

Appendix 1A

BOOTH, FRERET & IMLAY, LLC

ATTORNEYS AT LAW

ROBERT M. BOOTH, JR. (1911-1981)
JULIAN P. FRERET (1918-1999)
CHRISTOPHER D. IMLAY

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June 30, 2015

Via E-mail and U.S. Mail
bruce.jacobs@fcc.gov
rashmi.doshi@fcc.gov

Bruce Jacobs, Chief
Spectrum Enforcement Division
Enforcement Bureau
Federal Communications Commission
445-12th Street, S.W.
Washington, D.C. 20554

Dr. Rashmi Doshi, Chief
Laboratory Division
Office of Engineering and Technology
Federal Communications Commission
7435 Oakland Mills Rd
Columbia MD 21046-1609

Re: Violation of Part 18 Regulations; Lumatek Dial-a-Watt/ Air Cooled
1000-Watt, 120-240 Volt RF Lighting Device (Electronic Ballast);
Conducted Emission Limit, Labeling and Marketing Violations.

Dear Mr. Jacobs and Dr. Doshi:

This office represents ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated. The purpose of this letter and the attached Conducted Emissions Test Report is to request on behalf of ARRL that the Commission investigate and commence an enforcement proceeding in order to halt immediately the marketing and retail sale of an RF lighting device in the United States known as the Lumatek Electronic Ballast. This device is intended for agricultural/horticultural deployment and is known as a "grow light." The device has been thoroughly tested by ARRL's laboratory as per the attached Test Report and has been found to grossly exceed the Conducted Emission limits set forth in Section 18.307(c) of the Commission's Rules. As well, the device is also being imported, marketed and sold in violation of, at least, Sections 18.203 and 18.213 of the Commission's Rules at numerous local and nationwide retail outlets in the United States

including Amazon (from which ARRL purchased the unit used for testing in ARRL's laboratory).

The instant complaint pertains to a different Lumatek RF lighting ballast than that which was the subject an ARRL complaint to your offices dated March 12, 2014, and about which apparently nothing has been done to date. The Lumatek device that is the subject of the instant complaint is actively being marketed to date and presumably deployed.

ARRL has received numerous complaints from amateur radio operators of significant noise in the Medium (MF) and High Frequency (HF) bands between 1.8 MHz and 30 MHz from "grow lights" and other RF lighting devices generally. In response to these complaints, among other things, ARRL purchased the Lumatek grow light at retail from Sears (i.e. Sears Holdings Corporation) through its web site. ARRL tested the device in its laboratory. The results of the tests made by ARRL are in the attached Conducted Emissions Test Report (the "Report"). These devices are easily capable of emitting RF noise sufficient to preclude Amateur Radio MF and HF communications (and as well AM Broadcast station reception) throughout entire communities.

The Lumatek grow light has been imported by Lumatek itself, a company located in Novato, California. See, <http://www.lumatekballast.com>. In addition to Amazon, the device is apparently available at retail sources including but not necessarily limited to those listed at page 1 of the attached Test Report.

As can be seen from the Report, ARRL tested the conducted emissions from this device according to the IEEE C63.4-2009 standard for Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment. At page 5, the Report concludes from the conducted emissions tests that the six highest emissions from the device in the HF band *vastly* exceed the Quasi-Peak limit specified in Section 18.307(c) of the Rules. For example, the Quasi-Peak limit in the bands between 3.0 and 30 MHz is 48 dBμV. The Lumatek device has a Quasi-Peak Interference Voltage at 6.1 MHz of 99 dBμV. At 14.9 MHz, the Quasi-Peak Interference Voltage is 72 dBμV. As per Appendix C of the Test Report, in both phase-to-ground and neutral-to-ground operating conditions, the conducted emissions limits are exceeded, sometimes by extreme margins, throughout the *entire* HF frequency range.

The level of conducted emissions from this device is so high that, as a practical matter, one RF ballast operated in a residential environment would create preclusive interference to Amateur radio HF communications throughout entire neighborhoods.

As discussed in Appendix B of the Report, there are, in addition to the blatantly excessive conducted emissions from this device, substantive marketing violations associated with this device. The Report indicates that there no FCC label or sticker on the device, as called for by Section 18.209(b) of the Rules for devices subject to Declarations of Conformity or certification. Nor is there any FCC compliance information anywhere in the documentation for the device, or in or on the box, or on the device itself. Marketing of

the device therefore does not comply with, at least, Sections 18.203 or 18.213(d) of the Commission's rules, which requires that RF lighting devices must provide an advisory statement, either on the packaging or with other user documentation, notifying the user that the operation of the device might cause interference to radio equipment operating between 0.45 MHz and 30 MHz. Variations of the language are permitted but presentation in a legible font or text style is required. No such notice is included with this device. Pursuant to Section 2.909 of the Commission's rules, the party responsible for FCC compliance with rules governing RF devices is, in the case of devices that are subject to a grant of equipment authorization, the equipment authorization grantee. Or, in the case of a device subject to a grant of a Declaration of Conformity, the responsible party is the importer. In this case, because there is no apparent grantee of equipment authorization, the Commission should look to the importer of the device as the responsible party.

ARRL respectfully requests that all such devices be removed from retail sale and marketing. Those devices that have been sold to consumers, or which are available for retail sale should be tracked and recalled. It is also requested that the importer of this device be subjected to a forfeiture proceeding commensurate with the Commission's enforcement policies.

Given the foregoing, on behalf of the more than 730,000 licensed radio amateurs in the United States, who have a significant interest in avoiding interference from these noncompliant devices, ARRL respectfully requests that your office take the appropriate action with respect to this device without delay.

Should any additional information be called for, please contact either the undersigned, General Counsel for ARRL, or Mr. Mike Gruber of the ARRL's staff, whose contact information is listed on the attached Report. Thank you very much for your consideration of this request.

Sincerely,

q). 

Christopher D. Imlay
General Counsel, ARRL

Attachment

Copies to: Growers House Hydroponic
Supplies
1501 East 21st Street
Tucson, AZ 85719

Sunlight Supply, Inc.
5408 N.E. 88th Street, Bldg. A
Vancouver, WA 98665

Appendix 1B



ARRL The national association for
AMATEUR RADIO™

ADMINISTRATIVE HEADQUARTERS
225 Main Street, Newington, Connecticut, USA 06111-1494
Telephone: 860-594-0200 ■ FAX: 860-594-0259
www.arrl.org

04/04/2014

Conducted Emissions Test Report

STANDARD	TITLE
IEEE C63.4 - 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

REVIEW	SIGNATURE	DATE
Performed By:	Mike Gruber – W1MG	4/4/14
Results Reviewed By:	Edward Hare – W1RFI	4/4/14

Summary of Test Results: **Fail**

EUT CONFIGURATION	
Manufacturer	Lumatek
Model Number	N/A
Model	Lumatek Electronic Ballast Dial-A-Watt / Air Cooled 1000W/120-240V
Serial Number	N/A
Importer	Lumatek
Retailers	Amazon Mail Order (purchased here) www.amazon.com See Appendix A for additional details. Other Sources include but not limited to: Growers House Hydroponics Supplies 1501 E 21 st St. Tuscon, AZ 85719 Tel: 855-289-1441 Email: staff@growershouse.com Sunlight Supply, Inc. Vancouver, WA (Corporate Headquarters) 5408 NE 88th Street, Bldg A Vancouver, WA 98665 Tel: 360-883-8846 Fax: 360-883-5395 SLS California Livermore, CA Tel: 925-337-8070 Fax: 925-454-1535



GENERAL INFORMATION

OBJECT

This document outlines the conducted emissions requirements applicable to lighting equipment covered under **47CFR18**. This procedure will be used for the testing of lighting products in the ARRL EMC laboratory.

EUT PASS CRITERIA (Consumer)

Table 1

Test Location	Test	Frequency Range	Limits
Power Supply	Conducted Emissions	0.45 MHz - 2.51 MHz	250 μ V / 48 dB(μ V) quasi peak
		2.51 MHz - 3 MHz	3,000 μ V / 70 dB(μ V) quasi peak
		3 MHz - 30 MHz	250 μ V / 48 dB(μ V) quasi peak

SETUP CHECKLIST

Initials	Setup
MG	The EUT should be in new condition, built to production specifications, using production parts and using production processes. (commercially available)
MG	Schedule EMC facility time with the ARRL Laboratory. (This test is performed by formally trained users of the EMC facility)
MG	Complete Equipment List Table.
MG	Connect output of LISN to input of EMC Receiver.
MG	Apply rated voltage to input of LISN.
MG	Connect the EUT to the LISN using a standard power cord supplied with the product. (approx. 1.2m in length)
MG	The Reference Ground Plane on the floor should be at least 2m x 2m in size and shall extend 0.5m beyond the footprint of the EUT.
MG	For measuring table-top devices, mount onto a table 0.8m high and use a vertical conducting plane at least 2m x 2m in size located 40cm to the rear of the EUT and bonded to the reference ground plane with 3cm-wide straps at intervals less than 1m.
MG	Test each EUT model number at its nominal (rated) voltage.
MG	Photograph the test setup and include in this test report.

TEST SETUP (insert photo)



EQUIPMENT LIST

Use the following equipment (or equivalent) in executing this procedure. If an equivalent piece of test equipment is used, then a note with the make, model, serial number, and calibration due date of the equipment must be made in the table.

Manufacturer	Description	Model Number	Serial Number	Cal Due
N/A	Conducted Emissions test area	N/A	N/A	N/A
R&S	EMC Spectrum Analyzer/EMI Receiver	FSH3	102393	06-21-14
N/A	Measurement Cable	N/A	N/A	N/A
R&S	Line Impedance Stabilization Network (LISN)	ENV216	100057	Self

CONDUCTED EMISSIONS TEST

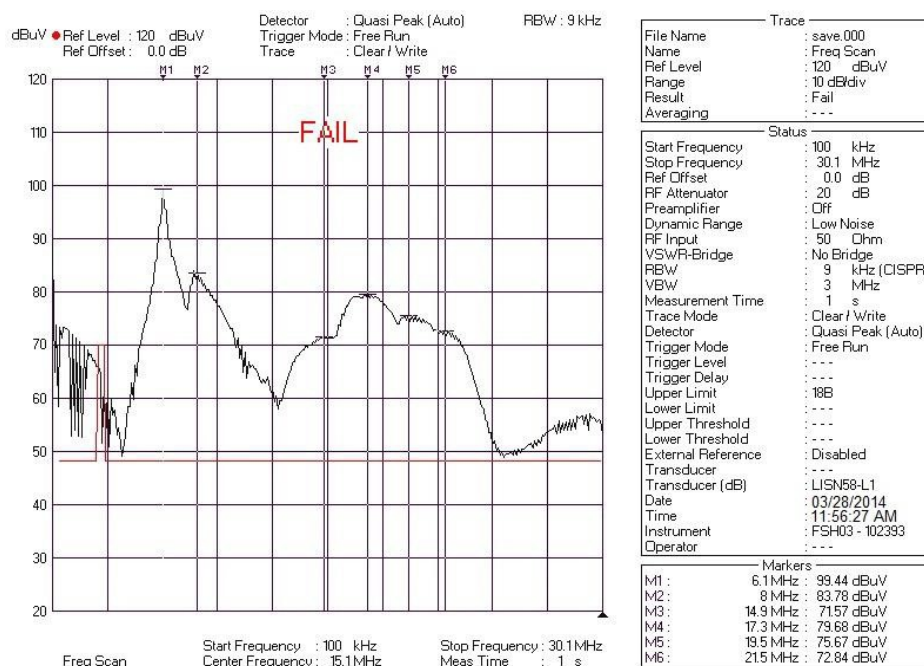
1. Bond the LISN to the ground plane of the test area using a grounding cable that is as short as possible.
2. Connect the EUT power cable to the Line Impedance Stabilization Network (LISN).
3. Measure the conducted emissions from the EUT using the LISN and a quasi-peak detector.
4. Record the six highest emissions from the EUT and compare the voltage to the limits specified in Table 1.
5. Attach emissions plots to this procedure.

Six Highest Emissions	Nominal Line Voltage	Interference Voltage (Quasi Peak)	Limit (Quasi Peak)	PASS / FAIL
6.1 MHz	120VAC	99 dB μ V	48 dB(μ V)	FAIL
8.0 MHz	120VAC	84 dB μ V	48 dB(μ V)	FAIL
14.9 MHz	120VAC	72 dB μ V	48 dB(μ V)	FAIL
17.3 MHz	120VAC	80 dB μ V	48 dB(μ V)	FAIL
19.5 MHz	120VAC	76 dB μ V	48 dB(μ V)	FAIL
21.5 MHz	120VAC	73 dB μ V	48 dB(μ V)	FAIL

(See Appendix B for additional rules violations.)

PLOT OF CONDUCTED EMISSIONS (PHASE TO GROUND)

NOTE: The Neutral conductor to ground spectra was very similar.



Lumatek Air Cooled Ballast at 400 Watt Setting

All Power Settings Are Similar. See Appendix C for supplemental data.

Appendix A

Lumatek Air Cooled Ballast Purchasing Info

On Ed Hare, ARRL Laboratory Manager, placed an on-line order with Amazon for the subject LumatekAir Cooled Ballast for grow lights. This order was placed through the ordering system at Amazon and shipped to ARRL from Grower's House Hydroponic Supplies in Tucson, AZ.

Supplemental and supporting documents are included as follows:

- 1) Amazon order
- 2) Email shipping notification
- 3) Contact information for Hydroponic Supplies

Hare, Ed W1RFI

From: Amazon.com [ship-confirm@amazon.com]
Sent: Tuesday, March 11, 2014 7:26 PM
To: Hare, Ed W1RFI
Subject: Your Amazon.com order of "NEW! LUMATEK LK1000AC..." has shipped!



[Your Orders](#) | [Your Account](#) | [Amazon.com](#)

Shipping Confirmation

Order #105-6269533-5786645

Hello Edward Hare,


Thank you for shopping with us. We thought you'd like to know that Growers House Com Hydroponics Supplies shipped your item, and that this completes your order. Your order is on its way, and can no longer be changed. If you need to return an item from this shipment or manage other orders, please visit [Your Orders](#) on Amazon.com.

Your estimated delivery date is:
Monday, March 17, 2014 -
Thursday, March 20, 2014

[Track Your Package](#)

Your order was sent to:
Edward Hare
ARRL
225 Main St
Newington, CT 06111
United States

Depending on the ship speed you chose, it may take 24 hours for tracking information to be available in your account.

GET A \$10 GIFT CARD upon approval for the Amazon.com Store Card  [Learn more](#)

Shipment Details



NEW! LUMATEK LK1000AC
1000W/600W/400W HPS/MH Digital Dimmable
Air-Cooled Ballast
Sold by Growers House Com Hydroponics Supplies
Condition: New



\$210.00

Item Subtotal:	\$210.00
Shipping & Handling:	\$0.00
Total Before Tax:	\$210.00
Shipment Total:	\$210.00
Paid by Amex:	\$210.00

Hare, Ed W1R

From: Growers House Com Hydroponics Supplies - Amazon Marketplace [43tp83c9z8dfsp1@marketplace.amazon.com]
Sent: Tuesday, March 11, 2014 7:24 PM
To: Hare, Ed W1RFI
Subj...: Your Growers House Order #26768 has shipped

Date: 11-Mar-2014

Shipp<,d to:

EDWARD HARE
225 MAIN ST
ARRL
NEWINGTON CT 06111-1400
CN!TED STATES

Ordered: 1 I WO-P09Y-IJW3 Lumak Ballast Dual Air Cooled use 400/600/1 000 wlttt HPS
or\1HBI;LBS PLL:S SCPER LCMENS **VI** i/ S210.00
Ordered: 1 ILKJOOOAC Lutnao:K JOOOW Air Cooled Dial A Watt Dimmable Ballast \$0.00

To track your package, click the link below.
[Federal Express Tracking Link](#)

Thanks for your order! Happy Growing :)

For Your Information: To help arbitrate disputes and preserve trust and safety, we retain all messages buyers and sellers send through Amazon.com for two years. This includes your response to the message above. Amazon.com uses filtering technology to protect buyers and sellers from possible fraud. Messages that fail this filtering will not be transmitted.

We want you to buy with confidence anytime you purchase products on Amazon.com. Learn more about Safe Online Shopping (<http://www.amazon.com/gp/help/customer/display.html?nodeId=551434>) and our safe buying guarantee (<http://www.amazon.com/gp/help/customer/display.html?nodeId=537868>).

[commMgrTok:A4U6CTSW7Z5RL]

855.289.1441 | [Review Lab](#) | [A-Z Glossary](#) | [Facebook](#) | [Twitter](#) | [Google+](#)Welcome to Growers House! | [My Account](#) | [My Wishlist](#) | [My Cart](#) | [Checkout](#) | [Log In](#)[Home](#) / [About GrowersHouse Hydroponics Supplies in Tucson AZ](#)

Welcome to Growers House ([GrowersHouse.com](#)) -- Let us help you grow the best plants you've ever seen.

Growers House is a family owned and operated hydroponics supply and indoor gardening center. We have both a retail and online store based out of Tucson, AZ to service our customers locally and globally. It is our belief that old business practices are becoming a scarce commodity today. Our goal is to provide our customers a large selection, [wholesale pricing](#), expert advice, [comparison tests](#), and most importantly, customer service. There are no automated phones, robots, or drone-like employees here. We answer the phone all the time when we're open and respond to emails usually within the hour.

If you need help getting started, we have a knowledgeable staff to help walk you through your first setup. Do you have experience but need some pointers on a [large-scale operation](#)? We've built numerous successful large gardens and work on a personal basis to make sure our customers' efforts succeed.

At Growers House we believe if you're not happy, then we haven't done our job.

Visit and shop at Growers House today if you're interested in price, advice, service, and selection. Happy Growing :)

Address:
1501 E 21ST Street
Tucson, AZ 85719

Phone: 855-289-1441
Fax: 520-333-3250
Email: staff@growershouse.com

We're Open (MST Time Zones):
M-F: 10 am to 7 pm
Sat: 10 am to 6 pm
Sun: 11 am to 5 pm

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Hare, Ed W1RFI

From: Growers House Com Hydroponics Supplies - Amazon Marketplace [43tp83c9z8dfsp1@marketplace.amazon.com]
Sent: Tuesday, March 11, 2014 7:24 PM
To: Hare, Ed W1RFI
Subject: Your Growers House Order #26768 has shipped



Date: 11-Mar-2014

Shipped to:

EDWARD HARE
225 MAIN ST
ARRL
NEWINGTON CT 06111-1400
UNITED STATES

Ordered: 1 Shipped: 1 W0-PO9Y-IJW3 Lumatek Digital Ballast Dual Air Cooled use 400/600/1000 watt HPS or MH BULBS PLUS SUPER LUMENS (NEW ON MARKET) \$210.00
Ordered: 1 Shipped: 1 LK1000AC Lumatek 1000W Air Cooled Dial A Watt Dimmable Ballast \$0.00

To track your package, click the link below:

[Federal Express Tracking Link](#)

Thanks for your order! Happy Growing :)

For Your Information: To help arbitrate disputes and preserve trust and safety, we retain all messages buyers and sellers send through Amazon.com for two years. This includes your response to the message above. Amazon.com uses filtering technology to protect buyers and sellers from possible fraud. Messages that fail this filtering will not be transmitted.

We want you to buy with confidence anytime you purchase products on Amazon.com. Learn more about Safe Online Shopping (<http://www.amazon.com/gp/help/customer/display.html?nodeId=551434>) and our safe buying guarantee (<http://www.amazon.com/gp/help/customer/display.html?nodeId=537868>).

[commMgrTok:A4U6CTSW7Z5RL]

APPENDIX B

Failure to Meet FCC Labeling Requirements

As the photos in this report show, there is no FCC label or sticker on this device. Furthermore, there is no FCC information included anywhere on the device, box or documentation. There is no reference to either Part 18 or Part 15 of the FCC rules.¹ This lack of proper labeling and documentation is an additional Part 18 rules violation.

Specifically, some of the more important rules that apply in this case are as follows. Please note that paragraph § 18.213 (d) specifically applies to RF Lighting Devices. In addition, some rules regarding equipment authorization under § 18.203 are included for reference purposes:

§ 18.203 Equipment authorization.

(a)) Consumer ISM equipment, unless otherwise specified, must be authorized under either the Declaration of Conformity or certification procedure prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in part 2, subpart J of this chapter and shall also be accompanied by:

(1) A description of measurement facilities pursuant to § 2.948, or reference to such information already on file with the Commission.

(2) A technical report pursuant to §§ 18.207 and 18.311.

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

(a) The interference potential of the device or system

(b) Maintenance of the system

(c)) Simple measures that can be taken by the user to correct interference.

(d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45–30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style.

¹ While not necessarily an FCC matter, we also note that the device does not have a UL label.

Furthermore, there isn't a UL label anywhere in the packaging material or documentation.

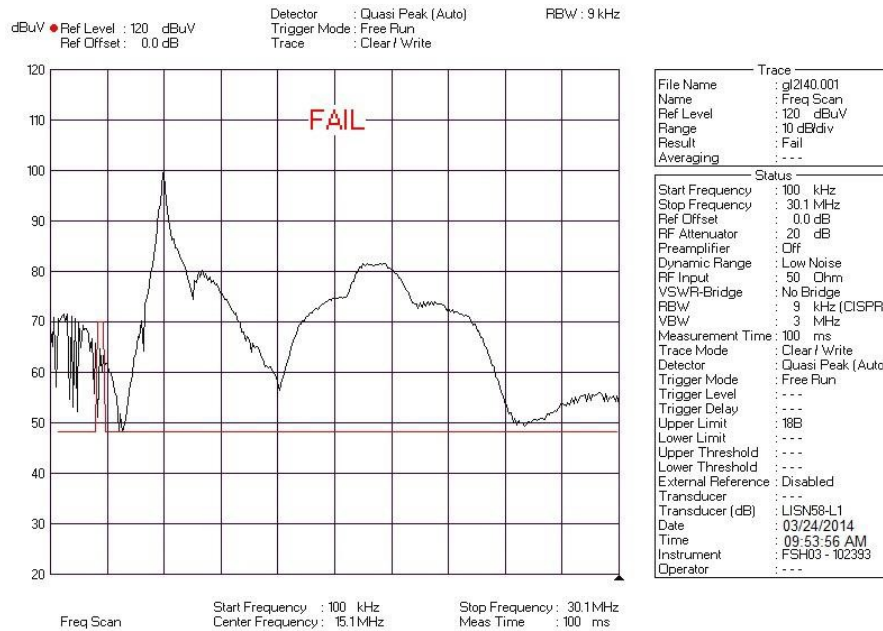
APPENDIX C

Lumatek Air-Cooled Ballast Conducted Emissions Testing Supplemental Data

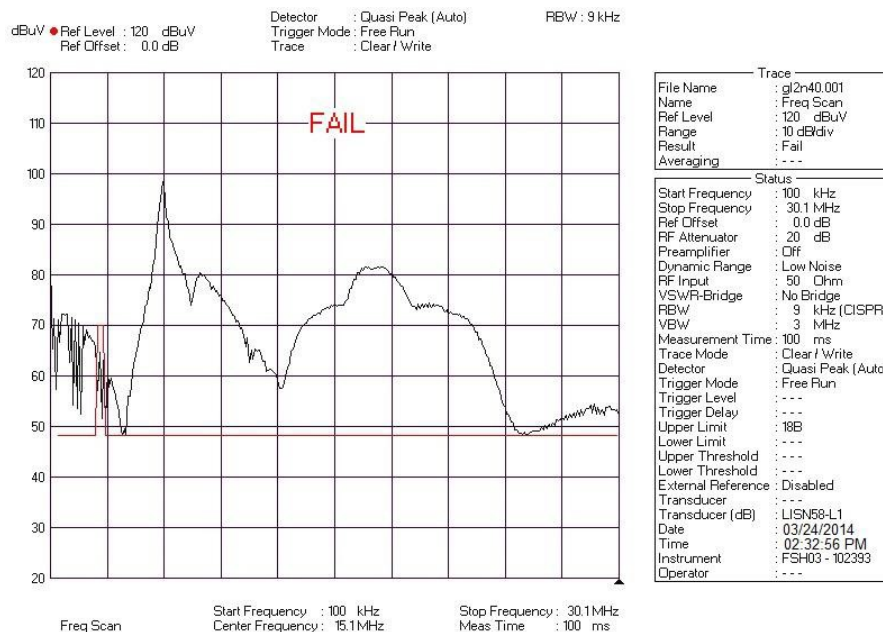
The Quasi Peak graphs in this Appendix show that the Lumatek Air-Cooled ballast significantly exceeds all FCC Part 18 limits under all operating conditions.

