Lab #6 Physics with Python I: Plotting .

A. Complete this:

Your Name Neil Sawhney Slot _____

Please mark the circle next to your lab section:

- ◯ A, Prof Yecko, Mon 1–3 PM
- ◯ B, Prof Webb-Mack, Tue 2–4 PM
- ◉ C, Prof Yecko, Wed 10 AM–12
- ◯ D, Prof Corn-Agostini, Thu 9 AM–11 AM
- ◯ E, Prof Webb-Mack, Tue 9–11 AM
- ◯ F, Prof Yecko, Fri 1 PM–3 PM

B. Read and sign Academic Integrity Statement:

I hereby attest that I have not given or received any unauthorized assistance on this assignment.

Neil Sawhney

Sign here

C. Grading rubric:

Category and very brief grading comments.....	Pts Available	Pts earned
Purpose	2	
Double Slit Plot	4	
N-slit Plot	4	
Single Slit Plots	8	
Question	1	
Conclusion	1	
Total	20	

Lab #6: Diffraction & Interference Python Plotting

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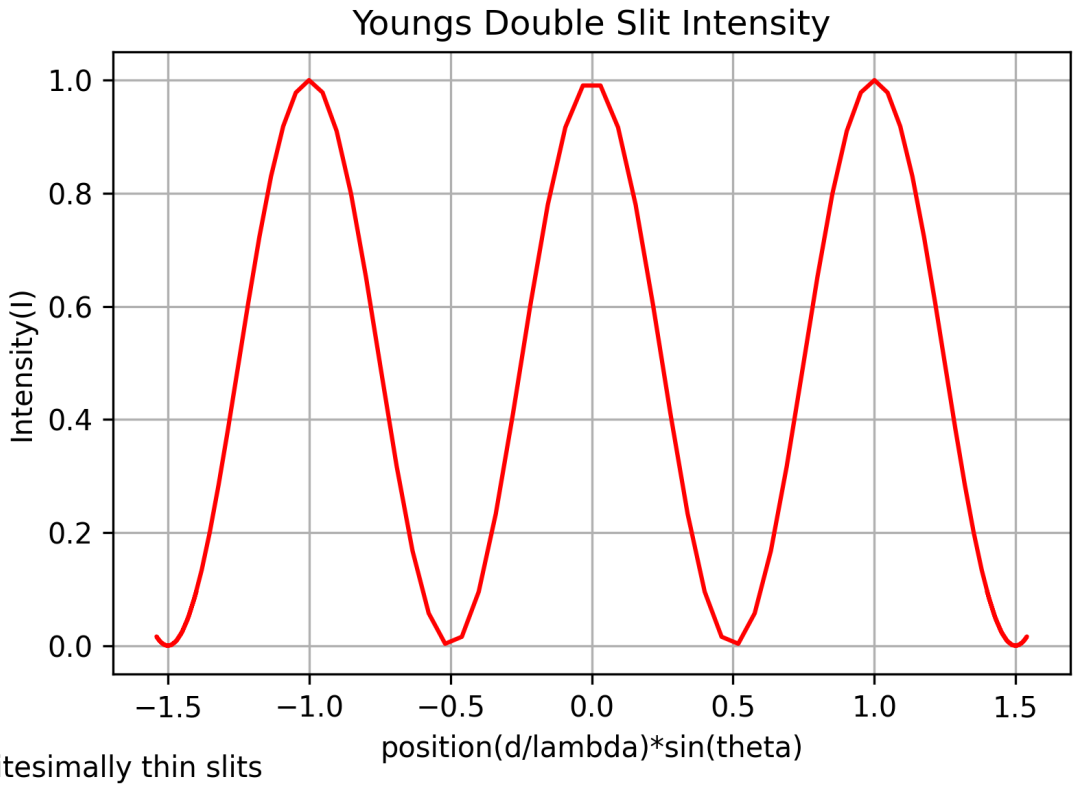
Contents

