



Lamp measurement report – 2 dec 2008 voor LineLite Int.

LineLite Sharp 4W GU10 Spotlight





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Summary measurement data

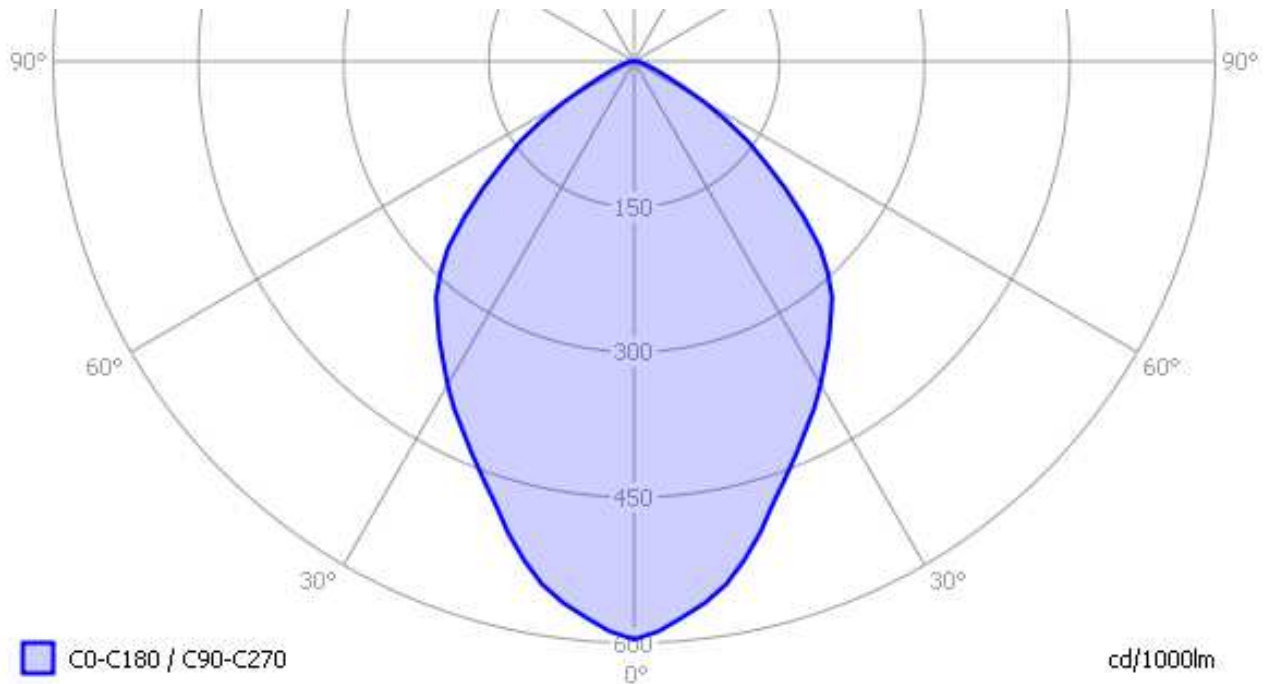
parameter	meas. result	remark
Color temperature	2840 K	Warm white
Luminous intensity I_v	81 Cd	
Beam angle	85 deg	Wide beam angle for a spot light.
Power P	3.6 W	
Power Factor	0.51	For every 1 kWh net power consumed, there has been 1.7 kVAhr for reactive power.
Luminous flux	136 lm	
Luminous efficacy	38 lm/W	
CRI_Ra	72	Color Rendering Index.
Coordinates chromaticity diagram	x=0.4641 and y=0.4135	
Screw fitting / mount	GU10	
D x H external dimensions	50 x 49 mm	External dimensions of the spot light.
Diameter luminous area	28 mm	Dimensions of the luminous area (used in Eulumdat file). This is a circular area of the size of the used reflector.
General remarks		<p>The ambient temperature during the whole set of measurements was 18.0 - 18.5 deg C.</p> <p>Warm up effect: little effects. The parameters were stable after 40 minutes.</p> <p>Voltage dependency: consumed power and illuminance are virtually not dependent from the light bulb voltage.</p>



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Eulumdat lichtdiagram

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 spot. All light beyond 60 degrees is effectively blocked by the used reflectors.