Lumatek Air-Cooled Ballast

400 Watt Setting 0.10 to 30.1 MHz

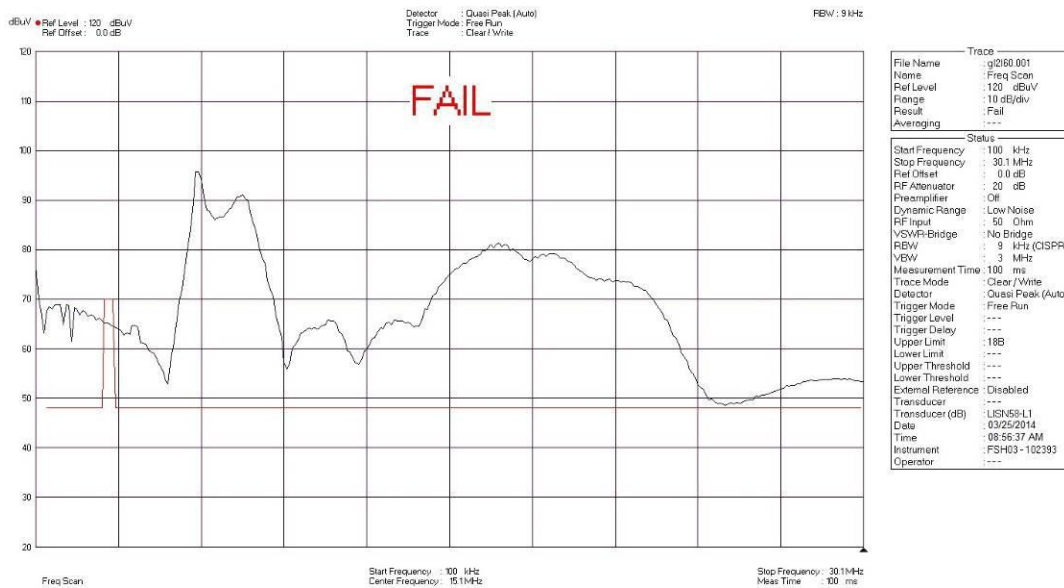


Phase to Ground

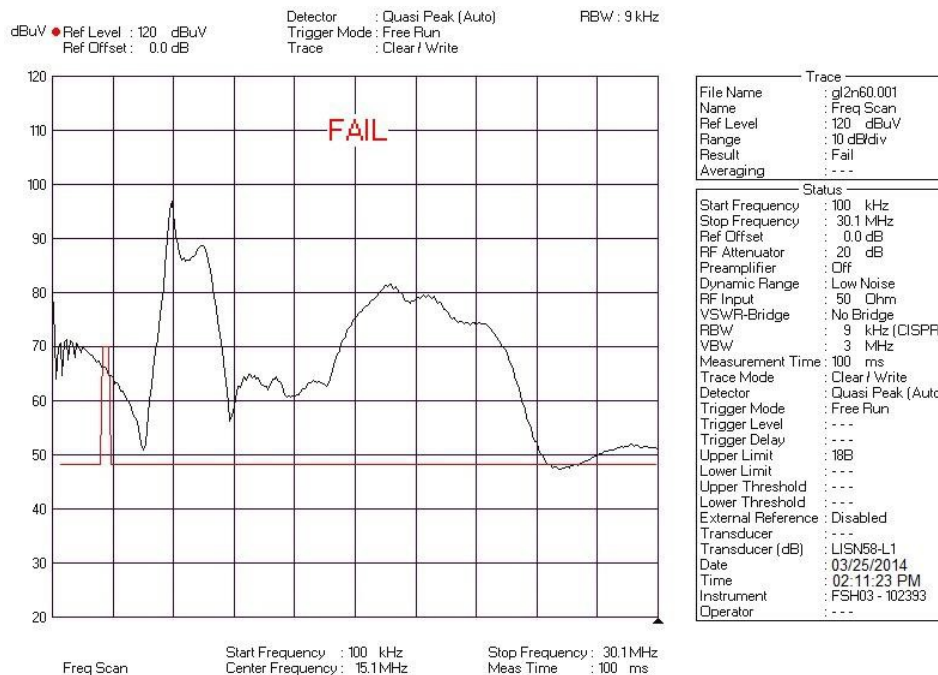


Neutral to Ground

Lumatek Air-Cooled Ballast **600 Watt Setting** **0.10 to 30.1 MHz**

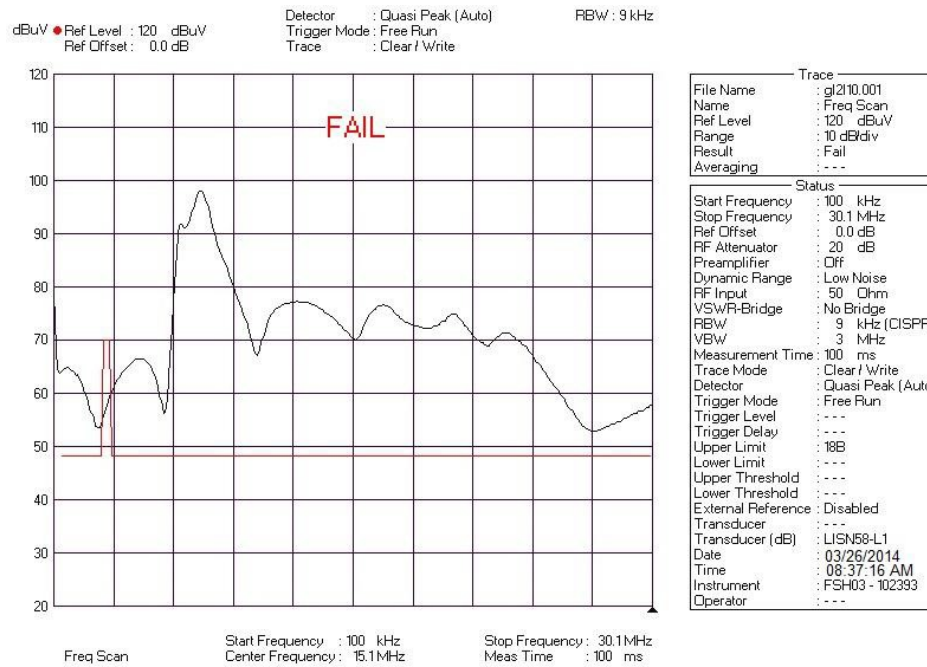


Phase to Ground

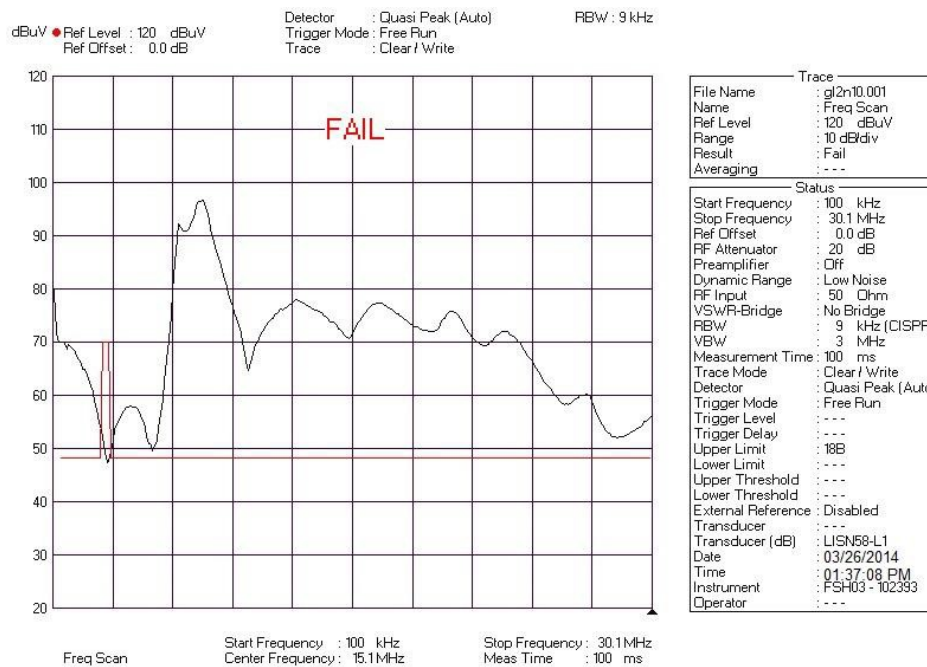


Neutral to Ground

Lumatek Air-Cooled Ballast **1,000 Watt Setting** **0.10 to 30.1 MHz**

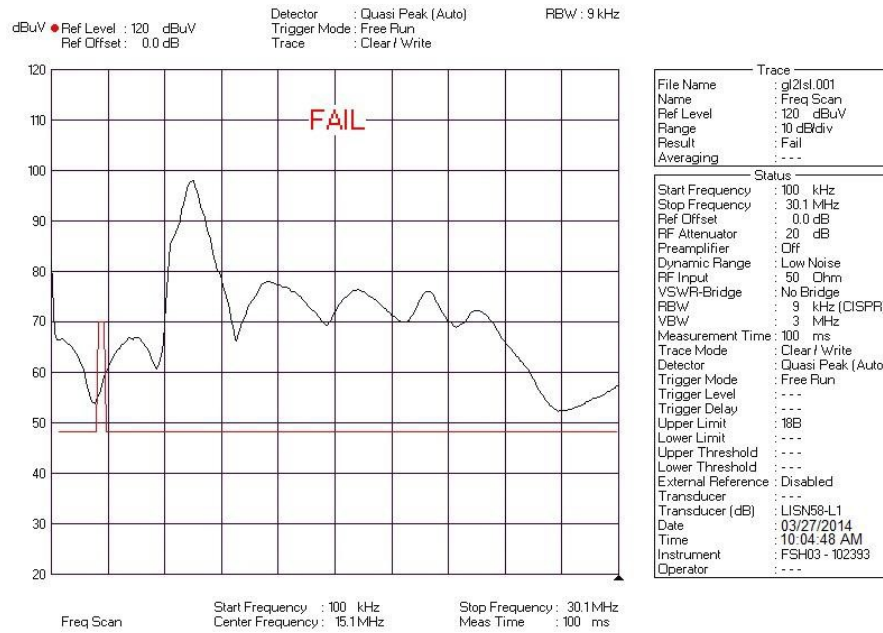


Phase to Ground

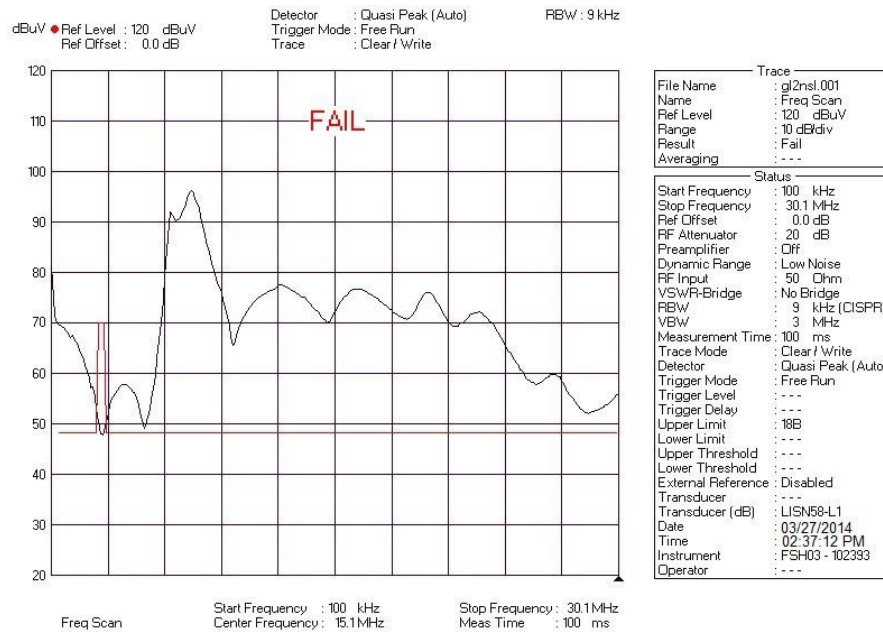


Neutral to Ground

Lumatek Air-Cooled Ballast **Super Lumens Setting** **0.10 to 30.1 MHz**



Phase to Ground



Neutral to Ground

Appendix 2A

BOOTH, FRERET & IMLAY, LLC

ATTORNEYS AT LAW

ROBERT M. BOOTH, JR. (1911-1981)
JULIAN P. FRERET (1918-1999)
CHRISTOPHER D. IMLAY

4356 CAPE MAY ROAD
SILVER SPRING, MD 20904-6011
WWW.IMLAYLAW.COM

TELEPHONE: (301) 384-5525
FACSIMILE: (301) 384-6384
CHRIS@IMLAYLAW.COM

June 30, 2015

Via E-mail and U.S. Mail

bruce.jacobs@fcc.gov
rashmi.doshi@fcc.gov

Bruce Jacobs, Chief
Spectrum Enforcement Division
Enforcement Bureau
Federal Communications Commission
445-1st Street, S.W.
Washington, D.C. 20554

Dr. Rashmi Doshi, Chief
Laboratory Division
Office of Engineering and Technology
Federal Communications Commission
7435 Oakland Mills Rd
Columbia MD 21046-1609

Re: Violation of Part 18 Regulations; Galaxy Legacy Selective Wattage
RF Lighting Device (Electronic Ballast); Conducted Emission Limit,
Labeling and Marketing Violations.

Dear Mr. Jacobs and Dr. Doshi:

This office represents ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated. The purpose of this letter and the attached Conducted Emissions Test Report is to request on behalf of ARRL that the Commission investigate and commence an enforcement proceeding in order to halt immediately the marketing and retail sale of an RF lighting device in the United States known as the Galaxy Legacy Selective Wattage Ballast. This device is intended for agricultural/horticultural deployment and is known as a "grow light." The device has been thoroughly tested by ARRL's laboratory as per the attached Test Report and has been found to grossly exceed the Conducted Emission limits set forth in Section 18.307(c) of the Commission's Rules. As well, the device is also being imported, marketed and sold in violation of, at least, Section 18.213 of the Commission's Rules at numerous retail outlets in the United States including Liquid Sun of Holyoke,

Massachusetts (from which ARRL purchased the unit used for testing in ARRL's laboratory).

The instant complaint is one of several being filed contemporaneously pertaining to various RF lighting ballasts which have been tested by ARRL's laboratory. As well, ARRL previously filed a complaint dated March 12, 2014 against an RF lighting ballast device imported and marketed by a company called Lumatek, about which apparently nothing has been done to date.

ARRL has received numerous complaints from amateur radio operators of significant noise in the Medium (MF) and High Frequency (HF) bands between 1.8 MHz and 30 MHz from "grow lights" and other Part 15 and Part 18 RF lighting devices. In response to these complaints, among other things, ARRL purchased the Galaxy grow light at retail from a company called Liquid Sun, located at 8 Lynwood Avenue, Suite 105, Holyoke, Massachusetts. ARRL tested the device in its laboratory. The results of the tests made by ARRL are in the attached Conducted Emissions Test Report (the "Report"). These devices are easily capable of emitting RF noise sufficient to preclude Amateur Radio MF and HF communications (and as well AM Broadcast station reception) throughout entire communities.

The Galaxy grow light has been imported by Sunlight Supply, a company located in Vancouver, Washington. See, <http://www.sunlightsupply.com>. In addition to Liquid Sun in Massachusetts, the device is apparently available at retail sources including but not limited to those listed at page 1 of the attached Test Report and at www.sunlightsupply.com/page/findretailer.

As can be seen from the Report, ARRL tested the conducted emissions from this device according to the IEEE C63.4-2009 standard for Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment. At page 5, the Report concludes from the conducted emissions tests that the six highest emissions from the device in the HF band *vastly* exceed the Quasi-Peak limit specified in Section 18.307(c) of the Rules. For example, the Quasi-Peak limit in the bands between 3.0 and 30 MHz is 48 dBµV. The Galaxy device has a Quasi-Peak Interference Voltage at 6.3 MHz of 106 dBµV. At 12.9 MHz, the Quasi-Peak Interference Voltage is 63 dBµV. As per Appendix C of the Test Report, in both phase-to-ground and neutral-to-ground operating conditions, the conducted emissions limits are exceeded, sometimes by extreme margins, throughout most of the HF frequency range.

The level of conducted emissions from this device is so high that, as a practical matter, one RF ballast operated in a residential environment would create preclusive interference to Amateur radio HF communications throughout entire neighborhoods.

As discussed in Appendix B of the Report, there are, in addition to the blatantly excessive conducted emissions from this device, substantive marketing violations associated with this device. The Report indicates that there no FCC label or sticker on the device, as called for by Section 18.209(b) of the Rules for devices subject to Declarations

of Conformity or certification. Nor is there any FCC compliance information anywhere in the documentation for the device, or in or on the box, or on the device itself. Marketing of the device therefore does not comply with, at least, Sections 18.209 or 18.213(d) of the Commission's rules, which requires that RF lighting devices must provide an advisory statement, either on the packaging or with other user documentation, notifying the user that the operation of the device might cause interference to radio equipment operating between 0.45 MHz and 30 MHz. Variations of the language are permitted but presentation in a legible font or text style is required. No such notice is included with this device. Pursuant to Section 2.909 of the Commission's rules, the party responsible for FCC compliance with rules governing RF devices is, in the case of devices that are subject to a grant of equipment authorization, the equipment authorization grantee. Or, in the case of a device subject to a grant of a Declaration of Conformity, the responsible party is the importer. In this case, because there is no apparent grantee of equipment authorization, the Commission should look to the importer of the device as the responsible party.

ARRL respectfully requests that all such devices be removed from retail sale and marketing. Those devices that have been sold to consumers, or which are available for retail sale should be tracked and recalled. It is also requested that the importer of this device be subjected to a forfeiture proceeding commensurate with the Commission's enforcement policies.

Given the foregoing, on behalf of the more than 730,000 licensed radio amateurs in the United States, who have a significant interest in avoiding interference from these noncompliant devices, ARRL respectfully requests that your office take the appropriate action with respect to this device without delay.

Should any additional information be called for, please contact either the undersigned, General Counsel for ARRL, or Mr. Mike Gruber of the ARRL's staff, whose contact information is listed on the attached Report. Thank you very much for your consideration of this request.

Sincerely,

q). 

Christopher D. Imlay
General Counsel, ARRL

Attachment

Copies to: Liquid Sun Massachusetts
8 Lynwood Avenue
Suite 105
Holyoke, MA 01040

Sunlight Supply, Inc.
5408 N.E. 88th Street, Bldg. A
Vancouver, WA 98665

Appendix 2B



ARRL The national association for
AMATEUR RADIO™

ADMINISTRATIVE HEADQUARTERS
225 Main Street, Newington, Connecticut, USA 06111-1494
Telephone: 860-594-0200 ■ FAX: 860-594-0259
www.arrl.org

04/25/2014

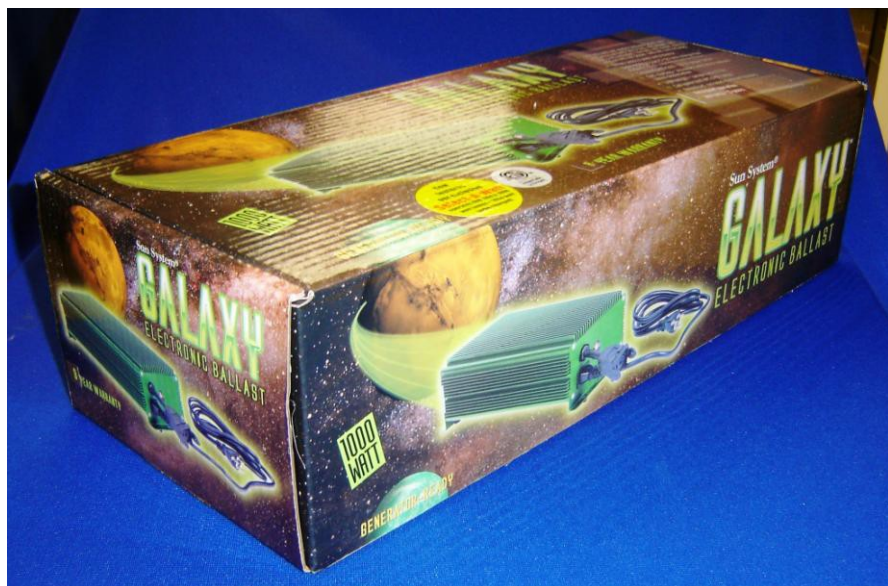
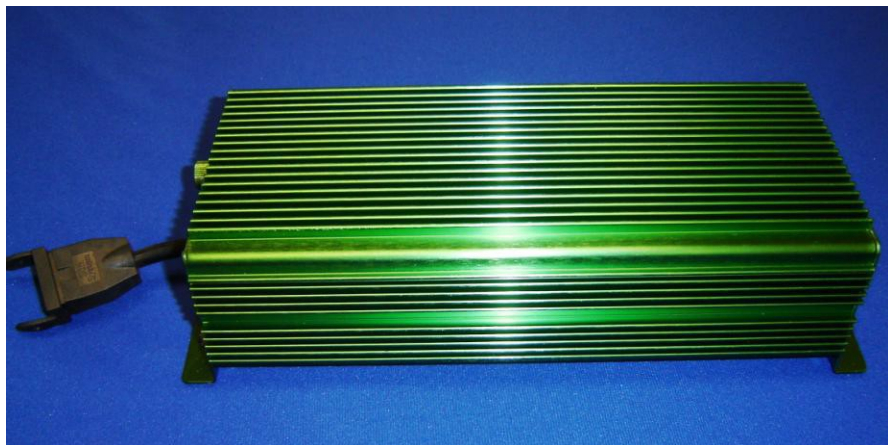
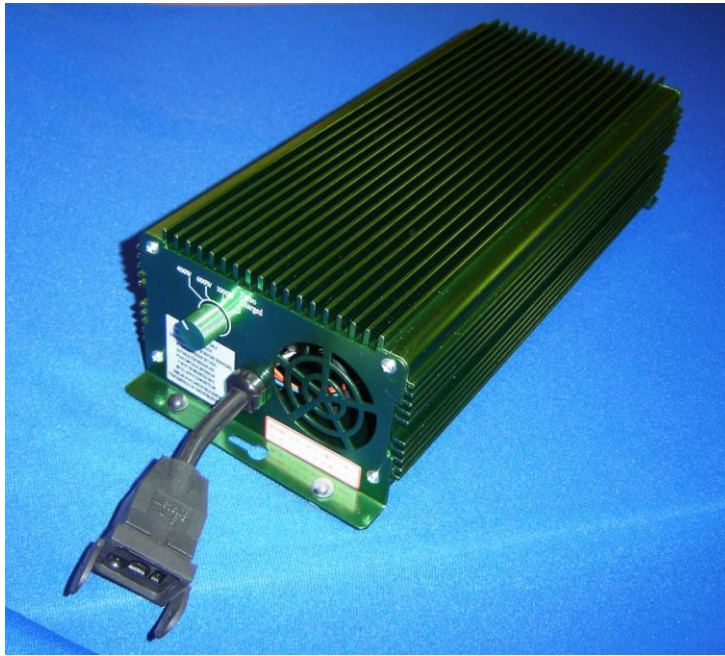
Conducted Emissions Test Report

STANDARD	TITLE
IEEE C63.4 - 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

REVIEW	SIGNATURE	DATE
Performed By:	Mike Gruber – W1MG	4/25/14
Results Reviewed By:	Edward Hare – W1RFI	4/25/14

Summary of Test Results: **Fail**

EUT CONFIGURATION	
Manufacturer	Galaxy
Model Number	N/A
Model	Legacy Selectable Wattage Ballast
Serial Number Importer (Note: This company also describes itself as a manufacturer, distributor and a wholesaler.)	N/A Sunlight Supply® , Inc. 5408 NE 88th St. Vancouver, WA 98665 Tel: (360) 883-8846 Web: www.sunlightsupply.com Sunlight Supply® also has a close business association with: National Garden Wholesale® Web: www.n-g-w.com
Retailers	Liquid Sun – Massachusetts (purchased here) 8 Lynwood Avenue Suite 105 Holyoke, MA 1040 Tel: (413) 732-3300 Web: http://liquidsun.bz See Appendix A for additional details. Other sources include but not necessarily limited to Sunlight Supply® product distributors of record. This list is too extensive for inclusion in this report. The complete list is available at: www.sunlightsupply.com/page/findretailer .



GENERAL INFORMATION

OBJECT

This document outlines the conducted emissions requirements applicable to lighting equipment covered under **47CFR18**. This procedure will be used for the testing of lighting products in the ARRL EMC laboratory.

EUT PASS CRITERIA (Consumer)

Table 1

Test Location	Test	Frequency Range	Limits
Power Supply	Conducted Emissions	0.45 MHz - 2.51 MHz	250 μ V / 48 dB(μ V) quasi peak
		2.51 MHz - 3 MHz	3,000 μ V / 70 dB(μ V) quasi peak
		3 MHz - 30 MHz	250 μ V / 48 dB(μ V) quasi peak

SETUP CHECKLIST

Initials	Setup
MG	The EUT should be in new condition, built to production specifications, using production parts and using production processes. (commercially available)
MG	Schedule EMC facility time with the ARRL Laboratory. (This test is performed by formally trained users of the EMC facility)
MG	Complete Equipment List Table.
MG	Connect output of LISN to input of EMC Receiver.
MG	Apply rated voltage to input of LISN.
MG	Connect the EUT to the LISN using a standard power cord supplied with the product. (approx. 1.2m in length)
MG	The Reference Ground Plane on the floor should be at least 2m x 2m in size and shall extend 0.5m beyond the footprint of the EUT.
MG	For measuring table-top devices, mount onto a table 0.8m high and use a vertical conducting plane at least 2m x 2m in size located 40cm to the rear of the EUT and bonded to the reference ground plane with 3cm-wide straps at intervals less than 1m.
MG	Test each EUT model number at its nominal (rated) voltage.
MG	Photograph the test setup and include in this test report.

TEST SETUP (insert photo)



EQUIPMENT LIST

Use the following equipment (or equivalent) in executing this procedure. If an equivalent piece of test equipment is used, then a note with the make, model, serial number, and calibration due date of the equipment must be made in the table.

Manufacturer	Description	Model Number	Serial Number	Cal Due
N/A	Conducted Emissions test area	N/A	N/A	N/A
R&S	EMC Spectrum Analyzer/EMI Receiver	FSH3	102393	06-21-14
N/A	Measurement Cable	N/A	N/A	N/A
R&S	Line Impedance Stabilization Network (LISN)	ENV216	100057	Self

CONDUCTED EMISSIONS TEST

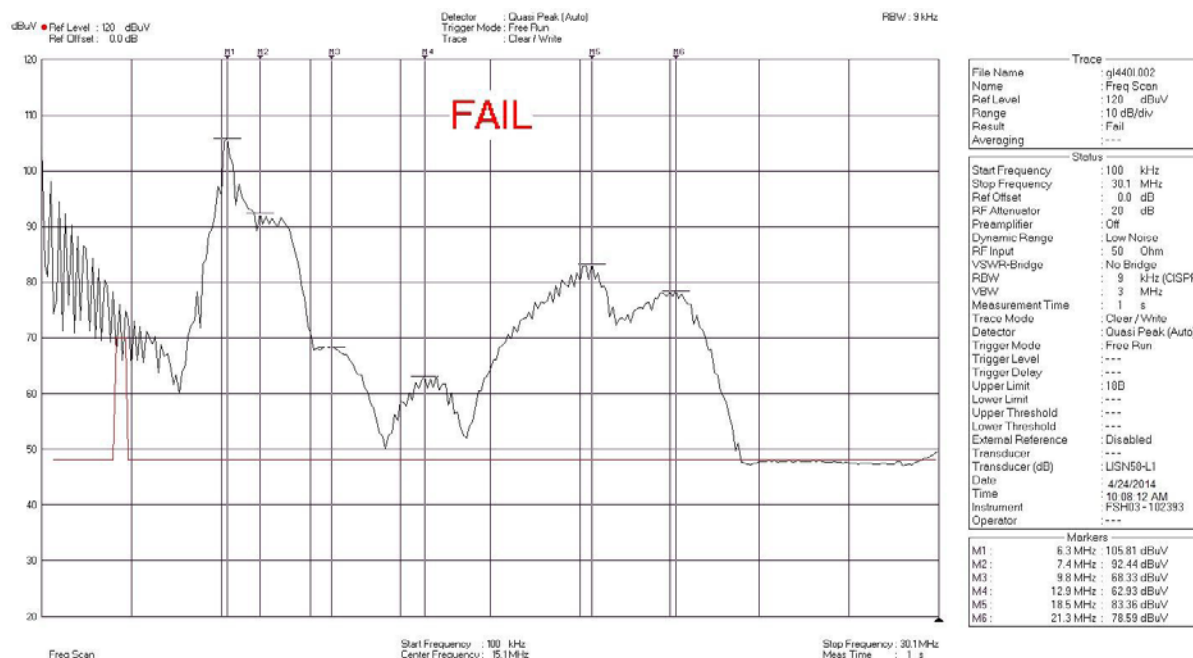
1. Bond the LISN to the ground plane of the test area using a grounding cable that is as short as possible.
2. Connect the EUT power cable to the Line Impedance Stabilization Network (LISN).
3. Measure the conducted emissions from the EUT using the LISN and a quasi-peak detector.
4. Record the six highest emissions from the EUT and compare the voltage to the limits specified in Table 1.
5. Attach emissions plots to this procedure.

Six Highest Emissions	Nominal Line Voltage	Interference Voltage (Quasi Peak)	Limit (Quasi Peak)	PASS / FAIL
6.3 MHz	120VAC	106 dB μ V	48 dB(μ V)	FAIL
7.4 MHz	120VAC	92 dB μ V	48 dB(μ V)	FAIL
9.8 MHz	120VAC	68 dB μ V	48 dB(μ V)	FAIL
12.9 MHz	120VAC	63 dB μ V	48 dB(μ V)	FAIL
18.5 MHz	120VAC	83 dB μ V	48 dB(μ V)	FAIL
21.3 MHz	120VAC	79 dB μ V	48 dB(μ V)	FAIL

(See Appendix B for additional comments on required FCC product labeling.)

PLOT OF CONDUCTED EMISSIONS (PHASE TO GROUND)

NOTE: The Neutral conductor to ground spectra was very similar.



Galaxy Legacy 1000 Watt Dimmable Ballast at 400 Watt Setting
All Power Settings Are Similar. See Appendix C for supplemental data.

Appendix A

Galaxy 1000 Watt Dimmable Ballast Purchasing Info

On April 23, 2014, an ARRL Laboratory Engineer used a personal credit card to purchase a Galaxy 1000 Watt Dimmable Ballast for grow lights. This purchase was made at the following nearby retail store:

Liquid Sun – Massachusetts
8 Lynwood Avenue Suite 105
Holyoke, MA 01040
Tel: (413) 732-3300
Web: <http://liquidsun.bz>

See the following sales receipt for supplemental and supporting documentation.

5571567 LIQUID SUN INC 8 LYNWOOD AVE HOLOKEE, MA 01040 (413)539-6875		Date: 4/23/14	
Term ID: 001	Ref #: 001	Address:	
Sale		Reg. No.	Clerk
XXXXXXXXXXXX	Entry Method: Swiped	1	Galaxy/KS
MASTERCARD		2	
04/23/14	10:02:40	3	
Inv #: 000001	Appr Code: 02141Z	4	
Apprvd: Online	Batch#: 113001	5	
Total:	\$ 265.00	6	
Customer Copy		7	
		8	
		9	
		10	
		11	
		12	
		13	
		14	
		15	

A-150003510/3530 Your Amount Stated to Date - If Error is Found, Return at Once
T-45202/46202/46203

APPENDIX B

Galaxy 1000 Watt Dimmable Ballast Fails to Meet FCC Labeling Requirements

As the photos in this report show, there is no FCC label or sticker on this device. Furthermore, there is no FCC information included anywhere on the device, box or documentation. There is no reference to either Part 18 or Part 15 of the FCC rules.¹ This lack of proper labeling and documentation is an additional Part 18 rules violation.

Specifically, some of the more important rules that apply in this case are as follows. Please note that paragraph § 18.213 (d) specifically applies to RF Lighting Devices. In addition, some rules regarding equipment authorization under § 18.203 are included for reference purposes:

§ 18.203 Equipment authorization.

(a)) Consumer ISM equipment, unless otherwise specified, must be authorized under either the Declaration of Conformity or certification procedure prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in part 2, subpart J of this chapter and shall also be accompanied by:

- (1) A description of measurement facilities pursuant to § 2.948, or reference to such information already on file with the Commission.
- (2) A technical report pursuant to §§ 18.207 and 18.311.

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c)) Simple measures that can be taken by the user to correct interference.
- (d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45–30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style.

¹ While not necessarily an FCC matter, we also note that the device does not have a UL logo, although
Conducted Emissions ARRL CONFIDENTIAL Page 7 of 12

there is a label on the device with a UL reference.

APPENDIX C

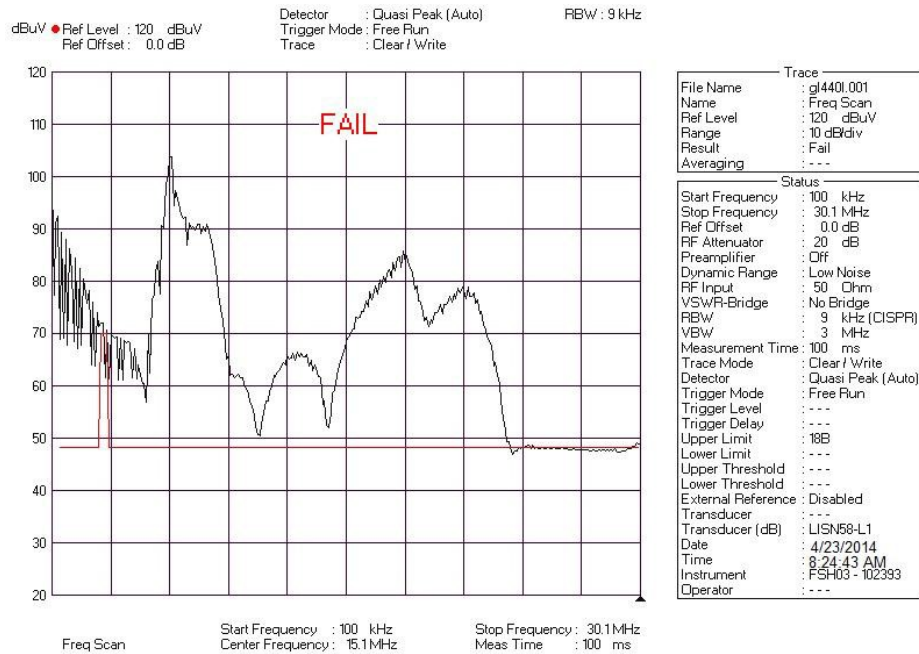
Galaxy Legacy 1000 Watt Dimmable Ballast Conducted Emissions Testing Supplemental Data

The Quasi Peak graphs in this Appendix show that the Galaxy Legacy 1000 Dimmable ballast significantly exceeds all FCC Part 18 limits under all operating conditions.

