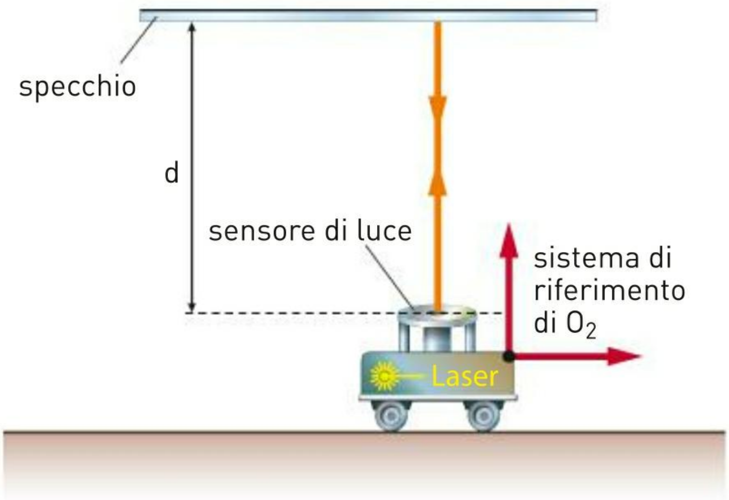
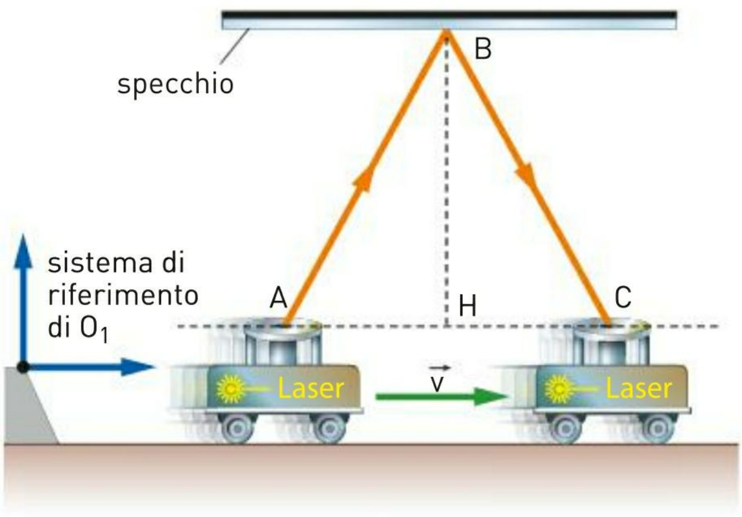
23/2/2018



$$\Delta t = \frac{2d}{c} \Rightarrow d = \frac{1}{2} c \Delta t$$

$\Delta t \downarrow$ DURATA, INTERVALLO DI TEMPO FRA PARTENZA E RICEZIONE DELLA LUCE NEL S.R. DEL CARRELLO (O_2)



$$\underbrace{\Delta t' = \underset{\substack{\downarrow \\ \text{ISTANTE DI ARRIVO}}}{t_C} - \underset{\substack{\downarrow \\ \text{ISTANTE DI PARTENZA}}}{t_A}}_{\text{DURATA DEL FENOMENO SECONDO S.R. TERRA } (O_1)}$$

$$\overline{AB}^2 = \overline{AH}^2 + \overline{HB}^2$$

$$\left(\frac{1}{2} c \Delta t'\right)^2 = \left(\frac{1}{2} v \Delta t'\right)^2 + \left(\frac{1}{2} c \Delta t\right)^2$$

$$\frac{c^2 \Delta t'^2}{\cancel{4}} = \frac{v^2 \Delta t'^2}{\cancel{4}} + \frac{c^2 \Delta t^2}{\cancel{4}}$$

$$(c^2 - v^2) \Delta t'^2 = c^2 \Delta t^2 \qquad \Delta t'^2 = \frac{1}{1 - \frac{v^2}{c^2}} \Delta t^2$$

$$\boxed{\Delta t' = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \Delta t}$$

26/2/2018

$\boxed{\beta = \frac{v}{c}}$ $\boxed{\gamma = \frac{1}{\sqrt{1-\beta^2}}}$ DEFINIZIONI $\boxed{\begin{array}{c}\gamma > 1 \\ \beta < 1\end{array}}$

$$\Delta t' = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \Delta t$$

TEMPO PROPRIO

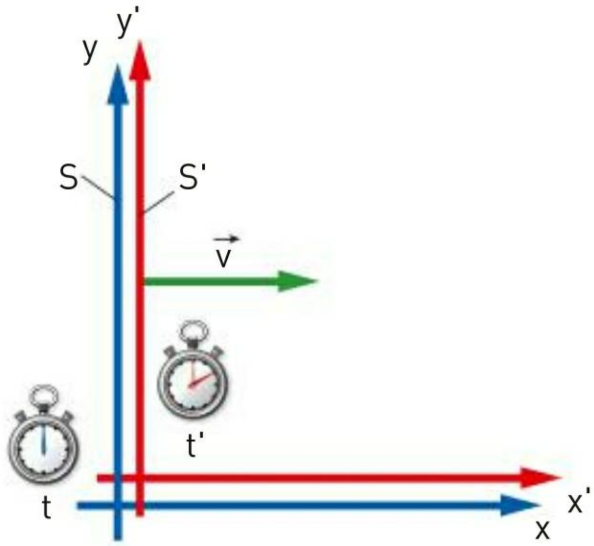
$\boxed{\Delta t' = \gamma \Delta t}$ DILATAZIONE DEI TEMPI $\Delta t' > \Delta t$

