ARRL EMC Committee Semi-Annual Report

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For The
American Radio
Relay League

Board of Directors Meeting
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Submitted By
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Chairman, ARRL EMC Committee

Mission Statement:

The EMC Committee monitors developments in the Electromagnetic Compatibility (EMC) field and assesses their impact on the Amateur Radio Service. The Committee informs the ARRL Board of Directors about these activities and makes policy recommendations for further action, if appropriate.

The overall goals of the committee are:

- Advise the ARRL Board about issues related to radio-frequency interference
- Advise the ARRL HQ staff on the content of its publications
- Make recommendations to the ARRL Board and HQ staff
- Maintain contact with other organizations involved in EMC matters through established liaison individuals

Members of the Committee:

- Mr. Kermit Carlson, W9XA, ARRL Central Division Vice Director, EMC Committee Chairman
- Mr. Phil Barsky, K3EW, Engineering/Management Consultant, retired
- Mr. Gordon Beattie, W2TTT, Principal Technical Architect, AT&T Enterprise IT Service Assurance
- Mr. Jody Boucher, WA1ZBL, RFI troubleshooter, Northeast Utilities, retired
- Mr. Brian Cramer, PE, W9RFI, Electrical Interference Solutions, Inc.
- Mr. Mike Gruber, W1MG, ARRL Lab RFI Engineer, HQ Staff Liaison
- Mr. Ed Hare, W1RFI, ARRL Laboratory Manager
- Mr. Ron Hranac, N0IVN, Technical Leader, Cisco Systems; past member of the Board of Directors, Society of Cable Telecommunications Engineers
- Mr. Richard D. Illman, AH6EZ Senior Engineer, Motorola Solutions
- Mr. Steve Jackson, KZ1X, VDSL and wireless communications
- Mr. John M. Krumenacker, KB3PJO Design Engineer

- Dr. Ron McConnell, W2IOL, T1E1.4 VDSL Standards Committee
- Mr. Jerry Ramie, KI6LGY, ARC Technical Resources, Inc.
- Mr. Cortland Richmond, KA5S, EMC Engineer
- Mr. Mark Steffka, WW8MS, Automotive EMC engineer
- Dr. Steve Strauss, NY3B, Home Phone Networking Alliance Technical Committee

HQ Staff:

The role of the ARRL HQ staff consists of the following:

- Answer individual inquiries from hams (and sometimes their neighbors) about RFI problems
- Write and publish articles about RFI
- Write and publish the ARRL RFI Book
- Design and update ARRL's RFI web pages
- Maintain a database at ARRL to facilitate EMC case tracking and reporting
- Work with ARRL's D.C. office on various spectrum and RFI-related filings
- Maintain contact with industry
- Participate in standards and industry groups, as a voting member or as a liaison. This includes ANSI accredited C63®, Society of Automotive Engineers EMC and EMR committees, Home Phone Networking Alliance, VDSL, HomePlug, FCC and individual companies.

Mr. Gruber handles the majority of the staff work on EMC matters. In the 1st half of 2015, he also continued with work in a number of key areas:

- Adding updates and revisions to the ARRL RFI Web pages.
- Facilitating and providing assistance on resolving long standing power line noise cases with the FCC.
- Testing the conducted emissions of suspect consumer electronic and electrical devices. Devices that exceed FCC specified absolute limits can be identified and reported to the FCC. Of particular concern are:

Large grow lighting devices used for indoor gardening have become increasingly problematic in all geographic areas of the country. As previously reported, the Lab has purchased and tested four separate ballast units and each exceeds the applicable Part 18 consumer limits by a significant margin – nearly 60 dB in one case. As previously reported, one of these cases has was submitted as a complaint to the FCC March 12, 2014. The remaining three cases were submitted to the FCC by General Counsel Chris Imlay on June 30, 2015.

It must be emphasized that these devices are being heard at much greater distances than normally expected from an otherwise legal device. In some cases, we have received reports of interference from devices that were found to be over ½ mile away.

Hams affected by grow light interference have found this problem to be particularly difficult to solve for several reasons:

1. Because of the abnormal distances over which this interference can propagate, hams often find it difficult to find the source. An otherwise legal device at the FCC limits is typically a few hundred feet or less, thus limiting the scope of the problem to one that can be located by sniffing with a portable shortwave receiver. This is often not practical in the case of a grow light.

2. Once the source residence is located, hams are often not comfortable approaching the homeowner or filing a complaint. He or she may no longer be a neighbor, and given the nature of what they might be growing, hams often fear for their personal safety.

These grow lights are not only the worst devices we've ever tested in the Lab for conducted emissions; they often are difficult if not impossible to resolve. In an effort to help hams locate these problems, Mr. Gruber helped Thompson, Tom, W0IVJ write his article, Locating RF Interference at HF, which appeared on page 33 in the November 2014 issue of QST. This article specifically addresses several aspects of the grow light problem.

- LED Part 15 Bulbs have so far not proven to be a significant source of RFI complaints. Nonetheless, Mr. Gruber continues to recommend cautious optimism. These devices still have the potential to become a serious problem without a practical solution. If we consider bulbs that are at or near the FCC limits in a typical suburban environment, the affected ham could easily be within range of 150 or more bulbs from just two neighboring homes. Attempting to find and fix this many sources is obviously not a practical or realistic solution for the ham.

- Non-consumer Part 18 electronic ballasts being marketed and sold for consumer and residential purposes. Note: Both the consumer and non-consumer limits Part 18 limits were exceeded in the case of all four ballasts tested by the ARRL Lab.

- Variable speed pulsed DC motors now appearing in such things as washing machines, HVAC systems and pool pumps. Furnaces and air conditioners seem to be particularly problematic and difficult to resolve.

- Working with AT&T engineering staff to help resolve RFI issues with U-Verse and other broad band systems.

- Reviewing proposed EMC related material for ARRL publications.

- Mr. Gruber co-wrote the *Radio Frequency Interference RFI Pocket Guide* with Kenneth Wyatt, WA6TTY. This publication is being published in conjunction with Scitech Publishing and made its debut at the Dayton ARRL booth.

Summary of Recent and Ongoing Lab Activities

Grow Lights

As previously reported in this document, Mr. Gruber tested four sample grow lights for conducted emissions. They were purchased from both local retailers and on-line sources. Three different manufacturers were included in this survey – Lumatek, Quantum and Galaxy. They were selected on the basis of complaints that from the field. Not surprisingly, each was also considerably over the FCC limits. The worst case measured 58 dB over the applicable Part 18 consumer limits. ARRL General Counsel Chris Imlay used the resulting Lab report as the basis for an FCC complaint, which was covered in the ARRL News. See Appendix 1A and 1B for this article and Mr. Imlay's complaint.

As previously discussed in this report, the three remaining FCC complaints were filed on June 30, 2015. See Appendices 2, 3 and 4 for copies of these filings.

Other Lighting Devices

As previously reported, Mr. Gruber tested a number of energy saving Part 15 & Part 18 Lighting Devices for conducted emissions. It should be emphasized that LED bulbs operate under are Part 15, while CFL's and electronic fluorescent light ballasts typically Part 18. In this case, there is an important distinction between these two rules - *Part 18 limits for consumer RF lighting device are considerably lower than applicable Part 15 limits*. As a consequence, the ARRL Board has previously asked us to consider a proposal to reduce Part 15 limits to Part 18 levels for lighting devices.

Mr. Gruber is happy to report that there continue to be very few complaints of RFI from these bulbs. However, these bulbs could still be legally marketed and sold if their emissions were close to the FCC limits. The emissions in this case would be high enough to create interference issues even from nearby residences in a typical suburban neighborhood. If and when such interference occurs, the burden then falls on the device *operator* to correct problem. While this rule may work on a case-by-case basis involving a small or limited number of sources, it is not practical should many bulbs in several houses be contributing to a wide spread problem.

An additional problem involves the sale and marketing of non-consumer rated ballasts to consumers in hardware and big box stores. These ballasts are being sold to unsuspecting consumers and have been the subject of interference complaints to the ARRL Lab. ARRL General Counsel Chris Imlay is working on filing a complaint with the FCC on the improper marketing of such devices. See Appendix 5 for this report.

Arc Fault Current Interrupter AFCI Breaker Immunity Issues

As previously reported, Mr. Gruber began receiving a few reports of "tripping breakers" from hams in early 2013. Specifically, these complaints concerned AFCI breakers, or Arc Fault Circuit Interrupter type breakers. These breakers are designed to trip if they sense an arc, and are now required by the electrical code in some specified rooms for residential wiring.

In response to these complaints, Mr. Gruber with invaluable help from W1AW Station Manager Joe Carcia built a "universal" circuit breaker test fixture. Using this fixture, he and Mr. Carcia tested as many breakers as they could find during W1AW broadcasts and other transmissions. The final results of this testing indicated that most of the AFCI breakers were surprisingly robust. The only problem breakers were a new – and only the new - model Eaton breaker at the time. Note: Eaton and Cutler Hammer are both part of the same company. Some Cutler Hammer breakers may have also had RFI issues, but the samples we tested were not a problem.

As previously reported, Mr. Gruber worked with Eaton to identify and test prototype breakers. At this point, Mr. Gruber is happy to report that new Eaton breakers are now being manufactured and the problematic breakers have been discontinued. The new Eaton "Ham Friendly" breakers are now being sold. Based on reports from members, these new breakers are not tripping in response to Amateur transmissions.

In cases where older breakers are improperly tripping, Eaton continues to provide assistance. The ham or homeowner can call one of two individuals at Eaton and they have been replacing the old breakers on a one-for-one basis free of charge. Complete details, including name and contact information, appeared in the November 19, 2013 ARRL news story, *ARRL Helps Manufacturer to Resolve Arc Fault Circuit Interrupter RFI Problems.*[1]

Assuming that there are no further issues with these breakers, this matter will be considered closed. No further mention will be included in Semi-Annual Reports.

Power Supply Conducted Emissions Investigation

As previously noted, Mr. Gruber noted a significant increase in conducted emission from an EtherWAN "ethernet switch" when an unterminated CAT5 cable was connected to it. This device could test very quiet in a lab, but be very noisy when used in actual practice. It should also be noted that the power supply was internal to the device, and the problem went away when an outboard power supply was used in place of the internal switching supply.

[1] The URL is www.arrl.org/news/arrl-helps-manufacturer-to-resolve-arc-fault-circuit-interrupter-rfi-problems.

A subsequent investigation with EMC Committee member Gordon Beattie also resulted in a similar observation. Mr. Beattie reported that a number of power supplies had apparently met Part 15 emissions limits but generated more noise than expected in an actual residential environment. Messer's Beattie and Gruber subsequently investigated this phenomenon in the ARRL Lab. They concluded it is caused by relatively low RF impedance at the load side of the power supply. In an actual real world environment, cables and wires connected to the load side of the power supply can cause this phenomenon to occur.

This phenomenon has now been observed in other products and power supplies. This investigation remains ongoing.

Status on FCC Enforcement and Outstanding EMC Cases

Mr. Gruber reports that the FCC has been sending letters to utilities (and consumers) with regularity. Meaningful enforcement beyond that has historically been very disappointing. To the best of his knowledge, no previously reported longstanding power line noise case has been resolved during the first half of 2015 due to enforcement. While some cases have been closed, many cases can drag on indefinitely. Protracted cases are often caught in an endless loop or letter writing campaign. As a result, new cases develop faster than old cases are resolved. There has been little or no change from the previously reported statics in this regard. The FCC has yet to issue even one NAL in a case of interference to Amateur Radio from a Part 15 or Part 18 device.

As previously reported, the FCC is not pursuing amateur related EMC enforcement issues in a meaningful way. At the present time, two examples of particular concern include:

1. On March 14, 2014, the following story appeared in the ARRL News: ARRL to FCC: "Grow Light" Ballast Causes HF Interference, Violates Rules.[2] This story reported a formal complaint made by the ARRL to the FCC concerning grow light ballasts that were considerably over the applicable FCC Part 18 limits. Since these devices are being marketed and sold in shops across America, and given the incredible margin by which they exceed the limits, this was a slam dunk case for FCC enforcement. Yet, at the time of this report, no enforcement has taken place. In fact, to the best of Mr. Gruber's knowledge, the FCC has yet to even respond to the ARRL's complaint.

   While it may be understandable for the Commission not to comment on an ongoing investigation, it is clear that timely FCC enforcement is not happening. It has now been approximately a year and a half since the ARRL's news story on this matter. It would appear that the FCC is either unable or unwilling to provide timely and meaningful enforcement, even in a clear and egregious case such as this. Mr. Gruber fears that if this should continue, it has the potential to compromise the FCC's credibility as an enforcement body. Meaningful FCC

[2] The URL is www.arrl.org/news/arrl-to-fcc-grow-light-ballast-causes-hf-interference-violates-rules. Included at the end of this report as Appendix 1A.

enforcement when warranted is essential toward protection of all spectrum, not just the ham bands.

It has also been reported by EMC Committee members who are professionally employed electrical engineers in the cable-TV/cable-modem area that grow light ballast have been found to cause serious harmful interference to the operation of cable systems; Electro-Magnetic Interference from grow-light ballasts enters the cable system in the downstream end and causes interference to subscribers in a relatively large areas. As previously noted in the Summer-2014 EMC Committee report, emissions from some grow-light ballasts have measured 58 dB above the FCC limits. In other words, these devices are presenting problems to cable distribution systems often with coupling to the ground and power of residences with the conducted levels far in excess of what is encountered in typical amateur installations.

2. On April 24, 2014, the following story appeared in the ARRL News: ARRL FCC Cites Washington Resident for Causing Interference on Amateur Frequencies.[3] This article describes a case in Woodinville, Washington in which the FCC conducted a field investigation. Although this investigation resulted in a finding of harmful interference from a nearby property, possibly caused by a lighting device, the property owner subsequently failed to respond to the Commission. As a result, the Commission released a Citation & Order on the 24th of April, the same day as the ARRL News article[4]. However, as of June 2015, the interference was confirmed to be ongoing.

   The noise in this matter is consistent with a grow light. At this point, it appears that the property owner has simply ignored the FCC's Citation and Order. Furthermore, to the best of ARRL staff's knowledge at this time, no additional enforcement has taken place. Failure to respond to an FCC citation and order would seem to be another slam dunk case, yet to the best of Mr. Gruber's knowledge, there has been no FCC follow-up in this matter, even after approximately fifteen months.

   The EMC Committee recommends to the Board that regular and repeated formal follow-up be conducted with the FCC in this matter. This is the best case for an NAL that he has seen in quite a while.

Historically, meaningful FCC enforcement beyond an advisory letter has been and continues to be disappointing. So far, most cases involving Amateur radio have been argued on the basis of harmful interference as opposed to exceeding the FCC emissions limits. The FCC rules place the burden to correct harmful interference on the *operator* of

[3] The URL is www.arrl.org/news/fcc-cites-washington-resident-for-causing-interference-on-amateur-frequencies.
[4] The URL is http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0424/DA-14-536A1.pdf.

the offending device – not the distributor or manufacturer. Device operators in a typical RFI case include a power company or neighbor.