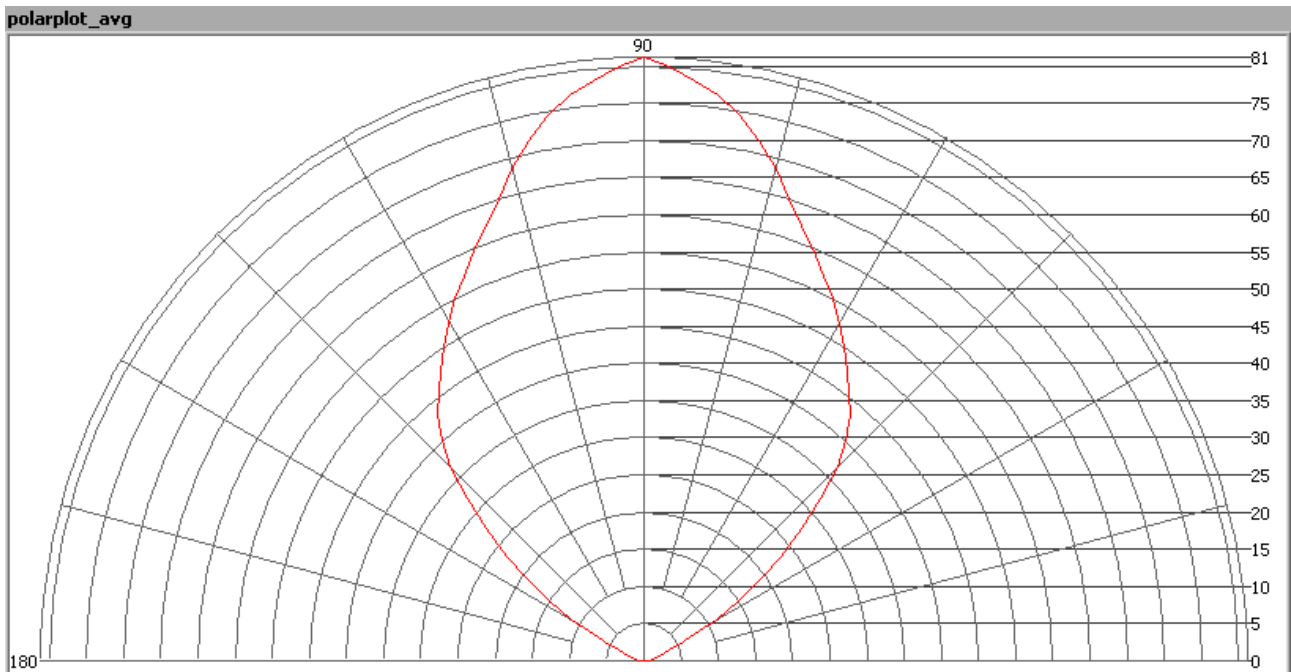
The unit is Cd/1000lm, meaning the intensity in Cd assuming there would be 1000 lumen in the measured light bulb. This enables comparing different types of light bulbs.

