Testing and Emission Limits for LED Lights Comments

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Testing and Emission Limits for LED Lights Comments

To: US FCC Office of Engineering and Technology

Via: Electronic Submission via FCC E-filing

Submission: January 8, 2016

Regarding the following,

Draft Laboratory Division Publication Report

Office of Engineering and Technology

Title: LED Lighting Products

Short Title: LED Lighting

Reason: Clarification of testing equipment authorization requirements for LED lighting devices

OET Publication: 640677

Keyword Testing and Emission for LED Lights

Question: What rules and approval procedure apply to LED Lighting Devices?

Posted: January 8, 2016

Due Date: January 8, 2016

Submitted Comments

Philips appreciates the opportunity granted by the United States Federal Communications Commission (FCC) to comment on this draft clarification regarding testing and authorization requirements for LED Lighting Devices (FCC_LED_Lighting, 2015). The FCC Office of Engineering and Technology (OET) shall be commended and recognized because of their efforts to address this important subject.

1) Scope of Action

This new clarification proposal follows a previous OET clarification draft; RF Lighting Products Must Meet All FCC Standards to Mitigate Potential Harmful Interference to Radio Services (FCC_RF_Lighting, 2014). The 2015 clarification scope encompasses LED lights only as opposed to the 2014 clarification draft that included discharge lighting and LED lighting devices.

It seems to be a reasonable action because a discharge lighting regulation change will yield minimum results. Discharge lighting has two major components: High-Intensity Discharge (HID) lighting and Fluorescent (FLS) lighting. HID lighting continues to be massively operated from magnetic ballast; these systems tend to be exempted from emissions scanning because they operate at a frequency lower than 9 KHz. FLS lighting has shifted mostly to electronic ballast, typically operating in a frequency around 50 KHz; however, it is dealing quickly after the introduction of LED lights. The National Electrical Manufacturers Association (NEMA) tracks

fluorescent ballast shipments as described in Figure 1. Ballast shipments were about 26% less in 2014 than in 2010.

The final ballast shipment numbers for 2015 are still to be published; early indications lead to a belief that fluorescent ballast shipments have been reduced to be about 35% less than in 2010.

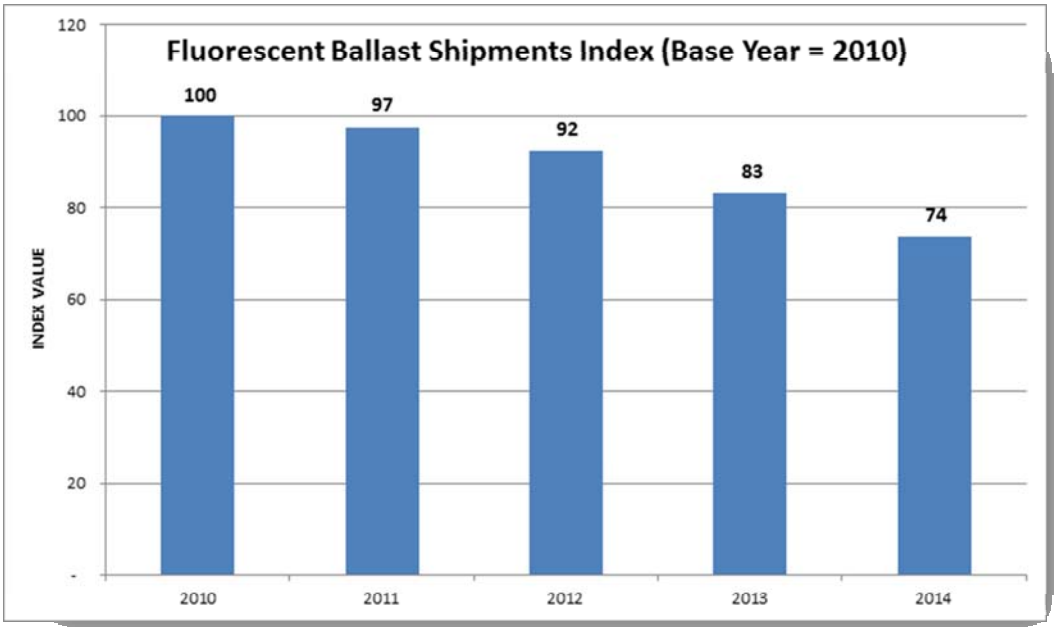

Figure 1. Illustrating NEMA's ballast shipments index.

Source: NEMA's Index 2014

Thus, a change of regulation for discharge lighting will have a minimum impact because it will affect a small number of products to be shipped to the marketplace as compared to the install base, in the period that this technology will remain relevant. We commend and support the

FCC OET 2015 draft scope that includes only LED Lights; discharge lighting devices may be addressed in a separate clarification if a need for it remains.

2) LED Lighting Device Definition

It is desirable to enhance the definition of LED light or device. It seems like the intent of the OET is to address LED devices used for general illumination, and that includes a clock frequency of at least 9 KHz. The use of the term RF LED Lighting Devices for General Illumination will be consistent with the current regulations used for RF General Illumination Lighting Devices (FCC-47-Part-15, 2009; FCC-47-Part-18, 2010) because it will reinforce the following concepts: a) It includes devices with a clock frequency equal to or higher than 9 KHz, b) it includes devices having their primary function to provide visible light to illuminate an area or object.

