



Lamp measurement report – 2 Jan 09 for Line Lite Int.

Line Lite Brilux AR111 7W WW





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Summary measurement data

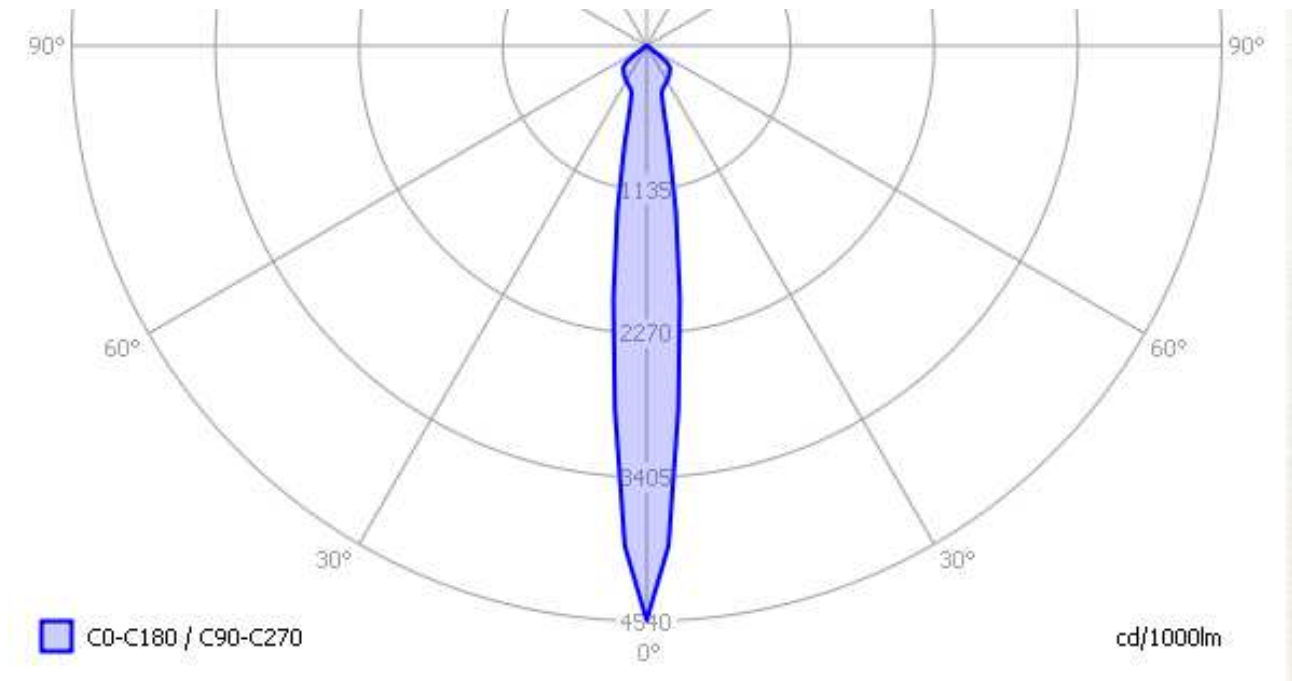
parameter	meas. result	remark
Color temperature	2878 K	Warm white
Luminous intensity I_v	1234 Cd	
Beam angle	14 deg	Small beam angle. Focused light beam.
Power P	6.7 W	
Power Factor	0.73	For every 1 kWh net power consumed, there has been 0.9 kVAhr for reactive power.
Luminous flux	280 lm	
Luminous efficacy	42 lm/W	
CRI_Ra	74	Color Rendering Index.
Coordinates chromaticity diagram	x=0.4397 and y=0.3953	
Fitting	12V	
D x H external dimensions	110 x 72 mm	External dimensions of the light bulb.
Diameter luminous area	100 mm	Dimensions of the luminous area (used in Eulumdat file).
General remarks		<p>The ambient temperature during the whole set of measurements was 21.0-24.0 deg C.</p> <p>Warm up effect: the illuminance as well as the consumed power are varying slightly, less than 3 %. This is neglectable.</p> <p>Voltage dependency: consumed power and illuminance are dependent from the light bulb voltage when it gets below 12 V.</p> <p>More sizes can be found in the photo at the end of this report.</p>



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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. This light bulb gives a very narrow beam. This light diagram is symmetrical around the z-axis.

