Lamp measurement report – 3 May 2011

E27 ledlamp

by

Ledsor

Lamp measurement report – 3 May 2011

Summary measurement data

parameter	meas. result	remark
Color temperature	5989 K	cold white
Luminous intensity I_v	258.7 Cd	Measured straight underneath the lamp.
Illuminance modulation index	38 %	Measured with a light sensor looking at the lamp (angle not defined). Is a measure for the amount of flickering.
Beam angle	145 deg	145 deg is the beam angle for all C-planes since the lamp is symmetrical along its 1st axis.
Power P	14.5 W	Follow the link for more information on electrical properties.
Power Factor	0.97	An electrical load with this power factor means that for every 1 kWh net energy consumed, there has been 0.25 kVAhr for reactive energy.
THD	18 %	Total Harmonic Distortion.
Luminous flux	1234 lm	
Luminous efficacy	85 lm/W	
EU-label classification	A	The energy class, from A (more efficient) to G (least efficient).
CRI_Ra	73	Color Rendering Index.
Coordinates chromaticity diagram	x=0.3209 en y=0.3535	
Fitting	E27	This lamp is connected directly to the grid voltage.
PAR-value	2.3 uMol/s/m^2	The number of photons seen by an average plant when it is lit by the light of this light bulb. Value valid at 1 m distance from light bulb.
PAR-photon efficacy	0.8 uMol/s/W_e	The total emitted number of photons by this light, divided by its consumption in W. It indicates a kind of efficacy in generating photons.

Lamp measurement report – 3 May 2011

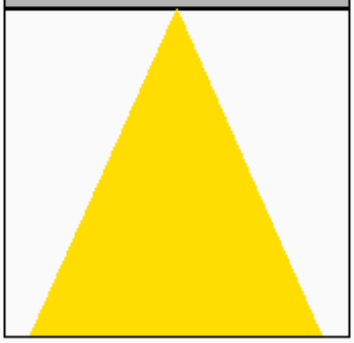
S/P ratio	2.0	This factor indicates the amount of times more efficient the light of this light bulb is perceived under scotopic circumstances (low environmental light level).
D x H external dimensions	70 mm x 135 mm	External dimensions of the lamp.
D x H luminous area	65 mm x 35 mm	Dimensions of the luminous area (used in Eulumdat file). It are the dimensions of the white cover around the leds.
General remarks		The ambient temperature during the whole set of illuminance measurements was 23.2 – 24.4 deg C. The temperature of the housing gets maximally about 40 degrees hotter than ambient temperature. Warm up effect: During the warmup time the illuminance varies during 30 minutes and decreases with 21 %. During the warmup time the power varies during 31 minutes and decreases with 19 %. Voltage dependency: There is a constant dependency of the illuminance when the power voltage varies between 200 – 250 V AC. There is a constant dependency of the consumed power when the power voltage varies between 200 – 250 V AC.

Lamp measurement report – 3 May 2011

Overview table

m.	Ø 50% C0-180	Ø 50% C90-270
0.25	1.6	1.6
0.5	3.21	3.21
1	6.41	6.41
1.5	9.62	9.62
3	19.23	19.23
4	25.64	25.64
5	32.05	32.05

C0-180: 145°
C90-270: 145°



E (lux)
4140
1035
259
115
29
16
10

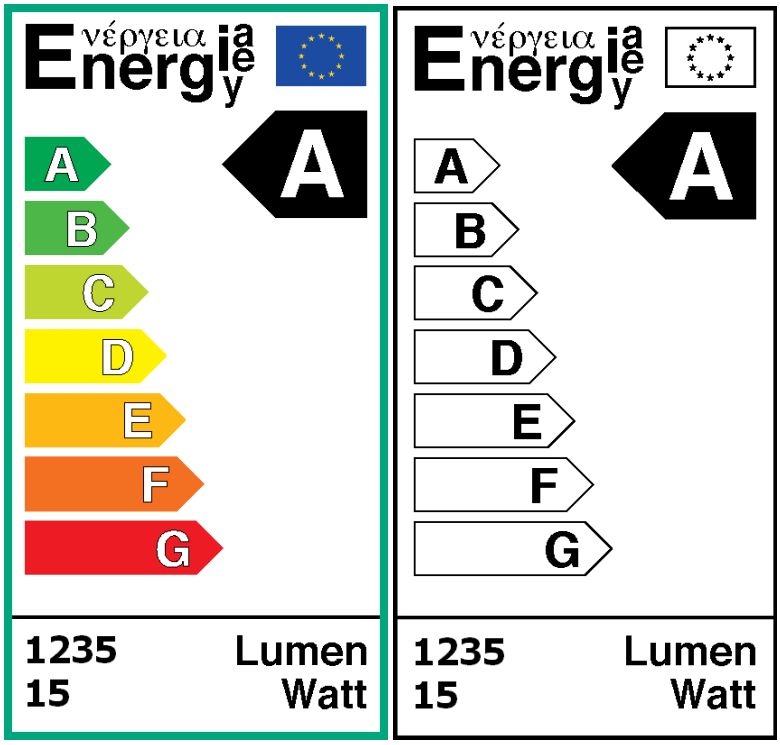
Luminaire Efficacy	
85	(lumen per Watt)
Half-peak diam C_{0-180}	
6.41	x diameter(m)
Half-peak diam C_{90-270}	
6.41	x diameter(m)
Illuminance	
259	/ distance² (lux)
Total Output	
1234	(lumen)

The overview table is explained on the OliNo website.
Please note that this overview table makes use of calculations, use this data with care as explained on the OliNo site. E (lux) values are not accurate, when within 5 x 65 mm (maximal luminous size, eventually diagonally measured)= 325 mm. Within this distance from the lamp, the measured lux values will be less than the computed values in this overview as the measurements are then within the near field of the lamp.

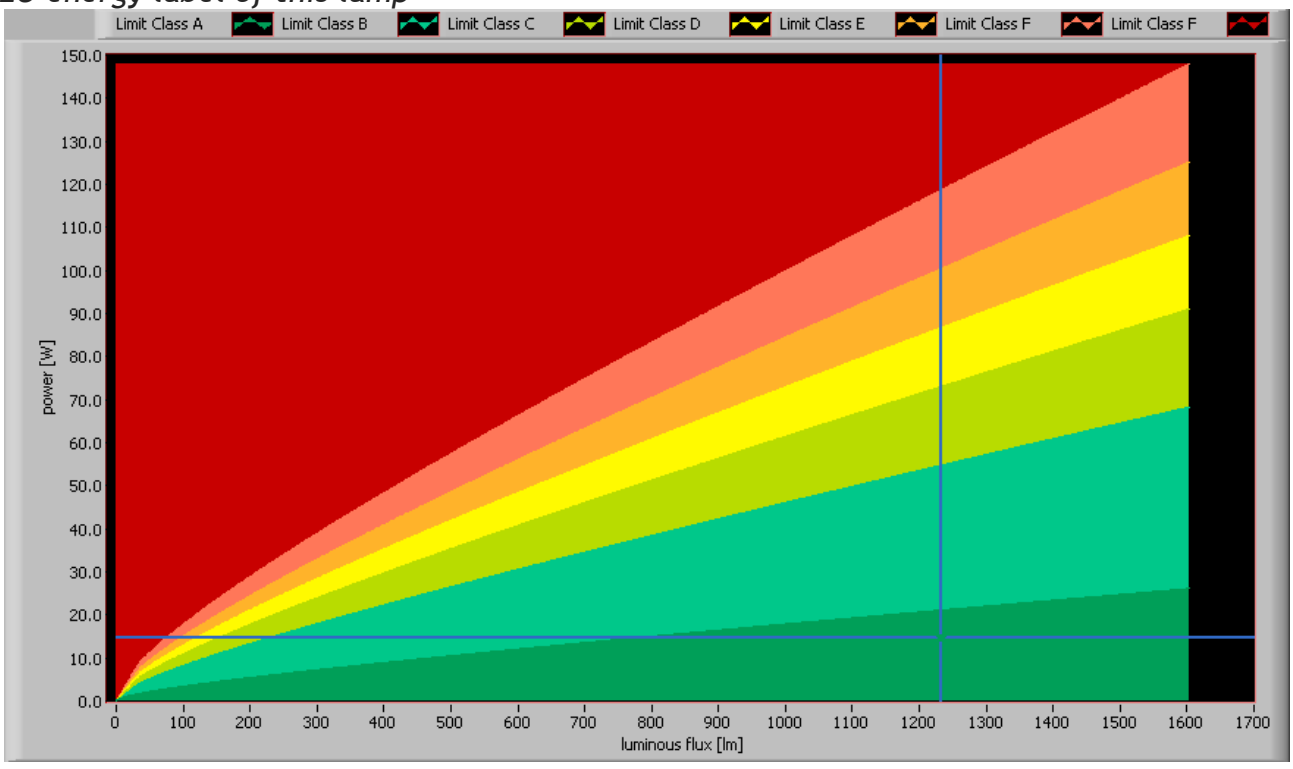
EU Energy label classification

With the measurement results of the luminous flux and the consumed power the classification on energy efficacy of this lamp is calculated. This information is requested in the EU for certain household lamps, see also the OliNo site that explains for which lamps it is requested, how the label looks like and what information it needs to contain. Herewith the labels for this lamp in color and black and white.

