##### Experiment No.1

##### Inverse square law

**Aim and Objective:** To verify inverse square law for intensity of light.

**Apparatus:** Source of light, photocell, ammeter, metre scale, etc.

**Diagram:**

**Outcome:** To relate the intensity of light and distance of detector from source.

**Theoretical background:**

**Inverse square law-**Intensity of illumination at any point is inversely proportional to square of distance between the point and source.

Consider a point source S emitting light in all directions. Let f be the luminous flux (amount of light emitted per unit time.) Consider two spherical surfaces A and B of radii R1and R2 respectively.

The illumination I1(Energy received per unit time and area)at any point on the surface A is given by.

f f

II= --------- = ---------- ----- - - - - - - ---- (1)

Area of A 4R12

Similarly I2 for surface B

f

I2 = ---------------- - ------------- (2)

4R22

Dividing (1) by (2)

I1 R22

------ = --------

I2  R12

1

OR I -----

R2

This is known as inverse square law.

**Photo cell**: In photocell light energy is converted into electrical energy. When light is incident on it, it emits photoelectrons, that are passed in external circuit and give current. This photocurrent is proportional to number of photons incident on photocell. i.e. intensity of illumination .

**Experimentation:**

Asource is placed at different distances from the photocell and current in ammeter is measured and graph of current (I) vs 1/d2 is plotted. The current is directly proportional to intensity of light.

I L

d is the distance between source and cell **I L 1/d2**

Sograph of I vs 1/d2 is straight line.

**Observation Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Obs No** | **Distance between source & cell**  **d (cm)** | **Current (I)**  𝝻**A** | **d2** | **1/ d2** | **Id2**  𝝻**A cm2** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **4** |  |  |  |  |  |
| **5** |  |  |  |  |  |
| **6** |  |  |  |  |  |

**Calculations:**

**Result and Discussion:**

**1**. **Id2** = - -- ---- - - - - - - **-** 𝝻**A cm2 By calculation**

**2. Id2 = - -- ---- - - - - - - -** 𝝻**A cm2 By graph**

Id2--- **constant**

This verifies inverse square law.

**Conclusion:**

**Questions –**

1State inverse square law and lamberts cosine law.

2 Define i) lumen ii) phot iii) lux iv) brightness

3 State principle used in photocell.

4 Name different photo cells .