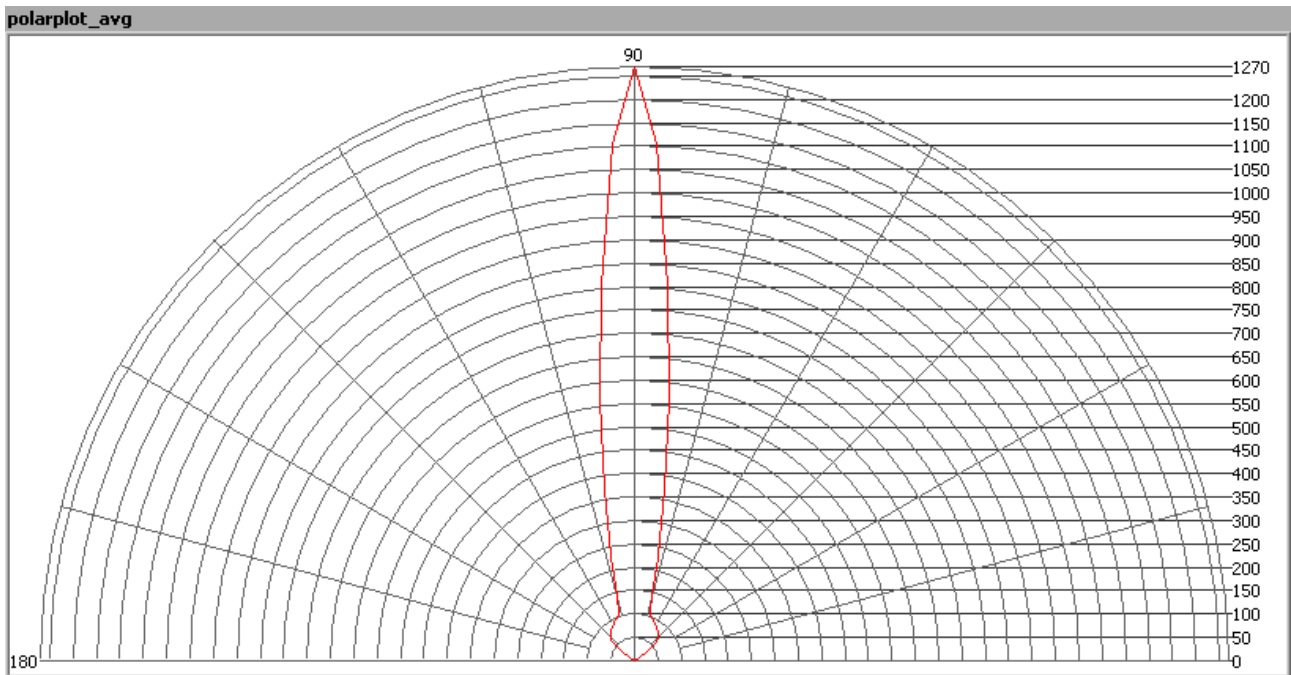
The unit is Cd/1000lm, meaning the intensity in Cd assuming there would be 1000 lumen in the measured light bulb. This enables comparing different types of light bulbs.

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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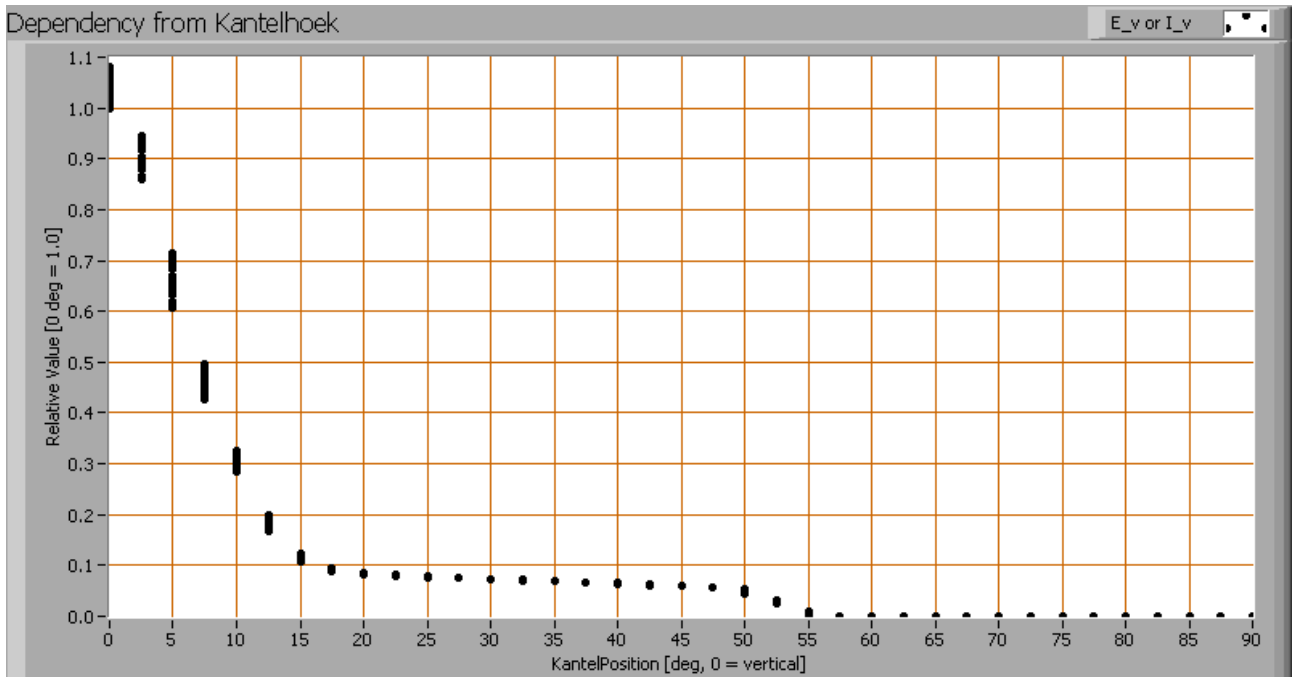
The radiation pattern of the light bulb.

