lab #1

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1 Abstract

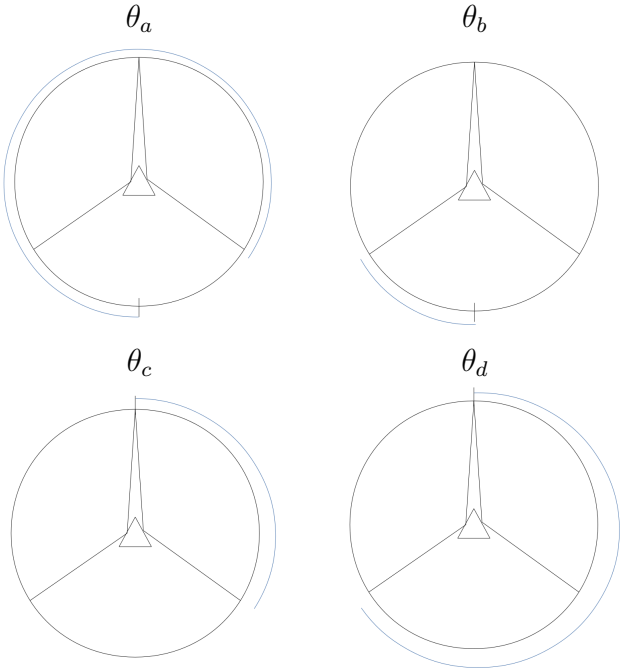
This experament was conducted to determine the speed of light for various wevelengths of light in glass. We did this by using a triangular prisim made of glass.

2 Tabulation of data

2.1 Triangle Apex Angle

These are the mesured angles of reflection, there were two vewing windows one next to the bar code and another, they are denoted accordingly. The uncertenty in our mesures of the angles was $\delta\theta = 1'$

	θ_{bar}	$\theta_\circ$
θ_1	$\theta_a = 297°10'$	$\theta_c = 117°10'$
θ_2	$\theta_b = 57°14'$	$\theta_d = 237°14'$



2.2 Divergence in Angle

Here I have tabulated the minimum divergence of the light beeing transmitted thrught the prisim. Eghther divergence from 0 in the case of ϕ_{bar} or divergence from 180 in the case of $\phi_\circ$. Note that as before all angles carry the same uncertenty $\delta\phi = .5'$. The last entry is the average of the two deviations $\phi_{ave} = \frac{\phi_{bar}+\phi_\circ-180}{2}$ and carrys a uncertenty of $\delta\phi_{ave} = 2^{-3/2}$.

color	ϕ_{bar}	$\phi_\circ$	ϕ_{ave}
yellow	$38°39'$	$218°39'$	$38°39'$
blue	$39°15'$	$219°15'$	$39°15'$
green	$39°1'$	$219°1'$	$39°1'$
red	$38°25'$	$218°25'$	$38°25'$
purple	$39°25'$	$219°25'$	$39°25'$

2.3 Images

This is the image seen thrugh the scope of the diviation between the diferent colors in the helium spectra:

This is the spectral intencity comming directly off the helium tube:
PUT THIS IN!!!!!!!!!!

3 Analasis of Results

First we must determine the angle of the apex of the prisim call this angle α, the angle between the two faces we pass the light thrugh. We are given that this angle must be half the angle between the two reflected beams. We can calculate this angle two ways, $\alpha = \frac{\theta_d-\theta_c}{2}$ and $\alpha = \frac{(360-\theta_a)+\theta_b}{2}$. Lets average these two methods and use that average angle as our α:

$$\alpha = \frac{\theta_d - \theta_c + 360 - \theta_a + \theta_b}{4}$$

We can also get the uncertenty in this angle (note all θs have the same uncertenty:

$$\delta\alpha^2 = \Sigma(\frac{\partial\alpha}{\partial\theta_i} * \delta\theta_i)^2 = (1/16 * 4)\delta\theta^2 = (.5')^2$$

Also plugging in the above values for the various θs we arrive at:

$$\alpha = 60^\circ 2' \pm .5'$$

I am given the equation for the index of refraction as:

$$n = \frac{\sin((\phi + \alpha)/2)}{\sin(\alpha/2)}$$

We can do normal uncertenty analasis procedure as done with α above to find the uncertenty in n: