BIRZEIT UNIVERSITY

Faculty of Science

Physics Department

Physics 212

Physical Optics

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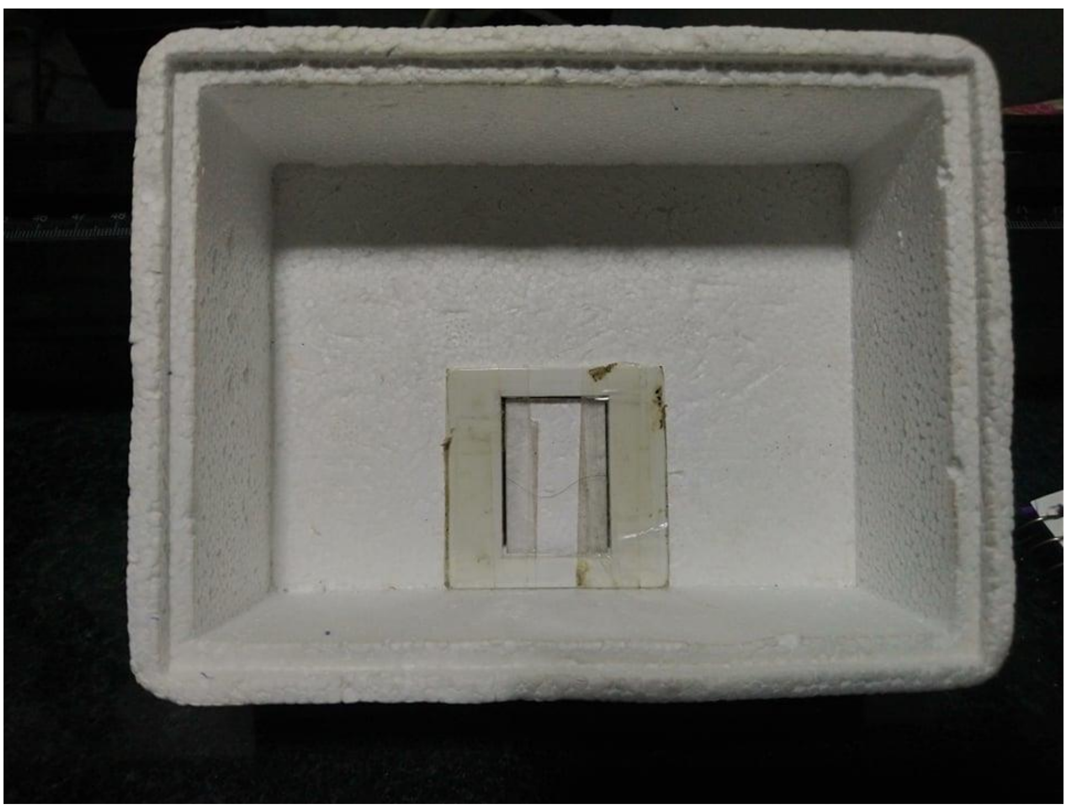
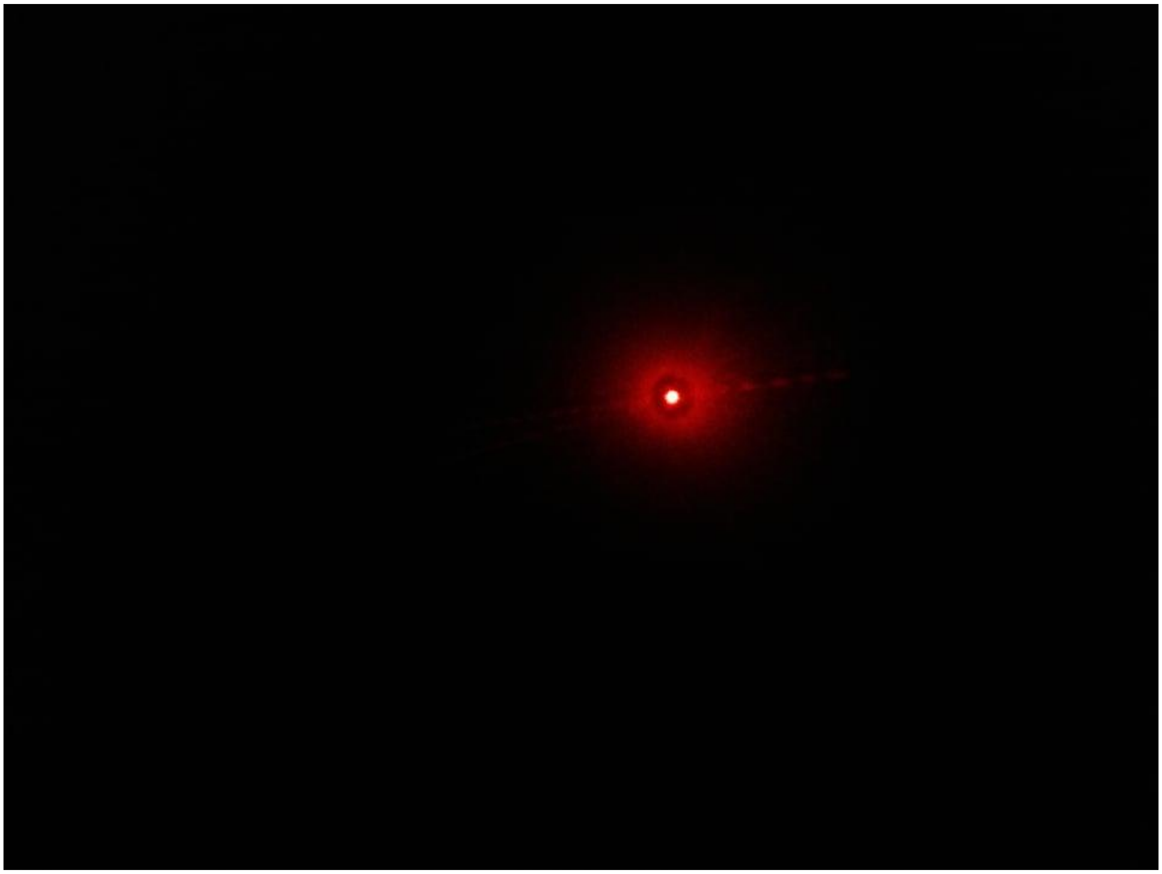
The slits which used:



