

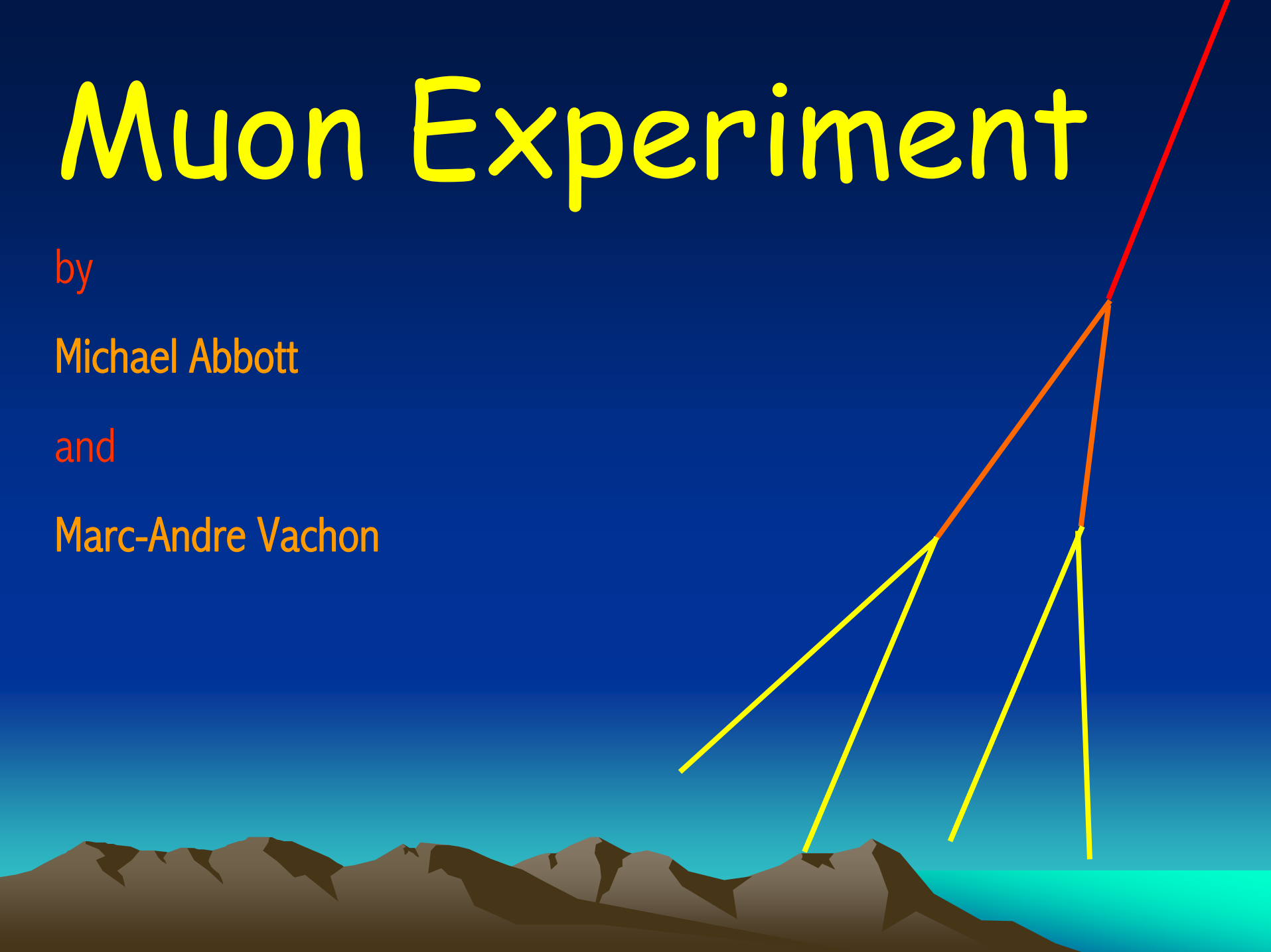
Muon Experiment

by

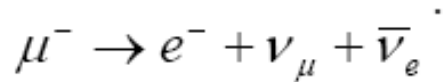
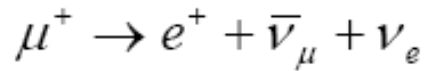
Michael Abbott

and

Marc-Andre Vachon



Where muons come from?