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. So at 5 degrees inclination angle, all the measurement results of illuminance for all measured turn angles are in the range of 60 - 72 % of the illuminance value at 0 degrees inclination angle.

When using the average values per inclination angle, the beam angle can be computed, being 14 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 280 lm.



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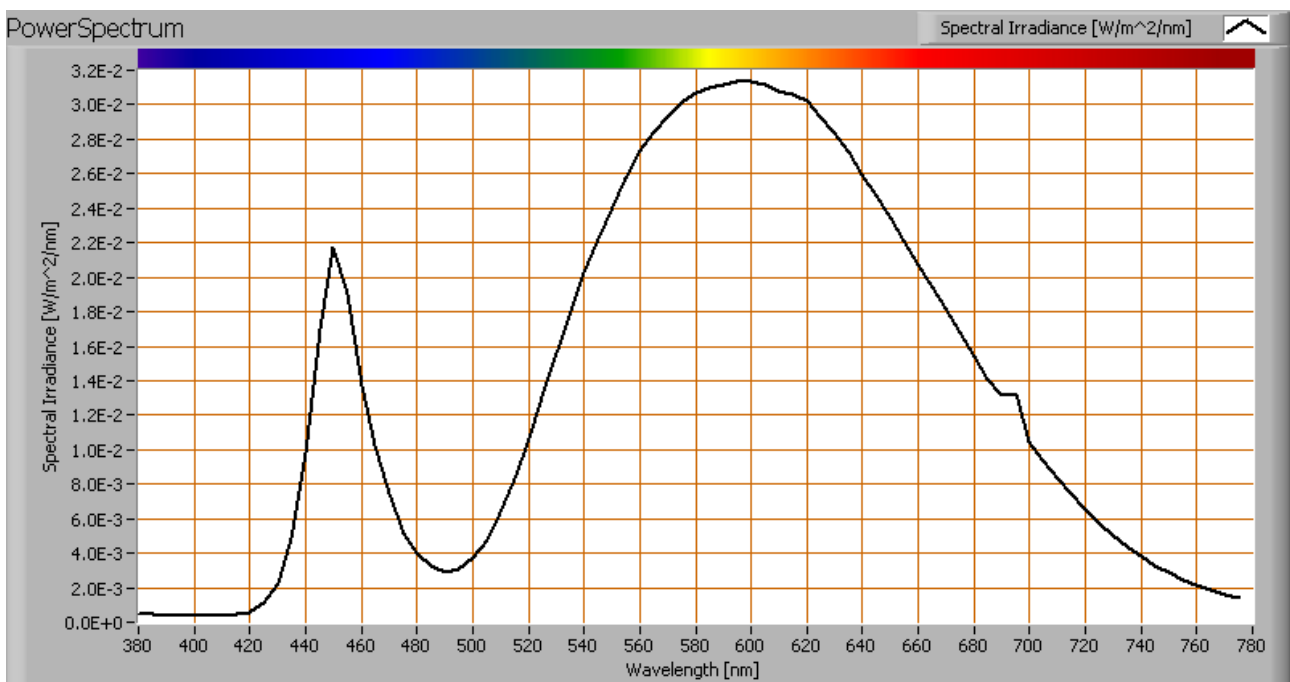
Luminous efficacy

The luminous flux being 280 lm, and the power of the light bulb being 6.7 W, yields a luminous efficacy of 42 lm/W.

A power factor of 0.73 means that for every 1 kWh net power consumed, a reactive component of 0.93 kVAr was needed.

