

ARRL EMC Committee Semi-Annual Report

Doc. # 16

**For The
American Radio
Relay League**

**Board of Directors Meeting
January 19-20, 2018**

**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 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, Eversource, 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. Bob Allison, WB1GCM, ARRL Laboratory Product Review Engineer
- Mr. Ron Hranac, N0IVN, Technical Leader, Cisco Systems; past member of the Board of Directors, Society of Cable Telecommunications Engineers
- 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 Emeritus at Missouri University of Science & Technology

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 ARRL Laboratory staff work on EMC matters. In the 2nd half of 2017, 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. Unfortunately complaints from these devices are still occurring. Some of these devices have been measured to exceed the FCC limits by a considerable margin. Although complaints have been filed concerning these devices, the FCC has failed to take any visible enforcement action.

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 LED Part 15 bulbs don't seem to have been a significant source of RFI problems in household environments, 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 (sometimes referred to as 18B) ballasts being marketed and sold for consumer and residential purposes.
 - 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.
 - 5) Complaints involving Solar PV systems are on the rise. Given the complexity of contract arrangements, it can sometimes be difficult to identify the operator of these systems, i.e., the party responsible to correct harmful interference under the FCC rules.
- 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.

EMC Committee Meeting on FCC Technical Advisory Docket 17-340

Mr. Carlson and ARRL Laboratory engineers Messrs. Hare, Gruber and Allison of the EMC Committee met with ARRL staff members in December to discuss issues facing Amateur Radio allocations that are presented by the FCC Technical Advisory, TAC Spectrum Policy Proposals, FCC Docket 17-340. The day-long meeting provided a good basis to formulate a response to the various points of that FCC Docket. The details of that Docket and the League response will be presented in reports by others at the January 2018 Annual ARRL Board Meeting.

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. Each was also considerably over the FCC limits. The worst case measured 58 dB over the applicable Part 18 consumer limits. In response, ARRL General Counsel Chris Inlay filed four FCC complaints between in 2014 and 2015.

Although each of these devices measured way over the applicable FCC limit, there does not yet appear to have been any enforcement action taken by the FCC. Nonetheless, one manufacturer, Hydrofarm, did respond and improved their products. In addition, they are also manufacturing outboard filters that can be added to reduce or eliminate RFI.

As referenced in Appendix 2 of this document, the FCC issued an NAL in November against a ballast manufacturer for a labeling violation. The ballast, however, was not of a type used for grow lights. Furthermore, Mr. Gruber reports that he is still receiving apparent grow light complaints from Amateurs. He believes that this lack of enforcement toward illegal grow lights 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 are Part 15, while CFL's and electronic fluorescent light ballasts typically Part 18. In this case, there is an important distinction between these two rules - *Part 18*

limits for consumer RF lighting device are considerably lower than applicable Part 15 limits. As a consequence, the ARRL Board has previously asked us to consider a proposal to reduce Part 15 limits to Part 18 levels for lighting devices. 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.

An additional problem involves the sale and marketing of non-consumer rated ballasts to consumers in hardware and big box stores. These ballasts are still being sold to unsuspecting consumers and have been the subject of interference complaints to the ARRL Lab.

Solar PV Systems

In response to numerous complaints of RFI from residential solar PV systems, Mr. Gruber determined that most of the complaints involved products made by one manufacturer. He arranged a teleconference between ARRL and two of company's representatives in Israel.

Mr. Gruber, along with Bob Allison, Ed Hare and Tony Brock-Fisher represented the ARRL. The manufacturer's attorney and an engineer discussed this issue for about an hour. As a result of this discussion, the company will provide a channel for ARRL to forward complaints, which they will address on a case-by-case basis.

Progress Update: Not all cases have been corrected at the time of this report. Repairs were not occurring in a timely manner, and when I expressed my concern, the company's representative responded as follows:

"I fully understand your concern. It took us some time to fully understand the right approach for solving these issues, and we have worked extensively on both finding a suitable technical solution and building the support team logistic abilities. Currently, we believe we can solve case-by-case and in the last few weeks things are starting to move with several installations.

Therefore, I believe that the current list of cases is more of a backlog than a run-rate issue.

The success rate and timeliness of the repairs has yet to be determined. However, Mr. Gruber remains cautiously optimistic.

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 versions of the “ham friendly” breaker. Unfortunately initial versions of this breaker were not always successful, at least in terms of fixing the RFI complaint. However, Mr. Gruber now reports the Lab is no longer receiving complaints involving current model AFCIs from Eaton or any other manufacturer.

