

EXP NO. -7

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BRANCH – B.TECH CSE

SEMESTER – 2<sup>ND</sup>

UID – 20BCS2761

SUB – PHY LAB

DOP – 12/04/2021

### AIM OF THE EXPERIMENT –

To determine the divergence of laser beam.

### **APPARATUS-**

S.NO.	Equipment	Range	Quantity
1.	Power supply/ operating voltage	5Mv/3-12V	1
2.	Diode laser	650nm	1
3.	Stand	NA	1

### THEORY-

The term LASER is the acronym for Light Amplification by Stimulated Emission of Radiation. It is a mechanism for emitting electromagnetic radiation via the process of stimulated emission. There are lasers that emit a broad spectrum of light, or emit different wavelengths of light simultaneously. A laser beam with a narrow beam divergence is greatly used to make laser pointer devices. Generally, the beam divergence of laser beam is measured using beam profiler. Like all electromagnetic

beams, laser are subject to divergence, which is measured in milliradian. For many applications, a lower-divergence beam is preferable. The divergence of a laser beam is proportional to its wavelength and inversely proportional to the diameter of the beam at its narrowest point.

## PROCEDURE-

- (i) Arrange the apparatus.
- (ii) Pencil, draw the circular spot on the paper and measure the vertical and horizontal diameters of the circular spot. Calculate the mean of both values to get the accurate value of the diameter. This is the waist size  $W_1$
- (iii) Now distance screen in the direction of beam propagation by a known distance  $D$  (total distance from laser becomes  $(Z+D)$  and measure spot size  $W_2$  as measured in previous step.
- (iv) Now displace screen further away by same value  $D$ , so the new distance becomes  $(Z+2D)$ . Measure spot size  $W_3$
- (v) Put the values in the formula and calculate laser divergence.

## OBSERVATIONS-

(i) Initial distance between laser and screen  $Z = \underline{50\text{cm}}$

(ii) Displacement of screen  $D = \underline{25\text{cm}}$

S.NO.	Distance(cm)	Diameter(cm)	$\theta = \frac{1}{D} \sqrt{\frac{W_1^2 - 2W_2^2 + W_3^2}{2}}$
1.	$Z=50$	0.00501	0.00020
2.	$Z+D=75$	0.00301	
3.	$Z+2D=100$	0.008161	

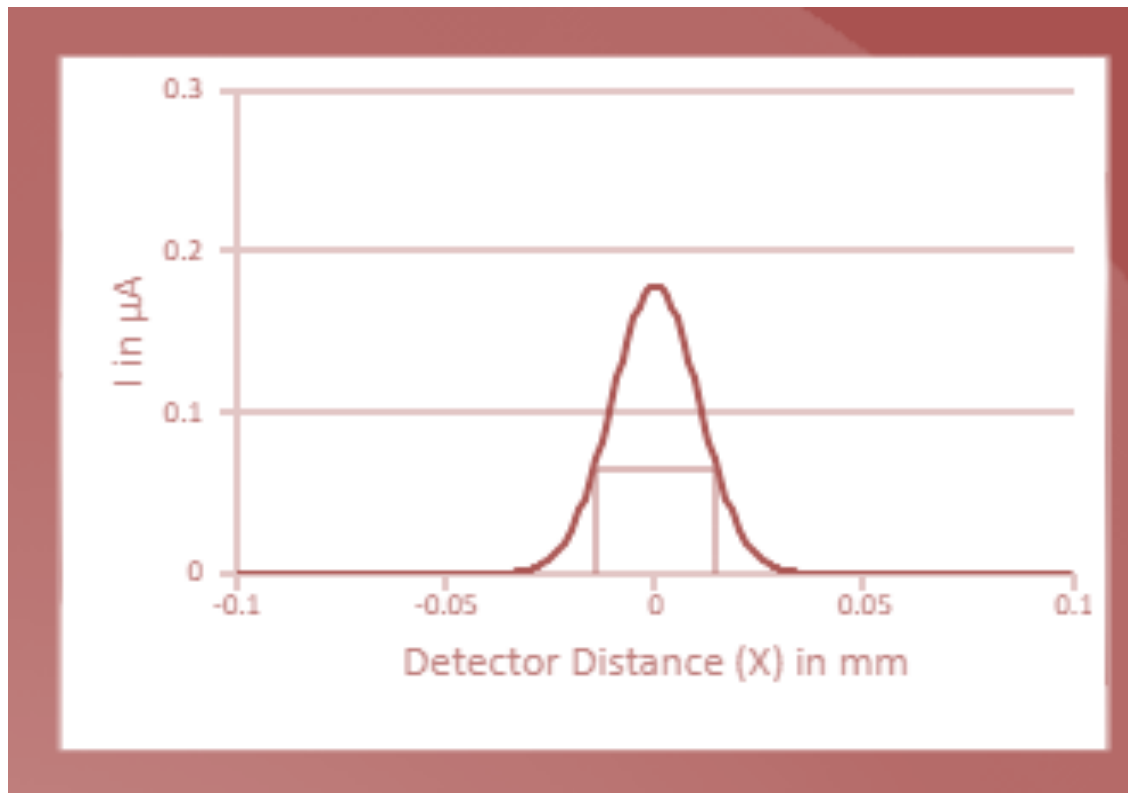
## RESULT(s):

The angle of divergence of the diode laser is 0.00020 milliradian.

## PERCENTAGE ERROR-

No error occurred

## GRAPH (ATTACH IF ANY)-



### LEARNING OUTCOMES

- It will provide the modest experience that allows students to develop and improve their experimental skills and develop ability to analyze data.
- Ability to demonstrate the practical skill on measurements and instrumentation techniques of some Physics experiments. Students will develop the ability to use appropriate physical concepts to obtain quantitative solutions to problems in physics.
- Students will demonstrate basic experimental skills by setting up laboratory equipment safely and efficiently, plan and carry out experimental procedures, and report verbally and in written language the results of the experiment.
- Students will develop skills by the practice of setting up and conducting an experiment with due regard to minimizing measurement error.

### EVALUATION COLUMN (To be filled by concerned faculty only)

Sr. No.	Parameters	Maximum Marks	Marks Obtained
1.	Worksheet completion including writing learning objectives /Outcomes. (To be submitted at the end of the day)	10	
2.	Post Lab Quiz Result.	5	
3.	Student Engagement in Simulation /Demonstration /Performance and Controls /Pre-Lab Questions.	5	
4.	Total Marks	20	
5.	Teacher's Signature (with date)		