Sidebands

The Newsletter of the EAST GREENBUSH AMATEUR RADIO ASSOCIATION

W2EGB

January 2017

Noise Floor: Where Do We Go From Here?

By Tom F. King

The subject of this paper concerns the licensed and unlicensed users of electromagnetic spectrum and the growing concern over the degradation in achieving reliable (1) amateur radio reception, (2) wireless communications service, (3) analog and HD AM and FM, as well as DTV broadcast reception, and (4) broadband Internet service as a result of a decreasing signal-to-noise ratio due to an apparent increase in the noise floor in the DC to >1 GHz frequency band.

It is for this reason that the Federal Communications Commission Technical Advisory Council under the direction of the Office of Engineering and Technology issued a Technical Inquiry under ET Docket No. 16-191 in order to request spectral noise measured data from any and all licensed and unlicensed users of electromagnetic spectrum and to respond to a list of questions that included the following:

- Is there a noise floor problem?
- Where does the problem exist? Spectrally? Spatially? Temporally?
- Is there quantitative evidence of the overall increase in the total integrated noise floor across various segments of the radio frequency spectrum?
- How should a noise study be performed?

An Effort to Control Noise

Noise is the bane of every amateur. This abridged article summarizes comments that were filed in a noise floor technical inquiry conducted by the Technological Advisory Council of the FCC's Office of Engineering and Technology. The TAC had asked users of public communications spectrum, including radio amateurs, for input to help it set goals for a radio spectrum noise study.

The author is president of Kintronic Labs Inc.; he was invited to prepare this summary for a presentation to the IEEE Broadcast Technology Society. This paper summarizes responses and concludes with the author's recommendations.

A copy also was filed with the commission.

The responses to these questions will serve to establish a basis from which the TAC could develop a set of achievable goals to present to the chairman of the FCC to act on in an effort to improve the reliability of broadcast and communication services that are being adversely affected by an increasing noise environment. The responsibility for this noise study will be the

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In This Issue

Keeping Club Gear On the Air Takes Work

By Steve Van Sickle, WB2HPR

Your club operates and maintains several UHF and VHF (2M and 440) repeaters that serve the Capital District. Periodically, scheduled maintenance is performed to assure system technical compliance with accepted engineering standards and to make adjustments, repairs, improvements and to conduct preventive maintenance. This work is done on a volunteer basis, and material costs are borne personally by the repeater maintenance team.

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Save the Date! Next EGARA Monthly Meeting is Janaury 11th! Antenna Building Workshop.

Noise Floor: Where Do We Go From Here?

responsibility of the TAC Spectrum and Receiver Performance working group that is currently co-chaired by Dr. Greg Lapin, who represents the American Radio Relay League, and Lynn Claudy, senior vice president for technology at the National Association of Broadcasters.

GENERAL RESPONSE SUMMARY TO THE TAC TI

According to a summary report prepared by Geoff Mendenhall, consultant to Gates Air Corp. and who is currently serving on the TAC Spectrum and Receiver Performance working group, a total of 93 submissions were received at the FCC Electronic Filing System, some of which were duplicates. Responses were received from 73 different people or organizations. The breakdown on responders was as follows:

- 31 licensed radio amateurs
- Amateur radio two-way communications
- 23 companies/industry organizations
- 39 RF professionals (broadcast and wireless)
- 9 responders did not reply to the questions asked
- The four [bullets] below illustrate the most widely used services that are affected by the increasing noise floor.
- Cellphone and broadband internet service
- AM/FM/DTV reception
- Police, fire and emergency responder communications

Individuals and companies representing each of these sectors of public communications submitted responses.

LIGHTS OF SPECIFIC RESPONDERS

I. ARRL

The FCC classification of noise emitters is as follows:

- Intentional emitters, such as broadcast stations or mobile telecom cell sites.
- Unintentional emitters, such as high-efficiency fluorescent and light emitting diode (LED) lights, computers, plasma TVs and switching power supplies
- Incidental emitters, such as overhead power lines and motors

Man-made noise sources fall under one of these three categories and together attribute to the overall spectral noise floor with the highest levels being in the large, metropolitan urban areas and the lowest levels being in the rural areas. The ARRL response noted that Section 15.5 of the FCC rules calls

for operators of an interference-causing RF device to cease operating the device if interference to authorized services develops.