Lamp measurement report – 3 May 2011



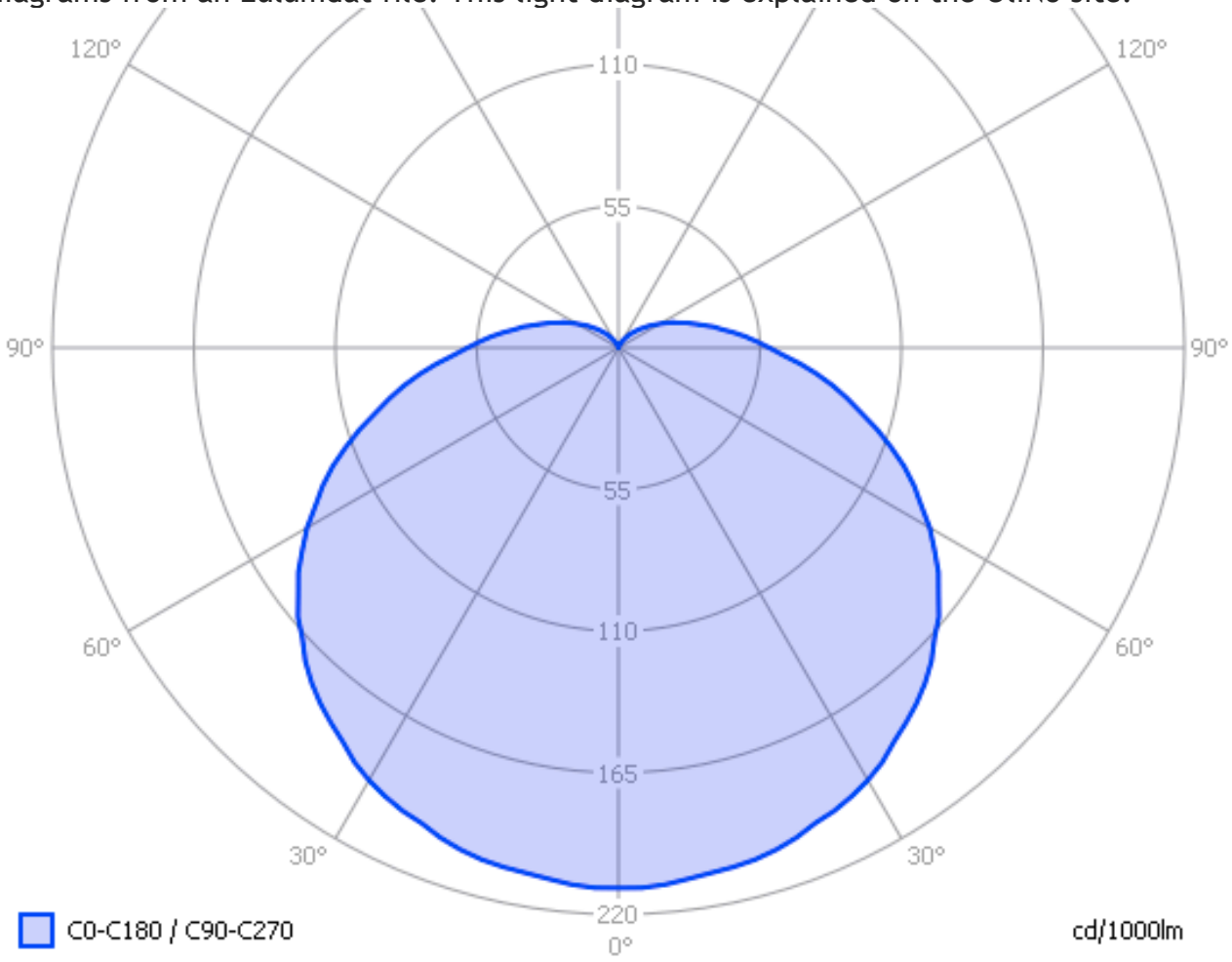
EU energy label of this lamp



The lamp's performance in the lumen-Watt field, with the energy efficacy fields indicated.

Eulumdat light diagram

This light diagram below comes from the program Qlumedit, that extracts these diagrams from an Eulumdat file. This light diagram is explained on the OliNo site.



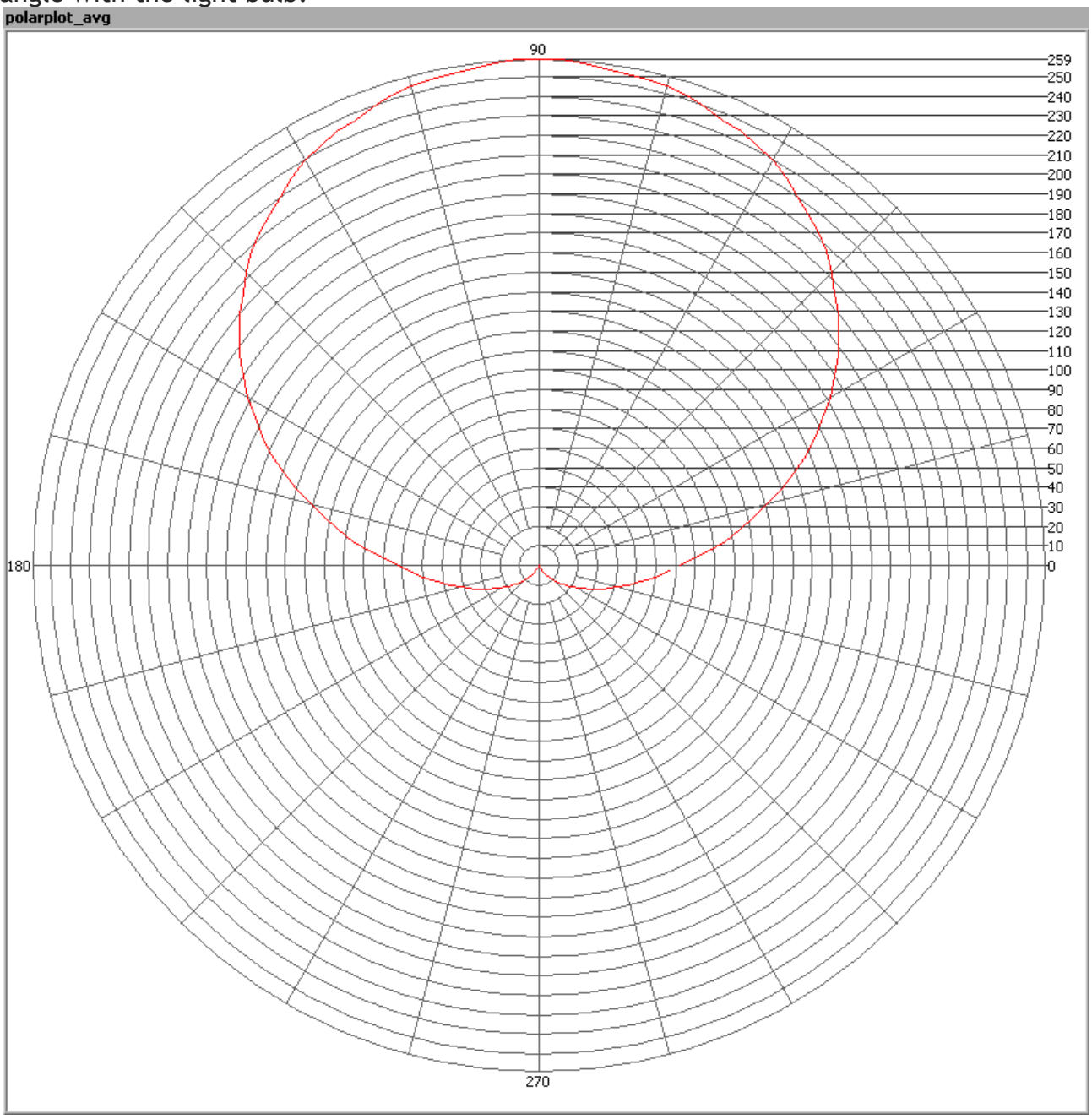
The light diagram giving the radiation pattern.

