☐PHYS115 ☐PHYS121 ☐PHYS123
☐PHYS116 ☐PHYS122 ☐PHYS124
Lab Cover Letter

Author (*You*) Trevor Sun Signature: Trevor Sun

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Lab Partner(s) Pratham Bhashyakula

Date Performed 4/22/25 Date Submitted 4/22/25

Lab (*such as #1: UNC*) #7: WAVES

TA: Samantha

GRADE (*to be filled in by your TA*) See your TA for detailed feedback.
An '*x*' next to a subcategory means you need to improve this aspect of your work.

Paper Subtotals (points)

( ) ***General*** **(6)**
_____ Sig. figs.
_____ Units
_____ Clarity of Presentation
_____ Format

( ) ***Abstract*** **(4)**
_____ Quantity or principle
_____ How measurement was made
_____ Numerical Results
_____ Conclusion

( ) ***Intro & Theory*** **(9)**
_____ Basic principle
_____ Main equations to be used
_____ Apparatus
_____ What will be plotted
_____ Fitting parameters related

( ) ***Exp. Procedures*** **(15)**
_____ Description
_____ Stating and justifying uncertainties
_____ Data Record
_____ Quality of Lab Work

( ) ***Analysis & Error Analysis*** **(20)**
_____ Discussion
_____ Equations & Calculations
_____ Presentation inc. Graphs, Tables
_____ Results Reported & Reasonable
_____ Underlined items addressed

( ) ***Discussion & Conclusions*** **(6)**
_____ Numerical comparison of results
_____ Logical conclusions
_____ Discussion of pos. errors
_____ Suggestions to reduce errors

( ) **Paper Total (60 points)**
(30 points for CME or EPF)

( ) **Notebook (10 points)**
_____ Format (*proper style, following directions*)
_____ Apparatus (*brief description of equipment, including sketches*)
_____ Data (*including computer file names and manually recorded data*)
_____ Experimental Technique (*describing your procedures; stating & justifying uncerts.*)
_____ Analysis (*results and errors*)

( ) **Worksheet(s)/Fill-in-the-Blank-Report (30 points)** *if applicable*

( ) **Adjustments** – late submissions, improper procedures, etc. – or bonus points for exceptional work.

( ) Total Grade

Graded by _____ *(TA's initial)*

Waves A & B Worksheet

Your Name: Travis Swan **Signature:** [signature]

Lab partner(s): Pratham Bhashyakula

Course & Section: PHYS 122 **Station #** 118 B **Date:** 4/22/25

Waves – A

Single Slit Diffraction (Section D.1)

What is the total separation between the first minima on either side of the central maxima for slit B?

6.8 ± 0.1 (units) cm

Your estimate of λ:

Slope = 0.01031 ± 1.9×10^{-4} m (units)

λ = 3.72×10^{-7} ± 7.0×10^{-9} m (units)

D = 55.4 cm = .554 m ± .001 m ↑ used slit A, TA said it was ok!

↑ dist from mill to slit

w = 0.002 cm = 0.00002 m

$y = m\frac{\lambda D}{w}$ ← slope

λ = slope · $\frac{w}{D}$ = slope · $\frac{.00002\,m}{.554\,m}$

Double Slit Diffraction (Section D.2)

Single slit diffraction features from slits "A": the total separation in mm between the first **minima** corresponding to single slit diffraction is: 2.0 ± 0.1 mm (units)

Double-slit interference pattern:

Number *n* of bright spots in the central *diffraction* maximum: 13

Width *s* of central *diffraction* **maximum**: 19.0 ± 0.1 mm (units)

Mean separation Δy of *interference* maxima: 1.46 ± 0.08 mm (units)

λ from your data and Eq. 5 0.00106 ± .00005 mm (units)

w = 0.04 mm, D = 554 mm

$\lambda = \frac{\Delta y}{\Delta m}\cdot\frac{w}{D} = \frac{1.46\,mm}{1}\cdot\frac{0.04}{554}$

Diffraction Grating (Section D.3)

Measure the positions of the left y_- and right y_+ maxima in first and second order. Calculate λ using Eq. 3 for each measurement and then combine all four to obtain a mean λ.

