Investigating Properties of Light Bulb

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The traditional incandescent light bulb is a basic technology that we take for granted, but if we delve into its underlying physics, we discover some amazing phenomenon at work.The bulb consists of a tungsten filament that is heated to a high temperature until it glows.These temperatures reach up to 3000 K. This is likely the hottest object we will ever encounter in our lifetimes.The temperature of the Sun's photosphere is about 6600 K which defines the color mixture of sunlight and the visible spectrum for our eyes.It is currently impossible to match the color with any filament because we have no substance that can be heated to this temperature and remain solid.

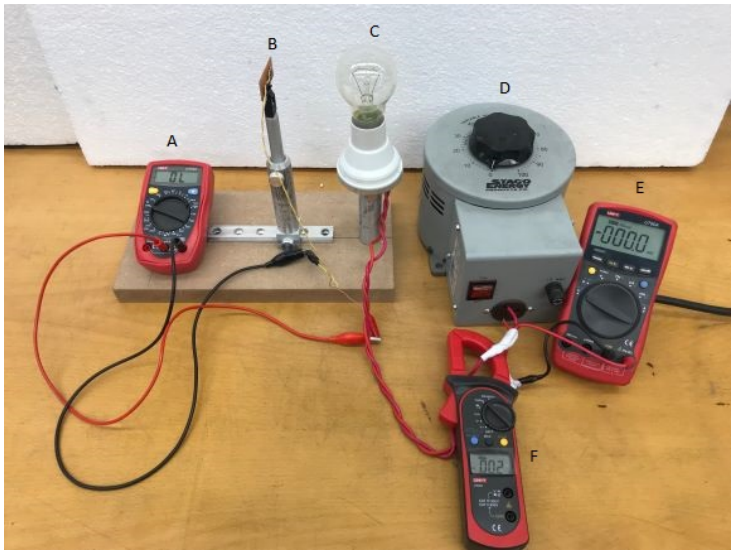
The radiation emitted by a hot object is called "black-body radiation" and has some interestingly simple properties.For a perfect black-body the color of the light and its overall spectrum does not depend on the properties of the material being heated, rather its temperature.

The setup for this experiment consists of a commercially available tungsten filament light bulb (60 W), a variac, four light dependent resistors and multimeters.A light dependent resistor is a component that is sensitive to light. When light falls upon it the resistance changes.The resistance of a light dependent resistor is inversely proportional to the light incident on it.

Using the setup as shown below we can investigate the electrical properties of the bulb. We would like you to investigate in depth the following points.

1. Does the light bulb follow Ohm's law? If not could you explain why?
2. Plot intensity of light vs current and interpret your results.
3. Also, plot logrithm of intensity of Light dependent resistor versus logrithm of distance of the LDRs from the bulb? Interpret your results.What is the uncertainty in log(I) and log(d)?
4. From the data acquired, Perform a weighted fit of the straight line and calculate the gradient. compare your values with part 3.

Figure 1: Experimental setup comprises of A.multimeter used to measure resistance across LDRs,B.light dependent resisitors,C.Bulb, D.a variac E.multimeter used to measure voltage F.clamp meter to measure current



References

[1] Kanner, Gary, and Dan MacIsaac. Basic Physics of the Incandescent Lamp (Lightbulb). The Physics Teacher Vol. 37, Dec.1999