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College of Engineering
Department of Medical Instrumentation
Techniques Engineering
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EXP.NO: 1

Name of experiment: Monochromatic

Purpose of experiment: Using diffraction phenomena to measure the wavelength and demonstrate the laser properties.

Apparatus: Laser He-Ne, Single Slit, Ruler, Screen.

Theory: In the beginning you must understand what is the diffraction means of how happen so you can be observed when light travels through a hole (in the lab it is usually a vertical slit) whose width, a, is small. Light from different points across the width of the slit will take paths of different lengths to arrive at a viewing screen (Figure 1). When the light interferes destructively, intensity minima appear on the screen. Figure 1 shows such a diffraction pattern, where the intensity of light is shown as a graph placed along the screen. For a rectangular slit it can be shown that the minima in the intensity pattern fit the formula:

$$\boldsymbol{sin\theta\ \lambda = am}$$

Where:

m is an integer (±1, ±2, ±3,..).

a is the width of the slit.

λ is the wavelength of the light.

θ is the angle to the position on the screen.

The m^{th} spot on the screen is called the m^{th} order minimum. Diffraction patterns for other shapes of holes are more complex but also result from the same principles of interference.

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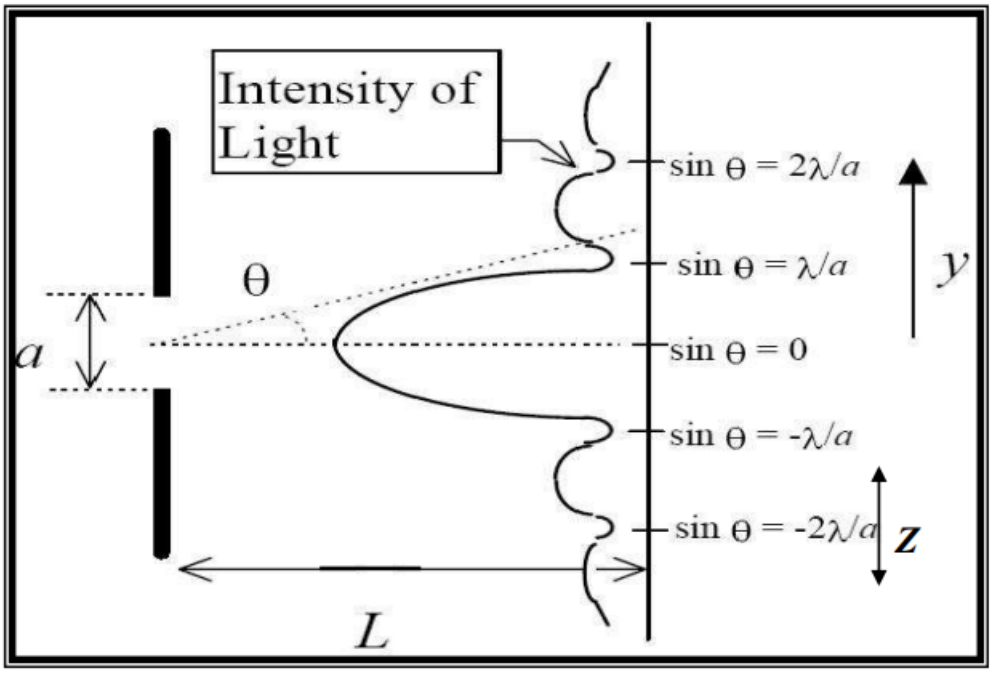

Fig (1): Diffraction by a slit of width a. Graph shows intensity of light on a screen.

Procedure:

1.Array your system as Fig (2).

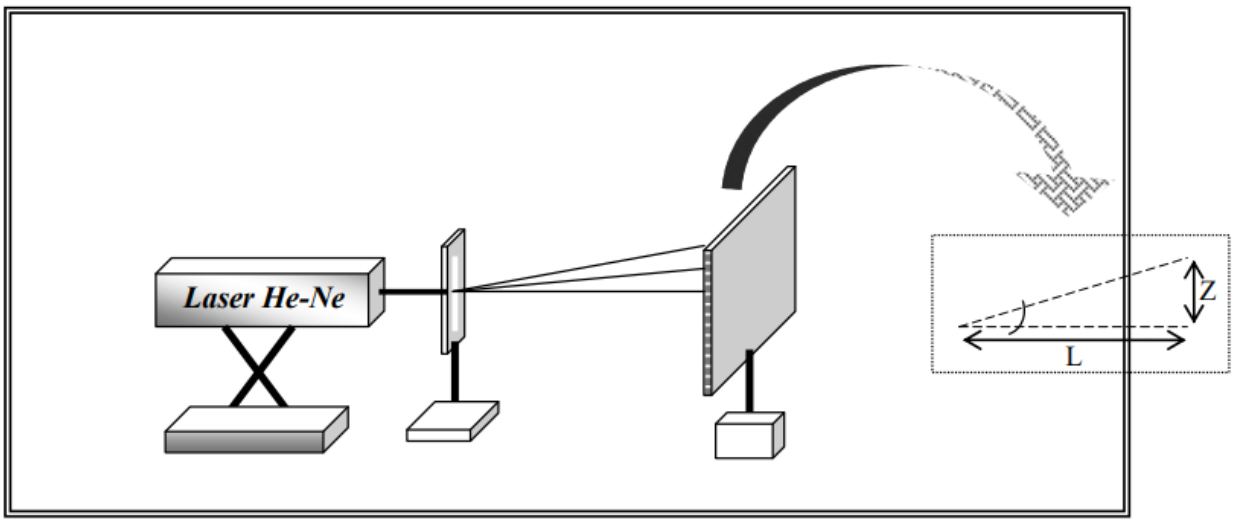

Fig (2): Setup of experiment

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Calculations:

1. Assume:

a. The distance between slit and screen (L) equal to 0.515 m.

b. The distance between center of fringes to first fringe (Z) equal to 0.103 cm.

c. Calculate the angle θ from equation (1):

$\tan \theta = Z/L$ ….....(1)

2. Calculate the wavelength from equation (2):

$\sin\theta\ \lambda = am$….....(2)

Assume a= 3.33e-06

Discussion:

1. Explain Diffraction Phenomena?
2. Is the light must be coherence? Why?
3. from experiment, explain what the properties of laser?
4. Is Laser monochromatic light? Explain?