Light bulb voltage	12.0 V
Light bulb current	757 mA
Power P	6.7 W
Apparent power S	9.1 VA
Power factor	0.73

Color temperature and Spectral power distribution



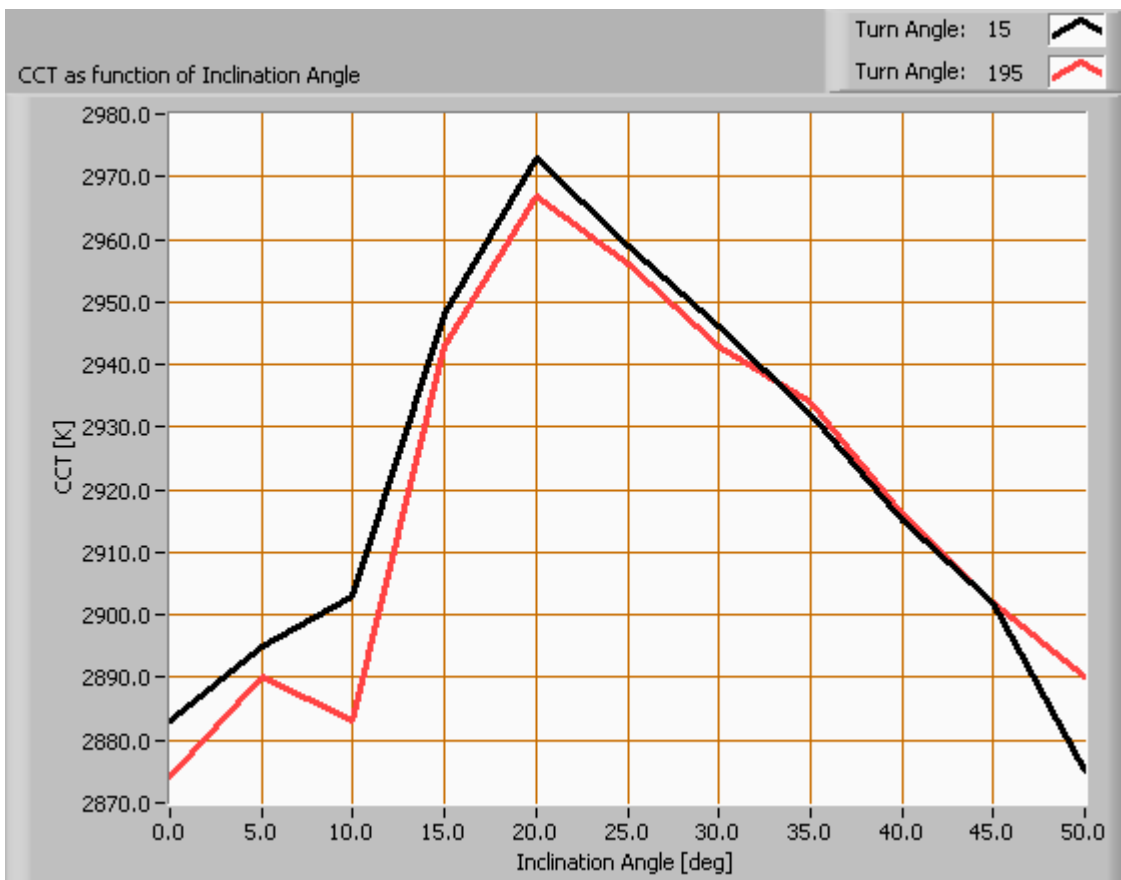
The spectral power distribution of this light bulb.