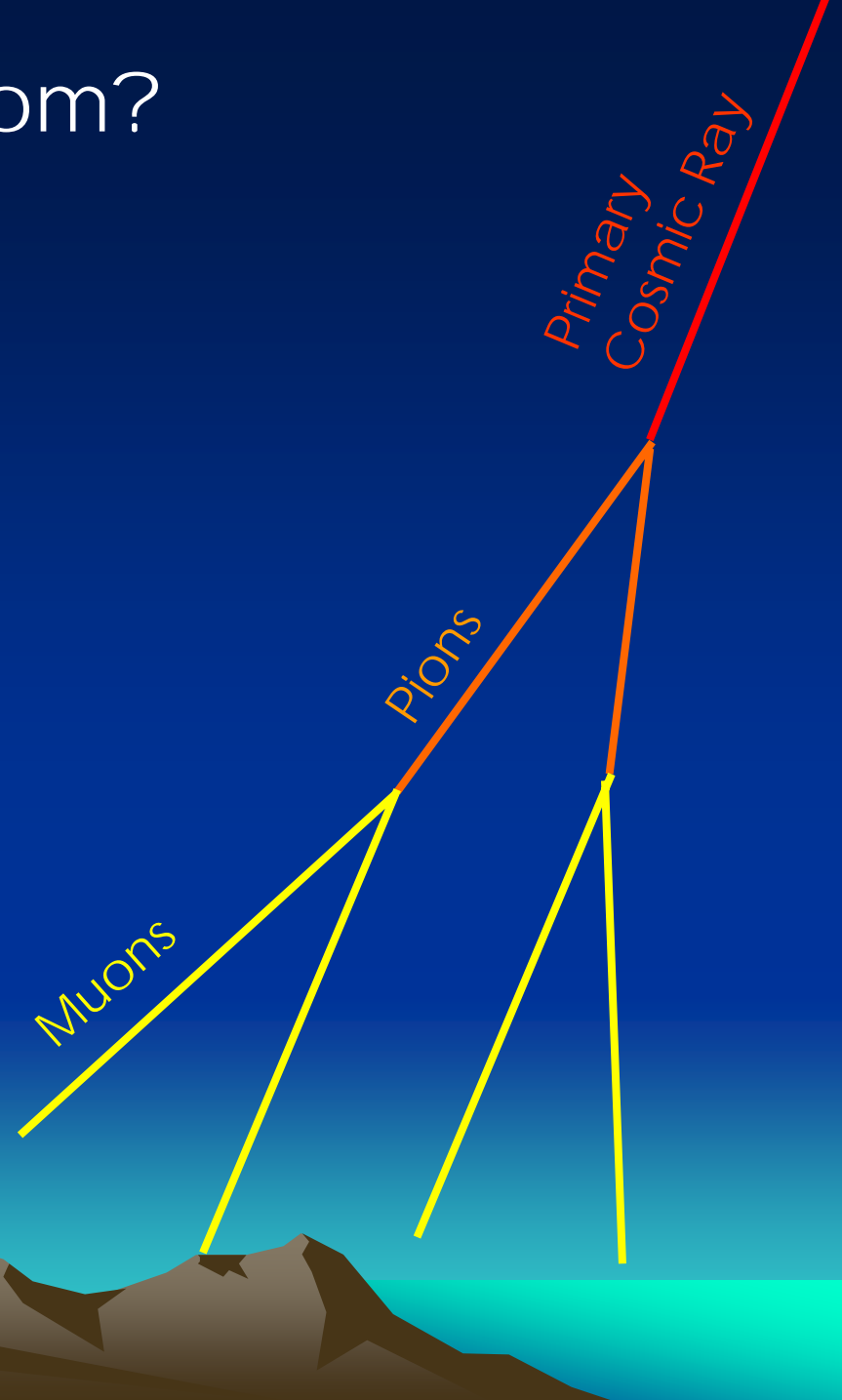


Equation for the decay

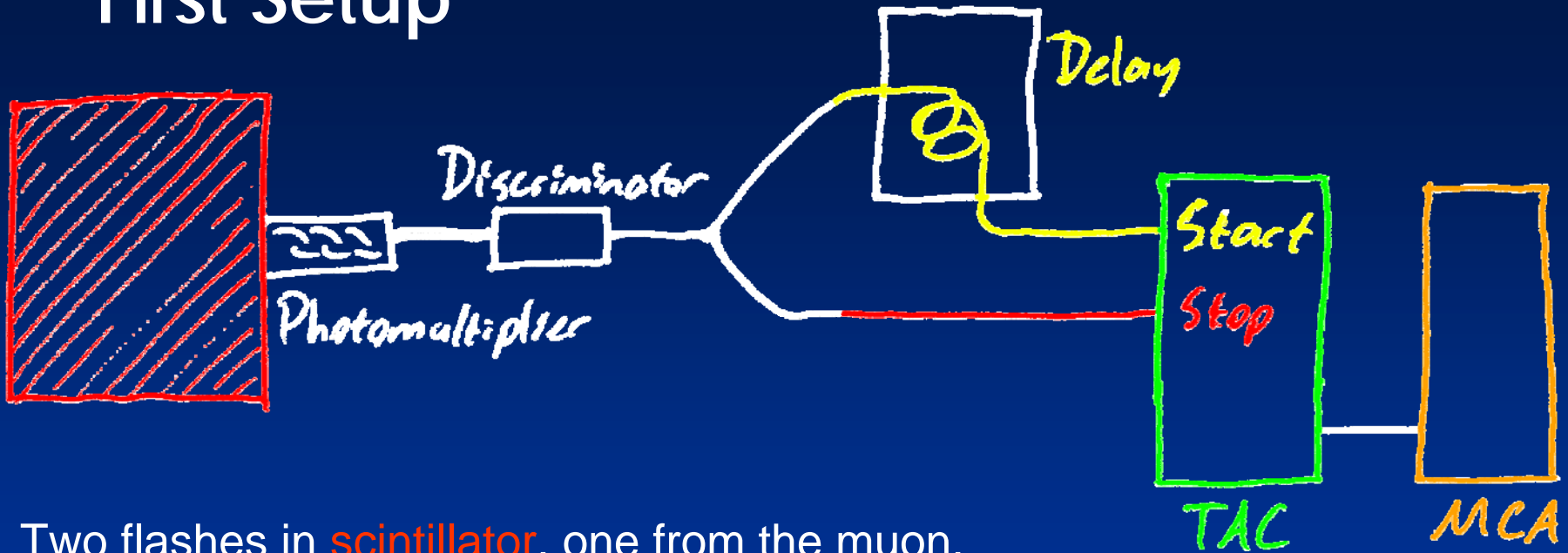
$$P(t)dt = \lambda e^{-\lambda t} dt$$

Muon Lifetime

$$\tau_0 = 1/\lambda.$$



