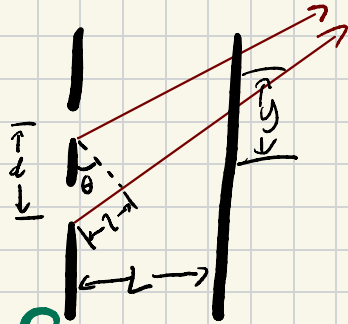




Lab 10 Interference of Light

Path difference between waves

$$l = d \sin \theta$$



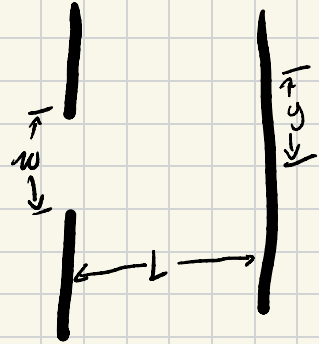
$m = \# \text{ of order}$

Constructive interference

$$d \sin \theta = m \lambda$$

Single slit interference

$$w \sin \theta = m \lambda \quad \text{Destructive}$$



Angle calculation

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

Double Slit

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

Single slit

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

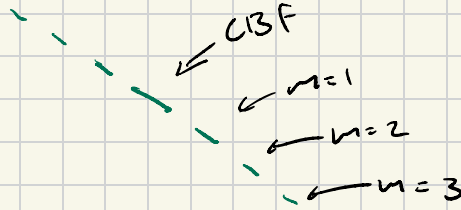
Part I: Double Slit

$$d = 0.25 \text{ mm}$$

$$w = 0.04 \text{ mm}$$

$$m, y = 0.7 \text{ mm}$$

What we see



$$79.2$$

$$112.1$$

$$\sqrt{32.9 \text{ mm}} = L$$

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

$$\frac{0.25 \cdot 0.7}{32.9 \text{ mm} \cdot 1} = \underline{532 \text{ nm}} \quad \text{Actual } 532 \text{ nm}$$

0% Error! 🎉



Part III Measure width of hair

$$W = \frac{m \lambda L}{y} \quad \lambda \text{ from Part I}$$

$$112.1 \text{ cm} = 40.7 \text{ cm} = L$$
$$71.4 \text{ cm}$$

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

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

$$W = 866 \mu\text{m} \quad \text{NO}$$

Round 2

$$0.275 \text{ mm } m, y$$

$$50.1$$

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

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

$$W = 1 \text{ mm} \quad \text{NO}$$

Round 3

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

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

$$W = \frac{3 \cdot 532 \text{ nm} \cdot 62 \text{ cm}}{1 \text{ cm}} = 98.61 \mu\text{m}$$

