

ARRL EMC Committee Semi-Annual Report

Doc. # 18

**For The
American Radio
Relay League**

**Board of Directors Meeting
July 15-16, 2016**

**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, 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, retired
- 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. James Roop, K9SE, past FCC District Director
- Mr. Mark Steffka, WW8MS, Automotive EMC engineer
- Dr. Steve Strauss, NY3B, Home Phone Networking Alliance Technical Committee
- Dr. Richard E. Dubroff, W9XW, Professor of Physics at Illinois State University

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 2016, 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:
 - 1) Large grow lighting devices used for indoor gardening. Fortunately complaints from these devices are on the decline. As previously reported, Mr. Gruber tested a grow light in the Lab was labeled as a Part 18 non-consumer device. It generally met the limits. As such, these grow lights are not intended to be marketed or sold for residential purposes. While this continues to be an obvious marketing violation, the interference potential is much less than grow lights in previous FCC complaints.

Also as previously reported, earlier grow lights grossly exceeded the FCC limits. 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. The first of these cases 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.

Although these devices exceeded the limits by an incredible margin, and were reported to the FCC, so far there has been no visible enforcement action taken by the Commission. Furthermore, given the amount of time that has lapsed since these filing, enforcement action now seem unlikely.

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.

It must be emphasized that 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.

- 2) Although there has been a slight increase in complaints from LED Part 15 bulbs, they haven't been a significant source of RFI problems in household environments. 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.
- 3) 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.

- 4) 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.

Welcome to EMC Committee

The EMC Committee is proud to announce the appointment of Dr. Richard DuBroff, W9XW, of Normal, Illinois to the ARRL-EMC Committee. Dr. DuBroff has recently retired as a Professor of Electrical Engineering and EMC Laboratory Director for the University of Missouri, Rolla. He is the author of the book, *Electromagnetic Concepts and Applications, (Prentice Hall, 1996)* and he presently serves as Adjunct Professor of Physics at the Illinois State University. We welcome him to the ARRL-EMC Committee.

EMC Committee Webinar

The EMC Committee met by Webinar on June 16, 2016. Chairman Kermit Carlson was pleased at the level of participation and productive outcome. Eleven members of the Committee were able to attend. Of particular interest was report from Dr. Greg Lapin, N9GL concerning the FCC Technological Advisory Council initiating a noise floor inquiry. Dr. Lapin serves as the Chair of the FCC Technological Advisory Council and is the Chairman of the ARRL RF Safety Committee. Please see "*Noise Monitoring Suggestion and Action Items*" later in this report.

Summary of Recent and Ongoing Lab Activities

Working Group for Recommended Practice of Locating Power Line Noise

Mr. Gruber now serves as Chairman of a Working Group to develop a Recommended Practice for Location of Power Line Gap Noise. See **Committees** section for additional details. EMC Committee member Jerry Ramie, also serves as the Working Group's secretary.

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 on March 12, 2014, which was covered in the ARRL News. See Appendix 1 in the July 2015 EMC Committee report for this article and Mr. Imlay's complaint. The three remaining FCC complaints were filed on June 30, 2015. See Appendices 2 and 3 of this report for copies of two of these filings.

Although the first complaint was submitted to the FCC over two years ago, and these devices measured way over the applicable FCC limit, there does not yet appear to have been any enforcement action taken by the FCC. Mr. Gruber believes that this lack of enforcement is simply unacceptable. He further advises that enforcement issues such as this be treated with a higher level of urgency within the ARRL.

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 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. This concern was included in FCC comments filed by ARRL on October 8 on a *Notice of Proposed Rule Making* (NPRM) in ET Docket 15-170 and RM-11673. The ARRL News covered the story on October 13, 2015. Here is the URL:

www.arrl.org/news/arrl-asks-fcc-to-clarify-that-hams-may-modify-non-amateur-gear-for-amateur-use

Mr. Gruber is happy to report that there continues to be relatively 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. This concern was also included in the previously mentioned NPRM comments filed by ARRL on October 8, 2015.

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 first filed a complaint concerning Home Depot on

July 14, 2015. This complaint concerned the improper marketing of such devices. See Appendix 4 for this report.

Two additional filings by Mr. Imlay occurred on December 28, 2015 against Lowes and Walmart. These complaints noted similar marketing issues as the one filed against Home Depot. The resulting news story and complaints are included as Appendices 5 and 6 in 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 worked with Eaton to identify the problem and find a solution. As a result, Eaton began to provide replacement breakers at no cost to homeowners affected by this problem. Since that time, Eaton has developed several version of the “ham friendly” breaker. Unfortunately, not all the new breakers fixed the problem, at least up until early this year. The latest version, released around January, seems to have fixed these issues, at least to the extent that they are reported to ARRL.

A new Square D breaker, however, seems to now be problematic. Mr. Gruber, along with assistance from WIAW Station Manager Joe Carcia, will be testing some of these breakers in the near future.

