

Teoria da relatividade especial espaço e tempo

Prof. Jadoski
Física

A black and white portrait of Albert Einstein, showing his characteristic wild hair and mustache. He is looking directly at the camera with a serious expression.

Albert Einstein



FIFTEEN CENTS

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EINSTEIN
Suspicion is the mother of perception.
(See 35-36)

Number 7

1 – a velocidade da luz no vácuo é a única constante absoluta e vale “ c ” em qualquer referencial inercial



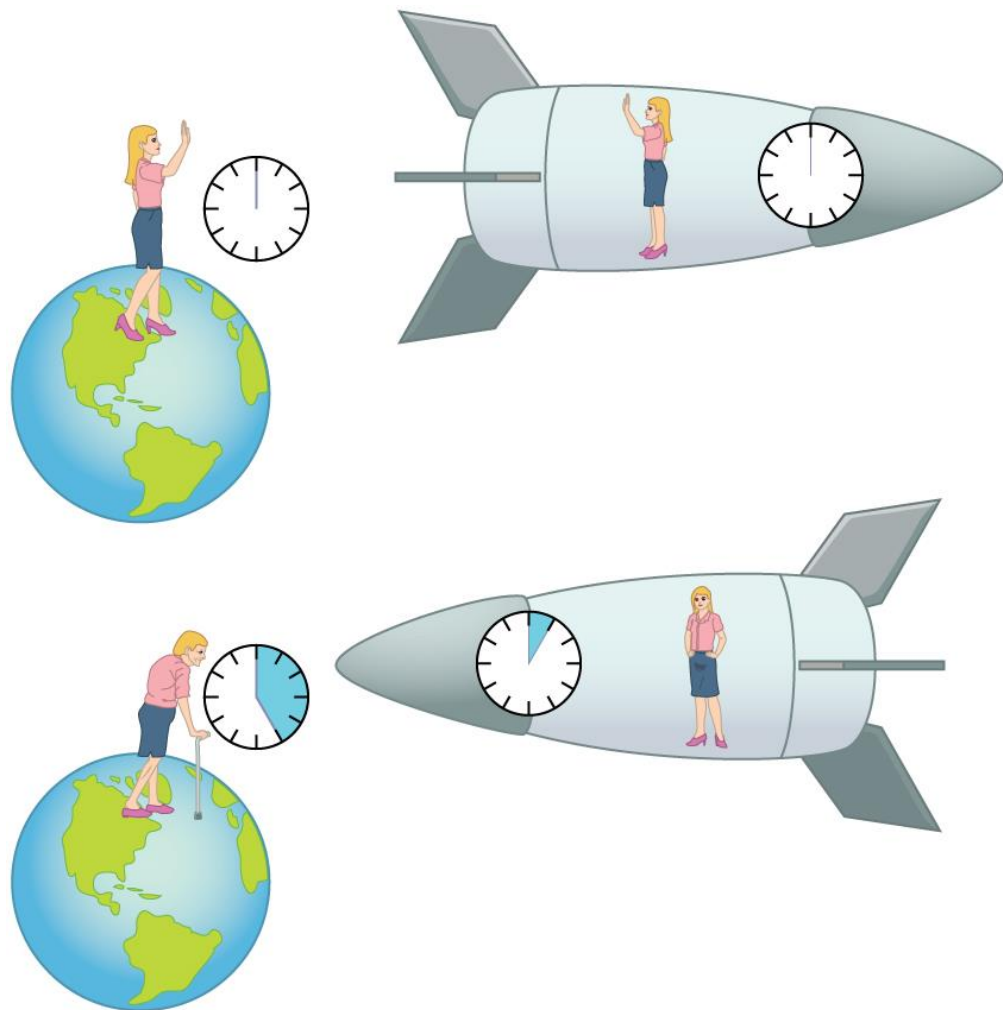
TR

2 – as Leis Físicas são as mesmas em qualquer referencial inercial

Dilatação do tempo



Paradoxo dos gêmeos



$$\Delta t_R = \frac{\Delta t_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