Mr. Gruber further reports that is aware of some RFI issues involving older Eaton model AFCIs. As neighborhoods evolve and new hams are licensed, these are likely to occur for the foreseeable future. In response to this, Mr. Gruber wrote an update during the 2nd half of 2017. This update appeared in the September 2017 issue of QST. It can also be downloaded from the ARRL Web site for distribution at conventions, club meetings, etc.

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

As previously reported, 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. Several of the non-authorized transmitters were DIP-switch settable to the internationally assigned Air

Traffic Control radar transponder and Aeronautical DME (Distance Measuring Equipment) navigation frequencies.

Messer's Gruber and Ramie wrote a report detailing numerous concerns regarding this matter September. It was subsequently submitted to General Counsel Chris Imlay on September 22, 2016 in an effort to facilitate an official FCC complaint. This report has been included as an Appendix in previous reports.

In an apparent response to that report, the FCC issued an Order on December 19, 2017 to Lumenier Holdco LLC (formerly known as FPV Manuals LLC). This Order imposed a \$180,000 civil penalty on the company for marketing noncompliant audio-visual transmitters intended for use on drones. See Appendix 1 for news story and the FCC's Order.

FCC Proposes \$25,000 Fine for Breaking Now-Voluntary Labeling Rules

In other related enforcement, the FCC has proposed fining Acuity Brands Inc. of Atlanta, Georgia, \$25,000 for apparently marketing electronic fluorescent lighting ballasts that were not labeled in accordance with Part 18 rules at the time. On November 21, 2017, the FCC issued a *Notice of Apparent Liability (NAL)* proposing a \$25,000 fine to the company. It should also be noted that the use of the FCC logo became voluntary on November 2, but Accuity's alleged violations occurred before that.

The ARRL has in the past filed complaints to the FCC concerning the marketing and sale of illegal lighting ballasts, including a lack of required compliance notifications, but without response.

The associated ARRL News story and FCC NAL concerning this matter are included as Appendix 2 of this document.

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 second half of 2017 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. Yet – some cases have dragged on for over a decade without resolution.

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 and the grow light problem continues.

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.

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 the FCC issued a Citation & Order on the 24th of April, the same day as the ARRL News article³. Although the interference went away a few months ago, the FCC failed to take any action in three years to correct the problem.

The noise in this matter was consistent with a grow light. It should be emphasized that the property owner simply ignored the FCC’s Citation and Order and no further FCC enforcement took place until the interference went away for unknown reasons. One possibility is that there was more than one source. Turning off the subject source did not eliminate the interference so the FCC simply dropped it.

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.

¹ The URL is www.arrl.org/news/arrl-to-fcc-grow-light-ballast-causes-hf-interference-violates-rules. This information has also been included as an appendix in previous EMC Committee reports.

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.

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. As an example, a grow light case

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.

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 two more appear to demonstrate a continuing and 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 continued unabated for three years. Although the interference is no longer an issue, **the FCC never took any meaningful action in this matter.**

3. The third example concerns the three illegal marketing of Part 18 non-consumer lighting devices. Although all three complaints were filed by the ARRL in 2015 the FCC has yet to take any action and the problem continues. **In fact, the Commission has yet to even acknowledge or respond to any of these complaints.**
4. The fourth example includes general field investigations that were conducted in such a way that the outcome would be favorable to the complainant. Examples include cases in which the investigation took place at times when the source was known to be off, checking for noise at random (unaffected) frequencies, etc.

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 enforcement 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 grow lights we've reported, or proper follow-up it 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.

The EMC Committee continues to recommend some sort of visible Board level follow-up in these matters. As a Committee we are greatly encouraged by the two enforcement actions in November and December of 2017.

Second Half 2017 Year Total RFI-Case Statistics:

New RFI Cases – 134

New electrical power-line cases – 26

- ARRL Letters sent – 6
- FCC 1st Letters submitted – 7 (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 – 2

Electric Utilities:

The two previous cases described in previous EMC Committee reports remain ongoing and for over 5 years. These cases are located in Pleasant Hill, California and Cochise, Arizona.

FCC Field Investigation of Concern

A problematic case in Santa Ana, California, was the subject of an FCC field investigation during the second half of 2017. The case started in March of 2017 when the complainant called Mr. Gruber at the ARRL RFI desk. The source was an unknown and radiating from a nearby uncooperative neighbor's house.

The case ran through the normal channels, i.e., an ARRL Letter followed by an FCC letter. The neighbor finally agreed to allow the FCC to investigate the matter at her home approximately in August of 2017. The first field investigation took place on August 30, 2017. A second followed on September 6, 2017.

Based on the noise signature and characteristic on-off cycling, the noise is being caused by arcing and controlled by a bimetallic strip. The noise also changes with outdoor air temperature, suggesting that it is not in homeowner's house. The most common source is likely to be a bad doorbell transformer and probably in homeowner's garage.

