COMMENTS SUBMITTED BY:
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Subject:
Proposed Draft OET Clarification of Test Requirements for RF Lighting Devices
Comments regarding-- OET Publication 640677 D01 RF LIGHTING

This comment submission pertains to the recently released above Draft FCC Clarification regarding test requirements for RF Lighting Devices.

I am appreciative of this opportunity to comment, and I wish to start my comments by thanking OET for recognizing a need to undertake a clarification of RF Lighting requirements in the current era. Test requirements are a key aspect of Title 47 CFR Parts 15 and 18, particularly as applied to RF Lighting Devices.

Before commenting specifically on the Draft document, it is instructive to consider several other aspects that also are relevant to OETs expressed concerns, and why it is timely to solicit comments.

As stated by OET in the subject Draft Clarification regarding test requirements for RF Lighting Devices (subsequently referred to as the Draft in these comments) for over 25 years the existing requirements contained in Part 18 have been effective. By FCC's own admission, RF Lighting products have not been a source of many interference issues, especially when considering their numerical proliferation in the field (hundreds of millions). Further, the industry has a good record of responsiveness in the comparatively few cases where interference complaints have been reported.

Recently, RF Lighting technology has continued to evolve, and we find ourselves in a situation where the earlier efforts undertaken for Part 18, and that were based primarily on linear fluorescent RF ballast technology, and, later, electronically ballasted compact fluorescent lamps, may need to be reviewed for the newer emergent technologies and product configurations that are evolving as a result of high performance LED and OLED products that were not available 25 years ago.

These new solid state lighting (SSL) technologies are quickly becoming the most likely choice for future industrial, commercial, and residential applications, primarily due to long life, high

efficiencies, the ability to offer new features such as variable color, and the ability to drive a whole new approach to lighting design.

This is not just a US phenomenon; it is a global phenomenon. The US Department of Energy (US DOE) is heavily involved in promoting Solid State Lighting technology due to its potential to significantly reduce the connected electrical load for the lighting. Reducing the connected load not only directly benefits end user customers but also is key to increasing the energy security of the nation, reducing pollutants from power plants, and reducing carbon emissions which contribute to climate change. Many other nations are similarly promoting use of SSL technology for the same reasons. DOE and other international regulatory energy agencies continue to establish mandatory efficiency requirements that will further accelerate the adoption of this technology.

The initial transition to RF Lighting products was driven by the development of so called 'high frequency' electronic fluorescent lighting, where the operating frequency of the fluorescent ballast was typically greater than 20 KHz. This was made possible by the development of cost effective high voltage bipolar power transistors.

In these early systems, the key technology innovation was to operate fluorescent lamps at an RF frequency instead of the traditional 60 Hz. Linear fluorescent lamps become more efficient once the operating frequency exceeds even a few KHz. To avoid audible noise, it is necessary to operate above 20 kHz. Thus the major change impacting potential interference to authorized radio services was due to changing the ballast technology from 60 Hz electromagnetic to specialized switching circuits that would operate the lamps above 20 KHz.

A similar transition occurred when the same electronic RF ballast technology became available for plug-in pin based compact lamps as well as the development of RF operated integral self ballasted CFLs that could directly replace screw-in incandescent lamps. Although greatly simplified for purposed of these comments, this evolution resulted in what has since become the current, more historical and traditional use of RF Lighting Devices. A further development was to extend this technology to High Intensity Discharge (HID) lighting, where so called electronic ballasts are used to operate various types of HID lamps.

Refinements in electronic ballast and discharge lamp technology, including the proliferation of lighting controls, resulted in further increases in efficiency.

Much more recently, another evolution, driven by the replacement of traditional discharge lamps with LED light sources, began to occur. Although this technology is still in its relatively early stages, it is has already made impressive strides and it is clear to many experts that LED lighting being adopted quickly and will eventually replace the more traditional discharge fluorescent and HID lamp technology for many common applications in the field, in addition to replacing incandescent and halogen bulbs in both residential and commercial applications.

Since LED is not discharge based, it can be operated by simpler electronic circuitry that is akin to that of a switching power supply (AC line input with a DC or quasi DC output), and, in some cases, even non-electronic technology. FCC requirements for these products are covered by

CFR 47 Part 15, although the current FCC Part 15 does not specifically use the term RF Lighting Device nor does it specifically define or mention LED (SSL) lighting. Today such LED products include retrofit kits, drivers, LED bulbs, and completely integrated LED fixtures and track systems.

Compared to Part 18, Part 15 is much more complicated. As yet there has been no explicit revision of Part 15 to specifically incorporate RF Lighting Devices such as LEDs. As the LED and SSL revolution has included developments from many non-traditional entrants, including manufacturers and importers, and since there has been no current era rulemaking for Part 15 that discusses lighting, it is understandable that OET would seek to issue a Clarification to ensure that the requirements are understood for both the more traditional RF Lighting Devices historically covered under Part 18 for decades, and the more recent and accelerating development of LED and other SSL devices that are covered under Part 15. *Note that covering some products in Part 15 and others in Part 18, despite similar equipment authorization, measurement, informational, and technical requirements may not be the best approach for the future.*

In an attempt to issue some current era guidance, OET has issued its recent Draft on measurements and has solicited comments in an attempt to clarify the situation for LEDs and to clarify the inclusion of radiated measurements without exclusion via operating frequency via 18.309 for all RF Lighting Devices.