Illuminance E_v at 1 m distance, or luminous intensity I_v

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



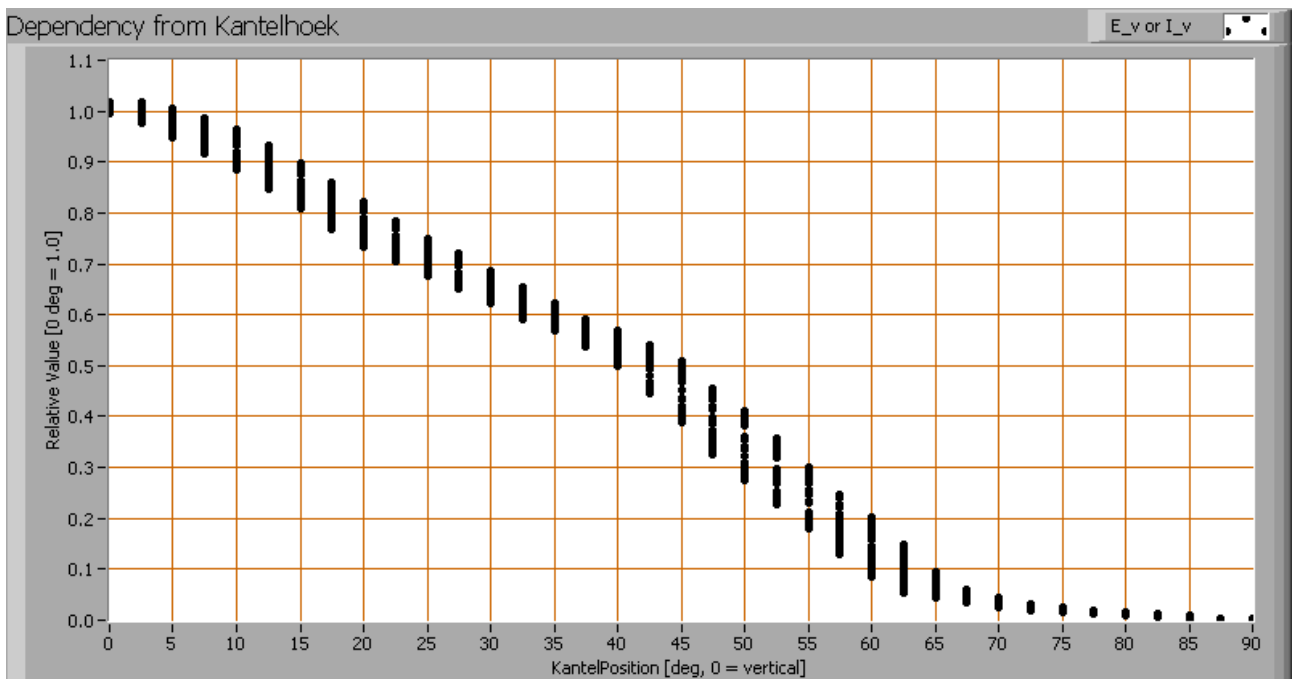
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The radiation pattern of the light bulb.

This radiation pattern is the same as the one given earlier. This is because in this light spot's case, the radiation pattern is symmetric around the z-axis, meaning that the averaged pattern given here is the same as the extraction of the Eulumdat file.

These averaged values are used (later) to compute the lumen output.





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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.

When using the average values per inclination angle, the beam angle can be computed, being 85 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 136 lm.

Luminous efficacy

The luminous flux being 136 lm, and the power of the lightbulb being 3.6 W, yields a luminous efficacy of 38 lm/W.

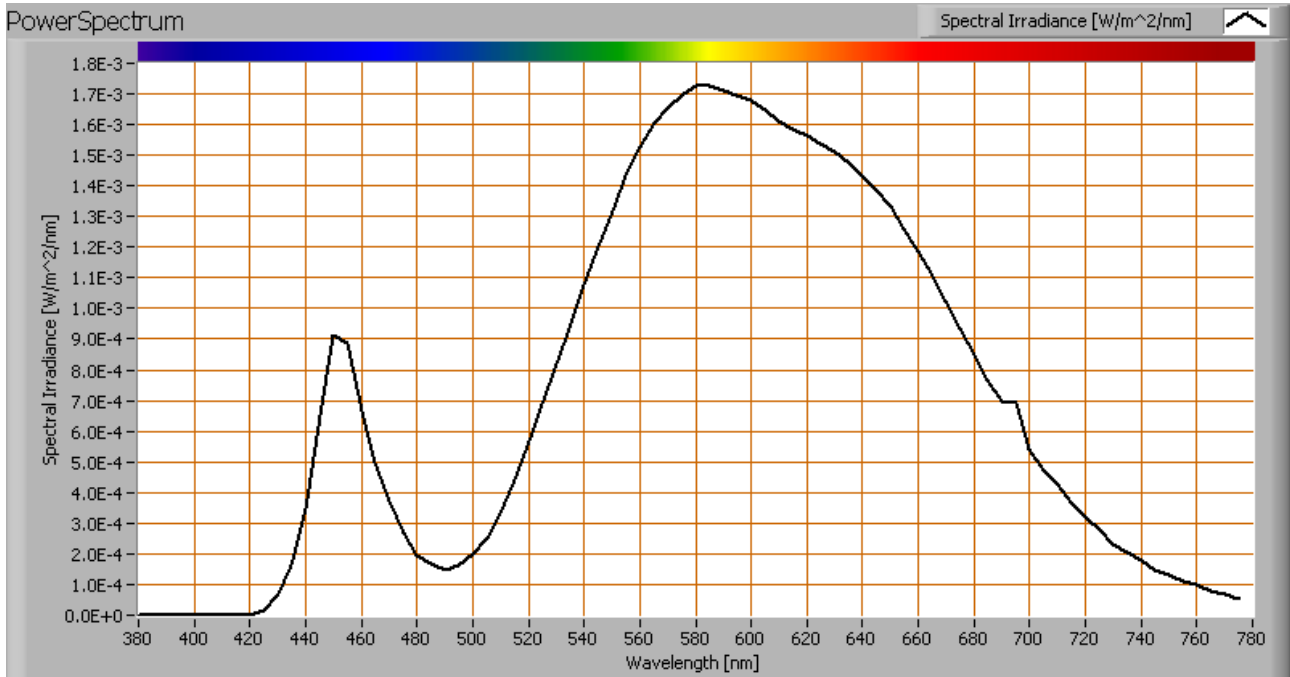
A power factor of 0.51 means that for every 1 kWh net power consumed, a reactive component of 1.7 kVAr was needed.

