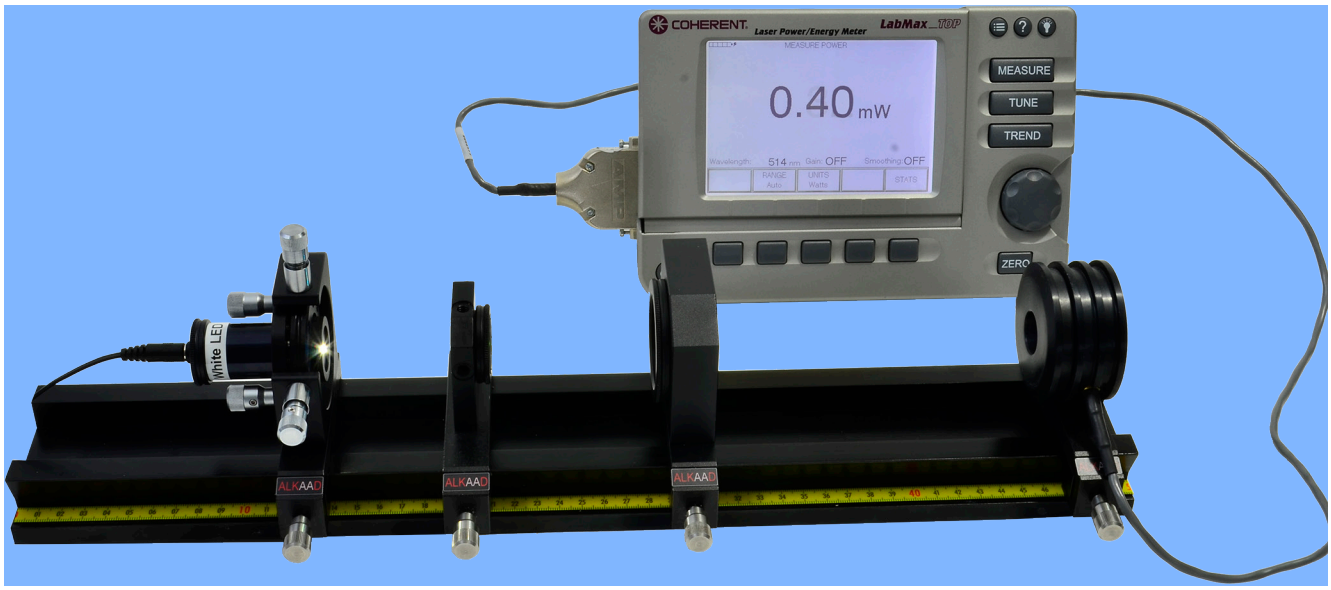
PE-1300 Radio-and Photometry of Light



Keywords

Black Body Radiator
V(λ) Filter
LED Light
Thermal and Cold Light
Photometric Units
Incandescent Light
Spectral Sensitivity of Human eye
Calibrated Radiometer
Energy Saver Lamp

Introduction

The values of optical radiation are usually measured in radiometric units as watt seconds or watts, however, the visible part of optical radiation has its own photometric units with a basic unit known as candela (cd). It is the sixth unit apart from the basic units length (m), mass (kg), time (s), electrical current (A) and temperature (T), which were defined during the 10th International Conference for Weights and Measures in 1954. All these units have an official measure which is standardised worldwide by calibrating institutes. The length for example, was for a long time defined by the primary standard meter in Paris, now it is defined by how long it takes light to pass through 1 meter in vacuum multiplied by the fixed speed of light in vacuum. The standards for mass, time etc. are also well known. However, the units in light engineering are not as common to us since we do not come across the measurement in our daily lives. These units however are indispensable in the preparation of lighting equipment for the various kinds of places people inhabit. In optical science the whole optical, spectral range of radiation is taken into consideration, which covers a wavelength range of 0.2 mm to approximately 1 mm. In light engineering or photometry however, only the range that can be perceived by the human eye is of interest. Since the sensitivity of the eye is a subjective unit, the International Commission for Lighting has defined the curve of the spectral response of the human eye V(λ). Several measurements were taken on people to obtain a statistical result for this purpose. Photometry considers the subjective spectral response (sensitivity) of the human eye combined with strict physical rules. The sensitivity of the human eye is the measure of all things in photometry. Within this experiments the basics of light are given in the comprehensive manual. The black body radiation is discussed in detail as well as the transition to photometric units. The key component of the experiment is the V(λ) filter which is designed in such a way that it represents the sensitivity curve of an average human eye. The experiments comes with two LED with different spectral emission, an energy saving and an incandescent lamp both having almost the same electrical power. A wavelength independent optical power meter is used to measure the power with and without V(λ) filter. From this measurements the optical power in radiometric as well as photometric units are measured.