In a typical case, one or more letters will be sent by the FCC in Gettysburg to an offending device operator. Beyond that, a typical case will be referred to the local FCC field office for an investigation. From what we've seen, most field investigations result in a conclusion of convenience. As a typical example, the agent may conclude that the noise is insufficient to meet the criteria for harmful interference, thus ending the case. Other complainants have reported a lack of follow-up after an investigation, especially if the source was not active during the initial field investigation.

Also from what we've seen, FCC field agents often do not have the proper training or equipment to correctly identify and locate power line noise. Their equipment seems better suited for locating such things as transmitters. Even if the source is known, or if the source is a consumer device in a nearby home, we've yet to see one in which the FCC issued an NAL or forfeiture. Some cases like this have dragged on for a considerable period of time with no resolution.

While a lack of meaningful enforcement in cases involving device operators has been the norm for a considerable period of time, the two cases previously described in this section appear to demonstrate an alarming trend. The first involves grow light manufacturers, and the second, an apparent lack of response to an FCC Citation & Order. It must be emphasized that even if there is an ongoing FCC effort in either or both of these matters, both have now been ongoing for over one year with no known FCC action. It would appear that the FCC has simply closed these cases. Even if there was to be an FCC action at this point, it would not be timely enough to achieve maximum impact as a future deterrent.

Note: Consider that over-the-limit grow light ballasts have been on the market for several years now. They are now proliferating across the country and causing interference to other services, including the cable industry. It's not just Amateur radio anymore. These devices are ridiculously over the FCC limits, yet there has been no meaningful response from the Commission in all this time. **Mr. Gruber recommends that Board consider additional lobbying and advocacy in these matters. Both the marketing and sale of illegal devices continues unabated. Furthermore, even when an interference case from such a device occurs, the FCC does not engage in timely or meaningful enforcement to stop it – *even after issuing a Citation & Order.***

With the proliferation of new types of lighting devices, including grow lights, not to mention such things as switching mode power supplies, battery chargers, pulsed dc motors in appliances, etc., meaningful enforcement is badly needed. A lack of it in RFI matters would no doubt be disastrous for both hams and other services as well. If the FCC does nothing about something as egregious as a grow light, it would call into question the FCC's credibility as an enforcement body. It would also seem unlikely that t meaningful enforcement could be expected in other interference matters as well.

First Half 2015 Year Total RFI-Case Statistics:

New RFI Cases – 88
New electrical power-line cases – 21

- ARRL Letters sent – 10
- FCC 1st Letters submitted – 5 (Note: Laura Smith may have issued FCC letters based on need and input from the ARRL. These letters were not formally submitted by ARRL and therefore not included in this total. Many of these letters could possibly be follow-up in nature and therefore require custom legal language. The effectiveness of these letters has yet to be determined.)
- FCC 2nd Letters submitted – 0

Electric Utilities:

Power-line interference has continued to be the single number one known interference problem reported to ARRL HQ. It can also be one of the most difficult to solve. Fortunately, Laura Smith clearly remains interested in RFI matters and continuing with the Cooperative Agreement; and there has been no change to the process of processing cases presented through the Agreement. Although none of the previously reported cases have been successfully resolved as a result of FCC enforcement, the Committee is continuing in the process of addressing this issue.

<u>KI6IBS Power Line Noise Investigation</u>

In an effort to develop a power line noise case for ARRL consideration as a higher level FCC complaint, Messer's Gruber and Ramie investigated the case of Eric Schreiber, KI6IBS, in Pleasant Hill, CA. This case was first reported to ARRL on April 24, 2012. The utility in this matter is PG&E.

Since first reported to us, PG&E has responded to numerous FCC and ARRL communications. PG&E also claims to have made significant effort toward resolving it. Although the noise at KI6IBS is intermittent and primarily active at higher temperatures, it was severe and not particularly difficult to find when using proper modern methods and equipment. The people that PG&E were sending out did not have the right equipment, or if they did, they didn't know how to use it.

Complete details on this investigation appear as Appendix 6 of this report. Although Mr. Gruber has forwarded this report to PG&E's attorney Jonathan Pendleton June 12, 2015, he has not received a response. Laura Smith at the FCC was also a CC recipient of this report.

Mr. Gruber reports that this case is solid. The only potential issue might be the intermittent nature of the noise in cooler weather. Given the extraordinary effort it requires to groom and develop a case to this level, Mr. Gruber recommends to the Board that it be used for a timely and higher level complaint at the FCC.

K7GMF Power Line Noise Complaint

Tom Lopez of Cochise Arizona first reported his power line noise problem to ARRL over ten years ago. Despite numerous FCC letters and an investigation by Mike Martin, the problem continues. A brief timeline is as follows:

- 02-18-04 – Complainant first reports interference problem to ARRL
- 03-20-06 – ARRL sends letter to Sulphur Springs Valley Electric Cooperative (SSVEC), the utility in this matter.
- 03-16-09 – FCC sends 1st FCC letter to utility.
- 08-17-09 – FCC sends 2nd FCC letter to utility.
- 05-10-10 – RFI investigator Mike Martin, whose services were obtained by the Utility, reports that he investigated the problem. There were numerous staples in a desert environment contributing to the problem. The primary source was found to be associated with 69 kV transmission lines about six miles away. This problem could not be fixed at the time of Mr. Martin's investigation.
- 03-01-11 – FCC sends 3rd FCC letter to utility.
- 07-08-14 – Mr. Carlson contacts Mr. Lopez to ascertain the current state of harmful interference to K7GMF from powerline noise.
- 08-18-14 – Mr. Gruber requests 4th FCC letter.
- 12-05-14 – Laura Smith reports that she had sent the utility a letter in August but did not receive a reply. She indicated that she would send to the field if nothing after the Holidays.
- Present – Mr. Lopez reports the problem continues and he has not heard from the field. He asks Mr. Gruber for help and provides him with a package of recent documents related to his case.

Mr. Gruber reports that he did have contact with FCC staff about this particular case at the beginning of July, 2015 but has not had sufficient time for a thorough follow-up with the FCC on this matter. Given the history of this case, it's unlikely that the field will be doing anything soon. Although Mr. Gruber has concerns about the complexity of the case with over five years since the professional investigation began, Mr. Gruber is now grooming this as one of the cases that the Committee believes should be used as a higher level complaint with the FCC.

Additional ARRL Power Line Noise Investigations by Kermit Carlson

Vice director and EMC Committee Chairman Kermit Carlson continues to perform follow-up on the status of the 74 open cases of power line noise that had been previously referred to the FCC. The purpose of this inquiry was to determine the status of harmful

interference from Power Line Noise for cases that had been reported in the past 5 years but for which the League had an unknown remediation status.

Of the 74 cases that Mr. Carlson investigated, fourteen were closed as a result of the inquiry. The harmful interference issue had been resolved and that no follow-up is necessary.

- Four of these cases were closed because the amateur had moved or become inactive.
- Five cases of these were closed because the complainant failed to respond to Mr. Carlson's inquiry. The inquiries were made by email and telephone.
- Three cases were closed because there was no accurate contact information. The complainant's email address in the ARRL and the QRZ.com database was no longer accurate and a phone number could be found.
- Two were closed for other reasons.

Out of the 41 unresolved cases identified by the follow-up several cases have been selected for further preparation for presentation to the Commission as long-term unresolved problems:

Along with the KI6IBS, Pleasant Hills, California and the K7GMF, Cochise, New Mexico situations few cases of persistent powerline noise have been as problematic as the K9XD powerline noise case in Warrenville, Illinois. This case is remarkable because the complainant, Mr. David Janiec, K9XD, has gone to the extreme extent of purchasing his own Radar Engineers RFI locating equipment and has actually been able to present credible and accurate location information of the noisy and failing equipment to the responsible utility, Commonwealth Edison.

<u>K9XD Power Line Noise Complaint</u>

Over the past 10 years, Mr. Janiec has become acquainted with the knowledgeable local linemen and utility engineers. Although some of Mr. Janiec's power line problems had been resolved successfully with the help of the utility staff, a number of his local power line noise issues continue to present harmful interference with noise well above S9 on the high frequency amateur bands. Unfortunately his experience has also provided him with viewpoint at close range of the active and purposeful non-action of line management responsible for scheduling overhead line repair. Mr. Janiec has provided the utility with the locations of the defective overhead equipment, the local knowledgeable linemen acknowledge the accuracy of Mr. Janiec's findings, but the resolution is derailed because the local office line management continues to delay any assignment of crews for the resolution of the outstanding repair tickets in a timely manner. In many instances the simple replacement of a lighting arrestor or insulator would solve the harmful interference RFI noise problem.

As demonstrated in the K9XD case, the lack of any substantial consequence for inaction by a utility does continue to confound suitable progress towards resolution in a number of cases. Unfortunately, with a Federal Communications Commission that appears to have

completely abandoned most enforcement, there would seem to be little more that can be produced by Commission involvement for these cases that remain unresolved. Although it would be extremely helpful for future efforts if the Commission were to levy a substantial fine in at least one egregious power line noise case of harmful interference, it appears that this would not be a realistic expectation of Commission action.

The conundrum is that other than letters, there is no real possibility for Commission sanction, fine, forfeiture or action. On the other hand there have been a number of recent cases that have been cured by the very same utility after only one letter from the FCC staff. The inconsistent response between different utility "garages" in the same utility and geographical area clearly demonstrates the difficulty of arriving at consistent and acceptable resolution of cases of harmful interference caused by power line noise sources.

It should be noted that the locating AND repair of electrical distribution equipment which causes harmful interference is the responsibility of the power line company, not the affected amateur. Mr. Janiec's case does demonstrate the nature of unacceptable inaction that is exampled by some utilities. As a result of the current state of affairs the ARRL EMC engineers have no alternative but to continue to lodge complaints through their staff counterparts at the Commission and though letters which are sent directly to the utility company; and hope for the best.

After over one decade of efforts, the resolution of harmful interference caused by power line noise to Amateur Radio station K9XD in Warrenville, Illinois remains elusive.

Smart Grid & EMC Standardization Efforts

Mr. Ramie (KI6LGY) expands on his efforts in these four areas:
1) Update to IEEE-1613.1(2013) - In the previous January 2015 report, there was a new League-supported effort just beginning to broaden the Scope of this recently-completed utility communications networking equipment immunity Standard. (including testing for immunity to HF frequencies). The new title was going to be "*IEEE Standard Environmental and Testing Requirements for Intelligent Electronic Devices Installed in Transmission and Distribution Facilities*." There are over 100 types of Intelligent Electronic Devices (IEDs) already numbered within the Power & Energy Society by function. Each numbered type may need its own Acceptance Criteria (rules for judging if a product "passes" an immunity test). There were three Subcommittees sponsoring the work; Substations, T&D and Power Systems Relaying Committee (PSRC). The Scope was becoming huge, so the working group met once by webinar and agreed to disband and re-form under an upcoming and related effort.

That related effort was the need to update IEEE-1613(2009) which will be administratively withdrawn soon without new efforts underway. The group felt that a "joint task force" approach, like that originally used for IEEE-1613, would be most appropriate. The manufacturers present noted that so many types of IEDs would require

so many types of Acceptance Criteria, not necessarily the same as those in the newly-released IEC 61000-6-5. (Generic Immunity for Utility Environments). While that may or may not be the case, and manufacturers usually don't like new immunity testing requirements being placed on their products, there was no objection to the tests or their test levels from anyone on the working group. The need for more and more specific Acceptance Criteria seemed to be the major hurdle. So, the work we sponsored in IEEE 1613.1(2013) will be taken into the next update to IEEE-1613(2009) later this year. Mr. Ramie will probably act as the working group Secretary or Vice Chair and as liaison back to the EMC Society.

2) SGIP2 - the Smart Grid Interoperability Panel hosts the EMI Issues Working Group to address EM interference issues to/from utility equipment. Work is continuing on the "Application Note" for using the existing IEEE-1613.1(2013) Standard to guide utilities in their communications equipment acquisitions, encourage manufacturers to embrace the additional tests and gain access to larger markets by doing so, and for testing labs to offers the suite of tests required. There was agreement that an Application Note on a planned update to 1613.1 was inappropriate as the update itself had become uncertain. The Application Note on the existing IEEE-1613.1(2013) points out reasons for its adoption by utilities, manufacturers and test labs and offers guidance to help manufacturers apply the document for the immunity type-testing of communications networking devices intended for utility environments.

3) Public Speaking about Smart Grid EMC Standards Harmonization - Mr. Ramie spoke at the IEEE - EMC Symposium in March to teach about IEEE-1613.1(2013) and discuss the disbandment of the working group assigned to update it. Since the group is re-forming under IEEE-1613, Mr. Ramie will still act as the liaison between the P&E Society and the EMC Society to keep both Societies informed. Mistrust from the BPL Standard effort under IEEE-1775 is fading now. For public outreach, Mr. Ramie solicited every EMC, Communications and Power/Energy chapter in the US and has given nine Presentations on *Smart Grid EMC Standards Harmonization* to good reviews. The opening slide of his Presentation shows the ARRL logo to acknowledge the support of the League and the comments Mr. Ramie delivers describe the effort. There are no further speaking dates set for this year.

4) Support the ARRL Lab - Mr. Ramie video recorded the KI6IBS powerline noise investigation conducted by Mike Gruber recently in Pleasant Hill, CA. The footage was edited and posted on the ARRL power-line FAQ page. http://www.arrl.org/power-line

The IEEE - EMC Society Standards Development & Education Committee met in March and approved the PAR authorizing work to begin on a sparking gap noise Recommended Practice to showcase industry best practices. Mr. Ramie already has an account with the IEEE Standards Association for webinar capability and he looks forward to beginning work on this important document as the working group Secretary.

Automotive EMC:

The Headquarters staff continues to send all reports of automotive EMC problems to interested people in the automotive industry. While these reports are advisory, they are helpful to the industry in planning for future designs. Mr. Steffka continues to help prepare automotive related responses to Technical Information Services (TIS) questions for ARRL members.

Cable Television:

As a whole, the cable industry continues to do a good job at adhering to the FCC's regulations about signal leakage and interference. During the past six months, ARRL received three reports of problems, indicating that most cable systems are either clean or are addressing complaints effectively. Two of the cases were resolved shortly after the cases were opened; the third was closed by ARRL after a request for additional information from the complainant went unanswered (it is thought that the last case was not likely related to cable TV). In all three instances Mr. Hranac served as the liaison between League and the cable companies. Mr. Hranac also provided some input into the development of an EMC pocket guide, that input related to leakage and TV channel allocations.

DSL, U-Verse & Home Phone Networking Alliance

Mr. Beatty continues to assist with broadband service complaints to the ARRL. Very few complaints were received since January. In addition, Mr. Beatty has been working toward formalizing the process that AT&T uses to address these issues with ARRL.