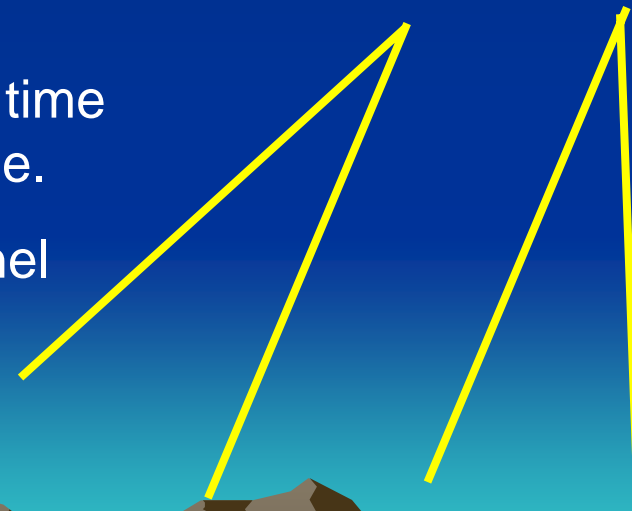
First Setup

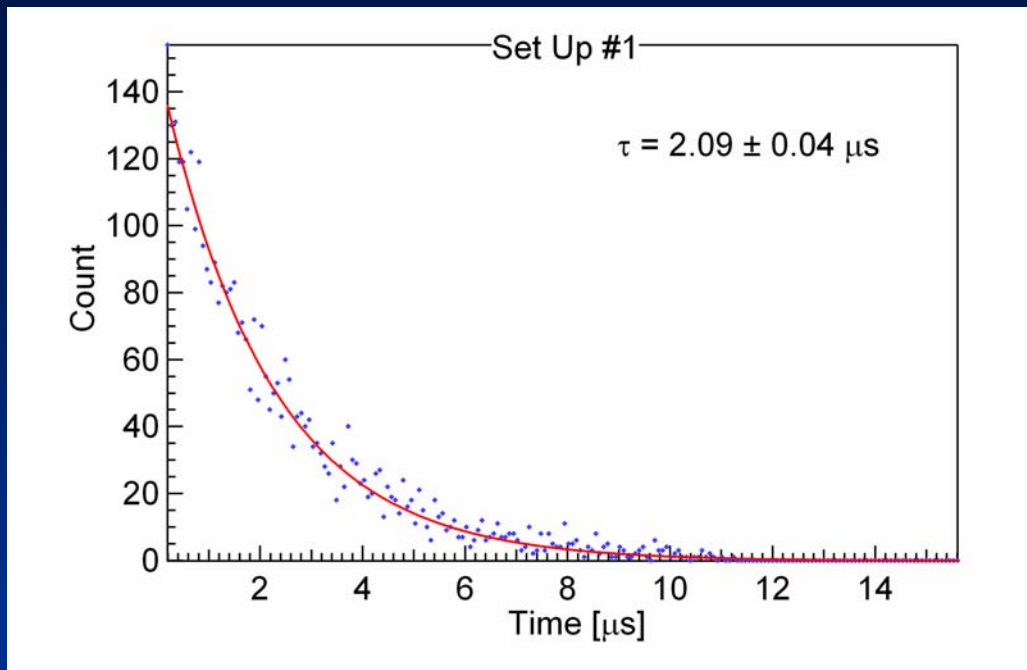


Two flashes in **scintillator**, one from the muon, one from its decay electron.

Time-to-**A**mplitude **C**onverter measures time from (**delayed**) start pulse until stop pulse.

Sends result (as voltage) to **M**ulti-**C**hannel **A**nalysers, which draws a histogram of time intervals.

