Answer on Question 64275, Physics, Quantum Mechanics

Question:

A subatomic particle with an average lifetime of $2.1 \cdot 10^{-9}\ s$ at rest is placed into a particle accelerator, and is made to move at $2.6 \cdot 10^{8}\ m/s$. Calculate the average lifetime of the particle in the accelerator.

Solution:

We can find the average lifetime of the particle in the accelerator from the time dilation formula:

$$\Delta t' = \frac{\Delta t}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{2.1 \cdot 10^{-9}\ s}{\sqrt{1 - \frac{\left(2.6 \cdot 10^{8}\ \frac{m}{s}\right)^2}{\left(3.0 \cdot 10^{8}\ \frac{m}{s}\right)^2}}} = 4.2 \cdot 10^{-9}\ s.$$

Answer:

$\Delta t' = 4.2 \cdot 10^{-9}\ s.$