$\boxed{\Delta x' = \frac{\Delta x}{\gamma}}$ CONTRAZIONE DELLE LUNGHEZZE $\Delta x' < \underbrace{\Delta x}_{\text{LUNGHEZZA PROPRIA}}$

28/2/2018

TRASFORMAZIONI DI GALILEO

$$\begin{cases} x' = x - vt \\ y' = y \\ z' = z \\ t' = t \end{cases}$$



TRASFORMAZIONI DI LORENTZ

$$\begin{cases} x' = \gamma (x - vt) \\ y' = y \\ z' = z \\ t' = \gamma \left(t - \frac{\beta}{c} x\right) \end{cases}$$

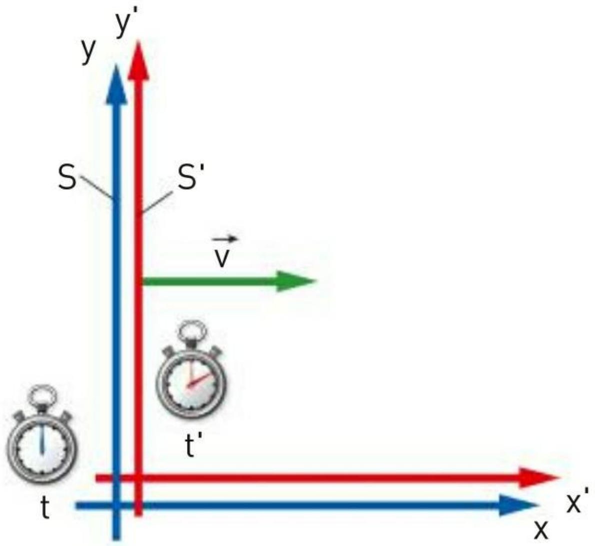
$$\beta = \frac{v}{c}$$

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

se $v << c$

allora $\beta \simeq 0$ e $\gamma \simeq 1$

LA DILATAZIONE DEI TEMPI



Nel sistema S

$x_1 = 0$ $\quad$ $x_2 = 0$

$t_1 = 0$ $\quad$ $t_2 = \Delta t$

Nel sistema S'

$x_1' = 0$ $\quad$ $x_2' = \gamma (x_2 - v t_2)$

$t_1' = 0$ $\quad$ $t_2' = \gamma \left(t_2 - \frac{\beta}{c} x_2\right) =$

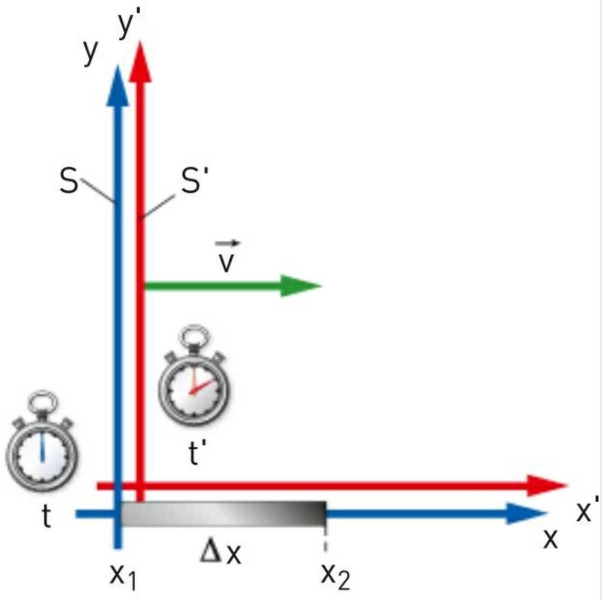
$= \gamma \left(\Delta t - \frac{\beta}{c} \cdot 0\right) =$

$= \gamma \Delta t$

Δt = TEMPO PROPRIO

$\Delta t' = t_2' - t_1' = \gamma \Delta t \rightsquigarrow \boxed{\Delta t' = \gamma \Delta t}$

CONTRAZIONE DELLE LUNGHEZZE



Nel riferimento S

$$x_1 = 0 \qquad x_2 = \Delta x$$

$$t_1 = 0 \qquad t_2 = \frac{\Delta x}{v}$$

Nel riferimento S'

$$x_1' = 0 \qquad x_2' = \gamma\left(\Delta x - v t_2\right) = 0$$

$$t_1' = 0 \qquad t_2' = \gamma\left(t_2 - \frac{\beta}{c} x_2\right) =$$

$$= \gamma\left(\frac{\Delta x}{v} - \frac{\beta}{c}\Delta x\right) =$$

$$= \gamma \Delta x \left(\frac{1}{v} - \frac{\beta}{c}\right)$$

Per S' la lunghezza $\Delta x' = v \Delta t' =$

$$= v \gamma \Delta x \left(\frac{1}{v} - \frac{\beta}{c}\right) =$$

$$= \gamma \Delta x \left(1 - \beta^2\right) = \cancel{\gamma} \Delta x \frac{1}{\gamma^{\cancel{2}}} = \frac{\Delta x}{\gamma}$$

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