The light diagram indicates the beam in the C0-C180 plane and in the plane perpendicular to that, the C90-C270 plane. These beams are equal as the lamp has symmetry over its first axis (the vertical axis).

Illuminance Ev at 1 m distance, or luminous intensity Iv

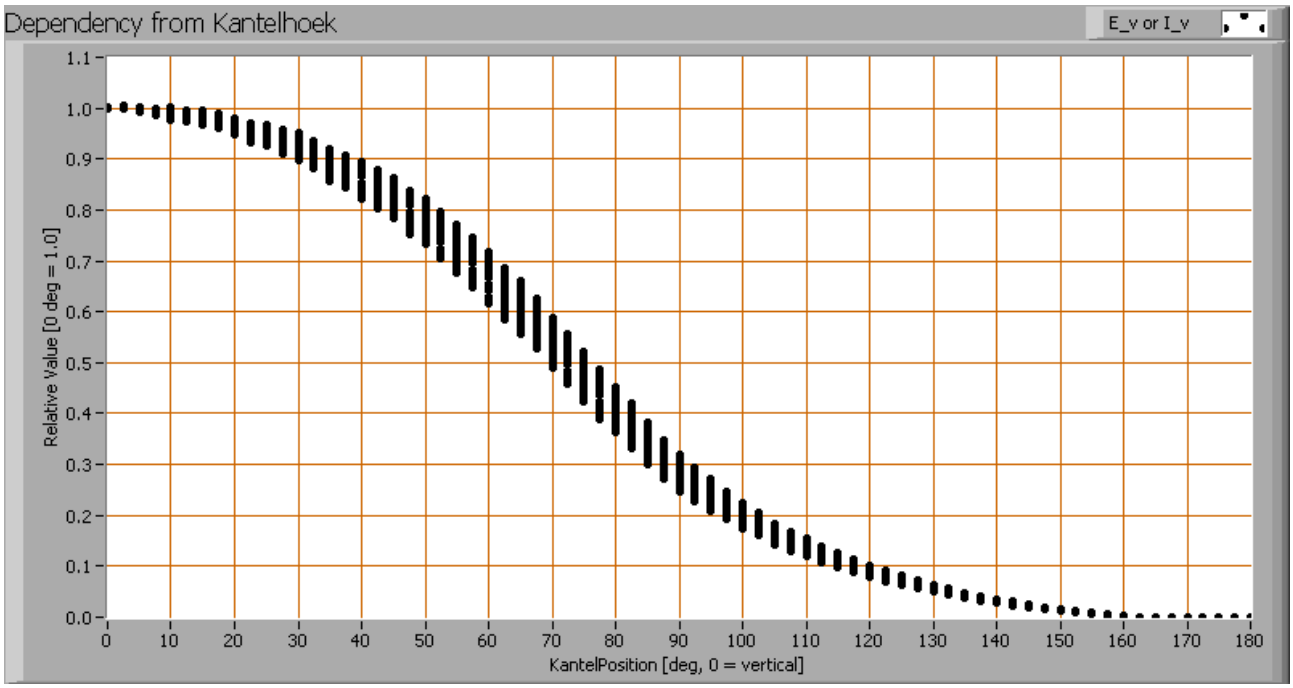
Herewith the plot of the *averaged* luminous intensity Iv as a function of the inclination

angle with the light bulb.



The radiation pattern of the light bulb.

This radiation pattern is the average of the light output of the light diagram given earlier. Also, in this graph the luminous intensity is given in Cd.
These averaged values are used (later) to compute the lumen output.



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. There normally are differences in illuminance values for different turn angles. However for further calculations the averaged values will be used. When using the average values per inclination angle, the beam angle can be computed, being 145 deg for the C0-C180 plane and 145 deg for the C90-C270 plane.

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 1234 lm.

Luminous efficacy

The luminous flux being 1234 lm, and the consumed power of the lamp being 14.5 Watt, results in a luminous efficacy of 85 lm/Watt.

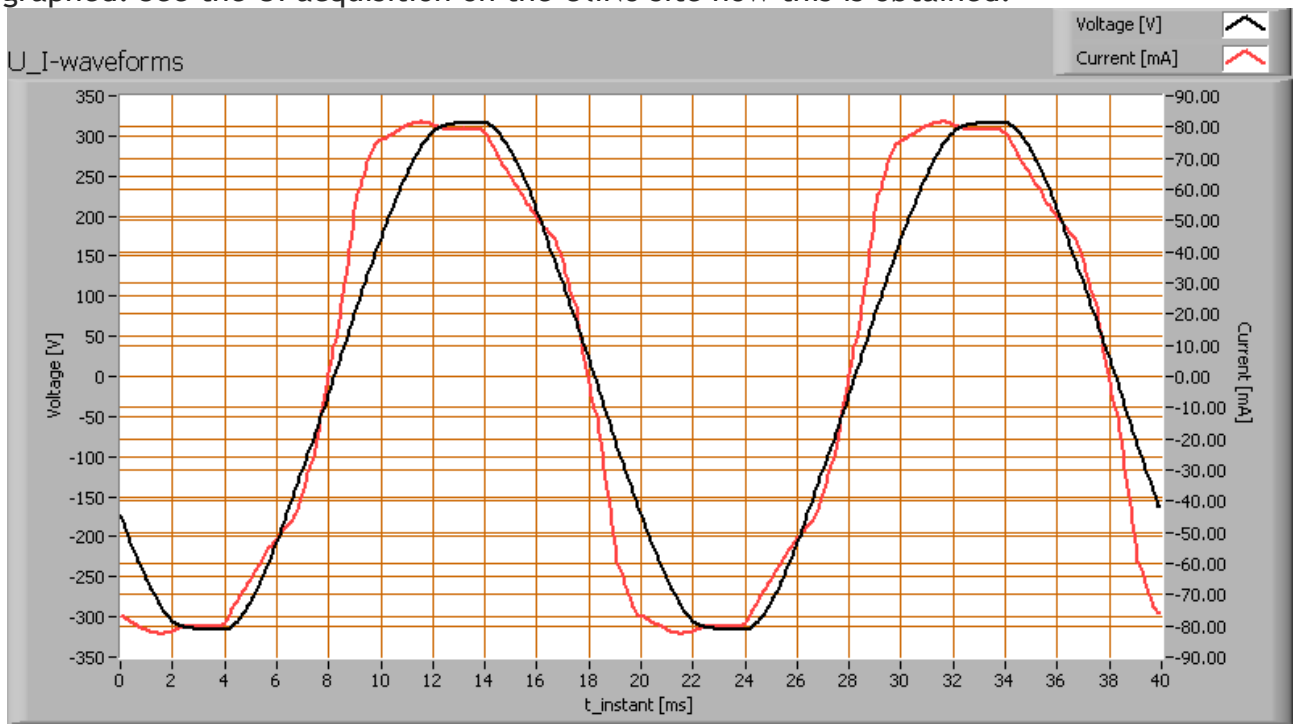
Lamp measurement report – 3 May 2011

Electrical properties

The power factor is 0.97. An electrical load with this power factor means that for every 1 kWh net energy consumed, there has been 0.25 kVAhr for reactive energy.