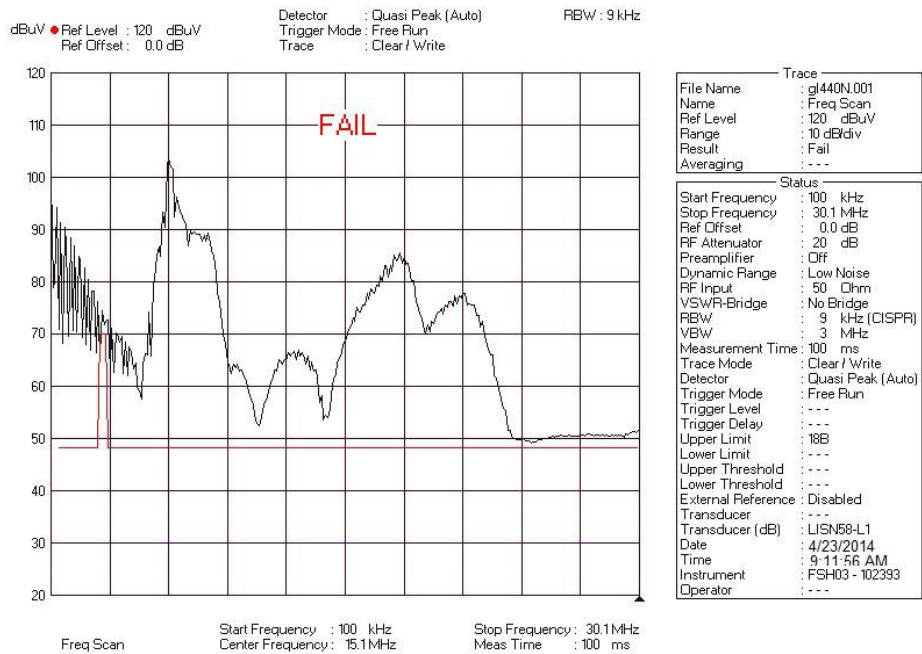
Galaxy Legacy 1000W Dimmable Ballast

400 Watt Setting

0.10 to 30.1 MHz



Phase to Ground

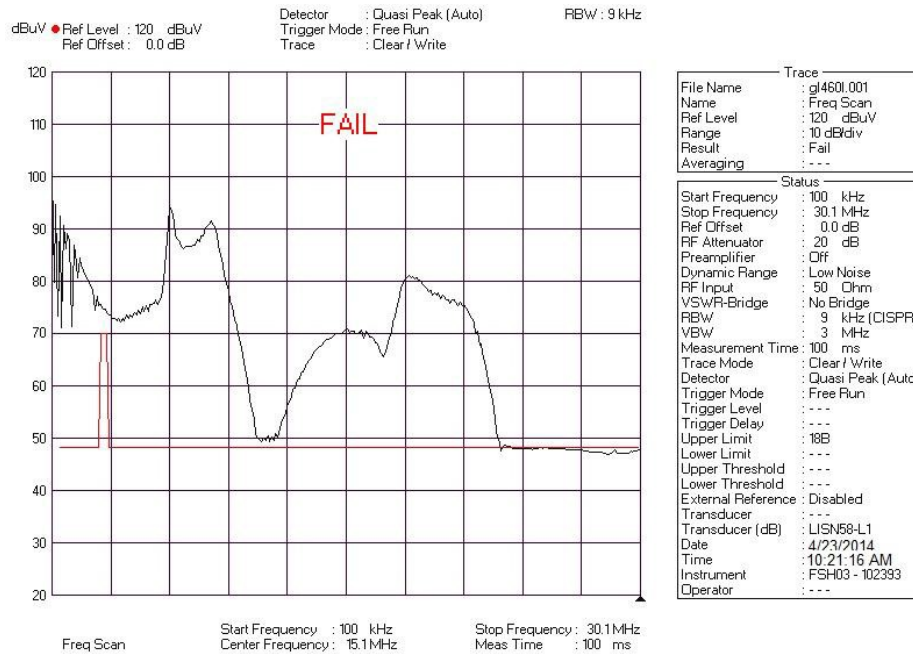


Neutral to Ground

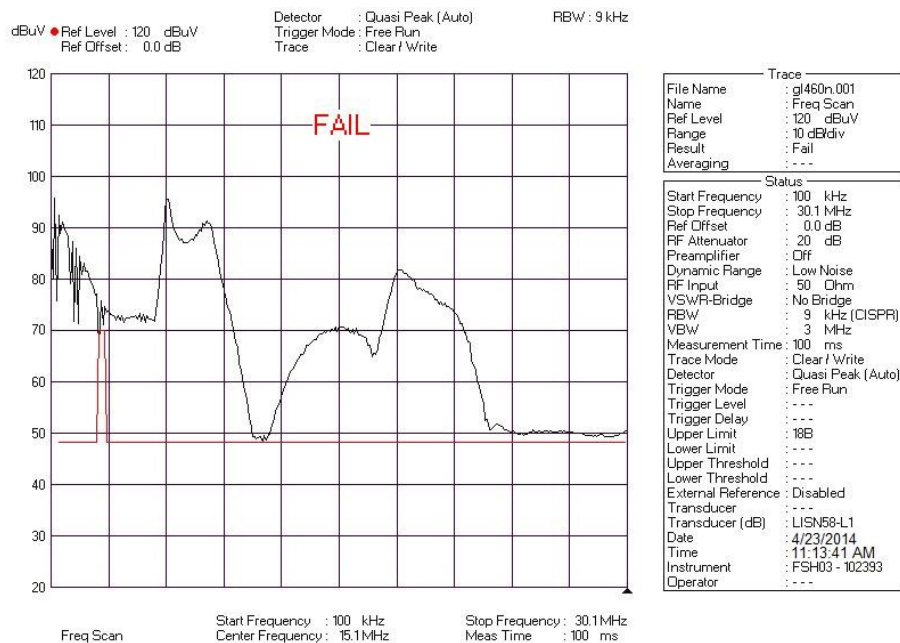
Galaxy Legacy 1000W Dimmable Ballast

600 Watt Setting

0.10 to 30.1 MHz



Phase to Ground

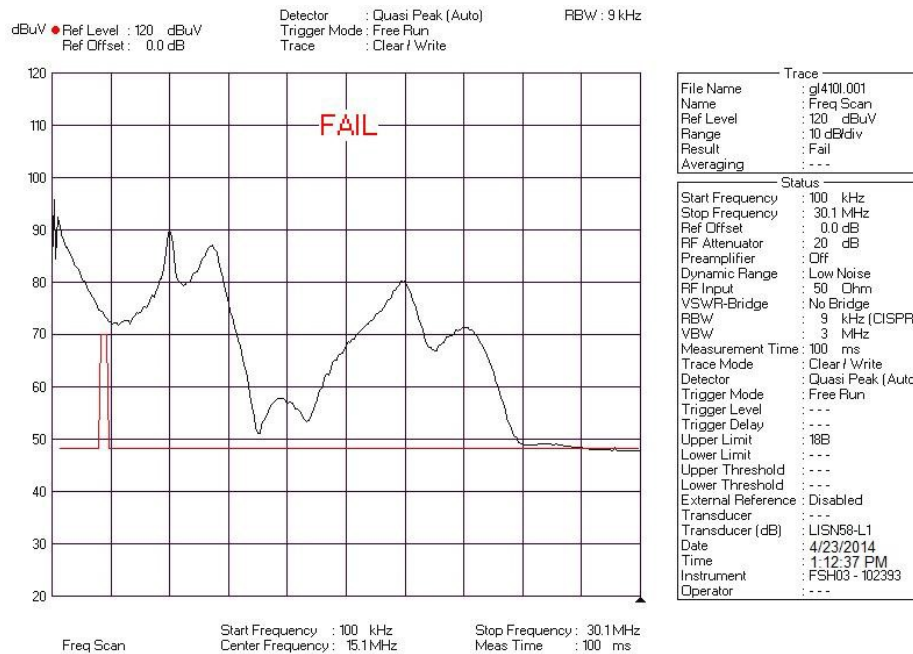


Neutral to Ground

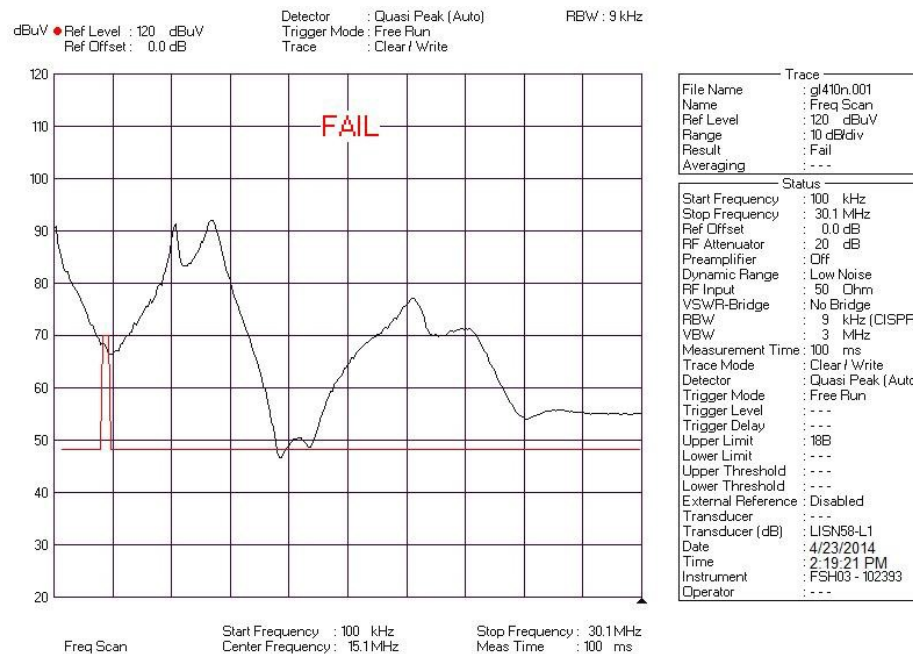
Galaxy Legacy 1000W Dimmable Ballast

1000 Watt Setting

0.10 to 30.1 MHz



Phase to Ground

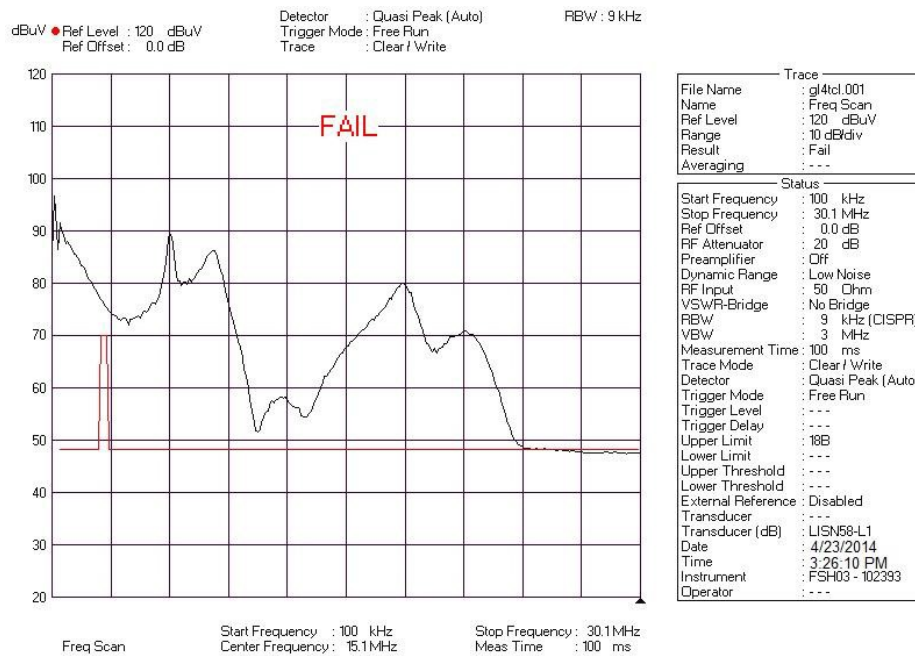


Neutral to Ground

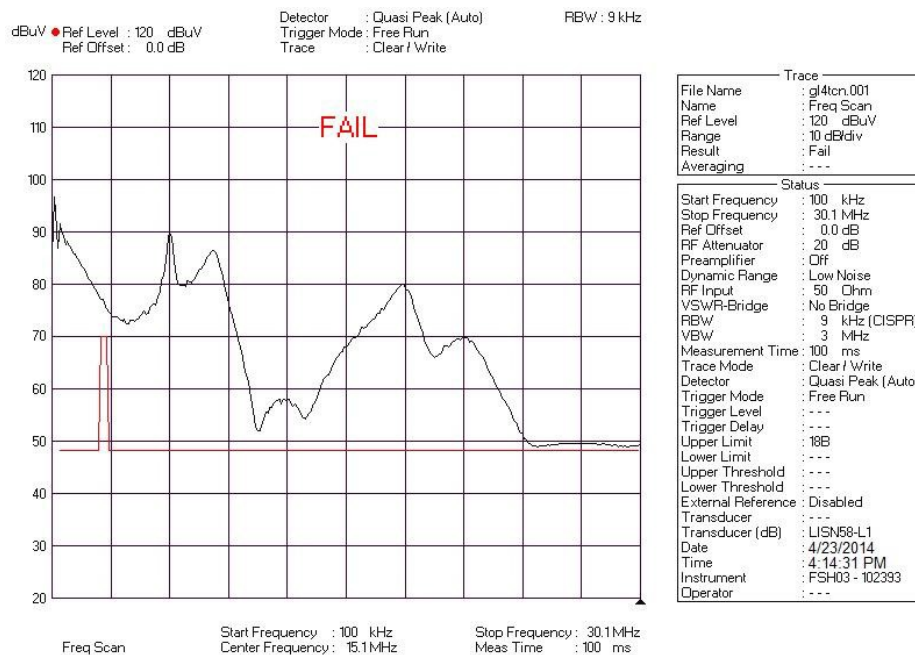
Galaxy Legacy 1000W Dimmable Ballast

Turbo Charged Setting

0.10 to 30.1 MHz



Phase to Ground



Neutral to Ground

Appendix 3A

BOOTH,FRERET &IMLAY,LLC

—ATTORNEYS AT LAW—

ROBERT M. BOOTH, JR. (1911-1981)
JULIAN P. FRERET (1918-1999)
CHRISTOPHER D. IMLAY

14356 CAPE MAY ROAD
SILVER SPRING, MD 20904-6011
WWW.IMLAYLAW.COM

TELEPHONE: (301) 384-5525
FACSIMILE: (301) 384-6384
CHRIS@IMLAYLAW.COM

June 30, 2015

Via E-mail and U.S. Mail

bruce.jacobs@fcc.gov
rashmi.doshi@fcc.gov

Bruce Jacobs, Chief
Spectrum Enforcement Division
Enforcement Bureau
Federal Communications Commission
445-lth Street, S.W.
Washington, D.C. 20554

Dr. Rashmi Doshi, Chief
Laboratory Division
Office of Engineering and Technology
Federal Communications Commission
7435 Oakland Mills Rd
Columbia MD 21046-1609

Re: Violation of Part 18 Regulations; Quantum Horticulture Model
HPS/MH-600W RF Lighting Device (Electronic Ballast); Conducted
Emission Limit, Labeling and Marketing Violations.

Dear Mr. Jacobs and Dr. Doshi:

This office represents ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated. The purpose of this letter and the attached Conducted Emissions Test Report is to request on behalf of ARRL that the Commission investigate and commence an enforcement proceeding in order to halt immediately the marketing and retail sale of an RF lighting device in the United States known as the Quantum Horticulture HPS/MH-600W RF Lighting Ballast. This device is intended for agricultural/horticultural deployment and is known as a "grow light." The device has been thoroughly tested by ARRL's laboratory as per the attached Test Report and has been found to grossly exceed the Conducted Emission limits set forth in Section 18.307(c) of the Commission's Rules. As well, the device is also being imported, marketed and sold in violation of, at least, Section 18.213 of the Commission's Rules at numerous retail outlets in the United States including Aquarius Hydroponics of

West Springfield, Massachusetts (from which ARRL purchased the *unit* used for testing in ARRL's laboratory).

The instant complaint is one of several being filed contemporaneously pertaining to various RF lighting ballasts which have been tested by ARRL's laboratory. As well, ARRL previously filed a complaint dated March 12, 2014 against an RF lighting ballast device imported and marketed by a company called Lumatek, about which apparently nothing has been done to date.

ARRL has received numerous complaints from amateur radio operators of significant noise in the Medium (MF) and High Frequency (HF) bands between 1.8 MHz and 30 MHz from "grow lights" and other Part 15 and Part 18 RF lighting devices. In response to these complaints, among other things, ARRL purchased the Quantum Horticulture grow light at retail from a company called Aquarius Hydroponics at 138 Memorial Avenue, West Springfield, Massachusetts 01089. ARRL tested the device in its laboratory. The results of the tests made by ARRL are in the attached Conducted Emissions Test Report (the "Report"). These devices are easily capable of emitting RF noise sufficient to preclude Amateur Radio MF and HF communications (and as well AM Broadcast station reception) throughout entire communities.

The Quantum Horticulture grow light has been imported by Hydrofarm Horticultural Products, a company located in Petaluma, California. See, www.hydrofarm.com. In addition to Aquarius Hydroponics in Massachusetts, the device is apparently available at retail sources including but not limited to those listed at page 1 of the attached Test Report and at www.hydrofarm.com/where-to-buy/index.php.

As can be seen from the Report, ARRL tested the conducted emissions from this device according to the IEEE C63.4-2009 standard for Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment. At page 5, the Report concludes from the conducted emissions tests that the six highest emissions from the device in the HF band *substantially* exceed the Quasi-Peak limit specified in Section 18.307(c) of the Rules. For example, the Quasi-Peak limit in the bands between 3.0 and 30 MHz is 48 dB μ V. The Quantum Horticulture device has a Quasi-Peak Interference Voltage at 6.5 MHz of 79 dB μ V. At 16.9 MHz, the Quasi-Peak Interference Voltage is 59 dB μ V. As per Appendix C of the Test Report, in both phase-to-ground and neutral-to-ground operating conditions, the conducted emissions limits are significantly exceeded, sometimes by extreme margins, throughout the entire HF frequency range.

The level of conducted emissions from this device is so high that, as a practical matter, one RF ballast operated in a residential environment would create preclusive interference to Amateur radio HF communications throughout entire neighborhoods.

As discussed in Appendix B of the Report, there are, in addition to the blatantly excessive conducted emissions from this device, substantive marketing violations associated with this device. Although there is an FCC label on the device, as called for by Section 18.209(b) of the Rules for devices subject to Declarations of Conformity or

certification, the label and documentation claim compliance with Part 18 regulations which in the case of this device is false and misleading. Marketing of the device therefore does not comply with, at least, Section 18.213 of the Commission's rules. Pursuant to Section 2.909 of the Commission's rules, the party responsible for FCC compliance with rules governing RF devices is, in the case of devices that are subject to a grant of equipment authorization, the equipment authorization grantee. Or, in the case of a device subject to a grant of a Declaration of Conformity, the responsible party is the importer. In this case, because there is no apparent grantee of equipment authorization, the Commission should look to the importer of the device as the responsible party.

ARRL respectfully requests that all such devices be removed from retail sale and marketing. Those devices that have been sold to consumers, or which are available for retail sale should be tracked and recalled. It is also requested that the importer of this device be subjected to a forfeiture proceeding commensurate with the Commission's enforcement policies.

Given the foregoing, on behalf of the more than 730,000 licensed radio amateurs in the United States, who have a significant interest in avoiding interference from these noncompliant devices, ARRL respectfully requests that your office take the appropriate action with respect to this device without delay.

Should any additional information be called for, please contact either the undersigned, General Counsel for ARRL, or Mr. Mike Gruber of the ARRL's staff, whose contact information is listed on the attached Report. Thank you very much for your consideration of this request.

Sincerely,

q). 

Christopher D. Imlay
General Counsel, ARRL

Attachment

Copies to:	Hydrofarm Horticultural Products 2249 S. McDowell Ext. Petaluma, CA 94954	Aquarius Hydroponics 138 Memorial Avenue West Springfield, MA 01089
------------	--	---

Appendix 3B



ARRL The national association for
AMATEUR RADIO™

ADMINISTRATIVE HEADQUARTERS
225 Main Street, Newington, Connecticut, USA 06111-1494
Telephone: 860-594-0200 ■ FAX: 860-594-0259
www.arrl.org

04/10/2014

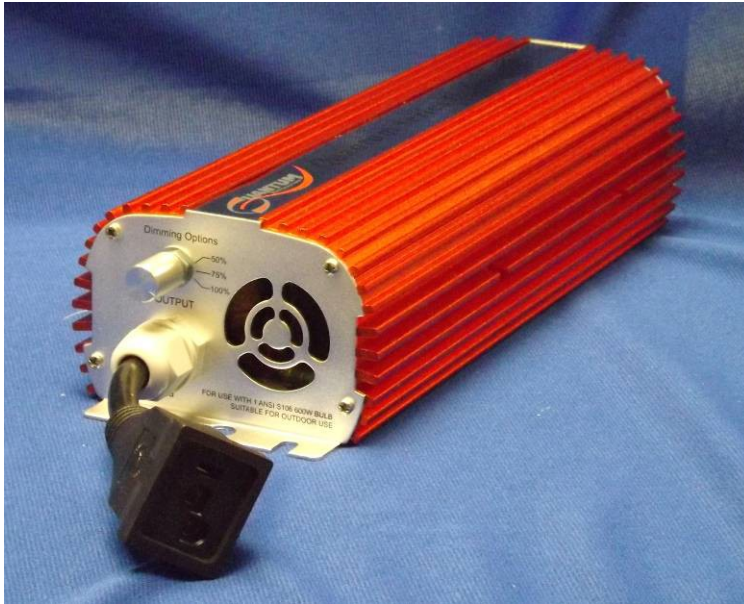
Conducted Emissions Test Report

STANDARD	TITLE
IEEE C63.4 - 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

REVIEW	SIGNATURE	DATE
Performed By:	Mike Gruber – W1MG Pete Turbide – W1PT	4/9/14
Results Reviewed By:	Edward Hare – W1RFI	4/10/14

Summary of Test Results: **Fail**

EUT CONFIGURATION	
Manufacturer	Quantum Horticulture
Model Number	N/A
Model	HPS/MH—600W
Serial Number	N/A
Importer	Hydrofarm Horticultural Products 2249 S. McDowell Ext. Petaluma CA 94954 Tel: (800) 634-9990 Web: www.hydrofarm.com Formerly: R & M Supply, Inc. 420 Harley Knox Blvd Perris CA 92571
Retailers	Aquarius Hydroponics (purchased here) 138 Memorial Ave West Springfield, MA 01089 Tel: (413) 732-3300 Web: http://aquariushydro.com See Appendix A for additional details. Other sources include but not necessarily limited to Hydrofarm Product distributors of record. This list is too extensive for inclusion in this report. The complete list is available at: www.hydrofarm.com/where-to-buy/index.php .



GENERAL INFORMATION

OBJECT

This document outlines the conducted emissions requirements applicable to lighting equipment covered under **47CFR18**. This procedure will be used for the testing of lighting products in the ARRL EMC laboratory.

EUT PASS CRITERIA (Consumer)

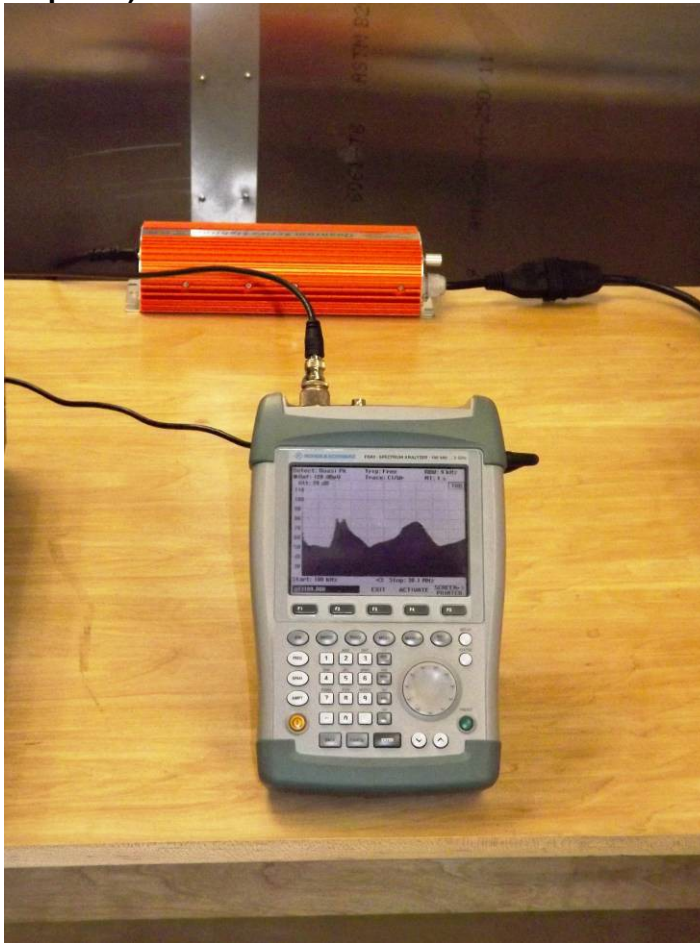
Table 1

Test Location	Test	Frequency Range	Limits
Power Supply	Conducted Emissions	0.45 MHz - 2.51 MHz	250 μ V / 48 dB(μ V) quasi peak
		2.51 MHz - 3 MHz	3,000 μ V / 70 dB(μ V) quasi peak
		3 MHz - 30 MHz	250 μ V / 48 dB(μ V) quasi peak

SETUP CHECKLIST

Initials	Setup
MG	The EUT should be in new condition, built to production specifications, using production parts and using production processes. (commercially available)
MG	Schedule EMC facility time with the ARRL Laboratory. (This test is performed by formally trained users of the EMC facility)
MG	Complete Equipment List Table.
MG	Connect output of LISN to input of EMC Receiver.
MG	Apply rated voltage to input of LISN.
MG	Connect the EUT to the LISN using a standard power cord supplied with the product. (approx. 1.2m in length)
MG	The Reference Ground Plane on the floor should be at least 2m x 2m in size and shall extend 0.5m beyond the footprint of the EUT.
MG	For measuring table-top devices, mount onto a table 0.8m high and use a vertical conducting plane at least 2m x 2m in size located 40cm to the rear of the EUT and bonded to the reference ground plane with 3cm-wide straps at intervals less than 1m.
MG	Test each EUT model number at its nominal (rated) voltage.
MG	Photograph the test setup and include in this test report.

TEST SETUP (insert photo)



EQUIPMENT LIST

Use the following equipment (or equivalent) in executing this procedure. If an equivalent piece of test equipment is used, then a note with the make, model, serial number, and calibration due date of the equipment must be made in the table.

Manufacturer	Description	Model Number	Serial Number	Cal Due
N/A	Conducted Emissions test area	N/A	N/A	N/A
R&S	EMC Spectrum Analyzer/EMI Receiver	FSH3	102393	06-21-14
N/A	Measurement Cable	N/A	N/A	N/A
R&S	Line Impedance Stabilization Network (LISN)	ENV216	100057	Self

CONDUCTED EMISSIONS TEST

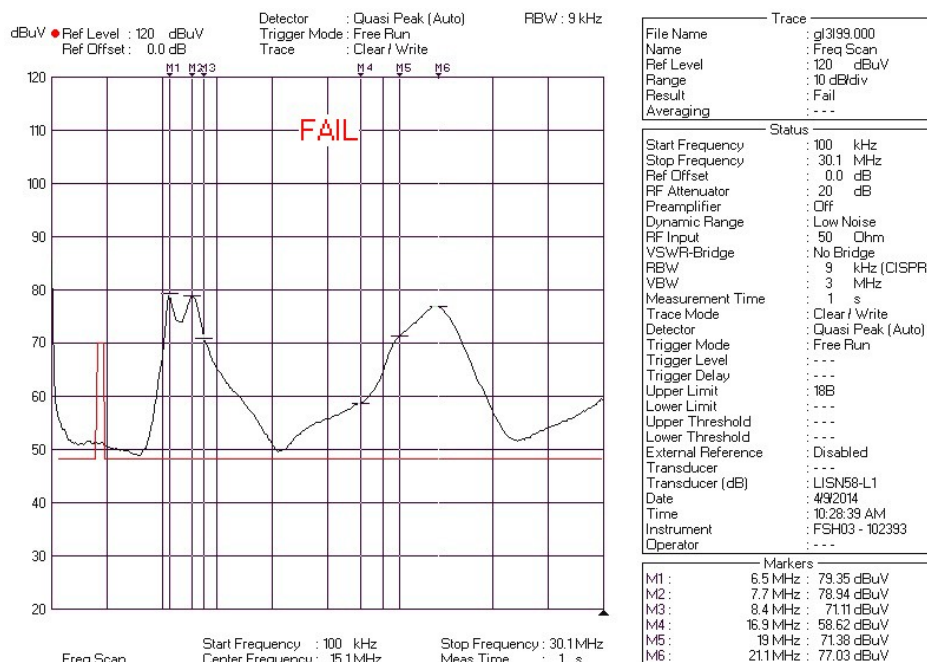
1. Bond the LISN to the ground plane of the test area using a grounding cable that is as short as possible.
2. Connect the EUT power cable to the Line Impedance Stabilization Network (LISN).
3. Measure the conducted emissions from the EUT using the LISN and a quasi-peak detector.
4. Record the six highest emissions from the EUT and compare the voltage to the limits specified in Table 1.
5. Attach emissions plots to this procedure.

Six Highest Emissions	Nominal Line Voltage	Interference Voltage (Quasi Peak)	Limit (Quasi Peak)	PASS / FAIL
6.5 MHz	120VAC	79 dB μ V	48 dB(μ V)	FAIL
7.7 MHz	120VAC	79 dB μ V	48 dB(μ V)	FAIL
8.4 MHz	120VAC	71 dB μ V	48 dB(μ V)	FAIL
16.9 MHz	120VAC	59 dB μ V	48 dB(μ V)	FAIL
19.0 MHz	120VAC	71 dB μ V	48 dB(μ V)	FAIL
21.1 MHz	120VAC	77 dB μ V	48 dB(μ V)	FAIL

(See Appendix B for additional comments on required FCC product labeling.)

