Determination of the velocity of muons

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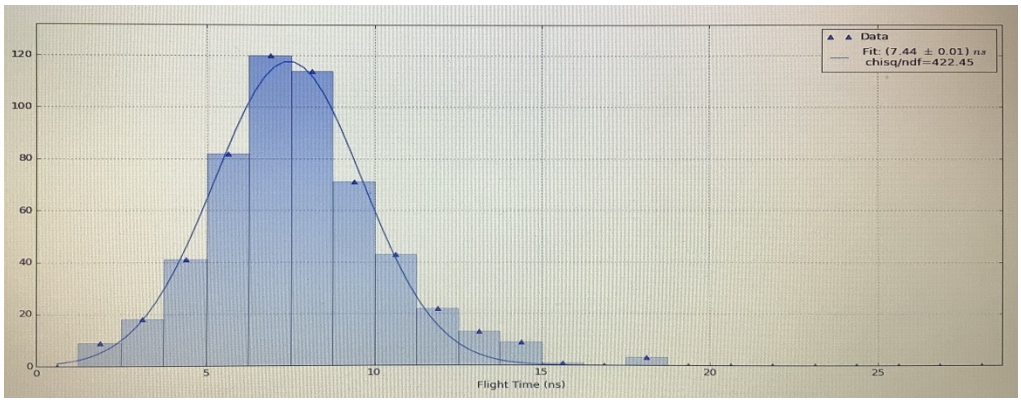
Advanced physics course (Q1)

Abstract
In this experiment the velocity of muons is determine with the CosMO experiment.

Experimental planning and implementation
To determine the velocity of muons, two detectors are positioned on top of each other at 2.09m. When a muon has passed two detectors, the time interval required for the muon to travel between the two detectors is recorded. The two detectors were switched in coincidence to minimize false signals. The measurement duration was 6.10h.

Data and evaluation
The evaluation of the data is done by the program Muonic.



$$\Delta t = 7.44ns \qquad v = \frac{\Delta s}{\Delta t} = \frac{2.09m}{7.44 \cdot 10^{-9} s} = 2.81 \cdot 10^8 \frac{m}{s}$$

The velocity of the muons was 93.6% of the speed of light. The percentage error is 6.33%.

Discussion
Overall, the results of this experiment are positive, as the percentage error is below 10%. The results can be improved by changing the experiment setup or the procedure:

- Exact measurement of the distance
- Increase in the distance
- Longer measurement duration