Lamp voltage	230.0 V
Lamp current	0.065 A
Power P	14.5 W
Apparent power S	15.0 VA
Power factor	0.97

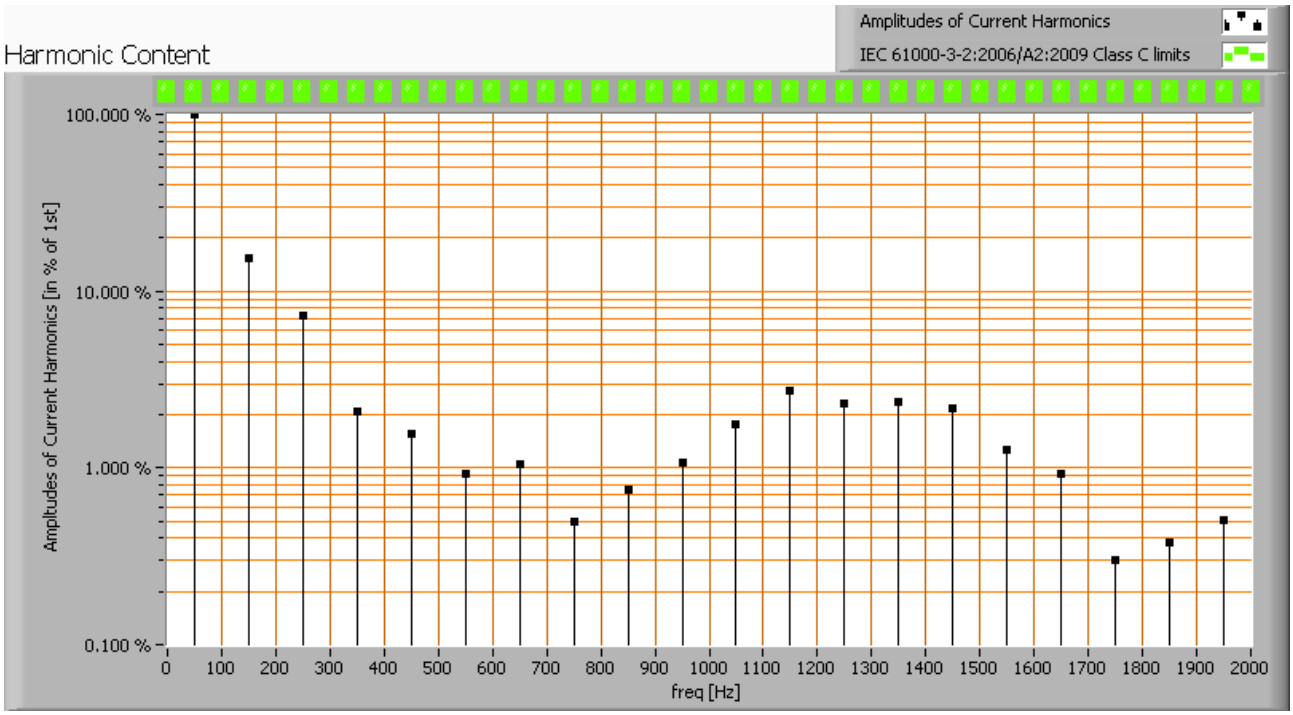
Of this lamp the voltage across and the resulting current through it are measured and graphed. See the UI acquisition on the OliNo site how this is obtained.



Voltage across and current through the lightbulb

This current waveform has been checked on requirements posed by the norm IEC 61000-3-2:2006 (including up to A2:2009). See also the IEC 61000-3-2:2006 explanation on the OliNo website.

Lamp measurement report – 3 May 2011

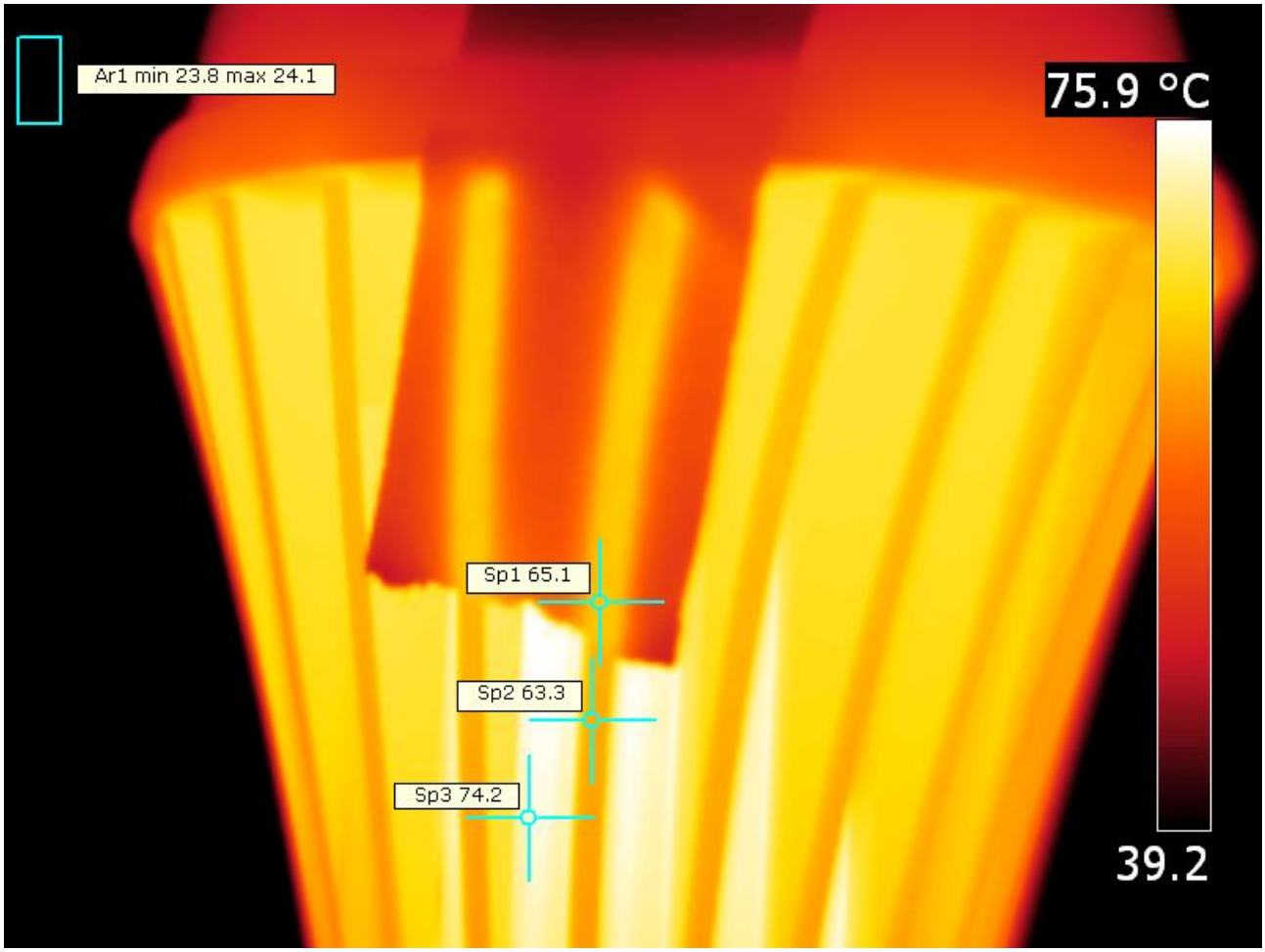


Harmonics in the current waveform and checked against IEC61000-3-2:2006 and A2:2009

When the consumed power is <= 25 W there are no limits for the harmonics.
The Total Harmonic Distortion of the current is computed and its value is 18 %.