PART I: Diffraction by grating using 13400 lines/inch:



Discussion:

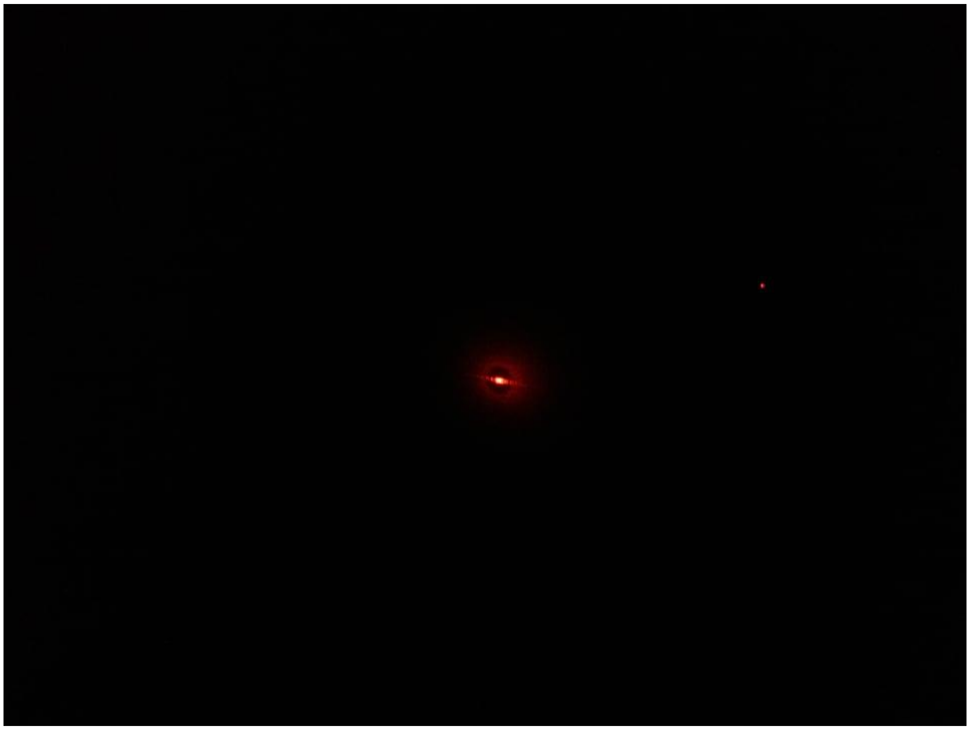
The great number of slits made a lot of fringes. Moreover, the shape of central maxima is as circle due to symmetry.