Light bulb voltage	230 V
Light bulb current	31 mA
Power P	3.6 W
Apparent power S	7.1 VA
Power factor	0.51



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Color temperature and Spectral power distribution



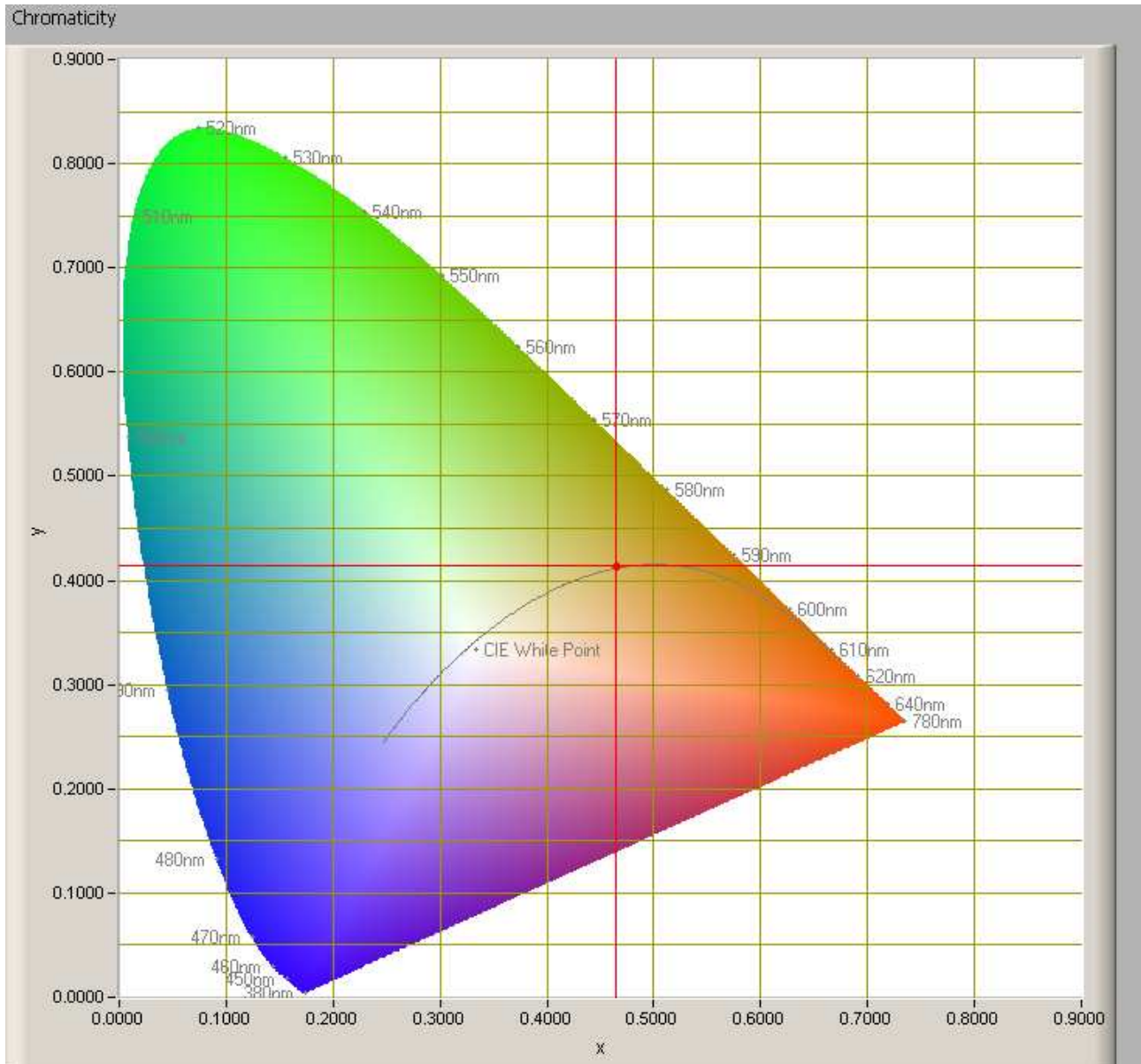
The spectral power distribution of this light bulb.