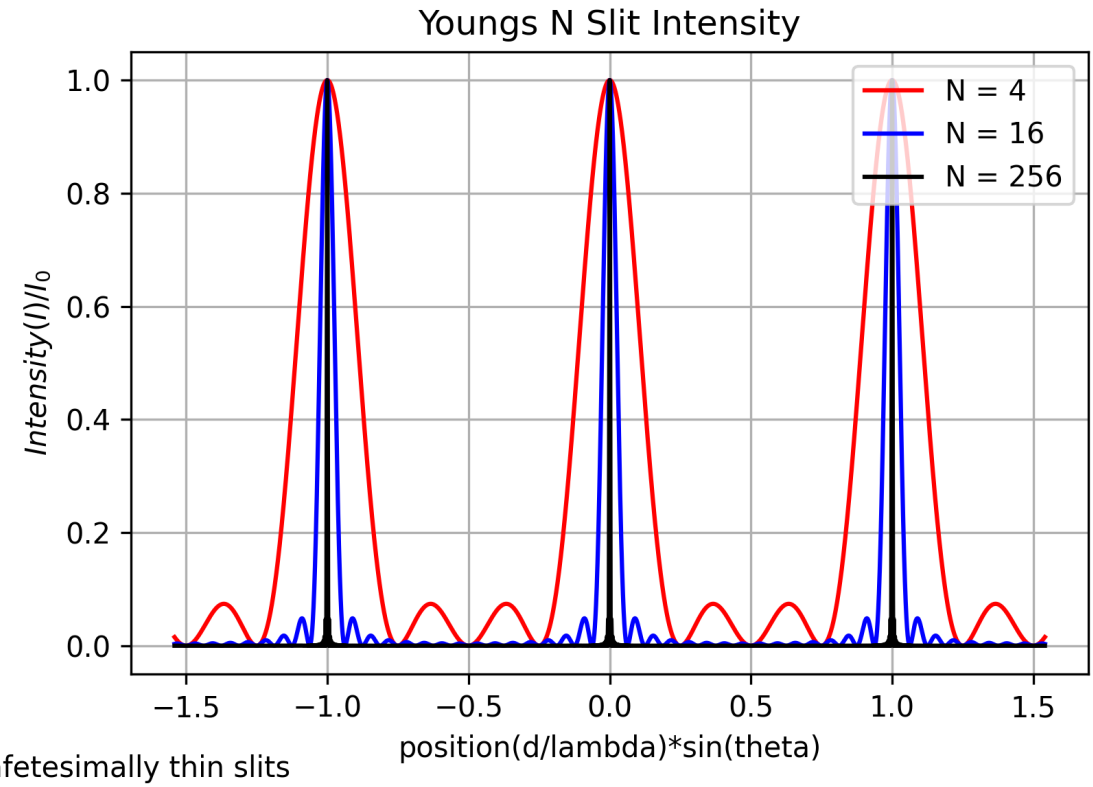
1. Purpose

The purpose of this lab is to plot the intensity pattern of light as it passes through 1, 2, and N number of slits for an infinitesimally small slit. Using these results we will plot the intensity pattern of light for a slit of finite width.

