Lamp measurement report – 11 April 09 for Lioris

Lioris IL-50 LED indoor/oudoor lighting

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Summary measurement data

parameter	meas. result	remark
Color temperature	6174 K	Bright white
Luminous intensity I_v	1337 Cd	Additionally a measurement has been taken at 232 cm distance. See the article.
Beam angle	88 deg	
Power P	45.2 W	
Power Factor	1.0	For every 1 kWh net power consumed, there has been 0.0 kVAhr for reactive power.
Luminous flux	2457 lm	
Luminous efficacy	54 lm/W	
CRI_Ra	74	Color Rendering Index.
Coordinates chromaticity diagram	x=0.3191 and y=0.3261	
Fitting	230V	
L x W x H external dimensions	330 x 100 x 70 mm	External dimensions of the luminaire.
L x W luminous area	315 x 80 mm	Dimensions of the luminous area (used in Eulumdat file). This is equal to the size of the area on which the leds are mounted.
General remarks		The ambient temperature during the whole set of measurements was 22.5-26 deg C. Warm up effect: during the warm up time the illuminance decreases with 7 %. Voltage dependency: the illuminance and power consumption are dependent on the voltage. The dependency is linear. The Eulumdat file can be found via the link on the OliNo web. An additional photo can be found at the end.

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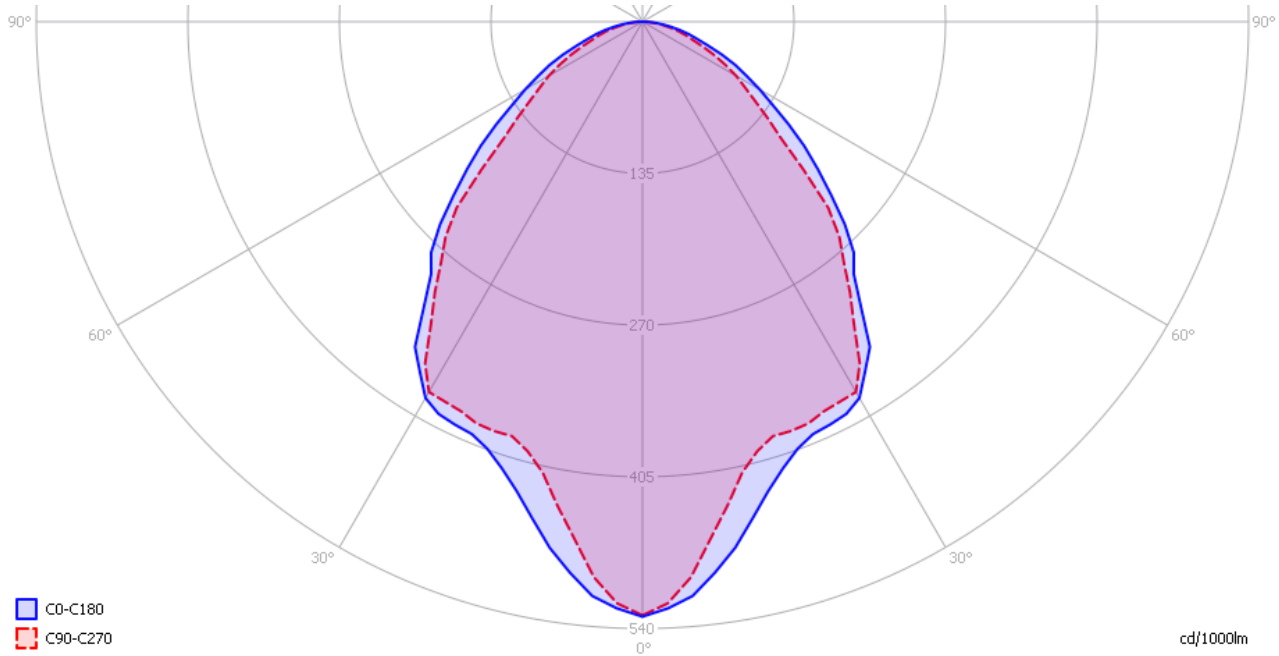
Eulumdat light diagram

An interesting graph is the light diagram, indicating the intensity in the C0-C180 and the C90-C270 plane. This light diagram below comes from the program Qlumedit, that extracts these diagrams from an Eulumdat file.



The light diagram giving the radiation pattern.

It indicates the luminous intensity around the light bulb. The C0-C180 plane is along the length direction of the lamp. The C90-C270 plane is perpendicular to the C0-C180 plane. There is little difference in the radiation patterns looking at the different planes.
The unit is Cd/1000lm, meaning the intensity in Cd assuming there would be 1000 lumen in the measured light bulb. This enables comparing different types of light bulbs.

Illuminance Ev at 1 m distance, or luminous intensity Iv

Herewith the plot of the *averaged* luminous intensity Iv as a function of the inclination angle with the light bulb.

