

5. In the laboratory, it travels a distance $d = 0.00105 \text{ m} = vt$, where $v = 0.992c$ and t is the time measured on the laboratory clocks. We can use Eq. 38-7 to relate t to the proper lifetime of the particle t_0 :

$$t = \frac{t_0}{\sqrt{1 - (v/c)^2}} \implies t_0 = t \sqrt{1 - \left(\frac{v}{c}\right)^2} = \frac{d}{0.992c} \sqrt{1 - 0.992^2}$$

which yields $t_0 = 4.46 \times 10^{-13} \text{ s}$.