RFI-Case Database:

The ARRL HQ staff maintains a database of RFI reports and cases. This is used primarily as a case-management tool for the several hundred RFI cases ARRL handles every year, but the information the Lab staff are gathering about types of interference cases, involved equipment and frequencies will provide a wide range of reporting capability. Here are some statistics from the database for the 1st half of 2015 and compared to the second half of 2014 and the previous five years:

Category of Case Reported to ARRL Lab/EMC Engineer	2010	2011	2012	2013	2014	2015-1
BPL	3	0	0	0	0	0
Unknown Unintentional Radiators	57	78	66	68	81	26
CABLE TV	8	7	3	4	4	1
Satellite TV				2	3	1
Computing Devices and Modems	4	7	3	5	6	6
Power Line Noise	90	65	53	52	51	21
Plasma TV Receivers	10	14	5	3	5	1
Other Broadcast Receivers	7	0	4	4	4	0
Other Receivers	8	3	1	1	4	1
Other Transmitters	2	9	2	2	4	2
Broadcast Transmitters	3	4	6	6	2	0
Lighting Devices	15	13	4	10	15	4
Confirmed & Suspect Grow Lights[5]	---	---	---	2	16	3
Fence Systems	4	2	0	3	3	0
Battery Chargers / Power Supplies	1	1	3	4	5	4
Wheelchair	1	1	0	0	0	0
Water Pump Systems	3	2	1	2	2	0
HVAC Systems	11	6	3	10	6	2
Alarm Systems including detectors	6	0	4	2	4	0
Other Appliances	3	8	7	7	4	3
GFIC / AFCI	1	1	5	7	25	2
AUTOMOBILE Systems	4	3	2	7	1	0
Manufacturing and Retail Generated Noise	1	0	0	1	2	0
AT&T U-Verse Systems	10	8	8	3	4	4
PV Systems	---	---	---	2	1	3
Doorbell Transformers	---	---	---	2	3	0
Other			36	16	16	4

[5] It can be difficult to confirm a Grow Light. As a result, a number of other grow lights may appear as Unknown Sources. Based on their signatures, a number of Unknown Sources are most likely Grow Lights but remain unconfirmed.

It is important to note that power line noise has consistently been the most reported and problematic RFI problem reported to the ARRL Lab. As Committee member Ed Hare indicted, ***more hams suffer from power line noise right now than will ever suffer from BPL.***

ARRL RFI Forums:

The two RFI forums remain ongoing in the ARRL forums pages. These forums provide self help and discussion for members. They are monitored and moderated by HQ Lab staff and other volunteers. The pages are:

- RFI - Questions and Answers
  - RFI questions and are answered by other members and RFI experts. Members can post questions and read answers about solutions to an RFI problem they are having. The link is: www.arrl.org/forum/categories/view/20

- RFI - General Discussion
  - This forum is a place to discuss technical issues associated with RFI and Amateur Radio. The link is: www.arrl.org/forum/categories/view/21ssion

Committees:

ARRL continues to be represented on professional EMC committees. Messrs. Hare and Carlson continue to represent the interests of Amateur Radio on the ANSI ASC C63® EMC committee. The C63® committee is working on developing industry standards for immunity, emissions and testing of electronic devices. ARRL serves as a resource to the committee to protect the interests of Amateur Radio.

Mr. Hare is the Primary ARRL C63® representative; Mr. Carlson is the Alternate. Mr. Hare serves as the Vice Chair of Subcommittee 5, Immunity. Mr. Hare also leads the C63® committee's Task Force on testing below 30 MHz, which has completed writing a section of an intentional emitter measurement standard that correctly and scientifically extrapolates field strength measurements below 30 MHz. This material was incorporated into the ANSI C63.10 standard on the measurement of unlicensed intentional emitters (transmitters).

Mr. Ramie serves as the C63® Secretary and as a member of Subcommittee 5 and the Below 30 MHz Task Group. Subcommittee 1 continues to work on a variety of EMC projects, primarily related to test site standardization. Subcommittee 5 deals with immunity and immunity measurement issues. Subcommittee 8 deals with various types of medical equipment. The multiple ARRL EMC-Committee representation on C63 watches immunity and testing developments.

Mr. Hare also serves on the IEEE EMC Society Standards Development and Education Committee (SDECom). SDECom serves as the EMC Society standards board, overseeing

the development of all IEEE EMC Standards. He was also elected to serve a two-year term, starting January 1, 2014, on the on the IEEE EMC Society Board of Directors.

Related to committee work, Mr. Hare also maintains informal contact with a number of industry groups, including HomePlug and the HomeGrid Forum (in-building BPL industry groups), Society of Cable Telecommunications Engineers, Society of Automotive Engineers and the Electric Power Research Institute, as a few examples.

A list of the planned, recent and ongoing EMC activities at the ARRL Laboratory includes;

- Advocate lower radiated emissions limits below 30 MHz in FCC Part 15 rules for unintentional emitters such as plasma TVs.
    - Test and document an actual instances of harmful interference.
    - Document cases from database.
    - Develop specific technical recommendations for changes to the FCC Rules and Regulations
- Advocate lower limits in Part 15 for non-CFL lighting to possibly harmonize with the lower limits for fluorescent bulbs in Part 18 rules.
    - Document cases from database. Obtain and test bulbs.
    - Mr. Gruber completed a related article for an upcoming issue of QST
    - Develop specific technical recommendations for changes to the FCC Rules and Regulations.
- Advocate better external labeling on packaging for Part 18 fluorescent bulbs and ballasts.
    - Document items sold in major stores through improper marketing.
    - Conduct testing of commercial devices sold into the consumer market .
- Develop standardized methods of locating RFI sources of harmful interference to Amateur Radio stations. Work with other Industry Groups to develop methods of best practices for location sources such as lighting controls, motor controls and power line noise.
- Investigate and document pulse-width specific radiated and/or conducted emissions limits for certain incidental emitters motor controllers used in appliances.
    - Test a number of devices that belong to staff and/or local hams that have caused instances of harmful interference.

The Future of EMC and Amateur Radio:

Interference to hams appears to be the present major work of the committee. Although immunity problems still do occur, this is being addressed at the national and international standards level. RFI from unlicensed devices poses a major real threat to Amateur Radio at this time. This will continue to require significant Committee and ARRL staff attention. To the extent possible with existing staff, or with additional resources, the ARRL should increase its contact with standards organization, industry groups and individual companies, and continue to work on all aspects of RFI problems and solutions.

ARRL's information about RFI can be read at:

www.arrl.org/radio-frequency-interference-rfi.

As a note of personal thanks, I would like to recognize Mr. Hare, W1RFI; Mr. Raime, KI6LGY and Mr. Gruber, W1MG for their authorship of material for this report, and to all of the EMC Committee members for their ongoing service to the ARRL and the Amateur Radio community.

Respectfully Submitted,

Kermit A Carlson W9XA
EMC Committee Chairman
ViceDirector Central Division

Appendix 1A

Web: www.arrl.org/news/arrl-to-fcc-grow-light-ballast-causes-hf-interference-violates-rules

ARRL to FCC: "Grow Light" Ballast Causes HF Interference, Violates Rules

03/14/2014

The ARRL has formally **complained** to the FCC, contending that a "grow light" ballast being widely marketed and sold is responsible for severe interference to the MF and HF bands. The League urged Commission action to halt sales of the Lumatek LK-1000 electronic ballast and to recall devices already on store shelves or in the hands of consumers. In a March 12 letter to the Commission's Enforcement Bureau and its Office of Engineering and Technology, ARRL General Counsel Chris Imlay, W3KD, said the ARRL's own laboratory testing revealed that the Lumatek device exhibited excessive conducted emissions, in violation of the FCC's rules.

"ARRL has received numerous complaints from Amateur Radio operators of significant noise in the medium and high frequency bands between 1.8 MHz and 30 MHz from 'grow lights' and other RF lighting devices generally," Imlay told the Commission. "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." An extensive ***Conducted Emissions Test Report*** detailing the ARRL Lab's test results was attached to the League's correspondence.

"[T]he *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," Imlay related. The ARRL further pointed out that, while a FCC sticker has been affixed to the device, it lacked FCC compliance information. FCC Part 18 rules require RF lighting devices to provide an advisory statement with the device, notifying users that it could interfere with radio equipment operating between 0.45 MHz and 30 MHz.

The League noted that the device is imported into the US and marketed and sold by Sears, where ARRL purchased its test sample, as well as by Amazon.com and other retail outlets.

"ARRL respectfully requests that your office take the appropriate action with respect to this device without delay," Imlay's letter concluded. Copies of the correspondence were sent to the importer.

In separate correspondence to FCC Commissioner Ajit Pai, seeking his review of the complaint, Imlay said the Lumatek unit was "typical in terms of its performance, and

many other types of ‘grow lights’ are being imported, marketed, sold and deployed now.” One of Pai’s main interests is the revitalization of the AM Broadcast Band, where noise can be an impediment to reception. “It is not at all an exaggeration that even one of these electronic ballasts operated in a residential neighborhood makes any AM Broadcast reception impossible,” Imlay asserted. The League included a copy of its test report with the letter to Commissioner Pai.

“Marked increases in the noise floor at MF and HF, year-over-year, are well-known to active Amateur Radio licensees, and it is devices such as the Lumatek LK-1000 and its progeny that are major contributors to this noise pollution,” Imlay added.

Appendix 1B

Web: www.arrl.org/attachments/view/News/74152

March 12, 2014

Via E-mail and U.S. Mail
john.poutasse@fcc.gov
rashmi.doshi@fcc.gov

Mr. John Poutasse, Acting 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: Violations of Part 18 Regulations; Lumatek LK-1000 RF Dual Voltage HPS-MH Dial A Watt Dimmable, 1000W-750W-600W Lighting Device (Electronic Ballast); Conducted Emission Limit, Labeling and Marketing Violations.

Dear Mr. Poutasse 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 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 LK-100 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 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 marketed and sold in violation of, at least, Section 18.213 of the Commission's Rules.

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 LK1000 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"). ***On information and belief, other similar products exhibit the same excessive conducted emissions as does the LK1000***.

The Lumatek grow light has been imported by Hydrofarm Horticultural Products of Petaluma, CA (see, www.hydrofarm.com). In addition to Sears, the device is apparently available from Amazon and other retail sources including but not necessarily limited to those listed at page 1 of the 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 6.4 MHz of 106 dBµV. At 21.2 MHz, the Quasi-Peak Interference Voltage is 64 dBµV. Appendix C of the attached Report shows that in both phase-to-ground and neutral-to-ground operating conditions, when operated at any of the four power settings of the device (i.e. 600 watts, 750 watts, 1,000 watts and "Super Lumens"), 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 is a circular sticker on the bottom of the device, bearing the FCC logo as called for by Section 18.209(b) of the Rules for devices subject to Declarations of Conformity. However, there is no 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, Section 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, but there is a label consistent with a claim that the device is subject to a Declaration of Conformity, 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 immediately. Those devices that have been sold to consumers, or which are available for retail sale should be tracked and recalled immediately. To the extent that there are successor or similar products imported by Hydrofarm Horticultural Products of Petaluma, CA, those devices should be immediately tested by the Commission for compliance with conducted emission limitations. Finally, it is 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 710,000 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,

Christopher D. Imlay

Christopher D. Imlay
General Counsel, ARRL

Attachment

Copies to:

Hydrofarm West
2249 S. McDowell Ext.
Petaluma, CA 94954

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

Sears Holdings Corporation
3333 Beverly Road
Hoffman Estates, IL 60179

SLS California
Livermore, CA
(Via Fax only: 925-454-1535)

Appendix 2A

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
445-12th 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,

Christopher D. Imlay

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 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

04/04/2014

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 21st 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


LUMATEK
ELECTRONIC BALLAST
1000W ELECTRONIC BALLAST
MULTI-WATTAGE LAMPS:
1000W/600W/400W M.H/H.P.S


AIR COOLED
1000W/120-240V
RUNS 400W, 600W, AND 1000W MH/HPS LAMPS
FULLY DIMMABLE
STAGGERED IGNITION TECHNOLOGY
SUPER LUMENS
WHISPER QUIET FANS
LED INDICATOR
LIGHTWEIGHT AT 7 LBS
13.75" (L) X 7.25" (W) X 3.5" (H)
DUAL-VOLTAGE WITH THE SAME LIGHT OUTPUT ON 120V OR 240V
3 YEAR WARRANTY
Dial-A-Watt PLUS Dimmable
Best with Lumatek Bulbs
Got questions?
Visit us online at www.lumatekLighting.com
or call 1.866.369.8943
AIR COOLED
1000W/120-240V


LUMATEK
ELECTRONIC BALLAST
400W
600W
1000W
Super Lumens

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 μV /	48 dB(μV)	quasi peak
		2.51 MHz - 3 MHz	3,000 μV /	70 dB(μV)	quasi peak
		3 MHz - 30 MHz	250 μV /	48 dB(μV)	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

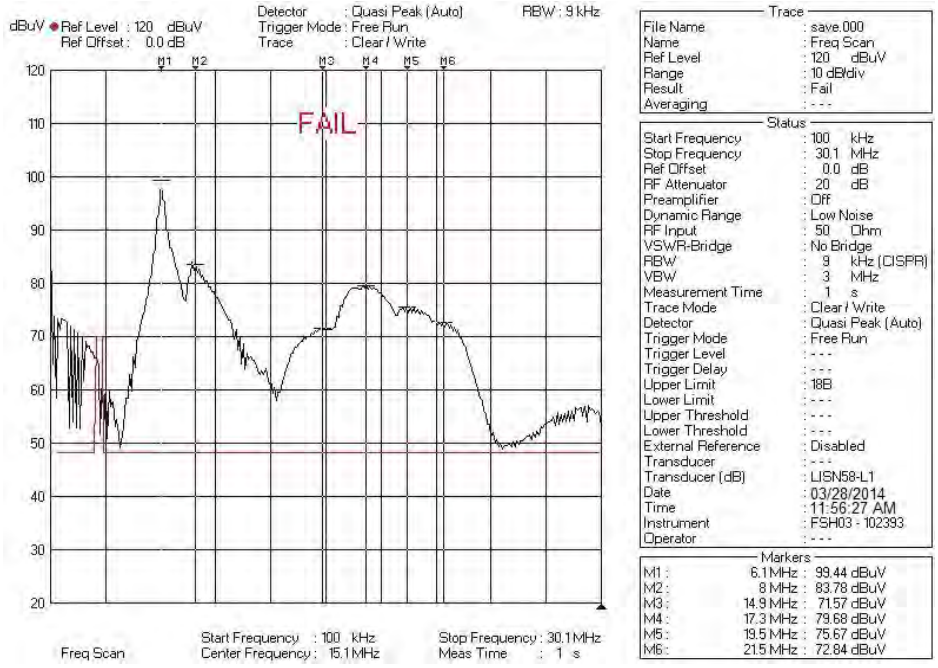
1. Bond the LISN to the ground plane of the test area using a grounding cable that is as short as possible.
2. Connect the EUT power cable to the Line Impedance Stabilization Network (LISN).
3. Measure the conducted emissions from the EUT using the LISN and a quasi-peak detector.
4. Record the six highest 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 dBµV	48 dB(µV)	FAIL
8.0 MHz	120VAC	84 dBµV	48 dB(µV)	FAIL
14.9 MHz	120VAC	72 dBµV	48 dB(µV)	FAIL
17.3 MHz	120VAC	80 dBµV	48 dB(µV)	FAIL
19.5 MHz	120VAC	76 dBµV	48 dB(µV)	FAIL
21.5 MHz	120VAC	73 dBµV	48 dB(µV)	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!