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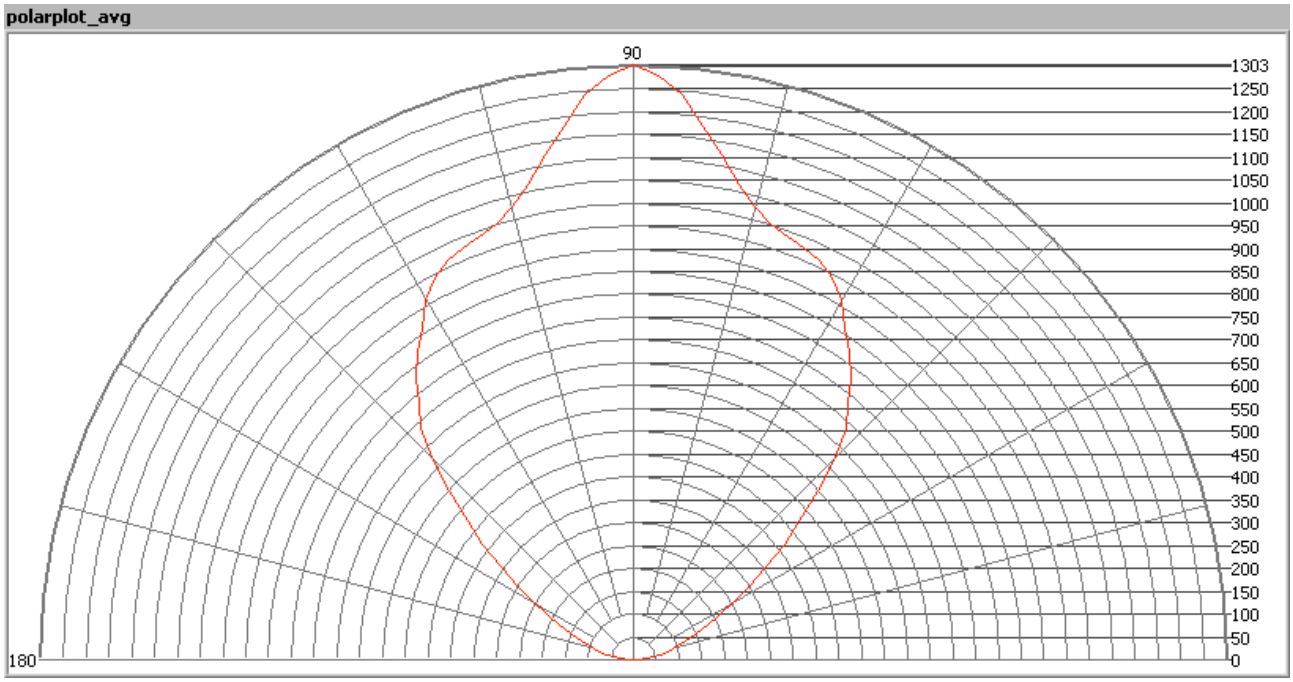

The radiation pattern of the light bulb.

This radiation pattern is not the same as the one given earlier. This is because of the (small) differences of beam angles in the different planes. In this graph the luminous intensity is given in Cd.
These averaged values are used (later) to compute the lumen output.

Illuminance at a distance of 232 cm directly underneath the tube

The bus was switched on and during an hour the illuminance was measured. The average result was 113 lux, with an ambient temperature of 26 deg C.

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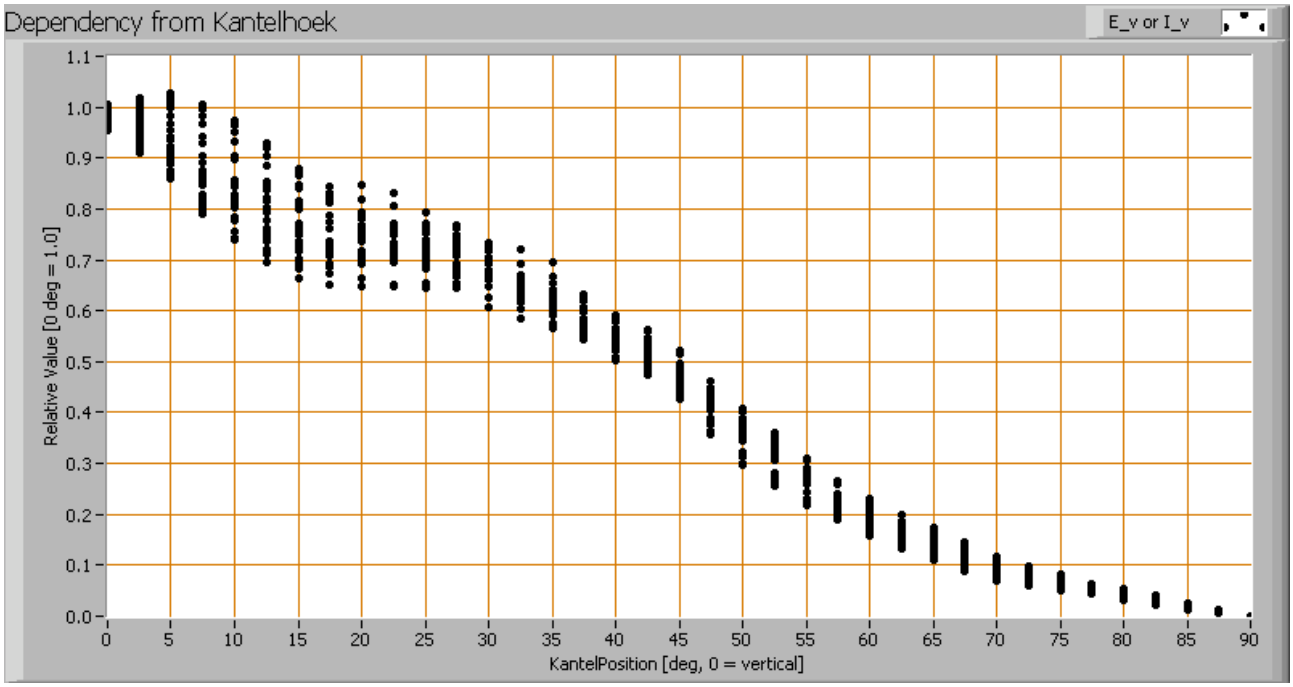

