

ARRL EMC Committee Semi-Annual Report

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**For The
American Radio
Relay League**

**Board of Directors Meeting
January 13-14, 2012**

**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

Welcome to the Committee:

I would like to take this opportunity to welcome Mr. Philip F. Keebler, MSEE, of the Electric Power Research Institute (EPRI) Knoxville EMC Lab to the ARRL EMC Committee. Mr Keebler joined the EMC Committee in August as a non-voting member with a strong interest in allying the interests of EPRI and the ARRL in the areas of power-line and associated EMI issues. Please join me in welcoming Mr Keebler to the ARRL EMC Committee.

Members of the Committee:

- Mr. Kermit Carlson, W9XA, ARRL Central Division Vice Director, EMC Committee Chairman
- Mr. Gordon Beattie, W2TTT, Principal Technical Architect, AT&T Enterprise IT Service Assurance
- Mr. Jody Boucher, WA1ZBL, RFI troubleshooter, Northeast Utilities
- Mr. Brian Cramer, PE, W9RFI, Electrical Interference Solutions, Inc.
- Mr. Mike Gruber, W1MG, ARRL Lab RFI Engineer, HQ Staff Liaison
- Mr. Ed Hare, W1RFI, ARRL Laboratory Manager
- Mr. Ron Hranac, N0IVN, Technical Leader, Cisco Systems; past member of the Board of Directors, Society of Cable Telecommunications Engineers
- Mr. Richard D. Illman, AH6EZ Senior Engineer, Motorola Solutions
- Mr. Steve Jackson, KZ1X, VDSL and wireless communications
- Mr. John M. Krumenacker, KB3PJO Design Engineer
- Dr. Ron McConnell, W2IOL, T1E1.4 VDSL Standards Committee
- Mr. Jerry Ramie, KI6LGY, ARC Technical Resources, Inc.
- Mr. Cortland Richmond, KA5S, EMC Engineer
- Mr. Mark Steffka, WW8MS, Automotive EMC engineer
- Dr. Steve Strauss, NY3B, Home Phone Networking Alliance Technical Committee
- Mr Phillip Philip F. Keebler, Electric Power Research Institute (EPRI)

Recent EMC Committee Activity and Discussion:

The EMC Committee held Webinar and Telephone Conferences during the months of September and November. Topics of discussion included:

- Status of Field investigations and results of work with the Commonwealth Edison, Chicago Illinois, Engineering Office regarding powerline noise investigations for AA9VI, Northbrook, Illinois and issues regarding follow-up repair by the utility.
- Status of Powerline Noise cases outstanding for resolution.
- Mr. Hare reported that the FCC had come out with a 2nd Report and Order, essentially affirming the BPL rules it had enacted earlier. He told the Committee that ARRL will be filing a Petition for Reconsideration. He also reported that he had done measurements of the IBEC and French Broad EMC BPL systems and found that the IBEC system still exceeded the FCC emissions limits. The French Broad system exceeded the limits and was operating in the frequency bands prohibited to BPL. ARRL will be filing formal complaints on both problems. ARRL will continue to investigate BPL systems that do not offer spectral notching for the Amateur bands.
- Considered the possibility of tracking RFI issues with new Hybrid and Electric Drive automobiles used by amateur radio operators.

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 2nd half of 2011, he also continued with work in a number of key areas:

- Adding updates and revisions to the ARRL RFI Web pages.
- Facilitating and providing assistance on resolving long standing power line noise cases with the FCC.
 - Of particular note is a case near Pittsburgh, PA. Although this case was first reported to the ARRL in 2003, and the FCC has written the utility five letters concerning the matter, it is clear the utility still lacks the proper equipment and expertise to correct the problem. Mr. Gruber, with assistance from Mike Martin of RFI Services, helped the FCC investigate the noise in May of 2011. Several sources were found and reportedly fixed by the utility. The utility however is unable to find the remaining sources. They point to a sign as the culprit, which is a tactic they had used previously. This case remains ongoing. It was also the subject of an ARRL News article when the utility told the complainant that they wanted to charge him for locating the noise several years ago.
- 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:
 - Non-consumer Part 18 electronic ballasts being marketed and sold for consumer and residential purposes.
 - 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.
 - Large grow lighting devices used for indoor gardening are particularly problematic in some parts of the country, especially California and Colorado. These devices can be heard at much greater distances than would normally be expected from a device that meets the FCC Part 15 or

18 limits. One light that we looked at, for example, was considerably over the limit.

