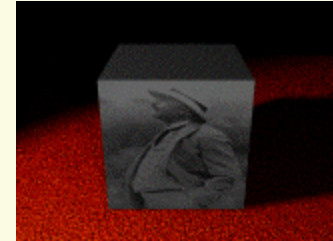


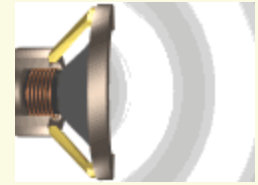
Aula 10: Relatividade restrita

1. Postulados da relatividade restrita
2. Transformações de Lorentz
3. Contraction do comprimento
4. Dilatação do tempo

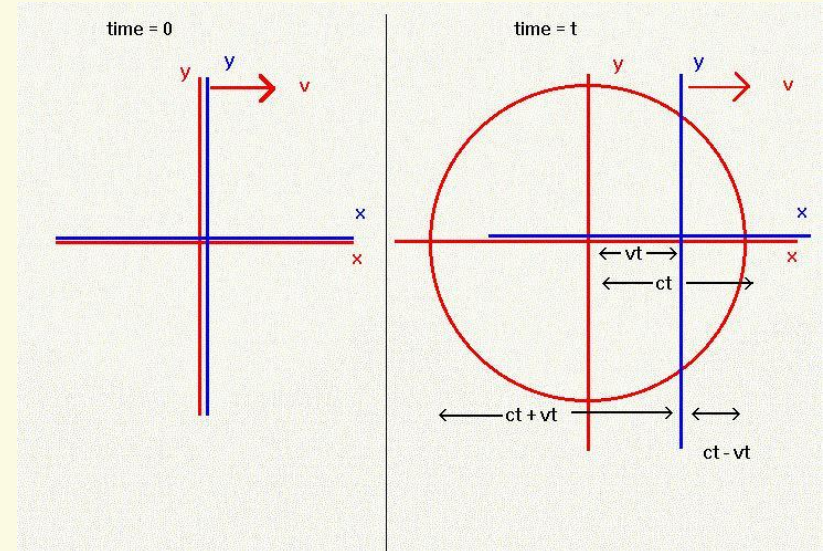
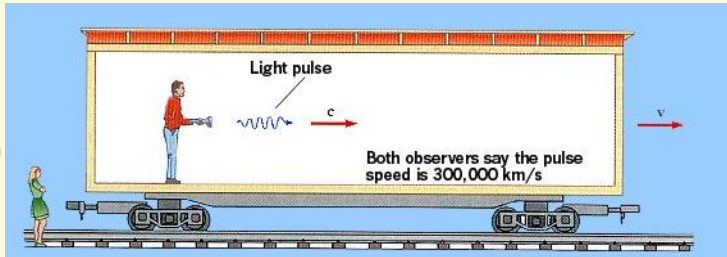


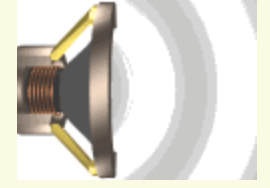
Simulação: experiência de Michelson-Morley

Experiência de Michelson: animação

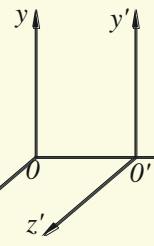


1. Postulados da relatividade restrita



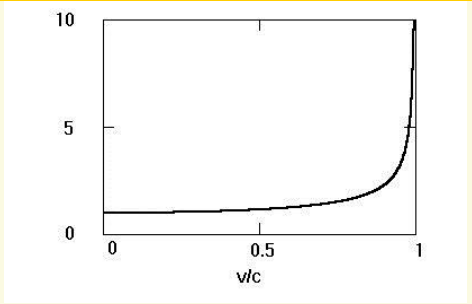


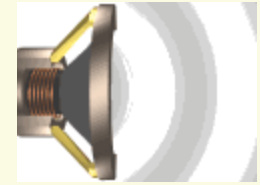
2. Transformações de Lorentz



$$\begin{aligned}x' &= \gamma(x - \beta ct) & x &= \gamma(x' + \beta ct') \\y' &= y & \text{or} & \quad y = y' \\z' &= z & z &= z' \\t' &= \gamma\left(t - \frac{\beta}{c}x\right) & t &= \gamma\left(t' + \frac{\beta}{c}x'\right)\end{aligned}$$

$$\beta = \frac{v}{c}, \quad \gamma = \frac{1}{\sqrt{1 - \beta^2}} = \frac{1}{\sqrt{1 - v^2/c^2}} \quad (\gamma \geq 1)$$





Simultaneidade: animação

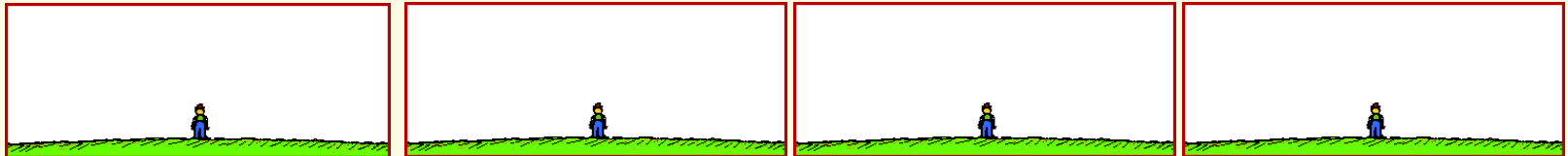
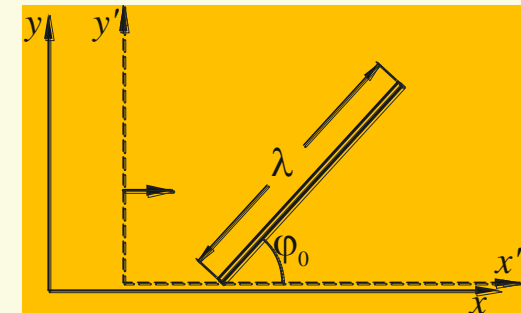
Contração de comprimento: animação

3. Contração do comprimento

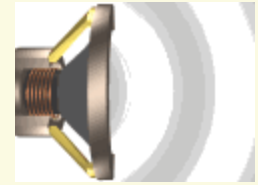
Simultaneidade

$$t'_1 = \frac{t - \beta x_1 / c}{\sqrt{1 - \beta^2}} \quad , \quad t'_2 = \frac{t - \beta x_2 / c}{\sqrt{1 - \beta^2}}$$

$$l = \lambda \sqrt{1 - \beta^2}$$



Dilatação do tempo: animação



4. Dilatação do tempo

$$\Delta t = \frac{\Delta \tau}{\sqrt{1 - \beta^2}} = \gamma \Delta \tau$$

Transformação de velocidades

$$v'_x = \frac{dx - v dt}{\sqrt{1 - v^2/c^2}} \frac{\sqrt{1 - v^2/c^2}}{dx - v dx/c^2} = \frac{v_x - v}{1 - v v_x/c^2}$$

$$v'_y = \frac{v_y \sqrt{1 - v^2/c^2}}{1 - v v_x/c^2} \quad v'_z = \frac{v_z \sqrt{1 - v^2/c^2}}{1 - v v_x/c^2}$$