

**Federal Communications Commission  
Office of Engineering and Technology  
Laboratory Division**

**August 27, 2014**

**Draft Laboratory Division Publications Report**

**Title:** RF Lighting Products Must Meet All FCC Standards to Mitigate Potential Harmful Interference to Radio Services

**Short Title:** RF Lighting

**Reason:** New publication to clarify testing requirements for lighting devices.

**Publication:** 640677

**Keyword/Subject:** RF Lighting, LED Fluorescent lamps, Ballast

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**Question:**

What is the current guidance for testing RF lighting devices including LEDs and fluorescent light ballasts?

**Answer:**

The attachment below [640677 D01 RF LIGHTING](#) provides guidance for testing RF lighting devices.

**Attachment List:**

[640677 D01 RF LIGHTING v01](#)

**RF LIGHTING PRODUCTS MUST MEET ALL FCC STANDARDS  
TO MITIGATE POTENTIAL HARMFUL INTERFERENCE TO RADIO SERVICES**

Radio frequency (RF) lighting products use RF energy to provide energy-efficient illumination and are subject to FCC rules to control potential interference to radio communications services. There have been several recent instances of harmful interference caused by certain of these products that were not compliant with FCC emissions limits. This KDB Publication clarifies how the present FCC rules apply to these products and outlines manufacturers' responsibilities for controlling interference to ensure compliance.

RF lighting technology has been available for more than 25 years. Typically, an RF signal is applied to a gas inside a lamp. RF ballasts used with fluorescent fixtures and compact fluorescent bulbs are two examples. These products are subject to the RF emissions limits in Part 18 of the FCC rules.

The Part 18 rules specify both AC power line conducted emissions limits below 30 MHz and radiated emissions limits above 30 MHz. (See §§ 18.307(c) and 18.305(c), respectively) Earlier generations of RF lighting products used operating frequencies below 3 MHz and rarely produced significant emissions above 30 MHz. Therefore, radiated emissions measurements were not routinely required. (See §18.309)

We are not aware of any significant interference caused by compact fluorescent lamps. However, we have recently observed interference caused by newly installed RF ballasts that produced significant radiated emissions well above 30 MHz into the UHF range of the spectrum (300 MHz–3 GHz), even though this equipment is being marketed as compliant with Part 18 of the FCC rules. We stress that manufacturers are responsible for compliance with the radiated emissions limits. ***The exception from routine testing above 30 MHz for devices that operate at less than 1.705 MHz does not eviscerate this rule and with this guidance we clarify that lighting devices are required to comply with the radiated emissions limits and we are requiring radiated emission testing to be performed up to 1000 MHz to demonstrate compliance.***

Light-emitting-diode (LED) lighting products use a different technology. In most cases they employ switching power supplies which operate at RF frequencies similar to those used in digital electronic products; they do not apply an RF signal to the gas in a lamp. As such, they are subject to the Part 15 rules for unintentional radiators and are subject to the "Verification" equipment authorization procedures with the line-conducted and radiated emissions limits in §§15.107 and 15.109, respectively. We are also aware of interference caused by LED lighting products, in particular in certain instances where a large number of lamps are used for applications such as large advertising or video displays at arenas or stadiums. ***With this guidance we also clarify that radiated emissions testing is required up to 1000 MHz for LED lighting products to ensure compliance with the radiated emissions requirements.***

The Commission will vigorously enforce these testing rules. In addition, we will vigorously enforce the underlying requirement not to interfere should any interference occur nonetheless. To avoid enforcement actions and possible sanctions, we strongly encourage manufacturers to help resolve any instances of harmful interference that may occur.

### **General Conditions of Operation**

Unintentional radiators are subject to operation on the condition that no harmful interference is caused. (See §§ 15.5 and 18.111). Manufacturers and importers (and users) should therefore note that lighting devices are required to cease operation if harmful interference occurs.

To help mitigate interference from lighting devices into authorized radio services, manufacturers and importers are encouraged to use good engineering designs and construction techniques to meet and even exceed the attenuation of unwanted emissions, extend compliance testing beyond procedures and guidance traditionally required, and advise the user on how to resolve harmful interference problems. (See §§ 15.15 and 18.109.)

Accordingly, in this guidance we are requiring that lighting devices which typically use frequencies below 1.705 MHz for their operation to perform radiated measurements up to 1000 MHz.<sup>1</sup>

### **Part 15 Lighting Devices Technical Requirements**

Lighting devices that power the bulb or tube with direct current (DC) or alternating current (AC) below 9 KHz and utilize switching power supply technology are authorized under FCC Part 15. An example of this type of device is an LED lighting device powered by a DC voltage from a switching power supply.

- *AC Power Line Conducted Emission Limits:* § 15.107(a) for Class B (residential) devices or § 15.107(b) for Class A (commercial) devices, as appropriate.
- *Radiated Emission Limits:* § 15.109(a) for Class B (residential) devices or § 15.109(b) for Class A (commercial), as appropriate. Radiated emission measurements are to be performed from **30 MHz to 1000 MHz**.
- *Equipment Authorization Procedure:* The “Verification” equipment authorization procedure is used for both Class A and Class B devices.

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<sup>1</sup> We recognize that §15.33(b) and § 18.309(a) specify when routine radiated emissions measurements are needed based on the highest frequency generated or used in the device or on which the device operates or tunes. However, to help mitigate interference from lighting devices we henceforth explicitly require that radiated emissions testing be performed from 30 MHz to 1000 MHz to demonstrate compliance with the applicable radiated emissions requirements.

## **Part 18 Lighting Devices Technical Requirements**

Lighting devices that power the bulb, tube, etc. using an RF signal that is applied to a gas inside a lamp are authorized under Part 18. Examples of these types of devices include ballasts for fluorescent lamps, and self-ballasted lamps powered from an RF source.

- *AC Power Line Conducted Emission Limits:* §18.307(c), for all equipment (i.e., consumer or non-consumer equipment).<sup>2</sup>
- *Radiated Emission Limits:* §18.305(c). Radiated emission measurements are to be performed from **30 MHz to 1000 MHz**.
- *Equipment Authorization Procedure:* The “Verification” equipment authorization procedure is used for non-consumer equipment; and the “Declaration of Conformity” (DoC) or “Certification” equipment authorization procedure is used for consumer equipment.

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<sup>2</sup> Note that there is a difference in the terminology between the Part 15 and 18 rules when referring to the applicability of the limits for different use conditions. Part 18 refers to “non-consumer” and “consumer” devices; and, Part 15 refers to “Class A digital device” and “Class B digital device.”