amazon

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

1

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]

1

855.289.1441 | Review Lab | A-Z Glossary | | | | 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

Sign Up for Our Newsletter:

Join Our Community

About Us	Customer Center	Info	Contacts	Visit Growers House
About Us	My Account	Buyers Guides	Send Us A Message	1501 E 21st ST
Shipping	Order Status	Privacy Policy	Our Contact Info	Tucson, AZ 85719
	Wishlist	Returns Policy	Store Location	1.855.289.1441
	Returns and Exchanges			get directions

Norton SECURED powered by VeriSign

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

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Federal Express Tracking Link

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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]

1

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

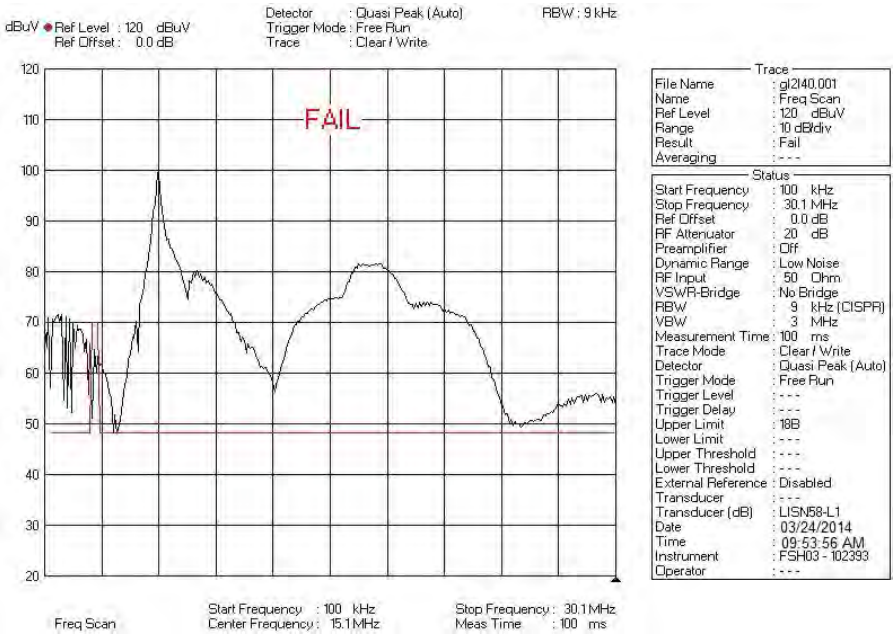
Lumatek Air-Cooled Ballast Conducted Emissions Testing
Supplemental Data

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.

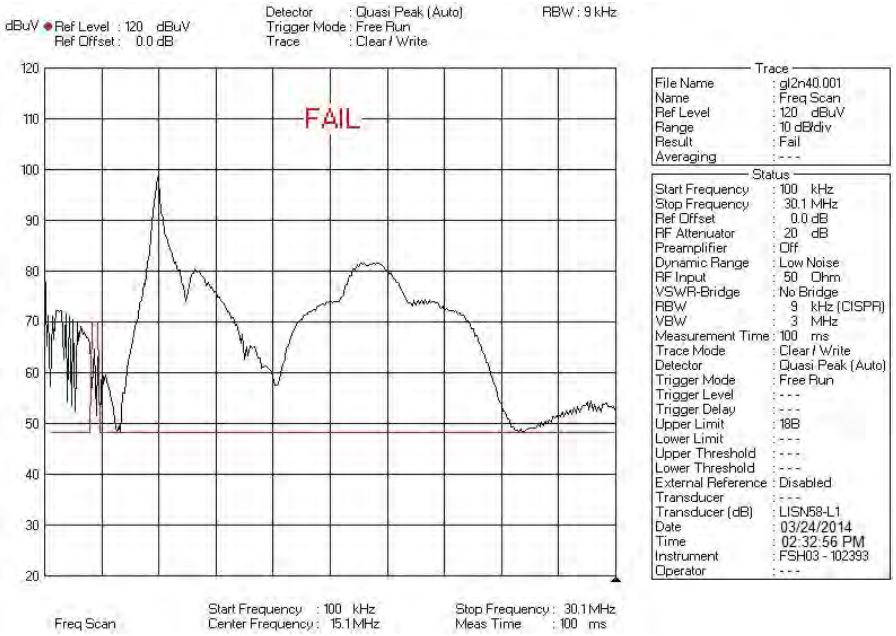
Lumatek Air-Cooled Ballast

400 Watt Setting

0.10 to 30.1 MHz



Phase to Ground



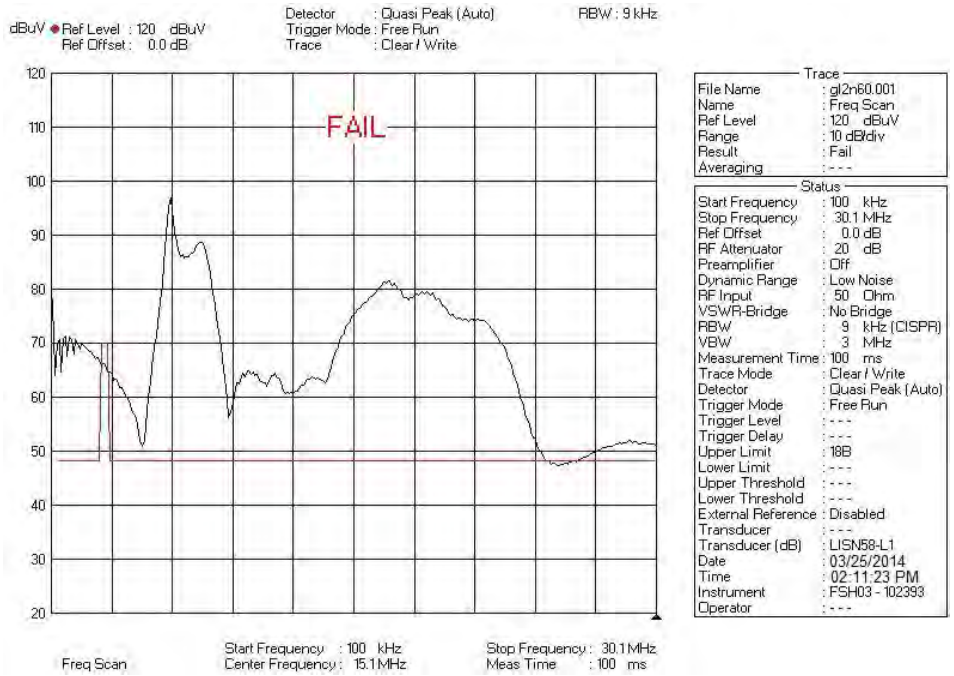
Neutral to Ground

Lumatek Air-Cooled Ballast

600 Watt Setting

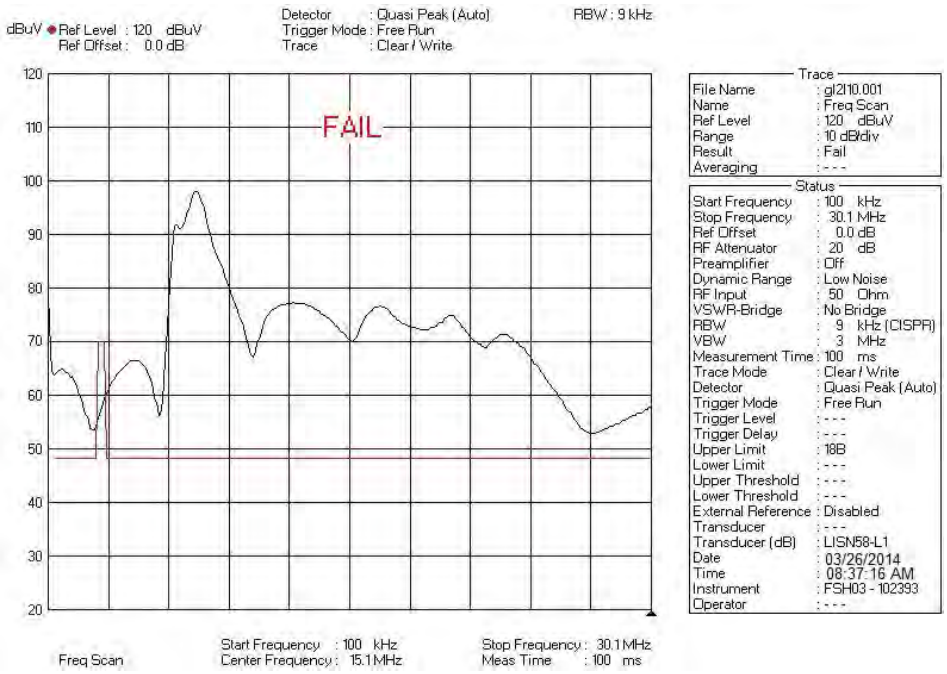
0.10 to 30.1 MHz

Phase to Ground

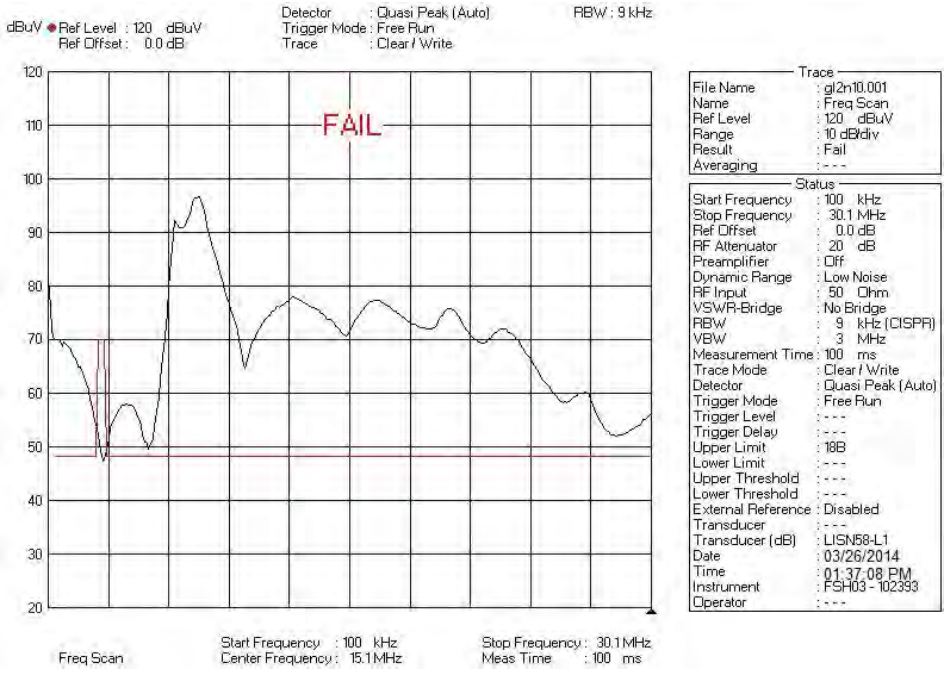


Neutral to Ground

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



Phase to Ground

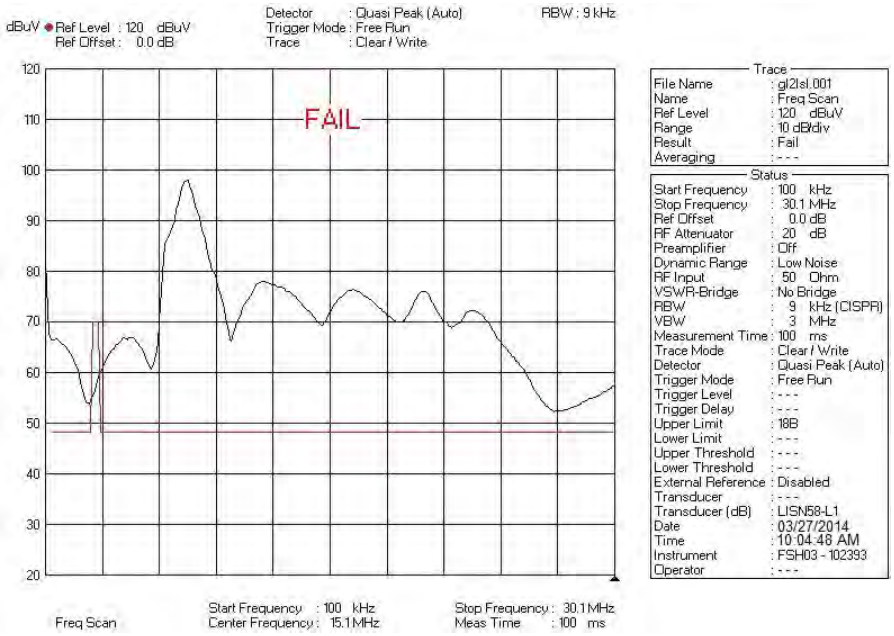


Neutral to Ground

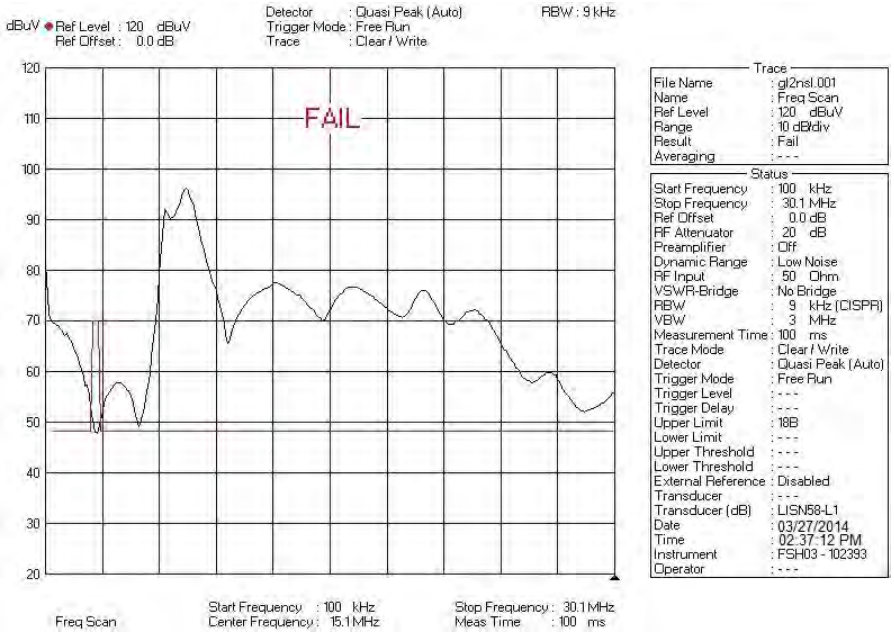
Lumatek Air-Cooled Ballast

Super Lumens Setting

0.10 to 30.1 MHz



Phase to Ground



Neutral to Ground

Appendix 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
445-12th 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; 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,

