

Measure For Time Dilation

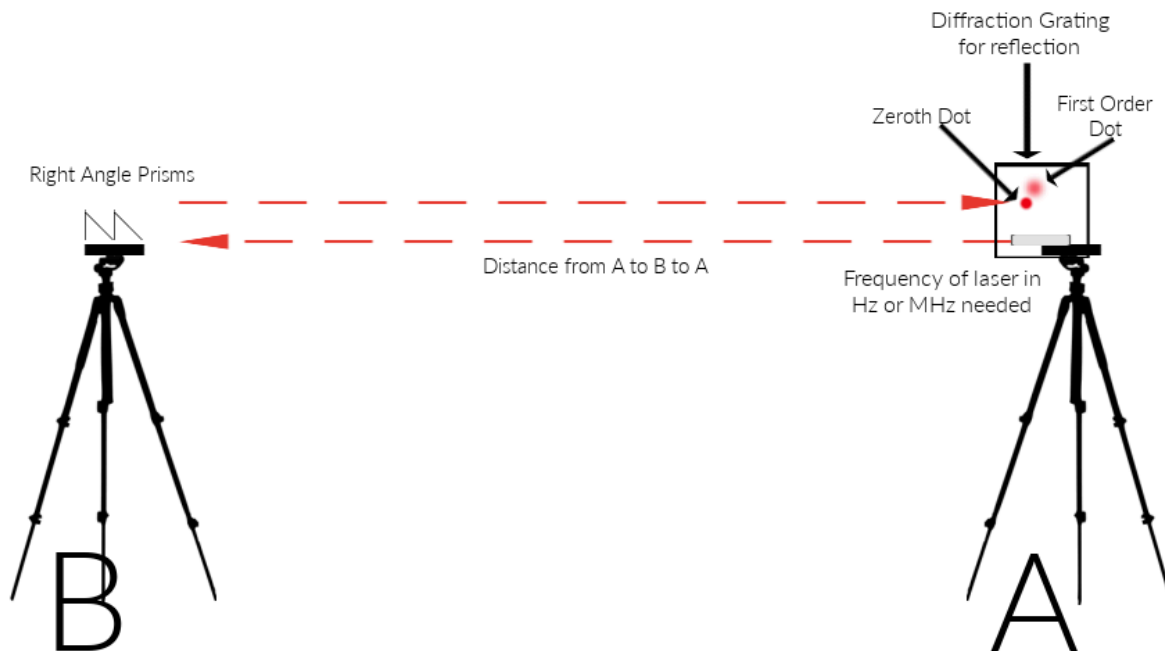
Jessie Desmond

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This is a method to measure for time dilation using a laser, right angle prisms, and a diffraction grating glass.

Materials

- 2 tripods
- 2 right angle prisms
- 1 laser pointer (battery operated for field use)
- 1 diffraction grating glass
- 50' or 100' tape measurer



Tripod A

Tripod A will have the laser pointer and the diffraction grating secured to a platform that can be attached to a tripod. Be sure the distance between the laser and grating matches up with the prisms on B.

Tripod B

Tripod B will have 2 right angle prisms set up to refract the laser back to the diffraction grating.

Equations to Understand

In order to understand the process, we need to understand what we are calculating for. The

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

following is the equation for determining time dilation:

$\Delta t'$ = Relative Time

Δt = Time Interval (seconds)

v = Velocity

c = Speed of Light (m/s) = 299,792,458 m/s

To determine the velocity, figure out the following: $v = f \cdot \lambda$

v = Velocity

f = Frequency of laser (Hz or MHz)

λ = Wavelength

To determine wavelength, figure out the following: $\lambda = d \cdot \sin(\theta)$

λ = Wavelength

d = Line distance of diffraction grating

θ = Angle

Example of d : 600 grooves per mm is $\frac{1}{600}$ mm. This can be broken down to $1.66 \cdot 10^{-6}$
Use this wavelength to frequency calculator, choosing option "light in air".