Operators should be aware of this rule and seek FCC enforcement with supporting documented evidence.

In addition Chris Imlay, the author of the ARRL response, referred to an IEEE Recommended Practice on the resolution of power line noise complaints (P1987) that is being developed by the IEEE Electromagnetic Compatibility Society Standards Development and Education Committee. This document should be distributed to all operators of broadcast and wireless communications services when available.

II. Society of Broadcast Engineers

On May 26, 1999 the FCC requested that the TAC study the noise floor and propose new approaches to spectrum management based on emerging and future technologies. The commission has since 1999 skipped the urgent step of evaluating the RF environment before repeatedly and constantly making allocation decisions. The time is now to proceed with a well-planned comprehensive nationwide noise floor study.

The commercially available range of RF devices has expanded significantly resulting in a previously limited range of 30 MHz to 3 GHz as per the current FCC Part 15 and 18 rules to an expanded range up to 70 GHz; hence a review and updating of the current rules relating to noise interference is in order.

The IEEE is in the process of revising Std. 473, a standard on site surveys, which does include test methodology for the measurement of signals and noise at test sites and at locations of equipment. This should be made available to TAC when completed.

SBE recommendations to the TAC:

Increased cooperation is needed between manufacturers of Part 15 devices and users of radio spectrum to identify noise sources and take appropriate remedial action.

thanks 1,000,000

The club wishes to recognize and thank the following members for their service during the past year:

VE Sessions

- Dave Williams
- Tom Scorsone
- Steve VanSickle
- Bryan Jackson
- Steve Sconfienza
- Bob Stark

Community Events

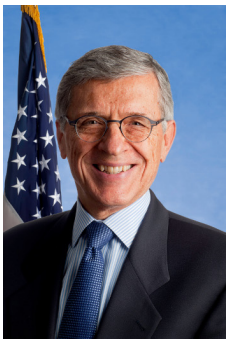
- Russ Greenman
- Steve Van Sickle
- Tom Scorsone
- Steve Sconfienza
- Ridge Macdonald
- Bryan Jackson
- Paul Dahoda
- Debbie Marsh
- Peggy Donnelly

Hamfest 2016

- Liz & Rick Gross
- Ridge Macdonald
- Steve VanSickle
- Tom Scorsone
- Chris Linck
- Bryan Jackaon
- Paul Dahoda
- Joe Saulier
- Lee Hatfied
- Dave Williams
- Andy Sullivan
- Joseph Squillace
- Tim Antonacci

We apologize to anyone we may have inadvertently missed on this list. Thanks to all!

Wheeler to Step Down as FCC Chair with Trump Transition



President Obama's FCC Chairman Tom Wheeler has made it official, he will step down from the commission entirely when President Trump takes office.

The news ends recent speculation about a possible muddied or prolonged transition in the makeup of the board between a Democratic-led commission into a GOP administration, though the eventual composition of the five-seat panel will probably not be clear for some time.

There had been some speculation that Wheeler would not leave the commission immediately because his term runs to 2018. Meanwhile fellow Democrat Jessica Rosenworcel has not been reconfirmed, and according to some accounts, Republicans indicated they would not reconfirm her if Wheeler insisted on staying on and making it harder for the new administration to put its stamp on the commission right away. So until Rosenworcel or another Democrat is named, and until a replacement for Wheeler, presumably Republican, is confirmed, the GOP will have a 2-1 majority come Jan. 21 under an acting chair.

Democrat Mignon Clyburn is the other remaining commissioner. She was acting chair prior to Wheeler's appointment.

Amateur Radio Parity Act Bill Unable to Overcome Florida Senator's Objections

The Amateur Radio Parity Act, H.R. 1301, went down to defeat December 9th as the 114th Congress drew to a close. The bill was designed to provide amateur radio operators with reasonable access to installing antennas in areas with private land use restrictions, such as those often imposed by Homeowner Associations.

After passing the House of Representatives on a unanimous vote earlier this fall, the bill stalled in the Senate due to the intervention of only one member, Sen. Bill Nelson (D-FL).