D = 12.2 cm

$d = \frac{1}{500}$ mm

$d\sin\theta = m\lambda$

$\sin\theta = \sin\left(\tan^{-1}\left(\frac{y}{D}\right)\right)$

$\lambda = \frac{d}{m}\cdot\sin\left(\tan^{-1}\frac{y}{D}\right)$

$m = 1$: y_+ = 4.4 ± 0.1 cm (units) λ = 6.79×10^{-4} mm (units)

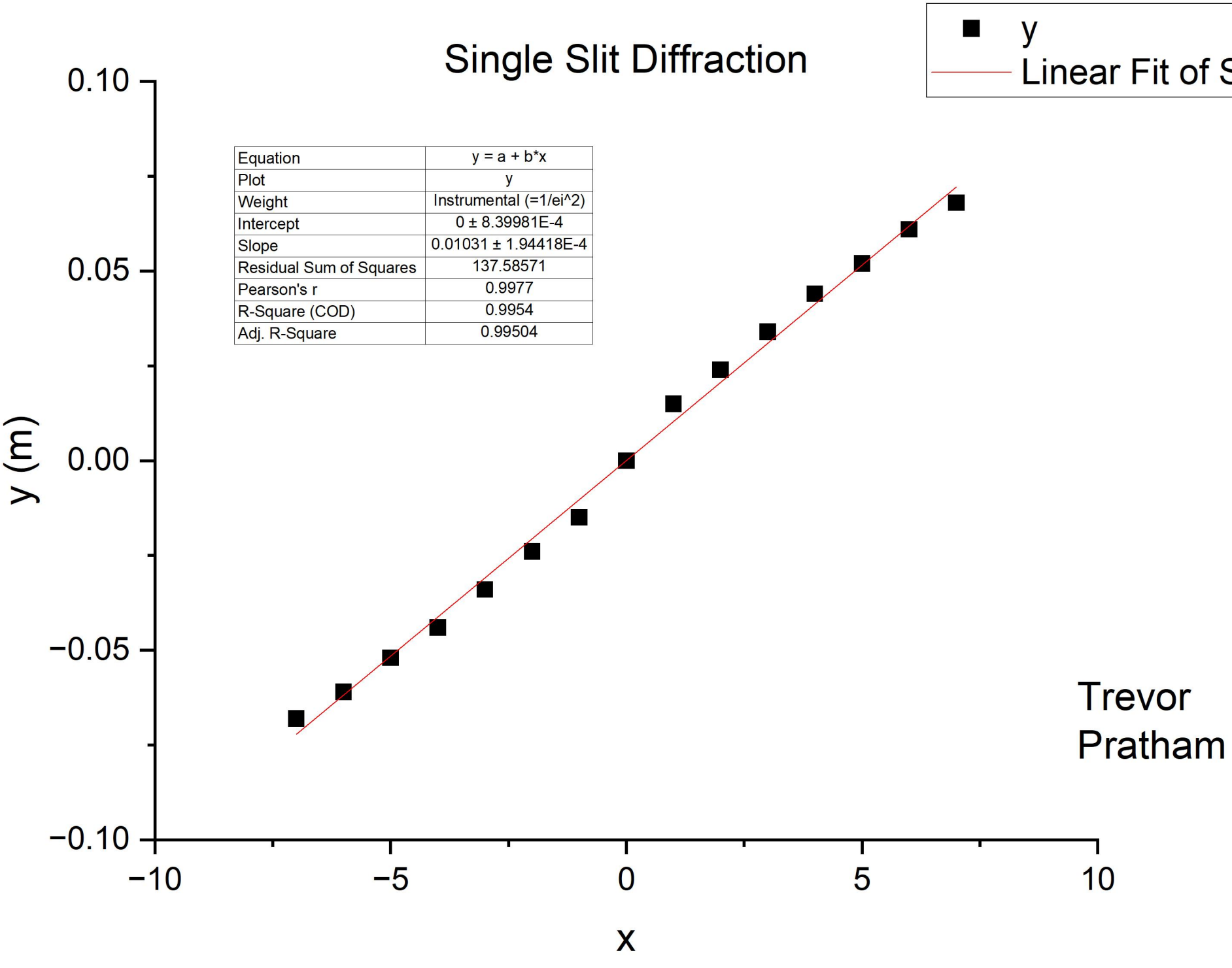
y_- = 4.4 ± 0.1 cm (units) λ = 6.79×10^{-4} mm (units)