PLOT OF CONDUCTED EMISSIONS (PHASE TO GROUND)

NOTE: The Neutral conductor to ground spectra was very similar.



Quantum 600 Watt Dimmable Ballast at 600 Watt Setting

All Power Settings Are Similar. See Appendix C for supplemental data.

Appendix A

Quantum 600 Watt Dimmable Ballast Purchasing Info

On April 8, 2014, an ARRL Laboratory Engineer used a personal credit card to purchase a Quantum 600 Watt Dimmable Ballast for grow lights. This purchase was made at the following nearby retail store:

Aquarius Hydroponics
138 Memorial Ave
West Springfield, MA 01089
Tel: (413) 732-3300
Web: <http://aquariushydro.com>

See the following sales receipt on next page for supplemental and supporting documentation.

Aquarius Hydroponics
138 Memorial Ave
West Springfield, MA 01103
413-732-8890



SOLD TO:
Retail Customer

Date: 2014-04-07 17:33:52

Payment Method: Credit Card

Product	Model	Tax	Price (excl)	Price (incl)	Sub Total	Total (incl)
1 x Quantum 600w Dimmable Ballast	QT600	6.25%	\$189.00	\$189.00	\$189.00	\$189.00
					Sub-Total:	\$189.00
					Tax:	\$11.81
					Discount: \$18.90 (-10%)	
					Total:	\$181.91

APPENDIX B

Product Meets FCC Labeling Requirements

As the photos in this report show, this product has the required FCC RFI warning and labeling. **This device, however, does not meet the emissions limits.** We also note the following:

- 1) **On box**: FCC logo and statement, “This device complies with Part 18 of the FCC Rules.” **Device however, clearly does not meet Part 18 emissions limits.** CE and UL logos also noted.
- 2) **In documentation**: FCC logo and statement, “This device complies with section 18 of the FCC rules and regulations. This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz. Move your ballast should any interference occur.” **Device however, clearly does not meet Part 18 emissions limits.** CE and UL logos also noted.
- 3) **On unit**: FCC logo. CE and UL logos also noted.

Some of the more important rules that apply in this case are as follows. Please note that paragraph § 18.213 (d) specifically applies to RF Lighting Devices. In addition, some rules regarding equipment authorization under § 18.203 are included for reference purposes:

§ 18.203 Equipment authorization.

(a) Consumer ISM equipment, unless otherwise specified, must be authorized under either the Declaration of Conformity or certification procedure prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in part 2, subpart J of this chapter and shall also be accompanied by:

- (1) A description of measurement facilities pursuant to § 2.948, or reference to such information already on file with the Commission.
- (2) A technical report pursuant to §§ 18.207 and 18.311.

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c) Simple measures that can be taken by the user to correct interference.
- (d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45–30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style.

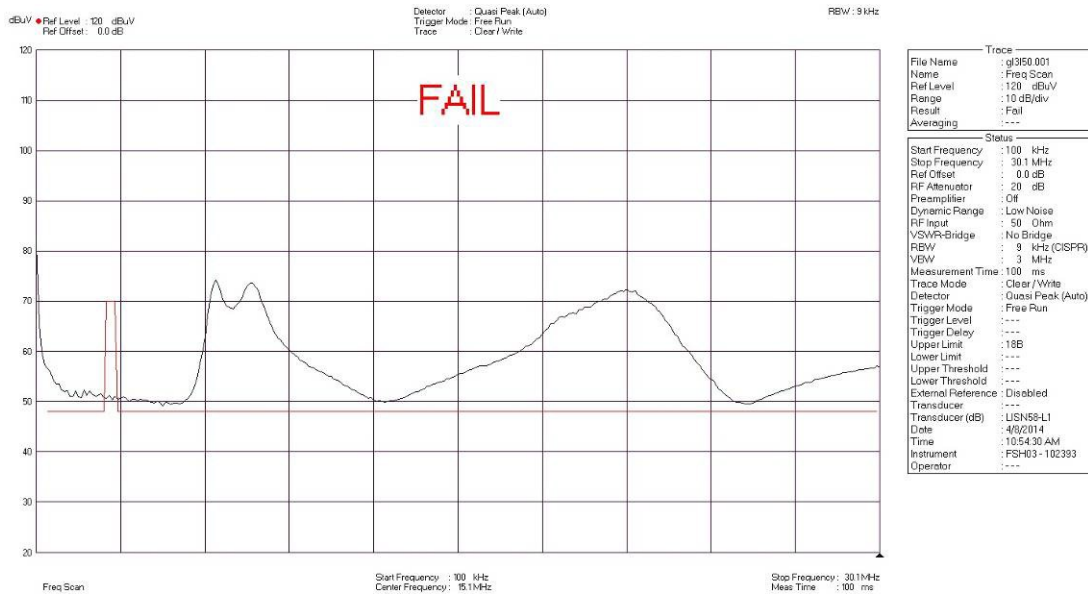
APPENDIX C

Quantum 600 Dimmable Ballast Conducted Emissions Testing Supplemental Data

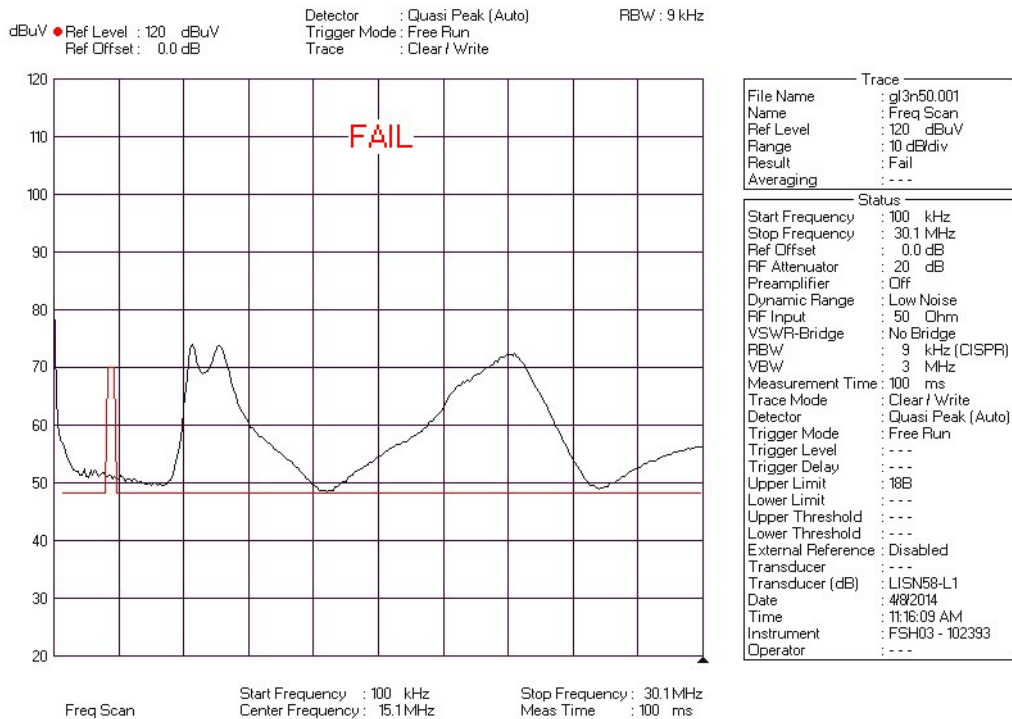
The Quasi Peak graphs in this Appendix show that the Quantum 600 Dimmable ballast significantly exceeds all FCC Part 18 limits under all operating conditions.

Quantum Horticulture 600W Dimmable Ballast

50% Setting
0.10 to 30.1 MHz



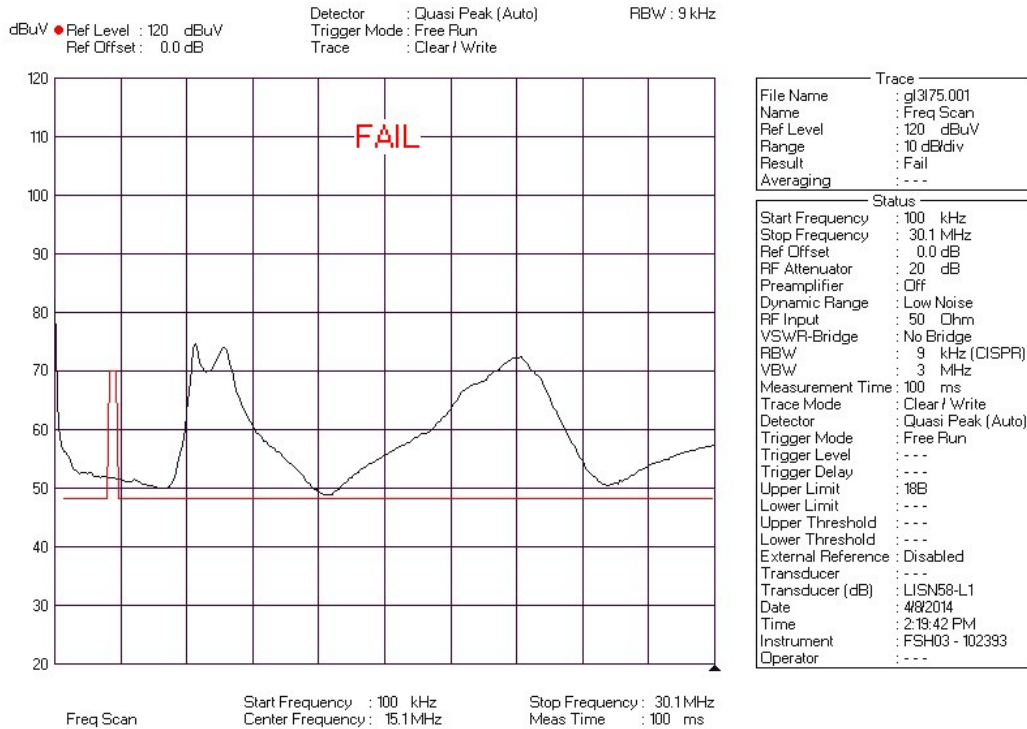
Phase to Ground



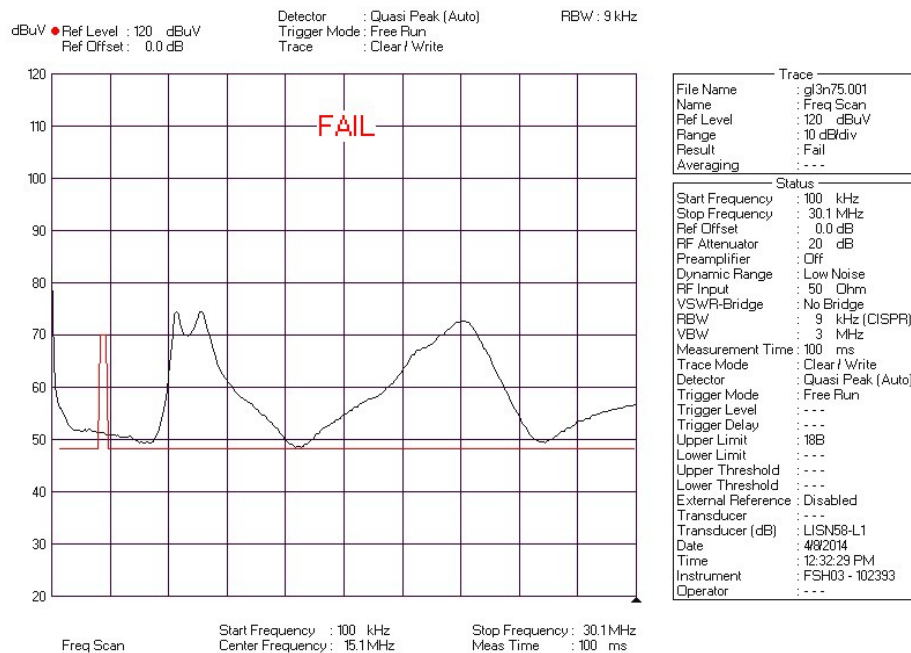
Neutral to Ground

Quantum Horticulture 600W Dimmable Ballast

75% Setting
0.10 to 30.1 MHz



Phase to Ground



Neutral to Ground

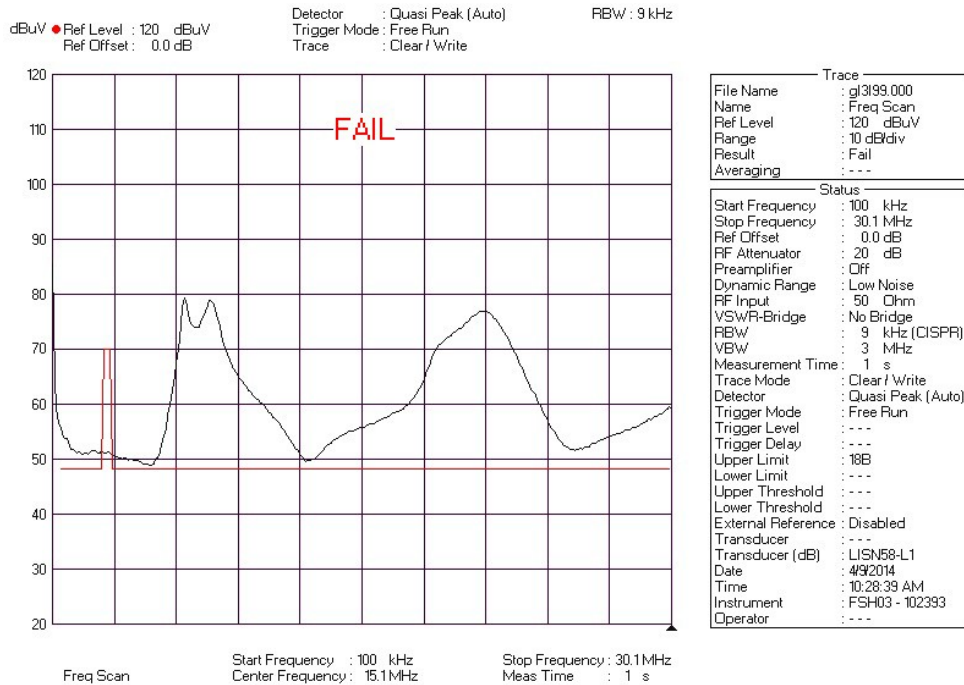
Conducted Emissions

ARRL CONFIDENTIAL

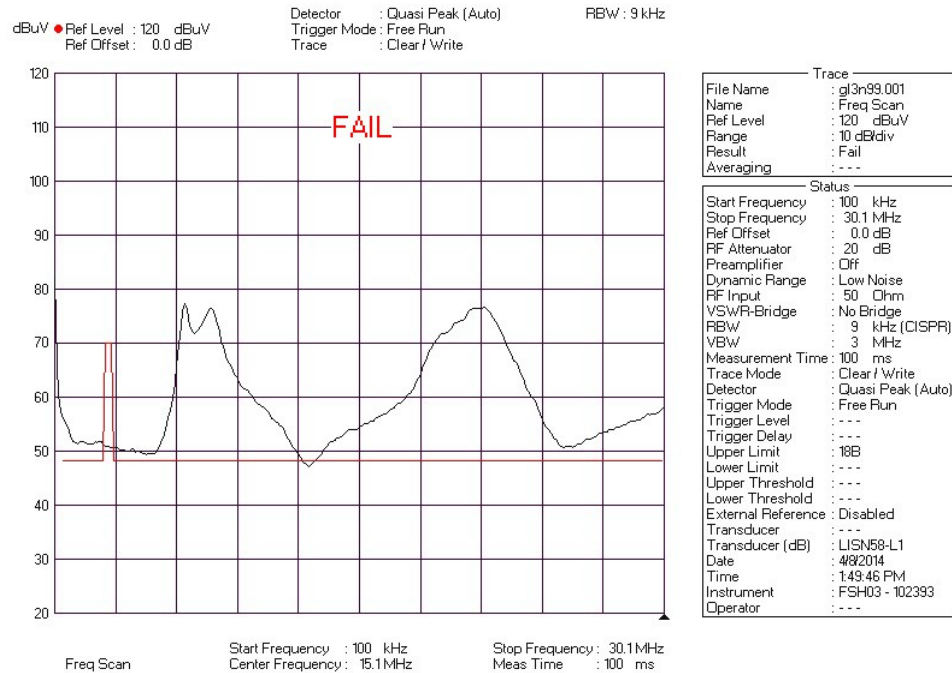
Page 11 of
12

Quantum Horticulture 600W Dimmable Ballast

100% Setting
0.10 to 30.1 MHz



Phase to Ground



Neutral to Ground

Conducted Emissions

ARRL CONFIDENTIAL

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12

Appendix 4

FCC Part 18 Marketing Violations By Home Depot

By Mike Gruber, W1MG

July 7, 2015

Introduction

Non-electronic ballasts, which once dominated the fluorescent light market, operated under Part 15 as incidental radiators. Today they have been phased out in favor of newer electronic ballasts which, along with CFL bulbs, operate under Part 18 as “RF Lighting Devices.” In this case, the FCC considers these devices to be converting RF energy above 9 kHz directly into light, i.e., another form of energy. For this reason, the Commission classifies an electronic ballast as an ISM device.

Recent surveys conducted by the ARRL in several states, including California, Illinois, Massachusetts and Connecticut indicate that most electrical and lighting retail outlets are now primarily or exclusively stocking and selling electronic ballasts. In fact, it should be noted that non-electronic ballasts are no longer being sold by several “big box stores” that we surveyed. Presumably this is a nationwide phenomenon being driven, in part, by a Government mandate.

Part 18 Limits for RF Lighting Devices

As shown by Appendix A, Part 18 has two sets of limits for RF Lighting Devices. Specifically, there is a separate set of limits for consumer vs. non-consumer lighting devices. The emissions limits are considerably lower for consumer rated devices. As an example, the conducted emissions limits for all present ham bands below 30 MHz are 22 dB less for consumer rated devices. It should also be noted that these are the only devices that should be used for a home or residential applications. Per § 18.107 (g), consumer ISM equipment is to be *“used or intended to be used by the general public in a residential environment, notwithstanding use in other areas.”*

Although non-consumer devices might be suitable for commercial and industrial environments, ARRL is now receiving reports of actual cases in which commercial devices are causing harmful interference in residential areas.

Illegal Marketing of Part 18 RF Lighting Devices

The previously mentioned multi-state survey of fluorescent light ballasts showed an alarming number of non-consumer rated ballasts mixed in with consumer products. Furthermore, the display signage in many cases did not mention or adequately address FCC Part 18 requirements as they pertain to interference in a residential environment. In most of the stores that we surveyed, unsuspecting consumers have no way of knowing the significance of consumer vs. non-consumer ballasts. In some cases, “commercial” grade ballasts, with their associated non-consumer emissions limits, appeared to be a heavier

duty or superior product. The display signage implies, therefore, that commercial ballasts are also a product upgrade for home use. It typically does not include or mention or mention the applicable FCC requirements.

Although Part 18 only describes limits for consumer and non-consumer RF Lighting Devices, many ballasts are only labeled as either Part 18A or 18B. This nomenclature is clearly an adaptation from Part 15A and 15B, which pertains to commercial/industrial and residential digital devices, respectively. Part 18 does not include an A or B designation for RF lighting devices.

See Appendix B for pertinent definitions and rules in Part 18, particularly with regard to the marketing and sale of non-consumer devices to consumers. Additional information in Appendix C is taken from Part 2 of the FCC rules. Appendix D is for reference purposes only. It contains some of the equivalent rules with regard to Part 15A (non-consumer) and Part 15B (consumer) digital devices.

Sale of Non-Consumer RF Lighting Devices for Residential Purposes

The following four cases highlight the marketing and sale of commercial light fixtures and ballasts by Home Depot to residential users. The device was actually purchased in each of the three ballast cases after consulting with a sales representative. Specifically, the sales representative was asked about the use of the ballast in a residential environment.

Case 1 (Florescent Light Ballast)

On July 3, 2015, Ms. Deborah Roy purchased a non-consumer rated GE UltraMax G-Series T8 ballast from a Home Depot located at the following address:

The Home Depot E Springfield - #2678
2001 Boston Road
Wilbraham, MA, 01095
Tel: (413)543-8100

Before selecting the ballast, Ms. Roy reports that she asked the sales help for assistance. She asked if she could use the ballast in her home, even though it was labeled as a commercial device. The Home Depot representative only asked about the voltage for the intended application, then said that it would “work okay.” The help person gave no indication that this non-consumer ballast could not be used in a home environment. Ms. Roy then paid for this device using her MasterCard at the store’s check out. Again, this non-consumer item was in not flagged during check-out. After paying for it, she simply walked out of the store with it.

The consumer and non-consumer ballasts in this store were in no apparent order but differentiated by a color scheme. Blue was for residential environments, and red for commercial. (A quick survey of several samples showed the ratio to be about 50/50.) Although this color scheme made it easy to tell commercial from residential ballasts, it wasn't clear why a consumer would select one over the other. In fact, the commercial rating to most consumers might suggest a heavier duty or better quality product.

The particular ballast purchased by Ms. Roy was mixed in with both consumer and non-consumer ballasts. It was labeled in small print as "FCC Part 18, Non-Consumer" on the top part of the ballast. This particular unit was packaged in a cardboard box with an open top. The instruction sheet was not visible in the box without opening it. Once the ballast was purchased and the box opened, an instruction sheet was found to be folded and inserted inside. This sheet has the following warning:

**WARNING: PLEASE READ THE FOLLWING NOTICE BEFORE INSTALLING
"CLASS A" ELECTRONIC FLOURESCENT BALLASTS!**

This equipment has been tested and found to comply with FCC 47 CFR Part 18, Non-Consumer RFI/EMI ("Class A") limits. This ballast should only be installed in a commercial environment. Do not install this ballast in a residential environment.

The ballasts in this particular store did not all come in a box. It is, therefore, not known if they all came with a similar instruction sheet and warning. Some of these ballasts were non-consumer rated, as indicted only by the Part 18 A labeling. It should also be pointed out that this labeling is most likely meaningless to most of the customers that purchase these devices. The typical consumer would not know the significance between Part 18A and Part 18B ratings.

The store display is shown in Figure 1. There was no clear indication of Part 18 FCC requirements. A relatively small sign, shown in Figure 2, was attached to the display and about eye level. Although it contained instructions on how to select a ballast, it did not specifically address the FCC rules nor prohibit the use of non-consumer ballasts in a residential environment. Figure 3 shows a close-up of the only display instructions on how to select between commercial and non-consumer ballasts. It only references voltage requirements. Since 120 vac is typically available in both commercial and residential environments, the consumer in this case might logically conclude that the commercial ballast could be used in a home or residential environment.



Figure 1 - Store display.



Figure 2 - Close-up of store display signage with instructions on how to select a ballast.

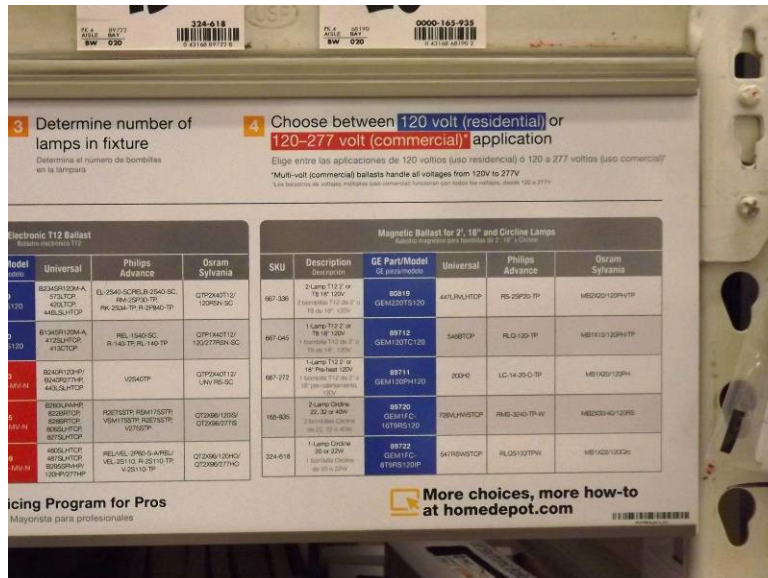


Figure 3 - Step 4 in previously depicted signage describes how to select between residential and commercial ballasts. This is the only such reference at the store display. It only mentions voltage differences. There is no reference to the FCC rules nor the potential for radio interference.

Conclusion

Home Depot is not only selling and marketing to commercial devices to consumes, their sales staff is not knowledgeable enough to properly advise their customers.

Case 2 (Lighting Fixtures)

Mr. Jerry Ramie arrived at the Home Depot #1041 in Milpitas, CA at about 9:50AM on July 2, 2015. He looked at three fluorescent lighting fixtures for his garage. There were several sections for these fixtures; the first two were industrial, although there was one fixture for sale marked as “For Commercial or Residential Use.” The middle, residential display is shown in Figure 4.



Figure 4 - The middle display containing both residential and commercial fluorescent light fixtures mixed together in no certain order.

The bottom left, third stack of fixtures in Figure 4 is the 4x48" T8 fixture pulled forward, and the three pulled forward on the lower right of the bottom shelf are all 4x48" T8 fixtures marked "For commercial use." They are shown in greater detail below in Figure 5.



Figure 5 - Close-up of commercial fixtures in the residential section.

The signage above the display is shown next in Figure 6.



Figure 6 – Display signage for light fixtures shown in previous Figure 5.

This sign, and others showing home scenes, is directly above the three commercial fixtures, as shown next in Figure 7.



Figure 7 - Home scenes in vicinity of commercial lighting devices.

Mr. Ramie asked an assistant for help and the lighting department manager came by. He asked which 48" four-light T8 fixture he should buy and he showed him the residential unit (lower left above) and the three commercial fixtures (lower right above). He asked him what the difference was. The department manager responded that all of them required hard wiring and that he (Mr. Ramie) might want to consider a different unit with a line cord instead. Mr. Ramie told him that he had an electrical box in his garage ceiling and didn't care.

Mr. Ramie then asked him which fixture was of better quality, the residential one or one of the three commercial ones. He said they were "all the same. They all come from China." He noted that the residential version was lower in cost. He recommended the corded residential fixture and suggested using LED lights instead of the fluorescent T8 tubes.

Conclusion:

Although the advice that Mr. Ramie received was correct in that he should have chosen a residential version of the fixture for use in his garage, there were numerous issues with the marketing and display. The layout of the display was confusing with a mix of commercial fixtures under a banner suggesting the products were for residential applications. The marketing of these fixtures is such that a consumer could easily purchase a commercial device for a residential application. The signage was inadequate to properly inform the consumer.

Mr. Ramie also found one product mislabeled in the commercial section. The labeling in this case stated that the fixture was suitable for Commercial or Residential use. It was, however, a commercial fixture as indicated by the 120-277 vac input listed on the box.

Case 3 (Fluorescent Light Ballast)

Mr. Ramie arrived at the Home Depot #6672 in San Jose, CA at about 11:15AM on 7/2/15. He spoke with a sales assistant in the lighting department. He told her that he had two 4x48" T8 fixtures in his garage and wanted to replace the ballast on the one that quit working. He was shown two Philips ballasts; the red one on the left "green tagged" for \$14.97 (Commercial) and the blue one on the right for \$17.97 (Residential).



Figure 8 - Ballasts on display at Home Depot store in San Jose.

Mr. Ramie asked the sales representative which one was “better” and she said they were the same. He asked her why he should “spend more on the blue one than on the red one.” He pointed out that both ballasts had the same number and colors of wires and the connection diagram was the same. She said that Mr. Ramie could save money by purchasing the red one (commercial device) and that “it will work fine for you.” A detail of the ballast she suggested that Mr. Ramie purchase and the receipt for it are shown below in Figure 9.



Figure 9 - Commercial ballast suggested by sales person for residential use, and the sales receipt from the resulting transaction.

Conclusion:

The sales people in this case clearly did not understand the difference between the blue (residential) and the red (commercial) ballasts. In a consumer price-driven atmosphere like a big-box retailer named Home Depot, price is the selling point. You would also expect to see products for the Home, as suggested in the name of the store. The sales representative sold Mr. Ramie the lowest cost item she felt would work. The display mixed commercial and residential products together and there were no signs indicating what the differences might be.

Case 4 (Fluorescent Light Ballast)

On July 22, 2013, Ms. Lori Kosior purchased a non-consumer rated GE PROLINE T8 ballast from a Home Depot located at the following address:

The Home Depot
225 Berlin Turnpike
Berlin, CT 06037

Before selecting the ballast, Ms. Kosior reports that she asked the sales help for assistance. She indicated that she was buying the ballast for her husband, who was attempting to fix a light in their basement, clearly a residential application. The Home Depot representative asked a few questions pertaining to the number of bulbs in the fixture, then said that it “should be okay.” The help person gave no indication that this non-consumer ballast could not be used in a home environment. Ms. Kosior then paid cash for this device at the store’s check out. Again, this non-consumer item was in no flagged during check-out. After paying for it, she simply walked out of the store with it.

This particular ballast was mixed in with both consumer and non-consumer ballasts, and in no apparent certain order. (A quick survey of several samples showed the ratio to be about 50/50.) It was labeled in small print as “FCC Part 18 Class A” on the top part of the ballast. This particular unit was wrapped in clear plastic. It also had an instruction sheet visible through the plastic wrap along the bottom of the ballast. This sheet has the following warning:

FOR COMMERCIAL USE ONLY. NOT FOR RESIDENTIAL (CONSUMER) USE.
FCC 47 CFR Part 18 Class A, Non-Consumer Rated Product

Many ballasts in this particular store did not have such a plastic wrapping, and therefore, did not come with an instruction sheet. Some of these ballasts were non-consumer rated, as indicated only by the Part 18 A labeling. It should also be pointed out that this labeling is most likely meaningless to most of the customers that purchase these devices.