Lamp measurement report – 3 May 2011

Temperature measurements lamp

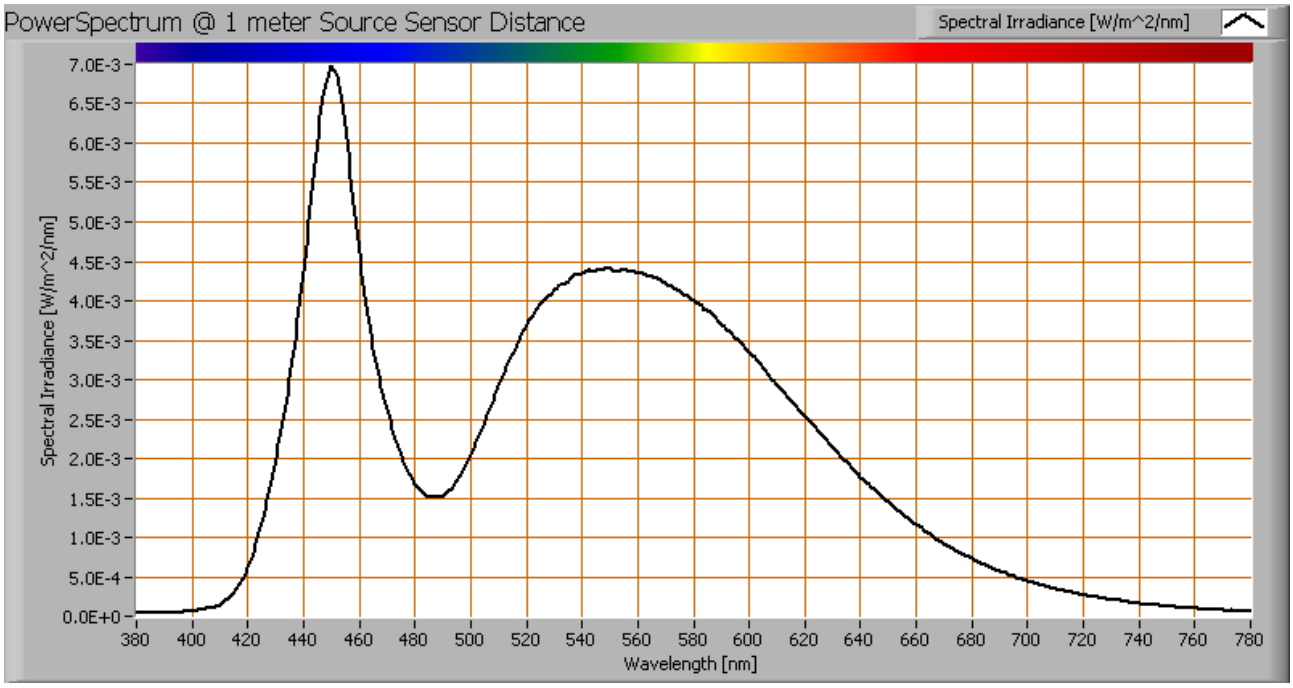


Emissivity of the aluminum is 0.90.

status lamp	> 2 hours on
ambient temperature	24 deg C
reflected background temperature	24 deg C
camera	Flir T335
emissivity	0.90
measurement distance	0.2 m
$IFOV_{geometric}$	0.136 mm per 0.1 m distance
NETD (thermal sensitivity)	50 mK

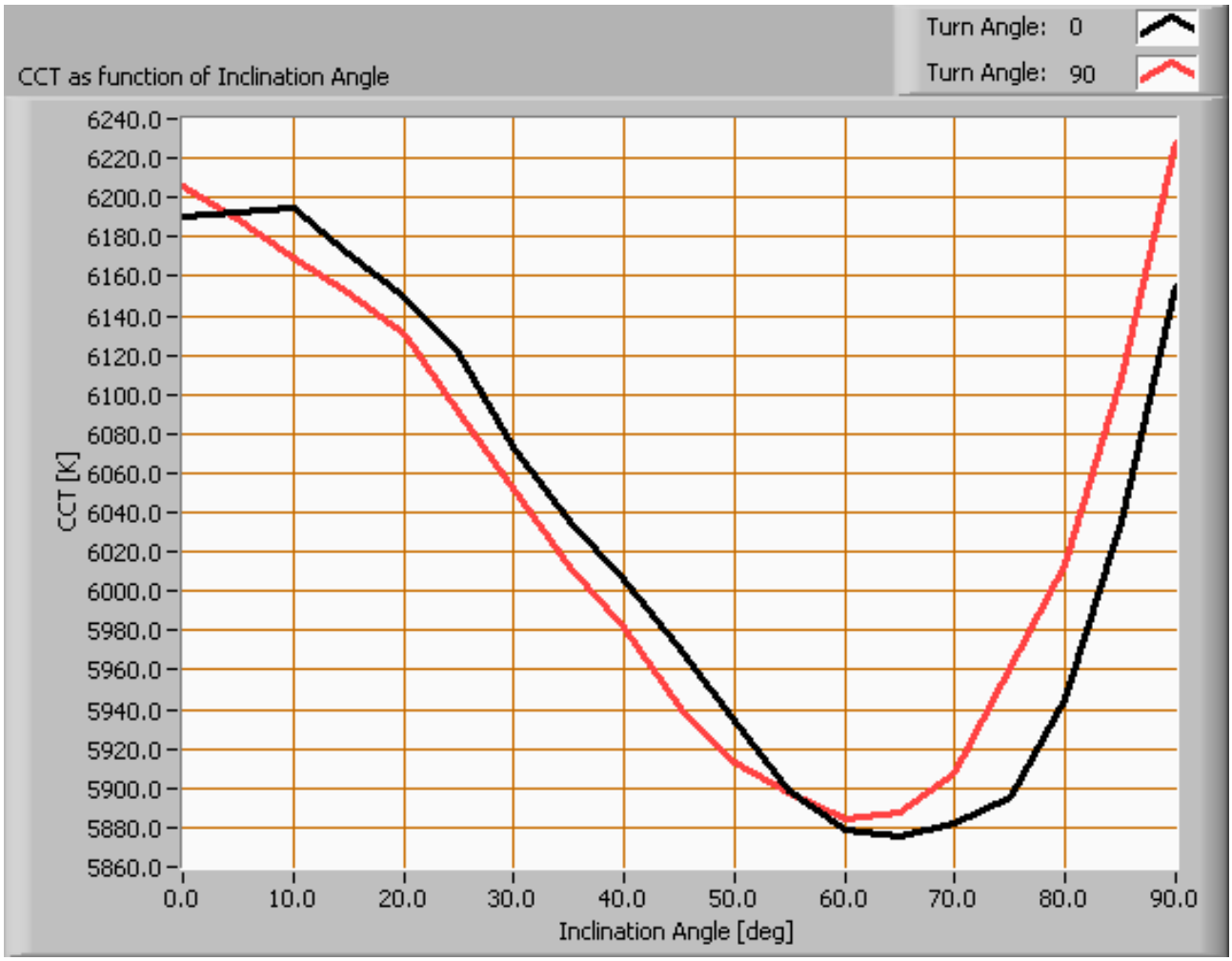
Lamp measurement report – 3 May 2011

Color temperature and Spectral power distribution



The spectral power distribution of this light bulb, energies on y-axis valid at 1 m distance.

The measured color temperature is 5989 K which is cold white.
This color temperature is measured straight underneath the light bulb. Below a graph showing the color temperature for different inclination angles.



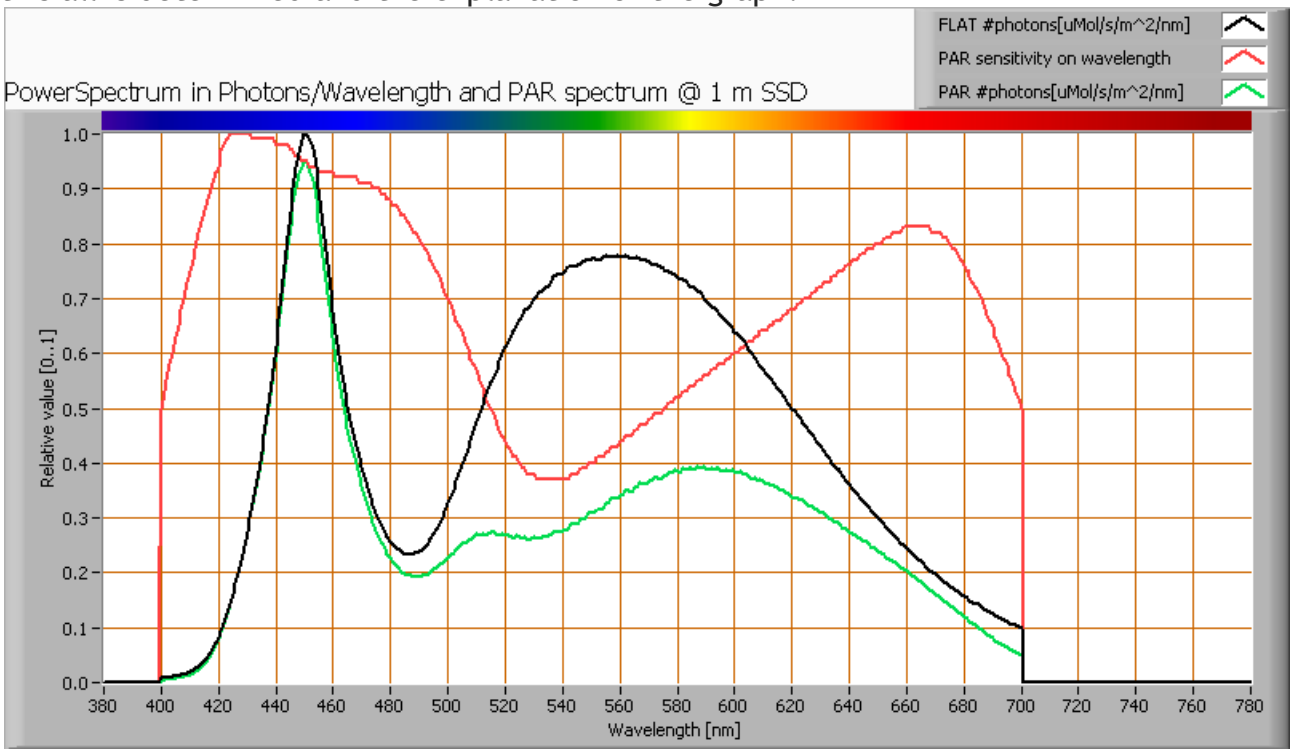
Color temperature as a function of inclination angle.