Initially the FCC field agent thought the source was a microwave oven but couldn't unplug it due to a large refrigerator being in the way. I then offered the use of a Radar Engineers Model 245 to locate the source, which I suggested was exposed to outdoor air temperature and consistent with a bad doorbell transformer. The complainant emailed my thoughts on the matter to the FCC field office. The response, however, was rather cool and unenthusiastic.

The second field investigation concluded that the microwave oven was not the source and the field agent would not say what it was. The solution proposed by the agent was for him to put a "large toroid" on the power cord of the suspect device. Since this is an arcing source, it is likely to have a large differential mode component. A common mode choke may not work very well in this case.

At this point, the FCC may no longer actively be working on the case. They indicate that they haven't closed it, but can't say when they will get back to it. To the best of the complainant's knowledge, the last known FCC visit was Friday, October 13, 2017. One encouraging incident occurred in late December when an FCC agent called the complainant and asked him to keep a log of the interference.

Given the FCC's previous involvement in it, Mr. Gruber also recommends that this case could be used as an opportunity to demonstrate the ARRL's interference locating techniques and equipment if given the opportunity.

See Appendix 3 for complete details on this case.

Smart Grid & EMC Standardization Efforts

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

1) IEEE-P1613 development

The draft document is very near completion, but additional content is needed to specify pulse repetition rates for spot frequency radiated RF immunity tests above 1GHz (to simulate various wireless/digital emitters). Examples are available for our use from IEC-61000-2-5 (Generic Immunity Testing for Utility Environments) and IEC-60601-1-2 (Generic Immunity Testing for Biomedical Equipment). This is an hour or two of work, but allocating time with the Working Group Secretary (Craig Preuss of Black & Veatch) is difficult due to his tight schedule right before the working group meetings in Florida early in January.

2) SEPA-EMI Issues Working Group

The League is continuing to support work with the former Smart Grid Interoperability Panel (SGIP) originally under NIST, now a working group within SEPA. (Smart Electric Power Alliance) The EMI Issues Working Group did the original work defining the missing tests for utility equipment that became IEEE-1613.1(2013). That Standard was the vehicle that brought American utilities into harmonization with the Europeans on specifying reliable communications networking equipment that could resist interference by demonstrating "immunity" to simulated interference during required type-testing. The utilities liked it so much that they sponsored the Project Authorization for P1613 under PSRC to become the replacement to 1613.1 to cover all IEDs.

Our next product will be a webinar presentation for the rest of SEPA and the General Public to be given January 4. The webinar is the visual presentation of our recent white paper on EMC Immunity Test Setups, using the list of tests in the draft IEEE-P1613 discussed above. (We assumed that the P1613 draft would eventually make it out of Committee, into balloting and succeed in becoming a Standard) We're soliciting EMC testing labs from ACIL (American Council of Independent Laboratories) as they are members of SEPA. We are also sending invitations out to all the electrical equipment manufacturers belonging to NEMA (National Electrical Manufacturers Association, a founding Member of SEPA), which will include Mr. Beckwith. I expect a large audience of maybe 60 people.

3) IEEE-P1897 Recommended Practice for Powerline Noise Mitigation

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, W9RFI, of Exelon, is also a member of the EMC Committee. Additional EMC Committee members in the Group also include Mr. Ramie, KI6LGY, who serves as its secretary, Mr. Hare, W1RFI, Mr. Beattie, W2TTT, Mr. Boucher, WA1ZBL, Mr. Hranac, N0IVN, and Mr. Carlson, W9XA. Although not a member of the EMC Committee, it should be noted that Atlantic Division Vice Director Riley Hollingsworth, K4ZDH, is also a Working Group member.

Mr. Ramie further reports that we want consensus with the utility industry and feels it is attainable. Progress has been slow, as the Working Group insists on reading the document together at each meeting. Relationships are cordial, however. This has been going on for two years! He is assuming we can have text ready to ballot and push out of this Working Group up to our Sponsoring EMC Society Standards Development & Education Committee by the end of 2018.”

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. Our cable liaison, Mr. Ron Hranac (N0IVN), also noted that he received no reports or complaints directly, indicating that most cable systems are either clean or are addressing complaints effectively.

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.