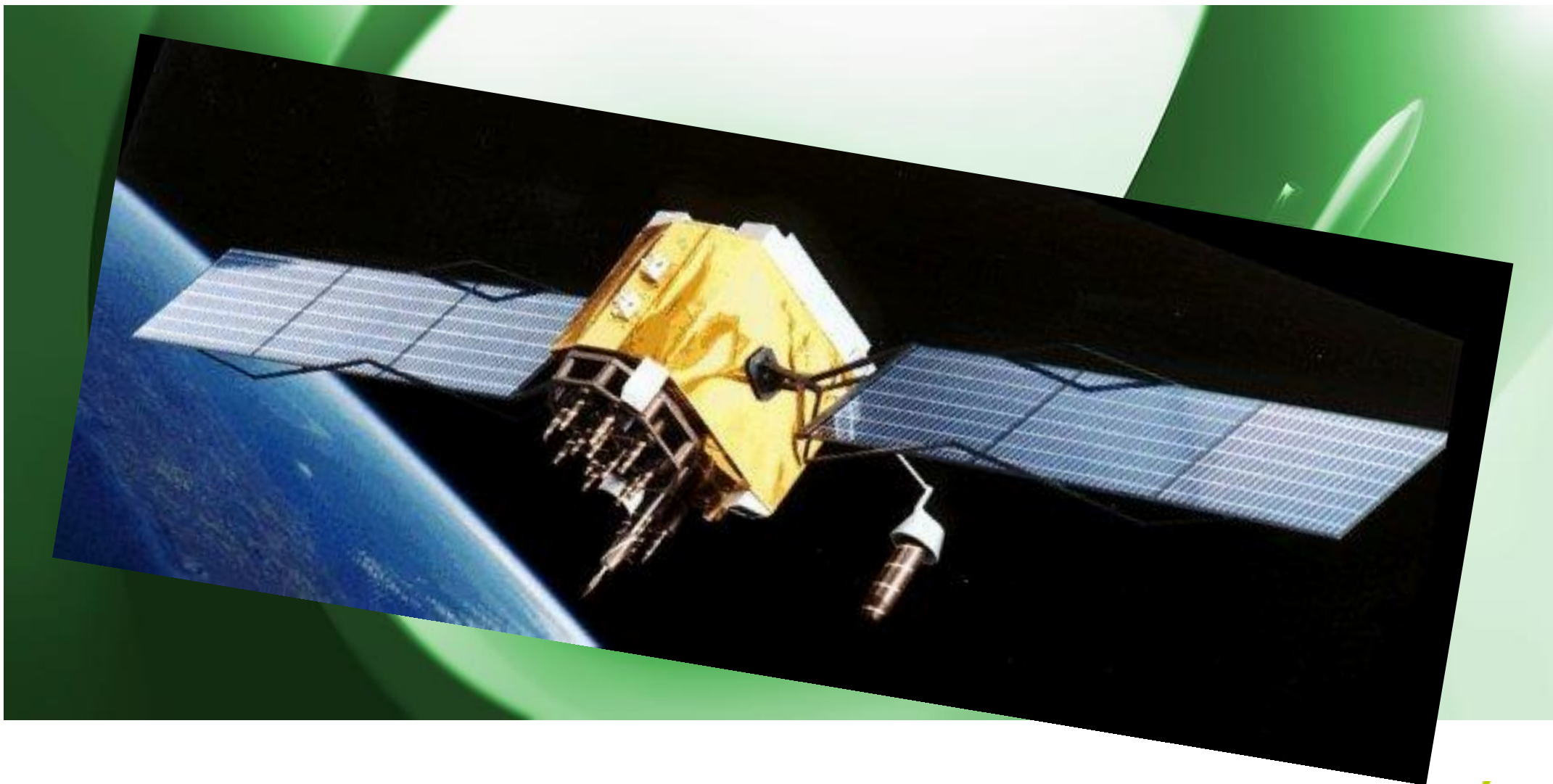
$$\Delta t_R = \frac{10}{\sqrt{1 - \left(\frac{0,8c}{c}\right)^2}}$$