Intensity data of every measured turn angle at each inclination angle.

This plot shows per inclination angle the intensity measurement results for each turn angle at that inclination angle. At lower inclination values there' s a little more spread in the illuminance values.
When using the average values per inclination angle, the beam angle can be computed, being 88 degrees.

Luminous flux

With the averaged illuminance data at 1 m distance, taken from the graph showing the averaged radiation pattern, it is possible to compute the luminous flux.
The result of this computation for this light spot is a luminous flux of 2457 lm.

Luminous efficacy

The luminous flux being 2457 lm, and the power of the lightbulb being 45.2 W, yields a luminous efficacy of 54 lm/W.
A power factor of (almost) 1.0 means that for every 1 kWh net power consumed, a reactive component of 0.1 kVAr was needed.

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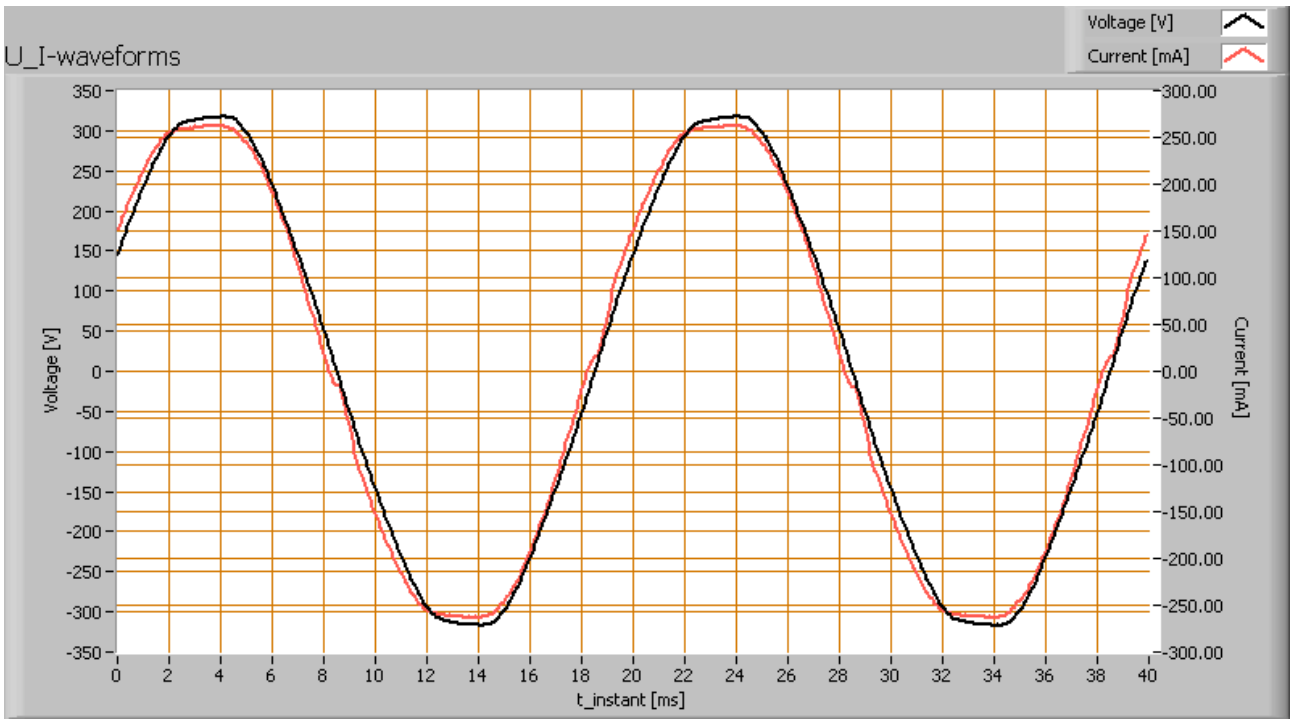
Light bulb voltage	230 V
Light bulb current	197 mA
Power P	45.2 W
Apparent power S	45.4 VA
Power factor	1.0

Of this light bulb the voltage across ad the resulting current through it are measured and graphed.



Voltage across and current through the lightbulb

Current has the same phase as the voltage, and also has a nice sinusoidal form. Also the power spectrum of the current is determined.

