ARRL EMC Committee Semi-Annual Report

Doc. # 20

For The
American Radio
Relay League

Board of Directors Meeting
July 21-22, 2014

Submitted By
Kermit Carlson, W9XA
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
- 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 2014, 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.
    - Of particular note is that no previously reported case has been successfully resolved, although one case was closed since the complainant is moving.
- 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 are becoming increasingly problematic in all geographic areas of the country. 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. It is not surprising, therefore, that these devices are heard at much greater distances than normally be expected from an otherwise legal device. As an example, the Lab has received reports of interference from devices that were found to be over ½ mile away. Not surprisingly hams affected by this interference often find it difficult to find the source. In cases where the source s known, they are often not comfortable approaching the homeowner or filing a complaint. 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.
    - LED Part 15 Bulbs have so far not proven to be a significant source of RFI complaints. Nonetheless, Mr. Gruber recommends 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.

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 of the FCC limits. The worst case measured 58 dB over the applicable Part 18 consumer limits.

The first grow light tested was a Lumatek LK1000. ARRL General Counsel Chris Imlay used the resulting Lab report as the basis for an FCC complaint, which was covered in the ARRL News. This news story, Mr. Imlay's letter to the FCC, and the Lab's test results are included in this report as Appendix 1A, 1B and 1C, respectively.

Although it isn't always possible to identify a grow light solely on the basis of its RFI signature, Mr. Gruber reports that we are receiving more and more grow light and grow light suspect complaints. **Due to the nature of these devices and interference they create, the only long-term and practical solution is for FCC enforcement against the manufacturers and importers of these devices. Furthermore, since many of these cases are being reported to us as unidentified sources, the overall impact to Amateur Radio is unknown and hard to assess.**

The status of the FCC complaint filed by Mr. Imlay remains ongoing.

Other Lighting Devices

As previously reported January's EMC Committee report, 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 look at proposal to reduce Part 15 limits to Part 18 levels for lighting devices.

The results and data from this testing helped provide us with a better understanding of the interference potential from LED and CFL bulbs as they exist at the time. As detailed in the EMC Committee's last report, Mr. Gruber used this information to write QST article on RFI from bulbs in the October 2013 issue of QST, page 42. This analysis suggested that these products substantially met the applicable Part 15 or Part 18 limits in the Amateur spectrum. Those that failed primarily did so below 500 kHz. The measured emissions in most cases, however, were within our measurement tolerance.

Mr. Gruber is now 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.

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. Mr. Gruber purchased every AFCI breaker that he could find at local electrical supply centers and big box home supply stores. Most of the complaints that he received seem to have involved breakers made by Eaton, which is a Cutler Hammer company, a well known manufacturer of electrical equipment. As a result, he purchased both a 15 and 20 Amp Eaton AFCI breakers for these tests.

Joe Carcia, NJ1Q & Circuit Breaker Test Fixture at W1AW

The final results of this testing indicated that most of the AFCI breakers were surprisingly robust. Each breaker was operated in the basement of W1AW during code practice sessions. They were simply not tripping, even with multiple transmitters all operating simultaneously at 1,000+ watts. 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, the new Eaton "Ham Friendly" breakers are on the market and the problem is corrected. In cases where older breakers are improperly tripping, Eaton continues providing 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*. The URL is:

www.arrl.org/news/arrl-helps-manufacturer-to-resolve-arc-fault-circuit-interrupter-rfi-problems

Mr. Gruber wishes to emphasize that Eaton's response to this problem was and continues to be impressive. To the best of his knowledge, all problems reported to Eaton were quickly and successfully resolved.

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. With regard to power line noise, no previously reported longstanding power line noise case has been resolved during the first half of 2014 due to enforcement. (Note: One case

was closed when the complainant reported that he was moving.) 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 an RFI case involving Amateur Radio. As previously reported, the FCC is clearly not doing its job!

