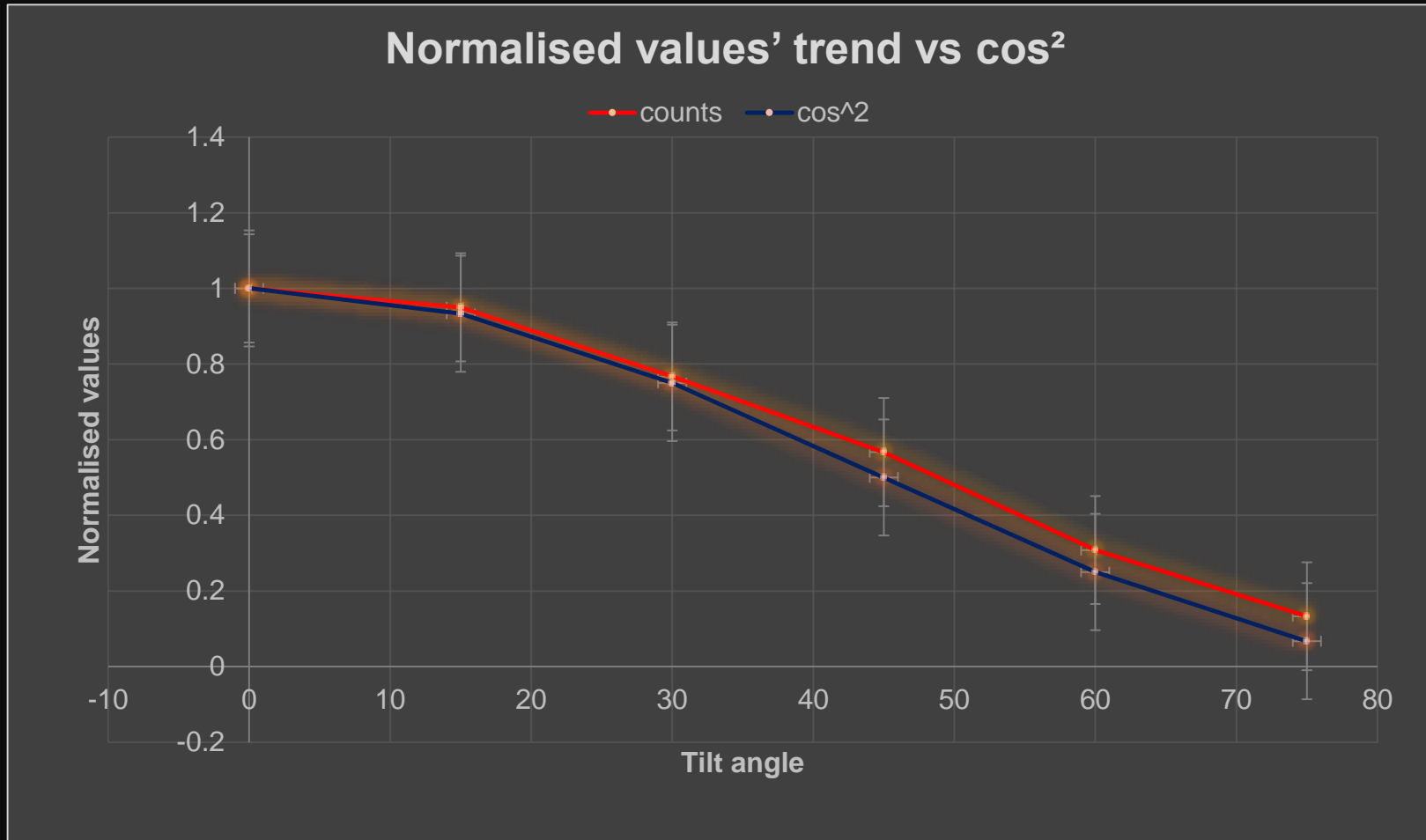
Since muons tend to decay in electrons, their most convenient route for the Earth's surface is the one that goes vertical, because it is the shorter one and so it implies less decays.

Therefore, by changing the telescope's angle, we can observe that the muons' rate decreases.

We've measured the various rates, considering the errors, and built a chart with both the rates and the normalised values.

$\theta$	muon/s (Hz)	error	normalized values
<b>0°</b>	1,247	0,225	1
<b>15°</b>	1,137	0,2	0,95
<b>30°</b>	0,917	0,167	0,767
<b>45°</b>	0,683	0,137	0,567
<b>60°</b>	0,37	0,108	0,308
<b>75°</b>	0,16	0,025	0,133

# The construction of the graph to analyze the trend.



After building the chart, we inserted our data in a graph and verified that the trend is similar to the cosine squared ( $\cos^2$ ) of the tilt angle of the telescope.