Christopher D. Imlay

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 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

04/25/2014

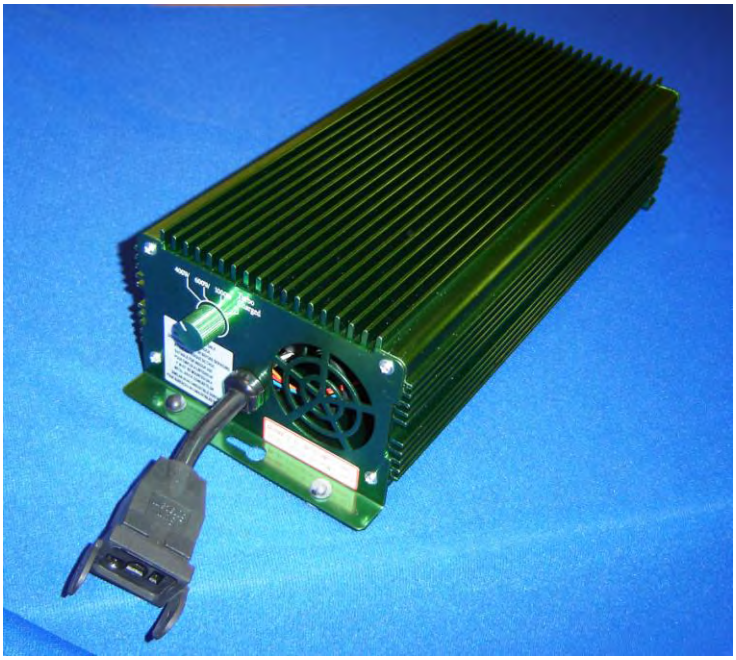
Conducted Emissions Test Report

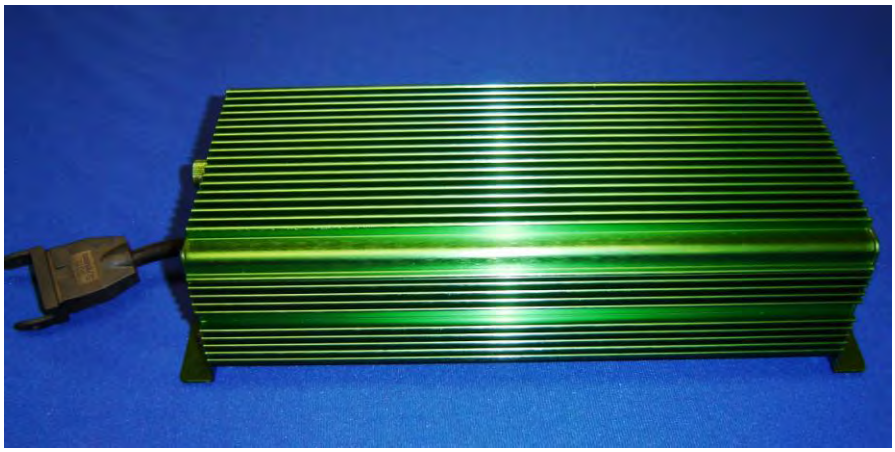
STANDARD	TITLE
IEEE C63.4 - 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

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	N/A
Importer (Note: This company also describes itself as a manufacturer, distributor and a wholesaler.)	**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.






GALAXY
ELECTRONIC BALLAST
1000 WATT
GALAXY
ELECTRONIC BALLAST

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)

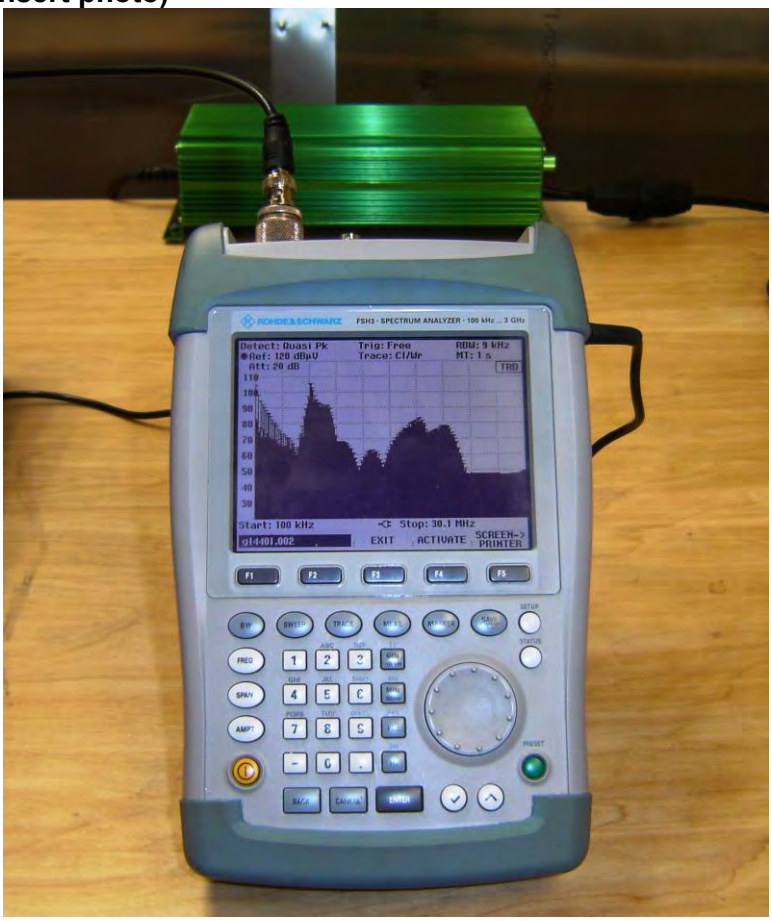
Table 1

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

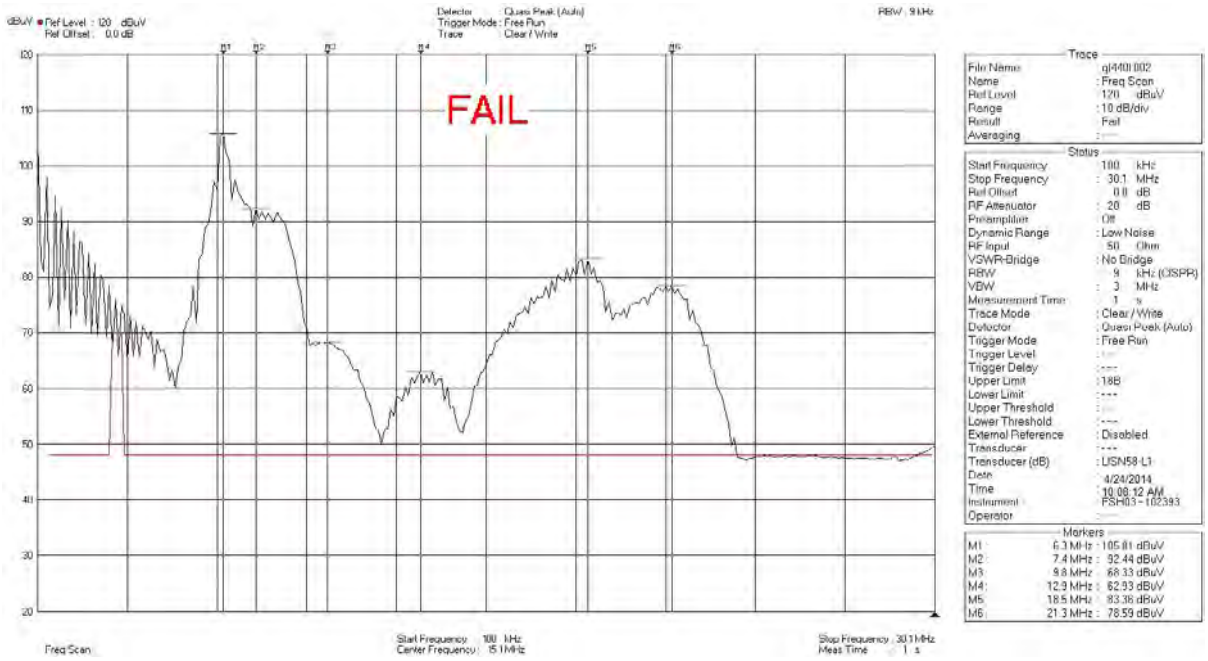
1. Bond the LISN to the ground plane of the test area using a grounding cable that is as short as possible.
2. Connect the EUT power cable to the Line Impedance Stabilization Network (LISN).
3. Measure the conducted emissions from the EUT using the LISN and a quasi-peak detector.
4. Record the six highest 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 dBµV	48 dB(µV)	FAIL
7.4 MHz	120VAC	92 dBµV	48 dB(µV)	FAIL
9.8 MHz	120VAC	68 dBµV	48 dB(µV)	FAIL
12.9 MHz	120VAC	63 dBµV	48 dB(µV)	FAIL
18.5 MHz	120VAC	83 dBµV	48 dB(µV)	FAIL
21.3 MHz	120VAC	79 dBµV	48 dB(µV)	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.

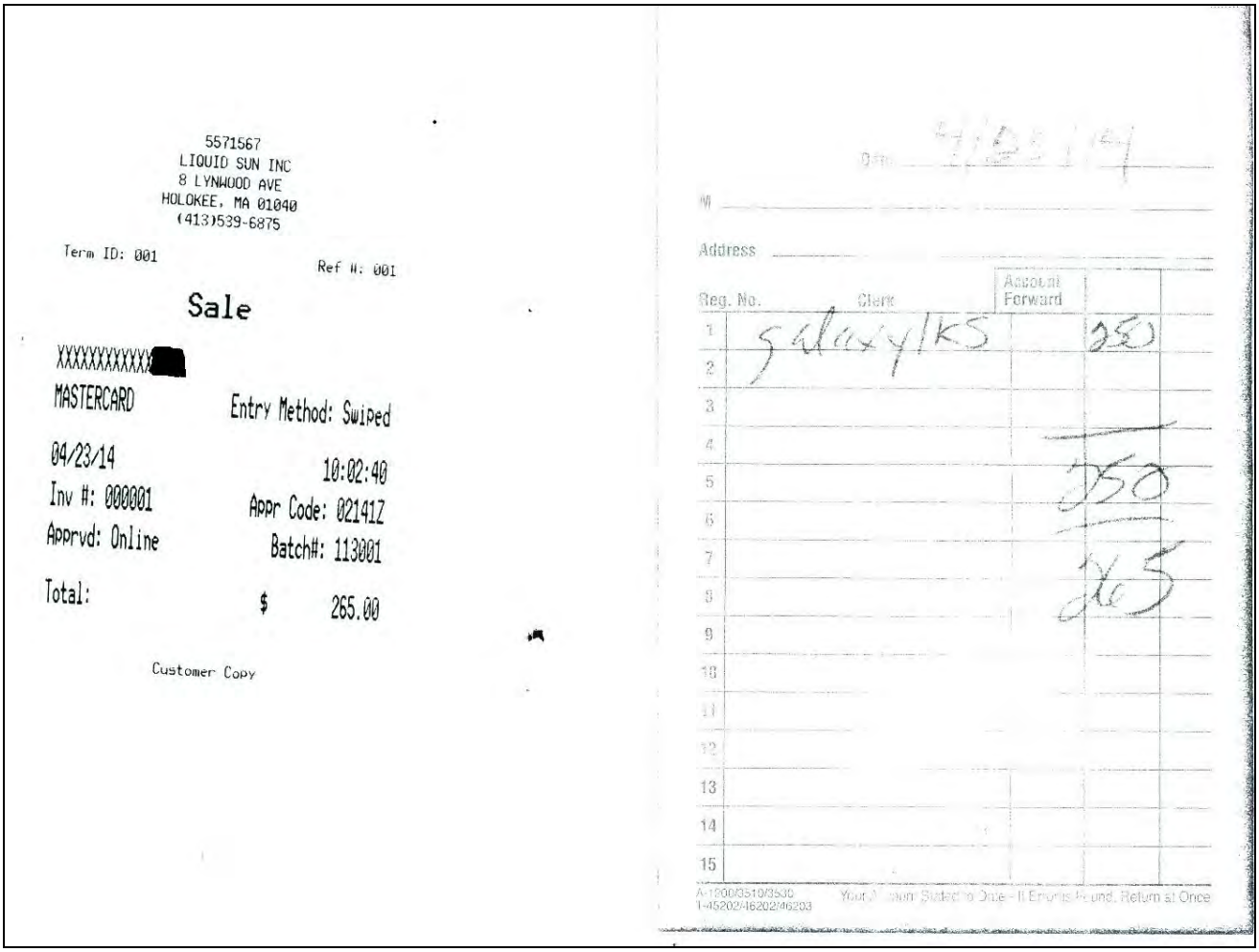
Appendix A

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 1040
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

Term ID: 001 Ref #: 001

Sale

XXXXXXXXXXXX[redacted]
MASTERCARD Entry Method: Swiped

04/23/14 10:02:40
Inv #: 000001 Appr Code: 021417
Apprvd: Online Batch#: 113001

Total: $ 265.00

Customer Copy

Date 4/23/14
M
Address
Reg. No. Clerk Account Forward
1 galaxy1KS 250
2
3
4
5 250
6
7
8 265
9
10
11
12
13
14
15

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.

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

APPENDIX C

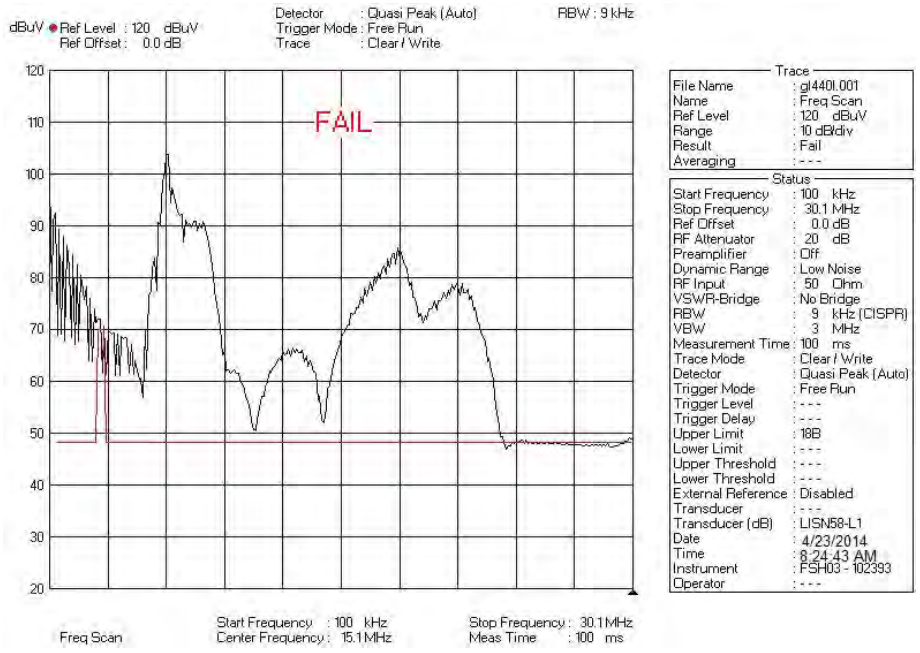
Galaxy Legacy 1000 Watt Dimmable Ballast Conducted Emissions Testing
Supplemental Data

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.