m = 2: y_+ = 11.0 ± 0.1 cm (units) λ = 6.70×10^{-4} mm (units)

y_- = 11.0 ± 0.1 cm (units) λ = 6.70×10^{-4} mm (units)

λ_{mean} = 6.74×10^{-4} mm (units)

$\lambda_{mean} = \frac{6.79\times10^{-4} + 6.79\times10^{-4} + 6.70\times10^{-4} + 6.70\times10^{-4}}{4}$


Single Slit Diffraction
y
Linear Fit of Shee
Equation | y = a + b*x
Plot | y
Weight | Instrumental (=1/ei^2)
Intercept | 0 ± 8.39981E-4
Slope | 0.01031 ± 1.94418E-4
Residual Sum of Squares | 137.58571
Pearson's r | 0.9977
R-Square (COD) | 0.9954
Adj. R-Square | 0.99504
0.10
0.05
0.00
−0.05
−0.10
y (m)
−10
−5
0
5
10
x
Trevor
Pratham

Waves – B

Polarization by Transmission (Section C.3 & C.4)

Attach your *Origin* plot and least-squares fit of the intensity I *vs.* angle θ.

List here your fitted parameters: $A =$ 266.52 ± 0.12 Lux (units)

$I_o =$ 503.55 ± 0.14 Lux (units)

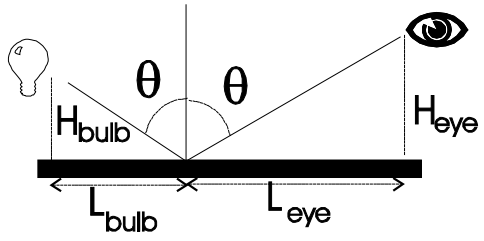
$\phi =$ 2.15×10^{-5} ± 0.007 Degrees (units)

Polarization by Reflection (Section D.2 & D.3)

$H_{eye} =$ 1.655 ± 0.001 m (units) $L_{eye} =$ 2.310 ± 0.001 m (units) $\tan\theta_{eye} =$ 1.44 ± 0.0001

$H_{bulb} =$ 1.010 ± 0.001 m (units) $L_{bulb} =$ 1.640 ± 0.001 m (units) $\tan\theta_{bulb} =$ 1.62 ± 0.0001

Index of refraction: 1.53



Michelson Interferometer (Section E.2 & E.3)

Each lab partner must count her or his own $N = 50$ or so fringes.