- Working with AT&T engineering staff to help resolve RFI issues with U-Verse systems.
- Reviewing proposed EMC related material for ARRL publications.

Second Half 2011 Year Total RFI-Case Statistics:

New RFI Cases – 117

New electrical power-line cases – 23

- ARRL Letters sent – 14
- FCC 1st Letters submitted – 9 (Some letters may involve multiple complainants.)
- FCC 2nd Letters submitted – 4 (Note: Laura Smith issued numerous 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 were follow-up in nature and therefore required custom legal language. The effectiveness of these letters has yet to be determined.)

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. In addition, the Committee is continuing in the process of forming a working group to address this issue of power line noise.

The following power line noise cases are of particular interest. Some have been previously discussed in semi-annual reports.

- W4FGC in Lakeland, Florida: This previously reported case also remains ongoing. Although the FCC investigated the matter, it was at a time of unusually low noise activity. It should be noted that the noise is typically present at slightly varying levels most of the time.

Over the years, the utility's RFI investigator has claimed that the complainant's equipment and antenna are responsible for the noise. He also claimed that the complainant's expectations are unrealistic. It should be noted that none of these claims have been validated by Mike Martin or Mike Gruber during their investigations into this noise. In addition, the complainant's daughter obtained the services of a 3rd party independent RFI investigator from a nearby city in Florida in May of 2011. This investigator was able to locate four sources of noise in the complainant's neighborhood in a relatively short period of time.

At the time of this report, the complainant is 90 years old. Although this case has been partially resolved, it remains on-hold. It was first reported to the ARRL in January 2003. Mr. Gruber reports that he has spent probably more time on this

case than any other. Despite his effort, little or no improvement occurred as a result of sources located by the utility.

- W2PM in Ramsey, NJ: This case involves a 69 kV transmission line with a tower in the complainant's backyard. The utility's RFI investigator initially concluded that there was a composite of noises that were being generated all along the line. The problem was not fixable. Based on a recording of the noise, Mr. Gruber concluded that there were only two noises affecting the complainant's station. Mr. Gruber found the two sources in November of 2009. Based on his reports, the utility's RFI investigator took a second look. He concluded there were hardware issues with approximately four towers that needed replacement. These towers were somewhat unique as a result of hardware incompatibility when the voltage was increased on the line several years ago to 69 kV.

In 2010, the utility's RFI investigator informed Mr. Gruber that they would need to shut down the line in order to make the repairs. The repairs were expected to be completed before the start of the air conditioning season. The repairs were never started, and the utility never contacted the ARRL or complainant to advise of the schedule change. The case then went to the FCC and Laura Smith issued an advisory notice.

At the time of the last Committee report, the primary source tower appeared to have been fixed. An attempt to work on the second tower was delayed due to access issues involving an easement. A second attempt to repair this tower appears to have failed. At the time of this report, however, the utility's RFI investigator reports the noise has now been fixed and the case closed.

This case was first reported to the ARRL in May of 2009. Mr. Gruber believes this would make a great example case for stations near high voltage transmission lines. A power line noise case in the vicinity of transmission lines has always been problematic with the FCC, even if the lines were not the source.

- K3GT in Allison Park, Pennsylvania: As previously reported, Mr. Gruber, with the assistance of Mike Martin of RFI Services helped the FCC investigate this case in May. Matthew Urick of the FCC Field Office in Philadelphia conducted the investigation, which is located near Pittsburgh. Also present was the complainant, Bob Thacker, K3GT. The utility in this matter, Duquesne Light & Power, had wanted to charge the complainant for RFI investigations.

