

# Capturing Muons

## Experiment overview:

- Background radiation comes to us from multiple sources (see the CERN@school Curriculum guide for details). This experiment attempts to gather evidence of particles from space. These cosmic rays account for around 10% of background radiation experienced, but this increased the higher above sea level you go.

## Equipment:

- CERN@school kit
- Clamp stand

## Detector settings

- Exp. count = 10
- Exp. time = 30 seconds
- Bias = 95V
- “Integral mode” should be checked
- The following depends on your software version, either “Finite number of steps” should be checked **OR** “Continuous measurement” should be un-checked

## Method:

- Choose two locations: one outside and one inside.
- At your first location set up the laptop and detector. The detector should be standing vertically as we want to capture the Muon track through the detector as a straight line.
- Open the Pixelman software and input the detector settings.
- Press “Start” and when the run is complete save the measurements in a new folder, with clear filenames indicated what the measurements are of.
- If possible leave the detector running overnight. The detector settings above will take 5 minutes’ worth of measurements. Without changing the Exp. time increase the Exp. count for the desired length of time.

## Analysis:

- In Pixelman select the area around the Muon to zoom in.
- Is the pattern left by the Muon uniform or does it change? What do you observe? Why does the Muon leave the track that it does?
- Review the measurements and record the number of Muons detected.
- What is the rate of detection per m<sup>2</sup>?

## Suggestions for further investigation

- What other methods can be used to detect muons?
- Can muons be detected underground?

\*Please note that we have discovered that the newer version of Pixelman (2.2.3) has a Exp. time limit of 42 seconds for a single frame, beyond which it won't take longer measurements. In order to take longer measurements, please increase the Exp. count field and take more frames.