12 January 2011

To: International Energy Agency,

Re: Comments for IEA-4E-SSL Annex 2010-2014

Dear Sir/Madam,

First of all, we appreciate your efforts in making available performance tiers for solid state lighting products and wish you success with your ongoing task.

We are a SSL product manufacturer and would like to share the following general comments with you on the draft performance tiers:

a) **An acceptable test method and procedures** should be set for SSL products before performance tiers are set. For example, it should be specified whether lumen measurements are to be taken at 0 hrs (cold lumen) or at 20 hrs (hot lumen). From our own testing of various SSL products, we have found that stable light output occurs after approximately 20 hrs. Thus when lumen is measured at different time interval , it will greatly affect the lm/W value.

   According to IESNA–LM-79-08:

   > "The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours (for large SSL luminaries') …"

   We are not convinced that this claim is accurate for all SSL products. Even so, if test labs are not required to follow a common, acceptable method, different test results will be obtained for different measurement intervals. Any mistakes by the lab will be at the cost of manufacturer.

b) Lumens per watt (lm/W) is a very useful parameter in energy efficiency calculations, but can it be used as the basis for performance tiers? In most cases it can, but there are situations where it gives the wrong information. Consider figure 1 on pages 2 and 3. This shows test results—both integrated and distribution photometry—for an A60 LED lamp. As per the draft performance tier system,the results show that the lamp belongs to tier 1, but only because it failed in the lm/W requirement and is thus going to be grouped with lamps where Ra >= 70.

Moreover, it is not clear how the magic lm/W magic figures (40, 50, 65, 80, etc.) were derived. (We note that *lm/W* is sometimes used but so too is *lm/watt*. The authors of the draft should be careful about what unit they use first. If the parameter is mentioned with the unit, then subsequent mention of values without the unit is fine.)

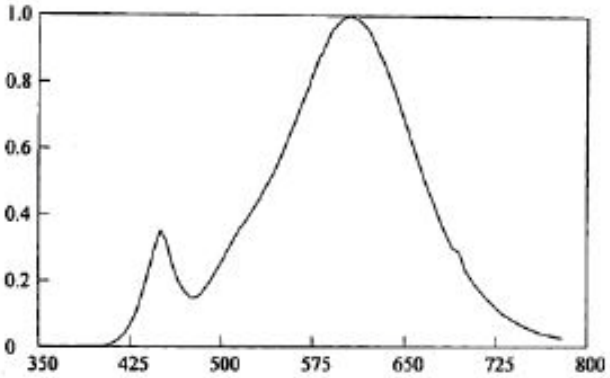
Manufacturer: Danson
Sample No.: 1#
Tested By: Blake

Date: 7-27-2011
Reviewed By: Miya

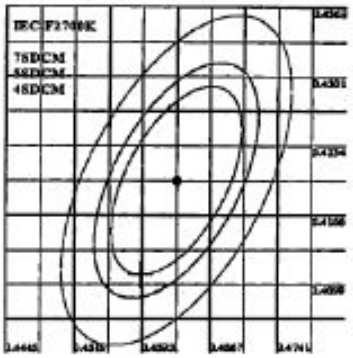
Test Condition

Temperature: 25.0°C
RH: 65.0%
Spectrum Range: 380-780 nm
Scan Step: 5 nm

Spectroradiometric Parameters



Spectral Distribution



SDCM:IEC-F2700K

x0=0.4630 y0=0.4200

Chromaticity Coordinates: x=0.4591 y=0.4109 u=0.2619 v=0.3516

Correlated Color Temperature: 2712 K
Dominant Wavelength: 583.0 nm(E)