Mr. Beattie also reports that concerns over AT&T's new Project AirGig technology does not involve the HF spectrum. As such, it should not have a BPL-like impact on the Amateur Radio Community. Mr. Beattie recommends the following references for anyone interested in learning more about this technology:

- *AT&T Launches Project AirGig Trials to Bring Ultra-Fast Internet Over...*
http://about.att.com/story/project_airgig_trials_georgia.html
- *AT&T Labs' Project AirGig Nears First Field Trials for Ultra-Fast...*
http://about.att.com/newsroom/att_to_test_delivering_multi_gigabit_wireless_internet_speeds_using_power_lines.html
- *Georgia Power assists AT&T with Project AirGig Trials to Bring Ultra-Fast Internet Over Power Lines Closer to Reality:*
www.prnewswire.com/news-releases/georgia-power-assists-att-with-project-airgig-trials-to-bring-ultra-fast-internet-over-power-lines-closer-to-reality-300571100.html

Input From Committee Members

Mr. Roop reports that he is slowly getting back on the air after a move from Illinois to Indiana. His new location appears to be quieter than the previous location in suburban Chicago. He has not had the time to fully investigate the source of HF interference that manifests itself as spurious spectra spaced nominally every 60 kHz. These signals are fairly weak though he does see other stronger but intermittent signals. Local amateurs also reported seeing similar emissions on the HF bands. He plans to further investigate the source(s) of the interference.

Dr. DuBroff does not have anything particular to report but a couple of the local hams have mentioned that they are having a susceptibility problem with their garage doors opening and closing. He thinks this is mainly affected by operation on 160 meters.

Mr. Barsky reports that Mike Martin is working on a serious power line noise area at the Germantown-Boyd MD QTH of Dennis, N8IVN. Mike was out surveying the situation couple of weeks ago and he agrees there is a problem with the lines running by the N8IVN QTH. Mr. Barsky now reports that Mike has identified the faulty component- a pole mounted transformer that is singing away. It should get replaced shortly and Mr. Barsky will report on the subsequent noise level at N8IVN QTH when that occurs. Presently this is an S9 power line type noise case on all bands.

Mr. Barsky also reports that his local clubs in central MD, know that we are there for them to handle interference problems. They have his contact information

Mr. Illman checked in and reported nothing new from Seattle.

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 entire year of 2017 and compared to the previous six years:

Category of Case Reported to ARRL Lab/EMC Engineer	2011	2012	2013	2014	2015	2016	2017
BPL	0	0	0	0	0	0	0
Unknown Unintentional Radiators	78	66	68	81	49	70	73
CABLE TV	7	3	4	4	4	2	2
Satellite TV			2	3	1	0	2
Computing Devices and Modems	7	3	5	6	8	3	12
Power Line Noise	65	53	52	51	43	47	44
Plasma TV Receivers	14	5	3	5	1	3	1
Other Broadcast Receivers	0	4	4	4	0	1	1
Other Receivers	3	1	1	4	1	6	5
Other Transmitters	9	2	2	4	3	3	2
Broadcast Transmitters	4	6	6	2	5	1	3
Lighting Devices	13	4	10	15	7	19	6
Confirmed & Suspect Grow Lights ⁴	---	---	2	16	6	12	11
Fence Systems	2	0	3	3	0	2	0
Battery Chargers / Power Supplies	1	3	4	5	7	9	6
Wheelchair	1	0	0	0	0	0	0
Water Pump Systems	2	1	2	2	0	0	1
HVAC Systems	6	3	10	6	5	12	6
Alarm Systems including detectors	0	4	2	4	2	3	4
Other Appliances	8	7	7	4	3	10	7
GFIC / AFCI	1	5	7	25	6	5	6
AUTOMOBILE Systems	3	2	7	1	1	3	5
Manufacturing and Retail							0
Generated Noise	0	0	1	2	0	0	
AT&T U-Verse Systems	8	8	3	4	6	1	2
PV Systems	---	---	2	1	3	10	24
Doorbell Transformers	---	---	2	3	0	2	2
Other	---	36	16	16	15	30	16

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 indicated, *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 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, 2017, as the IEEE EMC Society Vice President of Standards.

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, Hare 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.

As a note of personal thanks, I would like to recognize Mr. Hare, W1RFI, Mr. Gruber, W1MG, Mr. Bob Allison WB1GCM and Mr. Ramie, KI6LGY, for their contribution of material for this report. I would also like to thank 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
Director Central Division**

List of Appendices

Appendix 1A *FCC Penalizes Marketer of Ham-Band Drone Audio-Visual Transmitters*, ARRL News, December 17, 2017

Appendix 1B FCC Order regarding drone transmitters, December 19, 2017.

Appendix 2A *FCC Proposes \$25,000 Fine for Breaking Now-Voluntary Labeling Rules*, ARRL News, December 13, 2017

Appendix 2B FCC NAL regarding logo violation, November 21, 2017

Appendix 3 Problematic RFI Case in Santa Ana, California