PART II: Double slit diffraction by increasing the distance between slits I:

d = 0.06 mm

d = 0.19 mm

d = 0.62 mm



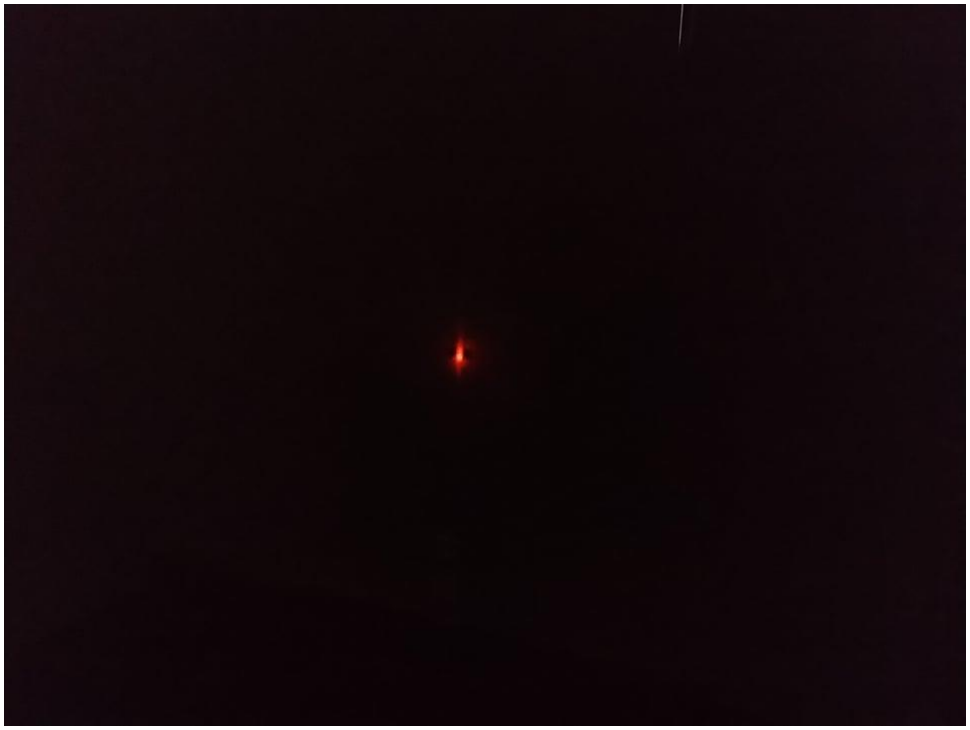
Discussion:

As increasing of the distance between the slits, the distance between successive minima is increasing. This result is agreed with the theoretical expression.

$$\Delta y = \lambda L/d$$

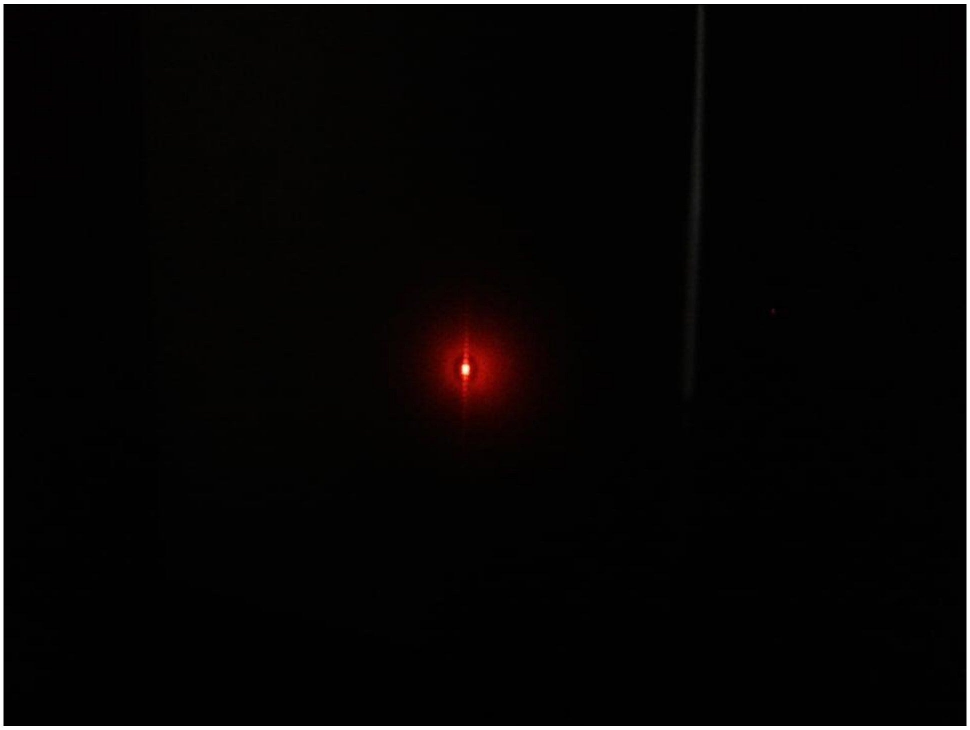
PART III: Double slit diffraction by increasing the distance between slits II:

Thick:



Medium:

Small:



Discussion:

As increasing of the thickness of the separator line, the distance between successive minima is increasing. This result is agreed with the theoretical expression.