Luminous Flux: 740.926 lm
Purity: 0.6120

Chromaticity Difference: 1.70E-04duv
Peak Wavelength: 604.8 nm

Red Color Ratio: 47.3%
Green Color Ratio: 46.7%

Blue Color Ratio: 6.0%
Color Tolerance: 4.0 SDCM

Rendering Index: Ra=80.7
Radiant Flux: 2.331 W

R1=78 R2=89 R3=97 R4=77 R5=78 R6=86 R7=83 R8=58

R9=8 R10=75 R11=75 R12=70 R13=81 R14=98 R15=72

Electric Parameters

Voltage: 240.03 V
Current: 0.09 A

Power Factor: 0.536
Power: 11.61 W

Luminous Efficacy: 63.818 lm/W

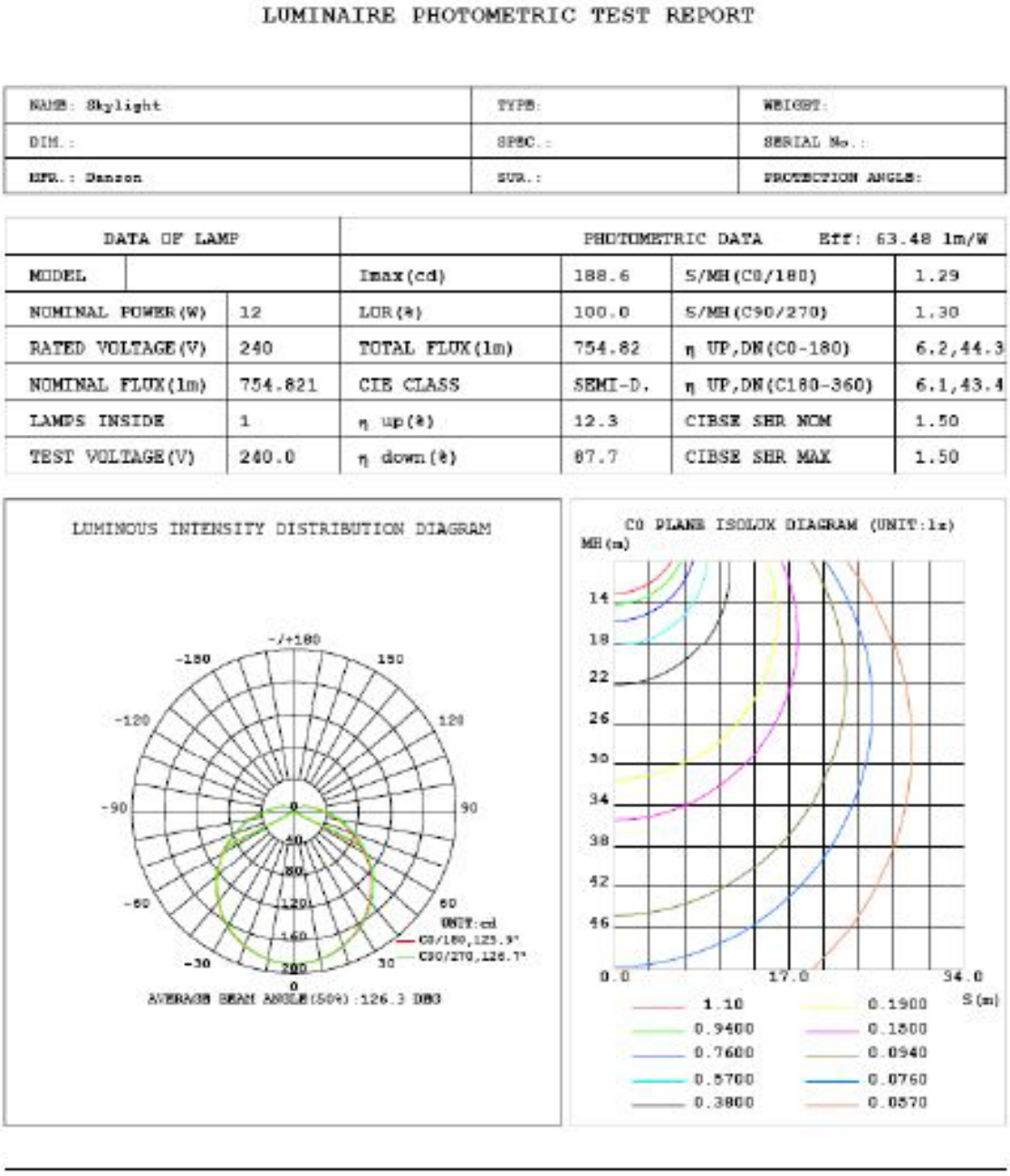


Figure 1: test results for an A60 LED lamp

There is always uncertainty with lumen measurements, just as there is with power measurements. Both uncertainties will affect any lm/W calculation. As per the basic rules governing calculations involving uncertain values, the uncertainty of constituent parameters (lm and W in this case) will only compound the uncertainty of calculations involving both those parameters (that is, lm/W).

An equivalency table is meaningful and it will give good information to the end user. But having the kind of performance tier system that is proposed is going to give a good marketer plenty of scope to exploit loop holes, and sell their products at a disadvantage to other, more scrupulous manufacturers.

c) Is the requirement that R9 is greater than 0 giving any meaningful indication to the end user as to the quality of the lamp? Further, why can't R9 be greater than *or equal to* 0?

Note that you can achieve R9 > 0 when Ra < 80 (as shown in figure 2 below):

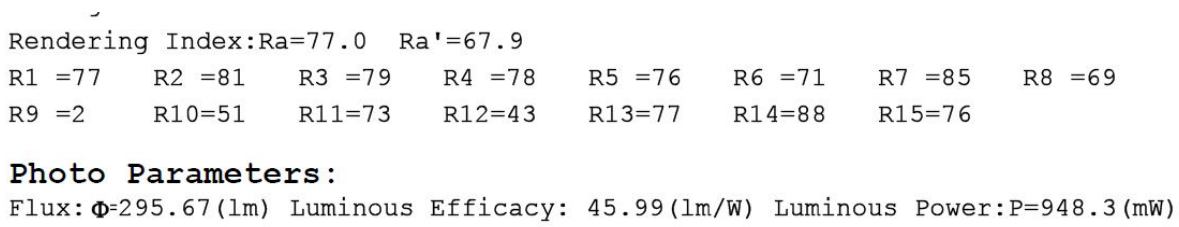


Figure 2: test results showing R9 > 0 with Ra < 80

Based on our CFLi experience, it seems that many quality parameters are proposed and added to specifications, but when it comes to implementation, nothing is done. Only the responsible manufacturer pays heed to the specification and works through the difficulties that must be overcome to meet the requirements. Most manufacturers, however, simply dump their products, claiming whatever they want to claim for their product. So it is important that when the IEA sets parameters, priority is given to the most important parameters.