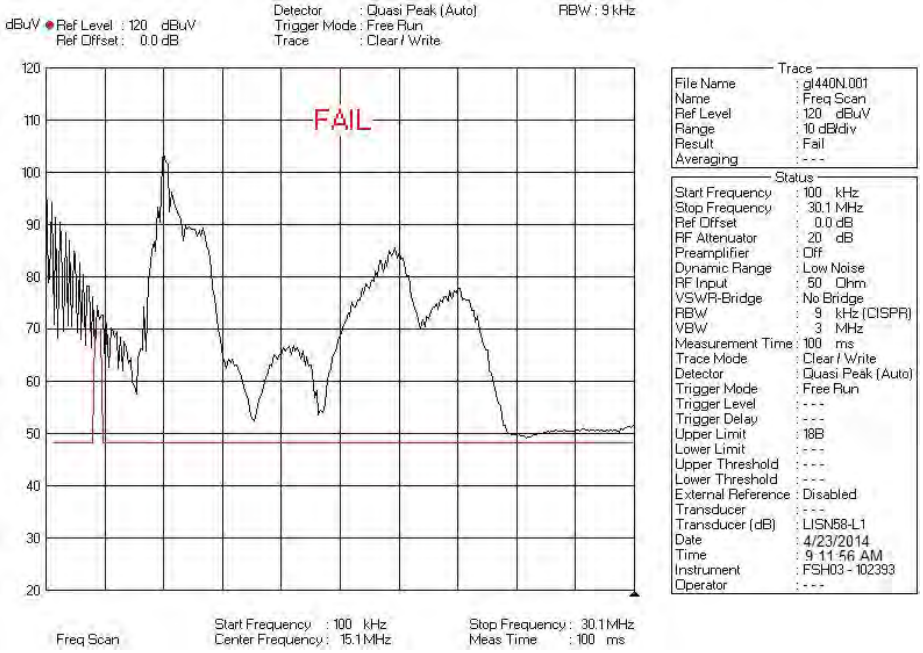
Galaxy Legacy 1000W Dimmable Ballast

400 Watt Setting

0.10 to 30.1 MHz



Phase to Ground

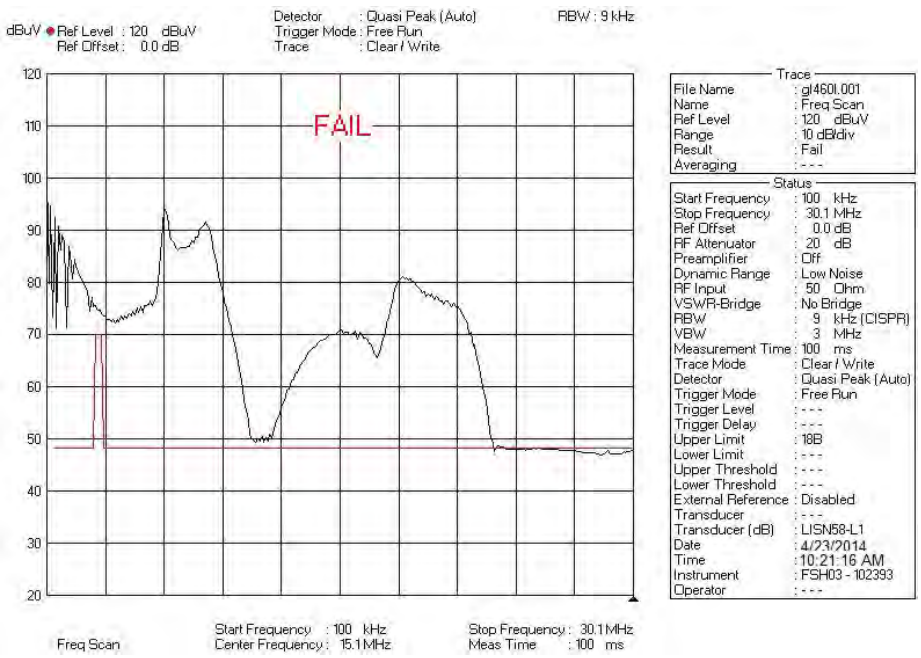


Neutral to Ground

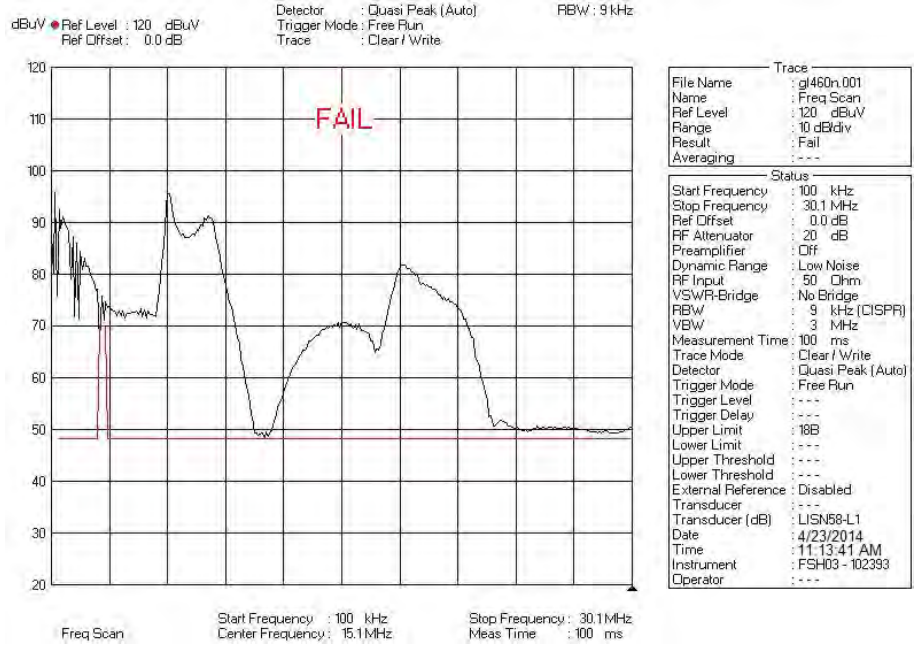
Galaxy Legacy 1000W Dimmable Ballast

600 Watt Setting

0.10 to 30.1 MHz



Phase to Ground

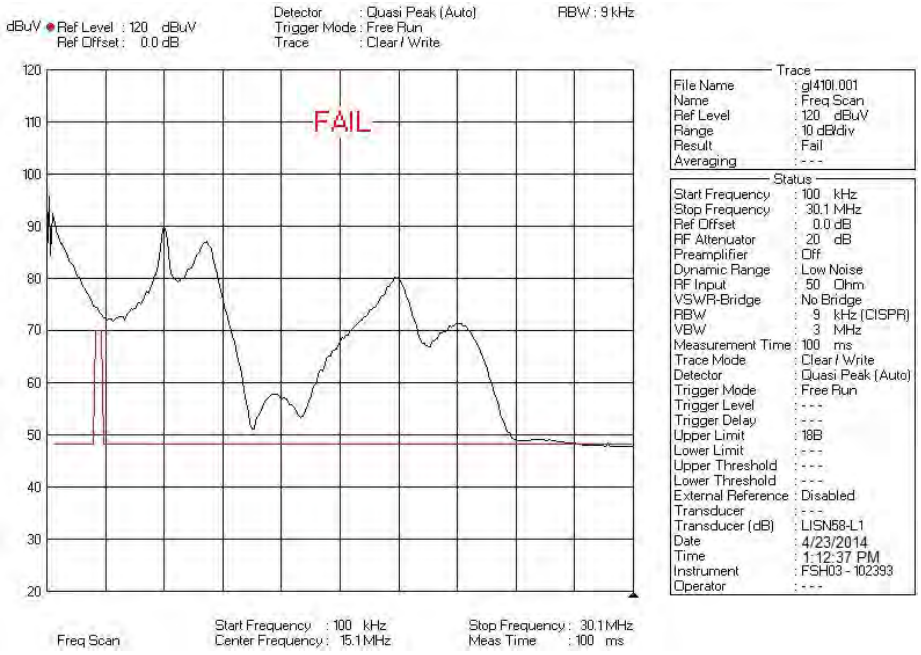


Neutral to Ground

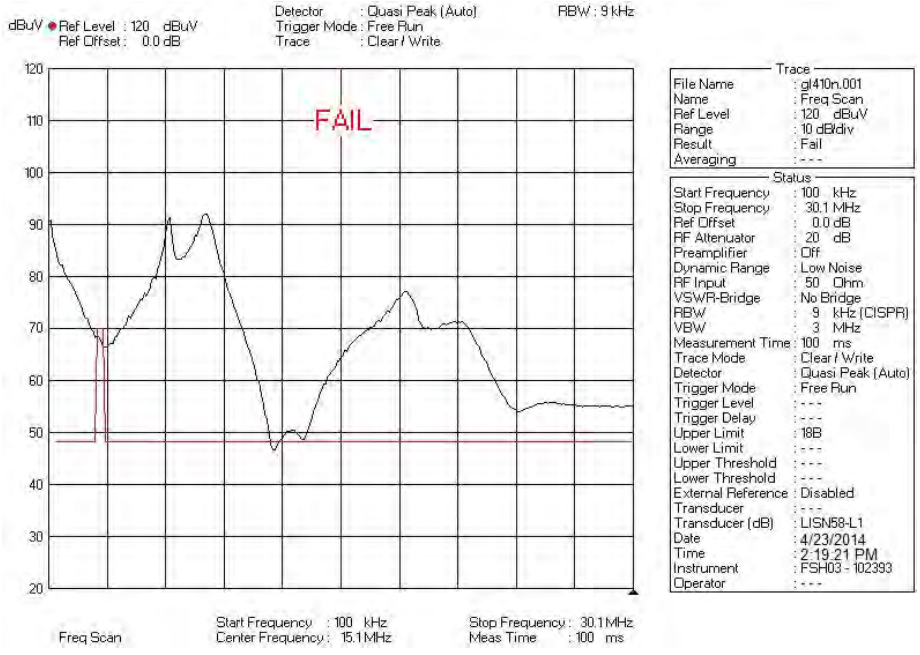
Galaxy Legacy 1000W Dimmable Ballast

1000 Watt Setting

0.10 to 30.1 MHz



Phase to Ground

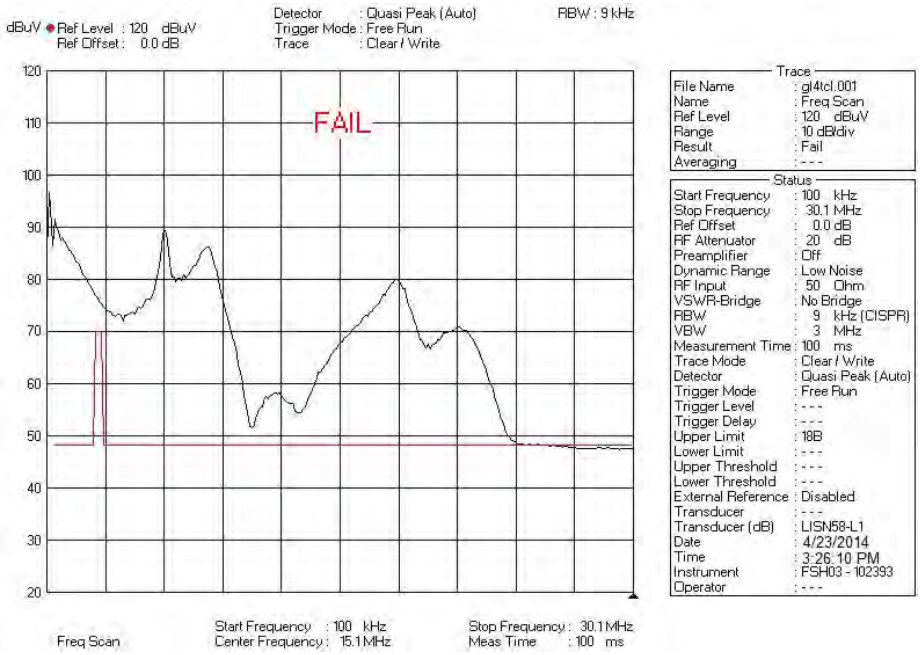


Neutral to Ground

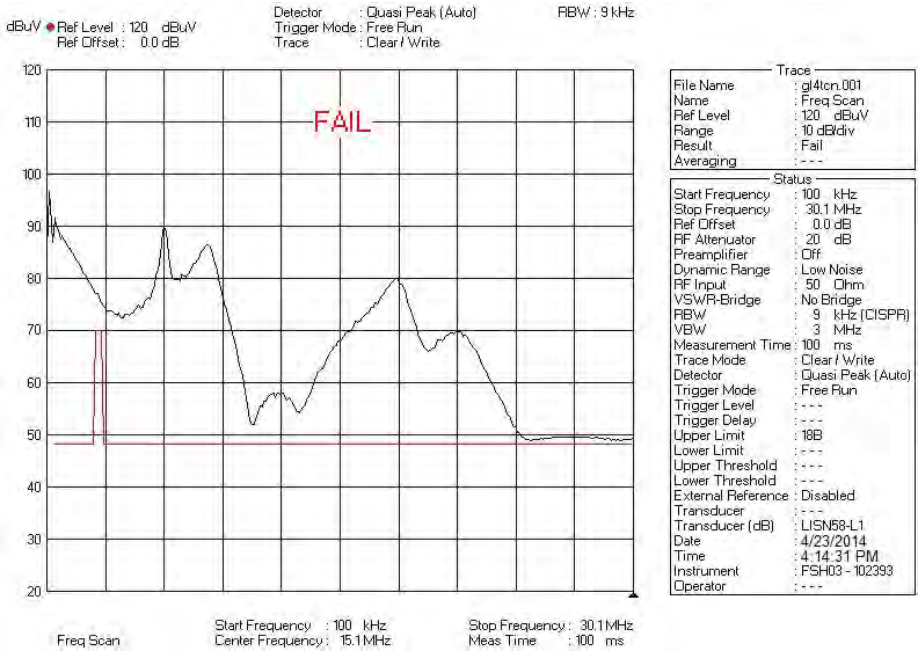
Galaxy Legacy 1000W Dimmable Ballast

Turbo Charged Setting

0.10 to 30.1 MHz



Phase to Ground



Neutral to Ground

Appendix 4A

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
445-12th 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; 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 Aquarious 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 dBμV. The Quantum Horticulture device has a Quasi-Peak Interference Voltage at 6.5 MHz of 79 dBμV. At 16.9 MHz, the Quasi-Peak Interference Voltage is 59 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 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,

