

UI characteristics of an LED

Task and equipment

Information for teachers

Additional Information

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Because stray light cannot enter the LED on account of the tube, this experiment can also be carried out in daylight.

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Task

What does the UI characteristic of an LED look like?

A light emitting diode (LED) is a semiconductor component which has a characteristic curve. A component can be characterised by the relationship between the applied voltage and the measured current. In this experiment you will learn to record a characteristic and to interpret it.



Equipment



Position No.	Material	Order No.	Quantity
1	LED - IR, with series resistor and 4 mm plugs	09852-10	1
2	LED - red, with series resistor and 4 mm plugs	09852-20	1
3	LED - green, with series resistor and 4 mm plugs	09852-30	1
4	LED - blue, with series resistor and 4 mm plugs	09852-40	1
5	LED - UV, with series resistor and 4 mm plugs	09852-50	1
6	Stray light tube for LED, $D_i = 8 \text{ mm}$, $l = 40 \text{ mm}$	09852-01	1
Additional material			
7	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
8	DMM with NiCr-Ni thermo couple	07122-00	2
9	Connecting cord, 32 A, 750 mm, red	07362-01	3
10	Connecting cord, 32 A, 750 mm, blue	07362-04	2

Set-up and procedure

Set-up

- Connect an LED to the power supply as shown in figure 1. Warning: Observe the correct polarity!



Fig. 1



Fig. 2



Fig. 3

Procedure

- Select the LEDs with the colours UV, blue, green, red and IR in sequence.
- Fit the stray light tube over the LED and cover the opening with your thumb in order to prevent ingress of light.



Fig. 4



Fig. 5

- The voltage is increased in the steps shown in table 1 and the corresponding current is noted.
- Record the distance of the first maximum from the centre as a_k in table 1.



Fig. 6

- Return the voltage at the power supply to zero and change the LED.
- The same procedure is repeated with the subsequent LEDs.



Fig. 7

Report: UI characteristics of an LED

Result - Table 1

Supplement the table 1 with the Voltage of the LEDs.

Voltage U/V	Current / mA									
	UV		blue		green		red		IR	
0	0	1	0	1	0	1	0	1	0	1
0.5	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0.09	1
1.5	0	1	0	1	0	1	0	1	0.95	1
2	0	1	0	1	0	1	0.66	1	1.95	1
2.5	0	1	0.17	1	0.06	1	1.62	1	2.92	1
3	0.17	1	1.01	1	0.82	1	2.73	1	4.07	1
3.5	0.76	1	2.02	1	1.76	1	3.65	1	5.04	1
4	1.38	1	3.04	1	2.79	1	4.72	1	6.13	1
4.5	1.97	1	4.04	1	3.96	1	5.86	1	7.16	1
5	2.56	1	5.23	1	5.02	1	6.90	1	8.18	1
5.5	3.22	1	6.33	1	6.15	1	7.87	1	9.25	1
6	3.9	1	7.28	1	7.38	1	9.02	1	10.34	1
7	5.13	1	9.61	1	9.60	1	11.03	1	12.33	1
8	6.45	1	11.71	1	12.03	1	13.18	1	14.48	1
9	7.68	1	13.98	1	14.27	1	15.28	1	16.58	1
10	8.99	1	16.11	1	16.70	1	17.40	1	18.69	1
11	10.26	1	18.40	1	19	1	19.60	1	20.77	1
12	11.55	1	20.46	1	21.30	1	21.66	1	22.92	1

Evaluation - Question 1

Characterise the measured curves in your own words and compare the measured curves (common features and differences).

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