$$\Delta t_R = \frac{10}{\sqrt{1 - 0,64}}$$

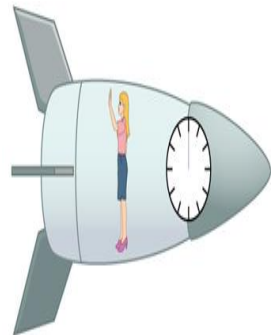
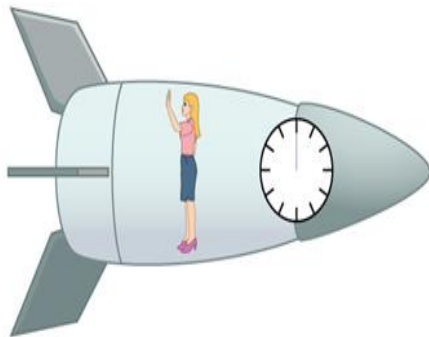
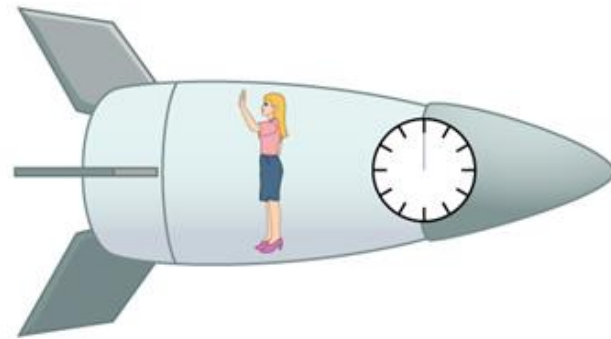
$$\Delta t_R = \frac{10}{\sqrt{0,36}}$$

$$\Delta t_R = \frac{10}{0,6} = 16,6 \text{ anos}$$

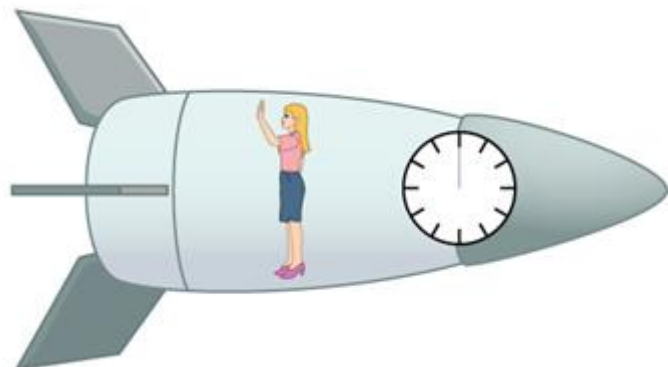
Comprovação



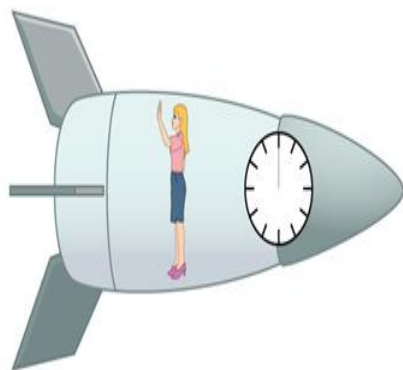
Contração do espaço



Contração do espaço



10 m $v = 0$



$L=?$ $v = 0,6c$

$$L_R = L_0 \cdot \sqrt{1 - \left(\frac{v}{c}\right)^2}$$

$$L_R = 10 \cdot \sqrt{1 - \left(\frac{0,6c}{c}\right)^2}$$

$$L_R = 10 \cdot \sqrt{1 - 0,36}$$

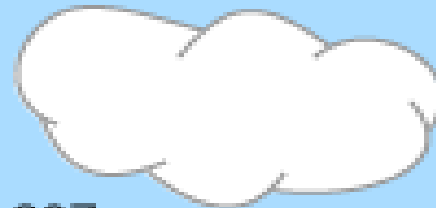
$$L_R = 10 \cdot \sqrt{0,64}$$

$$L_R = 10 \cdot 0,8 = 8m$$

Comprovação

Out of a million particles at 10 km, how many will reach the Earth?

Measure muon flux at 10 km height.



μ : mass $207 m_e$
charge + or -
Rest halflife:
 $T_0 = 1.56 \times 10^{-6}$ sec



$v = .98c$

$\gamma = 5$

Relativity factor

$L_0 = 10$ km

Simultaneously monitor flux at ground level.