Although this problem had been going for over a decade, Mr. Gruber reports that they were able to demonstrate to the FCC that the noise was coming from a number of poles that they identified. By the end of the day, they had identified noise sources in all directions but one. Special thanks to Mike Martin for his invaluable assistance. This effort was extremely successful.

As a result of this investigation the FCC had issued a letter to the utility. Despite the ARRL's exceptional effort to hand this case for enforcement to the FCC, the FCC gave them another 60 days to fix the problem. Remarkably, this was the same requirement afforded by the Commission in their first letter to the utility dated December 17, 2002.

Although the utility appears to have fixed the sources that were identified during the investigation, they were unable to find the remaining sources. They have claimed by letter to the Commission that the remaining sources are being caused by signage. They previously made similar claims before the investigation. Mr Gruber reports however, that the noise signatures were consistent with power line noise sources – not signage.

At the moment, this case remains ongoing. It is, however, one of the best cases we've ever seen for FCC enforcement. The FCC's enforcement in this case has been disappointing to say the least.

- AA9VI in Northbrook, Illinois: As previously reported, this case was investigated by EMC Committee member Brian Cramer, W9RFI. Also present was Committee Chairman Kermit Carlson. It had also been previously investigated by the FCC and first reported to the ARRL on December 10, 2007. At the time of Mr. Cramer's investigation, the FCC field agents had been unable to locate the source of the problem.

Mr. Cramer reports that in many ways the RFI problems at AA9VI highlight the frustration that electric utility trouble-shooters can have resolving issues. There are individuals within the utility who are committed to resolving the problem, but their actions are sometimes mis-directed and very expensive.

In this case, the utility had identified "noisy" insulators on a 345kV transmission tower just outside the substation. The insulators were replaced, but there was no improvement for the ham. Mr. Cramer was sent on behalf of the ARRL to locate the source. From outside the substation he was able to trace the time-domain signature to a portion of the substation. The utility then located a "noisy" 354kV bus insulator, and requested an outage to replace it.

Mr. Cramer then returned to the substation with utility personnel and checked inside the substation. The signature from AA9VI did not match the noisy insulator they had identified, but it did match a 345kV bus insulator on the opposite bus.

The fact is that the utility has expended a great deal of time and money in an effort to fix the problem. But, the situation has not improved because the utility personnel lack the training and experience to identify the correct noise source. Although this noise was not particularly difficult to locate with the right training

and equipment, neither the FCC nor the utility had been able to find it prior to Mr. Cramer's investigation.

At present, ComEd reports that they replaced the identified insulator. However, they did not provide the complainant with advance notice before the repairs were made. The complainant was therefore unable to monitor the effect on his issues of de-energizing, repairing, and re-energizing the bus. He is still having problems. Mr. Cramer has informed ComEd that they would need to financially participate in further investigation. So far, ComEd has not responded to that offer. The case remains unresolved.

PAVE PAWS

Mr. Hare has continued to work with Dan Henderson and Chris Imlay to analyze PAVE-PAWS interference and systems. He reports that requests for Longley-Rice modeling of potential repeater systems has slowed down, but that ARRL will continue to help on request.

Broadband over Power Line (BPL):

Broadband over power line (BPL) is the use of electrical wiring or power-distribution lines to carry high-speed digital signals. There are two types of BPL of concern to amateurs. Both *in-building* and *access* BPL have signals that occupy most or all of the HF range, extending into VHF. The power-line or electrical wiring can act as an antenna and radiate these signals. In-building BPL can be used to network computers within a building. It uses the building wiring to carry digital signals from one computer to another. Most in-building BPL operates under the [HomePlug](#) industry specification, which does not use the Amateur bands and thus poses no significant threat to Amateur operation.