How it works

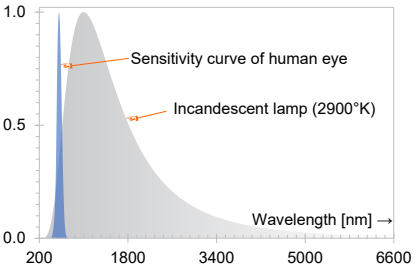


Fig. 4.53: Incandescent lamp

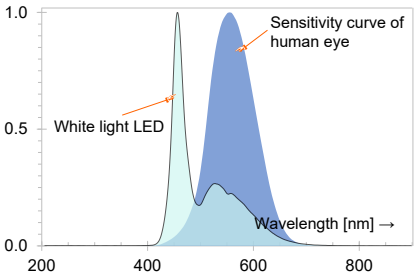


Fig. 4.54: White light LED

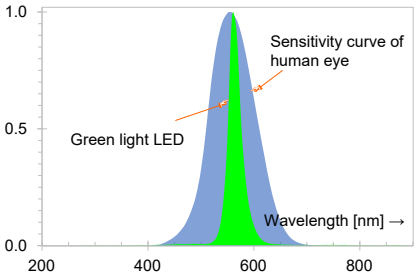


Fig. 4.55: Green light LED

PE-1300 Radio-and Photometry of Light consisting of:

Item	*Code*	*Qty.*	*Description*	*Details page*
1	CA-0260	1	Laser power meter LabMax-TO	129 (22)
2	DC-0200	1	High sensitive power sensor, 0.3-11 µm	123 (20)
3	LQ-0200	1	White LED in ø 25 Housing	119 (6)
4	LQ-0220	1	Green LED in ø C25 housing	119 (10)
5	LQ-0410	1	Energy saving lamp GU10, 9W/230V	120 (16)
6	LQ-0450	1	Tungsten lamp, GU10, 10 W/230V	120 (18)
7	MM-0020	1	Mounting plate C25 on carrier MG20	93 (1)
8	MM-0050	2	Mounting plate C50 with carrier MG20	94 (6)
9	MM-0620	1	Lamp socket GU10 on MG65	98 (38)
10	MP-0150	1	Optical Bench MG-65, 500 mm	93 (8)
11	OC-0150	1	Biconvex lens f=150 mm in C50 mount	99 (10)
12	OC-0920	1	V(λ) filter in C50 mount	104 (52)
13	UM-PE13	1	Manual Radio and Photometry	

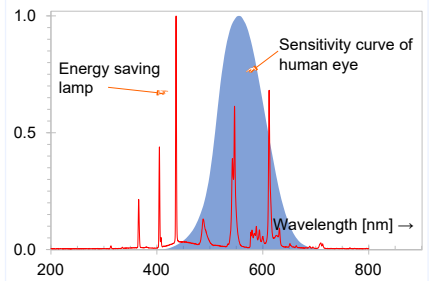


Fig. 4.56: Energy saving lamp in relation to the sensitivity curve of the human eye