Spectral measurements of different light sources.

1. Objectives

The aim of the exercise is understanding of the spectral characteristics of different light sources and the mechanisms of the formation of color. The scope of laboratory includes measurements of the spectral characteristics of different light sources and to determine the reflection characteristics of the various standard elements.

2. Components and instrumentation.

Light sources:

- LED of different colors,
- Laser pointer,
- Bulbs: tungsten incandescent, halogen incandescent, LED, fluorescent

Ocean Optics spectroscope USB4000 (see below [1,2]).

3. Preparation.

Estimated time to prepare for classes is 3 to 6 hours.

3.1. .Readings

[1] Program manual: SpectraSuit.pdf
[2] Spectrometer manual: USB4000OperatingInstructions.pdf
[3] W. Tietze, Ch. Schenk, Electronic circuits – Handbook for Design and Applications, Springer, 2008. Chapters 5.1, 5.2, 11.2, 11.3.11.4, 11.5

3.2. Problems

1. The spectral distribution of electromagnetic radiation, wavelength and frequency
2. The basic unit of light and energy of radiation: radiation intensity, luminous flux, illuminance, luminous intensity, luminance (brightness)
3. Spectral distribution of LEDs, lasers, sunlight, popular light sources.
4. Basic characteristics of LEDs: Power of radiation from the diode current, current-voltage (in forward and reverse bias), the change in length of the emitted wave from the forward current, the effect of temperature on the current-voltage characteristics
5. LEDs power supply- limitations.

3.3. Detailed preparation

The student does not prepare any project.

4. Contest of rapport

1. Plots of spectral characteristics of light sources (+ lamps + sunlight),
2. Plots of the reflective characteristics of three different colors of papers for two different light sources,
3. Plots LEDs spectral characteristics; Readings of the λ_{max} and FWHM (Full Width at Half Maximum**)** for all available diodes and lasers. Results put dawn to Table 1
4. Discuss the results.

Nr.	Diode description	λ_{max} [nm]	FWHM [nm]
1	e.g. red LED		