3) The Inclusion of Radiated Emissions Scans

RF LED Lighting devices tend to be used in a more flexible way than discharge lighting devices (Gluskin, Tsirbas, Kateri, & Topalis, 2013; McLean-Conner, 2011; NEMA-SSL1, 2010; Protzman & Houser, 2006; Royer, 2013; UL_8750, 2014); thus LED Lighting Devices power supply tend to have a variable frequency of operation to provide various stable points of operation. Most LED lighting devices output frequency of operation is 0 Hz (DC); however, various internal signals may be present. Input power electronic preconditioning to manage a wide range of input voltages (e.g., 120 to 277V) tends to result in a variable input current switching frequency in the input stage; load variation, programmability, and dimming tend to lead to a

variable commutated frequency in the output stage. This combination is unique and different than discharge lighting. We are in support to the OET (FCC_LED_Lighting, 2015) proposal to require radiated emissions scans regardless of the clock frequency and to use the FCC-47-Part-15, 2009 limits.

4) The Need of Class A and Class B Differentiated Limits

A differentiated set of limits is consistent with the ANSI C63 Recommended Practice for Electromagnetic Compatibility Limits (ANSI_C63_12, 1999). (See Figure 2.)

Table 5—Generic emission requirements—Residential

	Frequency	Limits		Test method
Radiated	30 to 230 MHz 230 to 1000 MHz	30 dB(μV/m) at 10 m QP[a] 37 dB(μV/m) at 10 m QP		ANSI C63.4-1992
Power-line conducted	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	Average 56 to 46 dB(μV) 46 dB(μV) 50 dB(μV)	Quasi-Peak 66 to 56 dB(μV) 56 dB(μV) 60 dB(μV)	ANSI C63.4-1992

[a]quasi-peak

Table 6—Generic emission requirements—Commercial and industrial

	Frequency	Limits		Test methods
Radiated	30 to 230 MHz 230 to 1000 MHz	40 dB(μV/m) at 10 m QP[a] 47 dB(μV/m) at 10 m QP		ANSI C63.4-1992
Power-line conducted	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	Average 66 dB(μV) 60 dB(μV) 60 dB(μV)	Quasi-Peak 79 dB(μV) 73 dB(μV) 73 dB(μV)	ANSI C63.4-1992

[a]quasi-peak

Figure 2. Showing ANSI differentiated emissions limits.

Note, adapted from: ANSI_C63_12. (1999). American National Standard Recommended Practice for Electromagnetic Compatibility Limits. New York, NY: The Institute of Electrical and Electronics Engineers, Inc.

Additionally, residential products tend to be mains connected through a power cord (outside of grounded conduit) and closer to the homeowner radio devices when compared with commercial or industrial locations.

5) Measurement Guidance

Following up with comments 3) and 4), including radiated emissions scans (regardless of the clock frequency) in the measurement guidance makes sense. Furthermore, the measurement guidance may be enhanced by including the adoption of the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz (ANSI_C63_4, 2014). This standard will be complemented by the Lighting devices test method Standard ANSI C63.29, when published.

The ANSI C63.29 working group has been discussing LED drivers testing conditions that are different than discharge lighting as described in item 3). LED programmable drivers (a popular technology) are capable of operating in various current and voltage operation points. It is suggested to perform radiated and conducted emissions scans in the four corners of the LED driver operational window as described in Table 1.

Table 1

LED Drivers Testing Conditions

Output Voltage	Output Current
Minimum output Voltage	Minimum output current
	Maximum output current
Maximum Output Voltage	Minimum output current
	Maximum output current

Following on with the existing emissions testing technology, RF LED lighting devices such as LED drivers, LED self-ballasted light sources (LED self-ballasted lamps and LED self-ballasted modules), LED self-ballasted OLEDs are to be tested. Luminaires intended for LED applications are not to be tested when they incorporate RF LED lighting devices already tested.

Summary

Philips appreciates the opportunity to comment on this important OET document focused on LED lighting devices. Table 2 presents a summary of the suggestions presented above. We will be looking for the opportunity to continue discussing this subject.

Table 2

Proposals summary

Item	Proposal
1	We commend and support the FCC OET 2015 draft scope that includes only LED lights; discharge lighting devices may be addressed in a separate clarification if a need for it remains.
2	The use of the term RF LED Lighting Devices for General Illumination
3	We are in support to the OET (FCC_LED_Lighting, 2015) proposal to require radiated emissions scans regardless of the clock frequency and to use the FCC-47-Part-15, 2009 limits.
4	A differentiated set of limits Class A and Class B
5	Including by adoption the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz (ANSI_C63_4, 2014)
	Perform radiated and conducted emissions scans in the four corners of the LED driver operational window
	RF LED lighting devices such as LED drivers, LED self-ballasted light sources (LED self-ballasted lamps and LED self-ballasted modules),

	LED self-ballasted OLEDs are to be tested. Luminaires intended for LED applications are not to be tested when they incorporate RF LED lighting devices already tested

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