The measured color temperature is about 2900 K which is warm 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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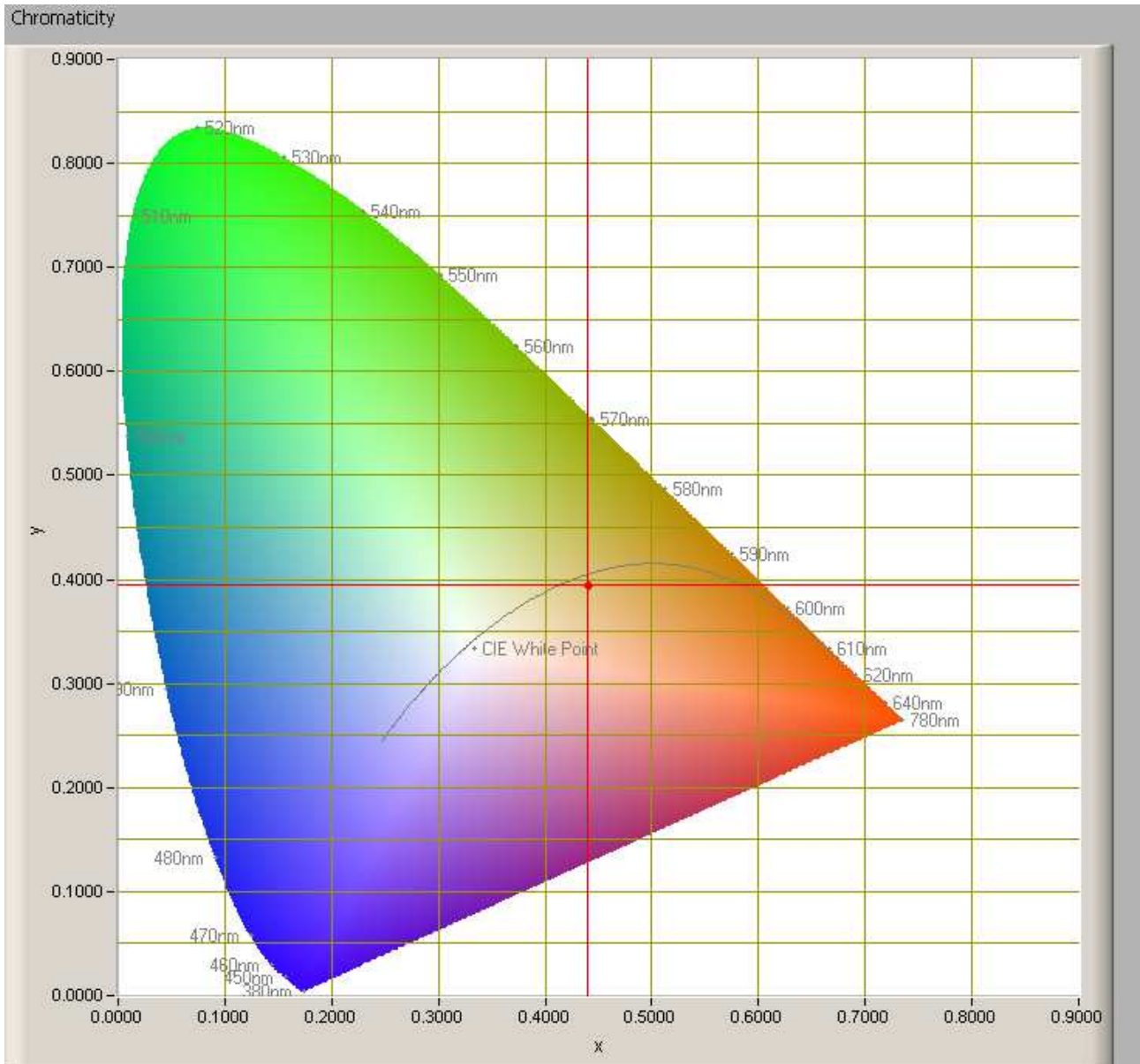
Color temperature as a function of inclination angle.

The maximum value of inclination angle is 50 degrees. Beyond that value there is virtually no intensity anymore. Then it becomes clear that the colortemperature increases and then decreases. Its maximum temperature being 4 % higher than the value at 0 degrees.



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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 close to the Planckian Locus (the black path in the graph).

Its coordinates are $x=0.4397$ and $y=0.3953$.

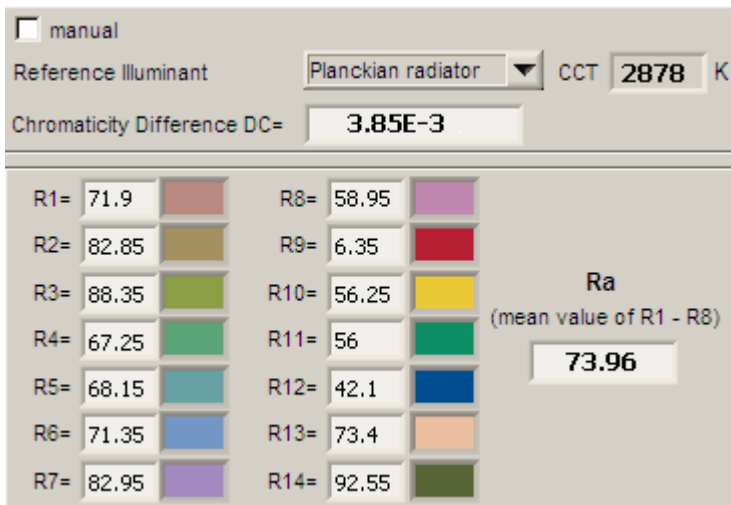


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Color Rendering Index (CRI) or also Ra

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 74 is lower than 80 which is considered a minimum value for indoor usage.