"Negotiations, which led to an agreement with the Community Associations Institute (CAI), the National Association of Homeowner's Associations and publicly supported by CAI and ARRL, were brushed aside by Sen. Nelson as irrelevant," ARRL said in a news release.

EGARA December Meeting

The December EGARA was combined with the club's annual holiday party, which was held this year at Mosciatello's Restaurant in Troy. Reading of the minutes from the November meeting were waived.

Treasurer Bryan Jackson, W2RBJ, also announced that he had received a statement from Key Bank for the month of November showing the club with a negative balance of over $1.1 Million dollars in its account. After those in attendance had a good laugh, he said he would visit the bank to rectify its error. It was also discussed and decided that the club would move its account to a different financial institution because Key Bank announced it would begin charging monthly fees to maintain the club's account. There were also numerous reports of other clubs and non-profits experiencing similar issues during Key Bank's acquisition of First Niagara, where the club originally had its bank account. The following day, the club's bank account was transferred to SEFCU, which does not charge fees.

Following a delicious dinner, the holiday party adjourned at 8:45 pm.

We Have a Winner!

Dave Gillette, KC2RPU, was the lucky winner of the dual band HT radio given away in EGARA's annual Holiday Raffle fund raiser. Dave's winning ticket was drawn during the club's Holiday Dinner at Mosciatello's Restaurant on December 14th. In addition to the radio, the package included the battery, charger, PC interface cable, and programming software.


Steve directs the waiter to give our check to the group at the next table... as soon as we leave.


A Glass of Wine (or two or three) Makes the Season Bright!


EGARA's Three Wise Men?


A Holiday Feast!

Noise Floor

Radiated emission limits below 30 MHz in the FCC Part 15 rules for unintentional emitters should be enacted. There are presently no radiated emission limits below 30 MHz for most unintentional emitters.

Reduced Part 15 limits for LED lights should be enacted to be harmonized with the Part 18 lower limits for fluorescent bulbs.

Better labeling on packaging for Part 18 fluorescent bulbs and ballasts to better inform consumers of potential interference to radio, TV and cellphone reception in the residential environment.

Specific radiated and/or conducted emission limits for incidental emitters, such as motors or power lines, should be enacted.

Conducted emission limits on pulse-width motor controllers used in appliances should be enacted.

Substantially increase the visibility of enforcement in power line interference cases.

III. Telecommunications Council

Public Law 110-140-DEC.19, 2007, Subtitle B, Lighting Energy Efficiency: Energy Independence and Security Act of 2007 established requirements for improvements in energy efficiency of lighting equipment, which set the transition from incandescent to high-efficiency fluorescent and LED lighting on a fast track. Section R404.1 of the 2012 International Energy Conservation Code requires that a minimum of 75 percent of lamps in permanently installed lighting fixtures should be high-efficiency lamps. High-efficiency lamp types include:

- Compact fluorescent lamps
  A T8 or smaller linear fluorescent lamp
  Any lamp meeting minimum efficiency requirements:
    A. 60 lumens/watt for lamps over 40 watts
    B. 50 lumens/watt for lamps over 15 watts, but no more than 40 watts
    C. 40 lumens/watt for lamps rated at 15 watts or less

The NPSTC response included a list of noise interference to public safety communications examples among which are the following two examples:

1. Reported by the New York Department of Transportation: Multi-voltage ballasts for fluorescent lighting in a particular building resulted in noise in the VHF low band, loss of coverage, and garbled transmissions impacting portables, mobiles and base receivers within 50 yards of the building.

2. Industry Canada: Electronic ballasts for fluorescent lights in a nearby store produced 20 MHz wide broadband noise in the 800 MHz cellular band resulting in loss of coverage or dropped calls within 2 km of the store location.