Access BPL provides broadband Internet access to homes and businesses, using a combination of techniques and wiring. In late December 2011, the last large Access BPL company and provider, IBEC, announced that it was shutting down in January 2012. Although there are a handful of tiny BPL systems still in operation in the US, at this point, Ed reports that these remaining systems do not use the ham bands. ARRL will continue to press the FCC to use this successful model of operation to create equally successful regulations.

BPL is also one of several options for the developing smart-grid technologies, although it is far from being the front runner in current smart-grid deployments. The reliability of using BPL on overhead and underground distribution lines is not sufficient to make BPL the first choice of smart-grid backbone technology.

In early 2011, and again at the end of the year, Mr. Hare assessed and measured IBEC BPL systems operating in North Carolina, Virginia and Pennsylvania. Although IBEC had corrected the lack of these systems being entered into the BPL database, the system

in North Carolina, operated by the French Broad Electric Membership Cooperative and the system in Virginia, operated by IBEC, were found to be operating at levels as much as 40 dB greater than the FCC limits for radiated emissions. Prior to the announcement that IBEC was shutting down, ARRL was planning additional formal complaints to the FCC.

Mr. Hare continues to represent Amateur Radio's stake in BPL standards development on various industry committees. These include the IEEE P1775 BPL EMC committee; the [IEEE EMC Society Standards Development Committee](#) and [ANSI ASC C63](#)[®]. The IEEE P1775 BPL EMC standard has completed its balloting process, rejecting comments provided by the IEEE EMC Society Standards Development Committee (SDCom). As a result, SDCom had chosen to seek to withdraw as a co-sponsor of the BPL EMC standard.

FCC

In late 2011, the FCC announced the 2nd Report and Order in the BPL rulemaking proceeding. Not surprisingly, the FCC essentially affirmed its present rules, in response to a court order to either change those rules or justify the reason it was keeping them. Although prepared independently of the EMC Committee, Mr. Hare prepared a detailed technical analysis of the Order and the numerous technical flaws it contains.

International

CISPR, a major international standardization group, had tried to develop a BPL standard, but was unable to muster sufficient votes to adopt a position in either direction. CENELEC, a group of European nations, picked up on the project. CENELEC now has a BPL standard that accomplished what CISPR was unable to do adopted a proposal that correctly measures BPL signals, but at a level of conducted emissions equivalent to a level slightly higher than what the FCC permits. However, there are several important provisions in this standard that are of direct interest to Amateur Radio. The standard mandates that BPL systems *not* use the Amateur bands, with a notch depth equivalent to the current conducted emissions limits in CISPR 22. This is equivalent to a notch depth of 35 to 50 dB, depending on what assumptions are used to correlate the quasi-peak levels in CISPR 22 with the peak and average levels in the CENELEC standard. The standard also mandates adaptive notching to protect HF broadcast spectrum. ARRL's information on BPL is found at www.arrl.org/bpl.

Smart-Grid and Related Standardization

Mr. Ramie indicates there isn't much to report in this area. He has regrettably resigned as a Distinguished Lecturer for the EMC Society. In this capacity, Mr. Ramie gave his ARRL PowerPoint presentation involving EPRI projects primarily for the smart grid. Mr. Ramie cites a lack of available time as the reason for his resignation.

Mr. Ramie also reports that he has received a couple of phone calls, one from a municipality, concerning RFI. Mr. Ramie adds however, that these calls were not related to hams.

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 also helped prepare some responses to Technical Information Services (TIS) questions for ARRL members.

Cable Television:

As a whole, the cable industry continues to do a good job at adhering to the FCC's regulations about signal leakage and interference. ARRL has received only a few inquiries and reports of problems, indicating that most cable systems are either clean or are addressing complaints effectively. Only a couple of these cases have required Mr. Hranac's involvement and ARRL follow up.

