

Philips Electronics Draft Comments on September 18 Proposal for Energy Star Requirements for Integral LED Lamps

We are pleased to provide the following:

Definitions

Correlated Color Temperature (CCT)

For clarity the first sentence should state the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the LED is referred to as the color temperature.

Requirements for All Lamps

CCT and Duv

We suggest allowing all color bins specified in ANSI C78.377-2008 for products intended for outdoor applications and non-standard lamps and include the flexible 4200K CCT into the main list of eight nominal CCTs.

Color Maintenance

The way the current specification is written it is somewhat ambiguous and could be interpreted that the chromaticity may exceed the stated limit after 6,000 hours. However, the 6000 hours testing is part of an accelerated lumen maintenance testing, at specific conditions (e.g. for omnidirectional GLS replacement at 45°C). Due to the long life of LED lamps in general (and to obtain the label in due time), there is no other way to verify such a maintenance criteria (whether lumen maintenance or color maintenance) but by performing an accelerated test.

Is the minimum lumen maintenance test 3000 or 6000 hours? The specification should clearly state the number of hours for this determination such as 6000 hours since other hours are also referenced in the document.

CRI

We propose the minimum CRI be a function of CCT and application. It is not critical to have a low CRI for outdoor applications whereas indoor such as retail shops it becomes very critical. The proposal could be to keep the minimum CRI value of 80 for all lamps for indoor applications (usually along with a CCT of 2700K and 3000K), while for lamps

for outdoor applications should have a minimum CRI of 75 (as for outdoor applications higher CCT bins are used 4200K (4000K, 4500K, or perhaps higher as per ANSI C78.377-2008).

Dimming

First, a dimming standard for integral LED lamps must be established before the Energy Star requirements can be effective. Secondly, the manufacturer should have the option of making the lamp for dimming systems or not if there is additional cost to do so. The purpose of Energy Star is to accelerate the market acceptance of quality, energy saving products. Needless cost increases will increase price and prevent rapid market acceptance.

Secondly, until the standard for dimming is established and the Energy Star requirements become effective for that standard, manufacturers must label their products whether or not they are dimmable and must provide information either in the carton or on a website as to which dimmers they are compatible with.

Power Factor

We recommend:

For lamp power <5 W would no requirement. For lamp power between 5-25W a power factor of ≥ 0.6 and for lamp power greater than 25W, a $PF \geq 0.7$. This is consistent with PF categories for other products. Requirement should state clearly that it applies at 120V, 60Hz.

The current requirement of the DOE proposal (For lamp power >5W, power factor must be ≥ 0.70) is currently not feasible, especially when considering the lamp dimensions and that (when dimmable) the LED lamp shall be dimmable on most of the existing dimmers. Restricted dimensions (space), dimmability and such a power factor are not feasible currently, and if required will drastically delay the application of the DOE ENERGY STAR for LED Replacement lamps.

EMI and RFI

The latest proposal of DOE states the EMI/RFI requirement based on the final application/use (for consumer use (FCC 47 CFR Part 15) and/or industrial use (FCC 47 CFR Part 18). This is impractical: the lamp manufacturer can specify/recommend the application usage, but he cannot control the final customer application. Therefore, only one requirement would be the best compromise.

In past discussions/ proposals, we recommend using the FCC 47 CFR Part 18, similar to CFLi lamps. Another alternative would be to invoke Part 15, with Class B. (as proposed in NEMA's earlier proposal)

Packaging Requirements

Dimmable Lamps

Since dimmable integral LED lamps should comply with the (upcoming) standard for dimmable lamps (to be published by NEMA), the dimming range will be most likely an integral part of that standard. Therefore if (in future) the lamp is claimed to be dimmable, it has to comply with that standard and there is no need to specifically state the minimum sustained light output as a percentage of full light output.

Non-Standard Lamps

We do not believe non-standard lamps should be part of the Energy Star standard. If one of the purposes of energy Star is to quickly drive market acceptance of quality, energy saving products, the last thing they want to do is to confuse the market. By including non-standard lamps which may not properly fit in various residential applications since they would have non-standard shapes, this will lead to market dissatisfaction. We experienced the exact same issue with CFLi.

Minimum Luminous Efficacy

We recommend changing this to 40 lm/W and 45 lm/W rather than the 50 and 55 that are listed. These revised values work in concert with our recommended minimum CRI of 80.