The measured color temperature is about 2850 K, close to warm white.



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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 is on the Planckian Locus (the black path in the graph).

Its coordinates are $x=0.4641$ and $y=0.4135$.

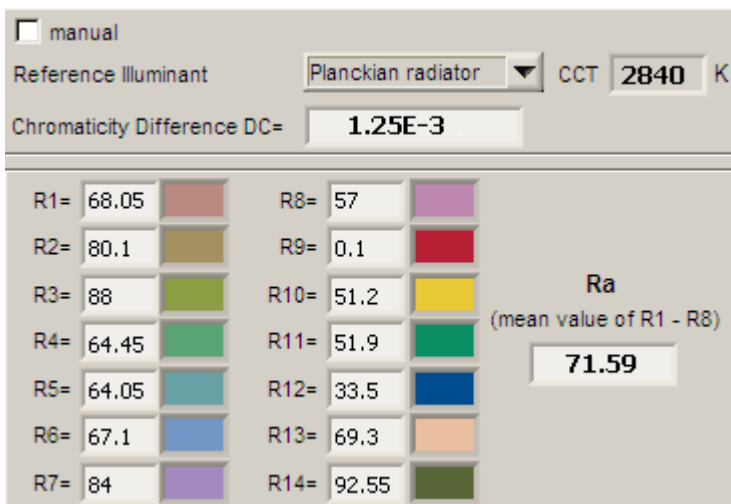


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Color Rendering Index (CRI) or also Ra

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 R_x , and the first 8 indexes ($R_1 .. R_8$) are averaged to compute the R_a which is equivalent to the CRI.



CRI of the light of this lightbulb.

The value of 72 is lower than 80 which is considered a minimum value for indoor usage.

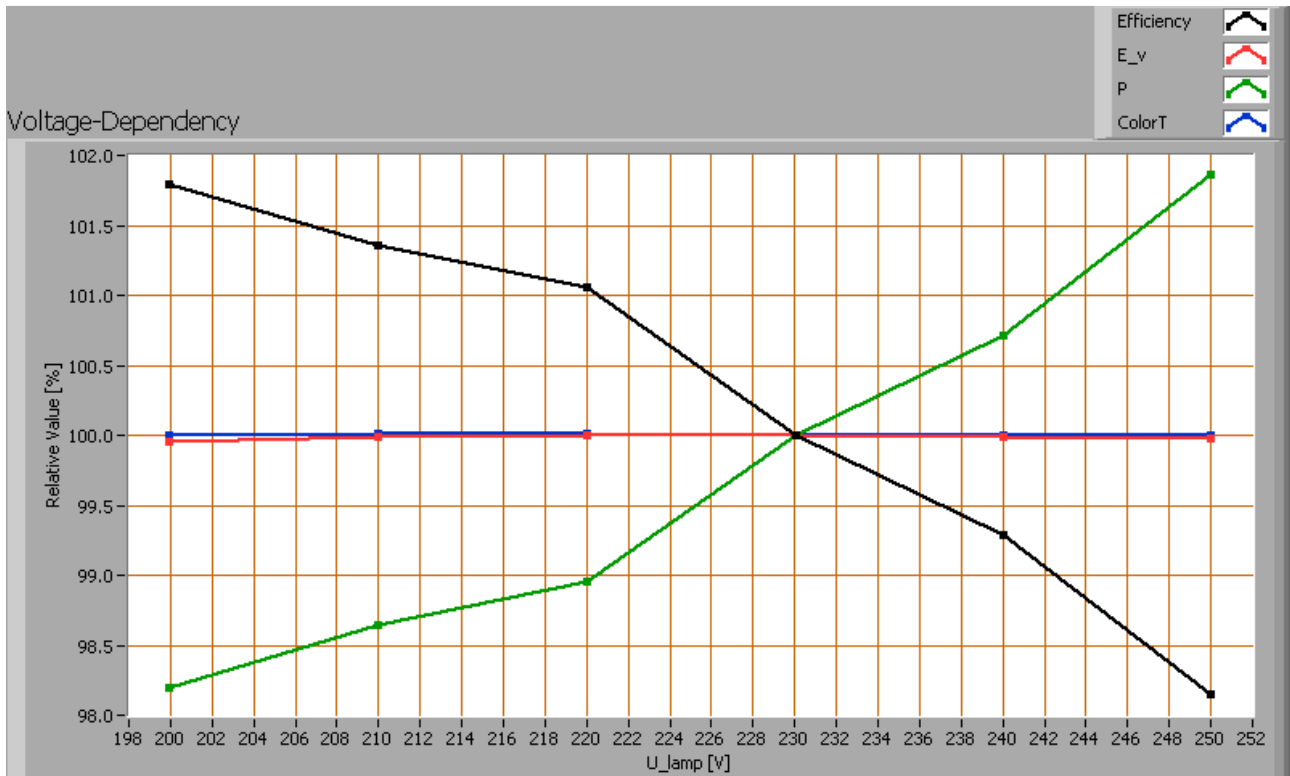
Note: the chromaticity difference is 0.0013 indicates the distance to the Planckian Locus. Its value is lower than 0.0054, which means that the calculated CRI result is meaningful.