The color temperature is given for inclination angles up to 90 deg. Beyond that angle has not been measured.
For the C0-C180 plane: the beam angle of 145 deg is equivalent to 72.7 deg inclination angle,which is the area where most of the light falls within. The maximum variation of color temperature in the first 90 degrees of this inclination area is about 5 %.
For the C90-C270 plane: the beam angle of 145 deg is equivalent to 72.7 deg inclination angle,which is the area where most of the light falls within. The maximum variation of color temperature in the first 90 degrees of this inclination area is about 5 %.

Lamp measurement report – 3 May 2011

PAR value and PAR spectrum

To make a statement how well the light of this light bulb is for growing plants, the PAR-area needs to be determined. See the explanation about PAR on the OliNo website how this all is determined and the explanation of the graph.



The photon spectrum, then the sensitivity curve and as result the final PAR spectrum of the light of this light bulb

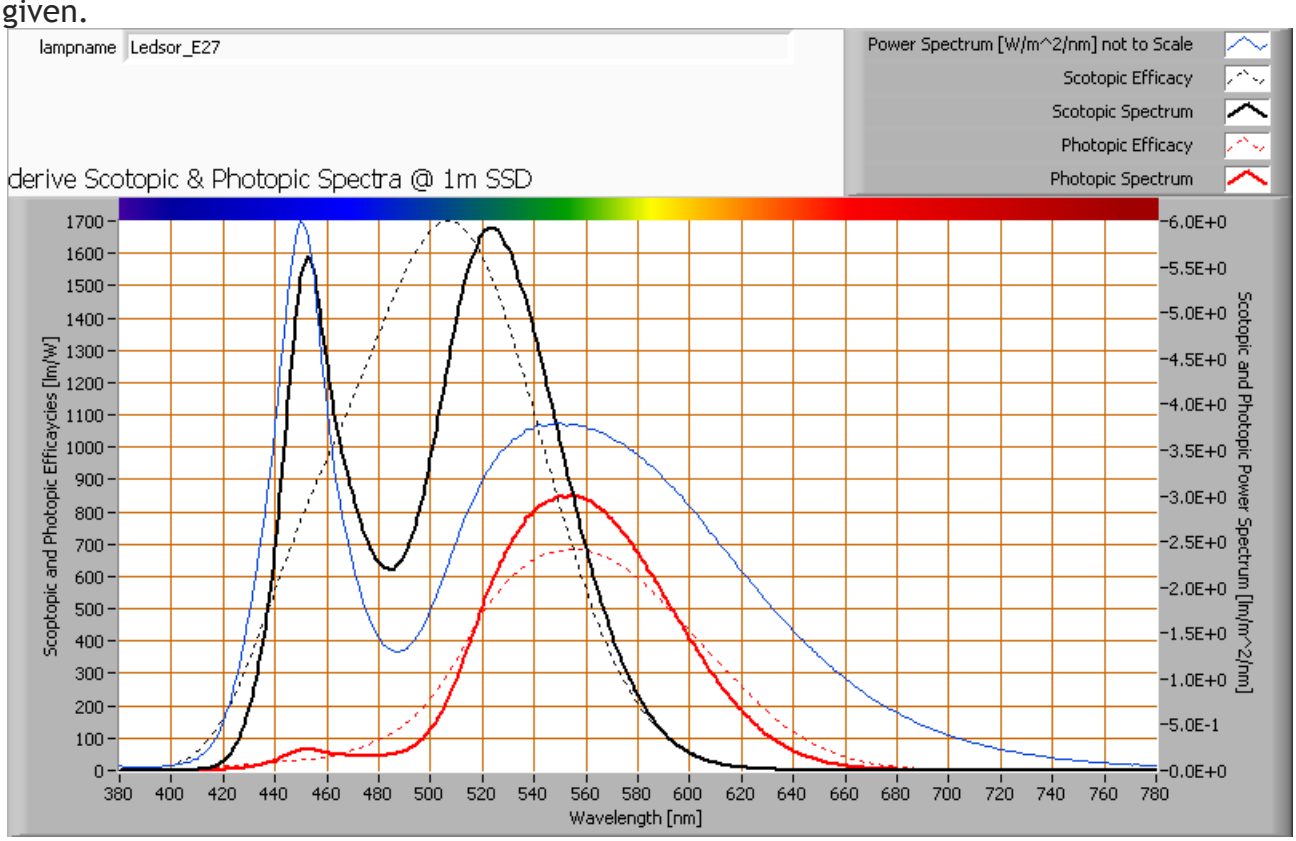
parameter	value	unit
PAR-number	2.3	uMol/s/m^2
PAR-photon current	11.2	uMol/s
PAR-photon efficacy	0.8	uMol/s/W

The PAR efficiency is 65 % (valid for the PAR wave length range of 400 – 700 nm). This is the maximum percentage of the total of photons in the light that is effectively used by the average plant (since the plant might not take 100 % of the photons at the frequency where its relative sensitivity is 100 %).

Lamp measurement report – 3 May 2011

S/P ratio

The S/P ratio and measurement is explained on the OliNo website. Here the results are given.

