TOKEN 759472

$\lambda_{vis} = 400-700$ nm

$E = h\nu$ $\qquad \lambda = cT = c\frac{1}{\nu}$

$c = 3\times10^{8}$ m/s

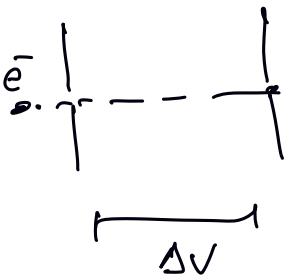
$h = ?$ $\qquad \hbar = 1.055\times10^{-34}$ J.s

$E_{vis} = 1$ eV

e^-

P

ioni



$E = q\Delta V =$

$e = 1.6\times10^{-19}$ C

$E = 1$ eV $\qquad \Delta V = 1$ V

$= 1.6\times10^{-19}$ J

$m_e = 9.109 \times10^{-31}$ kg

$m_p = 1.673\times10^{-27}$ kg

$\Delta p \cdot \Delta x = \hbar$

$\hbar = 1 \qquad c = 1$ adimensionale

$[c] = \frac{[L]}{[T]} \Rightarrow [L] = [T]$

$E = h\nu = \frac{h}{T} \qquad [E] = [T]^{-1}$

E eV.

$$\hbar c = 1.055 \times 10^{-34} \text{ J.S} \times 3 \times 10^{8} \frac{m}{s} = 197 \text{ fm MeV}$$

$$\approx 200 \text{ MeV} \times \text{fm}$$

$$\text{MeV} = 10^{6} \text{ eV}$$

$$1 \text{ fm} = 10^{-15} \text{ m} \quad \Rightarrow \quad 1 \text{ fm} = \frac{1}{200 \text{ MeV}}$$

$$\Delta p \cdot \Delta x = \hbar = 1$$

$$\Delta p = \frac{1}{\Delta x}$$

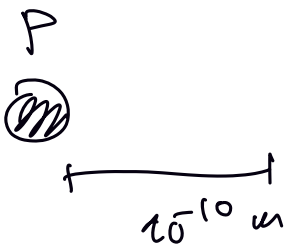
$$\lambda_{DB} = \frac{h}{p} = \frac{2\pi\hbar}{p} = \frac{2\pi}{p}$$

$$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$$

$$c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}} \quad \Rightarrow \quad \varepsilon_0 = \mu_0 = 1$$

$$F = \left(\frac{e^2}{4\pi}\right) \frac{z_1 z_2}{r^2} = \alpha \frac{z_1 z_2}{r^2}$$

$$\alpha = \frac{1}{137}$$



$$U = \frac{1}{137} \frac{1}{(10^{-10})} \text{ m}$$

$$= \frac{1}{137} 10^{20} \text{ m}^{-2}$$

$$10^{-15} \text{ m} = 200 \text{ MeV}^{-1} \quad \Rightarrow \quad 10^{15} \text{ m}^{-1} = \frac{1}{200} \text{ MeV}$$

$U \sim 14$ eV

$E^2 = c^2 p^2 + m^2 c^4$

$E = mc^2$

$m_e = 0.511$ MeV

$m_p = 938$ MeV

$= 1$ GeV

LHC

protoni

$E = 6.5$ TeV $= 6.5 \times 10^{12}$ eV

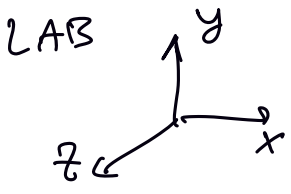
$\underline{x} = (t, \vec{x})$ $\quad g_{\mu\nu} = \begin{pmatrix} 1 & & & \\ & -1 & & \\ & & -1 & \\ & & & -1 \end{pmatrix}$

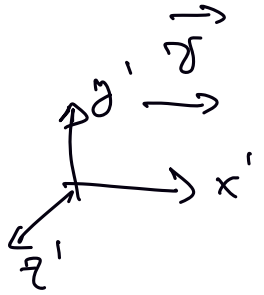
$ds^2 = t^2 - |\vec{x}|^2$

invariante

tempo proprio τ

$ds = d\tau$





$L_{\mu\nu} = \begin{pmatrix} \gamma & \beta\gamma & 0 \\ \beta\gamma & \gamma & \\ 0 & & 1 \end{pmatrix}$

$\beta = \frac{v}{c} \in [0,1]$

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

$\underline{x} = L \cdot \underline{x}'$