The store display is shown in Figure 10. There was no clear indication of Part 18 FCC requirements. A small sign, shown in Figure 11, was perpendicular to the display and

above eye level. Although it contained instructions on how to select a ballast, it did not specifically address the FCC rules nor prohibit the use of non-consumer ballasts in a residential environment. Figure 12 shows commercial ballasts included and mixed into store's display.



Figure 10 - Main display.



Figure 11 - Fluorescent ballast sign.



Figure 12 - Commercial ballast on sale and marketed to consumers. There is no FCC warning to indicate that this product cannot be used for residential applications.

Final Conclusion & Recommendation

Clearly Home Depot's marketing and sale of non-consumer ballasts is not adequate to ensure compliance with FCC Part 18 requirements. This was demonstrated by the four cases described in this report, including the purchase of non-consumer ballasts after telling store personnel that the product was for residential purposes. Furthermore, since the first case (#4 in this report) occurred almost two years ago in July of 2013, it is clear that improper and misleading marketing of non-consumer devices by Home Depot has been occurring for a considerable period of time. It also appears to be a widespread problem in Home Depot stores across America, including California, Connecticut and Massachusetts. It is, therefore, recommended that Home Depot be reported to the FCC for the illegal and misleading market of Part 18 non-consumer ballasts.

List of Appendices

- 1) Appendix A - Part 18 Emissions limits for RF Lighting Devices (Including Electronic Fluorescent Light Ballasts)
- 2) Appendix B - Part 18 - Pertinent Definitions and Rules
- 3) Appendix C - Part 2 - Pertinent Definitions and Rules
- 4) Appendix D - Part 15 - Pertinent Definitions and Rules

Appendix A

Part 18 Emissions limits for RF Lighting Devices **(Including Electronic Fluorescent Light Ballasts)**

Table 1A - Part 18 Conducted Emissions Limits (For RF Lighting Devices, such as CFLs and Electronic Fluorescent Light Ballasts)

Frequency (MHz)	Maximum RF line voltage measured with a 50 μH/50 ohm LISN (μV)	Conducted limit (dBμV)
Consumer equipment:		
0.45 to 2.51	250	48
2.51 to 3.0	3,000	70
3.0 to 30	250	48
Non-consumer equipment:		
0.45 to 1.6	1,000	60
1.6 to 30	3,000	70

(d) If testing with a quasi-peak detector demonstrates that the equipment complies with the average

Table 1B - Part 18 Radiated Emissions Limits for RF lighting devices

Frequency (MHz)	Field strength limit at 30 meters (μV/m)
Non-consumer equipment:	
30-88	30
88-216	50
216-1000	70
Consumer equipment:	
30-88	10
88-216	15
216-1000	20

Appendix B

Part 18 - Pertinent Definitions and Rules

§ 18.107 Definitions.

(a) *Radio frequency (RF) energy.* Electromagnetic energy at any frequency in the radio spectrum from 9 kHz to 3 THz (3,000 GHz).

(b) *Harmful interference.* Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter.

(c) *Industrial, scientific, and medical (ISM) equipment.* Equipment or appliances designed to generate and use locally RF energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunication. Typical ISM applications are the production of physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal and acceleration of charged particles.

(g) *Consumer ISM equipment.* A category of ISM equipment used or intended to be used by the general public in a residential environment, notwithstanding use in other areas. Examples are domestic microwave ovens, jewelry cleaners for home use, ultrasonic humidifiers.

(i) *Marketing.* As used in this part, marketing shall include sale or lease, offer for sale or lease, advertising for sale or lease, the import or shipment or other distribution for the purpose of sale or lease or offer for sale or lease. See subpart I of part 2 of this chapter.

NOTE: In the foregoing, sale (or lease) shall mean sale (or lease) to the user or a vendor who in turn sells (or leases) to the user. Sale shall not be construed to apply to devices sold to a second party for manufacture or fabrication into a device which is subsequently sold (or leased) to the user.

§ 18.203 Equipment authorization.

(a) Consumer ISM equipment, unless otherwise specified, must be authorized under either the Declaration of Conformity or certification procedure prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in part 2, subpart J of this chapter and shall also be accompanied by:

(1) A description of measurement facilities pursuant to § 2.948, or reference to such information already on file with the Commission.

(2) A technical report pursuant to §§ 18.207 and 18.311.

(b) Consumer ultrasonic equipment generating less than 500 watts and operating below 90 kHz, and non-consumer ISM equipment shall be subject to verification, in accordance with the relevant sections of part 2, subpart J of this chapter.

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c) Simple measures that can be taken by the user to correct interference.

(d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style.

Appendix C

Part 2 - Pertinent Definitions and Rules

§ 2.1 Terms and definitions.

Interference. The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy. (RR)

§ 2.801 Radiofrequency device defined.

As used in this part, a radiofrequency device is any device which in its operation is capable of emitting radiofrequency energy by radiation, conduction, or other means. Radiofrequency devices include, but are not limited to:

(c) The industrial, scientific, and medical equipment described in part 18 of this chapter.

(d) Any part or component thereof which in use emits radiofrequency energy by radiation, conduction, or other means.

§ 2.909 Responsible party.

The following parties are responsible for the compliance of radio frequency equipment with the applicable standards:

(a) In the case of equipment which requires the issuance by the Commission of a grant of equipment authorization, the party to whom that grant of authorization is issued (the grantee) If the radio frequency equipment is modified by any party other than the grantee and that party is not working under the authorization of the grantee pursuant to § 2.929(b), the party performing the modification is responsible for compliance of the product with the applicable administrative and technical provisions in this chapter.

(b) In the case of equipment subject to authorization under the verification procedure, the manufacturer or, in the case of imported equipment, the importer. If subsequent to manufacture and importation, the radio frequency equipment is modified by any party not working under the authority of the responsible party, the party performing the modification becomes the new responsible party.

(c) In the case of equipment subject to authorization under the Declaration of Conformity procedure:

(1) The manufacturer or, if the equipment is assembled from individual component parts and the resulting system is subject to authorization under a Declaration of Conformity, the assembler.

(2) If the equipment, by itself, is subject to a Declaration of Conformity and that equipment is imported, the importer.

(3) Retailers or original equipment manufacturers may enter into an agreement with the responsible party designated in paragraph (c)(1) or (c)(2) of this section to assume the responsibilities to ensure compliance of equipment and become the new responsible party.

(4) If the radio frequency equipment is modified by any party not working under the authority of the responsible party, the party performing the modifications, if located within the U.S., or the importer, if the equipment is imported subsequent to the modifications, becomes the new responsible party.

(d) If, because of modifications performed subsequent to authorization, a new party becomes responsible for ensuring that a product complies with the technical standards and the new party does not obtain a new equipment authorization, the equipment shall be labelled, following the specifications in § 2.925(d), with the following: “This product has been modified by [insert name, address and telephone number of the party performing the modifications].”

[54 FR 17712, Apr. 25, 1989, as amended at 61 FR 31045, June 19, 1996; 62 FR 10470, Mar. 7, 1997; 62 FR 41880, Aug. 4, 1997]

Appendix D

Part 15 - Pertinent Definitions and Rules

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

(c) The provisions of paragraphs (a) and (b) of this section do not apply to digital devices exempted from the technical standards under the provisions of § 15.103.

(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) of this section needs to be contained only in the instruction manual for the main control unit.

(e) In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68546, Dec. 9, 2003]

Appendix 5

ARRL Again Complains to FCC about Illegal Marketing of Electronic Lighting Ballasts

12/29/2015

The ARRL has again complained to the FCC to allege illegal marketing of electronic RF lighting ballasts, operating under Part 18 of the Commission's rules, on the part of two major retailers. Letters went out this week to the FCC Enforcement Bureau and its Office of Engineering and Technology claiming Part 18 marketing regulations violations by Lowe's and by Walmart stores. At issue is the sale of non-consumer RF lighting ballasts to consumers who, in several instances, were told by store personnel that it was okay to install these in a residential setting. In addition, non-consumer and residential-class ballasts are intermixed in store displays with inadequate signage to direct consumers to the correct choice. Both letters asked the FCC to investigate and commence enforcement proceedings with respect to the two stores' marketing and retail sale of RF lighting devices in the US.

"ARRL purports to show that the [retailer] is...marketing and selling to consumers (by retail sale) non-consumer Part 18 RF lighting devices which are *not* intended for residential deployment, to consumers who have specifically noted their intention to deploy the devices in residential applications," ARRL Chief Counsel Chris Imlay, W3KD, said in similar complaint letters to the Commission on December 28 and December 29 (attached below). Part 18 emissions limits for consumer devices are far lower than those allowed for non-consumer devices.

"ARRL has received numerous complaints from Amateur Radio operators of significant noise in the medium (MF) and high frequency (HF) bands between 1.8 MHz and 30 MHz from 'grow lights' and other Part 15 and part 18 RF lighting devices," Imlay continued. "These devices are easily capable of emitting RF noise sufficient to preclude Amateur Radio MF and HF communications (and, as well, AM broadcast station reception) throughout entire communities."

Supporting both complaints are extensive and detailed reports by ARRL Laboratory EMC Specialist Mike Gruber, W1MG. The reports recount incidents of actual purchases of Part 18 RF lighting devices intended for commercial use to consumers who made clear to store personnel that they intended to use the devices at home. Gruber's report includes multiple photographs that depict in-store displays of the products in question and showing signage that does not adequately explain which devices may be sold to whom.

The ARRL has asked that all non-consumer devices be removed from retail sale and marketing at the stores and to track and recall non-consumer devices already sold to consumers.

In his report, Gruber concluded that retailers should require purchasers of non-consumer Part 18 RF lighting devices to provide a valid contractor's number. He also advised that the stores improve display signage to make it clear that non-consumer Part 18 devices may not be used in residential settings.

Earlier this year, the ARRL sent similar complaint letters to the FCC regarding the marketing of Part 18 RF lighting devices by The Home Depot. The League also has complained about specific RF lighting “grow light” devices that it has alleged exceed Part 18 emission limits.

December 28, 2015

Via E-mail and U.S. Mail

bruce.jacobs@fcc.gov

rashmi.doshi@fcc.gov

Bruce Jacobs, Chief
Spectrum Enforcement Division
Enforcement Bureau
Federal Communications Commission
445-12th Street, S.W.
Washington, D.C. 20554

Dr. Rashmi Doshi, Chief
Laboratory Division
Office of Engineering and Technology
Federal Communications Commission
7435 Oakland Mills Rd
Columbia MD 21046-1609

Re: Complaint of Violation of Part 18 Marketing Regulations
By Lowe's Companies, Inc. with Respect to RF Lighting Devices.

Dear Mr. Jacobs and Dr. Doshi:

This office represents ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated. The purpose of this letter and the attached evidentiary document entitled "*FCC Part 18 Marketing Violations by Lowe's Companies, Inc.*" (the Report) prepared by ARRL Laboratory Staff member Mike Gruber is to request on behalf of ARRL that the Commission investigate and commence an enforcement proceeding with respect to Lowe's marketing and retail sale of radio frequency (RF) lighting devices in the United States. ARRL purports to show that the hardware and home improvement chain is, in at least three stores located in California, Connecticut and Massachusetts (and by inference in other stores nationwide) marketing and selling to consumers (by retail sale) non-consumer, Part 18 RF lighting devices which are *not* intended for residential deployment, to consumers who have specifically noted their intention to deploy the devices in residential applications.

As is noted in the attached Report, there are within the Part 18 ISM rules [See Sections 18.305(c) and 18.307(c)] two classes of Conducted and Radiated Emissions limits for RF lighting devices such as CFLs and Electronic Fluorescent Light Ballasts. One is for consumer equipment (defined at Section 18.107 as that category of ISM equipment which is used or intended to be used by the general public in a residential environment, notwithstanding its use in other areas). The other is for non-consumer equipment (which of necessity is intended for non-residential applications). These classes of limits are vastly different. For example, the conducted emission limits for Amateur Radio allocations below 30 megahertz are 22 dB different as between consumer and non-consumer applications. Section 18.213(d) states that "manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to

radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz.”

ARRL has received numerous complaints from amateur radio operators of significant noise in the Medium (MF) and High Frequency (HF) bands between 1.8 MHz and 30 MHz from “grow lights” and other Part 15 and Part 18 RF lighting devices. These devices are easily capable of emitting RF noise sufficient to preclude Amateur Radio MF and HF communications (and as well AM Broadcast station reception) throughout entire communities (and at distances of up to ½ mile from the device). ARRL has, as is noted in the attached Report, conducted studies in several states, including California, Massachusetts and Connecticut and has discovered an alarming number of instances of retail sale of electronic lighting ballasts, in which non-consumer-rated ballasts were mixed in with consumer ballasts and other consumer products and available for retail sale without guidance as to the proper deployment of them. Furthermore, the display signage in many cases did not mention or adequately address FCC Part 18 requirements as they pertain to interference in a residential environment. In most of the stores surveyed, unsuspecting consumers have no way of knowing the significance of consumer vs. non-consumer ballasts. In some cases, “commercial” grade ballasts, with their associated non-consumer emissions limits, appeared to be a merely heavier duty or longer lasting version of the same product. The display signage typically used implies, therefore, that commercial ballasts are also a product upgrade for home use. It typically does not include or mention the applicable FCC requirements.

Although Part 18 rules describe limits for consumer and non-consumer RF Lighting Devices, many ballasts are labeled only as either “Part 18A” or “18B”. This nomenclature is clearly an adaptation from Part 15A and 15B, which pertains to commercial/industrial and residential digital devices, respectively. Part 18 does not include an A or B designation for RF lighting devices and the labelling is not at all helpful to consumers and, as used, has no regulatory connotation at all.

In the four cases of actual purchases of RF Lighting devices at retail from Lowe’s stores, the purchasers specifically asked about residential deployment of non-consumer RF lighting ballasts. The device was actually purchased in each case cited. It is readily apparent that Lowe’s (and, in ARRL’s experience, other similar hardware retail sellers) are actively and knowingly engaged on a daily basis in selling non-consumer, commercial RF lighting products to Lowe’s customers for residential deployment. If this activity is left unchecked, the Commission will continue to note a deterioration in ambient noise levels and preclusive interfering signals for both AM Broadcasters and Amateur Radio licensees in the entirety of the High Frequency bands.

ARRL respectfully requests that all non-consumer devices be removed from retail sale and marketing at Lowe’s. Those non-consumer devices that have been sold to consumers should be tracked and recalled.

Given the foregoing, on behalf of the more than 730,000 licensed radio amateurs in the United States who have a significant interest in avoiding interference in residential environments from RF lighting devices which were never intended to be deployed in a residential environment, ARRL respectfully requests that your offices take the appropriate action with respect to Lowe’s and other similar chains of retail sales of these devices without delay.

Should any additional information be called for, please contact the undersigned, General Counsel for ARRL, the national association for Amateur Radio. Thank you very much for your consideration of this request.

Sincerely,

Christopher D. Imlay
General Counsel, ARRL

Attachment

Copy to: Lowe's Companies, Inc., 1000 Lowe's Boulevard, Mooresville, NC 28117
(Attention: Ross W. McCanless, Esquire, Executive Vice President, General Counsel, Secretary
and Chief Compliance Officer)

FCC Part 18 Marketing Violations by Lowe's Companies, Inc.

By Mike Gruber, W1MG, ARRL Laboratory

September 8, 2015

Introduction

Non-electronic ballasts, which once dominated the fluorescent light market, operated under Part 15 as incidental radiators. Today they have been phased out in favor of newer electronic ballasts which, along with CFL bulbs, operate under Part 18 as "RF Lighting Devices." In this case, the FCC considers these devices to be converting RF energy above 9 kHz directly into light, i.e., another form of energy. For this reason, the Commission classifies an electronic ballast as an ISM device.

Recent surveys conducted by ARRL, the national association for Amateur Radio in several states, including California, Illinois, Massachusetts and Connecticut indicate that most electrical and lighting retail outlets are now primarily or exclusively stocking and selling electronic ballasts. In fact, it should be noted that non-electronic ballasts are no longer being sold by several "big box stores" that we surveyed. Presumably this is a nationwide phenomenon being driven in part by government mandate.

Part 18 Limits for RF Lighting Devices

As shown by Appendix A, Part 18 has two sets of limits for RF Lighting Devices: one limit for consumer devices, and one for non-consumer devices. The emissions limits are *considerably lower for consumer rated devices*. As an example, the conducted emissions limits for operation within all present Amateur Radio allocations below 30 MHz are 22 dB less for consumer-rated devices than for non-consumer-rated devices. It should also be noted that consumer-rated devices are the only RF lighting devices that should be used for a home or residential applications. Per § 18.107 (g), consumer ISM equipment is defined as that which is to be "*used or intended to be used by the general public in a residential environment, notwithstanding use in other areas.*"

Although non-consumer devices might be suitable for commercial and industrial environments, ARRL is now receiving a significant number of reports of actual cases in which commercial devices are being operated in and which are causing harmful interference to licensed Amateur Radio operation in residential areas.

Illegal Marketing by Lowe's of Part 18 RF Lighting Devices

The previously mentioned multi-state survey of fluorescent light ballasts showed an alarming number of non-consumer rated ballasts mixed in or on display adjacent to consumer products. Furthermore, the display signage in every store that we surveyed did not adequately address or mention FCC Part 18 requirements as they pertain to interference in a residential environment. Unsuspecting consumers have no way of knowing the significance of consumer vs. non-consumer ballasts. It is apparent that most consumers assume the "commercial" grade ballasts, with their associated non-consumer emissions limits, would be a heavier duty or superior product. The display signage implies, therefore, that commercial ballasts might be a product upgrade for home use. In no case did the signage include or mention the applicable FCC requirements or

any limitations on deployment of the devices.

Although Part 18 only describes limits for consumer and non-consumer RF Lighting Devices, many ballasts are labeled only as either Part 18A or 18B without explanation. This nomenclature is clearly an adaptation from Part 15A and 15B, which pertains to commercial/industrial and residential digital devices, respectively. Part 18 does not include an A or B designation for RF lighting devices and so the labeling is (i) undefined and unexplained, and (ii) meaningless from a regulatory standpoint.

See Appendix B for pertinent definitions and rules in Part 18, particularly with regard to the marketing and sale of non-consumer devices to consumers. Additional information in Appendix C is taken from Part 2 of the FCC rules. Appendix D is for reference purposes only. It contains some of the equivalent rules with regard to Part 15A (non-consumer) and Part 15B (consumer) digital devices.

Sale of Non-Consumer RF Lighting Devices for Residential Purposes

The following four cases highlight the marketing and sale of commercial light fixtures and ballasts by Lowe's to residential users. A non-consumer or "commercial" product was actually purchased in each case after consulting with a sales associate. Specifically, the sales associate was asked about the use of a commercial Part 18 non-consumer rated ballast in a residential environment.

Case 1 (Florescent Light Ballast)

On August 19, 2015, Ms. Deborah Roy purchased a non-consumer rated OSRAM QTP 2x32T8/UNV ISN-SC (50994) ballast from a Lowe's located at the following address:

Lowe's Store #0660 / E. Springfield, MA
1600 Boston Road
Springfield, MA 01129
Tel: (413) 543-0601

Before selecting the ballast, Ms. Roy reports that she asked the sales associate for assistance. She pointed out that it was labelled as a commercial device and asked if she could use it in the basement of her home. The Lowe's associate responded, "Sure – yes – no problem. It's okay for use in a home." Ms. Roy then thanked him and paid for this device using her Visa Card at the store's check out. Again, this non-consumer item was in not flagged during check-out. After paying for it, she simply walked out of the store with it. See Figure 1.1 for photo of ballasts on display.



Figure 1.1 - Ballasts on display. Commercial ballasts with orange stripe are on the left. Residential ballasts with blue labelling are on right.

As can be seen in Figure 1.1, the consumer and non-consumer ballasts in this store were in a somewhat apparent order. Non-consumer ballasts were on the left. Consumer ballasts were on the same shelf and to the right of the non-consumer ballasts. The ballasts were adjacent to each other and differentiated by a color scheme. Packaging with blue labels with white lettering were for residential environments. An orange stripe on the box indicated a commercial device. (A quick survey of several samples showed the ratio to be about 50/50.) Although this color scheme made it easy to tell commercial from residential ballasts, it wasn't clear why a consumer would select one over the other. In fact, the commercial rating to most consumers might suggest a heavier duty or better quality product. See Figure 1.2 for photo of store display.

The particular ballast purchased by Ms. Roy was mixed in with non-consumer "commercial" ballasts. Although consumer ballasts are labeled for residential use only, there is no equivalent statement anywhere on the device packaging or store display. While the box label does include a statement "Complies with FCC 47 CFR Part 18, Non-Consumer No PCBs" it is in small print. Furthermore, unsuspecting consumers have no way of knowing what this means. There is no mention – anywhere – of radio interference or a warning against using it in a home environment.

Once home, Ms. Roy opened the box and was also surprised that there was no instruction sheet or documentation inside. There is only a statement printed on the ballast, which is identical to the one on the box, "Complies with FCC 47 CFR Part 18, Non-Consumer No PCBs." However, this does not comply with FCC rule § 18.213, particularly paragraph (d), which reads as follows:

"(d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style"

The ballasts in this particular store were all packaged in a box. It is, therefore, not known which, if any, ballasts came with an instruction sheet or had the proper FCC advisory statement required by § 18.213 (d). It should also be noted that the labeling provided is effectively

meaningless to most of the customers that purchase these devices. The typical consumer would not know the significance of the non-standard references to the Part 18A and Part 18B ratings.



Figure 1.2 – The store display. The ballasts are on a shelf above the fixtures. The store signage on the right provides information on how to choose a ballast but makes no mention of the FCC rules, Part 18, or the potential to cause radio interference.

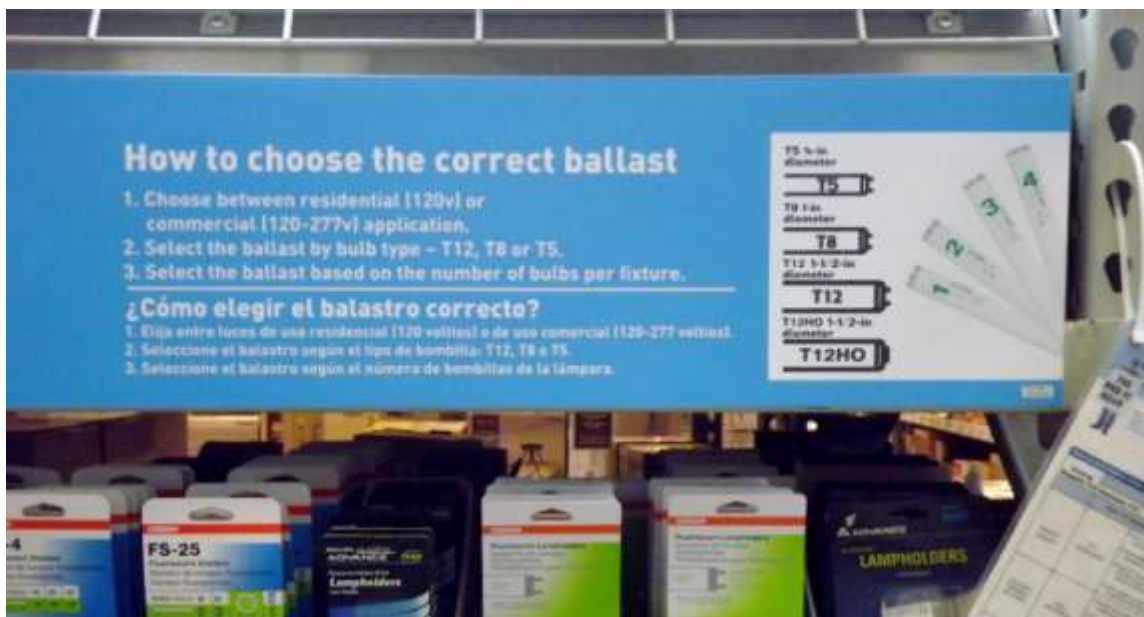


Figure 1.3 – Close-up of the signage pertaining to ballast selection. Although it mentions the difference between residential and commercial ballasts, the difference appears to be based only on voltage. It makes no mention of FCC Part 18 rules or the potential for radio interference. The consumer would have no way of knowing that a commercial device should not be used in a residential environment.

The store display is shown in Figure 1.2. There is no indication of Part 18 FCC requirements. Figure 1.3 also shows a close-up of the display signage pertaining to the selection of ballasts. Although it tells customers to select commercial and residential ballasts accordingly, it does not

specifically tell them not to use a commercial ballast in a home. Consumer ballasts, on the other hand, are clearly labeled for residential use only. The customer is left with the impression that the commercial ballast is a superior or heavier duty product. A relatively small info sheet attached to the display provided a cross reference of magnetic ballasts to the newer electronic ballasts. See Figure 1.4.



Figure 1.4 – This info sheet provides a cross reference for electronic ballasts when replacing older magnetic ballasts. It does not provide any information on the FCC rules pertaining to Part 18.

Although the display had instructions on ballast selection, they did not specifically address the FCC rules nor prohibit the use of non-consumer ballasts in a residential environment. The store's display instructions on how to select between consumer and non-consumer ballasts are inadequate. As previously shown in Figure 1.3, the instructions only reference voltage requirements. Since 120 vac is typically available in both commercial and residential environments, the consumer in this case might logically conclude that the commercial ballast could be used in a home or residential environment.

The photo in Figures 1.5 shows the ballast that was ultimately purchased by Ms. Roy at this store. The photos in Figures 1.5 and 1.6 show the only references that she had concerning Part 18 rules and requirements.



Figure 1.5 – This is the non-consumer ballast purchased by Ms. Roy at the Lowe's store in E. Springfield, MA.



Figure 1.6 – This is the only reference to Part 18 on the Packaging and visible at the time of purchase. Ms. Roy had no way of knowing that this device should not be used in her home. When she asked a Lowe's associate, the advice he provided was incorrect.



Figure 1.7 – When Ms. Roy opened the box at home, there was no information for the user as required by Part 18. In fact, there was no additional instruction sheet or documentation. The only reference to Part 18 inside the box was on the device itself and shown in this photo.

Conclusion

Lowe's is not only selling and marketing commercial devices to consumers, their sales staff is not knowledgeable enough to properly advise its customers about FCC regulatory requirements for deployment of the products. In addition to this marketing violation by Lowe's, a second Part 18 violation is also noted. Specifically, the manufacturer (OSRAM Sylvania, Inc.) failed to include the advisory statement required by § 18.213 (d) with the device purchased by Ms. Roy, and Lowe's either knew or should have known that such is a violation of FCC rules governing marketing and sale of RF devices.

Case 2 (Lighting Fixtures)

Mr. Jerry Ramie arrived at the Lowe's Home Improvement store on 775 Ridder Park Drive in San Jose, CA 95131 a little before 1:00PM on August 17, 2015. The fluorescent lighting section was a mixture of ballasts and fixtures, both residential and commercial intermingled.

Figure 2.1, at right, shows the right side of the lighting display at this store.

Ballasts are at the top of the display, with a mixture of residential and commercial fixtures below them. The "Universal Volt" reference is the only signage that differentiates commercial-grade from residential products, as can be seen on the top-right of the display. These voltage tags are also imprinted along the sides of the boxes shown below the sign.

Commercial and residential lighting fixtures are also on the same shelf and adjacent to each other. Two blue Metatech commercial fixtures are pulled out at bottom-right. The red Utilitec residential fixtures are at the lower-left in the photo.



Figure 2.1 - Right side of lighting display at Lowe's on Ridder Park Drive in San Jose, California. Commercial and consumer devices are mixed and intermingled. See text at left of photo for detailed description.

The top-left area of the signage below shown in Figure 2.2 shows some of the commercial and

residential ballasts offered. The sign indicates that “Wrap Lights” in this section are “Best in utility settings such as laundry areas, closets & more.”



Figure 2.2 – Left side of store signage.

Also in Figure 2.2, the orange-striped ballasts are all commercial grade and the third-from-right box (pulled forward obscuring the price) holds the Osram (Sylvania) 50994 commercial T8 ballasts. Two stacks to the right of them are the blue GE residential T8 ballasts. (Also obscuring the price tag) The commercial ballasts cost more than the residential ballasts. There is no other differentiation shown regarding residential or commercial products.



The left side of the display is shown in Figure 2.3. Additional ballasts and starters are displayed at the top, with residential and commercial fixtures intermingled below them.

Note the green 4' long T8 fixtures pulled out at bottom right. These are Cooper commercial fixtures on sale for \$47.98. The Utilitec consumer T8 fixture is at lower-left and is not sale priced at \$54.98.

About this time, a Lowe's associate from the electrical department asked if Mr. Ramie needed help. Mr. Ramie inquired as to which T8 fixture was appropriate for his garage at home. The Lowe's associate immediately recommended the Cooper commercial fixture that was on sale. Mr. Ramie asked him what the difference was. The associate told Mr. Ramie that if he bought the Cooper he could “put it up once and it'll last forever. Cooper is the best quality.” Mr. Ramie thanked him for his

advice and purchased the Cooper commercial fixture for his residential garage.

Figure 2.3 – Left side of display. See text at right of photo for detailed description.

Details of the product recommended by the Lowes associate are shown below in Figure 2.4. The middle photo in Figure 2.4B indicates compliance with Part 18 EMI/RFI regulations. “Meets FCC Part 18 (Class A) for EMI and RFI – Non-consumer limits”



Figure 2.4A – Back view.
sales receipt.



Figure 2.4B – Front view.



Figure 2.4C – End view with

Conclusion:

The display mixed Commercial and Residential products together and there were no signs indicating what the differences might be. The advice given to Mr. Ramie by the staff was not correct. It led to the purchase of the wrong product which may cause interference when used at home.

Case 3 (Ballasts)

Mr. Jerry Ramie arrived at the Lowe's Home Improvement Store at 750 Newhall Drive in San Jose, CA 95110 a little after 1:00PM on August 17, 2015. He wanted to look at ballasts for lighting two T8-F32 tubes and found the display shown in Figure 3.1.



Figure 3.1 – Fluorescent light ballasts on display at Lowe's on Newhall Drive in San Jose.