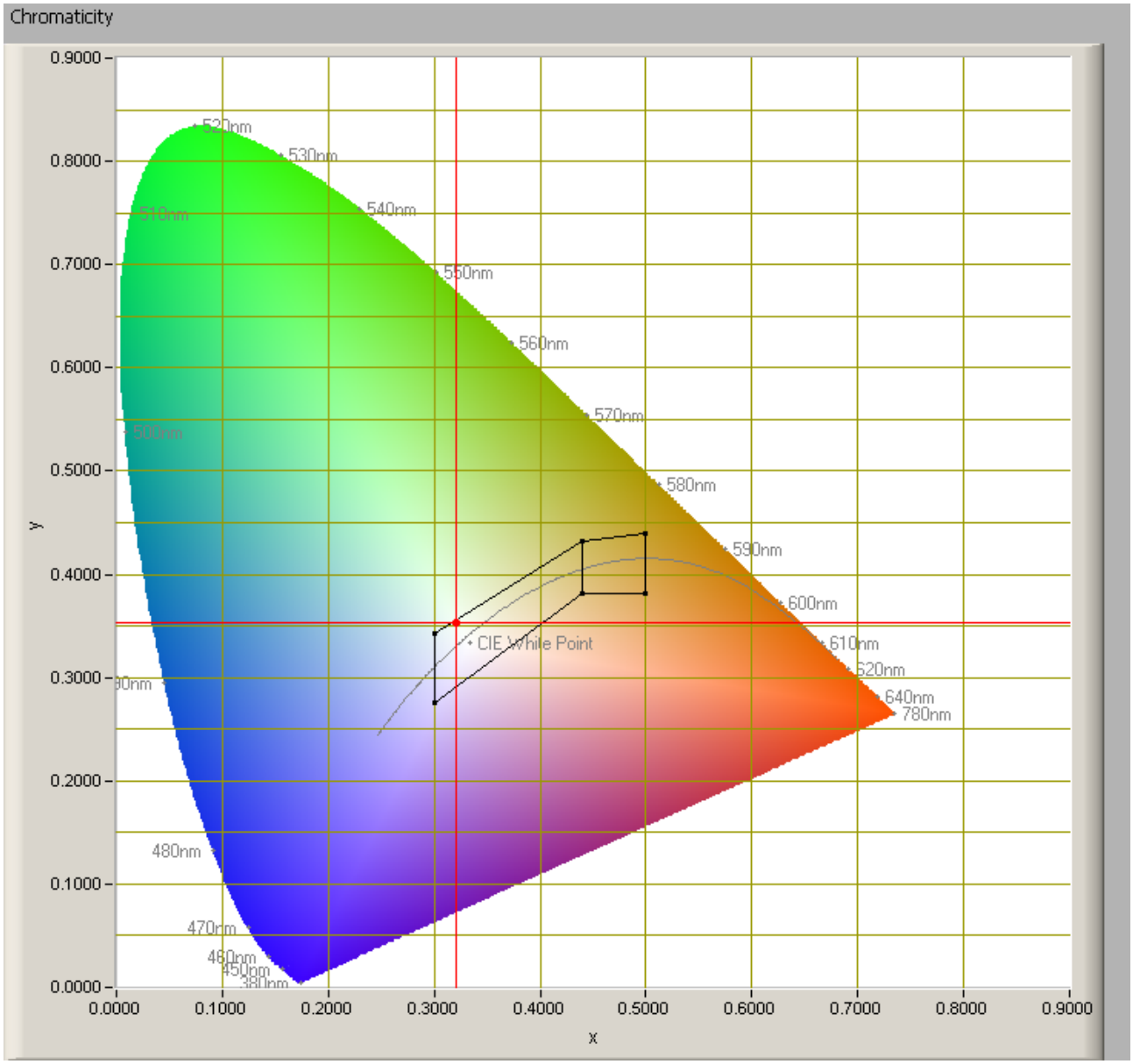


The power spectrum, sensitivity curves and resulting scotopic and photopic spectra (spectra energy content defined at 1 m distance).

The S/P ratio of the light coming from this lamp is 2.0.
More info on S/P ratio can be found on the OliNo website.

Lamp measurement report – 3 May 2011

Chromaticity diagram



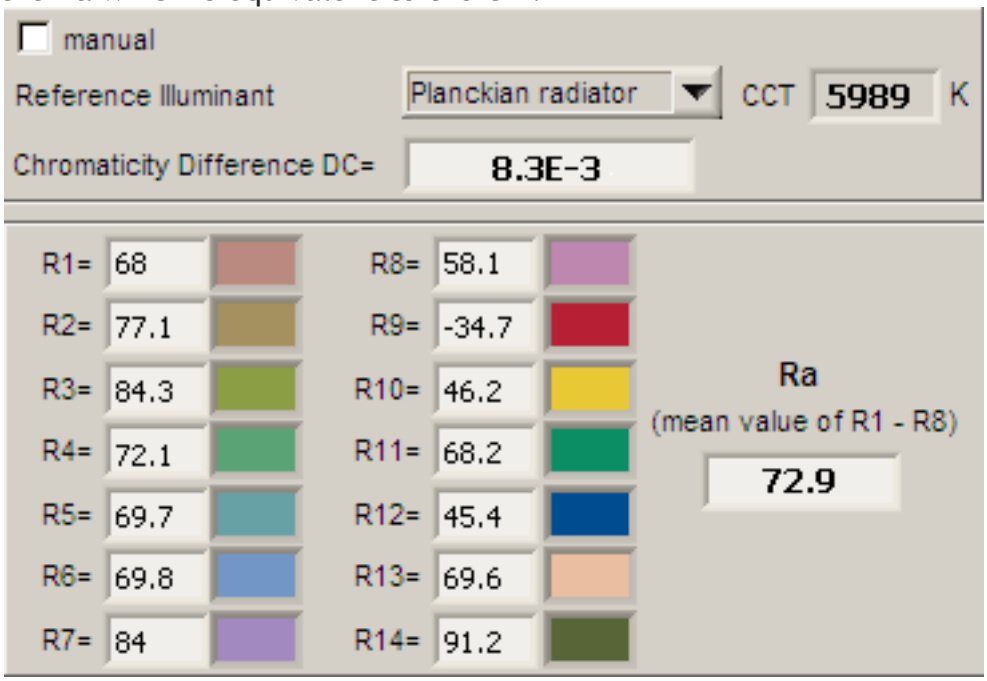
The chromaticity space and the position of the lamp's color coordinates in it.

The point of the light in this diagram is inside the area indicated with class A. This area indicates an area for signal lamps, see also the article on signal lamps and color areas on the OliNo website.

The color coordinates are x=0.3209 and y=0.3535.

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). Practical information and also some critics about the CRI can be found on the OliNo website.
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.

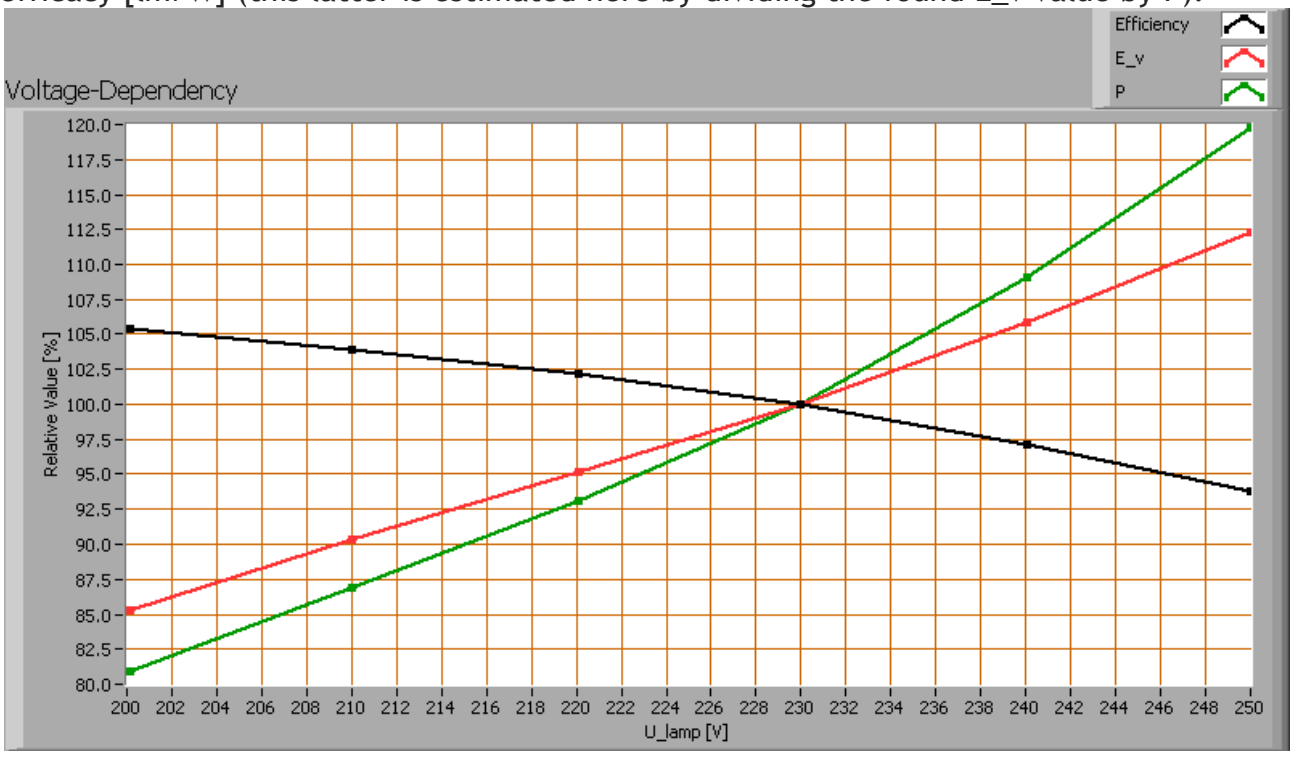


CRI of the light of this lightbulb.

This value of 73 indicates how well the light of this lamp can render well a set of reference colors, this in comparison with the light of a reference source (for color temperatures < 5000K a black radiator is used as reference and for color temperatures > 5000K the sun or the light outside during the day).
The value of 73 is smaller than the value of 80 that is considered as a minimum for working areas in general.
Note: the chromaticity difference is 0.0083 and indicates the distance to the Planckian Locus. There is no norm yet that states what the max deviation from white light is allowed to be. A reference with signal lights as a reference is given in the chromaticity diagram.

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 light bulb parameters measured: illuminance E_v [lx], the lamppower P [W] and the luminous efficacy [lm/W] (this latter is estimated here by dividing the found E_v value by P).



