

Physics 113 -Lecture 7

Special Relativity

- 1) Laws of Physics hold in any inertial frame
- 2) Speed of Light (vacuum) is c no matter how or where it is generated

Time Dilation - moving clocks run slow



Δt_0 proper time (rest frame of clock)

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

Length Contraction- moving rulers shrink



at rest



contraction along direction of motion

L_0 proper length (rest frame of ruler)

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

When we give time and position of an event, we must specify the reference frame !

Relativity effects are small for normal velocities

$V = 30 \text{ m/s}$ (~ 100 MPH)

Length contraction of 1000 km is $5 \times 10^{-6} \text{ m}$ (1/100th λ blue light) !
Time dilation of 1 day is 0.4 nsec !