As in the other Lowe's, the display intermingled residential and commercial ballasts and fixtures. The orange striped box at the left holds Osram (Sylvania) 50994 commercial T8 ballasts for powering two 4' T8 tubes at 32W each (F32) from 120-277VAC. The blue GE residential ballast at right powers the same complement of tubes from 120VAC mains only for \$15.97 each.



Figure 3.2 – This is the commercial ballast incorrectly recommended by a Lowe's associate for residential lighting purposes.

When a Lowe's lighting associate came by, Mr. Ramie told him that he wanted to replace the

ballast in his home garage with a new one for powering two 4' F32 tubes. Mr. Ramie pointed out the two ballasts in the photo shown in Figure 3.1 and asked him what the difference was. The associate told Mr. Ramie that the commercial ballast shown in Figure 3.2 offered “faster turn-on in cold weather.” Mr. Ramie then asked if that was the only difference between the two. The associate told him that the commercial voltage range was wider and that “there aren’t any other differences.”

Mr. Ramie thanked him and told him that he liked the idea of the lights coming on quickly in his home garage. Mr. Ramie mentioned that the price of the GE residential ballast was half that of the commercial ballast, but he told the associate that he wanted “the best.” The associate agreed that the commercial ballast was “better” and Mr. Ramie purchased it for his home garage.

Details of this ballast are shown below in Figures 3.3 and 3.4.



Figure 3.3 – Upon the recommendation of a Lowe’s lighting associate, Mr. Ramie purchased this commercial “FCC Part 18 non-consumer” ballast for residential purposes. Under the FCC rules, however, this device should not be used in a home environment. It is intended only for commercial and industrial environments. The box labelling indicates in small print, “Complies with FCC 47 CFR Part 18, Non-Consumer No PCBs.”



Figure 3.4 – Inside the box. FCC rule § 18.213 (d) requires manufacturers of RF lighting devices to include an advisory statement on product packaging or in documentation. This statement describes and addresses the device potential to cause radio interference. Although small print on the ballast indicates, “Complies with FCC 47 CFR Part 18, Non-Consumer No PCBs,” the required advisory statement was not included on the product packaging. There was no documentation included with the device in the box. This is a labelling violation on the part of the manufacturer.

Conclusion:

The sales representatives at both Lowe’s locations did not understand the differences between commercial and residential fluorescent lighting. They both implied that additional features and quality advantages were available by using commercial lighting equipment in a residential setting. The displays were confusing and did not provide any information as to how a consumer might choose between residential and commercial ballasts and fixtures or what the differences might be.

The only way to stop such incorrect information coming from a sales person is with correct and complete information in the signage. If the sign gives useful information on the interference potential of commercial lighting equipment when used in residential settings, then the sales representatives and their customers may actually read it and purchase only residential rated devices for residential installations.

Another violation by the manufacturer involves § 18.213 (d). This rule requires information to the user “be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment.” The advisory statement required by the rule was previously quoted in Case 1. It was not included with the packaging or product documentation. See Appendix B for complete text of § 18.213.

Case 4 (Fluorescent Light Ballast)

On September 1, 2015, Ms. Lori Kosior purchased a non-consumer rated OSRAM QTP 2x32T8/UNV ISN-SC (50994) ballast from a Lowe's located at the following address:

Lowe's Store #0623 / Newington, CT
3270 Berlin Turnpike
Newington, CT 06111, Store #0623
Phone: (860) 667-7003

Before purchasing the ballast, Ms. Kosior reports that she asked the appropriate Lowe's associate for assistance. She indicated that she was buying the commercial ballast for her husband, who was attempting to use it in the basement of their home, clearly a residential application. The Lowe's associate asked some questions pertaining to the number and type of bulbs in the fixture. Ms. Kosior responded that she thought she had the right ballast in that regard, but wanted to know if it okay to use a commercial device in her home. The associate responded, "All that commercial means is that it can be used for 120 standard volts, or as high as 277 volts, as listed on the package."

The associate did not know and gave no indication that this commercial ballast should not be used in a home environment. Ms. Kosior then paid cash for this device at the store's check out. Again, this non-consumer item was not flagged during check-out. After paying for it, she simply walked out of the store with it.

As can be seen in Figure 4.1, the consumer and non-consumer ballasts in this store were in a somewhat apparent order. Non-consumer ballasts were on the left. Consumer ballasts were on the same shelf and to the right of the non-consumer ballasts. This is similar to other Lowe's stores that we investigated. The ballasts were adjacent to each other and differentiated by a color scheme.



Figure 4.1 – Consumer and non-consumer ballasts on display at the Lowe's store in Newington, CT. This is similar to the other Lowe's stores in this report.

The information provided by Lowe's to its customers is clearly inadequate to properly advise them with regard to Part 18 rules. This is similar to the other Lowe's stores in this report. There is no clear reference to FCC Part 18 requirements when selecting a ballast, and the package labeling only references compliance with Part 18A, which would be meaningless to most consumers and Lowe's customers.



Figure 4.2 – The information provided by Lowe's at this Connecticut store is essentially the same as at other Lowe's stores that we investigated. Refer to Figures 1.3 and 1.4 for similar signage and info sheet that we found at the Massachusetts store in E. Springfield.

Finally, after receiving incorrect advice from the Lowe's associate, Ms. Kosior purchased the non-consumer ballast shown in Figure 4.3.



Figure 4.3 – The ballast purchased by Ms. Kosior at the Newington, CT store. This purchase was the result of the store's improper marketing and incorrect advice from a Lowe's associate. The only reference to Part 18 at the time of purchase is a reference to Part 18A compliance on the box.

Conclusion

The improper sale and marketing of Part 18 non-consumer devices to consumers at this location is similar to the other Lowe's stores detailed in this report. Furthermore, their sales staff is not knowledgeable enough to properly advise its customers. In addition to this marketing violation by Lowe's, the product purchased by Ms. Kosior also included a second Part 18 violation. Specifically, the manufacturer (OSRAM Sylvania, Inc.) failed to include the advisory statement required by § 18.213 (d) with the device that she purchased.

Final Conclusion & Recommendations

Clearly Lowe's marketing and sale of non-consumer ballasts is not adequate to ensure compliance with FCC Part 18 requirements. This was demonstrated by the four cases described in this report, including the purchase of non-consumer ballasts after clearly telling store personnel that the product was intended for residential purposes. This appears to be a widespread problem in Lowe's stores throughout the United States, including California, Connecticut and Massachusetts. It is therefore recommended that an enforcement proceeding against Lowe's be commenced by the FCC for the illegal and misleading marketing of Part 18 non-consumer lighting devices.

Specific marketing recommendations include:

- 1) Non-consumer (Commercial) and consumer (Residential) products should be marketed from two different locations, with a clear line of separation between them.
- 2) Improved display signage clearly stating that commercial devices should not be used in a residential environments. Reference should be made to FCC Part 18 rules and the increased potential for commercial devices to cause radio interference.
- 3) Purchasers of commercial devices must provide a valid contractor's number at the time of purchase.

An additional FCC rule violation is also noted. Specifically, Osram Sylvania failed to include the advisory statement required by § 18.213 (d) of the Commission's Rules. See Appendix B for the entire text of § 18.213, including paragraph (d). It is therefore recommended that Osram Sylvania also be sanctioned by the Commission for repeated and willful failure to comply with § 18.213 (d).

List of Appendices

- 1) Appendix A - Part 18 Emissions limits for RF Lighting Devices (Including Electronic Fluorescent Light Ballasts)
- 2) Appendix B - Part 18 - Pertinent Definitions and Rules
- 3) Appendix C - Part 2 - Pertinent Definitions and Rules
- 4) Appendix D - Part 15 - Pertinent Definitions and Rules

Appendix A

Part 18 Emissions limits for RF Lighting Devices (Including Electronic Fluorescent Light Ballasts)

Table 1A - Part 18 Conducted Emissions Limits (For RF Lighting Devices, such as CFLs and Electronic Fluorescent Light Ballasts)

Frequency (MHz)	Maximum RF line voltage measured with a 50 uH/50 ohm LISN (uV)	Conducted limit (dBµV)
Consumer equipment:		
0.45 to 2.51	250	48
2.51 to 3.0	3,000	70
3.0 to 30	250	48
Non-consumer equipment:		
0.45 to 1.6	1,000	60
1.6 to 30	3,000	70

(d) If testing with a quasi-peak detector demonstrates that the equipment complies with the average

Table 1B - Part 18 Radiated Emissions Limits for RF lighting devices

Frequency (MHz)	Field strength limit at 30 meters (µV/m)
Non-consumer equipment:	
30-88	30
88-216	50
216-1000	70
Consumer equipment:	
30-88	10
88-216	15
216-1000	20

Appendix B

Part 18 - Pertinent Definitions and Rules

§ 18.107 Definitions.

(a) *Radio frequency (RF) energy.* Electromagnetic energy at any frequency in the radio spectrum from 9 kHz to 3 THz (3,000 GHz).

(b) *Harmful interference.* Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter.

(c) *Industrial, scientific, and medical (ISM) equipment.* Equipment or appliances designed to generate and use locally RF energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunication. Typical ISM applications are the production of physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal and acceleration of charged particles.

(g) *Consumer ISM equipment.* A category of ISM equipment used or intended to be used by the general public in a residential environment, notwithstanding use in other areas. Examples are domestic microwave ovens, jewelry cleaners for home use, ultrasonic humidifiers.

(i) *Marketing.* As used in this part, marketing shall include sale or lease, offer for sale or lease, advertising for sale or lease, the import or shipment or other distribution for the purpose of sale or lease or offer for sale or lease. See subpart I of part 2 of this chapter.

NOTE: In the foregoing, sale (or lease) shall mean sale (or lease) to the user or a vendor who in turn sells (or leases) to the user. Sale shall not be construed to apply to devices sold to a second party for manufacture or fabrication into a device which is subsequently sold (or leased) to the user.

§ 18.203 Equipment authorization.

(a)) Consumer ISM equipment, unless otherwise specified, must be authorized under either the Declaration of Conformity or certification procedure prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in part 2, subpart J of this chapter and shall also be accompanied by:

(1) A description of measurement facilities pursuant to § 2.948, or reference to such information already on file with the Commission.

(2) A technical report pursuant to §§ 18.207 and 18.311.

(b) Consumer ultrasonic equipment generating less than 500 watts and operating below 90 kHz, and non-consumer ISM equipment shall be subject to verification, in accordance with the relevant sections of part 2, subpart J of this chapter.

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c)) Simple measures that can be taken by the user to correct interference.

(d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style.

Appendix C

Part 2 - Pertinent Definitions and Rules

§ 2.1 Terms and definitions.

Interference. The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy. (RR)

§ 2.801 Radiofrequency device defined.

As used in this part, a radiofrequency device is any device which in its operation is capable of emitting radiofrequency energy by radiation, conduction, or other means. Radiofrequency devices include, but are not limited to:

- (c) The industrial, scientific, and medical equipment described in part 18 of this chapter.
- (d) Any part or component thereof which in use emits radiofrequency energy by radiation, conduction, or other means.

§ 2.909 Responsible party.

The following parties are responsible for the compliance of radio frequency equipment with the applicable standards:

(a) In the case of equipment which requires the issuance by the Commission of a grant of equipment authorization, the party to whom that grant of authorization is issued (the grantee) If the radio frequency equipment is modified by any party other than the grantee and that party is not working under the authorization of the grantee pursuant to § 2.929(b), the party performing the modification is responsible for compliance of the product with the applicable administrative and technical provisions in this chapter.

(b) In the case of equipment subject to authorization under the verification procedure, the manufacturer or, in the case of imported equipment, the importer. If subsequent to manufacture and importation, the radio frequency equipment is modified by any party not working under the authority of the responsible party, the party performing the modification becomes the new responsible party.

(c) In the case of equipment subject to authorization under the Declaration of Conformity procedure:

(1) The manufacturer or, if the equipment is assembled from individual component parts and the resulting system is subject to authorization under a Declaration of Conformity, the assembler.

(2) If the equipment, by itself, is subject to a Declaration of Conformity and that equipment is imported, the importer.

(3) Retailers or original equipment manufacturers may enter into an agreement with the responsible party designated in paragraph (c)(1) or (c)(2) of this section to assume the responsibilities to ensure compliance of equipment and become the new responsible party.

(4) If the radio frequency equipment is modified by any party not working under the authority of the responsible party, the party performing the modifications, if located within the U.S., or the importer, if the equipment is imported subsequent to the modifications, becomes the new responsible party.

(d) If, because of modifications performed subsequent to authorization, a new party becomes responsible for ensuring that a product complies with the technical standards and the new party does not obtain a new equipment authorization, the equipment shall be labelled, following the specifications in § 2.925(d), with the following: “This product has been modified by [insert name, address and telephone number of the party performing the modifications].”

[54 FR 17712, Apr. 25, 1989, as amended at 61 FR 31045, June 19, 1996; 62 FR 10470, Mar. 7, 1997; 62 FR 41880, Aug. 4, 1997]

Appendix D

Part 15 - Pertinent Definitions and Rules

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

(c) The provisions of paragraphs (a) and (b) of this section do not apply to digital devices exempted from the technical standards under the provisions of § 15.103.

(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) of this section needs to be contained only in the instruction manual for the main control unit.

(e) In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68546, Dec. 9, 2003]

Appendix 6

December 29, 2015

Via E-mail and U.S. Mail

bruce.jacobs@fcc.gov

rashmi.doshi@fcc.gov

Bruce Jacobs, Chief
Spectrum Enforcement Division
Enforcement Bureau
Federal Communications Commission
445-12th Street, S.W.
Washington, D.C. 20554

Dr. Rashmi Doshi, Chief
Laboratory Division
Office of Engineering and Technology
Federal Communications Commission
7435 Oakland Mills Rd
Columbia MD 21046-1609

Re: Complaint of Violation of Part 18 Marketing Regulations
By Wal-Mart Stores, Inc. with Respect to RF Lighting Devices.

Dear Mr. Jacobs and Dr. Doshi:

This office represents ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated. The purpose of this letter and the attached evidentiary document entitled “*FCC Part 18 Marketing Violations by Wal-Mart Stores, Inc.*” (the Report) prepared by ARRL Laboratory Staff member Mike Gruber is to request on behalf of ARRL that the Commission investigate and commence an enforcement proceeding with respect to Walmart’s marketing and retail sale of radio frequency (RF) lighting devices in the United States. ARRL purports to show that the hardware and home improvement chain is, in at least one store located in Connecticut (and by inference in other stores nationwide) marketing and selling to consumers (by retail sale) non-consumer, Part 18 RF lighting devices which are *not* intended for residential deployment, to consumers who have specifically noted their intention to deploy the devices in residential applications.

As is noted in the attached Report, there are within the Part 18 ISM rules [See Sections 18.305(c) and 18.307(c)] two classes of Conducted and Radiated Emissions limits for RF lighting devices such as CFLs and Electronic Fluorescent Light Ballasts. One is for consumer equipment (defined at Section 18.107 as that category of ISM equipment which is used or intended to be used by the general public in a residential environment, notwithstanding its use in other areas). The other is for non-consumer equipment (which of necessity is intended for non-residential applications). These classes of limits are vastly different. For example, the conducted emission limits for Amateur Radio allocations below 30 megahertz are 22 dB different as between consumer and non-consumer applications. Section 18.213(d) states that “manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz.”

ARRL has received numerous complaints from amateur radio operators of significant noise in the Medium (MF) and High Frequency (HF) bands between 1.8 MHz and 30 MHz from “grow lights” and other Part 15 and Part 18 RF lighting devices. These devices are easily capable of emitting RF noise sufficient to preclude Amateur Radio MF and HF communications (and as well AM Broadcast station reception) throughout entire communities (and at distances of up to ½ mile from the device). ARRL has, as is noted in the attached Report, conducted studies in several states, including California, Massachusetts and Connecticut and has discovered an alarming number of instances of retail sale of electronic lighting ballasts, in which non-consumer-rated ballasts were mixed in with consumer ballasts and other consumer products and available for retail sale without guidance as to the proper deployment of them. Furthermore, the display signage in many cases did not mention or adequately address FCC Part 18 requirements as they pertain to interference in a residential environment. In most of the stores surveyed, unsuspecting consumers have no way of knowing the significance of consumer vs. non-consumer ballasts. In some cases, “commercial” grade ballasts, with their associated non-consumer emissions limits, appeared to be a merely heavier duty or longer lasting version of the same product. The display signage typically used implies, therefore, that commercial ballasts are also a product upgrade for home use. It typically does not include or mention the applicable FCC requirements or the radio interference potential of the device.

Although Part 18 rules describe limits for consumer and non-consumer RF Lighting Devices, many ballasts are labeled only as either “Part 18A” or “18B”. This nomenclature is clearly an adaptation from Part 15A and 15B, which pertains to commercial/industrial and residential digital devices, respectively. Part 18 does not include an A or B designation for RF lighting devices and the labelling is not at all helpful to consumers and, as used, has no regulatory connotation at all.

In the one case of actual purchases of an RF Lighting device at retail from a Walmart store, the purchaser specifically asked about residential deployment of non-consumer RF lighting ballasts. The device was actually purchased in each case cited. It is readily apparent that Walmart (and, in ARRL’s experience, other similar hardware retail sellers including Home Depot and Lowe’s have the same marketing practices) is actively and knowingly engaged on a daily basis in selling non-consumer, commercial RF lighting products to Walmart customers for residential deployment. If this activity is left unchecked, the Commission will continue to note a deterioration in ambient noise levels and preclusive interfering signals for both AM Broadcasters and Amateur Radio licensees in the entirety of the High Frequency bands.

ARRL respectfully requests that all non-consumer devices be removed from retail sale and marketing at Walmart, absent a more appropriate and informational marketing program. Those non-consumer devices that have been sold to consumers for residential installation should be tracked and recalled.

Given the foregoing, on behalf of the more than 730,000 licensed radio amateurs in the United States who have a significant interest in avoiding interference in residential environments from RF lighting devices which were never intended to be deployed in a residential environment, ARRL respectfully requests that your offices take the appropriate action with respect to Walmart and other similar chains of retail sales of these devices without delay.

Should any additional information be called for, please contact the undersigned, General Counsel for ARRL, the national association for Amateur Radio. Thank you very much for your consideration of this request.

Sincerely,

Christopher D. Imlay
General Counsel, ARRL

Attachment

Copy to: Karen Roberts, Executive Vice President and General Counsel for Wal-Mart Stores, Inc. 702 SW 8th Street Bentonville, AR 72716-8611 Karen.Roberts@wal-mart.com (via U.S. Mail and e-mail)

FCC Part 18 Marketing Violations by Wal-Mart Stores, Inc.

By Mike Gruber, ARRL Laboratory Staff

October 20, 2015

Introduction

Non-electronic ballasts, which once dominated the fluorescent light market, operated under FCC Rule Part 15 as incidental radiators. Today they have been phased out in favor of newer electronic ballasts which, along with CFL bulbs, operate under Rule Part 18 as “RF Lighting Devices.” In this case, FCC considers these devices to be converting RF energy above 9 kHz directly into light, i.e., another form of energy. For this reason, the Commission classifies an electronic ballast as an ISM device.

Part 18 Limits for RF Lighting Devices

As shown by Appendix A, Part 18 has two sets of limits for RF Lighting Devices. Specifically, there is a separate set of limits for consumer vs. non-consumer lighting devices. The emissions limits are considerably lower for consumer rated devices. As an example, the conducted emissions limits for all present ham bands below 30 MHz are 22 dB less for consumer rated devices. It should also be noted that these are the only devices that should be used for a home or residential applications. Per § 18.107 (g), consumer ISM equipment is to be *“used or intended to be used by the general public in a residential environment, notwithstanding use in other areas.”*

Although non-consumer devices might be suitable for commercial and industrial environments, ARRL is now receiving numerous reports of actual cases in which commercial RF lighting devices are causing harmful interference in residential areas.

Illegal Marketing by Walmart of Part 18 RF Lighting Devices

A recent survey of fluorescent light ballasts on sale at a nearby Walmart store showed an alarming number of non-consumer rated ballasts mixed with or on display adjacent to consumer products. Furthermore, there is no display signage at the store to address or mention FCC Part 18 requirements as they pertain to interference in a residential environment. Unsuspecting consumers have no way of knowing the difference in interference potential of consumer vs. non-consumer ballasts. Most consumers would simply assume that any product available at a consumer retail store like Walmart would be suitable for residential consumer use.

As will be seen in the photos of Figure 1, there was no store signage that addressed or mentioned the applicable FCC requirements. Figure 4 shows the only product labeling available at the time of purchase. This is the only mention of or reference to Part 18 rules that would be available to the Walmart customer at the time of purchase. Even if the customer read the label, which is in small print, it would clearly not be reasonable to expect him or her to know or understand its meaning or significance.

Note: Although Part 18 only describes limits for consumer and non-consumer RF Lighting Devices, many ballasts are only labeled as either Part 18A or 18B. This nomenclature is clearly an adaptation from Part 15A and 15B, which pertains to commercial/industrial and residential digital devices, respectively. Part 18 rules, however, do not include an A or B designation for RF

lighting devices and therefore the nomenclature has no regulatory or informational meaning at all.



Figure 1A – The store display as viewed by a customer walking down the aisle. The ballasts are on the bottom shelf. There is no signage to provide customers with guidance in ballast selection. Furthermore, there is no mention of the FCC rules, FCC Rule Part 18, or the potential of these devices to cause radio interference.



Figure 1B – Ballasts as viewed from the center of the aisle.



Figure 1C – Ballast display.



Figure 1D – Ballasts as seen while looking down.

See Appendix B for pertinent definitions and rules in Part 18, particularly with regard to the marketing and sale of non-consumer devices to consumers. Additional information in Appendix C is taken from Part 2 of the FCC rules. Appendix D is for reference purposes only. It contains some of the equivalent rules with regard to Part 15A (non-consumer) and Part 15B (consumer) digital devices.

Walmart's Marketing and Sale of a Non-Consumer RF Lighting Device for Residential Purposes

This case highlights the actual marketing and sale of a commercial ballast by Walmart to a residential user. Furthermore, the non-consumer or “commercial” product was actually purchased after consulting with a sales associate. Specifically, the customer asked the Walmart sales associate about the use of a commercial Part 18 non-consumer rated ballast in a residential environment.

The Investigation and Sale of a Non-Consumer Device at a Nearby Walmart

On September 24, 2015, Ms. Lori Kosior purchased a non-consumer rated General Electric GE232MAX ballast from a Walmart located at the following address:

Walmart
3164 Berlin Turnpike
Newington, CT 06111
Tel: (860) 667-7657

Before selecting the ballast, Ms. Kosior reports that she asked the sales associate for assistance. She pointed out that it was labelled as a “non-consumer” device and asked if she could use it in the basement of her home. The Walmart associate then asked if the ballast was a “light bulb.”

Once Ms. Kosior explained that it was a ballast and not a light bulb, the associate told her that she needed to speak to a person in the lighting department. That person, however, was at lunch. It was approximately 2 pm and Ms. Kosior didn't want to wait. Ms. Kosior then thanked the associate and paid for this device using a Master Card at the store's check out.

This non-consumer item was in not flagged during check-out. After paying for it, Ms. Kosior simply walked out of the store with it. See Figures 4 and 5 for photos.



Figure 2 – Close-up of ballasts on display at a Walmart in Newington, CT. Although a few ballasts were initially in the wrong box, three different types of ballasts are included. On the right in a broken box are non-consumer ballasts for fixtures with two T8 bulbs. These ballasts are labeled Part 18A. In the center box are ballasts for T12 bulbs. These ballasts can be either a consumer or non-consumer device, depending on voltage. See Figure 3 for additional details. In the far left box are non-consumer ballasts for two T8 bulbs – probably the most common application for ballasts in a residence. See Figure 4 for close-up of label on this device.



Figure 3 – Close-up of T12 ballasts in the center box shown in Figure 2. As can be seen in this photo, this ballast is labeled FCC Part 18 “Class A” (277V) and FCC Part 18 “Class B” (120V). It can be either a consumer or non-consumer device, depending on the voltage.

The particular ballast purchased by Ms. Kosior was mixed in with consumer and non-consumer “commercial” ballasts. Other than what is shown in Figure 4, there is no additional store signage or product labeling for the consumer. Ms. Kosior was clearly not properly informed about the requirements of Part 18 or the additional interference potential when using this device at the time of purchase. While the device label does include a statement “FCC Part 18, Non-Consumer,” it is in small print and the purchaser has no way of knowing what this means. There is no mention – anywhere – of radio interference or a warning against using it in a home environment. It would be unreasonable to expect the typical customer to understand the significance of the label.

Once home, Ms. Kosior opened the box and found an instruction sheet inside. This documentation included the following warning:

**WARNING: PLEASE READ THE FOLLOWING NOTICE BEFORE INSTALLING
“CLASS A” ELECTRONIC FLOURESCENT LIGHT BALLASTS!**

This equipment has been tested and found to comply with FCC 47 CFR Part 18, Non-Consumer RFI/EMI (“Class A”) limits. This Ballast should only be installed in a commercial environment. Do not install this ballast in a residential environment.

Also at the bottom of the sheet is the following statement:

FOR COMMERCIAL USE ONLY. NOT FOR RESIDENTIAL (CONSUMER) USE

FCC 47 CFR Part 18, Non-Consumer Rated Product.

Since neither statement specifically mentions radio equipment, maritime safety, communications equipment or critical navigation equipment, it should probably also be noted that these statements deviate considerably from the required warning per Part 18. See FCC rule § 18.213, particularly paragraph (d), which is as follows:

“(d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style

Since the ballasts in this particular store were all packaged in plastic, it is not known which, if any, came with an instruction sheet having the proper FCC advisory statement as required by § 18.213 (d).

Conclusion & Recommendations

Clearly Walmart’s marketing and sale of non-consumer ballasts is not adequate to ensure compliance with FCC Part 18 requirements. This was demonstrated by the case described in this report, which includes the purchase of non-consumer ballasts after clearly telling store personnel

that a product was needed for residential use. Furthermore, there was no store signage or sales associate available at the time that could properly guide Ms. Kosior at the time of this purchase. The only labeling that she could see without opening the box is undoubtedly meaningless to most customers that would purchase such a device at a department store like Walmart. Even if a customer read the small print on this label, he or she should not be expected to know the significance of consumer vs. non-consumer ratings based solely on this vague and ambiguous reference.

Walmart is not only selling and marketing commercial devices to consumers, their sales staff is not knowledgeable or simply not available to properly advise its customers. It is, therefore, recommended that Walmart be reported to the FCC for the illegal and misleading marketing of Part 18 non-consumer lighting devices.

Since Walmart is primarily a consumer retail department store, it arguably should not be selling any non-consumer devices. However, should Walmart choose to continue to do so, some specific marketing recommendations would be as follows:

- 1) Non-consumer (Commercial) and consumer (Residential) products should be marketed from two different locations, with a clear separation between them.
- 2) Add clear and obvious display signage stating that commercial devices should not be used in a residential environments. Reference should be made to FCC Part 18 rules and the increased potential for commercial devices to cause radio interference if used in a residential environment.
- 3) Purchasers of commercial devices should be required to provide a valid contractor's number at the time of purchase.
- 4) Walmart should sell only Part 18 non-consumer lighting devices that:
 - a. Are clearly labeled as such and visible at the time of purchase. A suggested notice might include:
"CAUTION: This is an FCC Part 18 Class A device and may cause harmful interference to radio communications. It should not be used in a home or residential environment. Any interference to authorized radio services caused by this device in a residential environment must be corrected by the user at his or her expense."
 - b. Include the proper and complete FCC warning per § 18.107 (g).

List of Appendices

- 1) Appendix A - Part 18 Emissions limits for RF Lighting Devices (Including Electronic Fluorescent Light Ballasts)
- 2) Appendix B - Part 18 - Pertinent Definitions and Rules
- 3) Appendix C - Part 2 - Pertinent Definitions and Rules
- 4) Appendix D - Part 15 - Pertinent Definitions and Rules

Appendix A

Part 18 Emissions limits for RF Lighting Devices (Including Electronic Fluorescent Light Ballasts)

Table 1A - Part 18 Conducted Emissions Limits (For RF Lighting Devices, such as CFLs and Electronic Fluorescent Light Ballasts)

Frequency (MHz)	Maximum RF line voltage measured with a 50 uH/50 ohm LISN (uV)	Conducted limit (dBµV)
Consumer equipment:		
0.45 to 2.51	250	48
2.51 to 3.0	3,000	70
3.0 to 30	250	48
Non-consumer equipment:		
0.45 to 1.6	1,000	60
1.6 to 30	3,000	70

(d) If testing with a quasi-peak detector demonstrates that the equipment complies with the average

Table 1B - Part 18 Radiated Emissions Limits for RF lighting devices

Frequency (MHz)	Field strength limit at 30 meters (µV/m)
Non-consumer equipment:	
30-88	30
88-216	50
216-1000	70
Consumer equipment:	
30-88	10
88-216	15
216-1000	20

Appendix B

Part 18 - Pertinent Definitions and Rules

§ 18.107 Definitions.

(a) *Radio frequency (RF) energy.* Electromagnetic energy at any frequency in the radio spectrum from 9 kHz to 3 THz (3,000 GHz).

(b) *Harmful interference.* Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter.

(c) *Industrial, scientific, and medical (ISM) equipment.* Equipment or appliances designed to generate and use locally RF energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunication. Typical ISM applications are the production of physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal and acceleration of charged particles.

(g) *Consumer ISM equipment.* A category of ISM equipment used or intended to be used by the general public in a residential environment, notwithstanding use in other areas. Examples are domestic microwave ovens, jewelry cleaners for home use, ultrasonic humidifiers.

(i) *Marketing.* As used in this part, marketing shall include sale or lease, offer for sale or lease, advertising for sale or lease, the import or shipment or other distribution for the purpose of sale or lease or offer for sale or lease. See subpart I of part 2 of this chapter.

NOTE: In the foregoing, sale (or lease) shall mean sale (or lease) to the user or a vendor who in turn sells (or leases) to the user. Sale shall not be construed to apply to devices sold to a second party for manufacture or fabrication into a device which is subsequently sold (or leased) to the user.

