PHY 122/124 EXPERIMENT 7: Interference and Diffraction – Worksheet

PART I

Micrometer zero reading:____________________________________

Micrometer reading with hair:________________________________

Hair Diameter (include unit and estimate of error in measurement):

__________________________________________

When the hair is positioned vertically which way does the diffraction pattern spread out?

_______________________________________________________________________________

When the hair is positioned horizontally which way does the diffraction pattern spread out?

_______________________________________________________________________________

What happens to the pattern, specifically the positions on the intensity maxima, when you move the frame closer to the wall? How are $D$ and $x$ and related?
What is the wavelength of the laser light (in meters)? ________________________ m

Distance D between the frame and wall (include unit and error):
_________________________________________________________

Place Tape Here:

<table>
<thead>
<tr>
<th>Order m</th>
<th>2x (m)</th>
<th>x (m)</th>
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Estimate of error in 2x: ____________________ m
Estimate of error in x: ____________________ m
Slope of graph:________________________+/-____________________ m

Hair Diameter from diffraction( b):________________________+/-____________________m

Are the two values you have measured for the hair diameter consistent?
PART II

Single Slit Diffraction:
Is the blue pattern, wider or narrower than the red one? Why?

How do the central maximum and the minima vary with slit width $b$? Explain.

Why does the pattern eventually disappear when $b$ becomes very large ($b \gg \lambda$)?

Double Slit Interference:
As you go from E2 to E5 how does the number of two slit interference maxima (or minima)
inside the central diffraction maximum change?

The slit widths are the same for all slits in column E. What does this mean for the width of the
central diffraction maximum?

Many Slits, going toward the Diffraction Grating
Explain your observations about the change in the spread of the maxima from slide to slide in
terms of the equation $m\lambda = d \sin \theta$ using the fact that different numbers of slits are etched into
the same size area on the different slides.