

Exercise no.3 Integrating sphere

Measurement of luminous flux of the tested light source

Measurement process:

- a) Place the primary light source (etalon/standard) of the luminous flux (usually calibrated light bulb) into the integrating sphere, with the assistance of the tutor.
- b) Connect the supply cables of the socket of the integrating sphere to the current and voltage clamp patch panel at the laboratory table (ready)
- c) If the primary light source is the light bulb short the terminals A and B for ballast connection.
- d) Make sure that regulatory autotransformer next to the integrating sphere is set to zero voltage and in the position OFF. Turn on the laboratory table and terminals 3×400 V.
- e) Use the control panel of the voltage stabilizer set the output voltage value 0V and frequency 50Hz.
- f) Turn the switch of the voltage stabilizer to the ON position. Set the voltage on the regulatory transformer at the terminals of primary light source (ref. U_n) to the value stated at the box of light source ($U_n=220$ V). Leave the light source to heat up approx. 5 minutes.
- g) Read and write down the data at the photocurrent measure device (F) E_n (it is proportional to the luminous flux of the primary light source). And also the current I_n and power P_n , THD_{F_n} (total harmonic distortion – related to the 1st harmonic) of the primary light source. Turn of the primary light source.
- h) By the regulatory transformer at the laboratory table (right) turn on the auxiliary light source (correction light source). After heating up the auxiliary light source, set the voltage so that the photocurrent measure device shows approximately the same value as in the measurement of primary light source luminous flux. Write down the photocurrent value E_{kn} . Write down also the value of voltage at the terminal of the auxiliary lamp (U_k). Do not turn off the auxiliary lamp!!!
- i) Turn the switch of the stabilizer to the OFF position. With the assistance of the tutor remove (with gloves) the primary light source and store it in a box. Fix the tested light source into the integrating sphere.
- j) Check the voltage of the auxiliary light source (U_k), eventually regulate the value again. On the photocurrent measure device (F) read and write down the deflection E_{kz} .
- k) Turn off the auxiliary light source and turn on the tested light source by the setting of voltage. Leave the light source to heat up approx. 10 minutes.
- l) Then read the value of photocurrent measure device (F) and deflection E_z and also the rest of the values as current I_z and power P_z . All read by the way that only one measuring device is switched on by the time at the light source power supply circuit.

1) Observed values are determined from the relationships

- a) Luminous flux of the tested light source:

$$\Phi_z = \Phi_n \cdot \frac{E_z}{E_n} \cdot \frac{E_{kn}}{E_{kz}} \quad [\text{lm}]$$

- b) Luminous power of the tested light source:

$$\eta_{ez} = \frac{\Phi_z}{P_z} \quad [\text{lm/W}]$$