Status on FCC Enforcement and Outstanding EMC Cases

Mr. Gruber reports that the FCC has been sending letters to utilities (and consumers) with some regularity. Meaningful enforcement beyond that, however, continues to be very disappointing. To the best of his knowledge, no previously reported longstanding power line noise case has been resolved during the first half of 2016 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 can 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 non-power line 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.¹ 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 over two years 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 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.² 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 article³. However, as of early July, the interference was confirmed to be ongoing.

¹ 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 XXA.

² The URL is www.arrl.org/news/fcc-cites-washington-resident-for-causing-interference-on-amateur-frequencies.

³ The URL is http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0424/DA-14-536A1.pdf.

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 and no formal enforcement has taken place after over two years. Mr. Gruber believes that 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 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.

Furthermore, from what we've seen so far, the FCC Field Office reduction has had a significant and negative impact on FCC field resources. Despite the Commission's enthusiastic claims for a centralized "Tiger Team" approach, it has only made matters worse. To the best of Mr. Gruber's knowledge, it has yet to be even one Amateur case investigated by a Tiger Team. It also appears that FCC enforcement issues have become problematic for other radio services as well.

A particularly alarming example occurred in early May when Mr. Gruber received a phone call from an Evanston, IL police officer. Although this case was not Amateur related, Officer Jessica Henderson did suggest that they had considered it a matter of public safety. She had further stated that they had contacted the FCC asking for help but the Chicago Field Office was unable to help. She therefore turned to ARRL for help.

Officer Henderson reported that a particular neighborhood in Evanston was plagued by issues with key FOBs, cell phones, and similar devices. People had been unable to open doors, start their cars or use their cell phones in this area, a serious situation could develop as a result. For example, if someone tried to call for an ambulance or needed police help, the public safety could clearly be at risk.

Given the seriousness of this situation, Mr. Gruber contacted Kermit Carlson and asked him to investigate this matter. Mr. Carlson provides his findings later in this report. See *Additional ARRL RFI Investigations by Kermit Carlson* for this information.

FCC Enforcement Concerns

While a lack of meaningful enforcement in cases involving device operators has been the norm for a considerable period of time, the two examples described in the previous section plus a third appear to demonstrate an alarming trend.

In summary:

1. The first involves grow light manufacturers. The ARRL has so far filed four complaints of devices that were grossly over the applicable FCC limits. Although the first complaint was filed on March 14, 2014, so far there has been no apparent enforcement action by the Commission. **In fact, the Commission has yet to even acknowledge or respond to any of these complaints.**
2. The second is an apparent lack of response to an FCC Citation & Order that was issued on April 24, 2014. The Citation and Order was ignored by the recipient and the interference continues unabated. **The FCC has yet to take any meaningful action in the matter after over two years.**
3. The third example concerns the illegal marketing of Part 18 non-consumer lighting devices. The first Home Depot complaint was filed by the ARRL on July 14, 2015. The Lowe's and Walmart complaints were filed on December 28 and 29, respectively. Although the first complaint was filed one year ago, the FCC has failed to take any action problem continues. **In fact, the Commission has yet to even acknowledge or respond to any of these complaints. At the time of this report, the only response has been from Walmart seeking to rectify the problem.**

It must be emphasized that even if there is an ongoing FCC effort in any of these matters, they have now been ongoing for a considerable period of time with no known formal FCC action. 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.

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, proper follow-up to a Citation & Order, or illegal marketing of industrial devices, it would fundamentally call into question the FCC's credibility as an enforcement body. It would also seem unlikely that meaningful enforcement could be expected in other interference matters as well.

Another case involving an FCC field investigation in Maine was reported by New England Division Director Tom Frenaye. The problem was confirmed to be a plasma television by the FCC's Boston Field Office in early November of 2015. The noise, however, continues as of the time of this report. Mr. Gruber adds that he was asked to look at recordings of the noise by Laura Smith in June, 2016. Although its exact status is unknown, the matter has presumably been forwarded back to the Boston Field Office and remains in progress.

First Half 2016 Year Total RFI-Case Statistics:

New RFI Cases – 99

New electrical power-line cases – 18

- ARRL Letters sent – 9
- FCC 1st Letters submitted – 3 (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.

KI6IBS Power Line Noise Investigation

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 March and April of 2015. This case is located in Pleasant Hill, CA and 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 7 of this report. Although Mr. Gruber has forwarded this report to PG&E's attorney Jonathan Pendleton on June 12, 2015, the problem remains ongoing. Laura Smith at the FCC was also a CC recipient of this report. While there was a subsequent attempt to fix this problem, it was unsuccessful. PG&E failed to conduct a technically competent RFI investigation in response to Mr. Gruber's 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. He also notes that Mr. Schreiber continues to periodically ask about the status of his case with the ARRL. Since his case is being handled at a higher level within the ARRL, he has been unable to advise Mr. Schreiber in this regard. Since it has now been nine months since his investigation, Mr. Gruber suggests that a higher level decision be made as to what we tell Mr. Schreiber.