IV. State of California Governor's Office of Emergency Services & Public Safety Communications

The response for the CalOES included the following statement: "During the last 20 years, and even more so over the last 5 years, we have encountered more and more interference from sources that were not causing interference prior to that time." In their response they listed the following major sources of noise interference:

- Fluorescent lights
- LED lights
- Computers and embedded controllers
- Switching power supplies and battery chargers
- Industrial equipment
- Power tools
- Solar panel inverters
- Cable TV/Internet distribution systems
- Power line communications (PLC) and Broadband over Power Lines (BPL)
- Electric automobiles

In response to the question as to what levels does the noise floor cause harmful interference to particular radio service, CalOES responded with the following levels shown below:

Table 2. Receiver threshold levels for specified service bands

Band	Minimum Signal Level*
Low Band (40–50MHz)	–100 dBm
VHF Band (150–170MHz)	–106 dBm
UHF Band (450–470MHz)	–110 dBm
700/800 MHz Bands	–116 dBm

** Noise floor should be at least 10 dB below these levels.*

V. CTIA Representing the U.S. Wireless Communications Industry

CTIA highlighted the following RF emitters as major sources of noise interference to the US wireless services:

A. Incidental radiators
  a. Electric motors
  b. Light dimmers
  c. Switching power supplies

B. Unintentional radiators
  a. High-efficiency lights
  b. Computers
  c. Garage door receivers

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Noise Floor

Commercial Mobile Radio Service is impacted by an increasing noise floor as follows:

- Reduction in carrier's reliable service area
- Lost coverage for cell sites at the outer boundary of a carrier's network
- More dropped calls traveling between cell sites
- Diminished voice quality
- Slower data transmission or lost data packets

Considering the number of cell sites that are presently in operation in the USA, the cost to the service providers in reduced quality of service resulting from noise interference has to be a staggering amount.

VI. AT&T

AT&T has had marginal success in working with large manufacturers of industrial lighting to encourage the incorporation of noise filtering in the associated power modules. In the midst of our government's drive toward the increase usage of high-efficiency lighting, manufacturers are motivated to disregard noise concerns due to the higher product cost of adding filter components.

AT&T is particularly concerned about the potential impact of noise on small cells sharing a support with LED lights. A single faulty power supply conducting noise through power lines can compromise their network service out to a distance of a half mile, which is a significantly large area.

Harmonics from unintentional radiators, i.e. FM broadcast transmitters, are the greatest noise source impacting AT&T Mobility Services. FM station interference can degrade the uplink signal in the 700–2300 MHz band within 2,000 feet of the station. Also data speeds in the 3–4 GHz range between a computer and other ancillary devices, such as a video display, create harmonics and noise products that interfere with cellphone service.

AT&T recommendations to TAC:

- Noise from incidental radiators could be mitigated through updated industry standards, better testing protocols for device manufacturers, and clarity in commission regulations for spurious emissions
- Improved testing at a wider frequency range up to 6 GHz would identify the potential for interference to commercial mobile and public safety licensees, avoiding the inefficient and piecemeal approach of identifying and mitigating noise after it occurs.

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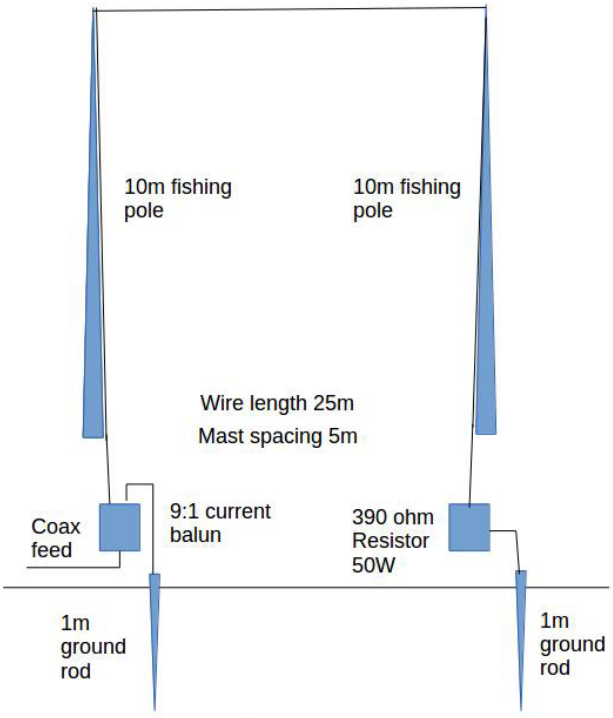
Something New! A Terminated Inverted "U" Antenna by Chris Moulding, G4HYG

I've recently moved to a house with only a small area for antennas and I'm also getting local RF noise. It's motivated me to start working on a low noise antenna that would be suitable for transmitting.