Dilatação da massa

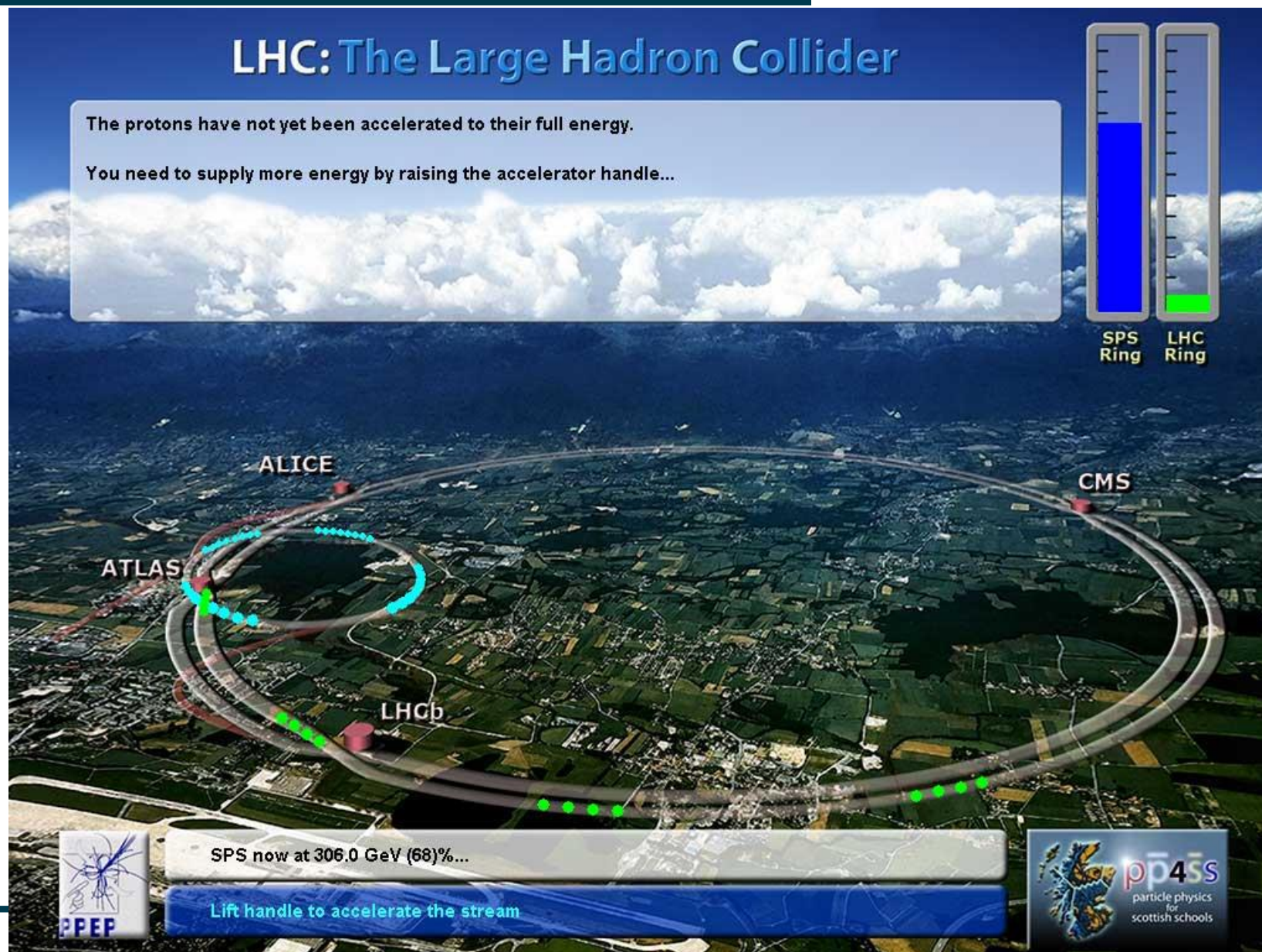
$$m_R = \frac{m_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

Comprovação

LHC: The Large Hadron Collider

The protons have not yet been accelerated to their full energy.

You need to supply more energy by raising the accelerator handle...



SPS now at 306.0 GeV (68)%...

Lift handle to accelerate the stream