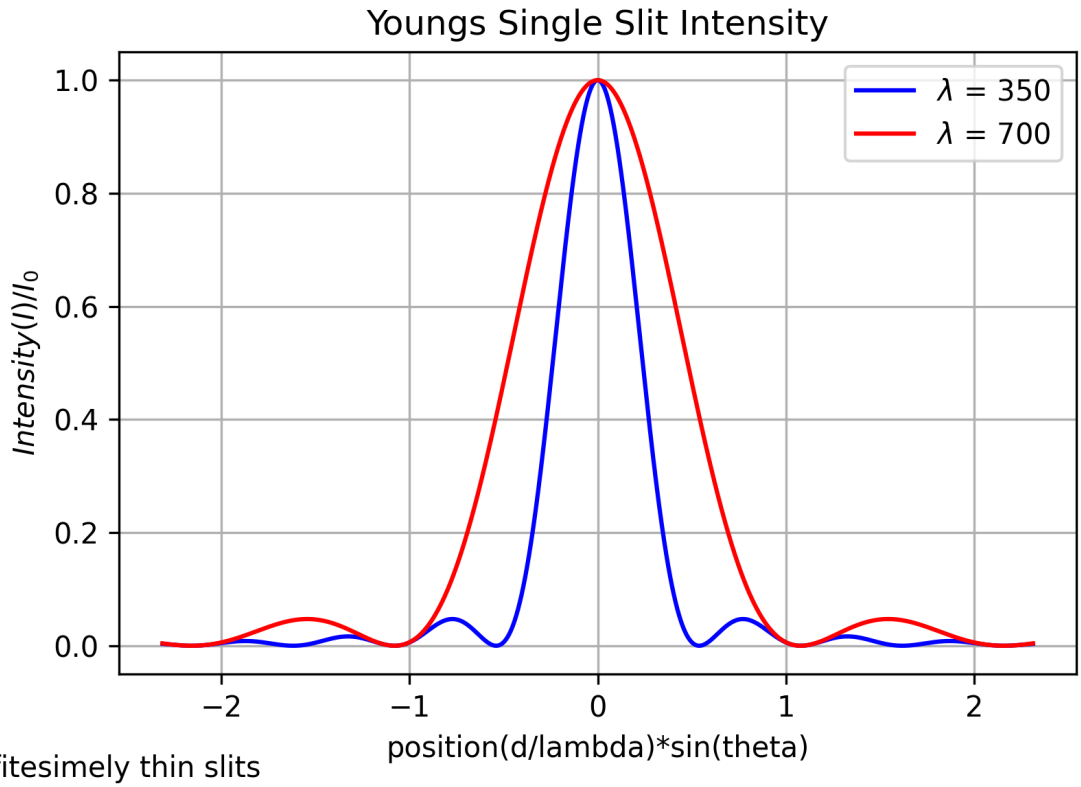
2. Results



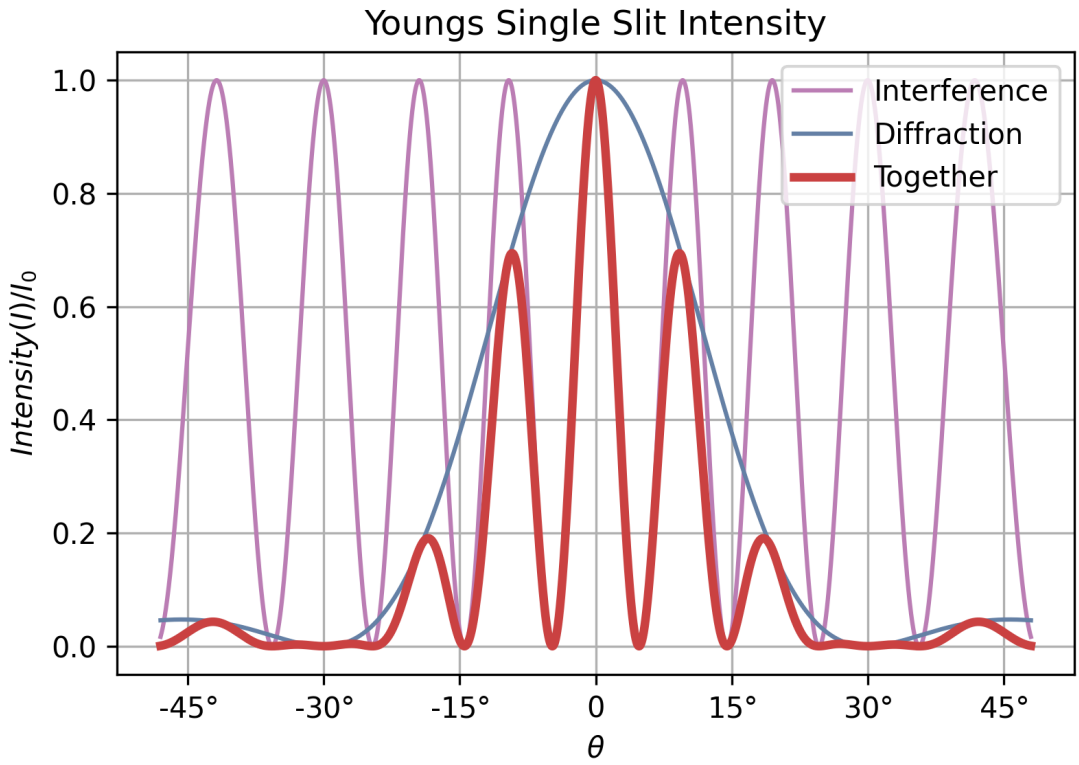
infitesimally thin slits
d = 1000 nm; λ = 649 nm



infetesimally thin slits
d = 1000 nm; λ = 649 nm



infitesimely thin slits
d = 1500 nm



$\lambda = 350nm$ slit width = 700 nm slit seperation = 2100 nm

Question

Notice that the m=3 ($\theta \approx 30°$) order is missing.

The bright interference fringes occur at $d \sin\theta = m\lambda$, or

$$\sin\theta = \frac{m\lambda}{d} \tag{2.1}$$

We also know that,

$$I = I_0 \left(\frac{\sin\beta}{\beta}\right)^2$$

where

$$\beta = \frac{\pi a \sin\theta}{\lambda} \tag{2.2}$$

Substituting equation 2.1 into 2.2,

$$\beta = \frac{\pi a \sin\theta}{\lambda} = \frac{\pi a}{\lambda} \cdot \frac{m\lambda}{d} = \frac{m\pi a}{d}$$

For $a = 2\lambda, d = 6\lambda$, and $m = 3$,

$$\beta = \frac{(3)\pi(2\lambda)}{(6\lambda)} = \pi$$

Then, the intensity is

$$I = I_0 \left(\frac{\sin \beta}{\beta} \right)^2 = I_0 \left(\frac{\sin(\pi)}{\pi} \right)^2 = 0$$

Although the interference intensity in very high at this point, the diffraction inten:w sity is 0 and cancels it out

3. Conclusions

A single slit of finite width can be plotted by multiplying the equation for a double slit of infinitesimally small width and a single slit of infinitesimally small width where d of the double slit is the slit separation and d of the single slit is the slit width.

4. Answered Questions

Click the question to be brought to the location where the question is answered.

4.1 Question

missing m = 3 order