

PHOTODIODE

The intensity of the light emitted by an small light bulb decreases with the distance to the light source. This relation is investigated with a photodiode, voltage source whose parameters depend on the intensity of the light it is exposed to.

GOALS: You know how the intensity of a point source decreases with increasing distance. You understand how a real voltage source can be described.

DEVICES:

- Photodiode and light bulb on optical bench
- Series resistors
- Voltmeter

MEASUREMENTS:

A Measure the precise values of the resistors. Connect the photodiode to a first resistor. Set the voltmeter to measure the voltage across the photodiode.

B Before switching on the light bulb, measure the signal produced by the ambient light. Determine the distance at which the active light bulb's intensity cannot be distinguished from this "light pollution".

C Measure the voltage across the photodiode for at least ten different distances between light bulb and photodiode. Choose a smaller spacing close to the light bulb.

D Repeat C for a total of at least three different resistors.

ANALYSIS:

1. Graph the data series in a way that should result in a straight line. Take into account the ambient light and a (possible) correction for the exact position of the photodiode. Write the corresponding law in a physical way and determine the numerical values for the parameters from a linear fit.
2. Discuss why there is a significant deviation from the expected law for small distances to the light bulb.
3. Calculate the photodiode's electromotive force and the internal resistance for maximum and minimum brightness.

REQUIREMENTS: If you do write a short report on this lab, work at least on steps 1 and 2 of the interpretation. The complete interpretation is required for a full report.

Hand in your report or interpretation and the lab journal by Friday, 28 January 2011. Delayed reports cannot be accepted.