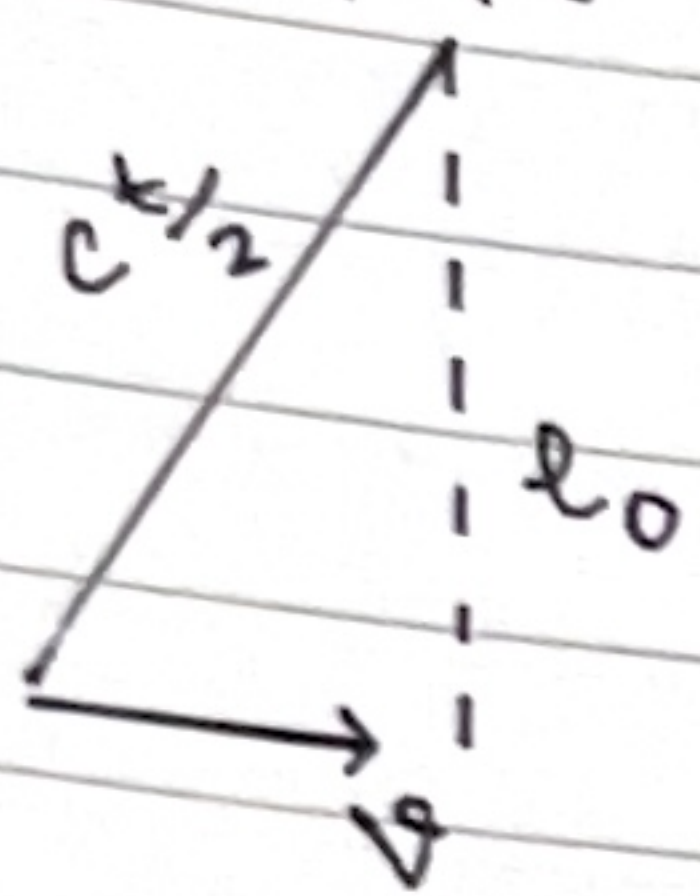


Nama : Aurellia Mecca
 Npm : 2313022030
 Kelas : 23 A
 Fisika modern

Tinjau kembali kepemuaian, roket bergerak dengan kecepatan v menembakkan cahaya dp ke c maka,



$$l_0^2 = \left(c \frac{t}{2}\right)^2 - \left(v \frac{t}{2}\right)^2$$

$$= \frac{t^2}{4} (c^2 - v^2)$$

$$t^2 = \frac{4 l_0^2}{c^2 - v^2} = \frac{4 l_0^2 / c^2}{1 - \frac{v^2}{c^2}}$$

$$= \frac{4 l_0 / c}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{l_0}{\sqrt{1 - \frac{v^2}{c^2}}} \rightarrow \text{pemuaian waktu}$$

ex. sebuah roket bergerak dengan kecepatan besar. jika dalam 1 jam waktu di roket 1 detik dibandingkan dengan waktu di bumi, hitung kec. roket!

diket : $t = 3601$

$t_0 = 3600$ detik

jawab :

$$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}} \rightarrow \frac{t}{t_0} = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$\frac{t_0}{t} = \sqrt{1 - \frac{v^2}{c^2}} \rightarrow \frac{v^2}{c^2} = 1 - \frac{t_0^2}{t^2}$$

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

$$v = c \sqrt{1 - \frac{t_0^2}{t^2}} = 3 \cdot 10^8 \sqrt{1 - \left(\frac{3600}{3601}\right)^2}$$

Efek Doppler:

$$f = f_0 \left(\frac{1 + v/c}{1 - v/c} \right)$$

f : frekuensi yang diterima pengamat

f_0 : frekuensi sumber

v : kecepatan pengamat

c : kecepatan bunyi

Efek Doopler transversal cahaya

$$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$\frac{1}{t} = 1 - \frac{v^2}{c^2}$$

$$f = f_0 \sqrt{1 - \frac{v^2}{c^2}} \rightarrow \text{Efek Doopler transversal}$$

$v = \text{kec. pengamat.}$

secara umum

$$f = f_0 \sqrt{\frac{1 + v/c}{1 - v/c}}$$

Problem:

1. Diket:

Panjang : 2%

Panjang terukur $L = 0,98$

Penyelesaian:

$$0,98 \sqrt{1 - \frac{v^2}{c^2}}$$

$$(0,98)^2 = 1 - \frac{v^2}{c^2}$$

$$0,9604 = 1 - \frac{v^2}{c^2}$$

$$\frac{v^2}{c^2} = 1 - 0,9604 = 0,0396$$

$$v = c \sqrt{0,0396}$$

$$v = c \times 0,199 \%$$

2. $L_0 = 12,740 \text{ km} = 1,274 \times 10^7 \text{ m}$

$$v = 3 \times 10^4 \text{ m/s}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$$

$$L = (1,274 \times 10^7) \times \sqrt{1 - \frac{(3 \times 10^4)^2}{(3 \times 10^8)^2}}$$

$$L = 1,274 \times 10^7 \times \sqrt{1 - 10^{-8}}$$

$$L = 1,274 \times 10^7 - 6137 \text{ cm}$$

$$3 \sim \theta' = 75,9^\circ$$