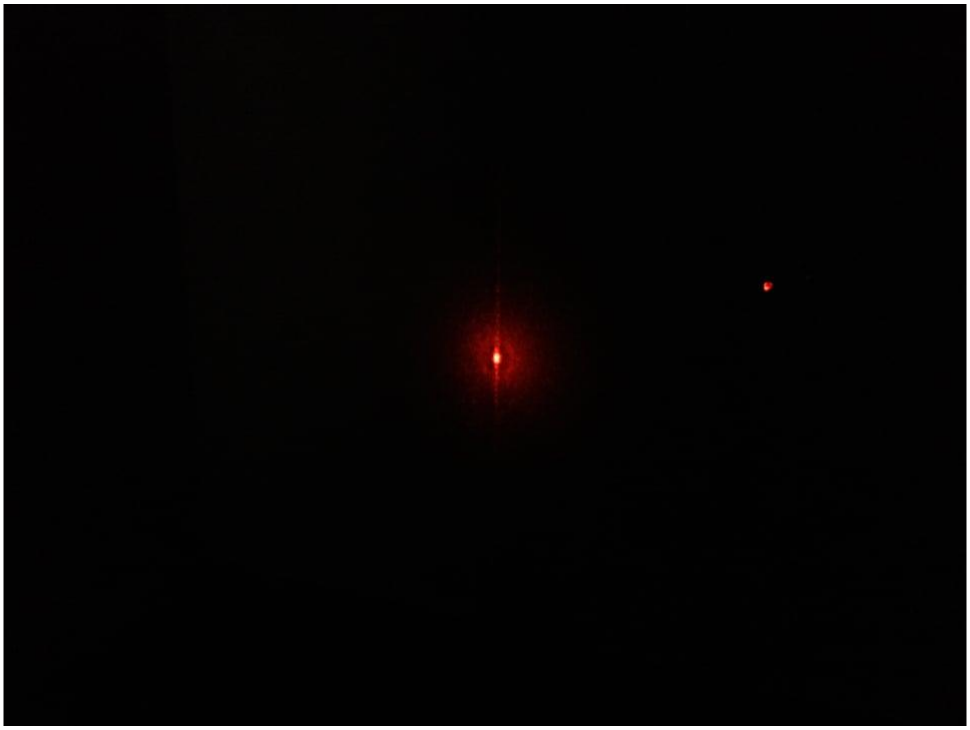
$$\Delta y = \lambda L/d$$

PART IV: Double slit diffraction by increasing the distance between slits III:

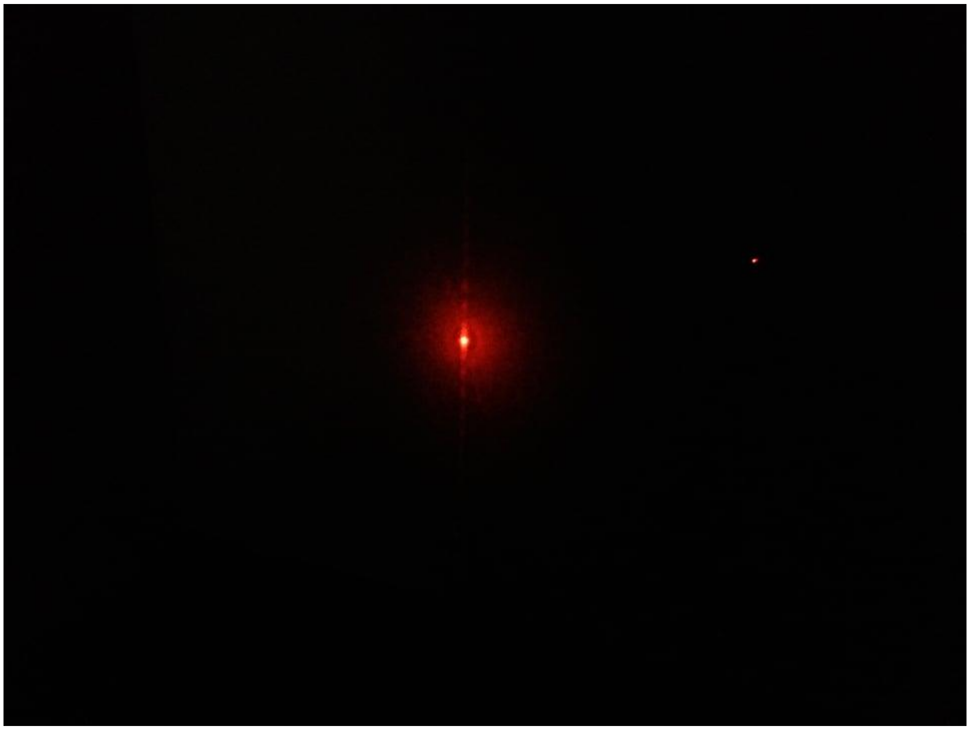
d = 0.25 mm

d = 0.50 mm

d = 0.75 mm



d = 1.00 mm



Discussion:

As increasing of the distance between the slits, the distance between successive minima is increasing. This result is agreed with the theoretical expression.