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 power line 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. Later that month, Laura Smith responded that she had asked the Field Office to put it on their schedule. She also added that they can only make the site visit when they can bundle it with other Arizona matters. She noted that they are coming from CA and the FCC front office will only approve travel for a case like this if they can kill multiple birds with that one stone. She will let Mr. Gruber know once they have a trip planned. At this point, however, it has been over a year and the field offices have been severely cut back.

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 still believes should be used as a higher level complaint with the FCC.

Additional ARRL RFI 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.

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; KI6IBS, Pleasant Hills, California and the K7GMF, Cochise, New Mexico have been identified as long outstanding cases of detrimental harmful interference from power line gap noise. Similar cases do exist in every Division of the ARRL.

Mr. Carlson continues to work on several new cases of gap noise and noise sources of unknown origin which are causing harmful interference to amateurs. Presently these cases are trying to be resolved by working directly with the owners of the noise generating sources.

Evanston, Illinois

A very interesting case of Electromagnetic Compatibility arose in Evanston, Illinois as the result of an inquiry from Officer Henderson of the Evanston, Illinois Police Department to Mr. Mike Gruber, the ARRL EMC Engineer in Newington. Although not directly an Amateur radio problem the request for help in Evanston presented a very unusual fact pattern. The six-hundred block of Dempster Avenue in the commercial down-town area of the North Chicago suburb was plagued with the strange problem of wireless motor vehicle key-fob's not allowing owners open their vehicles or in the case of some very expensive cars, the problem would not allow the owner to start their cars until it was towed to a point a block away. Also it was reported that when this occurred the drivers were not able to use their cellphones to summon help. The location of this



problem favored one set of eight on-street parallel parking spots in this Chicago suburb. In response to the unusual request Mr. Carlson, W9XA, the ARRL-EMC Chair made the short trip to Evanston for a look at the EMC implications of the situation. Mr. Carlson met with two officers of the Evanston PD, an affected business owner and the owner of the building nearest the problem area in late June.

It was learned during the visit that the Evanston PD had requested help from the FCC but had been told that this was a car maker's problem and that this was not something that the Commission would investigate. Of some concern to the PD was possibility that this was a potential beginning or indication of some nefarious or illegal activity. But even more disconcerting was the increasingly common need to have the local gendarme's present for a police tow or assistance to the public for what seemed to have become a common occurrence.

Mr. Carlson employed a Radar Engineers-240A Noise Signature Receiver and UHF Yagi antenna to survey the affected block of Dempster Avenue. Since Key-fob operation is typically around 315 MHz and 433 MHz both sets of frequencies were used in the survey along the sidewalks of the block. Although several sources of noise generation were identified in the survey of the block, a particularly strong source was noted at either end of the block, and the directional antenna indicated the same central point in the middle of the block.

The source at the center of the block was identified as a neon sign transformer replacement power supply that provided a very significant radiated signal to the area of the on-street parking just across the sidewalk a distance from eight to 40 feet to the affected parking spot locations. Although the actual neon tube portion of the sign was over 40 years old, the power supply was relatively new. The building owner and the police officers were advised to have the business owner who owns the sign to turn-off the sign should this problem arise. The owner of the sign was made aware of the issue that his neon lighting device is causing a problem. Since that visit, several other instances have been reported in other Chicagoland areas of unexplained key-fob problems that are resolved once the car has been towed from a location. This situation demonstrates the electromagnetic compatibility problems that are evolving in an atmosphere of non-compliant imported unintentional RF emitting devices. The Ventex neon power supply did cause Mr. Carlson's Verizon cellphone to not work when closer than a few feet from the device, so it is anticipated that further investigation will show that this device given the extremely close proximity to a public way does cause harmful interference and disruption to licensed radio services. A return visit to the area with calibrated antennas and equipment capable of measuring the radiated signal strength with quasi-peak detection is planned for late July. As a note the owner of the sign power supply was not the business owner who had met with Mr. Carlson during this visit.



Marketing of Drone TV transmitters that operate on Amateur, Aeronautical Radio-Navigation and FAA radar frequencies.

The ARRL EMC Engineer Mike Gruber and Mr. Carlson were sent information which revealed there is a serious potential problem with the marketing of video transmitters for installation on airborne drones that operate on amateur and aeronautical radio-navigation radio frequencies. The marketing of radio equipment which has obviously not been tested for FCC rules compliance is nothing new, but in addition to being a nuisance for the operators on the 23 cm band the operation of these transmitters does carry the distinct possibility of causing harmful interference which would result in a serious safety of flight issue for aircraft operations.