First Half 2014 Year Total RFI-Case Statistics:

New RFI Cases – 122
New electrical power-line cases – 23

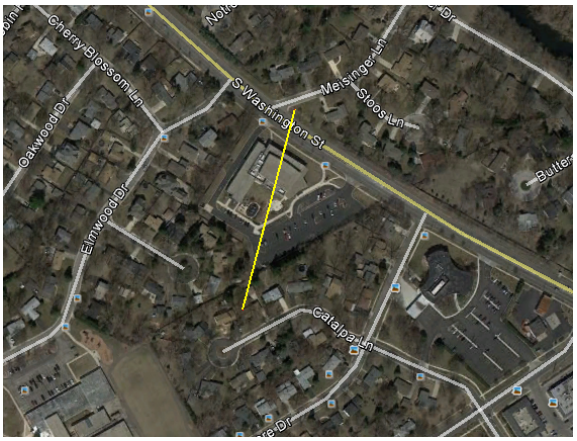
- ARRL Letters sent – 16 (Note: One letter involved four complainants.)
- FCC 1st Letters submitted – 14 (Note: Laura Smith may have issued FCC letters based on need and input from the ARRL. These letters were not formally submitted by ARRL and therefore not included in this total. Many of these letters 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 – 3

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. 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.

Vice director and EMC Committee Chairman Kermit Carlson has been performing field survey work for power line noise interference. Several different cases were chosen in the Chicago Metropolitan/Northern Illinois area for local investigation using Radar Engineers noise signature equipment provided by the ARRL Laboratory.

- A powerline noise case in Naperville, Illinois was determined to be primarily due to a single power line insulator located 700 feet from the victim site. This particular source could only be located using Direction Finding with Interference Signature methods available with the Radar Engineers equipment. When normal DF was used by the amateur, following an HF beam heading from the amateur's station the path to the source crossed several intervening properties, each with interference emitters. Each of these emitters was of a radiated level not sufficient to reach the victim site, but was strong enough to be detected by portable HF and VHF receivers when following the path. The result was the several smaller sources were identified as possible emitters which actually were not responsible for the interference presented to the victim site. Replacement of this insulator in February of 2014 eliminated this interference.



Naperville, IL aerial Photo

- The powerline noise case in Palatine, Illinois where an active VHF/UHF operator has been experiencing significant harmful interference levels of power line noise on 50 MHz and 144 MHz continues. This case has been referred to the Utility for repair in December of 2013 but no action has been taken by the Utility as of July 2014 despite the letter sent by Mr. Gruber, the ARRL EMC Engineer.

- An ongoing powerline noise case was briefly investigated while at the Dayton Hamvention by Messer's. Carlson and Gruber. Located in nearby Tipp City, it was first reported to ARRL ten years ago in July of 2004. Since then, Mr. Gruber sent the municipal utility an ARRL Letter, and the FCC also sent a letter was sent in June 2013. The ARRL investigation took place on the morning of May 17, 2014.

  Using signature analysis, the ARRL confirmed that the reported interference is consistent with power line noise, which the utility had previously denied in a letter to the FCC. They were further able to investigate two general locations within walking distance of Mr. Peura's residence. Although unable to complete the investigation due to inclement weather, Mr. Carlson conclusively located one source on the edge of a park. During windy conditions, some pine trees were brushing against power lines resulting in bursts of power line noise. Trimming these trees would also seem to be a relatively simple and straightforward fix.

  It should be emphasized that the Messer's. Carlson and Gruber were unable to locate additional power line noise sources due to rain. Power line noise is often intermittent and weather related. It frequently goes away during rain and high humidity. In the case of the ARRL's investigation, the onset of rain caused the sources to go away while attempting to locate them.

  Mr. Gruber filed for FCC follow-up with Laura Smith on June 13, 2014. At the present time, this case remains ongoing.