d) If a CFLi cannot achieve a certain power factor, it cannot meet the harmonics requirements. This is also the case for LEDs. Consider the requirement for linear fluorescent lamps: the power factor (PF) must be greater than 0.5 and the total harmonic distortion (THD) no greater than 20%. This is somewhat amazing. If you do not set these requirements for LEDs correctly, there will be a never-ending debate as in the case of the CFLi.

To summarise: in some situations, LEDs are more energy efficient and in others they are at neck-to-neck with CFLi. But with the new developments in LED chips, lm/W for the complete product is going up. Hence, sooner or later LED products will be more energy efficient than CFLi.

At this stage the most important requirements for the LED products should be safety and EMC.

Most T8 LED products in the market have Ra < 80. Even though T8 LEDs with Ra > 80 are possible, most manufacturers aim for Ra value of approximately75 in order to keep the lumen at a high level. Technology in this area is still at developing. Hence, having a tier system for certain products is meaningless. Nonetheless, as honest manufacturers we will accept whatever challenge is put our way in order to meet whatever requirements are set by any organisation.

Based on our longstanding experience developing such products, we could elaborate on each and every relevant parameter. But if we did so, this letter would be never-ending. We just wish to alert you to some important facts.

Thank you for the opportunity to comment on the performance tier draft for SSL products.

Yours sincerely,

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