Lumen Maintenance

The operating temperature should be reduced from 45C to 25C. It is very difficult to control the operating temperature and its tight tolerance as proposed ($\pm 1^{\circ}\text{C}$). Firstly, (with such a low tolerance) the definition of the operating temperature needs to be clearly specified: ambient temperature within a restricted area/ volume in which the lamp is tested, distance of point of temperature measurement to lamp, measurement point on lamp, etc.: the definition and location of the measurement point can easily represent several degrees in variation! Secondly, the tolerance is too tight to be maintained as such over the full lifetime test period. (Proposal: nominal temperature $\pm 10\%$)

Rapid Cycle Stress Test

Clearly a test procedure must be established and agreement reached for this test to be successful.

Replacement Lamps

Minimum Luminous Efficacy

The proposed values should be reduced to 45 lm/W and 50 lm/W. (LED lamp power <10W: 45 lm/W and LED lamp power >=10W: 50 lm/W). The charter for Energy Star is to reduce energy consumption within the US. As such, we would like to convert as many households to lower wattage products as fast as possible. If Energy Star is to do this, then we need to have realistic targets for efficacy. The maximum heat dissipated by the form factor of an A-lamp is roughly equivalent to 7 watts. All manufacturers will design to a 7 watt maximum. Is this low enough for industry to be considered acceptable for Energy Star?. Note, as shown today, to gain Energy Star for a 25 watt replacement will require a 4 watt bulb (at 50 lm/W efficacy), which is less than 7 watts. Are we really going to exclude a 7 watt replacement for Energy Star, just because a specification wants us to go to 4 watts? Why?

We suggest that Energy Star lower the requirements to 45 lm/W so that Energy Star can be achieved by lower wattage products earlier in the life cycle. Because the light benefits of LEDs are preferred (i.e. long life, no mercury, and instant turn-on), getting Energy Star earlier for these products will help lower the overall environmental impact of lighting

Omnidirectional Lamps

Minimum Light Output

We recommend the 35 W category remain as new LED products enter the market they do not necessarily have to have incandescent equivalents.

Luminous Intensity Distribution

Products shall have an even distribution of luminous intensity within the 0° to 120° zone (axially symmetrical). Luminous intensity at any angle within this zone shall not differ from the mean luminous intensity for the entire 0° to 120° zone by more than 25%.

[There needs to be an accepted procedure for measuring Luminous Intensity over different planes]

For non-directional lamps:

Need a definition of non-directional lamps to provide clarity.

Lumen Maintenance

The 45°C is only part of an **accelerated stress** test to evaluate and extrapolate the lumen maintenance. (It is our interpretation that the lamp is tested in an ambient environment of 45°C, for the duration of the test period (6000 hours). During the test period of 6000 hours, some lamp failures may happen due to electronic component (driver) failure... So the average lumen maintenance should only be computed over the surviving lamps; meaning that we need perhaps to test more than 10 lamps (to make sure that at the end of the test there are still 10 lamps alive).

Decorative Lamps

Minimum Luminous Efficacy

To promote the LED decorative lamp's applications and large adoption, we recommend changing the efficacy target to minimum 35 lumens/W, which works in concert with our recommended minimum CRI of 80.

Directional Lamps

Minimum Luminous Efficacy

We recommend changing this to 35 lumens/W and 40 lumens/W rather than the 40 and 45 that are listed.

Lumen Maintenance

The 45°C is only part of an **accelerated stress** test to evaluate and extrapolate the lumen maintenance. (It is our interpretation that the lamp is tested in an ambient environment of 45°C, for the duration of the test period (6000 hours). During the test period of 6000 hours, some lamp failures may happen due to electronic component (driver) failure... So the average lumen maintenance should only be computed over the surviving lamps; meaning that we need perhaps to test more than 10 lamps (to make sure that at the end of the test there are still 10 lamps alive).

PAR Lamps and MR16 Lamps

We recommend Energy Star define typical CBCP value for each level of replaced wattage, along with a minus tolerance (such as max -15 percent). We are concerned the use of an Excel spreadsheet to determine values can lead to manipulation of results.

Certification

If a laboratory is accredited by UL as a DAP or CSA-I within the scope, it does not matter if it is wholly owned by the manufacturer or if it is a third party. Data from the lab should be accepted, otherwise it will force undue costs and delay time to market.

END DRAFT