§ 18.203 Equipment authorization.

(a)) Consumer ISM equipment, unless otherwise specified, must be authorized under either the Declaration of Conformity or certification procedure prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in part 2, subpart J of this chapter and shall also be accompanied by:

(1) A description of measurement facilities pursuant to § 2.948, or reference to such information already on file with the Commission.

(2) A technical report pursuant to §§ 18.207 and 18.311.

(b) Consumer ultrasonic equipment generating less than 500 watts and operating below 90 kHz, and non-consumer ISM equipment shall be subject to verification, in accordance with the relevant sections of part 2, subpart J of this chapter.

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c)) Simple measures that can be taken by the user to correct interference.
- (d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following: This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45-30 MHz. Variations of this language are permitted provided all the points of the statement are addressed and may be presented in any legible font or text style.

Appendix C

Part 2 - Pertinent Definitions and Rules

§ 2.1 Terms and definitions.

Interference. The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy. (RR)

§ 2.801 Radiofrequency device defined.

As used in this part, a radiofrequency device is any device which in its operation is capable of emitting radiofrequency energy by radiation, conduction, or other means. Radiofrequency devices include, but are not limited to:

- (c) The industrial, scientific, and medical equipment described in part 18 of this chapter.
- (d) Any part or component thereof which in use emits radiofrequency energy by radiation, conduction, or other means.

§ 2.909 Responsible party.

The following parties are responsible for the compliance of radio frequency equipment with the applicable standards:

(a) In the case of equipment which requires the issuance by the Commission of a grant of equipment authorization, the party to whom that grant of authorization is issued (the grantee) If the radio frequency equipment is modified by any party other than the grantee and that party is not working under the authorization of the grantee pursuant to § 2.929(b), the party performing the modification is responsible for compliance of the product with the applicable administrative and technical provisions in this chapter.

(b) In the case of equipment subject to authorization under the verification procedure, the manufacturer or, in the case of imported equipment, the importer. If subsequent to manufacture and importation, the radio frequency equipment is modified by any party not working under the authority of the responsible party, the party performing the modification becomes the new responsible party.

(c) In the case of equipment subject to authorization under the Declaration of Conformity procedure:

(1) The manufacturer or, if the equipment is assembled from individual component parts and the resulting system is subject to authorization under a Declaration of Conformity, the assembler.

(2) If the equipment, by itself, is subject to a Declaration of Conformity and that equipment is imported, the importer.

(3) Retailers or original equipment manufacturers may enter into an agreement with the responsible party designated in paragraph (c)(1) or (c)(2) of this section to assume the responsibilities to ensure compliance of equipment and become the new responsible party.

(4) If the radio frequency equipment is modified by any party not working under the authority of the responsible party, the party performing the modifications, if located within the U.S., or the importer, if the equipment is imported subsequent to the modifications, becomes the new responsible party.

(d) If, because of modifications performed subsequent to authorization, a new party becomes responsible for ensuring that a product complies with the technical standards and the new party does not obtain a new equipment authorization, the equipment shall be labelled, following the specifications in § 2.925(d), with the following: “This product has been modified by [insert name, address and telephone number of the party performing the modifications].”

[54 FR 17712, Apr. 25, 1989, as amended at 61 FR 31045, June 19, 1996; 62 FR 10470, Mar. 7, 1997; 62 FR 41880, Aug. 4, 1997]

Appendix D

Part 15 - Pertinent Definitions and Rules

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

(c) The provisions of paragraphs (a) and (b) of this section do not apply to digital devices exempted from the technical standards under the provisions of § 15.103.

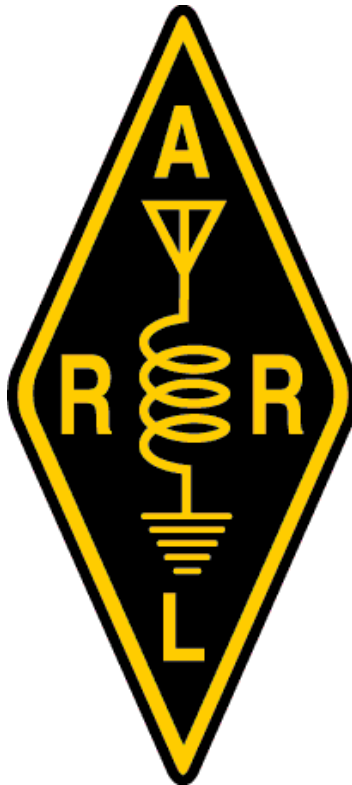
(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) of this section needs to be contained only in the instruction manual for the main control unit.

(e) In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68546, Dec. 9, 2003]

Appendix 7

Power-Line Noise RFI Investigation Report
Interference to Amateur Station KI6IBS in Pleasant Hill, CA
From Pacific Gas & Electric Company



The National Association for Amateur Radio

American Radio Relay League
225 Main Street
Newington, CT 06111
Tel: (860) 594-0200

By:
Michael E. Gruber, BSEE
April 14, 2015

1) **Introduction**

About the Author

Before joining the ARRL, Mr. Gruber was an electrical engineer in both the air traffic control and aerospace industry. He holds a B.S.E.E. degree from the University of Bridgeport and an A.S.E.T from Hartford State Technical Institute. First licensed in 1974 as WN1SVF, Mike now holds both an Extra class and a commercial radio license. While at the ARRL, Mike served as the Product Review Test Engineer for seven years. He's been an EMC Engineer with the ARRL since 2002, primarily assisting in power line noise and other Part 15 interference cases, writing articles and editing ARRL books pertaining to RFI.

Memberships include IEEE, IEEE EMC Committee, IEEE PES, IEEE Standards Association, ARRL, and the RSGB.

The FCC / ARRL Cooperative Agreement

The FCC has established a cooperative agreement with the ARRL to help in complaints involving power-line noise, which is a problem that typically occurs as a result of arcing or sparking on power-lines or related hardware. Under the terms of this agreement, the ARRL provides information and other assistance to help utilities meet Part 15 FCC rules concerning radio interference.

The ARRL Investigation

Under the terms of the cooperative agreement, it has been ARRL's experience that many power companies will correct the problem without FCC intervention. In some cases however, resolution has not been achieved even after an extended period of time. This report concerns one such case. As the record will show, this is a clear and well documented situation of repeated interference complaints spanning approximately four years. Furthermore, despite continued FCC intervention, there has been no significant if any reduction in the interfering noise since the time of the initial complaint.

Mr. Gruber and ARRL representative Jerry Ramie, KI6LGY visited the site of the subject noise in March 31, 2015. At the time of this visit, there did not appear to be any evidence of an ongoing effort to correct the problem.

The following report is an effort to document my findings during the investigation.

2) The Complainant

The complainant in this case is:

Mr. Eric S. Schreiber, KI6IBS
523 Kiki Dr.
Pleasant Hill, CA 94523
Tel: (925) 451-1904

First licensed in March of 2007, Mr. Schreiber currently holds a General Amateur Class license. As a radio Amateur, he primarily operates sideband from 160 to 10 meters with occasional operation on 2 meters. Mr. Schreiber's primary interest is rag chewing but enjoys DX "when it comes along." He has lived at his current residence since July of 2004.

It is also important to note that the noise began on April 1, 2011. Before that, there were no significant interference issues. Once it started, however, there has been no appreciable relief from it.

See Figure 1 for photo of Mr. Schreiber's station.



Figure 1 - The operating position at Amateur station KI6IBS.

3) The KI6IBS Station Equipment

The station equipment at KI6IBS for the HF Amateur bands is as follows:

- Transceiver - ICOM 756-PRO III
- Tuner - Palstar AT1500CV
- Amplifier - Ameritron AL811H
Metron MA1000B
- Primary Power Supply – Batteries (500 lbs). Charged by solar and a La Marche A-46 commercial battery charger. This is kept at a constant 14.0v. An MFJ battery booster is also in the shack.
- Optional power supply (1) - Astron RS-70m. Dedicated to the Metron amp.
- Optional power supply (2) – 25A Radio Shack switching power supply.
- Antenna - 320' rectangle loop antenna at 40' high. Fed with window line from a 4:1 balun.

All station equipment appeared to be in good working order and properly installed using good engineering practice.

4) The Utility

The utility in the case is Pacific Gas and Electric Company, commonly known as PG&E:

PG&E Corporation
One Market, Spear Tower, Suite 2400
San Francisco, California 94105-1126

Pertinent contact information for the utility's CEO is as follows:

Mr. Anthony F. Earley Jr., Chairman of the Board, Chief Executive
Officer and President of PG&E Corporation

5) Case History & Background

Mr. Schreiber reports he first noticed power-line-type noise on April 1, 2011. He reported the problem to the local utility company, PG&E shortly thereafter. Despite numerous complaints and FCC inquiries since that time, Mr. Schreiber reports there has never been any significant mitigation of the noise level. He also reports that there have been approximately ten visits by PG&E personnel to his station since his initial complaint. A technically competent RFI investigation, however, can often locate and correct such interference complaints in an afternoon or less.

Ever since his initial complaint, Mr. Schreiber reports the noise has been so strong at his house that two-way communications at his station has been severely impaired. When the noise is active, the interference on 7 MHz Amateur band is strong enough that communications with most stations is usually not possible.

To the best of his knowledge, the noise has not changed significantly in character or amplitude during the entire period since it started. While some noise is present most of the time, the primary sources of loud noise are active during the late afternoons and evenings, especially during the summer and warmer weather. Seasonal and weather changes have a significant impact on the noise level at KI6IBS. See Figure 2.



Figure 2 - The noise as it affected Mr. Schreiber's station during the initial phase of our investigation. It registered well over S9 on the S Meter.

There has been no activity by the utility in resolving this problem for some time and Mr. Schreiber's noise case now appears to be at a standstill. The following is a brief timeline history concerning this case:

04-01-11 - Complainant reports noise started on this day.

04-24-12 – As a result of an FCC referral, complainant contacts ARRL for first time regarding noise.

05-07-12 – Mr. Gruber submits case directly to PG&E's attorney, Jonathan Pendleton, at J1Pc@pge.com.

07-16-12 - 1st FCC Letter:

http://transition.fcc.gov/eb/AmateurActions/files/PGE_-12_11_21_5339.html. See Appendix 1.

09-19-12 – Mr. Gruber requested FCC follow-up in this matter, typically in the form of a second FCC Letter. However, this letter does not appear in the FCC log. ARRL is unable to confirm when this letter was sent.

Present – Case remains ongoing after four years. There has been over three years of ARRL/FCC involvement. There has been little or no improvement in the interference.

6) Current Status & Summary

PG&E claims to have done a lot of work to fix problem. The record also shows that there initially seemed to be some activity toward a resolution, although the lack of results was puzzling.

Mr. Gruber suspected and later confirmed that PG&E did not appear to be using technically competent locating methods and equipment to find the problem(s). Instead, they use a shotgun approach, or fix “any noise”, in order to address this complaint. They don’t appear to be using any credible means to identify the source or sources at the complainant’s station. Under FCC rules, it is not necessary to fix every problem – only those affecting the complainant’s station.

Note: Mr. Gruber has analyzed a number of recordings since this problem was initially reported to ARRL. He was typically able to see a primary noise source in at least some of them. Finding and fixing this source shouldn’t be too difficult using a technically competent approach to solving the problem. Considering the number of sources that have supposedly been fixed by PG&E so far, it doesn’t appear that they found the right one(s). Their “guess and hope” approach simply isn’t working. The reported number of repairs made by the utility has only added to the cost without producing any results.

Given the utility’s lack of results so far, it seems unlikely that there is any realistic end in sight. The utility lacks the capability to meet its obligation under the FCC rules, and (so far) they have expressed no interest in obtaining it. Several times Mr. Gruber suggested that they hire a consultant, but he never received a response.

In short, PG&E’s effort often appears to be more of a charade than a good faith effort to actually fix the problem. They do just enough to appease the FCC but meaningful results beyond that seem unlikely. While the utility may not be completely unresponsive to the complainant, the response is almost never timely and generally lacks commitment.

“The Endless Loop”

So far, the FCC has not required the utility to use proper techniques or equipment to locate the sources. As a result, this case has fallen into what I call “the endless loop.” Here is the scenario:

1. The complainant calls ARRL.
2. ARRL calls FCC’s Laura Smith.
3. FCC’s Laura Smith calls the PG&E Attorney Jonathan Pendleton.
4. PG&E Attorney Jonathan Pendleton reports they will look into it.
5. PG&E will typically find and report “something,” but never actually fixes the problem. Note: Usually multiple repairs are reported, although Mr. Gruber typically only saw one or two primary sources.
6. Since PG&E never reports when or if the repairs are made, someone (typical Mr. Schreiber or ARRL) needs to contact Jonathan Pendleton for repair status.

7. Once the repairs are reported as complete, the whole process then repeats. Back to step 1 above.

So far, this case has gone on for years like this with no realistic end in sight. However, as we'll see, most of these cases can probably be solved in an afternoon by a competent RFI investigator using proper equipment.

Note: At the time of this report, Mr. Schreiber's last communication from PG&E was on January 7, 2015. It was from Shaun Rohmiller, the utility's Public Safety & Regulatory Supervisor. Mr. Rohmiller's email, quoted in full below, clearly demonstrates that they will be attempting repairs without using proper techniques or equipment:

From: "Shaun Rohmiller" <S1R3@pge.com>
To: "Eric Schreiber" <ki6ibs@comcast.net>, "Mike L Farinsky (Superintendent)" <MLFa@pge.com>, "Randy Dunkel" <R3DH@pge.com>
Cc: "John Oldham" <J1O9@pge.com>
Sent: Wednesday, January 7, 2015 7:40:53 AM
Subject: RE: Pleasant Hill noise

Eric, I am going into our scheduling meeting today and I will see what we have for availability on Friday afternoon. I won't be bring a troubleman out, this will more than likely be a 3 person rubber glove crew so we can get up on the primary lines and replace ties and hardware. Good news is we will be able to make repairs on the spot, bad news is they won't have any noise detection equipment so if you have something that you use, it would be nice to have it on site. If this Friday doesn't work, is there a particular day of the week that works best for you?

Mike, with the new year, do you have any availability to come up and help us troubleshoot this neighborhood for RTVI noise?

Randy, I will discuss this job with you later this morning and if possible, I would like to have a solid date we can perform this work so we can let Eric know.

Thank you all for your help trying to solve this problem.

Shaun Rohmiller
Public Safety & Regulatory Supervisor
Diablo Division
1030 Detroit Ave, Concord, CA 94518

Mobile: 925-337-9205
Fax: 925-674-6412

7) The ARRL Investigation

As previously reported, Messer's Gruber and Ramie first visited the site of this complaint on March 31, 2015. The purpose of this visit was to better assess the noise, confirm it to be power line related, and better understand why it isn't corrected after more than three years of PG&E's effort to fix it. They both had experience locating power-line noise and using test equipment to identify "noise signatures."

Noise Locating Equipment

The ARRL noise locating equipment meets all applicable calibration requirements. It is professional grade equipment and commonly used in the power industry. The specific equipment used in this investigation included the following items:

- Radar Engineers Model 240A HF-UHF RFI Locator. This is a portable battery powered radio receiver that features an oscilloscope display for observing noise signatures. It is tunable from 1.8 to 1,000 MHz and has a waveform memory for comparing noise patterns. See Figure 7.01 for photo.
- Radar Engineers 390-415 MHz Antenna. This is a portable hand-held Yagi useful from 390 to 415 MHz. It has eight elements.
- A handheld 4-element 144 MHz Yagi antenna used for RDFing purposes.
- A 144 MHz and 440 MHz dual-band mobile antenna.
- Radar Engineers Model 250 Parabolic Pinpointer. This is used for identify the precise offending hardware on a pole once the pole has been identified.



Figure 3 - The Radar Engineers Model 240 HF-UHF RFI Locator is a professional grade receiver for locating RFI sources. It has a built-in oscilloscope display for recording and observing noise signatures. This receiver operates from 1.8 to 1000 MHz.

Investigation Procedures

The procedures used during the investigation were consistent with modern noise locating techniques and included signature matching, a technique for positively associating a suspect noise source with the noise heard at the licensed station. These techniques are described in greater detail in Appendix 2, which is an expansion from an article that appeared in the September 2004 issue of *Transmission & Distribution Magazine*. Specifically, this Appendix was written by Mike Martin¹ of RFI Services, a recognized authority in the field of power-line noise locating. Mr. Martin was also a coauthor of the original T&D article.

Messer's Gruber and Ramie began the subject RFI investigation shortly after meeting Mr. Schreiber at his residence. As dictated by standard procedure, they first observed the noise at Mr. Schreiber's station and took note of such things as:

- Frequency and bands at which the noise could be heard
- Noise strength
- Noise signatures
- General noise characteristics that suggest a possible source
- Weather conditions

While some interference was readily apparent once Mr. Schreiber turned on his receiver, although it was not initially as severe as expected. Mr. Schreiber had previously explained that the severe noise primarily occurred during warmer temperatures. It was most likely to occur during late afternoons and summertime. It was late morning, and temperatures on the last day of March were still too cool for the primary source or sources to become active.

Mr. Schreiber also did not have a rotatable directional antenna so they could not obtain noise headings with his antenna. All observed noise signatures were consistent with power-line noise with multiple sources. Mr. Gruber also noted that the interference could be heard across the spectrum, as one would expect with power line noise.

Locating Noise Sources

As shown in Figure 4, Mr. Gruber first saved the noise signature using Mr. Schreiber's antenna in the Model 240's memory. This is an important and often crucial step toward success when locating power line noise. Since there were multiple sources, and the primary noise was not active at the time, Mr. Schreiber was asked to provide a length of coax in his yard that was connected to his antenna. Mr. Gruber could then access the antenna to his station for fresh signatures as the temperatures increased during the day. He would also know when the primary noises were active, which is critical if they were going to be found.

¹ Mike Martin, RFI Services, 6469 Old Solomons Is. Road, Tracey's Landing, MD 20779
www.rfiservices.com



Figure 4 - Observing the noise as it affects a complainant's station is a critical step in the process. In this photo, the RFI Investigator is connecting his locating receiver to observe and record the noise that is the source of this complaint.

Messer's Ramie and Gruber then proceeded to take some initial headings in front of Mr. Schreiber's residence. They obtained an initial heading on it at 146 MHz, and headed off in the direction of the noise. The source of this noise was found to be near the intersection of Fafnir Place and Odin Drive. This area is described as Area A in Figure 5.

NOTE: A second but intermittent gap noise was also briefly observed near the intersection of Kiki Odin Drive. This source was too intermittent to get a clear signature or determine the impact on Mr. Schreiber's radio reception.

As the investigation progressed, they took additional signatures at Mr. Schreiber's residence. They also noted that many of the observed sources were intermittent in nature. And as Mr. Schreiber had initially informed the ARRL investigators, the noise dramatically increased later in the afternoon as the day warmed up. Due to the intermittent nature of the sources, it was decided to return for two additional follow-up visits on Wednesday and Thursday of that week.

Here is a summary of what was found during the remainder of the investigation:

- A. One previously gap source near the intersection of Fafnir Place and Odin Drive. This source is described as Area A in Figure 5.
- B. Two gap sources were identified in the area near the intersection of Odin Drive and Freya Way. This area is described as Area B in Figure 5.
- C. A fourth gap source was located near the intersection of Morello Ave and Aleta Place. This area is described as Area C in Figure 5.
- D. Three more sources were located in Area D as depicted in Figure 5. All of these sources were intermittent and primarily occurred during the warmer temperatures of late afternoon. **These were determined to be the primary sources affecting Mr. Schreiber's station, i.e., the sources responsible for the severe interference as reported by Mr. Schreiber.**

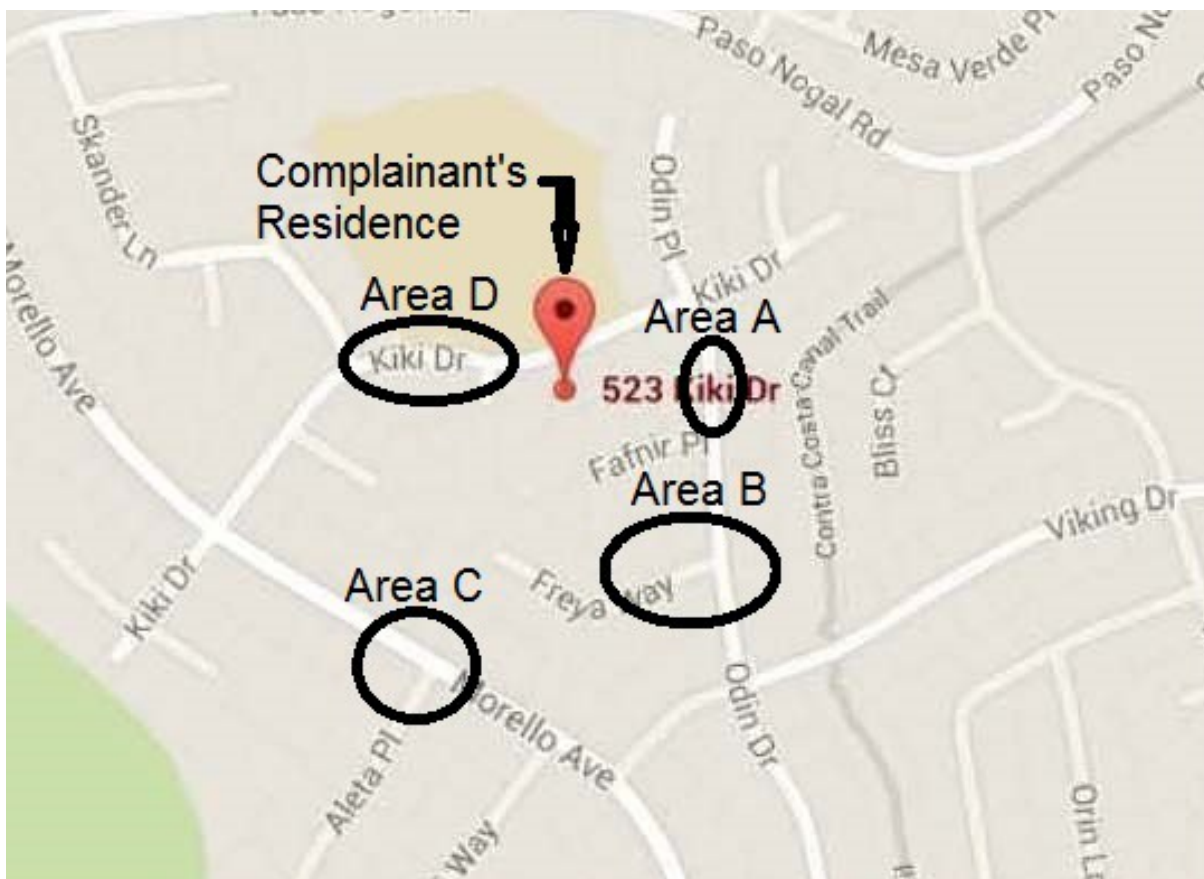


Figure 5 - This map shows the general areas in which the sources were located during this investigation.

8) Findings and Conclusions

The noise at Mr. Schreiber's station at some times during the investigation was quite severe. The noise is clearly causing harmful interference to the operation of the licensed Amateur station. The interference was 10 to 20 dB over S9 or higher at 7 MHz, rendering communications on this Amateur band almost impossible in most cases. Noise could also be heard into the VHF spectrum and on the 50 MHz Amateur band.

As the results show, there were at least seven sources in four general areas that were located and documented. Two or three sources were identified as primary causes of the interference at Mr. Schreiber's station at the time of this investigation. Since one of these sources had been intermittent, it was difficult to assess due, especially in such a noisy environment as Area D.

Each of the sources that they found was clearly power line or gap noise from PG&E's equipment and system. Furthermore, this has been a problem for several years, and Mr. Schreiber reports the extreme noise levels have been present during PG&E RFI investigations.

Although PG&E claims to have afforded considerable effort in this matter, there has been a surprising lack of results in getting it resolved. Although the problem has been ongoing for approximately four years, none of the noise sources "corrected" by the utility has resulted in any significant changes in the noise level at Mr. Schreiber's station. It would seem that sources may have been misidentified and problems not affecting Mr. Schreiber's station were "fixed" at needless expense to the involved utility.

In most cases, a noise source can be located easily by trained personnel using the proper equipment. Noise signature techniques in a well-conducted RFI investigation can also determine an offending noise source from the multitude of sources typically encountered during the investigation. This technique, for example, can reduce or eliminate confusion with regard to such sources as non-offending power-line noise and consumer devices.

As previously discussed, obtaining the source pattern affecting his reception is an important step toward a successful and cost effective approach toward eliminating the source. Given the number of sources apparently encountered by PG&E during their investigation, signature matching techniques are probably the only practical and efficient way to resolve this problem. In the three to four years since this problem was first reported by Mr. Schreiber, PG&E has not been able to make any significant progress toward resolving the interference problem. However, excluding the time lost due to the intermittent nature of the severe noise in cool weather, Messer's Gruber and Ramie located the primary sources in probably less than an hour of becoming active.

There does not appear to be any reason why this problem could not have been corrected years ago if PG&E had properly trained personnel and modern noise locating equipment. Although it's not possible to determine when any particular noise source first became active, or even if it was active during a specific utility conducted RFI investigation, it was

relatively easy to find these sources using the techniques previously described in this report. Certainly, two primary sources that can be heard in the VHF spectrum, such as they found, should have been fixed had there been any technically correct attempt to do so.

Note: At least at one time, it is believed that PG&E actually had two sets of Radar Engineers equipment. This is partially confirmed by Mr. Schreiber, who reports that one of the PG&E RFI investigators (now retired) had one set at his residence while working on his case. However, the investigator did not take or look at a noise signature at his station. Although he had the right equipment, he did not know how to use it. PG&E had failed to provide proper training in its use.

It should also be noted that there are consultants that specialize in the field of locating radio interference and power-line noise sources. RFI Services² for example, is a nationally recognized company in the area of power-line noise locating that provides both consulting and training workshops for power company personnel. If PG&E had been serious about resolving this issue, they could have, and should have, sent their investigator(s) to a training workshop or hired a consultant. Although Mr. Gruber has suggested to PG&E's attorney (Jonathan Pendleton) on numerous occasions that they hire Mike Martin, he has not done so.

It should be emphasized that this report only includes the sources that were observed at the time of the investigation. Power-line noise sources can be intermittent. Other sources may have started since the investigation, and additional sources may become apparent once the primary source is repaired. **This report is not intended as a complete and sole summary of noise sources that are presently affecting Mr. Schreiber's station. Once repairs of known sources are made, a more complete and technically competent RFI investigation may still be required for PG&E to meet Part 15 of the FCC's rules.**

² Mike Martin, RFI Services, 6469 Old Solomons Is. Road, Tracey's Landing, MD 20779
www.rfiservices.com

9) Some Final Conclusions

It is clear that PG&E has been operating and continues to operate its equipment in a way that is not consistent with FCC Part 15 rules. While some RFI sources can be challenging to locate, even under the best of circumstances, most are not particularly difficult with modern equipment and techniques. Once active, Mr. Gruber was able to locate several sources, and identify some of them as primary sources of harmful interference in Mr. Schreiber's case in a relatively short period of time.

It would seem that finding these sources could and should have been done in the four or so years since this problem was first reported. Despite approximately four years of ongoing utility effort, at least one FCC notice, numerous letters, emails and telephone calls, PG&E has clearly failed to meet its obligation under the FCC rules. A technically competent RFI investigation should have uncovered the primary sources of interference, such as Mr. Gruber found, in a couple hours time or less. **The primary sources in this case were, in fact, relatively easy to locate.**

As previously discussed in this report, there are consultants in the field of power-line noise locating, not to mention hands-on training workshops and books. There is a clear and well documented case of repeated interference complaints by Mr. Schreiber in this matter. Furthermore, the utility at the time of this report has yet to even provide him with a credible and technically competent response to his complaint. Hopefully this report will help in that regard.

Appendix 10A

FCC's OET Clarifies Emissions Compliance Testing for RF LED Lighting Devices

06/30/2016

The FCC's Office of Engineering and Technology ([OET](#)) [has clarified](#) that all RF LED lighting devices falling under Part 15 rules as "unintentional radiators" must meet conducted and radiated emissions limits set forth in those rules.

"Operation of Part 15 unintentional radiators is subject to the condition that no harmful interference is caused," the OET reminded, in a knowledge database paper released on June 17. "Manufacturers and users should therefore note that lighting devices are required to cease operation, if harmful interference occurs."

The OET said radiated emissions measurements must be performed at least from 30 MHz to 1000 MHz to adequately demonstrate compliance with Part 15 (§15.109). Its guidance, the OET continued, applies to RF LED lighting devices that, in the past, have been considered to operate on frequencies below 1.705 MHz. Previously, devices operating between 9 kHz and 1705 kHz had to be tested only for radiated emissions up to 30 MHz, where no specified radiated emissions limits exist, and were exempt from testing from 30 MHz to 1000 MHz. The OET said it recognizes that routine radiated emissions measurements are needed under Part 15, based on the highest frequency generated or used in the device.

"[W]e have found that emissions from RF LED lighting devices are non-periodic, broadband in nature, and are produced as a byproduct of the internal driver circuitry within the RF LED lighting device," the OET "knowledge data base" paper said. "These types of emissions have adequate energy and potential to generate radiated emissions well above 30 MHz."

The ARRL Lab's Electromagnetic Compatibility Engineer Mike Gruber, W1MG, said he was pleased to see the FCC's OET clarify the test measurement requirements. He said ARRL is generally hearing more RFI complaints stemming from RF LED bulbs.

