

Technical University of Lodz

Department of Semiconductor and Optoelectronics
Devices

Laboratory of Optoelectronics

Exercise 7

Energy-saving lamps

1. European Union Regulation

According to UE regulation energy saving device is only a device with energy class A. This regulation determines the minimum quality requirements for light sources.

Tab. 1 Schedule for successive steps to eliminate inefficient light sources in households.

Date	Light sources withdrawn from sale
1.09.2009	Clear lamps of 75W power or more
	All frosted lamps and compact fluorescent lamps (except those with the efficiency class A)
1.09.2010	Clear lamps of 65W power or more
1.09.2011	Clear lamps of 45W power or more
1.09.2012	Clear lamps of 7W power or more
1.09.2013	Light sources with S14, S15 or S19 caps
1.09.2016	Lamps with energy class C
	Light sources with E14/E27/B22d/B15d caps and voltage ≤ 60 V

2. Types of measured light sources

a) Incandescent lamp (bulb)



Photo 1. 60 W bulb and its labels

b) Halogenlamp



Photo 2. 42 W halogen lamp and its labels

c) Compact fluorescent lamp



Photo 3. Electronic ignition system for compact fluorescent lamp



Photo 4. Compact fluorescent lamps with integrated electronic ignition system - examples



Photo 5. 11W compact fluorescent lamp and its labels

d) LED lamp



Photo 6. 3.8 W LED lamp and its labels

3. Tasks to do

- 1) Ask the teacher for light sources to test.
- 2) Screw a lamp in the holder through the light dimmer.
- 3) Use remote control to change output power and carry out tests for 3 levels (use black tube and multimeter) – see tables below.
- 4) Calculate the average value.
- 5) Calculate the distance r between multimeter sensor and light source.
- 6) Repeat tasks 2) – 5) for each light source. Halogen lamp requires additional measurement – see table below.
- 7) For maximum output power calculate luminous efficacy [lm/W]

Useful formulas:

$$E = F/r^2 \quad [1\text{lux} = 1\text{lm}/\text{m}^2]$$

$$\text{Luminous efficacy} = F/P \quad [\text{lm}/\text{W}]$$

- 8) Observations and conclusions write in the report.

a) Incandescent lamp (bulb) r = [m]

Minimum power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Medium power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Maximum power – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Luminous efficacy = [lm/W]

b1) Halogen lamp $r = \dots\dots\dots$ [m]

Minimum power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Medium power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Maximum power – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Luminous efficacy =..... [lm/W]

b2) Halogen lamp – side test (with no tube usage) $r = \dots\dots\dots$ [m]

Minimum power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Medium power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Maximum power – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Luminous efficacy =..... [lm/W]

c) Compact fluorescent lamp $r = \dots\dots\dots$ [m]

Minimum power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Medium power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Maximum power – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Luminous efficacy =..... [lm/W]

d) LED lamp $r = \dots\dots\dots$ [m]

Minimum power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Medium power level – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Maximum power – illuminance value E [lux]									
1	2	3	4	5	6	7	8	9	10
Read value every 15 seconds					Average:				

Luminous efficacy =..... [lm/W]