I realized that it would have to be some form of loop antenna to avoid high impedance antenna ends picking up electric fields from the noise sources. It would also need a good current balun to isolate the antenna from the feeder cable that may have common mode RF noise on the shield. The final antenna design has effective radiation patterns from 160 to 10m and looked like it was worth building even though the gain figures were modest comparable with vertical antennas.

I built the antenna using two 10m fishing poles spaced 5m apart. 25m of thin 7 x 0.2mm insulated wire run up one pole, across to the other then down the other. A 9:1 current balun was used at the feed point with a single 1m ground rod as the earth connection. At the far end a 390 ohm 50W rated thick film resistor was mounted in a diecast aluminum box as heat sink and connected to another 1m ground rod. I've been pleased with the results and it's a keeper.

Costs are low. The fishing pole antenna supports are readily available, 1m long ground rods are inexpensive. In use the VSWR was very low rising to 1.8:1 on 160m and 4m. It's below 1.5:1 on the remaining bands.



Terminated inverted U HF antenna
Low noise on receive
Wide transmit bandwidth 1.8 to 70 MHz
200W input with 50W resistor

On the Beam
News & Notes

FCC Special Counsel Laura Smith Says Amateur Enforcement Will Be Aggressive

FCC Special Counsel Laura Smith told a standing-room-only audience at the ARRL Pacific Division Convention (Pacificon) that, despite FCC cutbacks, Amateur Radio enforcement will not be compromised. Smith spoke for nearly an hour and a half on a variety of FCC issues related to Amateur Radio.

Smith said that with the FCC set to shut down 11 field offices across the country in January, the Enforcement Bureau has reorganized into three US regions, and she does not anticipate any significant issues for the Amateur Service as a result.

"The amateur community will go forward," she said, noting that amateurs have "an incredible ability to self-police." In light of the field office closings, she has been working with ARRL to revamp the Official Observer (OO) program.

"We are going to redo the entire program," she told the Pacificon forum. Given that the field office cutbacks have left the FCC short staffed, the OO program will step into the gap, with OOs serving as the first line of defense in Amateur Radio enforcement, she explained. Working more closely with the OOs, Smith said, will get information on problems to the field staff more quickly, so they can follow up.

Smith praised the OOs for contributing their time and effort to monitor the bands and to alert licensees both to problematic and positive behavior on the air.

She also said the FCC is more aggressively policing the Amateur Radio bands.

Club Dues Stay the Same for 2017

January marks the beginning of a bright New Year -- and time for renewal of your EGARA membership.

This year, dues remain the same at just $15 for an individual or $25 for a family membership. Your membership will continue to support EGARA's many efforts to advance amateur radio and its service to the community. Dues can be paid at club meetings or by sending a check to:

Bryan Jackson, EGARA Treasurer
983 Sterling Ridge Drive, Rensselaer, NY 12144.

Please make your check payable to: EGARA.

Thank You!

NCVEC Question Pool Committee Seeks Comments on the Technician Question Pool

The National Conference of Volunteer Examiner Coordinators (NCVEC) Question Pool Committee (QPC) is reviewing the 2014-2018 Technician question pool for revisions and updates. The QPC will accept comments and suggestions from the Amateur Radio community via e-mail through March 31, 2017.

The NCVEC QPC will take all comments and suggestions into consideration as it updates the Technician question pool for 2018-2022.

Input from the Amateur Radio community may include suggestions for new questions, changes to the topic areas, or changes to existing questions in any of the current Amateur Radio examination question pools.

Submit comments by email to: **qpcinput@ncvec.org**

Is there a market for a $400 “prepper” radio?

