

# ARRL EMC Committee Semi-Annual Report

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**For The  
American Radio  
Relay League**

**Board of Directors Meeting  
January 20-21, 2006**

**Submitted By  
Dennis Bodson, W4PWF  
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

## **Members of the Committee:**

- Dr. Dennis Bodson, W4PWF, ARRL Roanoke Division Director, EMC Committee Chairman
- Mr. Mike Gruber, W1MG, ARRL Lab RFI Engineer, HQ Staff Liaison
- Mr. Jody Boucher, WA1ZBL, RFI troubleshooter, Northeast Utilities
- Mr. Ed Hare, W1RFI, ARRL Laboratory Manager
- Mr. Ron Hranac, N0IVN, Board of Directors, Society of Cable Telecommunications Engineers
- Mr. Steve Jackson, KZ1X, VDSL and wireless communications
- Dr. Ron McConnell, W2IOL, T1E1.4 VDSL Standards Committee
- Mr. Cortland Richmond, KA5S, EMC Engineer
- Mr. Mark Steffka, WW8MS, Automotive EMC engineer
- Mr. Walt Stinson, W0CP, ARRL Rocky Mountain Division Director
- Dr. Steve Strauss, NY3B, Home Phone Networking Alliance Technical Committee
- Mr. Hugh Turnbull, W3ABC, ARRL Honorary Vice President

## **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. This includes ANSI 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 2<sup>nd</sup> half of 2006, worked with a volunteer to develop and put on-line a library of RFI sound recordings, which has now been added to the ARRL's web site. Several products have also been informally tested for conducted and radiated emissions. The results of this testing will be used to help better appreciate the emissions levels of some Part 15 products.

## **Second Half 2005 Year Total RFI-case statistics:**

New RFI Cases - 273

New electrical power-line cases – 86

- ARRL Letters sent - 13
- FCC 1st Letters sent - 11
- FCC 2nd Letters sent – 3

EMC/RFI-related emails Total - 2017

## **Electric Utilities:**

Power-line interference has continued to be the single number one interference problem reported to ARRL HQ. These cases are being worked on by HQ staff, in cooperation with Riley Hollingsworth of the FCC. Several cases have been approved for field investigation by the FCC. (*Although not a case with direct ARRL involvement, Mr. Gruber reports an official FCC warning or citation will be forthcoming in the near future.*) The FCC and HQ staff continue to discuss all open cases monthly. Developing a strong case for enforcement action against an offending utility continues to be a primary goal of Mr. Gruber. The professional grade interference locating receiver (Radar Engineers Model 240) that was purchased to aid in the power-line noise effort was also put to good use. Two power-line noise cases were personally and successfully investigated by Mr. Gruber using this equipment. The results of these investigations are being made available to the FCC in an effort to facilitate enforcement action.

## **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. Access BPL provides broadband Internet access to homes and businesses, using a combination of techniques and wiring. Although some BPL feasibility trials have shut down, the number of locations trying access BPL are increasing. In-building applications are also on the rise.

There were a number of developments related to BPL that occurred in the second half of 2005:

- ARRL worked closely with Motorola to help them design a BPL system that incorporated the needs of Amateur Radio from the concept. A Motorola system had been installed at ARRL HQ for testing purposes, although at year's end, it was in the process of being upgraded. ARRL's tests showed that the additional filtering used by Motorola offered significant protection to Amateur Radio, although interference to shortwave broadcasting does remain. The filtering also improves the immunity of the Motorola system; no interference to the Motorola system was caused by the W1AW bulletin transmitters.
- Google and others announced that they were investing almost 100 million dollars in Current Technologies, the BPL manufacturer involved in the Cinergy installation in Cincinnati, OH. Current Technologies and ARRL are working together on EMC issues, to help Current improve the design of their product.
- IBM is also investing in BPL, through a Texas utility company, Centerpoint. They are using BPL equipment manufactured by Amperion and Mitsubishi, the companies involved in interference complaints in Irving, TX and Cottonwood, AZ respectively.
- TXU announced a major BPL deployment in its service area in Texas. They will be using Current Technologies equipment. Current systems do not use HF on MV primary distribution lines. Their use of HF is limited to premise wiring, using HomePlug modems with software notches in the Amateur bands.
- The BPL systems in the Allentown, PA area were shut down. Southern Company discontinued its foray into BPL, shutting down its BPL trial in Alabama. Florida Power and Light turned off its BPL trial in the Miami area. United Illuminating is discontinuing its trial in Shelton, CT.

As part of his HQ staff work, Mr. Hare continued to visit a number of BPL trial areas, documenting BPL interference and working with local BPL teams. Mr. Hare continued to participate on the IEEE P1775 BPL working groups, the ANSI ASC C63 BPL study group and the IEEE Standards Development Committee's BPL study project.