As an example, the “Lawmate 1.2 GHz 8-channel 1000 mW (1-watt) AV” transmitters for drones which is marketed by *Hobbyking.com* (information copied below) is capable of operating on the following frequencies; 1010 1040 1080 1120 1160 1200 1280 MHz

Although 1280 is in the amateur band, the 1200 MHz channel would be in conflict with the GLOSSNASS (Russian GPS) CDMA 1202.5 MHz channel. This frequency is in commercial use within the US for radiolocation. Operation on three of the other “channels” have a far more significant impact. For instance, 1010 MHz is used for aeronautical guidance in the TACAN/DME (Distance Measuring Equipment) aircraft radio navigation band, and it is the potential use of 1040 and 1080 MHz that represents the greatest threat to the safety of flight. These two frequencies are in direct conflict with the ATC (Air Traffic Control) transponder frequencies used to interrogate aircraft transponders (1030 MHz) and for the responding transmission from aircraft (1090 MHz) when those aircraft are operating in what is termed MODE-A, MODE-C or MODE-S transponder. The use of transponders is for aircraft traffic separation. Operation of transponders is required by all aircraft operating above 18,000 feet; within 30 miles of all major airports; and for all aircraft operating under IFR (Instrument Flight Rules). Additionally, the newest form of digital ATC information for aircraft is transmitted on 1082 MHz which is very close to the dip-switch selected frequency of 1080 MHz as advertised in the “Lawmate” literature. Also, since the TACAN/DME system and the ATC Transponder systems operate with 5 MHz bandwidths the use of an unlicensed drone transmitter on frequencies near the center frequency can cause serious issues with the integrity of the either the ATC radar system or the DME (Distance Measuring Equipment) system.

The channels chosen for operation of these airborne transmitters demonstrate a complete disregard by the manufacturer of the established and legal assignments of frequency allocations. At the June ARRL-EMC Committee meeting it was decided that the recommendation be made to the ARRL Board that the League should register a complaint with the Federal Communications Commission about the marketing of these transmitters. Given the potential of these devices to cripple the capability of the ATC secondary target/transponder system these illegal transmitters do represent a significant hazard to public safety in general and the safety of flight specifically. While these transmitters are sometimes marketed as appropriate for “ham” use, it is quite apparent that these devices have never been approved for use by the FCC, the frequencies of operation would make FCC approval highly improbable. Another reason to raise a complaint is that the frequencies often advertised for use are within the amateur spectrum. As one member of the ARRL-EMC Committee opined, “the official *Table of Allocations* appear to be treated more and more as a gentleman’s agreement that can be disregarded at the slightest whim or need of a manufacturer or marketer.”

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

<http://www.getfpv.com/fpv/video-transmitters/fatshark-1-3ghz-250mw-a-v-transmitter.html>

www.readymaderc.com/store/index.php?main_page=index&cPath=11&zenid=8be5bec447599f85ef884721a0c92d8e

www.hobbyking.com/hobbyking/store/_540_543_FPV_Aerial_Video_Telemetry-Video_Tx_Rx.html

It is only a matter of time until amateur operations will be affected by these transmitters, but if such a device ever does interfere with the integrity of the FAA's ATC transponder radar system it would be beneficial to be able to show that we had warned the Commission of the nature and dangerous potential that these transmitters represent. Although the response to any complaint of improper marketing of non-compliant devices is likely to be ignored by the Commission, it is the consensus of the ARRL-EMC Committee that the potential for serious problems does warrant consideration for filing a formal complaint. It is hoped that a Citation similar to the one shown in Appendix 8 of this report would be sent to each of the vendors of these devices who can be easily found online.

Marketing of various units continues unabated as sampling of the offerings can be found using any internet search engine with the search terms "1.2GHz, transmitter". A recent search of Amazon provided hundreds of offerings of transmitters capable of power levels between one-quarter and six watts. The FCC has in the past addressed the marketing of similar unauthorized radio frequency devices but there have been no recent Commission actions against the marketing or operation of these unauthorized devices.

This example of the internet direct marketing of transmitters for drone television transmitters is from;

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

From www.hobbyking.com

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

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

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

Features:

- Compact size
- Exceptional range
- Excellent video clarity

- **Highly integrated circuit**
- **Uses "Digital Phase Lock-Loop Circuit" with no temperature drift.**

Specs:

Transmission Frequency: 1.2GHz

Output Power: 1000mW

Channels: 8

Input Voltage: 5V

Modulation Deviation: 2.8MHz FM modulation

Sub-Carrier Frequency: 5.5MHz

Video Input: Impedance = 75ohms

Audio Input: Vp-p

Operating Temperature: -10C~+40C

Weight: 27.5g (transmitter only)

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

RF Output Connector: SMA

Dimensions: 60 x 25 x 11mm

Note:

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

end of text from www.hobbyking.com

Noise Monitoring Suggestion and Action Item

Dr. Greg Lapin, N9GL, the Chair of the ARRL RF Safety Committee contacted Mr. Hare and Mr. Carlson prior to the November EMC Committee meeting to suggest that the EMC Committee consider undertaking a the creation of a program to measure and monitor trends for background noise in the HF spectrum. Ed Hare has been working on the details of the formation of a crowd-sourced method of collecting background noise measurements.