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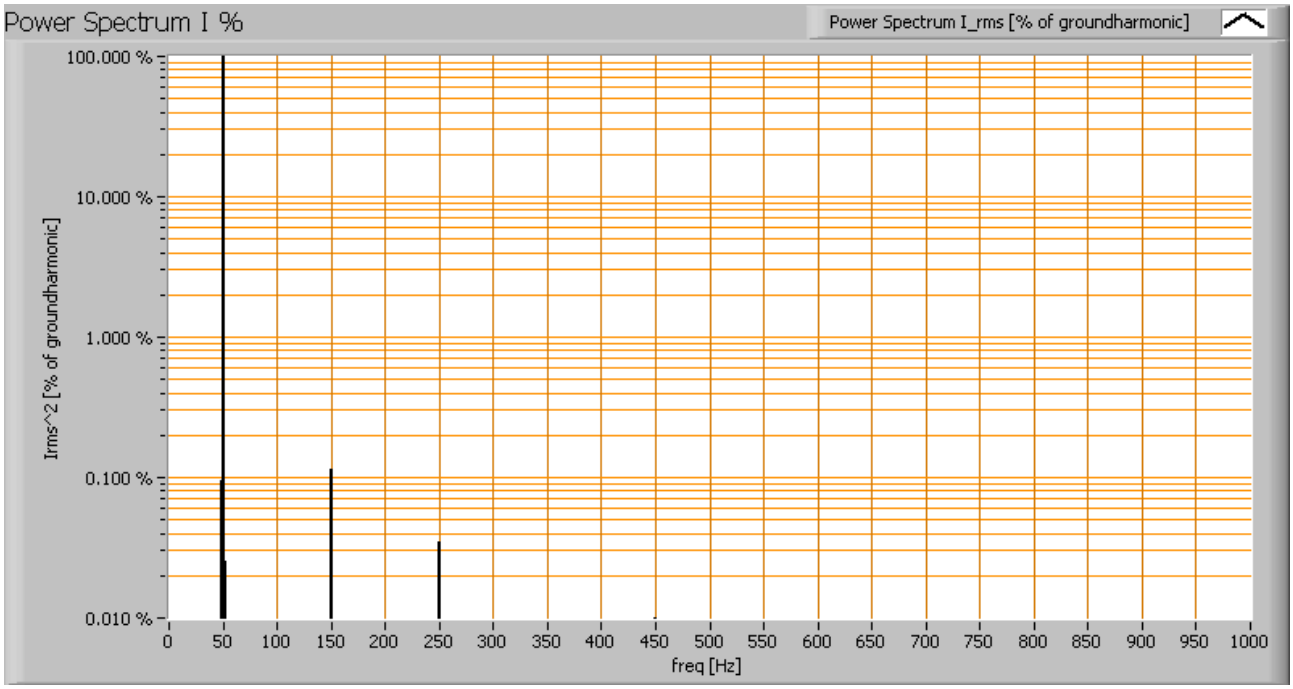

The powerspectrum of the current through the light bulb.

There are almost no harmonics apparent in the spectrum.

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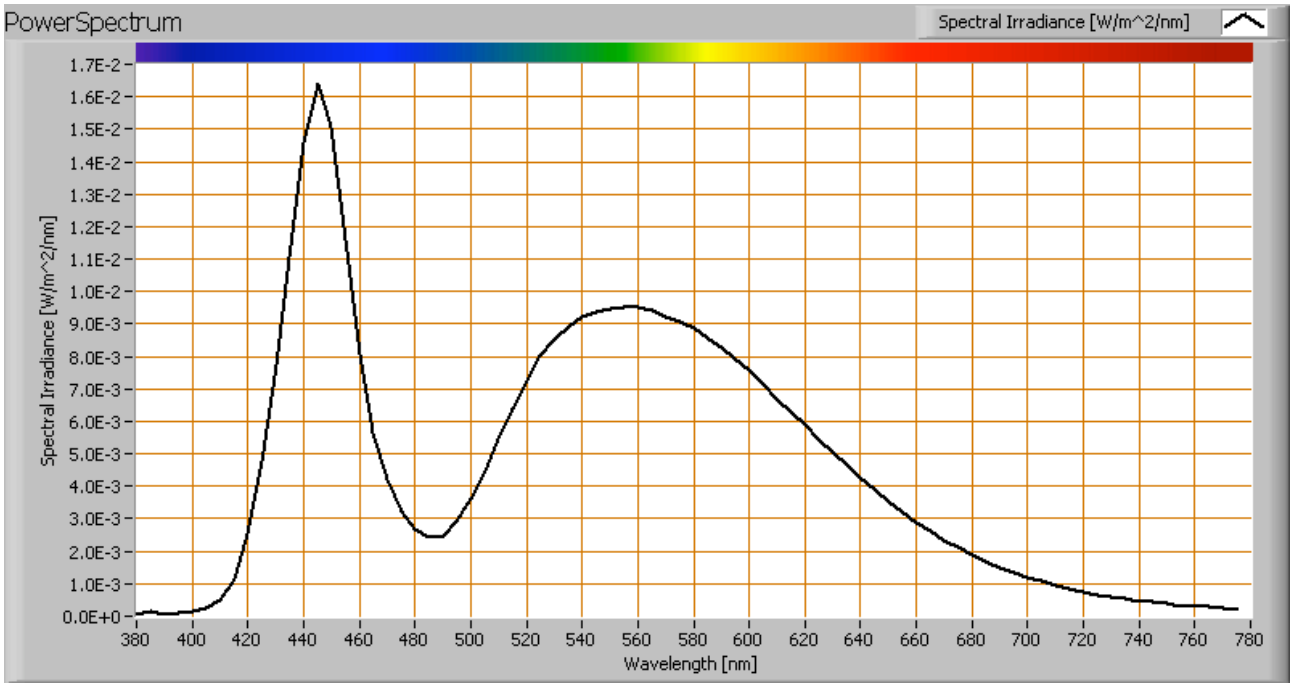
Color temperature and Spectral power distribution