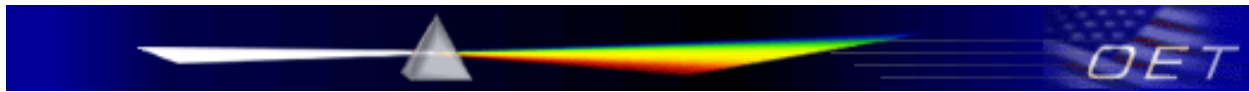
"Not only are the emissions limits higher for Part 15 LED bulbs — as opposed to Part 18 fluorescent and CFL bulbs, they seem to be winning out in terms of consumer popularity," Gruber said. "Higher limits and more bulbs probably make for more complaints." Gruber said the Lab has seen LED lighting devices causing problems in the 2 meter band. "Since conducted emissions limits do not apply above 30 MHz, radiated emissions limits can be the first line of defense against RFI at these higher frequencies."

Gruber pointed out that noise generated by street and traffic lighting can be widespread. In such instances, he suggested that Part 15b limits for residential areas should apply. "These limits are lower than Part 15a limits, which are intended only for commercial and industrial environments," he explained. "This is especially critical in cases where a pole transformer connected to the lighting device also feeds a home or residence. The 240 V split-phase secondary system can

conduct RF into a residence through the service entrance panel.” He suggested that the lower limits may benefit mobile users.

The OET noted that the ANSI Accredited Standards Committee C63® -EMC standards development committee is drafting measurement procedures for lighting devices. “When complete, we expect it will address in greater detail the measurement procedures and configurations to be used in determining compliance,” the OET said.

Appendix 10B



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

June 17, 2016

RADIO FREQUENCY LED LIGHTING PRODUCTS

INTRODUCTION

Radio frequency (RF) light-emitting diode (LED) lighting products are subject to FCC rules to ensure that devices do not cause harmful interference to radiocommunications services.¹ This KDB publication clarifies how the FCC rules apply to these products, and outlines manufacturers' responsibilities for controlling interference. This publication does not address older legacy lighting technologies such as incandescent, fluorescent, and high intensity discharge (HID) lighting products.²

For the purpose of this publication, the term RF LED lighting is used for a device which has the primary function of generating light by electrically powering semiconductor materials. Such light generation is commonly intended for general illumination, and also includes other applications such as traffic signaling, roadway lighting, manufacturing processes, agriculture, etc. RF LED lighting devices intentionally generate RF energy via electronic power conversion or digital circuitry, but are not intended to radiate RF energy by radiation or induction and thus they are classified as unintentional radiators according to the FCC rules.³ RF LED lighting products today employ single or multiple LED chips, but can also include organic LEDs (OLEDs), polymer OLEDs, quantum dots, etc.

In most cases, RF LED lighting devices employ either an independent or an integrated electronic driver that operates at RF frequencies similar to those used in digital electronic products. As such, RF LED lighting devices are subject to the Part 15 rules for unintentional radiators, and are subject to the "verification" equipment authorization procedure. These devices are required to meet the line-conducted and radiated emissions limits in Sections 15.107 and 15.109, respectively.

With this KDB publication, we further clarify that RF LED lighting devices are subject to Section 15.109 radiated emission limits from 30 MHz to 1000 MHz to ensure overall compliance with radiated emissions requirements.

¹ See 47 CFR. § 15.3(m).

² Other lighting devices, such as fluorescent lighting devices, and LED retro-fit tubes intended to replace linear fluorescent tubes operated by RF ballasts, are subject to compliance with Part 18 and are not addressed in this guidance document. Incandescent lamps are not considered RF devices. Also, LED lamps powered by internal direct current (DC) power sources, without RF circuitry (operating at greater than 9 kHz), with a passive LED array load and delivering only DC current to LEDs, are not considered RF devices. Large LED digital displays are considered digital-device peripheral devices subject to FCC Part 15.

³ For definitions of LED lighting products, see, e.g., Energy Star® Program Requirements, Product Specification for Luminaires, https://www.energystar.gov/products/spec/luminaires_specification_version_2_0_pd and ANSI/IES RP-16-10.

GENERAL CONDITIONS OF OPERATION

Operation of Part 15 unintentional radiators is subject to the condition that no harmful interference is caused.⁴ Manufacturers and users should therefore note that lighting devices are required to cease operation if harmful interference occurs.⁵

To help mitigate interference from lighting devices into authorized radio services, responsible parties are encouraged to: use good engineering design and construction techniques, to meet and even exceed the required attenuation of unwanted emissions; extend compliance testing beyond the frequency range guidance traditionally required; and provide suggested interference mitigation techniques to users on how to resolve harmful interference problems.⁶

MEASUREMENT GUIDANCE

Measurement Procedure. The AC power line conducted emissions and radiated emissions from the RF LED lighting device are to be measured in accordance with the procedures in ANSI C63.4-2014.⁷

Frequency Range of Radiated Emissions Measurements. Radiated emissions measurements shall be performed over the range of frequencies as specified in Section 15.33(b). We have found that in many interference cases involving RF LED lighting devices, the specified operating frequency of the lighting device is not consistent with the actual emissions, given the “broadband” nature of the radiated and conducted emissions generated by the device.

We recognize that Section 15.33(b) specifies when routine radiated emissions measurements are needed based on the highest frequency generated or used in the device. When the device’s internal frequency is less than 1.705 MHz, the rules stipulate the necessity to perform radiated emissions measurements only up to 30 MHz. However, we have found that emissions from RF LED lighting devices are non-periodic, broadband in nature, and are produced as a byproduct of the internal driver circuitry within the RF LED lighting device. These types of broadband, non-periodic emissions have adequate energy and potential to generate radiated emissions well above 30 MHz.

Accordingly, this guidance clarifies that all RF LED lighting devices, even those that have been considered to operate on frequencies below 1.705 MHz in the past, are required to have radiated emissions measurements performed at a minimum from 30 MHz to 1000 MHz, to adequately demonstrate compliance with the Section 15.109 radiated emission limits.

⁴ See 47 CFR § 15.5.

⁵ For devices subject to the verification procedure, the manufacturer, or in the case of imported equipment, the importer, is responsible for ensuring compliance. See 47 CFR § 2.909(b).

⁶ See 47 CFR § 15.15.

⁷ ANSI-ASC C63®-Electromagnetic Compatibility standards development committee has a project to develop measurement procedures for lighting devices (C63.29). When complete, we expect it will address in greater detail the measurement procedures and configurations to be used in determining compliance. See: http://www.c63.org/documents/misc/matrix/c63_standards.htm

Appendix 8

Illegal Drones Threaten Public Safety

*By Mike Gruber and Jerry Ramie on behalf of
ARRL, the national association for Amateur Radio*

Introduction

Despite their relatively recent introduction to the consumer market, the surge in unmanned aircraft sales known as drones has been dramatic. The FAA predicts the combined total commercial and hobbyist sales to increase from 2.5 million in 2016 to 7 million by 2020. Of that total, sales for commercial purposes are expected to grow from 600,000 in 2016 to 2.7 million by 2020. Small hobbyist drone sales may grow from 1.9 million in 2016 to as many as 4.3 million by 2020.¹

Hobbyist uses have so far included such things as racing and photography. These will no doubt continue to expand with such technologies as 4k cameras, Bluetooth and GPS.

Drones and FCC Rules

Radio control of hobbyist drones and associated equipment is typically conducted pursuant to Part 15 of the Commission's Rules. As an example, the radio control signals from a typical consumer drone covered from 2.411 to 2.463 GHz when measured in the ARRL Laboratory. Part 15 allows up to 1 watt of peak envelope power for wideband digital signals in specified Part 18 ISM bands. In this case, 2.450 GHz +/- 50.0 MHz is an ISM band. It should be noted that Part 18 rules prohibit the transmission of intelligence. Drones must therefore still operate under Part 15 but are allowed by the Part 15 rules a higher output power if the Part 15 device is operating in an ISM band.

Some drones are also being sold as Amateur radio equipment operating under Part 97. Some Amateur frequencies are set aside for radio control purposes. However, the operator must have a valid Amateur radio license in order to use this equipment. Under the Commission's Part 97 rules, the maximum transmitter power must not exceed 1 W. Furthermore, there must be a label indicating the station call sign and the licensee's name and address on the station transmitter.

See Appendix A for some of the more important FCC Part 97 rules with regard to radio control operation conducted under Part 97.

Unfortunately some of the drones and associated equipment found by ARRL are blatantly illegal at multiple levels. Particularly alarming are some of the television transmitters for use on drones. Rated at six times over the legal power limit, *and on critical air navigation transponder frequencies*, these devices represent a real and dangerous threat to the safety of flight, especially when operated from a drone platform that can be hundreds of feet in the air. Other violations are described later in this document.

¹ www.faa.gov/news/updates/?newsId=85227

Illegal Marketing of Drone TV Transmitters that Operate on Amateur and FAA Radar Frequencies

In November of 2015, the ARRL EMC Engineer Mike Gruber, W1MG became aware of the marketing of video transmitters for installation on airborne drones that operate on amateur radio frequencies. While the marketing of radio equipment that obviously is not tested for FCC rules compliance is nothing new, these devices are far more than a nuisance for the operators on the 23 cm (1240-1300 MHz) band. In fact, the operation of these transmitters does carry the distinct possibility of causing harmful interference which would result in a serious safety of flight issue for aircraft operations.

One example is the Lawmate 1.2 GHz, 8-channel 1000 mW (1-watt) AV transmitter for drones, which is now being marketed by several vendors. As Appendix B shows, these transmitters are capable of operating on the following frequencies: 1010, 1040, 1080, 1120, 1160, 1200 and 1280 MHz.

Although 1280 MHz is in an Amateur band, this channel would be in conflict with the GLONASS (Russian GPS) CDMA 1202.5 MHz channel. Here in the United States, Glonass is used by several government agencies for radiolocation. This frequency is also in commercial use within the US for the same purpose.

Operation on three of the other “channels” would have a far more significant impact. For example, 1010 MHz is used for aeronautical guidance in the TACAN/DME aircraft radio navigation band.² However, it is the potential use of 1040 and 1080 MHz that represents the greatest threat to the safety of flight. These two frequencies are in direct conflict with the ATC (Air Traffic Control) transponder frequencies. In this case, the transponder is interrogated at 1030 MHz with a response from the aircraft at 1090 MHz when those aircraft are operating in what is termed MODE-A or MODE-C transponder. **As noted in Appendix C, there is no shared spectrum with Amateur Radio below 1240 MHz.**

The use of transponders is required on these frequencies by all aircraft operating above 18,000 feet and within 30 miles of all major airports. Additionally, the newest form of digital ATC information for aircraft is transmitted at 1082 MHz. Since both the TACAN/DME and the ATC Transponder systems operate with a 10 MHz bandwidth, the use of an unlicensed drone transmitter can cause serious issues with the integrity of the ATC radar system.³

² TACAN/DME is used for direction and distance measurement in military aircraft and the DME is used for distance measurement equipment in large commercial aircraft operating in the instrument flight environment. Most importantly TACAN/DME is used for approach to landing navigation at airports and it is used for navigation aids in the departure, en-route and arrival/approach segments of aeronautical instrument navigation. The Airman's Information Manual (AIM) has several chapters on the details of electronic navigation. Any interference to these aeronautical navigation systems creates a very serious safety of flight issue.

³ While we do not have solid numbers for the sensitivity of the radar ground station on 1090 MHz, the 1030 aircraft receivers are typically -70dBm for 50% reply with 3 MHz bandwidth not less than -3 dB, -10 at 10 MHz and -50 at 25 MHz. The pulse from the transponder has a rise time of 0.1 us and the pulse from the ground station is less. Hence, a 10 MHz bandwidth for the receivers is a valid claim.

See Appendix C for pertinent spectrum information from the FAA and FCC concerning these frequencies. Appendix D also provides a more complete discussion of the potential impact to aircraft navigation systems caused by these devices.

The channels chosen for operation of these airborne transmitters demonstrate a disregard by the manufacturer of the established and legal assignments of frequency allocations. The Commission should take immediate action with respect to the marketing of these transmitters. Several facts supporting this complaint are:

- 1) The target market for these devices is the drone hobbyist - not the radio amateur. The device, due to the channel configuration, has no valid amateur radio application. And since transmitters operating in a ham band are being operated by non-hams, many of these devices are and will be used on an unlicensed basis in Amateur spectrum.
- 2) The use of these devices will cause undue interference to properly licensed amateur stations.
- 3) While these transmitters are marked as appropriate for “ham” use, they cannot be used legally for Amateur purposes.
- 4) Since these devices operate on critical aeronautical frequencies, Amateur Radio could be erroneously blamed if there is a problem.
- 5) The transmitter in this example (shown below) is not appropriate for unlicensed Part 15 use on any of the available channel settings.
- 6) It is quite obvious that these devices do not have proper FCC equipment authorization under Part 15. The rules require low power transmitters such as these to be Certified. While the state of FCC equipment authorization is not known for certain, the specified frequencies of operation would preclude the required FCC Certification by any knowledgeable TCB.
- 7) Finally and most importantly, given the capability of the devices to cripple the operation of the ATC secondary target/ transponder systems, these illegal transmitters represent a significant hazard to public safety in general and the safety of flight specifically.

These transmitters and amplifiers are being offered online by a number of internet vendors. A quick online perusal of vendors indicates that there is no shortage of suppliers of these devices:

- www.getfpv.com/fpv.html
- www.readymaderc.com/store/index.php?main_page=index&cPath=11&zenid=8be5bec447599f85ef884721a0c92d8e
- www.hobbyking.com/hobbyking/store/_540_543_FPV_Aerial_Video_Telemetry-Video_Tx_Rx.html

An example of the internet direct marketing of transmitters for drone television transmitters one only has to look as far as the “Hobbyking.com” website where the Lawmate transmitter is available for \$89, and a companion 6-watt amplifier is available for \$79.

www.hobbyking.com/hobbyking/store/_77815_Lawmate_1_2GHz_8CH_1000mW_Wireless_AV_Transmitter_for_FPV_CCTV_Camera.html



Figure 1 – The Lawmate 1.2 GHz 8CH Wireless AV Transmitter for FPV CCTV Cameras

This device is capable of operating at all four frequencies previously mentioned in this section 1010, 1040, 1080 and 1280 MHz. Consider that the maximum power allowed for this device is 1 watt under both Parts 15 and 97. This is six times the FCC limit when operated with the companion amplifier. When further you consider that this device will potentially be operating from a platform that is at high altitudes, the situation becomes alarming.

See Appendix E for additional drones that were for sale on the Internet at the time of this investigation.

ARRL Laboratory Measurements

In order to fully assess these products, the ARRL Laboratory purchased two samples of the 1.08 - 1.26 GHz TV transmitters from Hobby King. Hobby King had them shipped by air from China, but readily sold them to Ed Hare, the ARRL Laboratory manager. See Appendix F for the paperwork, which in addition to everything else, clearly demonstrates a marketing violation.

Mr. Hare found that the product carried no FCC ID number. He couldn't find anything in the certification database that looked to be this product. Since it operates at 500 mw to 1000 mw on 8 channels, only two of which are in the ham bands, there is no way that this can be legal.

Each sample was then tested for spectral purity. See Figures 2 and 3. ATV 1 TX failed during this testing so only only ATV 2 TX (the larger of the two samples) was tested for frequency and power output. The rated power output for both transmitters is 1,000 mW.

Channel	Channel Frequency	Measured frequency	Measured Output Power
CH 1	1.080 GHz	1.079.970 GHz	400 mW
CH 2	1.120 GHz	1.119.967 GHz	430 mW
CH 3	1.160 GHz	1.159.965 GHz	500 mW
CH 4	1.200 GHz	1.199.964 GHz	750 mW
CH 5	1.010 GHz	1.009.971 GHz	710 mW
CH 6	1.040 GHz	1.039.970 GHz	710 mW
CH 7	1.280 GHz	1.226.506 GHz	600 mW
CH 8	1.280 GHz	1.224.000 GHz	500 mW (Unstable frequency)

Conclusion: These devices are illegally operating at critical radio navigation frequencies. As such, they represent a real and significant threat to the safety of flight.

Spectral Plots

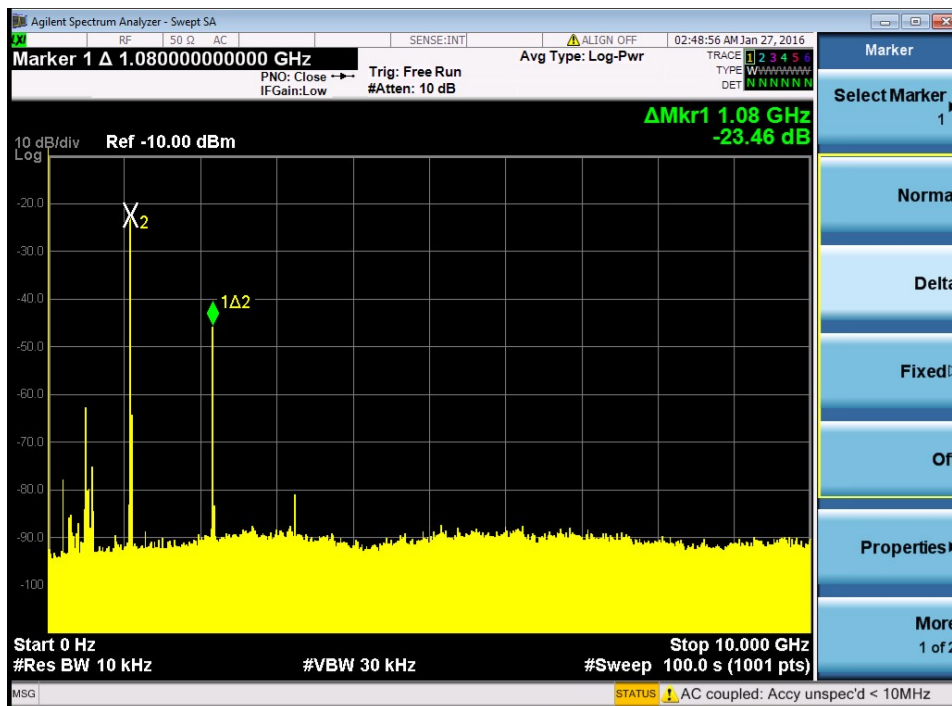


Figure 2 – Spectral plot of ATV transmitter sample 1. The harmonic is down by 23.5 dB.ⁱ

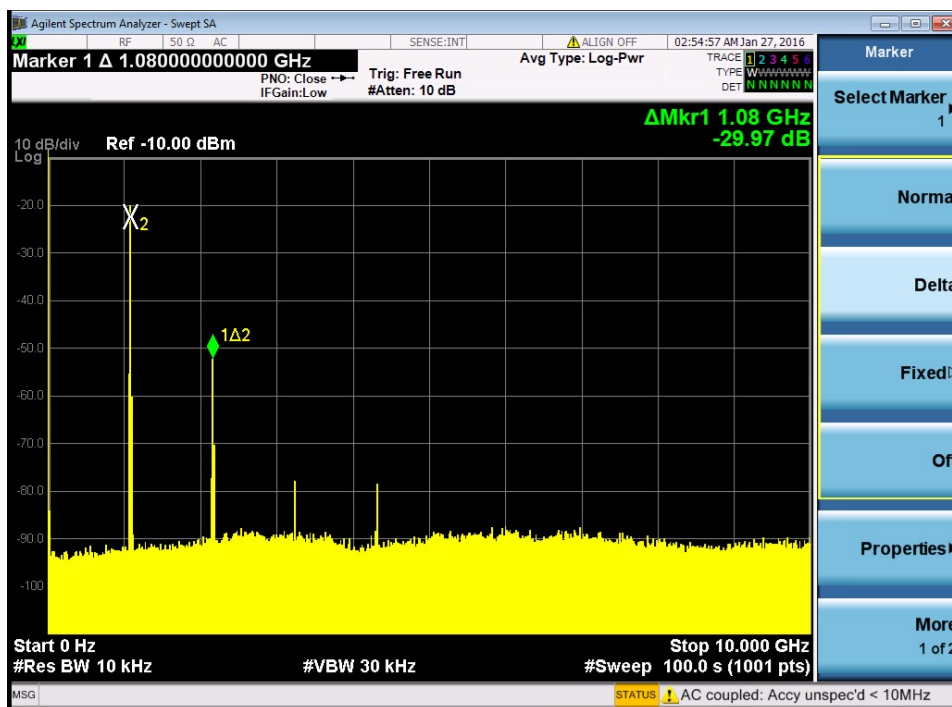


Figure 3 – Spectral plot of ATV transmitter sample 2. The harmonic is down by 30.0 dB.

Note: Regarding Figures 2 and 3, our step attenuator is not rated for the frequency of the harmonics measured. They may be higher than indicated on our spectrum analyzer.

Conclusion

It is only a matter of time until Amateur operations will be affected in large numbers by these transmitters. Interference with the integrity of the FAA's ATC transponder radar system, however is far more likely now, with obvious public safety implications. Previous ARRL complaints concerning the improper marketing and sale of non-compliant devices have not been responded to, even when the subject devices dramatically exceeded the legal emissions limits. This situation, however is quite different. This product presents a serious risk to safety of air commerce and to the public. As such, this should be a matter of urgency by the Commission.

Recommendation

The Commission should take immediate steps to preclude the importation, sale and marketing of these devices as quickly as possible.

List of Appendices

- 1) **Appendix A** – Part 97 Rules Regarding Radio Control
- 2) **Appendix B** – Additional Examples of 1080 MHz and 1.2 GHz Transmitters for Drones
- 3) **Appendix C** – Pertinent FAA and FCC Frequency Allocations
- 4) **Appendix D** – The Potential Impact of Illegal to Aircraft Radio Navigation Systems
- 5) **Appendix E** – Hobby King Web Page Information for the Lawmate transmitter and companion 6-watt amplifier

Appendix A

Part 97 Rules Regarding Radio Control

§97.215 Telecommand of model craft.

An amateur station transmitting signals to control a model craft may be operated as follows:

- (a) The station identification procedure is not required for transmissions directed only to the model craft, provided that a label indicating the station call sign and the station licensee's name and address is affixed to the station transmitter.
- (b) The control signals are not considered codes or ciphers intended to obscure the meaning of the communication.
- (c) The transmitter power must not exceed 1 W.

[54 FR 25857, June 20, 1989, as amended at 56 FR 56171, Nov. 1, 1991]

§97.217 Telemetry.

Telemetry transmitted by an amateur station on or within 50 km of the Earth's surface is not considered to be codes or ciphers intended to obscure the meaning of communications.

[56 FR 56172, Nov. 1, 1991. Redesignated at 59 FR 18975, Apr. 21, 1994]

Appendix B

Additional Examples of 1080 MHz and 1.2 GHz Transmitters for Drones

At the time of this investigation, eBay has over 70 sellers of these devices. Some are the same as Hobbyking's offering - 1 watt output and several channels that cover 1280 MHz and the Aircraft ATC Transponder frequencies. A search using "fpv 1.2 GHz" found close to 100 online offerings:

www.ebay.com/itm/1-2Ghz-800mW-Wireless-8CH-Transmitter-12-Receiver-for-Displayer-Moor-FPV-OSD-NEW-/361232990390?hash=item541b2a00b6:g:bCYAAOSwv0tU98Y-

www.ebay.com/itm/LawMate-1-2GHz-8CH-1000mW-Wireless-AV-Transmitter-VTX-TM-121800-for-FPV-Camera-/181763666158?hash=item2a51f570ee:g:lk0AAOSwZVhWSvHZ

www.ebay.com/itm/1-2GHZ-200mW-4CH-Wireless-Transmitter-A-V-Video-Audio-FPV-Monitoring-Fr-RC-Quad-/252133261211?hash=item3ab4503f9b:g:Gt4AAOSwA4dWHwc~

At the time of this investigation, a search on Amazon.com for "1.2 GHz fpv transmitter" brings up over 900 matches. At least 10% of those were offering the 1-watt version that covers the ham band and transponder frequencies. The search was concluded after looking at the first 50 results that seemed to cover the frequencies of most concern. The ones we found do, in fact, have switch-programmable frequency selections for Amateur, DME-TACAN and ATC (air traffic control) "Radar."

It should be further noted that the vast majority of transmitters offered are only compliant to Part-15 in the proper 2.4 and 5.8 GHz bands, with the notable exception of these "1.2 GHz" models.

Appendix C

Pertinent FAA and FCC Frequency Allocations

1. FAA Frequency Allocation for Spectrum Used by Illegal Drone Transmitters

The FAA's band and frequency allocation for the support of aviation can be found at the following FAA Web page:

www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/safety_ops_support/spec_management/engineering_office/rfb.cfm

In addition, the frequencies of concern and described in this report are provided in the following table. This information is taken from the above referenced FAA's Web page:

Radio Frequency Bands Supporting Aviation

Frequency	Band Name
960 - 1215 MHz	NAVAID (TACAN / DME, etc.)
1030 & 1090 MHz	Air Traffic Control Radar Beacon; Mode S; TCAS
1215 - 1390 MHz	Air Route Surveillance Radar; GPS and GLONASS L1

2. FCC Part 97 Frequency Allocation for 23 cm Band

The 23 cm Amateur Radio Band shares some spectrum with the above FAA frequency allocations. Frequency sharing requirements are described in §97.303 paragraphs (b), (d) and (o) shown below. **There is no shared spectrum below 1240 MHz:**

Wavelength band	ITU Region 1	ITU Region 2	ITU Region 3	Sharing requirements, see §97.303, paragraph:
23 cm	1240-1300 MHz	1240-1300 MHz	1240-1300 MHz	(b), (d), (o)

§97.303 Frequency sharing requirements.

(b) Amateur stations transmitting in the 70 cm band, the 33 cm band, the 23 cm band, the 9 cm band, the 5 cm band, the 3 cm band, or the 24.05-24.25 GHz segment must not cause harmful interference to, and must accept interference from, stations authorized by the United States Government in the radiolocation service.

(d) Amateur stations transmitting in the 430-450 MHz segment, the 23 cm band, the 3.3-3.4 GHz segment, the 5.65-5.85 GHz segment, the 13 cm band, or the 24.05-24.25 GHz segment, must not cause harmful interference to, and must accept interference from, stations authorized by other nations in the radiolocation service.

(o) Amateur stations transmitting in the 23 cm band must not cause harmful interference to, and must accept interference from, stations authorized by:

(1) The United States Government in the aeronautical radionavigation, Earth exploration-satellite (active), or space research (active) services;

(2) The FCC in the aeronautical radionavigation service; and

(3) Other nations in the Earth exploration-satellite (active), radionavigation-satellite (space-to-Earth) (space-to-space), or space research (active) services.

Appendix D

The Potential Impact of Illegal Devices to Aircraft Radio Navigation Systems

The antennas used on aircraft for these systems are basically 1/4 wave mounted to the bottom skin of the fuselage. In the case of an aircraft in close proximity to a drone, there is an additional interference issue caused by the Side-Lobe Suppression (SLS) portion of the system.

In the Secondary Aircraft Radar (SAR) system, the interrogation is sent at a 400-600 Hz rate from the radar ground station on 1030 MHz. The old system used 3 pulses for interrogation. However, the new upgraded system uses 4 pulses for the interrogation as follows:

- The first pulse (P-1) is sent from a sweep antenna.
- The second pulse (P-2) is sent -10db down from the first with an Omni antenna above the sweep antenna.
- The third pulse (P-3) varies between two possible spacing's:
 - P-0 which causes the transponder to send the 4 octal numbers from the front panel (Mode A or squawk code), or...
 - The 4 octal numbers from the encoding altimeter.
- The fourth pulse is sent when the interrogation is for a Mode-S transponder, which responds on the same frequency digitally with GPS and unique aircraft transponder ID data.

There are other details in the system - BUT if there is a signal present when the P-2 pulse is sent, this activates the SLS (side lobe suppression) which mutes the transponder reply. The transponder may then see the Omni antenna at the same level as the sweep antenna. The transponder is then in a side-lobe and should not respond.

IF a transponder sees a signal at the same time as the P-2 pulse, it will prevent the transponder from responding. These systems are very brittle and susceptible to poorly operating transponders. In fact, some manufacturer's designs have been problematic when their transponders are subject to the new P-4 signal for mode-S.

The -70 dBm level is the FAA-TSO standard for a 50/50 reply from the transponder. While this is a relatively strong signal, there should be no other signals on these frequencies, period.

Appendix E

Hobby King Web Page Information for the Lawmate transmitter and companion 6-watt amplifier

A compact 1000mW 1.2GHz A/V transmitter module designed for FPV use. An excellent quality unit that has 8 selectable frequencies and audio/video outputs. This transmitter will give you excellent range and very good video clarity.

It utilizes a "Digital Phase Lock-Loop Circuit" without temperature drifting problems. It also features a highly integrated circuit board for ultimate reliability.

Selectable channels: 1080 1120 1160 1200 1010 1040 1280 1280GHz

Features:

- Compact size
- Exceptional range
- Excellent video clarity
- Highly integrated circuit
- Uses "Digital Phase Lock-Loop Circuit" with no temperature drift.

Specs:

Transmission Frequency: 1.2GHz

Output Power: 1000mW

Channels: 8

Input Voltage: 5V

Modulation Deviation: 2.8MHz FM modulation

Sub-Carrier Frequency: 5.5MHz

Video Input: Impedance = 75ohms

Audio Input: Vp-p

Operating Temperature: -10C~+40C

Weight: 27.5g (transmitter only)

Weight: 76g (transmitter, antenna and supplied A/V lead)

RF Output Connector: SMA

Dimensions: 60 x 25 x 11mm

Note:

Please check with your local authorities regarding operation of this equipment before you purchase. Regulations on power output, usable frequencies and licenses to operate vary from region to region.

Appendix F

Hobby King Purchase documents



Hello, Edward Hare

This is an email to inform you that we have received your order and it has been sent to the warehouse print queue for dispatch.

YOUR ORDER ID IS: 20013095673

Your order will be shipped to;
Edward Hare
225 Main St
Newington, CT 06111, US
UNITED STATES
Ph:8605940318

If you wish to check your address, please log into our website and click on the order in your account section.

You can contact support by logging into our website and submitting a ticket.

ALWAYS QUOTE YOUR ORDER ID WHEN YOU EMAIL US

To check on the status of your order please log into your account at www.HobbyKing.com

Regards
www.HobbyKing.com

If you have any issues or questions regarding our products or service, please feel free to contact us at our [support center](#).

