Physics 375 - Prelab 1

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1 Pre-lab A1

$$\sin\theta_c = \frac{n_2}{n_1}$$

$$uncert_{n_2} = \sqrt{(\cos\theta_c * \triangle\theta_c)^2 + (\sin\theta_c * \triangle n_1)^2} \tag{1}$$

2 Pre-lab B1

I believe one photodiode scan would be necessary at a minimum to measure the displacement of the laser beam. Many more than one, evaluated from multiple incident angles would provide you more accuracy than only one measurement. In this lab, it suggests we take several photodiode scans to measure d.

I would use lj-get.m to make sure all the scans start from the same point.

3 Pre-lab B2

Using propagation of errors, we know that:

$$\sigma_{n_2} = \sqrt{(\frac{\partial}{\partial\theta_i}\sigma_{\theta_i})^2 + (\frac{\partial}{\partial d}\sigma_d)^2}$$

Since the only thing changing between the two configurations is L, mainly, L is increasing between configuration 1 and configuration 2, I asked what the effect would be on the equation above. My result is that since $\frac{\partial}{\partial d}$ is the only variable that depends on L, and it specifically depends on $\frac{1}{L}$, a larger L would make the $\frac{\partial}{\partial d}$ more small. This would have the impact of decreasing the σ_{n_2} since there would be a smaller value in the square root and therefore a smaller uncertainty. So I believe configuration 2 would be the best for minimizing uncertainty. Also, from a logical perspective, having more glass to measure through makes sense that you would have less uncertainty, since you would have more data points (loosly speaking) to base your answer off of.