Number of fringes, $N =$ 50 ± 5

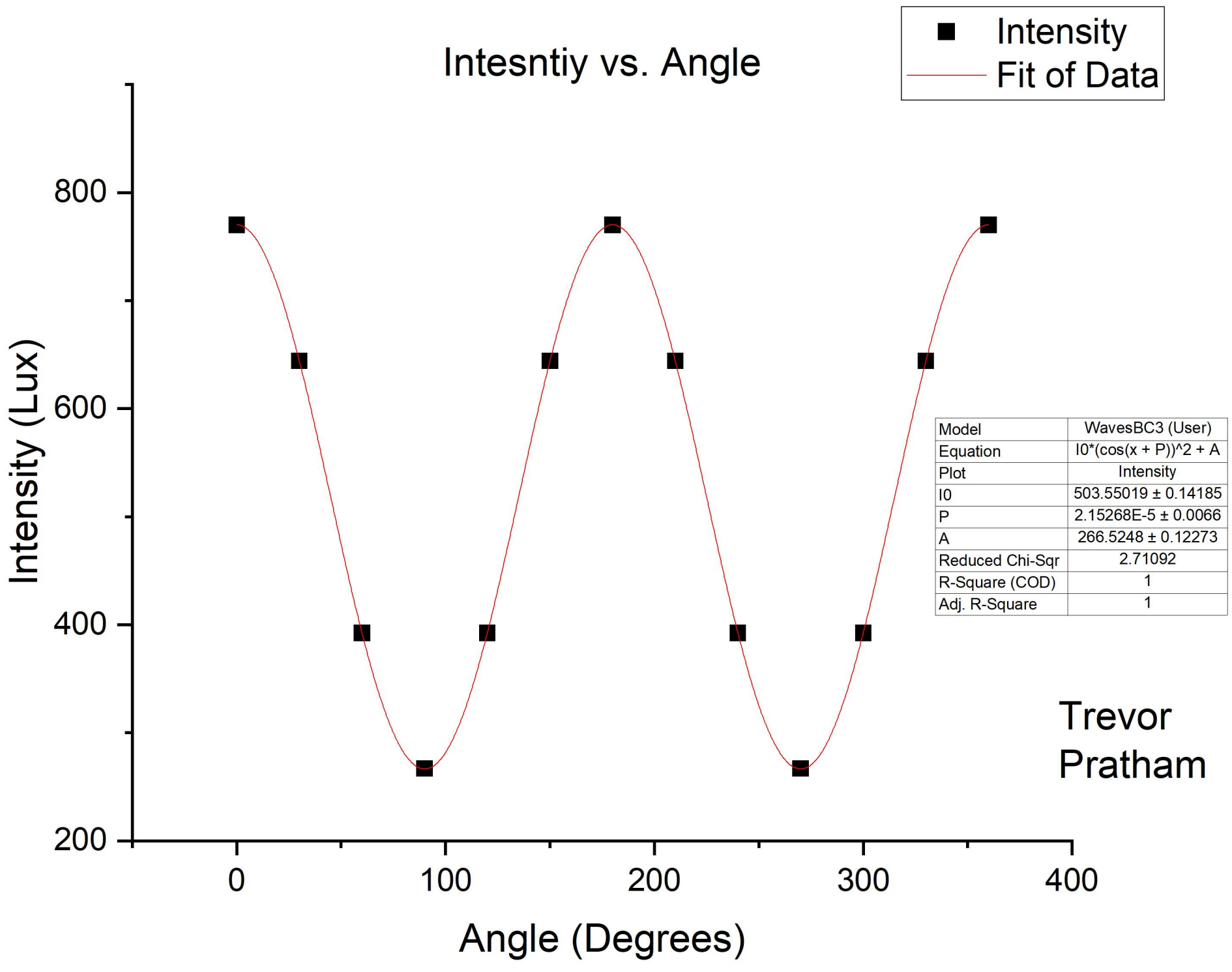
$$\lambda = \frac{2\Delta d}{N}$$

Micrometer Reading, $\Delta d =$ 22.4 ± 0.01 cm (units)

$\lambda =$ 0.0090 ± 0.00004 m (units)

GRADE:_____ (out of 30 points)

GRADED BY _____ (TA's initials)


Intesntiy vs. Angle
Intensity
Fit of Data
Intensity (Lux)
800
600
400
200
0
100
200
300
400
Angle (Degrees)
Model WavesBC3 (User)
Equation I0*(cos(x + P))^2 + A
Plot Intensity
I0 503.55019 ± 0.14185
P 2.15268E-5 ± 0.0066
A 266.5248 ± 0.12273
Reduced Chi-Sqr 2.71092
R-Square (COD) 1
Adj. R-Square 1
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