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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 lamp power P [W] and the luminous efficacy [lm/W].



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

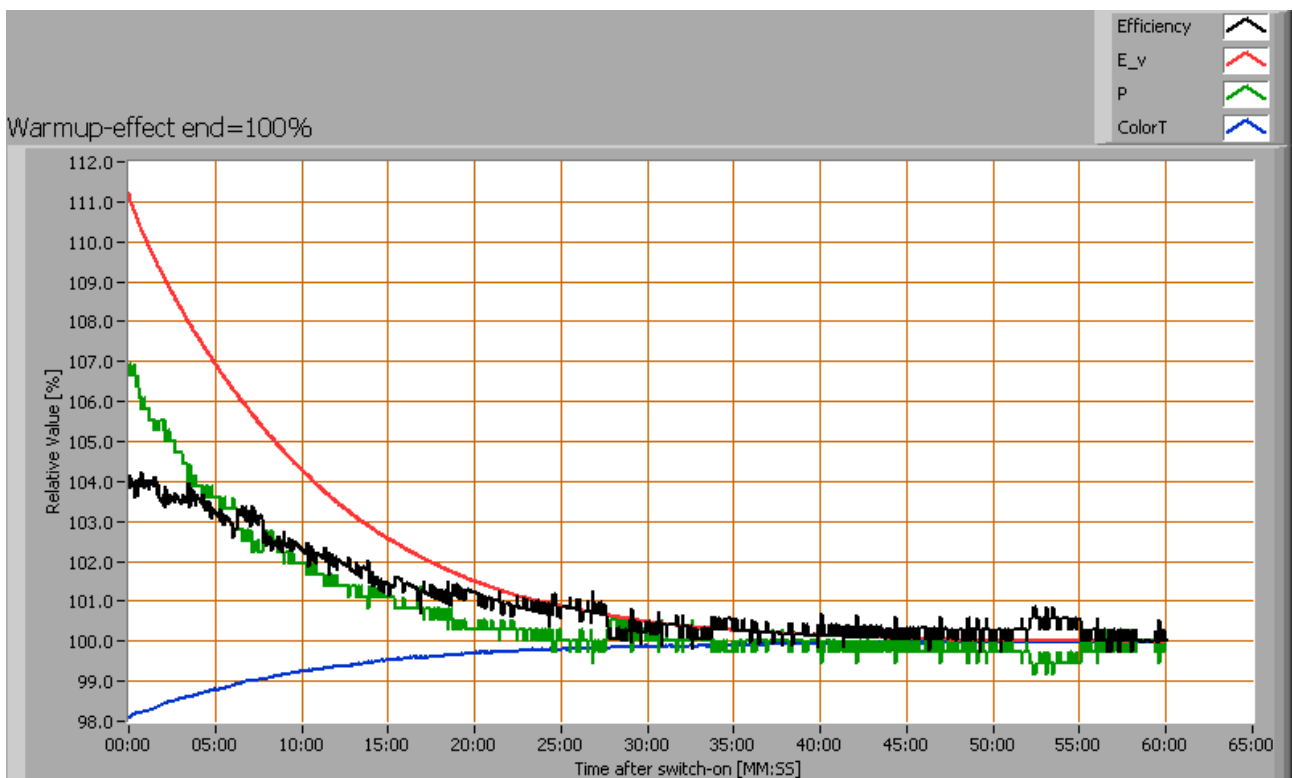
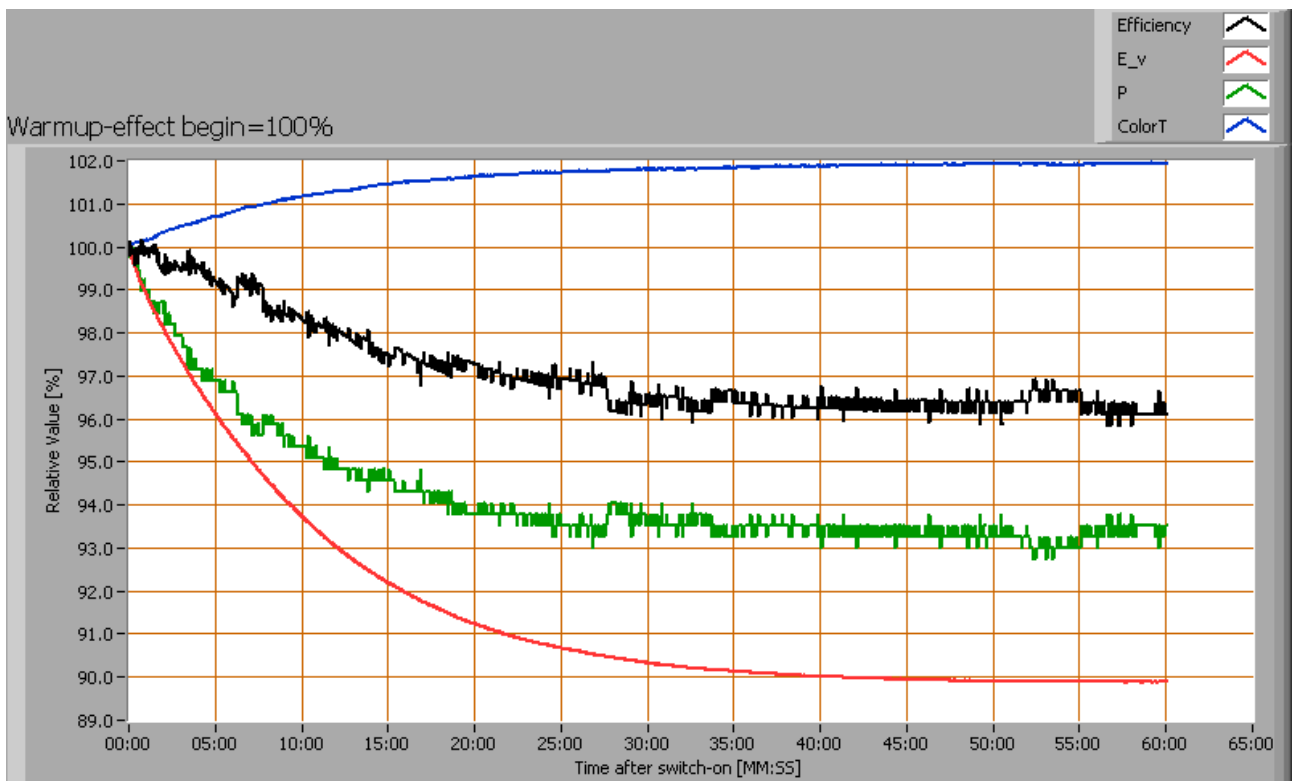
The consumed power does depend little on the light bulb voltage, and the illuminance not at all.

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 lamp power 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 effect of warming up results in a decrease of the illuminance of 10 %. The warm up period takes 40 minutes.

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