- An amateur from Streamwood, Illinois had experienced overwhelming interference from what was determined to be a bad insulator on a Utility

pole in the corner of his yard. Interference to the station at time rose 20dB over S9 on most HF bands, even with extremely aggressive noise blanker settings this amateur had very limited capability owing to the extremely high noise level. When Mr Carlson went to investigate the interference source he was able to locate the problem within minutes of unloading the Radar Engineers equipment, literally as fast as he could walk from the front of the house to the source in the amateur's backyard . This amateur had reported his problems to the Utility on a number of occasions but was unable to obtain a response. After Mr Carlson's visit, Mr Gruber, the ARRL's EMC engineer, sent a letter to the Utility explaining the details of the interference, there was no contact by the Utility to either the amateur or the ARRL. After three months, a letter was sent from the FCC and within days the Utility visited the site and scheduled the needed repairs. Within two weeks, the repairs were completed and the interference was gone.

- Two amateurs who are located just two blocks from one another on the far Northwest side of Chicago contacted the ARRL Lab for help in locating a powerline noise problem that seemed to be common to the stations of both operators. Mr Carlson visited the area and surveyed the neighborhood with both amateurs. One of the details that was offered by the amateurs was that the location of the source as indicated by directional antennas at their station locations seemed to be the general locatio of strong powerline noise interference to the AM broadcast band. When the location was verified by the Radar Engineers equipment, Mr Carlson measured the field strength of the interfering signal with a recently calibrated AM Signal Strength meter manufactured by Potomac Instruments. The level of interference at 100 feet either side from the offending powerline pole was measured as 150 Millivolts per meter. As a comparison, the signal strength measured from 3 clear-channel 50kW AM broadcast stations at 670, 720, and780 Khz located about 14 miles distant was slightly less this interference at 100 feet from the offending powerpole . Several attempts to contact the Utility have provided no relief, a letter was sent by Mr Gruber, the ARRL EMC engineer but nothing has been done by the Utility to remediate the problem.

Plans for standardization of Powerline Noise Location

The practice of locating powerline RF noise sources by amateurs is often hindered by the extreme expense of commercial noise signature DF receivers. Since the technique is well known as being highly effective in tracking to the offending source, an inexpensive alternative has been sought that would help make this type of source location more commonplace. Mr Bob Allison and the staff at the ARRL Laboratory have been working on a possible homemade portable alternative to the expensive commercial gear used by professionals. Hopefully, this effort could allow access to the noise signature method without the large expense of commercial gear, however this is still under development.

Smart-Grid, BPL and Related Standardization Efforts

Mr. Ramie reports a few updates on Smart-Grid EMI and standardization issues as follows. In general, we are continuing what we started:

1) SGIP 2.0: I am trying to get the EMI Issues working group to produce a Guide to using the IEEE-1613 + 1613.1 pair of EMC Immunity Standards for type-testing smart grid equipment. This guide would cover essential types of equipment and tests. It would also include discussion concerning harmonization with European requirements, criteria for passing a test, etc. They agreed to consider it.

2) Continue to work on the next update to IEEE-1613.1 (to add non-communicating utility equipment). That widening of the Scope will then allow the IEEE-1613 + 1613.1 pair of Standards to address the immunity to HF emanations of virtually any type of utility equipment used for smart grid. (This continues to be the Big News from this work.) We had our Power & Energy Society Substations C2 Committee kick-off meeting in Portland recently and now need to eliminate non-attendees (dead wood) from our roster to make achieving Quorum easier. The smaller the committee, the better!

3) Communicate publicly about these Standards harmonization efforts. I have included the ARRL logo on the opening slide and I always give the League credit for funding this important Spectrum Defense work. I will be speaking twice on these IEEE Standards efforts during the IEEE-EMC Symposium in Raleigh next month. (Smart Grid EMC Seminar and the G46 Luncheon.) I will also report to the EMC Society Standards Development committee on our progress as their liaison to C2. I intend to expand the Raleigh speech up from 20 minutes to 45 minutes so it can be given at EMC Society, Power & Energy Society and/or Communications Society chapter meetings. The last time I did this a big speech on smart grid, back in 2011, I ended up as a Distinguished Lecturer for the EMC Society. That may be a path this time, or I can just make myself available for chapters who pick up my travel expenses.