The spectral power distribution of this light bulb.

The measured color temperature is about 6150 K which is bright white.
This color temperature is measured straight underneath the light bulb. Below a graph showing the color temperature for different inclination angles.

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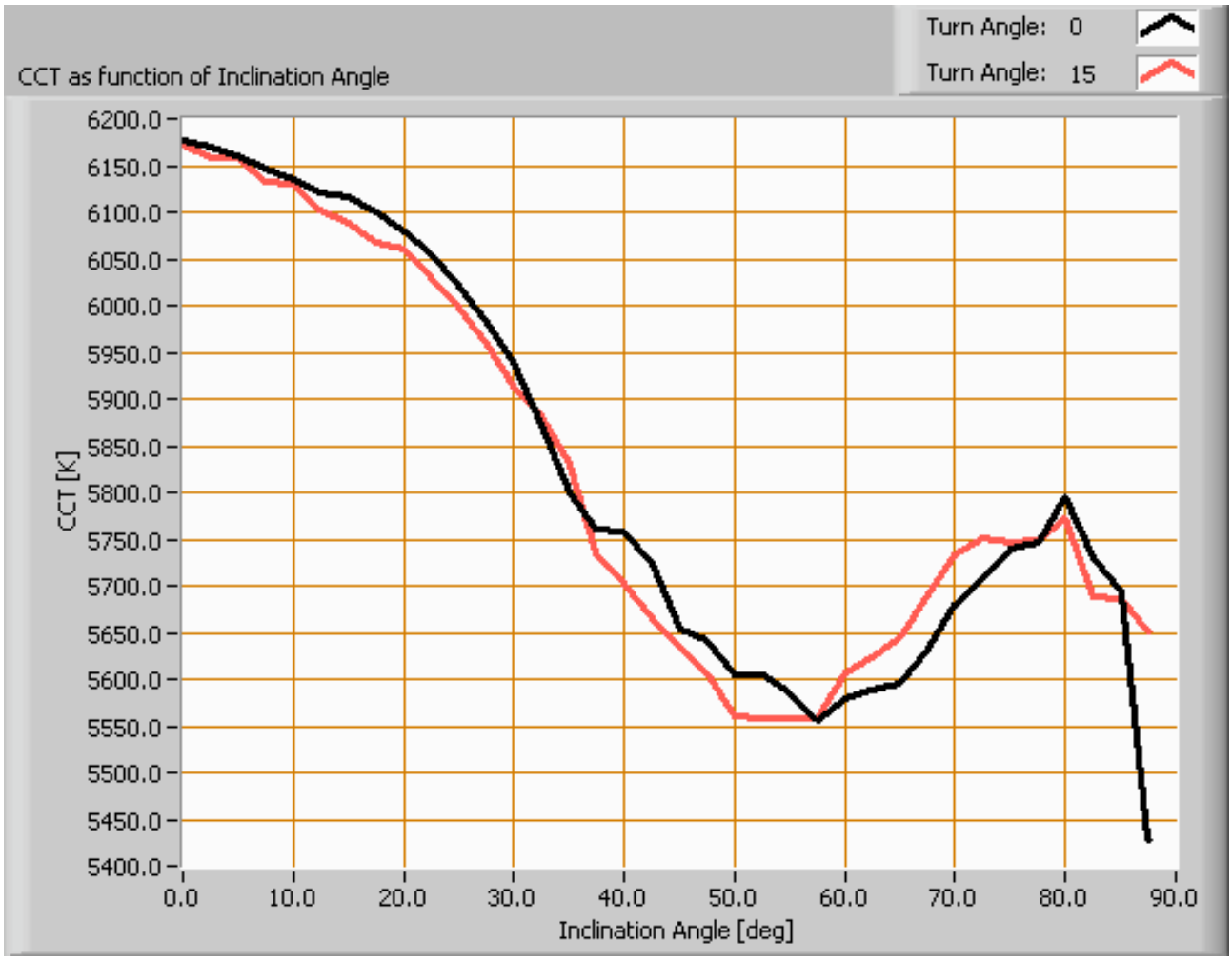

Color temperature as a function of inclination angle.

The color temperature is given for inclination angles up to 85 degrees since at larger inclination angles there is too little illumination.
The value remains constant within 10 %.

