Lab 10

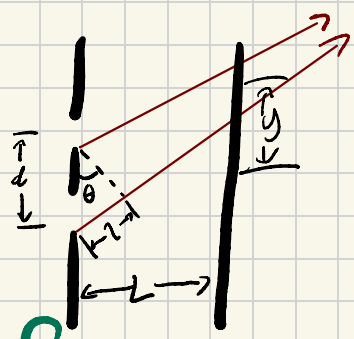
Garrett Haldrup, Christopher Hix

Kait Mounce

Lab 10 Interference of Light

Path difference between waves

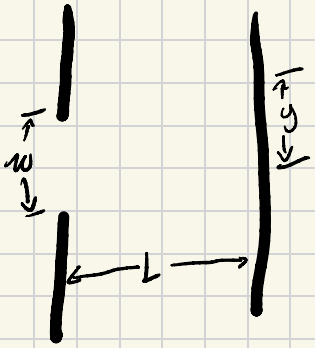
$l = d \sin\theta$



m = # of order

Constructive interference

$d \sin\theta = m\lambda$



Single slit interference

$w \sin\theta = m\lambda$ Destructive

Angle calculation

$\tan\theta = \frac{y}{L}$

Double Slit

$\frac{dy}{L} = m\lambda$

Single slit

$\frac{wy}{L} = m\lambda$

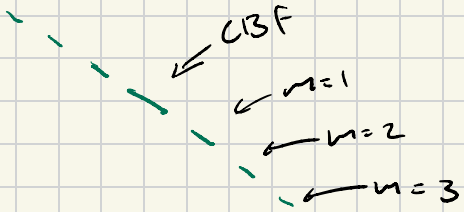
Part I: Double Slit

$d = 0.25\,mm$

$w = 0.04\,mm$

$m, y = 0.7\,mm$

what we see



79.2

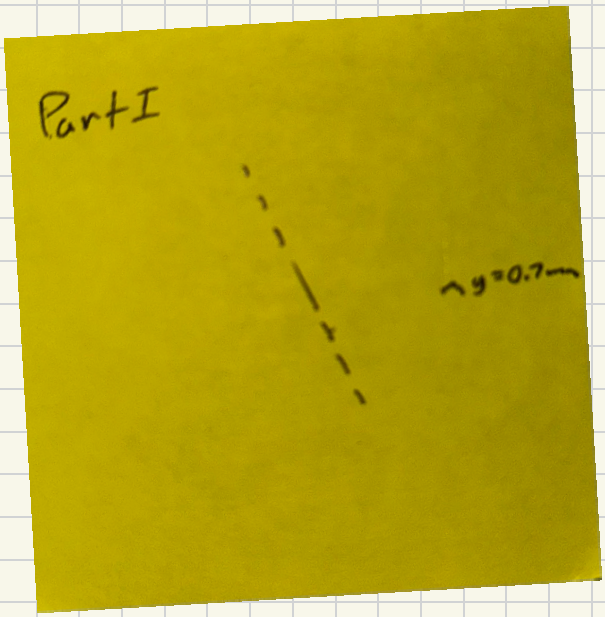
112.1

$32.9\,mm = L$

$$\frac{dy}{Lm} = \lambda$$

$$\frac{0.25 \cdot 0.7}{32.9\,mm \cdot 1} = 532\,nm$$ Actual 532nm

0% Error! 🥳



Part III Measure width of hair

$$w = \frac{m\lambda L}{y}$$

λ from Part I

112.1 cm − 40.7 cm = L

71.4 cm

$m, y = 1\text{ mm}$ $\lambda = 532\text{ nm}$

$$w = \frac{4 \cdot 532\text{nm} \cdot 40.7\text{cm}}{1\text{mm}}$$

$w = 866\mu m$ no

Round 2 0.275mm m, y

50.1

$L = 62\text{cm}$

$$w = \frac{1 \cdot 532\text{nm} \cdot 62\text{cm}}{0.275\text{cm}}$$

$w = 1\text{mm}$ no

Round 3 $L = 62\text{cm}$

$y = 1\text{cm}$ $m = 3$

$$w = \frac{3 \cdot 532\text{nm} \cdot 62\text{cm}}{1\text{cm}} = 98.81\,\mu m$$