Christopher D. Imlay

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 4B

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

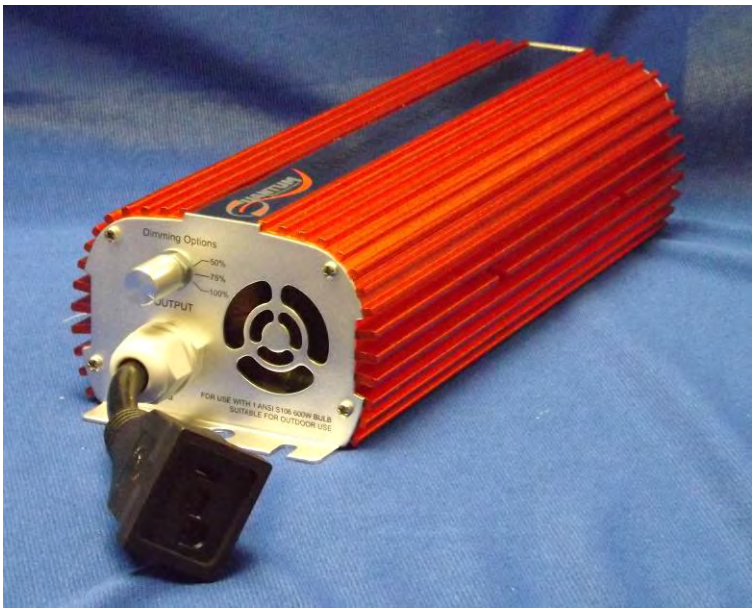
Conducted Emissions Test Report

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

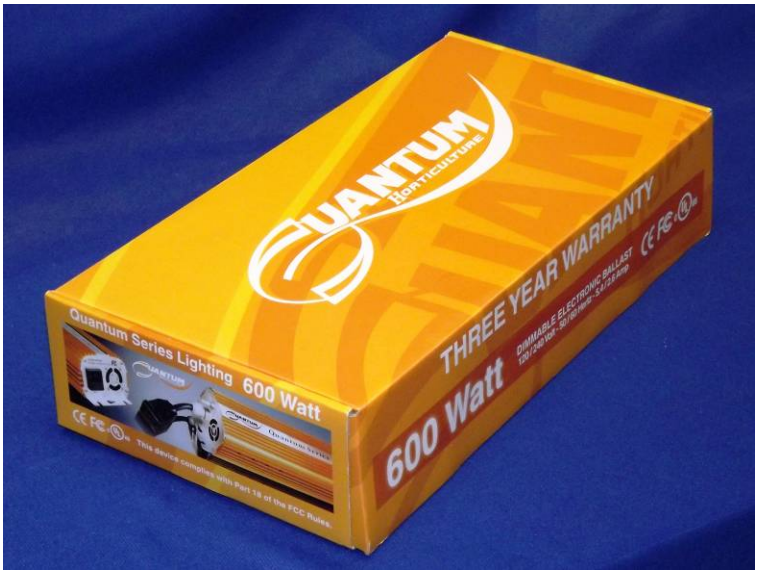
REVIEW	SIGNATURE	DATE
Performed By:	Mike Gruber – W1MG Pete Turbide – W1PT	4/9/14
Results Reviewed By:	Edward Hare – W1RFI	4/10/14

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.


Dimming Options
50%
75%
100%
OUTPUT
FOR USE WITH 1 ANSI S106 600W BULB
SUITABLE FOR OUTDOOR USE


Quantum Series Lighting


QUANTUM
HORTICULTURE
THREE YEAR WARRANTY
600 Watt
Quantum Series Lighting 600 Watt

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)

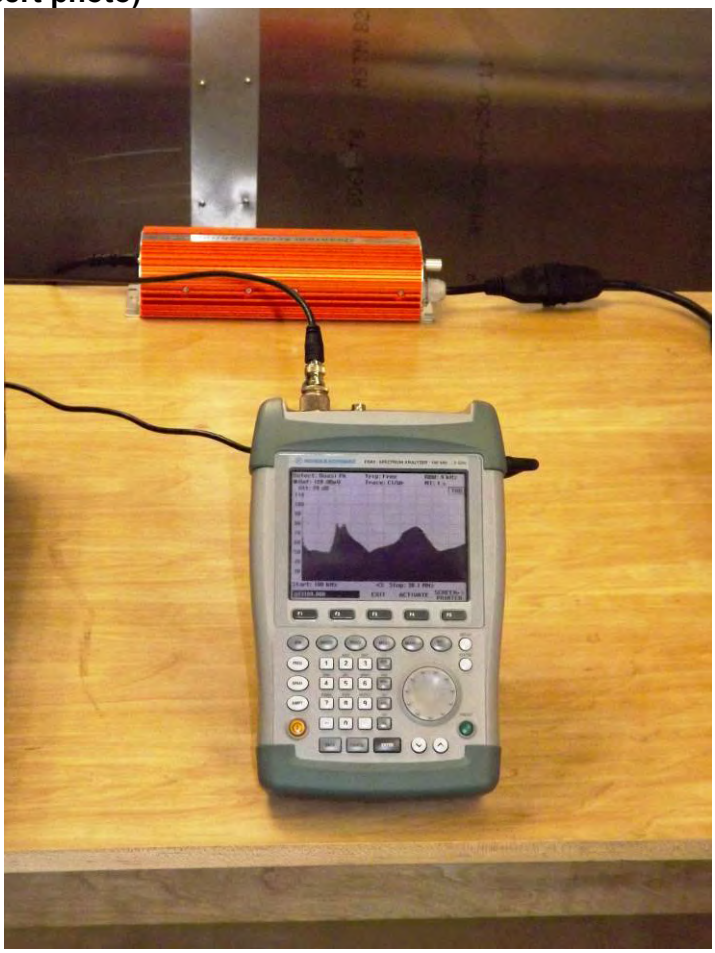
Table 1

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

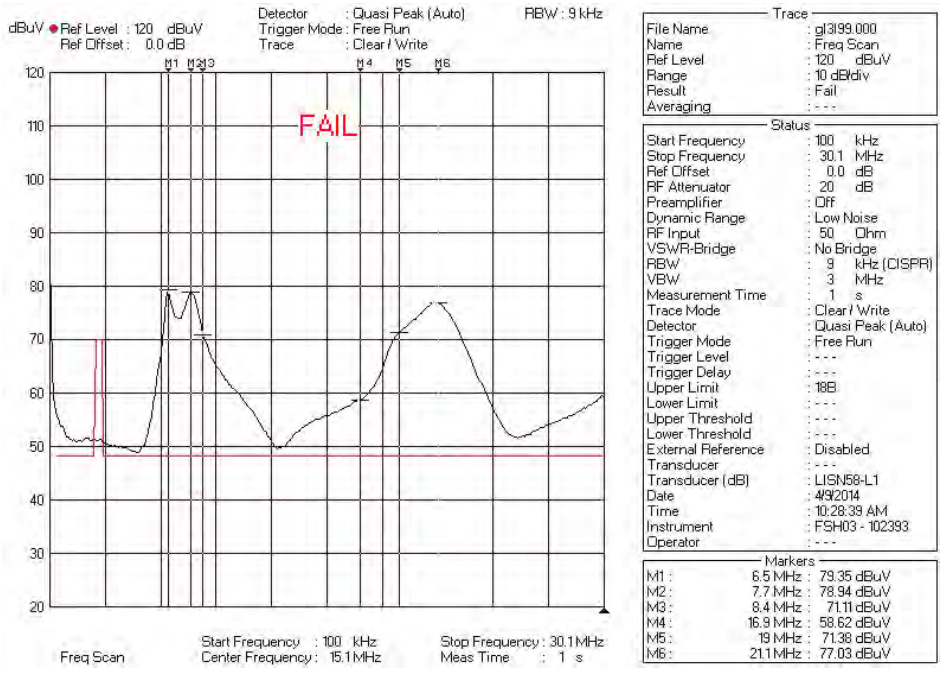
1. Bond the LISN to the ground plane of the test area using a grounding cable that is as short as possible.
2. Connect the EUT power cable to the Line Impedance Stabilization Network (LISN).
3. Measure the conducted emissions from the EUT using the LISN and a quasi-peak detector.
4. Record the six highest 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 dBµV	48 dB(µV)	FAIL
7.7 MHz	120VAC	79 dBµV	48 dB(µV)	FAIL
8.4 MHz	120VAC	71 dBµV	48 dB(µV)	FAIL
16.9 MHz	120VAC	59 dBµV	48 dB(µV)	FAIL
19.0 MHz	120VAC	71 dBµV	48 dB(µV)	FAIL
21.1 MHz	120VAC	77 dBµV	48 dB(µV)	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

SOLD TO:
Retail Customer

Date: 2014-04-07 17:33:52
Payment Method: Credit Card

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

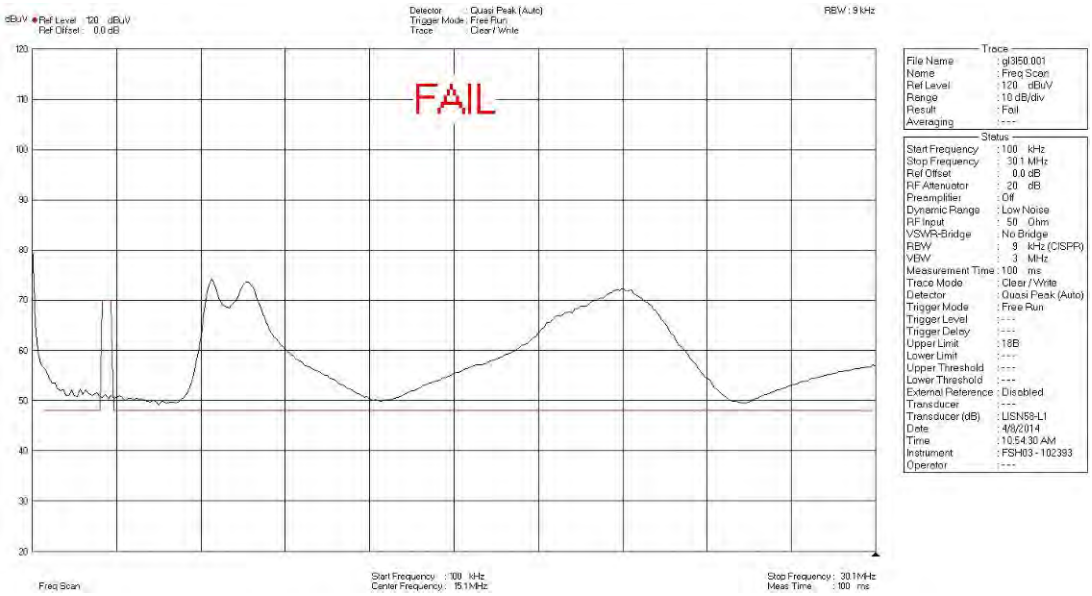
Quantum 600 Dimmable Ballast Conducted Emissions Testing
Supplemental Data

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.

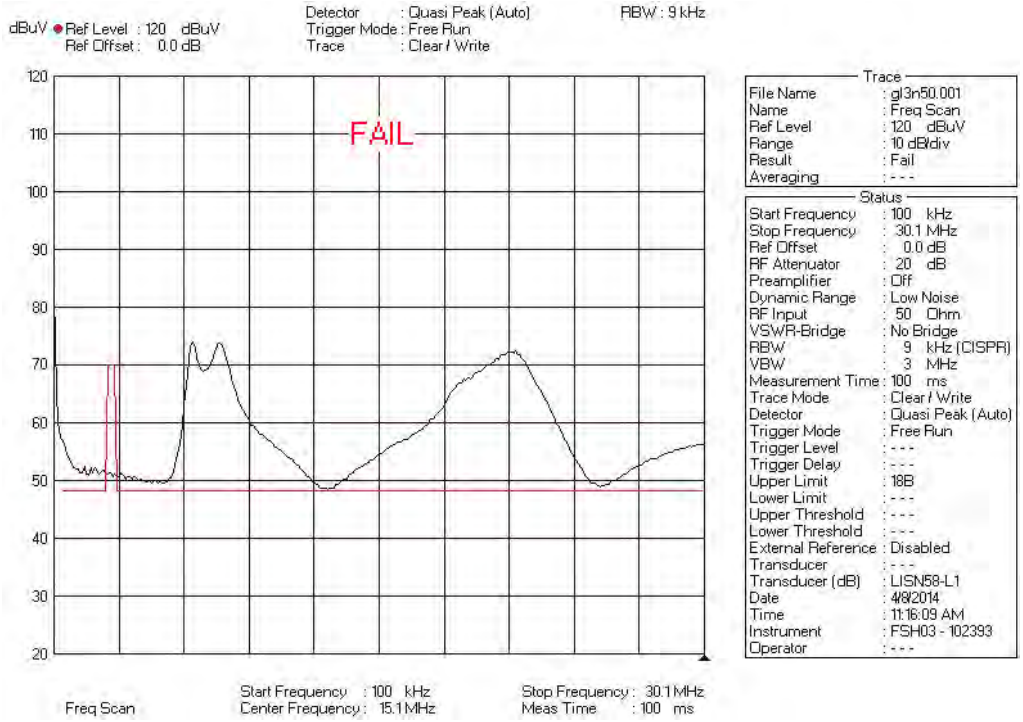
Quantum Horticulture 600W Dimmable Ballast