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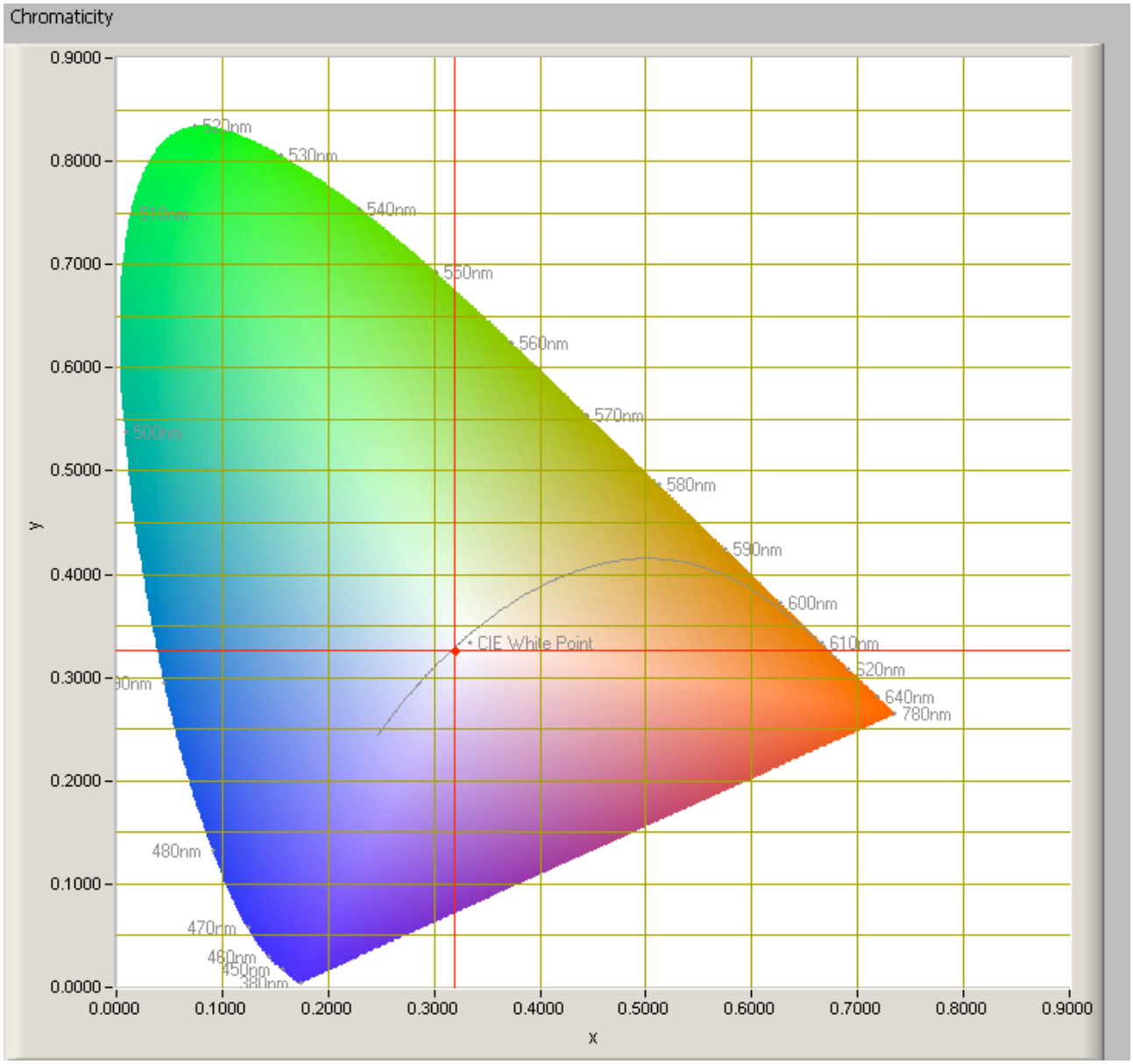
Chromaticity diagram



The chromaticity space and the position of the lamp's color coordinates in it.

The light coming from this lamp close to the Planckian Locus (the black path in the graph).
Its coordinates are x=0.3191 and y=0.3261.