By Dan Romanchik, KB6NU

A couple of days ago, a reader wrote:

"I would like to know if it would be feasible to build a radio with the following features:

- SSB operation (only SSB is required, CW would be an additional benefit)
- 20 – 50W of power
- Portable-friendly (lightweight, capable of operating at lower voltages from small portable batteries)
- Low receiver current drain
- Coverage of 40m and 80m bands. Very limited coverage is acceptable. Even channelized coverage of a few select frequencies would be acceptable.
- S-meter

"It strikes me that there is a large market for ham radio products for “preppers,” and there has been a lot of interest in the Baofeng line of radios from that market. I think there would be a LOT of interest in a radio that could go far beyond line-of-sight and contact friends or family hundreds of miles away. Preppers would have little interest in contacts more than a state or two away, and no interest at all in novel operating modes. I wonder if a radio that trims away excess features (all-mode operation, wide frequency coverage, high power output, sophisticated audio filtering) could be produced for a lot less cost than currently available HF rigs. If so, and it was paired with a decent NVIS dipole and some General-class study materials and sold as a package deal, it could be a huge hit – Something you could tuck in a bug-out-bag, set up in the field, and use to make contacts in a reasonably local area, or set up in your backyard at home and use minimal power to operate.

"Is there a reason why I don’t see radios like this on the market, some kind of technological limitation that would make this sort of thing impractical? If something like this was built, what kind of cost and performance would you expect? I’m certainly not expecting any kind of detailed analysis, but even just a speculation about if such a project could be feasible would be appreciated."

I replied:

"I think one of the reasons you don’t see radios with the feature set you describe is that more full-featured radios are already pretty inexpensive. The Yaesu FT-450D, for example, costs less than $800 and offers 100W output. The FT-817ND, which is designed for portable operation, costs less than $700. Is that too much for preppers?

"While it might seem like you could sell a radio with fewer features for less, I think that you hit the law of diminishing returns. At some point, removing features, doesn’t reduce the cost all that much. For example, removing the CW capabilities from a transceiver capable of SSB operation really doesn’t save that much because in a way CW operation is really just a subset of SSB operation. You’ll save the cost of a key jack, but how much is that? Maybe a buck or two. Having said that, it could be that the big amateur radio manufacturers are overlooking an opportunity here."

We swapped a couple more e-mails about this. He noted, “Most preppers would probably rather buy a high-end AR-15 or several months worth of storage food for $800 than a radio.” I suggested, “If there was a catastrophic event, and you really needed to communicate, wouldn’t it seem silly to have not spent the extra $400 on a really decent radio?”

What do you think? Is my analysis a little too simplistic perhaps? Are amateur radio manufacturers ignoring a potential market?

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Dan, KB6NU, is the author of the "No Nonsense" amateur radio license study guides, and blogs about amateur radio at KB6NU.Com. You can contact him by e-mailing cwgeek@kb6nu.com.

Noise Floor

- The commission should create incentives for FM broadcasters to encourage the use of FM transmitter cabinets that are properly bonded and shielded in an effort to comply with mobile service providers' minimum receiver signal levels.
- Better and updated standards and specifically higher frequency standards for designing, constructing and testing incidental radiators would minimize noise from data busses and interfaces in computing devices.

Noise Floor - Summary & Conclusions

We cannot afford to allow the producers of products with associated RF emissions in our limited electromagnetic spectrum to be proliferated without regulatory action. The matter of our understanding the noise floor versus frequency and what sources contribute to it is of great strategic importance to assure reliable and secure public communications for the safety of all citizens of the USA.

The SBE response made reference to the following statement: "It would be impossible for the commission to engage in effective spectrum management until it develops a more complete understanding of the current state of the radio noise environment."

This further substantiates the need for the noise floor study.

Next VE Session Set for Jan 7th

Exam Fees Remain Unchanged

Braille Exams Now Also Available

If you're looking to upgrade your license or know someone who wants to get their first ticket, EGARA will hold its next VE exam session on January 7th at 10 am. There's also good news for 2017 -- the exam fee will remain at $15. The session will be at the East Greenbush Community Library.

For visually impaired individuals, ARRL has developed Braille exams for all amateur license classes. Anyone interested in taking an exam in Braille should contact the VE team at least one month in advance of the posted exam date so appropriate exam materials can be obtained by the VE team. EGARA's VE contact is Tom Scorsone. Email him at: ***kc2fcp@nycap.rr.com.***

Join the Nightly Ragchew

EGARA members are invited to join the club's 80 meter ragchew every weeknight at 6 pm on 3840 khz. It's a great way to catch up on club news!

Keeping Club Gear On the Air

Tom Scorsone, KC2FCP, demonstrating Echolink equipment at the 270 repeater.