This is very timely issue given the recent work by the FCC Technological Advisory Council which is an advisory group to the FCC which is investigating changes and trends to the radio spectrum noise floor to determine if there is an increasing noise problem, and, if so, its extent. The FCC Office of Engineering and Technology (OET) announced the TAC study in a *Public Notice* in mid-July which invited comments and answers to questions that the TAC has posed in the notice. The comment deadline is August 11. The TAC said it is trying to determine the scope of any noise issues and has invited “quantitative evidence” of noise problems, as well as recommendations on how to perform a noise study.

“The TAC is requesting input to help answer questions about the study of changes to the spectrum noise floor over the past 20 years,” the announcement said. “Noise in this context denotes unwanted radio frequency (RF) energy from manmade sources. Like

many spectrum users, TAC members expect that the noise floor in the radio spectrum is rising as the number of devices in use that emit radio energy grows.”

The ARRL representative on the TAC, Greg Lapin, N9GL, co-chairs the TAC Spectrum and Receiver Performance Working Group with Lynn Claudy of the National Association of Broadcasters. Lapin also serves as chairman of the ARRL RF Safety Committee.

The TAC said that its search for “concrete evidence of increased noise floors” has turned up only “limited available quantitative data” to support its presumption of a rising noise floor. The TAC said it wants to find ways to add to the available data so it can “answer important questions” on the topic for the FCC.

The TAC noted that many types of devices generate radio spectrum noise. In the case of *incidental radiators* — devices not designed to emit RF but do so anyway — there is little regulation governing such noise. “Most electric motors, light dimmers, switching power supplies, utility transformers, and power lines are included in this category,” the TAC announcement explained.

Devices designed to generate RF for internal use, or send RF signals to associated equipment via connected wiring, but which are not intended to emit RF energy, are called *unintentional radiators*. This category includes computers and many portable electronic devices, as well as many new high-efficiency lamps. FCC regulations limit the levels of emitted RF energy from these devices.

A third group of devices categorized as *intentional radiators* (unlicensed and licensed) and *industrial, scientific, and medical (ISM) radiators* — are designed to generate and emit RF energy by radiation or induction. Intentional radiators include cellular phones and base stations, unlicensed wireless routers, Bluetooth devices, broadcast TV and radio stations, and radar systems. Amateur Radio transmitters also fall into this category. Microwave ovens, arc welders, and fluorescent lighting are examples of ISM equipment.

“Such emitters contribute to the noise floor with emissions outside of their assigned frequencies,” the TAC said. “These are sometimes generated as spurious emissions, including, but not limited to, harmonics of desired frequencies and intermodulation products.” FCC regulations permitting the operation of these devices specify emission limits outside of the device’s licensed or permitted operating frequencies.

The TAC said that responses to the questions it has posed in the *Public Notice* will help it to “identify aspects of a study to determine trends in the radio spectrum noise floor. The ARRL is planning to comment. Please refer to Mr. Imlay’s July report to the ARRL Board for details on the response by the ARRL.

Smart Grid & EMC Standardization Efforts

Mr. Ramie (KI6LGY) updates our efforts in these areas:

1) IEEE-P1613 development

The Project Authorization Request (PAR) for IEEE-P1613(201x) was approved in February, 2016. The old IEEE-1613(2009) was being administratively withdrawn anyway, so new work to increase the Scope from "Communications Networking Equipment" to "Intelligent Electronic Devices" (IEDs) fell under this PAR. The previous ARRL-sponsored work to upgrade the old IEEE-1613(2009) by extending it with 1613.1(2013) was very popular within the Power & Energy Society, with two sponsoring committees (Substations & T/D) and almost no opposition. So popular, in fact, that the large Relaying committee (PSRC) wanted to join in our effort to expand EMC immunity testing to cover all IEDs used in utility settings, (substation or distribution) whether they communicated or not. Now, the work is supported by three sponsoring committees. It appears to be important to the utilities, who recently stated "We have to keep the lights on" during the last meeting. The vendors have been silent, their advertising indicates that they already meet the Standards being discussed.

A small writing group logically "ORed" the old IEEE-1613(2009) and the extension IEEE-1613.1(2013) together into the new draft in about 90 days. Lots of copied text was deleted and the document is much tighter now. That draft P1613(201x) was discussed at last week's Substations (C-0) committee meeting. The generally-positive consensus of that group was that our previous radiated RF immunity level of 20V/m from 80-1,000MHz (before modulation is applied) was inadequate and should be increased somewhat to 30V/m. This level also harmonized with the new IEC-61000-6-5, the Generic Immunity Standard for Utility Environments. There was no disagreement. The use case of concern was the technician servicing equipment with the doors open while talking on the radio. Discussion is on-going about other use cases, with Ed Hare offering his help with use case modeling. I suspect that the group will stay at 30V/m after seeing Ed's models, but will probably require the immunity tests be performed with the doors open, as is currently done with telephone equipment. I'm optimistic that text can be ready to ballot before the end of this year. My only reservation is that three Committees are now sponsors, so the balloting pool may be large and the associated comments slow to clear. We have received no opposition or negative comments yet.