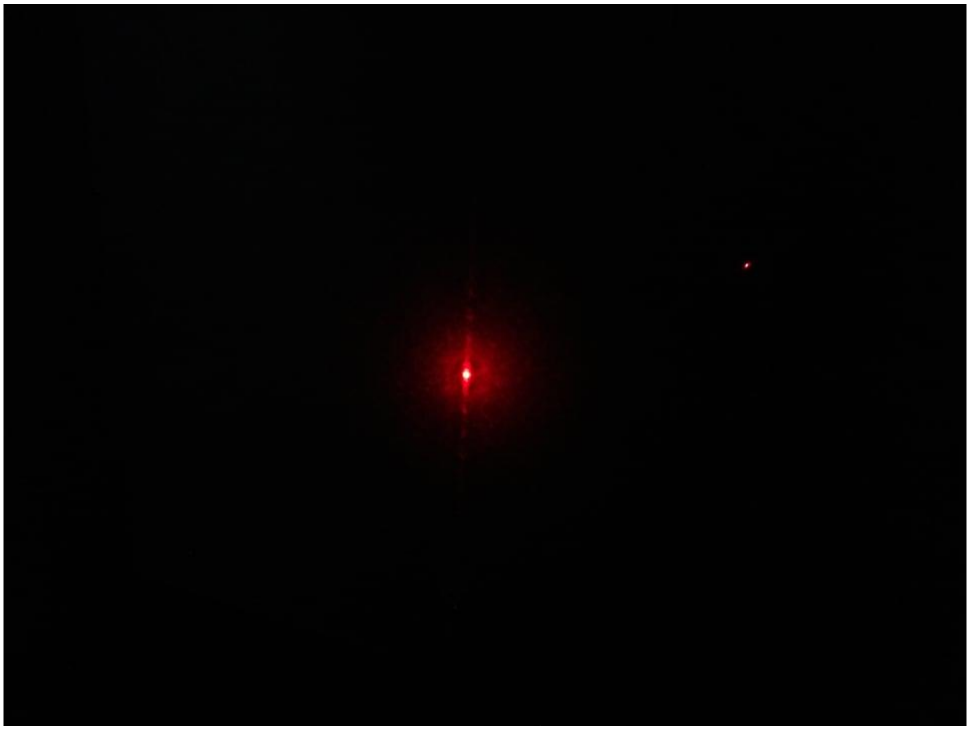
$$\Delta y = \lambda L/d$$

General discussion for parts (II, III, IV):

When the slit in horizontal orientation, the diffraction patterns would be in the vertical orientation, vice versa.

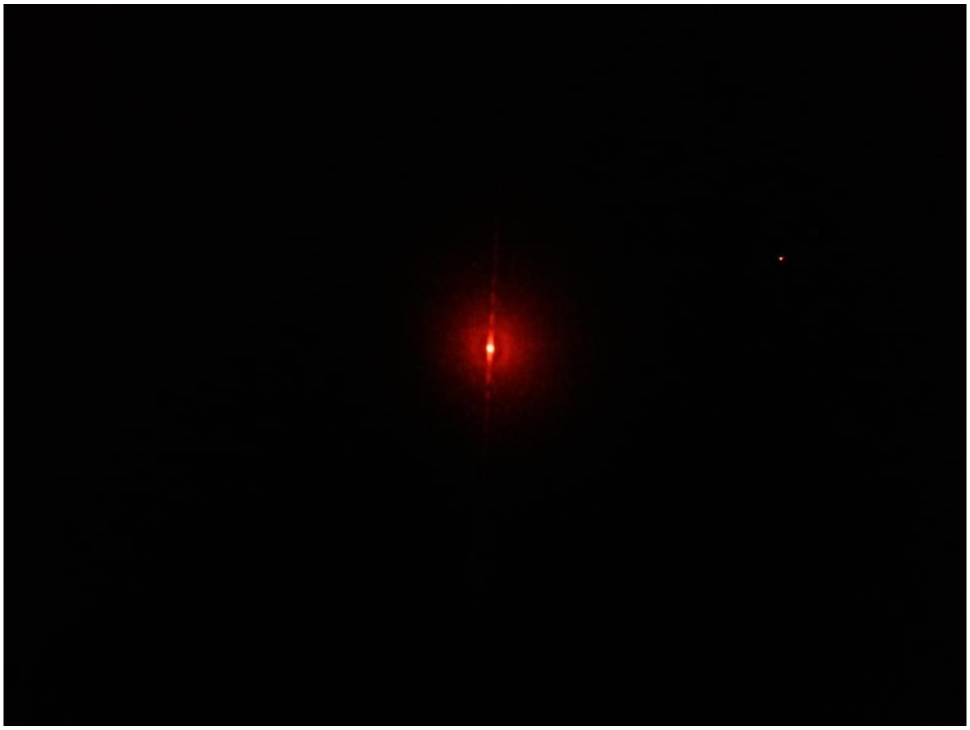
PART V: Diffraction by grating:

# of slits: 2



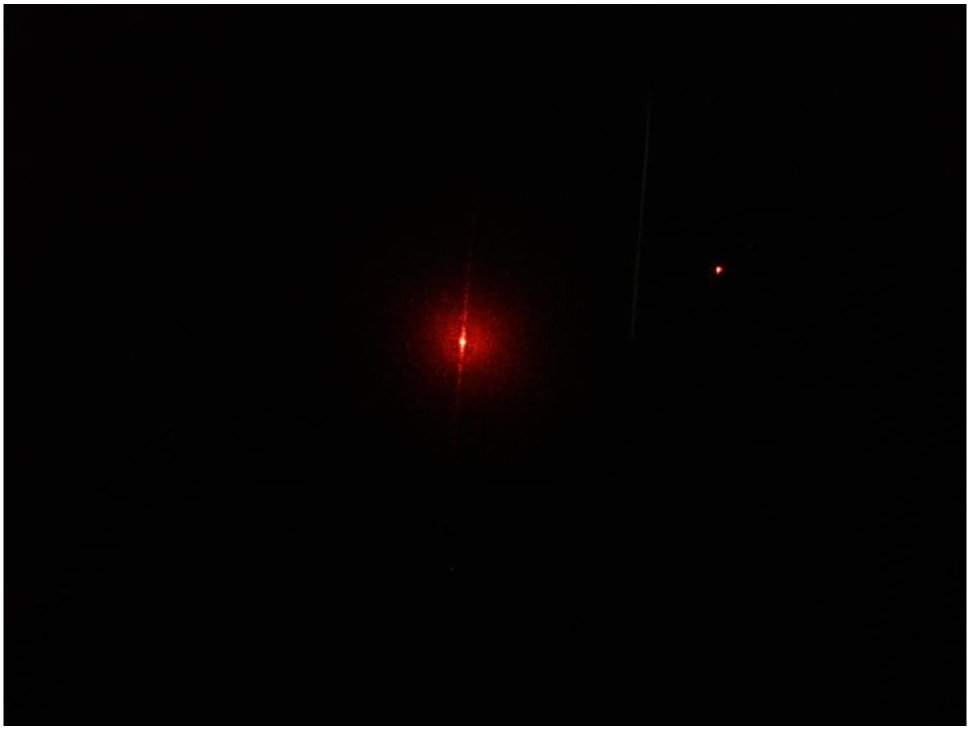
# of slits: 3

# of slits: 4



# of slits: 5

# of slits: 40



Discussion:

As increasing of the number of slits, the width of the fringes becomes narrower.

Theoretically:

The half width angle of central maxima is

$Nd\sin(\Delta\theta_{hw}) = \lambda$

$\Delta\theta_{hw} = \lambda/Nd$

PART VI: Single slit diffraction:

Wide:

Medium:

Tight:

Discussion:

As decreasing the slit width, the diffraction patterns become wider and clearer.

$$a\sin\theta = m\lambda$$

PART VII: Calculating the width of a hair:

$D = 1.3$ cm

$L = 1.5 + 1.4 + (96.9 – 35.8) = 64.0$ cm

D: the width of the central maxima.