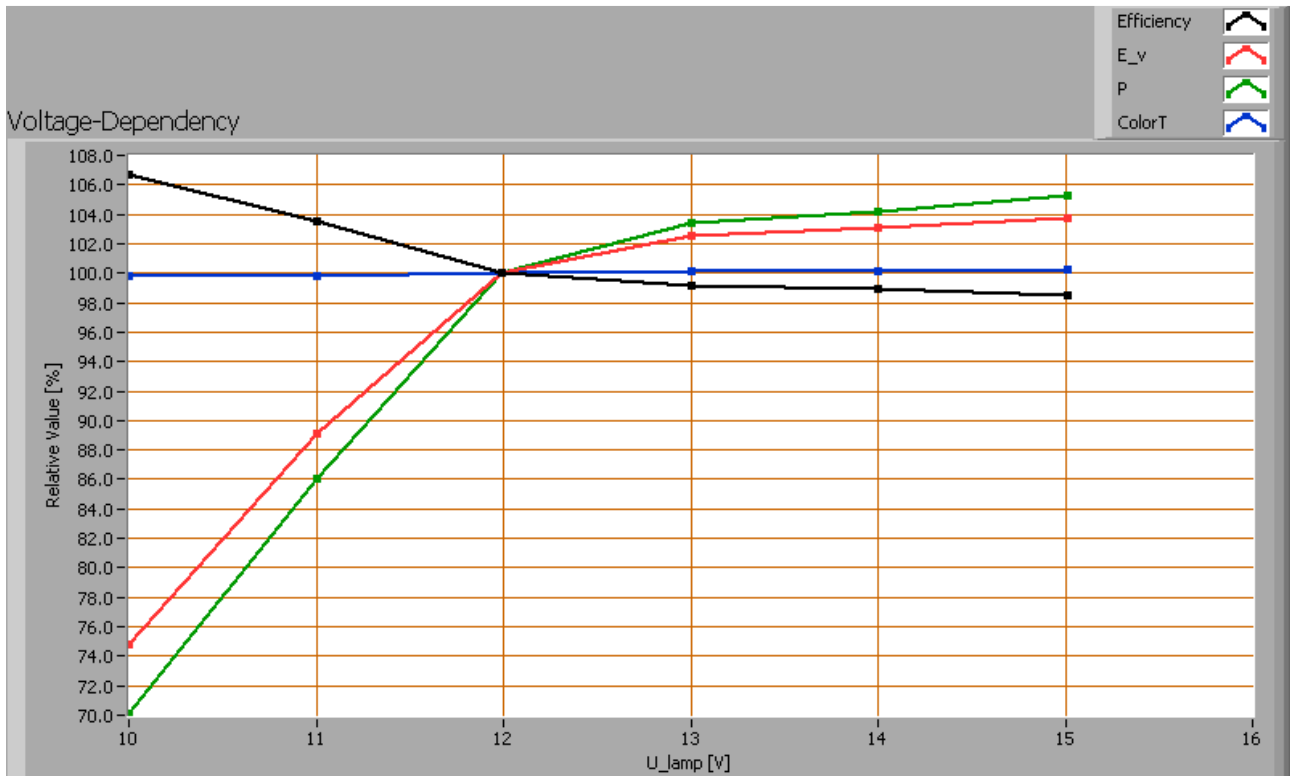
Note: the chromaticity difference is 0.0039 indicates the distance to the Planckian Locus. Its value is lower than 0.0054, which means that the calculated CRI result is meaningful.



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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 %.