Mr. Hranac writes a monthly column in *Communications Technology* magazine (a cable TV engineering publication), and his October and November 2011 columns discussed LTE interference. While not directly related to cable interference to amateur radio operations, the two-part article does note that cable TV signal leakage has been measured at higher frequencies (e.g., >700 MHz) when none is measureable in the VHF aeronautical band (108-139 MHz). An online version of the articles is available at <http://www.cable360.net/ct/sections/columns/broadband/48482.html> (October article) and <http://www.cable360.net/ct/operations/testing/48917.html> (November article).

In December of 2011, Mr. Hranac was inducted into *Communications Technology's* Hall of Fame.

DSL, U-Verse & Home Phone Networking Alliance

Mr. Beatty continues to assist with broadband service complaints to the ARRL. Only a handful of complaints were received since July.

Dr. Strauss indicates he has nothing new to report relative to the Committee.

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 2nd half of 2011 and compared to the three previous years:

Category of Case Reported to ARRL Lab/EMC Engineer	2008	2009	2010	2011-1	2011-2
BPL	2	1	3	0	0
Unknown Unintentional Radiators	49	65	57	51	27
CABLE TV	11	26	8	4	3
Computing Devices and Modems	15	21	4	1	6
Power Line Noise	81	113	90	42	23
Plasma TV Receivers	8	12	10	7	7
Other Broadcast Receivers	3	2	7	0	0
Other Receivers	1	4	8	2	1
Other Transmitters	11	1	2	5	4
Broadcast Transmitters	2	2	3	1	3
Lighting Devices	12	12	15	8	5
Fence Systems	3	4	4	1	1
Battery Chargers	6	2	1	0	1
Wheelchair	0	0	1	1	0
Water Pump Systems	1	1	3	1	1
HVAC Systems	5	4	11	2	4
Alarm Systems including detectors	3	4	6	0	0
Other Appliances	12	7	3	2	6
GFIC	5	1	1	0	1
AUTOMOBILE Systems	12	8	4	0	3
Manufacturing and Retail				0	0
Generated Noise	1	2	1		
AT&T U-Verse Systems	3	10	10	2	6

Data from this table now appears in tabular form. 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.*

The following graph indicates the percentage of calls and emails to the ARRL Laboratory and to the ARRL EMC Engineer, Mr Gruber, for help during 2010 as compiled from the ARRL EMC database. Similar percentages were observed during from 2008 through 2011. The record clearly indicates that Power Line Noise is the most commonly encountered RFI problem to Amateur installations referred to the ARRL for assistance.

ARRL RFI Forums:

Two RFI forums have been added to the new 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. Mr. Hare is the Primary ARRL C63[®] representative; Mr. Carlson is the Alternate. Mr. Hare ended his term as Chair of Subcommittee 5, Immunity, but continues to serve as its Vice Chair. Mr. Hare also leads the C63[®] committee's Task Force on testing below 30 MHz, which has completed a first draft of an intentional emitter measurement standard that correctly and scientifically extrapolates field strength measurements below 30 MHz. Mr. Ramie serves as the C63[®] Secretary and as a member of the Below 30 MHz Task Group. 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. 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.

ARRL also continues its participation in the Society of Automotive Engineers EMC and EMR Committees. Mr. Hare is the ARRL representative on those committees. Mr. Steffka also serves on the committees, representing his employment in the automotive industry.

RFI Locating

Mr. Richmond reports that he has had no calls through the program. As a club officer however, he is working on locating a noise source near the Lowell ARC W8LRC radio room.

In addition, Mr. Richmond reports he is installing an inverter and deep cycle auxiliary battery into a recently acquired vehicle so he can operate AC powered test equipment while mobile. Additional plans include a spring trip to locations identified on the ARRL BPL list for measurements.

FCC Rules

As previously reported in the July 2011 EMC Committee report, Messers. Gruber and Hare have proposed five suggestions for changes in the FCC rules. These proposals remain under review and are included as Appendix A in this document.

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.