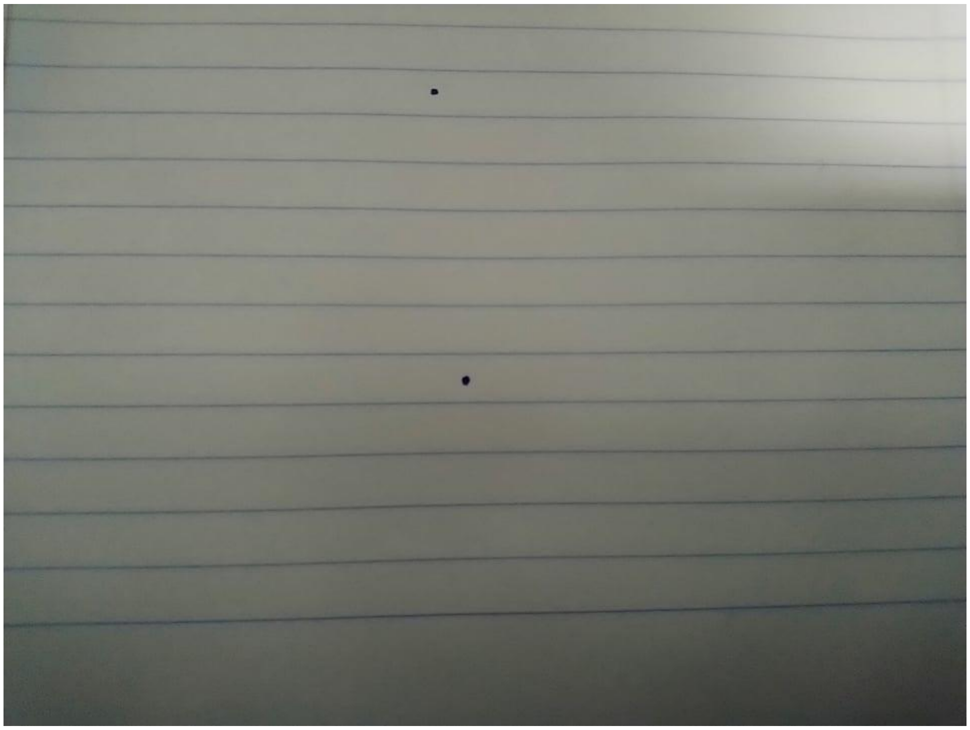
L: the distance from the screen.

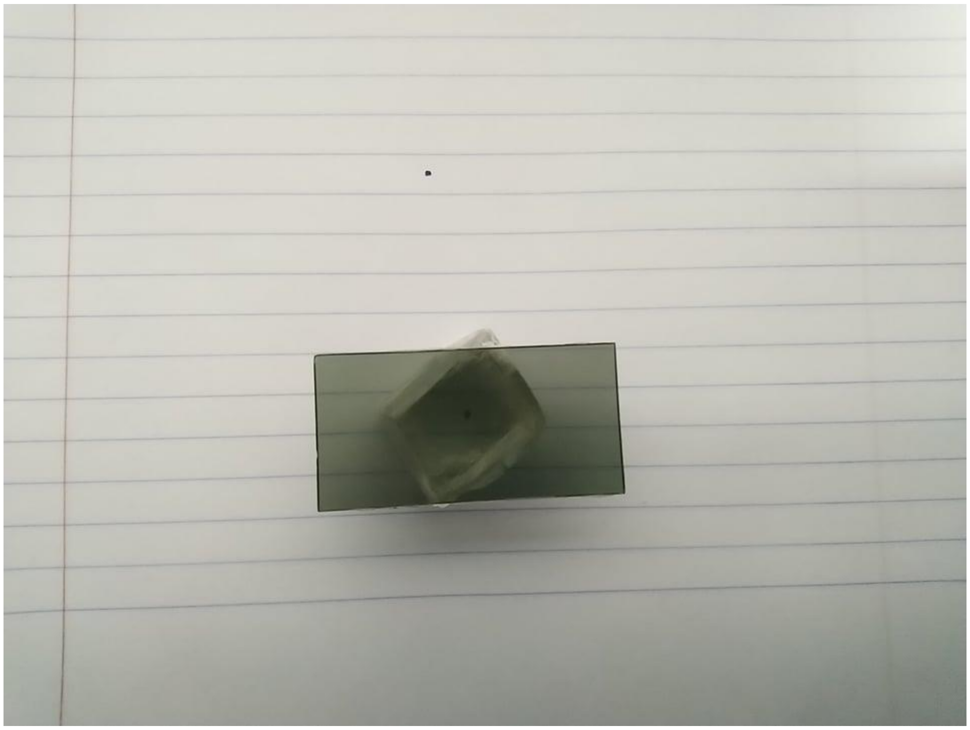
In this experiment, the wavelength of the laser light = 6328Å