During the past year, extensive work was done at the Camp Pinnacle UHF site (444.700), where preventive maintenance resulted in greatly improved temperature stability and transmitter cooling. The repeater has wide area coverage, reaching to Northway Exit 22, near Bolton Landing, as well as the Ticonderoga region.

A number of maintenance trips were also made to the Loudonville site to make repairs to the antenna cable and the Echolink system on the 270 repeater.

For those who may be unfamiliar with Echolink, see the Echolink website **http://www.echolink.org/** for a complete description of this world-wide system which allows amateur radio access to this and hundreds of other repeaters throughout the world.

Besides becoming acquainted with foreign hams, you can use apps on your smartphone or tablet or laptop to make contact with friends "back home" when on vacation or business travels – all via Echolink.

So if you are monitoring the 270 system and hear a DX call sign, chances they are on Echolink -- give them a call from your mobile, base or hand held. It sure makes the world a more-connected place! EGARA's 270 Echolink system utilizes a direct high-speed Internet connection resulting in superior audio quality. Check it out!

For 2017, plans are already underway to revamp the 220 repeater, with upgrades and relocation to a better site for improved area coverage.

All of these repeaters are there for use by any ham, EGARA member or not – use them! The frequencies are listed on the EGARA website: **http://www.w2egb.org/.**

CALENDAR

January 7, 2017 - EGARA VE Session - East Greenbush Library at 10 am.

January 11, 2017 - EGARA Monthly Meeting - 7 pm at the East Greenbush Masonic Temple - Antenna building workshop.

May 13, 2017 - EGARA Hamfest 2017 - East Greenbush Fire Department.

Pro Tip: Don't Make a Shocking Discovery

The insides of most amateur equipment are complicated, as you know if you've done a tear down. But don't let that complexity intimidate you. A little reading goes a long way—even people who have a lifetime of experience with circuitry need to brush up every now and then. Here is another tip to help prevent injury to you and damage to your device, so your repair comes off without a hitch.

C is for Capacitor

It goes without saying that you should unplug the power cable and any batteries while doing a repair. But simply removing the power source doesn't necessarily mean there isn't a chance of getting shocked. Capacitors store charge. They can be found on power supplies and scattered throughout circuitry.

While a shock from most capacitors in electronics isn't fatal, they can still give you a decent jump. When working with electronics, be sure not to grab capacitors directly or touch them with any conductive material.

If you plan on replacing a capacitor, you should make sure it's discharged first. To make the job easier, build a capacitor discharge tool. You'll find plans and information located at: **https://www.ifixit.com/Guide/Constructing-a-Capacitor-Discharge-Tool/2177/1**.

Remember too that discharge time varies with a capacitor's size. It's important to give the tool enough time to discharge the capacitor completely before starting your work.

For Sale

- ***Heathkit Antenna Tuner Model - SA-2060A*** -- $ 300;
- ***Heathkit Sine-Square Audio Generator Model Ig-5218*** -- $35;
- ***Heathkit Im-28 Vacuum Tube Voltmeter*** -- $35;

For above items, contact Tom Scorsone by e-mail at: ***kc2fcp@nycap.rr.com***.

- ***Ameritron Model Al-811H*** – Linear amplifier uses (4) 811's – with manual – great condition - $700 obo;
- ***Kenwood Ts-480 Hf Rig*** – 200 w PEP output, w/manual, cable, and microphone – like new - $800 obo;

For above items, contact: Steve WB2HPR at ***326-0902***.

Looking to Buy, Sell or Swap?
Send your info to W2RBJ@outlook.com

Keep EGARA Accredited - Join ARRL

EGARA gets many benefits from being ARRL accredited -- but we need at least 51% of our members to join ARRL Consider joining today if you're not.

The East Greenbush Amateur Radio Association

Organized in 1998, by Bert Bruins, N2FPJ, SK and Chris Linck, N2NEH, the East Greenbush Amateur Radio Association, an ARRL affiliate, is committed to providing emergency services, educational programs, and operating resources to the amateur radio operators and residents of the Capital Region of New York State. The club station is W2EGB. The club also has several VHF and UHF repeaters open to club members and the public.