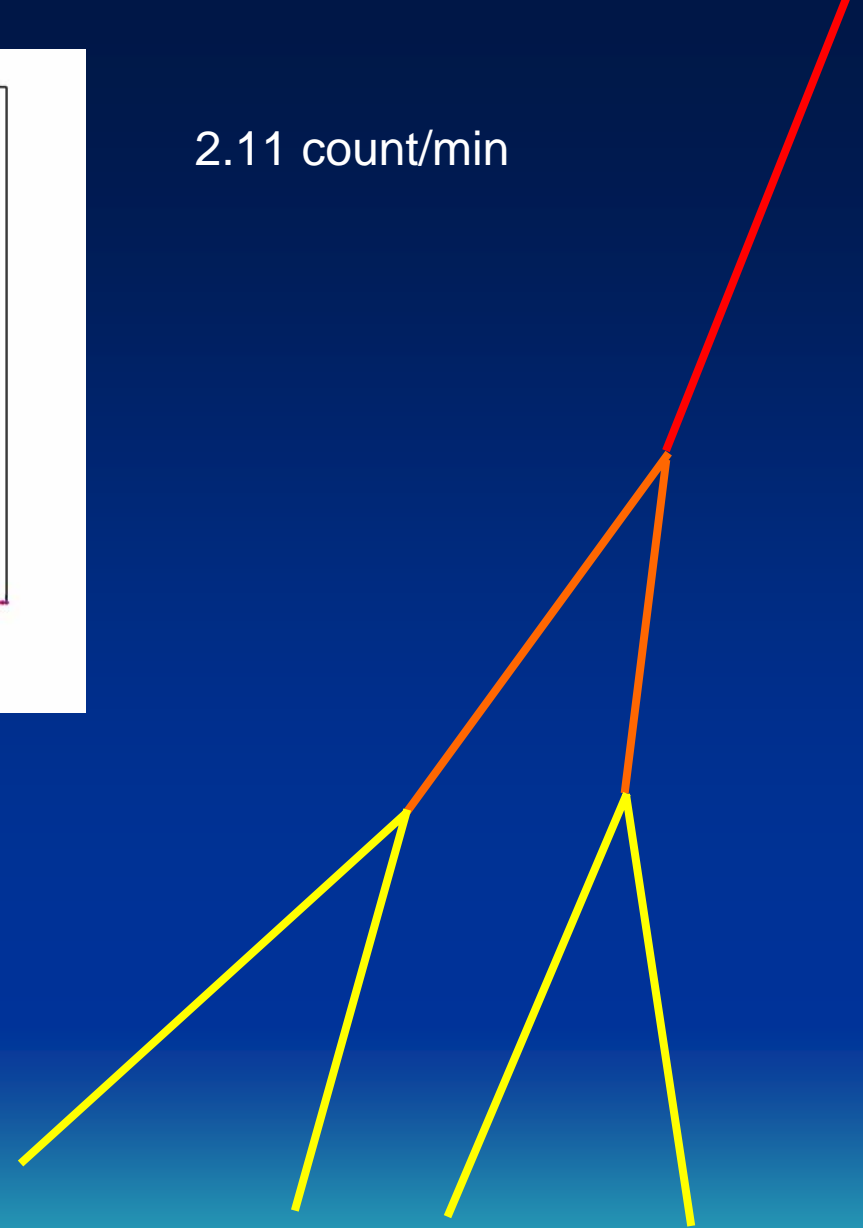




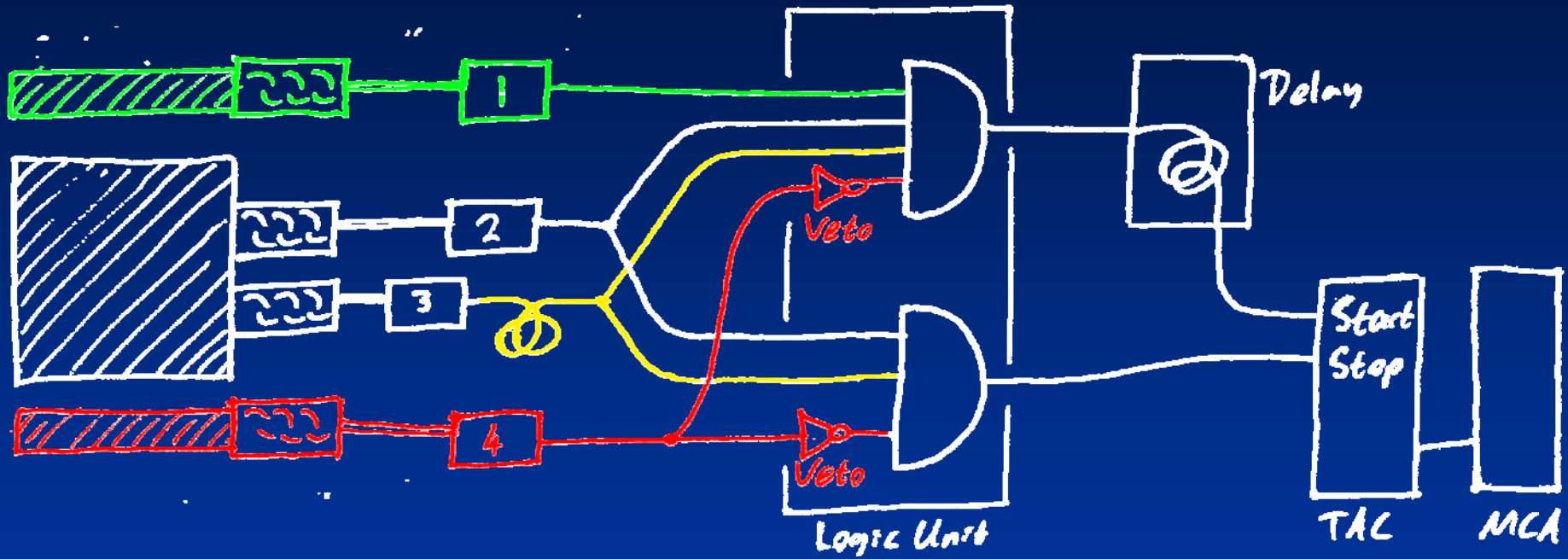
2.11 count/min

Fit curve $y_0 + A \exp(-(t-t_0)/\tau)$

Considering statistical weights.