The following comments are respectfully submitted in an attempt to advance this discussion.

1) The OET proposes in its Draft to clarify its determination for both the radiated and conducted emission limit test requirements for both Part 15 and Part 18 RF Lighting Devices via publication of a final version of the Draft in the OET Knowledge Data Base (KDB).
2) Although expedient, since it avoids a NOI and Rulemaking, this approach is not adequate.
3) The OET KDB is not a user friendly tool. It requires the use of very specific key words in order to return pertinent information. The current KDB offers very little information for RF Lighting Devices, including LEDs.
4) The OET KDB cannot and should not take the place of amending the appropriate Title 47 regulatory language where appropriate after a more thorough discussion of the subject.
5) There is no assurance that manufacturers or importers or distributors of RF Lighting Devices will be sufficiently informed of new requirements or clarifications for existing requirements simply by a document that is housed only within the OET KDB and only if they happen to search on the right key words.
6) The only approach that will ensure the ability of all parties to consistently understand key requirements for covered products is to amend the regulatory language after a proper consultation with impacted stakeholders.
7) In previous rulemakings where FCC has elected to use the KDB as one of its provisions, this implementation has been included as part of a Report and Order. This ensures that manufacturers, importers, distributors, as well as test laboratories, are aware of the use

of the KDB via formal reference in the applicable Part. Use of the KDB by itself, and without a formal change to either Part 15 or Part 18 language will not ensure that those seeking to understand and comply with RF Lighting requirements will find those requirements *in a consistent manner*.

8) To further make this point, note that the proposed key words for the Draft Clarification are-

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

These proposed key words demonstrate the difficulty of this approach. Key words should align with regulatory language as a minimum, and then expansively add others that yield a high likelihood of directing a user to the intended guidance. Thus, an improved set would be

Lighting
RF Lighting
RF Lighting Device
LED
OLED
Light Emitting Diode
Organic Light Emitting Diode
Solid State Lighting
Fluorescent
Fluorescent Lamp
Ballast
Driver

Others keywords might additionally be proposed by the industry. Further technical and product developments may make it necessary to revise such a list periodically.

9) As a minimum, OET should create a prominent location on the OET web site that links to a collection of all RF Lighting requirements to ensure that all parties understand which products are covered and where in Title 47 all requirements reside. Without such an approach there is the potential very uneven accessibility, and, hence, uneven compliance.

10) Further, OET has acknowledged in its Draft that the technological evolution in RF Lighting Devices may have obviated the need to apply the 1.705 MHz exclusion for RF Lighting Devices. If this is justified, such a clarification should not be made simply via a statement in an OET KDB document that may or may not be readily found. The language in Parts 15 and 18 should be properly amended.

11) Amending Title 47 Parts 15 and 18 would also ensure a greater likelihood that any such change in RF Lighting requirements would be more readily harmonized throughout North America. Such harmonized requirements are of key practical importance to all impacted stakeholders, especially consumers.

12) In addition, since the situation with emerging technologies and the potential for interference is still not fully understood, and OET has not fully shared technical details

or examples of the relatively few cases of reported interference that have precipitated the proposed Draft, and since the Draft does not consider measurement assessment methods for emerging RF Lighting technologies and the new types of products that are being developed, OET should initiate a Notice of Inquiry to more fully investigate and understand the potential, if any, for interference from evolving RF Lighting Devices. MP4 and MP5 test methods should also be reviewed as part of any investigation.

13) Further, at the same time that lighting technology has been undergoing a fast paced evolution, it is also apparent that the same has been happening with some authorized radio and telecommunications services. It is not clear if some of these developments in new radio or telecommunication services may have inadvertently contributed to an increase susceptibility to emissions that would not have been reported as interference in the past. Such an investigation should also be considered if an NOI is initiated.

In closing, any effort to eliminate the 1.705 MHz exclusion for RF Lighting devices should be based on a deliberate technical rationale, should include reviewing the data known to FCC, and should consider measurement methods including appropriate distances for various product configurations. For example, at what distance should an LED scoreboard or stadium display be measured? Should it be the same distance as would be appropriate for a CFL? As explained in comments already submitted by another commenter, signal strength, noise floors, and other pertinent factors should be considered.

Respectfully,

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My background includes over 40 years of lighting R&D, product development (including RF Lighting), technical and program management, standards development, and over 35 years of EMI-EMC technical experience related to lighting products, systems, and measurements. My FCC background includes leading the lighting industry effort to provide comprehensive comments when FCC first incorporated specific requirements for RF Lighting Devices under Part 18. Subsequent efforts included developing additional FCC RF Lighting comments and petitions on further Part 18 RF Lighting rulemakings. International contributions include participating in the adoption of radiated emission limits for induction lighting in IEC CISPR 15, and I am the current US Technical Advisor for CISPR F.

End Comments