2) SGIP-EMI Issues Working Group

Another area the League is supporting is continuing EMC work with the Smart Grid Interoperability Panel (SGIP) formerly under NIST (now a private non-profit). The EMI Issues Working Group did the original work defining the missing tests for utility equipment that became IEEE-1613.1(2013). It was the vehicle that brought the American utilities into harmonization with the Europeans on specifying reliable equipment that could resist interference by demonstrating "immunity" to simulated interference during required type-testing. The most recent output from the group has been the NEMA Standard Smart Grid Interoperability Testing & Certification Manual. EMC and demonstrated resistance to simulated interference ("immunity") is treated here with the

same importance as Cybersecurity. Both disciplines have murky metrics and are hard to quantify, but failure from these causes is always obvious and sometimes catastrophic. Next up will be a white paper on needed work to address geomagnetic storms and HEMP attacks, important work for our Nation. The Group is chaired by Don Heirman, the head of CISPR (a European SDO) and the contacts I've made here have helped me tremendously with the Standards work discussed above under the IEEE.

3) **IEEE-P1897 Recommended Practice for Powerline Noise Mitigation**

The PAR for this work was introduced by Ed Hare of the League. Mike Gruber is the Chair of this Working Group that's discussing the best practices for utilities to employ for resolving powerline noise complaints. The Vice Chair, Brian Cramer of Exelon, is also a member of the EMC Committee. Mr. Ramie, also with the EMC Committee, is the Secretary. Several other EMC Committee members are members of this working group as well. Our views are well represented. We want consensus with the utility industry and I feel it is attainable. I also tend to think we can finish up the work and have text ready to ballot by the end of the year.

4) **"Smart Grid EMC Standards Harmonization"**

This *Electromagnetic Compatibility* Magazine article was written to showcase the efforts that were expended getting EMC Immunity type testing requirements successfully introduced for Smart Grid communications networking equipment. It discusses earlier work within the IEEE and the EMC Society to have resistance (immunity) to outside interference designed into utility communications products that are expected to operate reliably. All the work discussed in the article could not have happened without the support of the League. According to this month's issue of *Electromagnetic Compatibility* magazine, published by the IEEE - EMC Society, this was one of the top-ten most downloaded EMC articles or papers from IEEE-XPlore in 2015!

<http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6714704>

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 just three reports of problems, which were relayed to our cable liaison, Mr. Ron Hranac (N0IVN), indicating that most cable systems are either clean or are addressing complaints effectively.

The first case, in January, came to ARRL via K0BOG, Field & Regulatory Correspondent, and had to do with interference in the roughly 20 MHz to 50+ MHz range (location and cable company not specified). After reviewing spectrum analyzer screen shots, Mr. Hranac determined that the interference in question was not cable signal leakage. Its signature did not match cable signals, and the frequency of much of the interference overlapped what is called the diplex filter crossover region, a range that is not used for signal transmission in North American cable networks. The interference was believed to be from a Part 15 or similar device.

The second case, in April, involved interference in the 6-meter band. The interference was occurring in Covington, LA and had the characteristic of switch-mode power supply harmonics. The complainant traced the source of the interference to the AC mains input to a nearby Alpha standby power supply, which is used to provide 60 VAC or 90 VAC quasi-square wave electricity to the coaxial cable network to power the network's amplifiers and other active devices. The cable operator (Charter) replaced modules inside of the power supply enclosure, which did not resolve the interference. The interference was reduced to the satisfaction of the complainant when the cable company replaced the Alpha power supply's AC input conduit on the utility pole with metallic conduit. [Note: There was a similar interference case a few years ago involving an Alpha power supply. The cable company, Comcast, ended up physically relocating the power supply far enough from the complainant's residence to eliminate the interference after other troubleshooting steps proved to be ineffective. Mr. Hranac believe the interference is probably related to the microprocessor-based controller inside of the power supply enclosure, which is used to control the charger, inverter, and backup power operation.]

The third case, in June, was related to correspondence between ARRL's Mike Gruber and Mr. Hranac. Apparently another case involving possible interference from an Alpha power supply has come to the attention of ARRL. Mr. Hranac was asked to review a photograph and identify a pole-mounted enclosure that the complainant said might be the source of interference. Mr. Hranac confirmed that the enclosure is an Alpha outdoor power supply for the cable network (location not specified in correspondence). Case resolution uncertain at the time of the submission of this report.

DSL, U-Verse & Home Phone Networking Alliance

Mr. Beattie continues to assist with broadband service complaints to the ARRL. In addition, Mr. Beattie has been working toward formalizing the process that AT&T uses to address these issues with ARRL.

Based on a previously reported complaint from Arizona, Mr. Beattie also reported that CenturyLink is doing something different than other xDSL carriers. Specifically, they are increasing their DSLAM in the specific spectrum where the interference is occurring. If the source is an Amateur station in the transmit mode, it can create interference to that same station when in the receive mode.

