

Q. A stationary μ -meson life time is 2.2×10^{-8} sec what will be length of its path when moving with velocity $0.99c$ towards the earth?

Sol. Given to find distance travelled by μ meson

$$\text{Proper life time } t_0 = 2.2 \times 10^{-8} \text{ sec}$$

$$\& \text{ velocity } v = 0.99c$$

$$\text{From time dilation } t = \frac{t_0}{\sqrt{1 - v^2/c^2}}$$

$$t = \frac{2.2 \times 10^{-8}}{\sqrt{1 - \frac{(0.99c)^2}{c^2}}}$$

$$\Rightarrow 15.59 \times 10^{-8} \text{ sec}$$

It will be the time taken by μ -meson to travel distance

$$\text{Distance} = \text{Dilated time} \times \text{Velocity}$$

$$= (15.59 \times 10^{-8}) \times (0.99 \times 3 \times 10^8) \text{ meter}$$

$$\text{Distance} = 46.33 \text{ meter}$$

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