Calibrating a Light-Dependent Resistor

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Abstract

This report estimates the response of a light-dependent resistor by measuring its resistance under controlled illumination. The example separates the instrument setup from the data record and highlights uncertainty sources that should be checked before interpreting a calibration curve.

1 Objective

Measure the resistance R at several illuminance levels E and determine whether a power-law model $R = aE^{-b}$ is adequate over the tested range.

2 Apparatus and safety

- LDR, multimeter, regulated supply, lamp, ruler, and dark enclosure;
- allow the lamp and sensor to reach thermal equilibrium before recording;
- do not stare into the lamp and keep the supply below the component rating.

3 Procedure

Place the sensor at a fixed distance from the lamp. Measure the illuminance with a calibrated meter, then measure resistance using the same range and polarity at each of six settings. Repeat the sequence in reverse order to detect drift.

4 Observations

Table 1: Example measurements; replace the values with your instrument readings.

E (lux)	R (Ω)	$u(R)$ (Ω)
20	8200	120
50	5100	80
100	3400	55
200	2250	40
500	1320	28
1000	890	20

5 Analysis

Fit $\log R = \log a - b \log E$ using the uncertainty model stated in the report. Plot residuals against $\log E$ and report the fit interval. Include meter calibration, repeatability, lamp stability, and sensor temperature in the uncertainty budget; do not treat the six readings as independent if they share a calibration error.

6 Conclusion

The fitted exponent is $b =$ _____ with uncertainty $u(b) =$ _____. State the usable illuminance range and the observation that would most improve the next calibration.