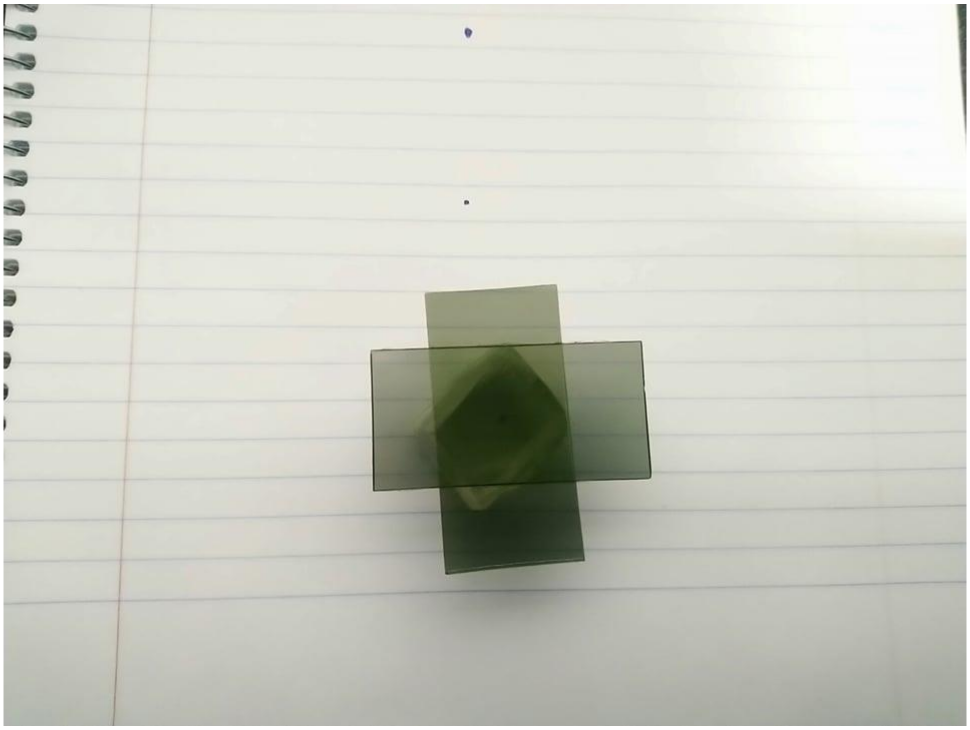
$w = 2\lambda L/D = (2\times6328\times10^{-10}\times64.0\times10^{-2})/(1.3\times10^{-2})$

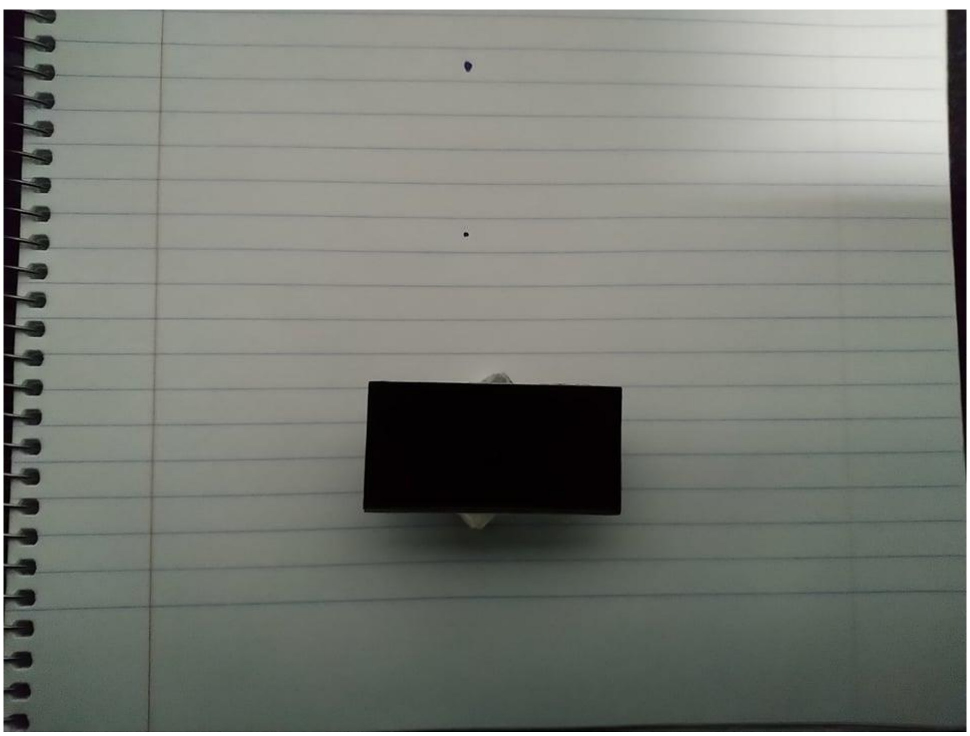
$= 6.2\times10^{-5}\text{m} = 0.062 \text{ mm}$

PART VIII: Observe birefringence in calcite:









Discussion:

Birefringence is the optical property of a material having a refractive index that depends on the polarization and propagation direction of light. The light that comes from the sun has half vertical half horizontal polarization. Therefore, there will be two images for the point. When the crystal rotates, one image remains fixed, while the other revolves around it.

When we put a polarizer above the crystal, one point disappeared and the other one still seen. When we rotate the polarizer 90 degree, the point which was disappeared, had appeared, and the other had disappeared. Since the light has half vertical half horizontal polarization, the polarizer allows one polarization to pass at a certain form. When two polarizers at the same orientation were put above the crystal, they show one point. When two polarizer at the opposite orientation were put above the crystal, they show nothing, and we will see just a dark region.