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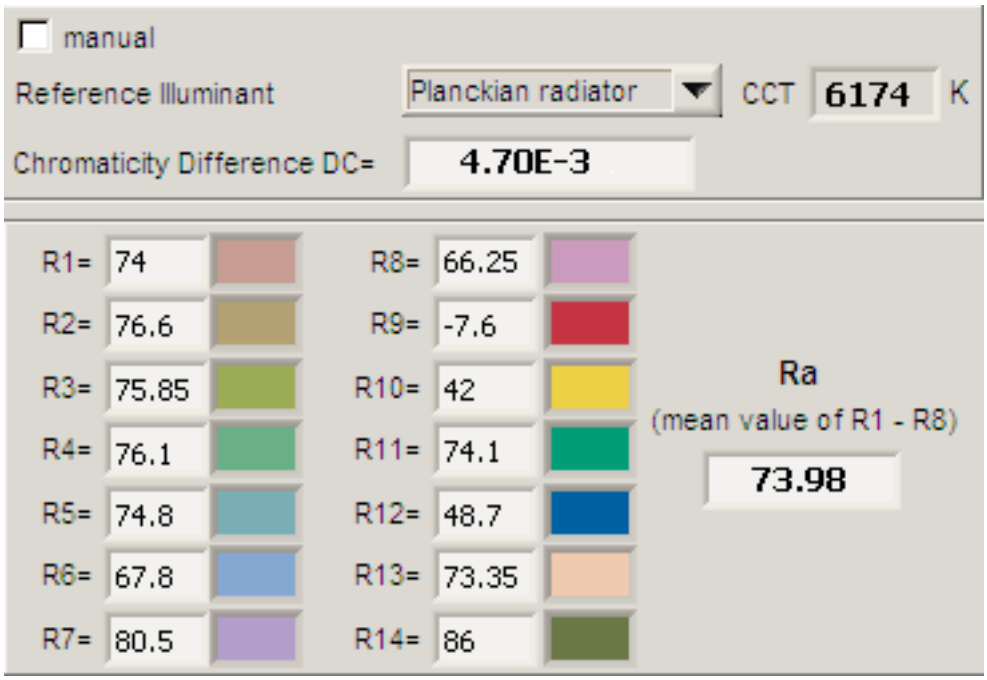
Color Rendering Index (CRI) or also Ra

Herewith the image showing the CRI as well as how well different colors are represented (rendered). The higher the number, the better the resemblance with the color when a black body radiator would have been used (the sun, or an incandescent lamp).
Each color has an index Rx, and the first 8 indexes (R1 .. R8) are averaged to compute the Ra which is equivalent to the CRI.



CRI of the light of this lightbulb.

The value of 74 is lower than 80 which is considered a minimum value for indoor usage.
Note: the chromaticity difference is 0.0047 indicates the distance to the Planckian Locus. Its value is lower than 0.0054, which means that the calculated CRI result is meaningful.

Voltage dependency

The dependency of a number of lamp parameters on the lamp voltage is determined. For this, the lamp voltage has been varied and its effect on the following lamp parameters measured: illuminance E_v [lx], color temperature CT or correlated color temperature CCT [K], the lamppower P [W] and the luminous efficacy [lm/W].

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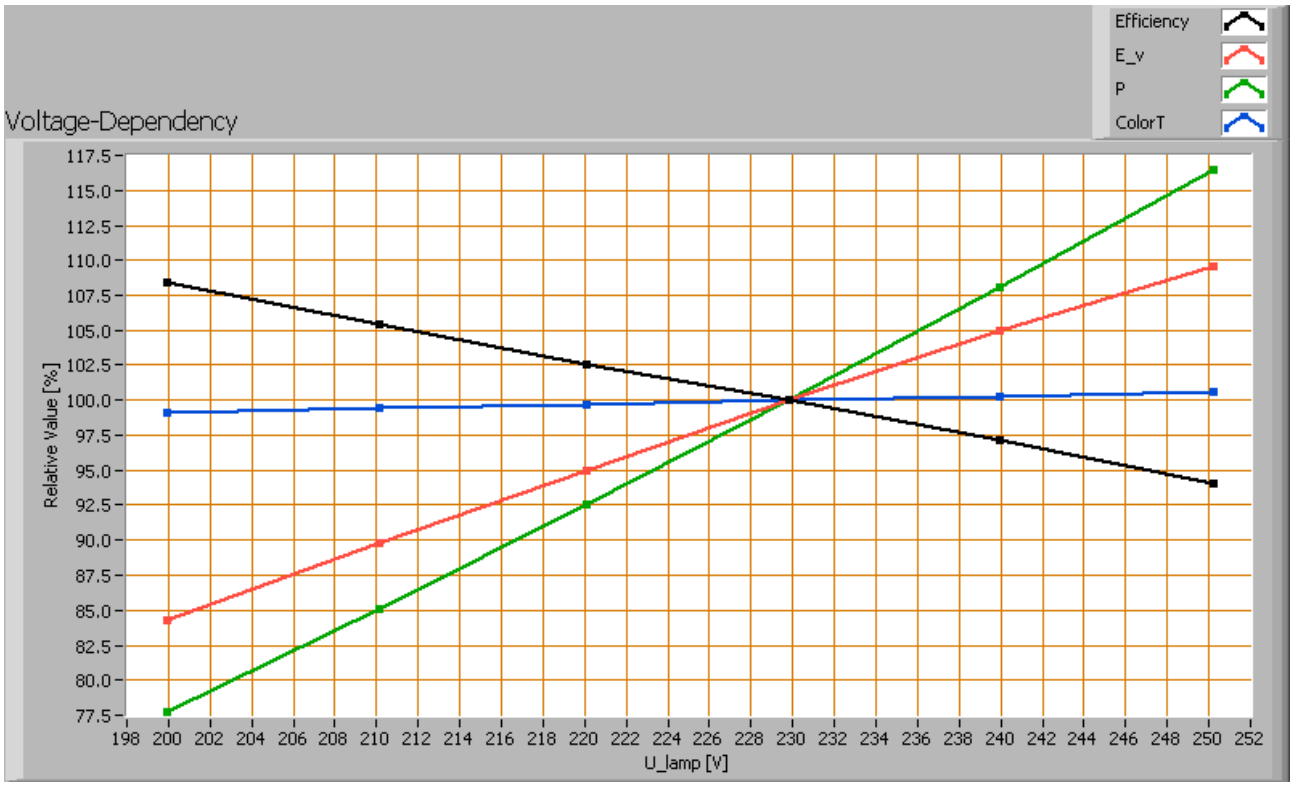

Lamp voltage dependencies of certain light bulb parameters, where the value at 230 V is taken as 100 %.

