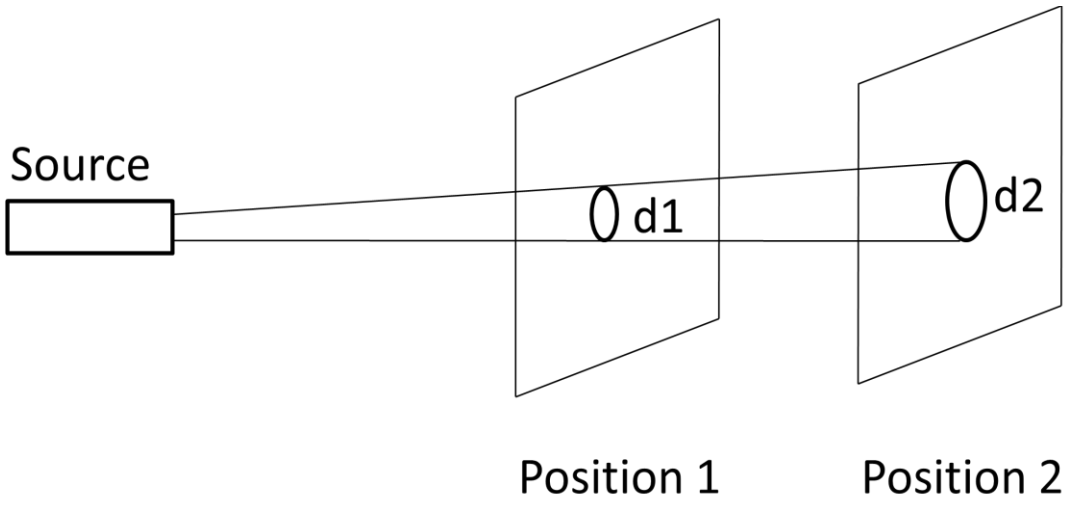
Experiment No. 2

Divergence of LASER beam

Aim and Objectives: To determine divergence of laser.

Apparatus: laser source, optical bench, screen etc.

Diagram:



Outcome: To describe properties of Laser

Theoretical Background:

The word LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Laser is a device producing intense, concentrated, parallel, coherent and monochromatic beam of light. Because of these properties it has many applications in different fields.

Characteristics of laser:

1. Coherence: Waves emitted by laser are in same phase and gives coherent beam of light. This coherence is described in terms of temporal (coherence in time) and spatial (coherence in space) coherence.

2. Directionality: The conventional source emits light in all directions while laser emits light in only one direction. Thus it is highly directional.

3. Divergence: Laser is highly directional, hence its divergence or angular spread is extremely small. It shows a little divergence due to diffraction from semisilvered face.

4. Intensity: Laser is highly concentrated beam with small divergence and hence it is highly intense beam of light and energy is concentrated in small region. Moreover its intensity remains Constant over long distance.

5. Monochromaticity : The light from normal monochromatic source spreads over a wavelength range of the order of 100 A^0 to 1000 A^0. In laser, the spread of wavelength range is very small (<10 A^0).

Procedure:

A screen is mounted on a vertical stand on a optical bench so that the laser beam falls normally on the screen. Keeping the piece of white paper at the spot on the screen, measure the diameter (d_1) of the spot and also note down the position of the screen on the scale on the optical bench.

Move the screen away from the source through certain distance (about 100cm) again measure the diameter d_2 of spot. Thus measure the diameter of spot t different distance from the LASER.

Observation Table :

Sr.No.	Position of Screen in cm	Dimeter of spot (d)	θ rad	θ degree	θmin	Mean θ min
1	50					
2	100					
3	150					
4	200					

Formula: $\theta = \dfrac{(d_2 - d_1)}{D}$

Where, $\mathbf{d_1}$ -- diameter of the spot in the first position of the screen

$\mathbf{d_2}$ -- diameter of the spot in the second position of the screen

D- Distance between two scale reading

Calculations :

Result and Discussion:

Angle of divergence θ =

Conclusion:

Questions:

1. Explain the principle of laser.
2. Explain the concept of angle of divergence and hence, inverse square law.
3. Describe different properties of laser.
4. Explain different applications of laser.