50% Setting

0.10 to 30.1 MHz



Phase to Ground

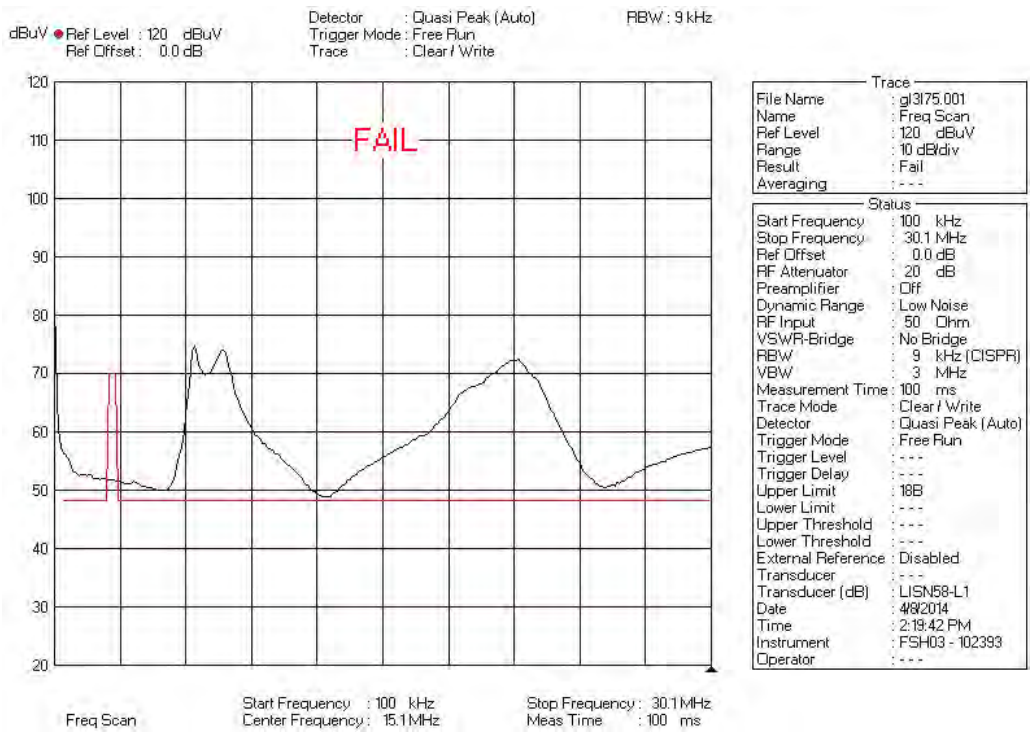


Neutral to Ground

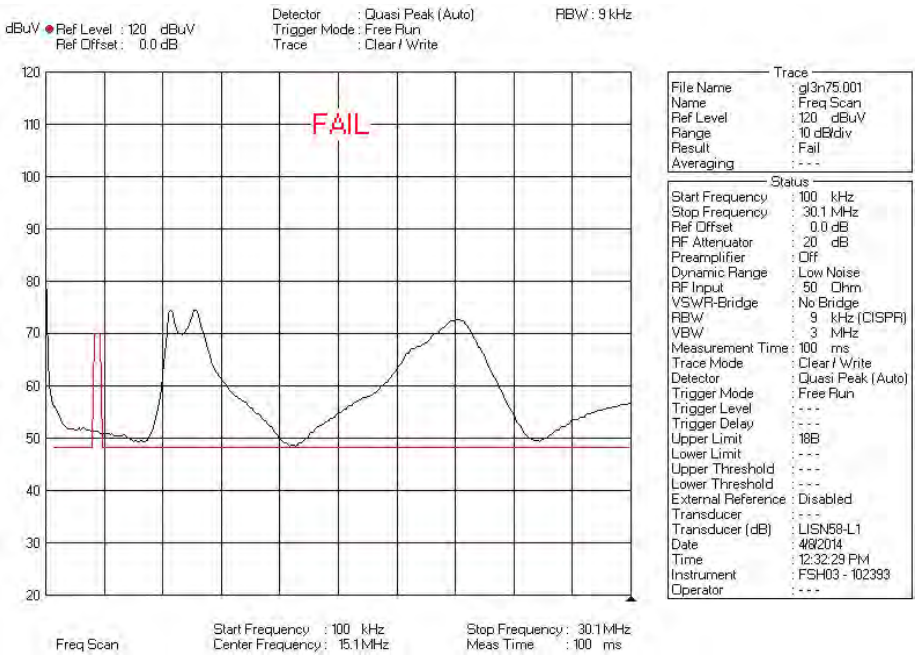
Quantum Horticulture 600W Dimmable Ballast

75% Setting

0.10 to 30.1 MHz



Phase to Ground

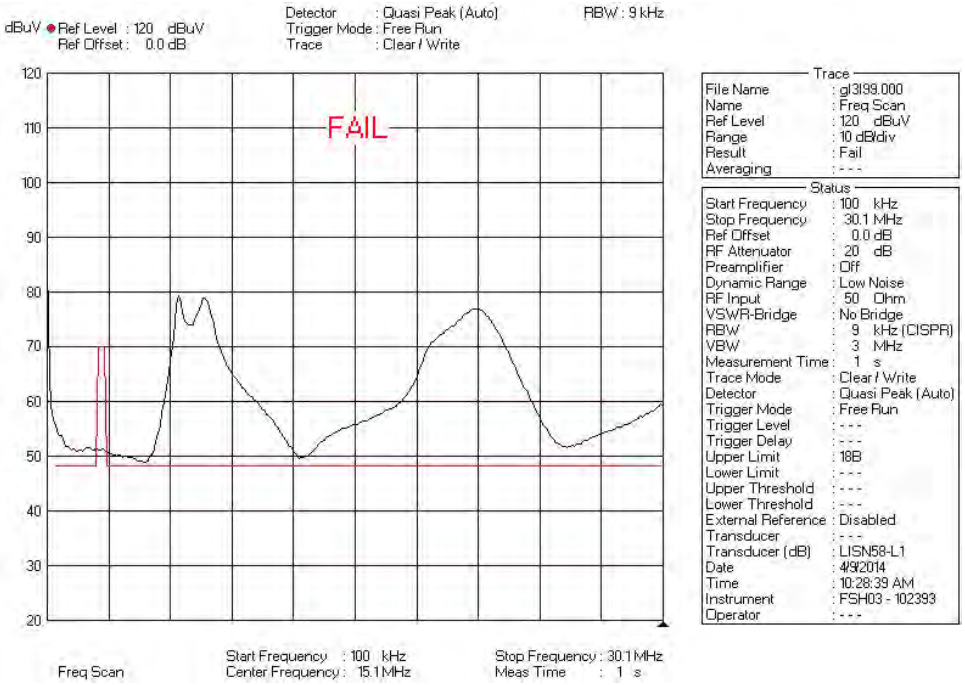


Neutral to Ground

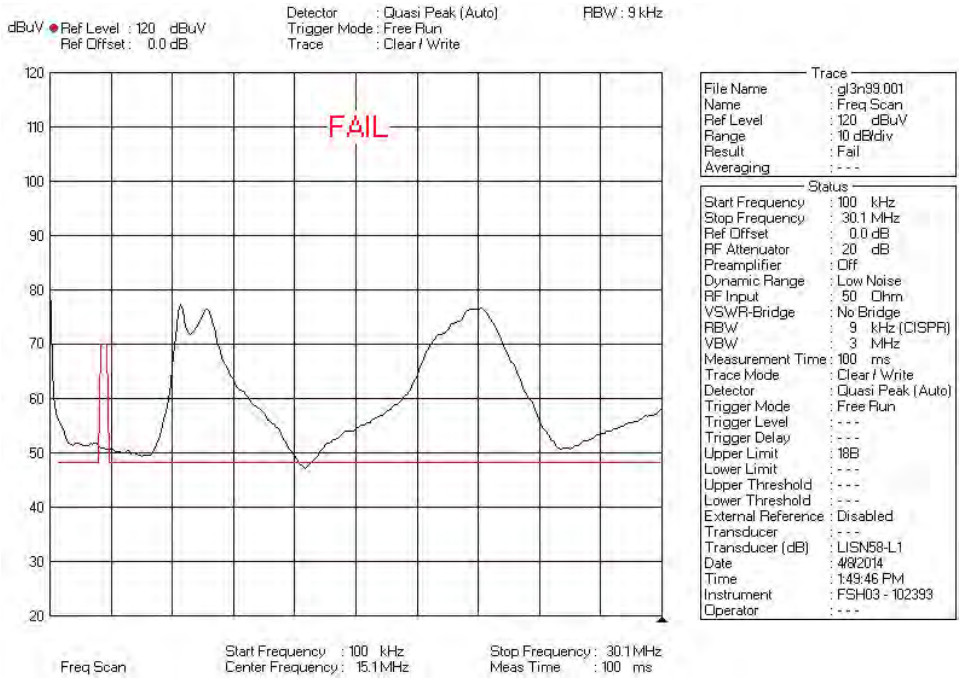
Quantum Horticulture 600W Dimmable Ballast

100% Setting

0.10 to 30.1 MHz



Phase to Ground



Neutral to Ground

Appendix 5

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 <u>not</u> install this ballast in a <u>residential</u> 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.

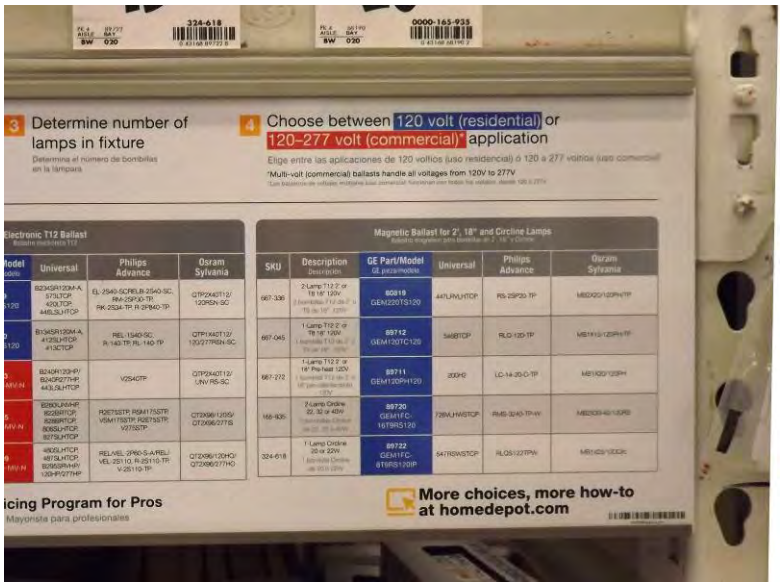


Figure 3 - Step 4 in previously depicted signage describes how to select between residential and commercial ballasts. This is the only such reference at the store display. It only mentions voltage differences. There is no reference to the FCC rules nor the potential for radio interference.

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. Kosier 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 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 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.

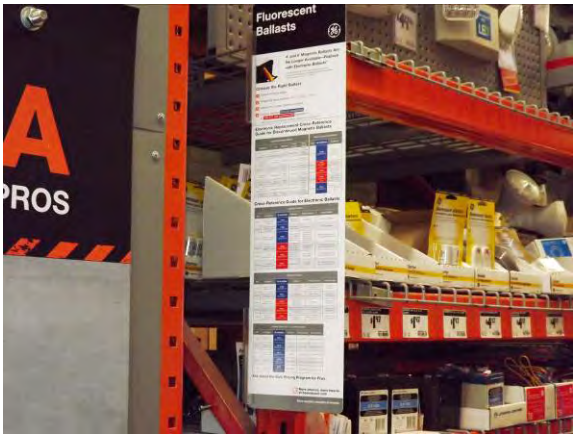


Figure 11 - Fluorescent ballast sign.

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 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

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 Martin[1] 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.**

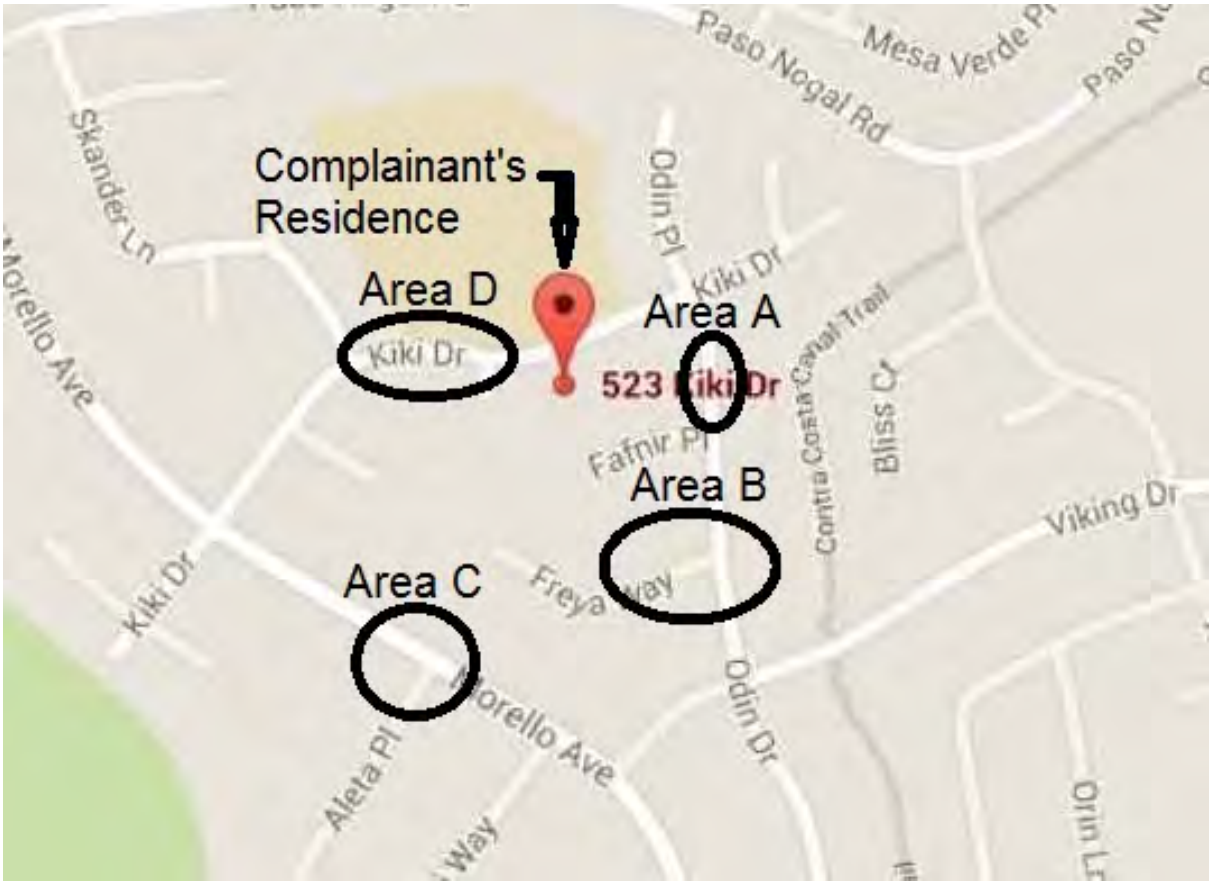


Figure 5 - This map shows the general areas in which the sources were located during this investigation.

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 Services[2] 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
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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.

List of Appendices

Appendix 1 – Letter dated July 16, 2012 from FCC to PG&E concerning Mr. Schreiber's interference complaint.

Appendix 2 - Copy of expansion from T&D Article by Mike Martin of RFI Services.

Appendices

Appendix 7

BOOTH, FRERET & IMLAY, LLC

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Re: Complaint of Violation of Part 18 Marketing Regulations
By Home Depot 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 Home Depot*" (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 Home Depot'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 Sections18.305(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. In response to these complaints, among other things, 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, Illinois, 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. 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 heavier duty or superior 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 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 and the labelling is not at all helpful to consumers.

In the four cases of actual purchases of RF Lighting devices at retail from Home Depot, 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

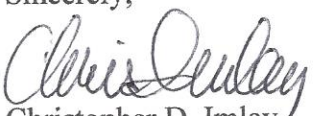
apparent that Home Depot (and, in ARRL's experience, other similar hardware retail sellers) are actively and knowingly engaged on a daily basis in selling non-consumer, commercial RF lighting products to Home Depot customers for residential deployment. If this activity is left unchecked the Commission 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 Home Depot. 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 Home Depot 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. Thank you very much for your consideration of this request.

Sincerely,



Christopher D. Imlay
General Counsel, ARRL

Attachment

Copy to: Home Depot Atlanta Store Support Center, 2455 Paces Ferry Road, S.E. # C-22, Atlanta, GA 30339 (Attention: Teresa Wynn Roseborough, Executive Vice President, General Counsel and Corporate Secretary)