Mr. Gruber also reports that there has been a rise in interference reports from CenturyLink DSL systems. The interference appears to be caused by radiation from the phone lines due to a fault or imbalance on the lines. The problem occurs in the upper portion of the 75 meter band above 3.8 MHz. One such complaint in Idaho remains unresolved since September 2015, even after FCC involvement.

This case is particularly interesting since the complainant initially filed his complaint using the FCC's online filing process. To the best of his knowledge, it is the only case in which the FCC contacted the operator of the offending device or system after using this process. See Appendix 9A for a letter written by CenturyLink in response to an FCC letter written by Sharon Bowers (now retired).

In response to CenturyLink's letter, Mr. Gruber sent a letter shown in Appendix 9B on March 31, 2016. At this point, there has been no response from the FCC or CenturyLink. Mr. Gruber will continue to monitor the situation and is requesting additional FCC follow-up.

Radio Frequency LED Lighting Products

The FCC's Office of Engineering and Technology (OET) issued a clarification concerning LED lighting products on June 17, 2016.

Previous to this notice, LED lighting devices with circuitry operating from 9 kHz to 1705 kHz only needed to meet conducted emissions testing up to 30 MHz. While it also refers to radiated emission testing below 30 MHz, Mr. Gruber notes that there are no specified FCC limits for this. (He also suggests that radiated emissions testing below 30 MHz would be particularly difficult to implement.)

The FCC's notice reaffirms previous testing requirements but also adds a new requirement – radiated emissions testing from 30 to 1,000 MHz. While this requirement only applies to RF lighting devices with internal circuitry operating between 9 kHz to 1705 kHz, Mr. Gruber is pleased to see the FCC take this step. He's been generally

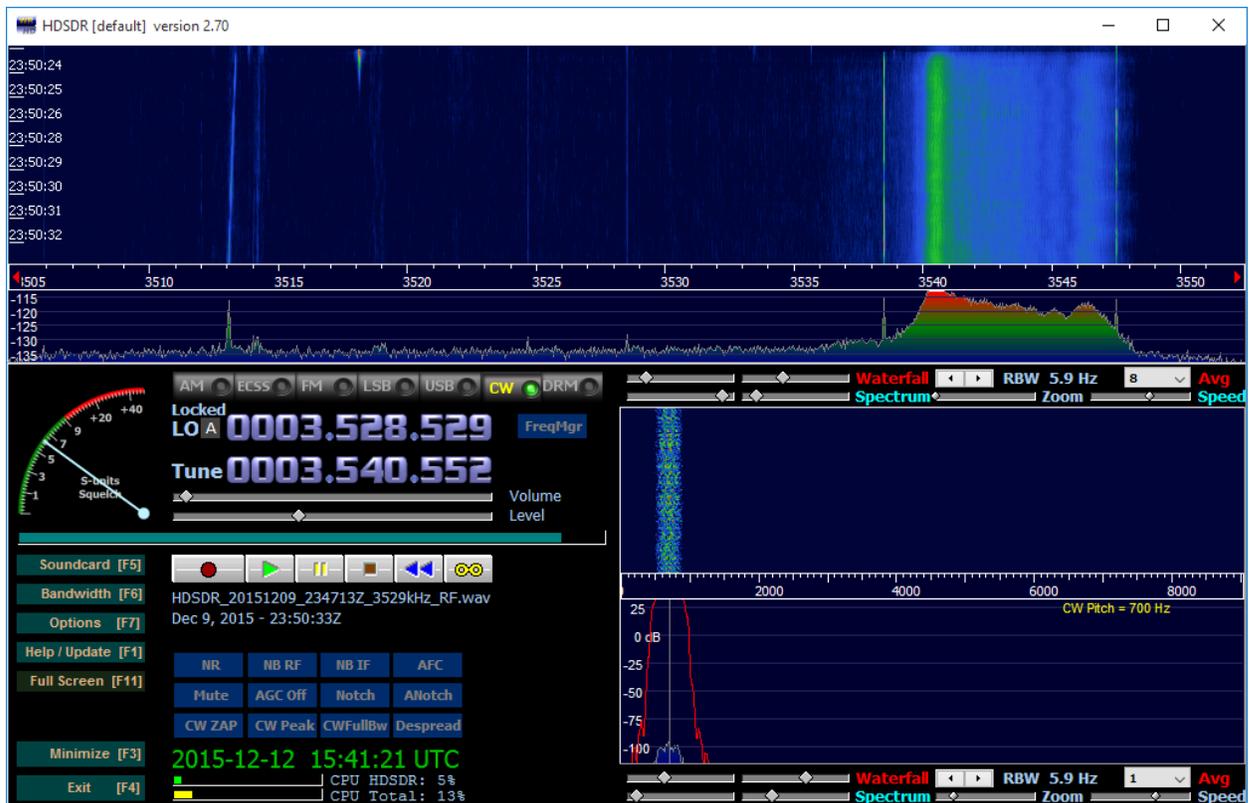
hearing of more RFI issues from LED lighting in the 2 meter band, apparently caused by radiated emissions. See Appendix 10 for the ARRL News story and the FCC's notice.

