

1. (a) The time an electron with a horizontal component of velocity  $v$  takes to travel a horizontal distance  $L$  is

$$t = \frac{L}{v} = \frac{20 \times 10^{-2} \text{ m}}{(0.992)(2.998 \times 10^8 \text{ m/s})} = 6.72 \times 10^{-10} \text{ s} .$$

- (b) During this time, it falls a vertical distance

$$y = \frac{1}{2}gt^2 = \frac{1}{2}(9.8 \text{ m/s}^2)(6.72 \times 10^{-10} \text{ s})^2 = 2.2 \times 10^{-18} \text{ m} .$$

This distance is much less than the radius of a proton. We can conclude that for particles traveling near the speed of light in a laboratory, Earth may be considered an approximately inertial frame.