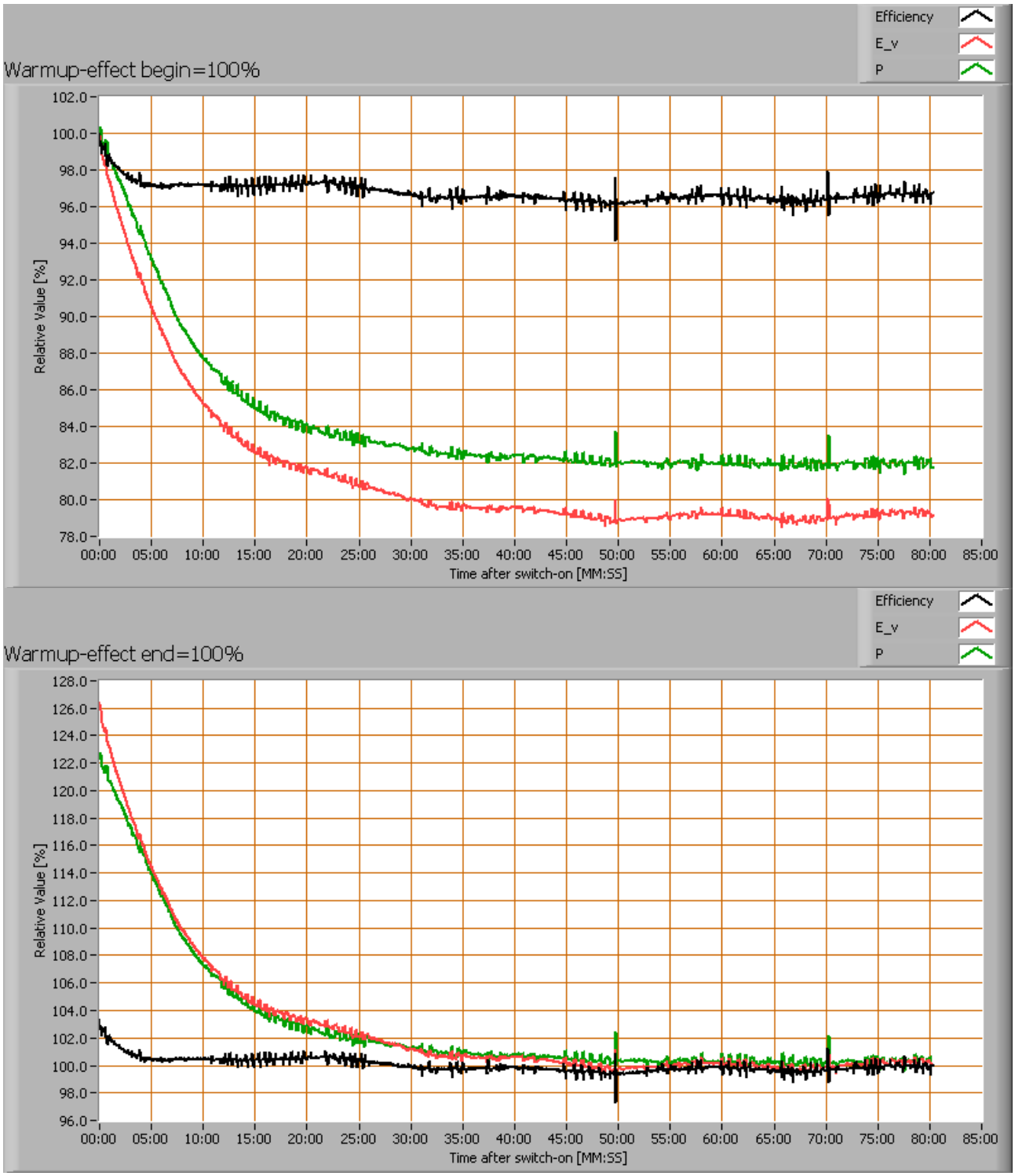
Lamp voltage dependencies of certain light bulb parameters

There is a constant dependency of the illuminance when the power voltage varies between 200 – 250 V AC. There is a constant dependency of the consumed power when the power voltage varies between 200 – 250 V AC.
When the voltage varies abruptly with + or – 5 V AC then this results in a variation of the illuminance of maximally 2.9 %. This difference in illuminance is not visible (when it occurs 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], the lamppower P [W] and the luminous efficacy [lm/W].

Lamp measurement report – 3 May 2011

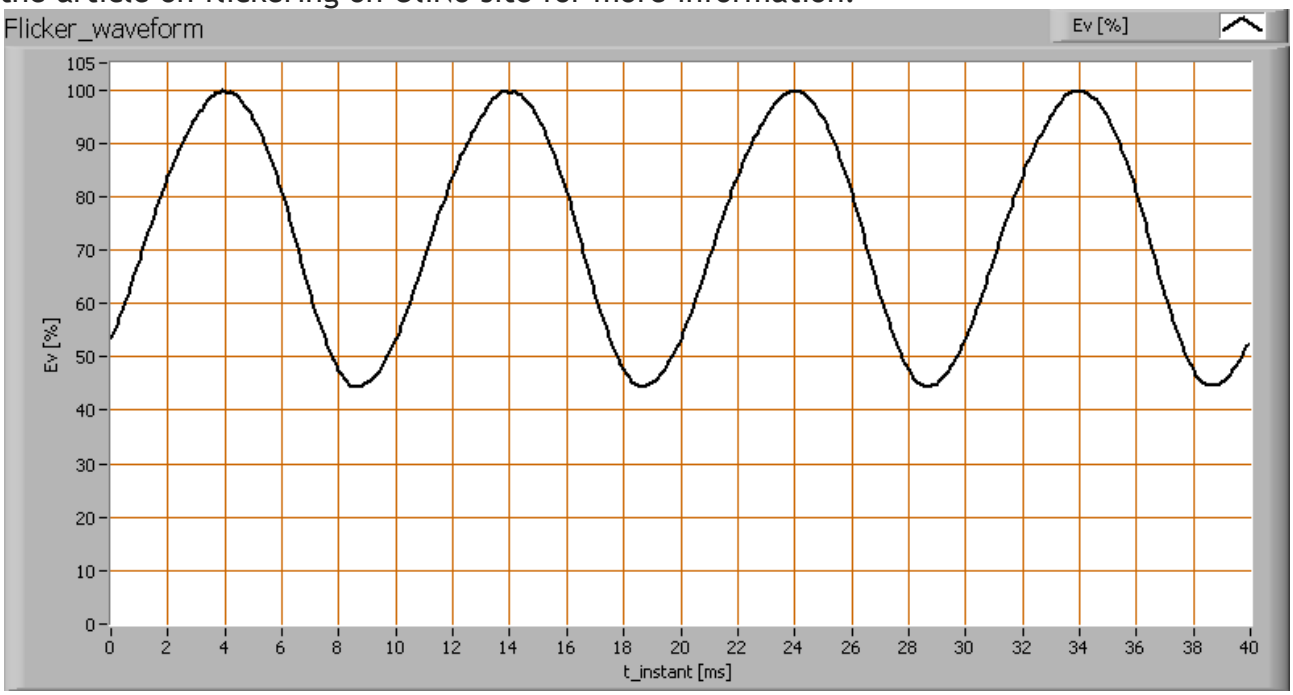


Effect of warming up on different light bulb parameters. In the first graph the 100 % level is put at begin, and in the last graph the 100 % level is put at the end.

During the warmup time the illuminance varies during 30 minutes and decreases with 21 %. During the warmup time the power varies during 31 minutes and decreases with 19 %.

Measure of flickering

An analysis is done on the measure of flickering of the light output by this light bulb. See the article on flickering on OliNo site for more information.



The measure of fast illuminance variation of the light of the light bulb

parameter	value	unit
Flicker frequency	100.0	Hz
Illuminance modulation index	38	%

The illuminance modulation index is computed as: (max_Ev – min_Ev) / (max_Ev + min_Ev).

Disclaimer

The information in this OliNo report is created with the utmost care. Despite this, the information

could contain inaccuracies. OliNo cannot be held liable in this instance nor can the data in this report be legally binding.

We strive to adhere to all of the conditions of any copyright holder in the publication of any illustration/article or item. In the event that we unintentionally violate said copyright holder's conditions in our articles, we kindly ask to be contacted here at OliNo so that we can resolve any disputes, issues or misunderstandings.

License