University of Al-Mustaqbal
College of Science
Department of Medical Physics

Laser in medicine

Practical Experiences

Third Stage

Laser Radiation Transmission By Material Mediums

Lec 1

Asst. lec. Ali Salman Hamadi

Mohammed abdulzahra

Haneen hani

Experiment:
Laser Radiation Transmission Through Material Mediums

Objective

To investigate how different materials transmit or block laser radiation and determine their effects on laser intensity.

Tools and Materials

1. **Laser Pointer** (low-power, visible wavelength, e.g., red or green)
2. **Power Meter** (to measure laser intensity after passing through materials)
3. **Material Samples**: (Transparent glass) (Frosted glass) (Acrylic sheet) (Colored plastic sheet) (Thin metal foil) (Paper sheet).
4. **Clamp or Holder** (to secure the laser pointer)
5. **Measuring Ruler** (for distance setup)
6. **Dark Room** (to minimize ambient light interference)
7. **Safety Goggles** (laser-protective, matching laser wavelength)

Steps

1. **Setup:**

a. Secure the laser pointer using a clamp so that the beam is stable.

b. Place the power meter at a fixed distance from the laser. Ensure the laser beam is directly aligned with the sensor.

2. **Calibrate:**

a. Turn on the laser and record the baseline intensity measurement on the power meter without any material in the beam path.

3. **Testing Transmission:**

a. Insert one material sample (e.g., transparent glass) into the laser beam path, perpendicular to the beam.

b. Record the intensity reading on the power meter.
c. Repeat this for all material samples, ensuring the materials are in the same position and orientation each time.

4. **Testing for Scattering/Blocking:**
   a. Observe and describe any visual effects (e.g., scattering, absorption, or beam diffusion) as the laser interacts with each material.
5. **Distance Effect:**
   a. Choose one material and vary the distance between the laser and the material. Record any changes in intensity or beam spread.
6. **Record Observations:**
   a. For each material, note the initial laser intensity, the transmitted intensity, and any visible effects on the beam (e.g., color change, diffusion).

Conclusion

1. **Analysis:**

- Compare the transmitted intensity of each material to the baseline measurement.
- Identify materials that allow the laser to pass through with minimal intensity loss (good transmitters).
- Identify materials that block, scatter, or absorb the laser beam effectively (poor transmitters or opaque).

2. Example Findings:

- Transparent glass may allow most laser radiation to pass with minimal loss.
- Frosted glass and thin metal foil may scatter or block the beam, reducing intensity significantly.
- Colored plastics may absorb specific wavelengths, altering the beam color or reducing intensity.

3. **Application Insight:**

The experiment demonstrates how material properties like transparency, thickness, and surface texture affect laser radiation. This knowledge is valuable for designing optical systems, safety barriers, or filters for lasers.

Discussion

1. **What is the primary objective of the experiment?**
   a) To measure the power of the laser beam
   b) To determine the distance a laser can travel
   c) To investigate how different materials affect laser intensity
   d) To change the wavelength of the laser beam
   e) To study the beam spread of lasers in air

2.Which of the following tools is used to measure laser intensity?
   a) Measuring ruler
   b) Power meter
   c) Clamp
   d) Safety goggles
   e) Laser pointer

3. **Why is a dark room recommended for this experiment?**
   a) To reduce material scattering
   b) To minimize ambient light interference

c) To protect the laser from overheating

d) To stabilize the laser's wavelength

e) To ensure accurate measurements of distance

4. **Which material is expected to allow most laser radiation to pass with minimal loss?**

   a) Frosted glass

   b) Transparent glass

   c) Thin metal foil

   d) Paper sheet

   e) Colored plastic sheet

5. **What is the purpose of calibrating the setup?**

   a) To ensure all materials are in the same position

   b) To record the baseline intensity of the laser

   c) To align the laser pointer with the power meter

   d) To test beam diffusion in the dark room

   e) To analyze material scattering

6. **Which material is most likely to scatter the laser beam?**

   a) Transparent glass

   b) Frosted glass

   c) Acrylic sheet

   d) Colored plastic sheet

   e) Paper sheet

7. **What is the expected effect of a colored plastic sheet on the laser beam?**

   a) Scatter the beam uniformly

   b) Absorb specific wavelengths

   c) Reflect the laser entirely

   d) Allow maximum intensity transmission

   e) Increase beam spread

8. **Why is it important to use a clamp for the laser pointer?**
    a) To block the beam
    b) To reduce scattering
    c) To stabilize the beam during the experiment
    d) To change the beam's wavelength
    e) To reduce ambient light
9. **What does varying the distance between the laser and a material test?**
    a) Material transparency
    b) Distance effect on intensity or beam spread
    c) Laser's baseline intensity
    d) The alignment of the power meter
    e) The laser's wavelength
10. **Which safety equipment is crucial for this experiment?**
    a) Measuring ruler
    b) Clamp
    c) Safety goggles
    d) Darkroom curtain
    e) Power meter
11. **Which material is expected to block or scatter the laser beam completely?**
    a) Transparent glass
    b) Frosted glass
    c) Thin metal foil
    d) Acrylic sheet
    e) Colored plastic sheet
12. **What parameter is being observed during the "Testing for Scattering/Blocking" step?**
    a) Laser wavelength
    b) Intensity variations

c) Visual effects like scattering or absorption

d) Distance between laser and power meter

e) Material thickness

13. **What material property is tested in this experiment?**

a) Melting point

b) Electrical conductivity

c) Transparency, thickness, and surface texture

d) Chemical composition

e) Reflectivity under sunlight

14. **What is an expected outcome for the frosted glass?**

a) Minimal intensity loss

b) Scatter or block the beam

c) No change in the beam color

d) Total absorption of the beam

e) Complete reflection of the beam

15. **What is the practical application of this experiment?**

a) Testing the lifespan of a laser pointer

b) Designing safety barriers or optical systems

c) Improving laser pointer alignment

d) Changing laser wavelengths for experiments

e) Measuring the speed of light in materials