<https://www.omnicalculator.com/physics/wavelength-to-frequency>

$$\theta = \arctan\left(\frac{x}{D}\right)$$

To determine the angle, figure out the following:

θ = Angle

D = Distance of laser travel (A to B to A)

x = Line distance between zeroth dot and first order dot on diffraction grating

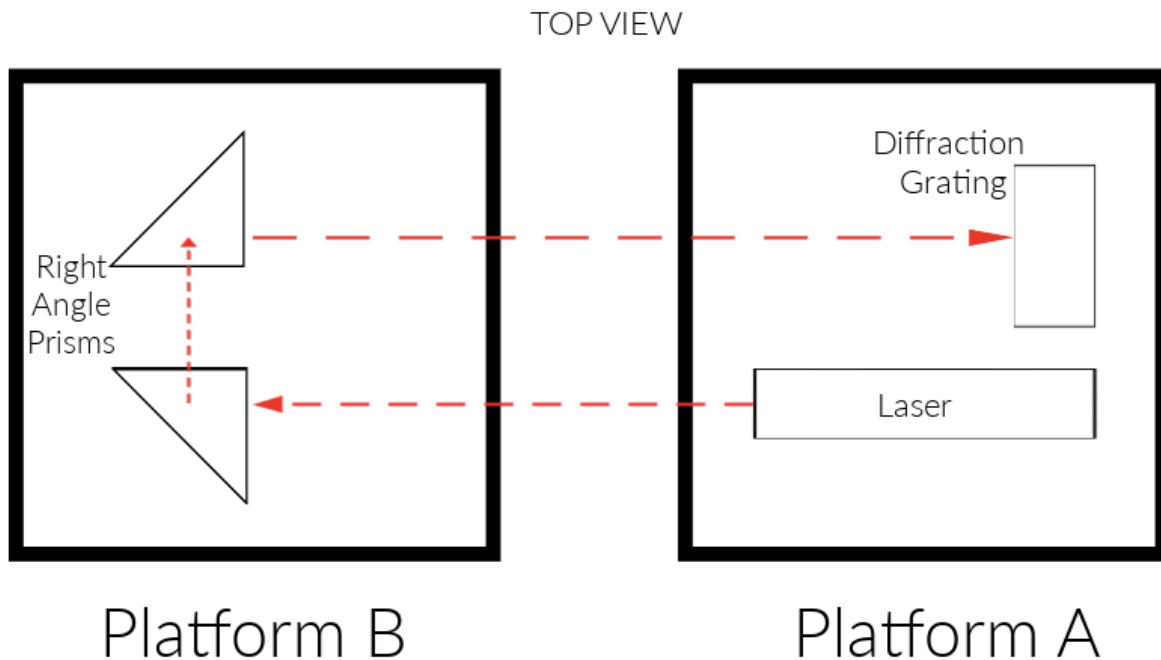
For convenience, there is an excel spreadsheet with calculations entered. Empty cells need to be filled by the user. DO NOT change calculations.

Procedure

Step One. Take an EMF reading of the area. This is a separate reading for additional correlation research, not part of the time dilation equation. Ambient readings are usually around or at zero.

Step Two. Secure the laser pointer and the diffraction grating to a platform that is attached to a tripod mount foot. On a second platform, mount the two right angle prisms to defract the light

from the laser back to the diffraction grating. You should be able to calculate the frequency of your laser (f) and the distance lines of diffraction grating (d). See illustration below.



Step Two. Connect platforms to tripods. Place tripods 50 to 100 feet apart (D). Turn on the laser to line up tripods. The light should be refracted back to the diffraction grating. If not, you either need to adjust the tripods or you need a stronger laser.

Step Three. Turn laser on and time (in seconds) the duration. You may want to take a hi-res photo of the diffraction grating. Determine the distance of the zeroth dot and the closest first order dot (x) on the diffraction grating.

Step Four. On the spreadsheet, enter d , f , D , and x . Since you are using the same d and f numbers, fill in those columns for future measurements. $\Delta t'$ should auto-generate based on the equations in the spreadsheet. Please note the GPS coordinates of your location.

Step Five. In each general location, take measurements with the tripods the same distance apart at either 3 or 5 intervals of 10-feet from each other. This will ensure a baseline in the area if there is any time dilation detected.