The consumed power and the illuminance vary when the voltage varies between 200-250 V. This variation is lineair.
When the voltage at 25 varies with + and - 5 V, then the illuminance varies with less than + and - 2.5 %, which will not be visible when the voltage changes abruptly.

Warm up effects

After switch on of a cold lamp, the effect of heating up of the lamp is measured on illuminance E_v [lx], color temperature CT or correlated color temperature CCT [K], the lamppower P [W] and the luminous efficacy [lm/W].

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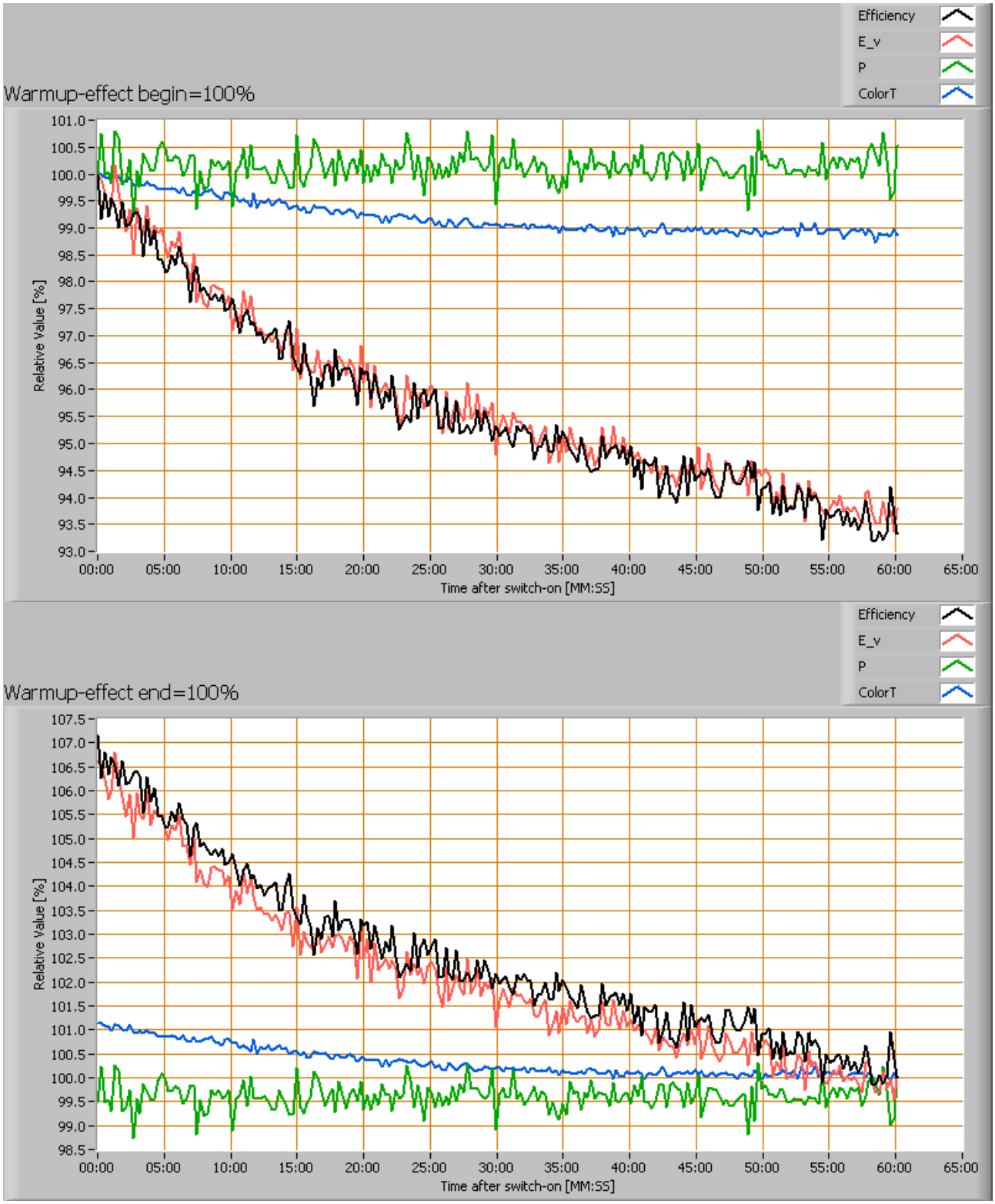

Effect of warming up on different light bulb parameters. At top the 100 % level is put at begin, and at bottom at the end.

The warming up takes more than one hour. After this hour, the illuminance has decreased with 7 %, which is not much.

Additional photo

The heat sink at the backside of the lamp

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