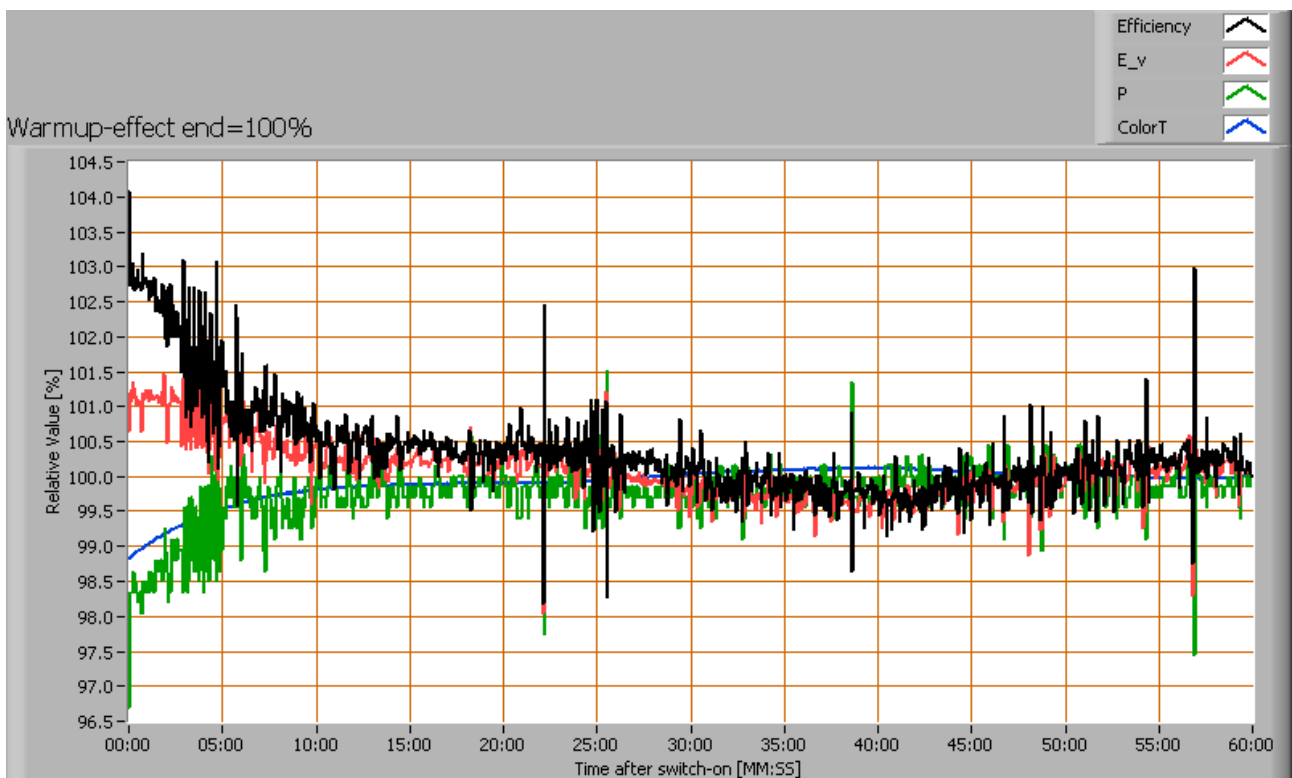
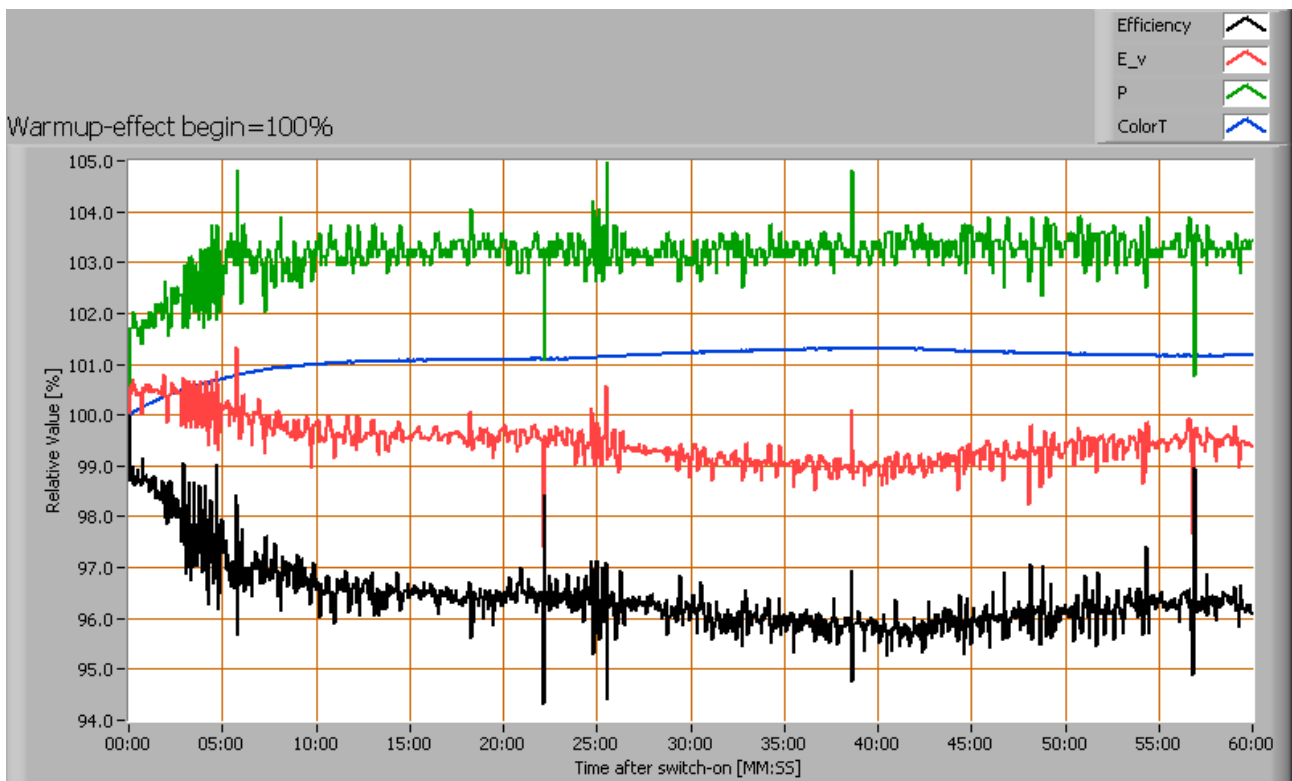
The consumed power and the illuminance do depend little on the light bulb voltage. Except for voltages below 12 V where both consumed power as well as illuminance drop quickly when voltage is decreased.