4) Continue to help support the Lab with local interference investigations and reporting. This includes power line noise and dirty ballasts, particularly grow light ballasts.

Broadband over power line (BPL) is the use of electrical wiring or power-distribution lines to carry high-speed digital signals. There are two types of BPL of concern to amateurs. Both *in-building* and *access* BPL have signals that occupy most or all of the HF range, extending into VHF. The power-line or electrical wiring can act as an antenna and radiate these signals. In-building BPL can be used to network computers within a building. It uses the building wiring to carry digital signals from one computer to another.

Mr. Hare reports that at this point, broadband-over-power-line (BPL) technology is still not posing a significant threat to US Amateur Radio. US access-BPL deployments have proven to be a financial and technical failure and have been dismantled. There is still some in-building BPL product being manufactured and sold, but in compliance with international standards on BPL, none of these products use the Amateur bands, with the exception of 60 meters. In-building BPL does pose some threat to the reception of international HF broadcast signals. ARRL has not received reports of harmful interference involving in-building or access-BPL devices.

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. ARRL has received only a few reports of problems, indicating that most cable systems are either clean or are addressing complaints effectively. Only a handful of these cases have required Mr. Hranac's involvement and ARRL follow up. There continues to be a small number of cases involving wideband noise in the MF and HF range that were initially thought to be cable TV-related interference, but after investigation were found to be Part 15 or other devices coupling interference to the cable TV support strand and coaxial cable shield outer surface via National Electrical Code and/or National Electrical Safety Code required neutral bonds.

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 July.

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 2014 and compared to the five previous years:

Category of Case Reported to ARRL Lab/EMC Engineer	2009	2010	2011	2012	2013-2	2014-1
BPL	1	3	0	0	0	0
Unknown Unintentional Radiators	65	57	78	66	32	44
CABLE TV	26	8	7	3	2	0
Satellite TV					1	1
Computing Devices and Modems	21	4	7	3	2	5
Power Line Noise	113	90	65	53	27	23
Plasma TV Receivers	12	10	14	5	2	4
Other Broadcast Receivers	2	7	0	4	3	1
Other Receivers	4	8	3	1	1	3
Other Transmitters	1	2	9	2	1	2
Broadcast Transmitters	2	3	4	6	3	1
Lighting Devices	12	15	13	4	6	6
Confirmed & Suspect Grow Lights	---	---	---	---	2[1]	8
Fence Systems	4	4	2	0	1	0
Battery Chargers / Power Supplies	2	1	1	3	4	2
Wheelchair	0	1	1	0	0	0
Water Pump Systems	1	3	2	1	1	1
HVAC Systems	4	11	6	3	5	3
Alarm Systems including detectors	4	6	0	4	1	1
Other Appliances	7	3	8	7	3	2
GFIC / AFCI	1	1	1	5	2	8
AUTOMOBILE Systems	8	4	3	2	6	0
Manufacturing and Retail Generated Noise	2	1	0	0	1	1
AT&T U-Verse Systems	10	10	8	8	3	2
PV Systems	---	---	---	---	2	0
Doorbell Transformers	---	---	---	---	2	1
Other				36	3	3

[1] 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.

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 the contributions of the members of EMC Committee and the ARRL Laboratory staff for their ongoing effort to protect the amateur radio service from harmful interference, and in their efforts to improve the state of the radio art. I especially owe a great debt of gratitude to Mr. Hare, W1RFI; Mr. Raime, KI6LGY and Mr. Gruber, W1MG; for their authorship of material for this report.

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 1C

Web: www.arrl.org/attachments/view/News/74153

Appendix 1C is attached to this report as Lumatek Ballast Report dated 1/28/2014