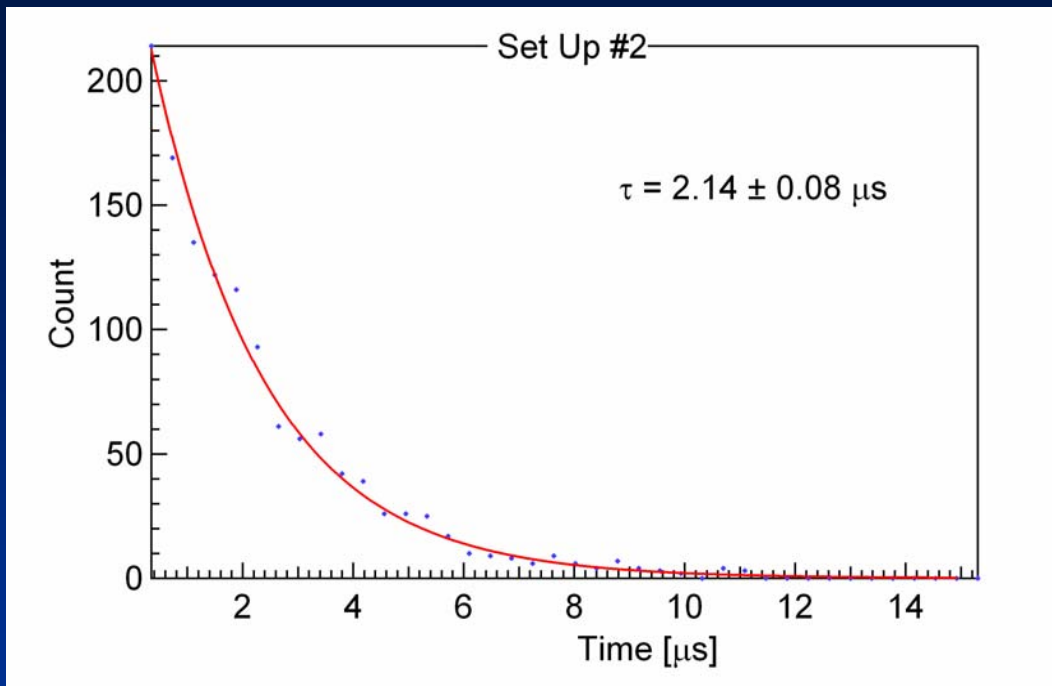
Second Setup



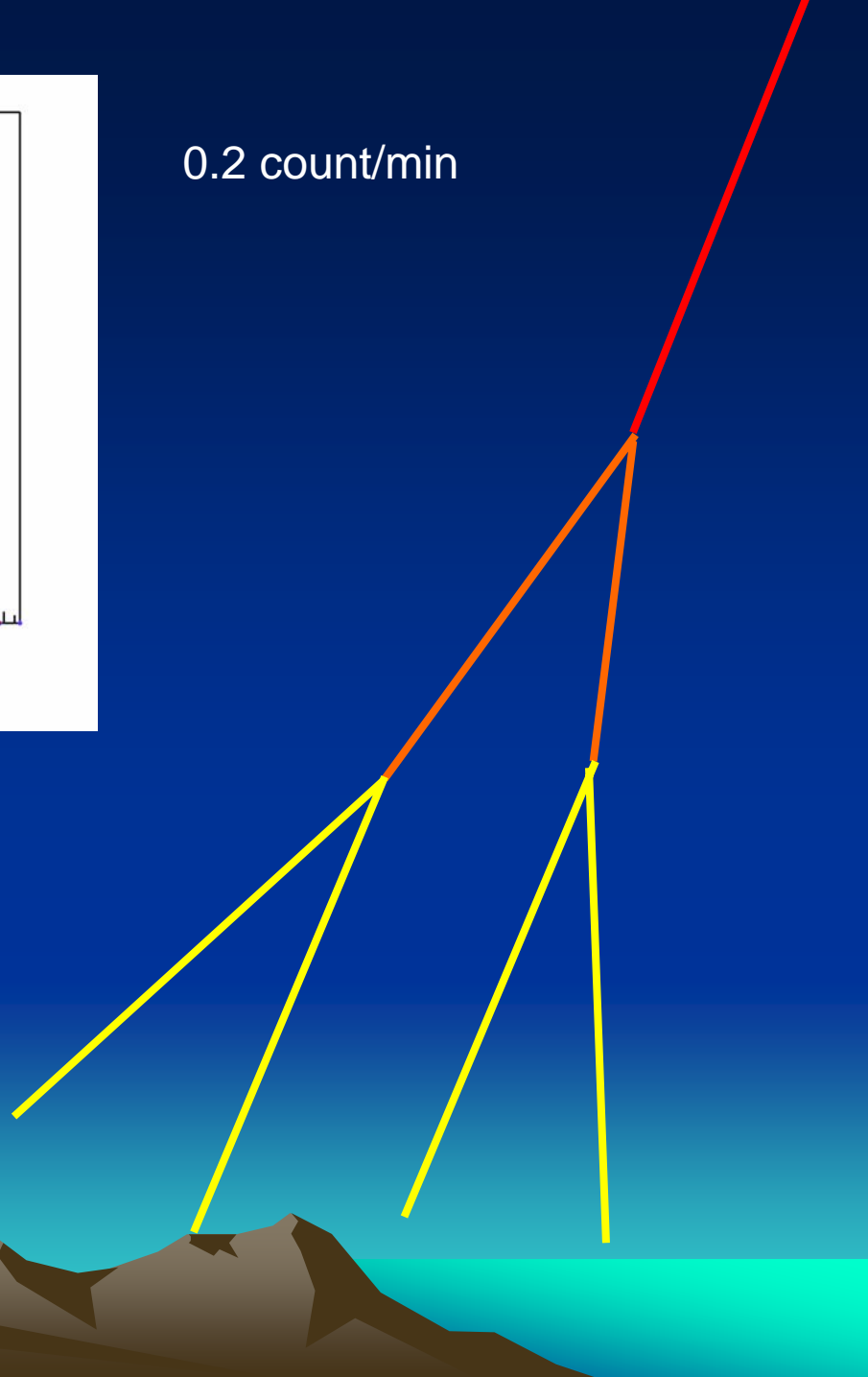
Top detector must fire, and

Bottom detector must not fire

(Careful timing needed)



0.2 count/min



Conclusion

Result Set up #1 $\tau = 2.09 \pm 0.04 \mu\text{s}$

Result Set up #2 $\tau = 2.14 \pm 0.08 \mu\text{s}$

Muon lifetime in literature
 $\tau = 2.19703 \pm 0.00004 \mu\text{s}$

