

EE 521 Measurement and Instrumentation

Fall 2007 - Dr. Anders M. Jorgensen

Measurements on a Light Bulb - preparation

In this lab we will perform measurements on a light bulb. In particular we are interested in measuring what fraction of the energy input to a light bulb is actually emitted as visible light. Here are some questions to prepare.

1. What is the wavelength range of the visible spectrum?
2. The filament and the glass bulb each emit a black body spectrum. Write the expression for a black body spectrum.
3. Note the units of the spectrum. How do you compute the total power (in Watts) emitted from a surface. Write a formula.
4. Now plot the spectrum of power emitted from a Light bulb (in units of power per wavelength) making appropriate assumptions about the temperature and area of the filament and glass bulb. You may want to use log scales.
5. Estimate the power and fraction of power emitted in the visible spectrum.
6. Design an experiment for measuring the total amount of power consumed by a light bulb.
7. We will use a photo diode to measure power emitted from the light bulb. We will also have some broadband gelatin filters. Design an experiment around a photo diode which can be used to measure power emitted. Make sure to include relevant formulas so that we can compute resistor values in the lab.
8. We will use two thermocouples to measure the temperature of the glass bulb. Design an experiment to perform this measurement. I will not be giving you a bucket of ice water, but use the room air as reference temperature. Be sure to include formulas so that we can compute resistor values in the lab.
9. Give some thought as to how we might calibrate the photo diode. I.e. measure the number of Amperes per Watt incident on the photo diode surface.