

Study of the Variation of Light Intensity as A Function of Distance for Different Light Source Using Smart Phone Light Sensor



Physics
KEYWORDS :

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ABSTRACT

This paper provides the use of Smartphone's light sensor to measure the intensity of different light source placed at different distances. The existence of large number of free android apps which exploit the characteristic of these sensors gives facility to design of new experiment. Moreover such sensors (accelerometer and ambient light sensor) give result directly in graphical form which opens the new doors of experiment in Physics

Introduction:

The smart phone ambient light sensor allows adjusting the brightness of the screen to the environment of light for saving battery and good visibility. This light sensor acts as a lux meter and measure the intensity of light in luminosity (lux). There are several ways to determine the light power measured by this sensor.



FIGURE.1 Experiment set-up FIGURE.2 Experiment set-up FIGURE.3 Experiment set-up

In this experiment set-up for measuring the variation of light intensity as a function of distance for light source, LED bulb is directed towards the facing of Smartphone light sensor without focusing lens (FIGURE.3) This experiment is performed for two different distances 6cm, and 12cm from smart phone to light source. Similarly this set-up is arranged for these three distances for tungsten filament (FIGURE.1) and CFL bulb (FIGURE.2) light source. Each time Intensity of light source for three different distances between the smart phone and light source is recorded using android free apps Sensor Kinetics.



SCREENSHOT.1 for Intensity of Light (lux) for 6cm distance Between Smartphone sensor and filament bulb; SCREENSHOT.2 for the Intensity of Light (lux) for 9cm distance between Smartphone sensor and filament bulb; SCREENSHOT.3 for the Intensity of light (lux) for 12cm distance between Smartphone sensor and filament bulb



SCREENSHOT.4 for Intensity of Light (lux) for 6cm distance Between Smartphone sensor and CFL bulb; SCREENSHOT.5 for the Intensity of Light (lux) for 9cm distance between Smartphone sensor and CFL bulb; SCREENSHOT.6 for the Intensity of light (lux) for 12cm distance between Smartphone sensor and CFL bulb



SCREENSHOT.7 for Intensity of Light (lux) for 6cm distance Between Smartphone sensor and LED bulb; SCREENSHOT.8 for the Intensity of Light (lux) for 9cm distance between Smartphone sensor and LED bulb; SCREENSHOT.9 for the Intensity of light (lux) for 12cm distance between Smartphone sensor and LED bulb

We have recorded the intensity of light in lux for three different distances 6cm, 9cm and 12cm for filament bulb (SCREENSHOT.3, 4 & 5), CFL Tube (SCREENSHOT.6, 7 & 8) and LED bulb (SCREENSHOT.9, 10 & 11). From the graph it is evident that light intensity is inversely proportional to square of the distance between the light source and distance.

$$I(d) \propto I_0 (1/d^2)$$

As the light source is considered as point light source the radiation emitted by this source spherical wave front. The ambient light sensor is also considered as point detector due to their small area compared to the total spherical wave front. In this way intensity detected by the ambient light sensor of smart phone is light power of lamp divided by square of the distance between sensor and light source. The light intensity measured by the smart phone for different distances follows this inverse square law.

Summary:

The ambient light sensor of smart phone is useful tool for the possible use in Physics experiment. The use of smartphone in Physics laboratory as a tool opens the new door to carry out their own experiment at home. This practise is very useful for the student and gives them new experience of learning with smart phone. In future new and advance experiment can be designed.

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