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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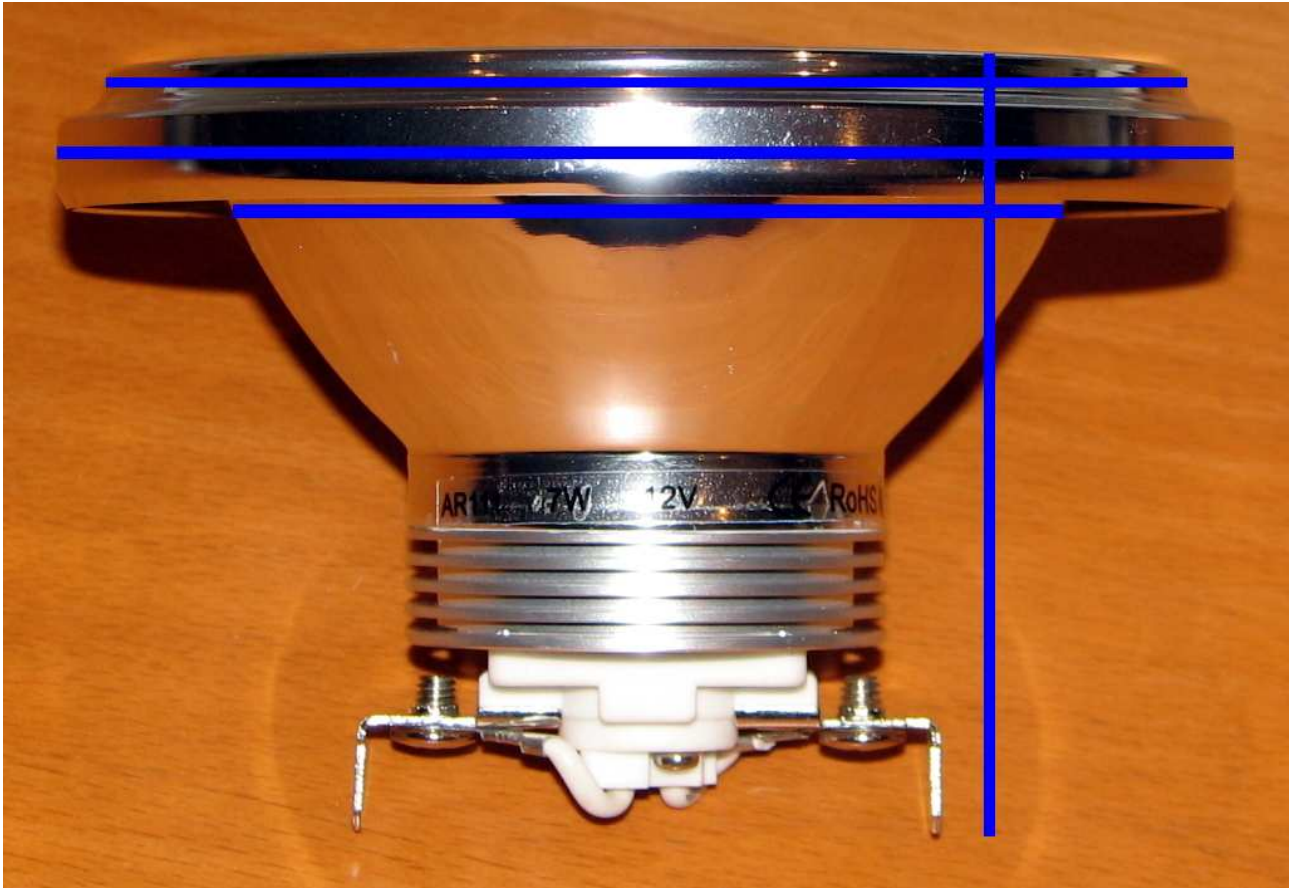


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Effect of warming up on different light bulb parameters. At top the 100 % level is put at begin, and at bottom at the end.

The effect of warming up results in an increase of power of only 3 %, which can be neglected.

More sizes



Sideview with indications of additional sizes.

The first, top blue line indicates the diameter of 104 mm, the second 110 mm, the third and most at bottom is 80 mm.

The total height is indicated by the vertical blue line and is 72 mm.



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