Miscellaneous Reports from Committee Members

Mr. Roop submits the following report:

Power Line Communication Devices

The Wireless Modem and Telephone Jack information at www.arrl.org/wireless-modem-and-telephone-jacks remains of current interest and not just a historical footnote. Interference from Phonex PX-421 power line communication devices remains a current source of interference to the low end of the 80 meter band.



The device appears to have a failing power supply since the frequency modulated carrier is modulated by 60 Hz hum. The occupied bandwidth is in excess of 15 kHz and the noise floor of the lower 25 kHz is raised by 6 dB over the ambient noise level.

The device appears to have been installed by DirectTV. The local FCC finally did make contact with the uncooperative homeowner and the defective devices were taken out of service and eventually replaced by newer units. This matter is now resolved.

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 2016 and compared to the previous four years:

Category of Case Reported to ARRL Lab/EMC Engineer	2011	2012	2013	2014	2015	2016-A
BPL	0	0	0	0	0	0
Unknown Unintentional Radiators	78	66	68	81	49	35
CABLE TV	7	3	4	4	4	1
Satellite TV			2	3	1	0
Computing Devices and Modems	7	3	5	6	8	1
Power Line Noise	65	53	52	51	43	18
Plasma TV Receivers	14	5	3	5	1	2
Other Broadcast Receivers	0	4	4	4	0	1
Other Receivers	3	1	1	4	1	4
Other Transmitters	9	2	2	4	3	1
Broadcast Transmitters	4	6	6	2	5	0
Lighting Devices	13	4	10	15	7	9
Confirmed & Suspect Grow Lights ⁴	---	---	2	16	6	3
Fence Systems	2	0	3	3	0	1
Battery Chargers / Power Supplies	1	3	4	5	7	6
Wheelchair	1	0	0	0	0	0
Water Pump Systems	2	1	2	2	0	0
HVAC Systems	6	3	10	6	5	6
Alarm Systems including detectors	0	4	2	4	2	2
Other Appliances	8	7	7	4	3	5
GFIC / AFCI	1	5	7	25	6	5
AUTOMOBILE Systems	3	2	7	1	1	3
Manufacturing and Retail						
Generated Noise	0	0	1	2	0	0
AT&T U-Verse Systems	8	8	3	4	6	1
PV Systems	---	---	2	1	3	2
Doorbell Transformers	---	---	2	3	0	2
Other	---	36	16	16	15	13

⁴ 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 serves on Working Groups developing standards for the measurement of LF and HF wireless power-transfer devices, lighting devices and a Working Group writing recommended procedures to test various forms of Industrial, Scientific and Medical devices.

Mr. Ramie serves as the C63® Secretary and as a member of Subcommittee 5. 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, 2015, 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, 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:

- Continue to identify and test devices that operate above the FCC limits, including lighting devices.
- 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.
- Test a number of devices that belong to staff and/or local hams that have caused instances of harmful interference.

Mr. Gruber continues as Chairman of a Working Group to develop a Recommended Practice for Location of Power Line Gap Noise. Additional EMC Committee members in this group include Messrs. Cramer as Co-chairman, Ramie, Carlson, and Boucher. This p1897 Working Group is sponsored by the EMC Society. The first formal meeting was held on December 10, 2015 and development on a set of best practices continues with monthly meetings.

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.

I am honored to welcome Dr. Richard DuBroff , W9XW, to the ARRL EMC Committee as a new member and we all look forward to working with him on the issues of Electromagnetic Compatibility as they apply to Amateur Radio.

I am pleased to report to the ARRL Board that ARRL EMC Committee Member Dr. Mark Steffka WW8MS has been named this year's recipient of the IEEE EMC Society's "Laurence G. Cumming Award for Outstanding Service to the Society".

As a note of personal thanks, I would like to recognize Mr. Hare, W1RFI, Mr. Ramie, KI6LGY; Mr. Gruber, W1MG; Mr. Roop, K9SE; Mr. Hranac N0IVN; Mr. Beattie W2TT , 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
Vice Director Central Division**

List of Appendices

1. Appendix 1 Lumatek Dial-a-Watt ballast complaint
2. Appendix 2 Quantum Horticulture HPS/MH-600W ballast complaint
3. Appendix 3 Galaxy 1000 Watt Dimmable ballast complaint
4. Appendix 4 Home Depot marketing complaint.
5. Appendix 5 Lowe's marketing complaint
6. Appendix 6 Walmart marketing complaint
7. Appendix 7 KI6IBS RFI investigation report
8. Appendix 8 FCC DOC-277887-A1 from 2007, which covers a previous FCC action on 1.2 GHz TV transmitters.
9. Appendix 9A and 9B – Letters involving CenturyLink interference case in Idaho.
10. Appendix 10A and 10B – Radio Frequency LED Lighting Products