ARRL's information on BPL is found at <http://www.arrl.org/bpl>

### **Automotive EMC:**

Mr. Hare continues as the ARRL representative on the Society of Automotive Engineers EMC (Electromagnetic Compatibility) and EMR (Electromagnetic Radiation) Committees. 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 has agreed to help ARRL rewrite the automotive chapter in a new edition of the The ARRL RFI Book.

### **Cable Television:**

As a whole, the cable industry continues to do a good job at adhering to the FCC's regulations about leakage and interference. ARRL has received few reports of problems, indicating that most systems are either clean or are addressing complaints effectively. The few cases ARRL has been involved with have been addressed through Mr. Hranac, the cable-industry member of this committee. He generally refers the report to the senior technical management of the involved cable company, who then in turn help the local system resolve the reported problem. All of the handful of cases with which Mr. Hranac has been involved in the last six months have all been resolved satisfactorily.

### **Home Phone Networking:**

Dr. Strauss indicates there is not a lot to report with respect to interference to or from the Amateur Radio community in the home networking area. The major technologies that we are continuing to track in this area are WiFi, HomePlug, HomePNA, and Bluetooth technologies.

WiFi is continuing its enormous growth trend within the home and is currently being deployed very aggressively. Bluetooth-based devices are now also being used in great numbers as a short distance wireless connection alternatives to home PC's, telephone headsets, and other consumer electronics products. Both use 2.4 GHz (and 5 GHz in some WiFi solutions) spectrum. HomePlug (existing electrical power lines) and HomePNA (phoneline), while they are deployed in some homes, are also continuing to be deployed within the home environment. From a deployment perspective, however, these technologies are statistically insignificant when compared to their wireless networking counterparts; HomePlug and HomePNA are mature standards and are very inexpensive to deploy. High-speed Ethernet (10/100/1000) is being used in many homes when wired connectivity is desired because it is a cost effective solution to

solving multi-widget connectivity issues. It should be noted that the cost of the wireless alternatives continues to decline, which in turn further fuels its enormous growth trend.

HomePNA technology is still being considered, however, by some service-provider companies like SBC as one option for distributing IP-based video services within customers' homes. HomePNA 3.0 technology was standardized by the ITU (i.e. is now internationally recognized) in May 2005. Like its predecessor the [3.0] technology also contains mandatory spectral notching requirements for protection of the ARS. The charter of HomePNA was recently extended to include developing home networking solutions using existing coax as well as over telephone lines.

Dr. Strauss also reports that he is no longer supports the standards activities within these groups as his primary job focus has taken him into other areas. He adds however, given the maturity of these standards, little opportunity exists by this committee to influence standards development in an effort to mitigate interference. The committee will need to continue monitoring any RFI issues on an “as needed” basis.

Dr. McConnell reports all is quiet on the xDSL front. The various standards committees seem to be following the path taken for VDSL.

**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 2<sup>nd</sup> half of 2005:

<b>RFI COMPLAINTS BY SOURCE:</b>	
Power Line Noise	86
Amateur Radio	29
Unknown	62
Appliances & Electrical Devices	37
Automotive	12
Computer	7
Electric Fence	7
Non-Amateur Transmitters	4
TV	9
Medical Device	6
Cordless Phone	2
CATV	7
Street Light	3
Miscellaneous	2
<b>TOTAL 2<sup>nd</sup> Half 2005 cases:</b>	<b>273</b>

<b>RFI COMPLAINTS BY VICTIM:</b>	
Amateur Radio	158
FM & TV	17
Electrical Device	7
CATV	8
Stereo & Intercom	5
Medical Device (Pacemakers)	5
Automotive	12
Telephones	16
Alarm	4
Unknown	3
Cordless Phone	3
AM Broadcast Radio	5
Computer	11
TV	12
Miscellaneous	7
<b>TOTAL 2<sup>nd</sup> Half 2005 cases:</b>	<b>273</b>

## **Committees:**

ARRL continues to be represented on professional EMC committees. Messrs. Bodson and Hare continue to represent the interests of Amateur Radio on the ANSI ASC C63 RFI committee. Dr. Bodson has been appointed as the C63 representative; Mr. Hare is ARRL's alternate. Mr. Hare serves as the chairman of Subcommittee 5, Immunity. Mr. Hare also chairs the C63 committee's ad-hoc working group on power-line communications devices. This continues to be a hot topic of discussion at the C63 meetings.

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 ARRL EMC-Committee representation on C63 watches immunity and testing developments.

Mr. Hare was also appointed to serve on the IEEE BPL-standard committee, serving on its EMC Working Group. He was also appointed to serve on the IEEE EMC Standards Development Committee, where he chairs their BPL/PLC study project.

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.

## **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 <http://www.arrl.org/tis/info/rfigen.html>.