In closing I would like to thank Mr. Mike Gruber W1MG, for his efforts in the preparation of this report; and to Mr. Ed Hare W1RFI and the ARRL Laboratory staff for their invaluable work protecting Amateur Radio through their continued diligence in the greater field of ElectroMagnetic Compatibility.

Respectfully Submitted,

**Kermit A Carlson W9XA
EMC Committee Chairman
ViceDirector Central Division**

Appendix A

FCC Rules

As previously reported in the July 2011 EMC Committee report, Messers. Gruber and Hare have proposed the following five suggestions for changes in the FCC rules. These proposals remain under review.

1. Presently there are no Part 15 radiated emissions limits for unintentional emitters below 30 MHz. This had been a relative non-issue until the proliferation of plasma TVs. Our experience has shown that direct radiation at HF from a plasma display can be problematic and difficult to fix. One suggestion therefore would be to add absolute radiated emissions limits in this case to the HF spectrum. (Note: In the cases looked at by the Lab, the interference was relatively short range. While reducing the frequency of the limits may not completely solve the problem, it should help in some cases.)
2. Fluorescent lights with electronic ballasts, electronic ballasts and CFLs typically operate under Part 18. Part 18 has a separate set of absolute limits for “RF Lighting Devices.” These limits are then broken down into consumer and non-consumer devices. Note: The limits are higher for non-consumer devices, similar to Part 15A and 15B for digital devices.

Quasi-Peak Part 18 limits from 3 to 30 MHz for consumer and non-consumer RF lighting devices are 48 dB_{μV} and 70 dB_{μV}, respectively. For consumer devices, these are the lowest of any specified limits in Parts 15 and 18 of the rules. It is also important to note that, in the case of Part 18 lighting devices, the FCC created a special set of lower limits just for them. Apparently, the difficulty in eliminating interference from a widespread proliferation of Part 18 bulbs in homes and neighborhoods is something that concerned the FCC when they wrote these rules.

Unlike fluorescent bulbs however, the new LED bulbs operate under Part 15. The limits for these bulbs are 56 dB_{μV} from 0.5 to 5 MHz, and 60 dB_{μV} from 5 to 30 MHz. These newer LED bulbs are becoming increasingly ubiquitous in many stores and homes. Unlike their Part 18 equivalent however, they have also become a source of interference. The suggestion would be to reduce the Part 15 limits for lighting devices to Part 18 lighting device limits from 3 to 30 MHz. Essentially, make the limits for Part 15 and 18 bulbs the same, thus reducing the RFI potential from newer LED bulbs before they become a major problem.

3. Part 18 rules specify labeling for RF lighting devices are as follows:

§ 18.213 Information to the user.

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

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

As the above indicates, including (d), the RFI potential is not required to appear on the outside of the package. One could easily buy a fluorescent light or ballast and not know there are issues until he opens the box. The suggestion would be to require an obvious warning on the outside of the package, similar to what appears on the box of a Part 15 unintentional emitter. The suggested wording would be similar to its Part 15 equivalent. In addition, part c of the above rules should be referenced and give the location of this information.

4. Part 18 specifies two sets of limits for RF Lighting Devices – consumer and non consumer. (Note: Some manufactures specify Part 18A and 18B on their products, similar to Part 15. This is not spelled out in Part 18 however.) A quick look at a local “big box” store will show that many ballasts are non-consumer rated. The label is not on the box but rather in very small print in the device or on a sheet inside the box. The suggestion would be to require consumer and non consumer labeling on the outside of the box. The labeling must also be large enough to be obvious to the consumer at the time of purchase.

In addition, some fluorescent light fixtures with electronic ballasts do not specify the type of ballast inside. The suggestion would be to also add labeling to the outside of the box in the case of a light fixture. It should be clear to the consumer that the device is or is not suitable for residential use.

5. Add intentional emitter radiated emissions limits for Part 15 incidental emitters in the case of power lines, associated hardware and electric motors. Although power line noise is the most reported source of known interference to the ARRL, and often the most difficult to solve, there are presently no specified limits for power lines (or any other) incidental emitters.