



# CQ

de WA2LQO

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## Communications Systems (continued from August 2010)

By Bob Wexelbaum, W2ILP

When we investigated the probability density by summing the dots on a pair of dice we developed a graph that took the form of a bell shaped curve. What might happen if we used more than two dice? What might happen if we used a very large number? The nature of random thermal noise is similar to the kind of probability density that we would expect to get from many throws of a very large number of dice. It is, as I said last month, like a Gaussian bell shaped curve. The noise I am speaking of is the noise floor, which does not include noise due to natural electrostatics (lightning discharge crackle) or noise from man-made devices, such as engine ignition or motor brush noise. The noise I am talking about is noise that is always present. Measuring the amplitude of the noise floor has been a controversial task until relatively recently. For example, the definition of the *tangential sensitivity* of a pulse radar receiver is the signal strength in decibels, related to a microvolt, required for a received pulse to be 3 dB above the noise floor. If we use an oscilloscope to find the tangential sensitivity of a receiver, we meet with a dilemma, because the visual noise floor on the scope will vary as we vary the intensity of the brightness of the scope. The brighter we make the display the higher the noise level appears to be. It is thus impossible to justify sensitivity measurements made in this way. If we use an analog spectrum analyzer to make the measurement of a transmitted signal, we have the same dilemma because the apparent noise floor will vary with the display brightness intensity. We must always remember that an analog spectrum analyzer is actually a scanning receiver, which has selectivity and sensitivity parameters of its own. These may not be the same as the receiving system that we intend to be evaluating and certainly can't be the ideal parameters that would be similar to those of a perfect receiver, which has a perfectly flat response at all frequencies. Now that we are able to sample signals and their responses at very high microprocessor clock frequencies, using digital spectrum analyzers, we can make measurements that are beginning to approach the kind of results that have been mathematically modeled, using what is known about theoretical random variables. Thermal noise is often referred to as *white noise*. This stems from the fact that visible white sunlight is made up of a spectral density distribution of all of the colors of the rainbow, which similarly approaches the radio frequency spectral distribution of Gaussian noise. "White noise" is not just light noise. It is noise that theoretically includes all the ever-present noise of the entire electromagnetic spectrum, most of which is noise due to thermal molecular agitation. What hams call a CW radio transmitter is actually a long pulse transmitter which keys an RF carrier on and off. Amplitude modulated (AM) transmitters were the first radio telephone transmitters used by hams. Communication system engineering texts use some different terms to define the circuits used in CW and AM transmitters and receivers. The terms used by the com engineers are more general, because they can be used to define all possible modes of communication, not just RF wireless communication. What hams refer to as an AM carrier, com engineers call a *baseband signal*. What hams refer to as frequency conversion, com engineers often call *frequency translation*,... The communications textbook describes a diode AM detector, which it calls an *AM demodulator*. The simple circuit for the

simplest AM receiver can be recognized as part of a crystal set receiver. This detector, like that of the crystal set, only can be used to receive AM signals, such as those on the MF AM broadcast band. It cannot be used as a CW or SSB receiver. An AM signal is fed into the diode cathode and the diode anode is fed to a resistor and a capacitor in parallel, which form its load. That is all there is to the AM demodulator. In a practical crystal set the resistor would actually be the electrical resistance of the headphone. The diode demodulator rectifies the AM signal, eliminating its double side. What remains is the carrier, whose peaks are distributed so as to be an analog of the AM modulation. This carrier envelope would actually look like a saw tooth riding on top of the carrier. It is smoothed by the capacitor in the detector circuit. The time between carrier cycles is extremely small in comparison with the time for the envelope to make a sizable change. Hence the signal follows the audio envelope much more closely than we might imagine and the saw tooth is easily removed by the low pass filter capacitor. If we want to transmit audio that has the most amplitude possible, we must limit an AM transmitter, so that it is not *over-modulated*. Over-modulation occurs when the audio waveform amplitude is greater than the RF carrier waveform amplitude. In an ideal case the audio would be equal in amplitude to the carrier and that condition is known as 100% modulation. Audio from real world voices and music is not constant in amplitude, thus methods must be made by which the maximum audio amplitude can be limited. If the audio volume is decreased for all audio inputs, the average audio amplitude would be too low and far less than 100%. Thus the audio peaks must be clipped and/or the audio must be compressed. Ham communication, which involves only voice, can use compression to advantage. High fidelity music broadcasting requires great consideration for the greater dynamic amplitude ranges of musical transmission. In all cases over-modulation must be prevented, with the least amount of audio distortion possible. We have only discussed analog modulation so far. Digital audio modulation can offer increased dynamic amplitude range without over modulating.

(to be continued)

### **PRESIDENT'S NOTE by ED GELLENDER, WB2EAV October 2010**

After a really long and hot summer, September continued to stay warm and dry up to the very end. By late September I was desperately looking forward to some cooler early fall air. All of a sudden we had a lot of rain and then the temperature plummeted. Whatever happened to that nice fall air? Soon it will be cold enough for hams to remember the antenna work that they wanted to do in the good weather, but only now do they have the time for it. I am sure that is the reason for the stereotype of the ham only doing antenna work in the dead of winter.

For many years I have seen a number of articles in the ham literature concerning the inventor from a century ago, Nikola Tesla. Most of what I have seen concerns only one aspect of his prolific history, the spectacular Tesla coils and their huge sparks. The other day I stopped to pick up some Chinese takeout and on the table there was a pile of copies of a free weekly newspaper "Long Island Press." Nothing unusual about that, but what I found staggeringly surprising was that the cover story was about Tesla! Apparently the abandoned remains of Tesla's 1901-1917 Shoreham facility are now at risk of being trashed entirely, before the historic scientific community can get together to restore them.

It is quite an interesting article and goes into what may have been Tesla's largest Tesla coil, as well as the impact of his less spectacular, but brilliant, work (such as Westinghouse 3-phase AC motors), and even some untested (dare I say flaky?) ideas. Such an article deserves a wider audience. I am figuring out if I should contact the author, and how best to broach the subject. Who knows, the article could be adapted to a technical journal...On the other hand, maybe the author selected the Long Island parts from just such a journal.

73, Ed, WB2EAV

**NEWS about Bob Verity, WA2UVY from John Jeavons, WA2YIY**

Bob Verity, WA2UVY, a Grumman Data System retiree and former GARC member, is no longer responding to chemotherapy and has entered into a hospice program near his home in Memphis, Tennessee, where he lives with his wife of two years, Penny and their two guide dogs. Bob was a net control op of a GARC 2-Meter net during the late 1980s.

*See page 6 for a WAG and GARC Net history. If you are interested, I can reprint a list of WAG standings (number of GARC stations worked by call) as found in my archives of old newsletters.*  
=w2ilp=

**GRUMMAN AMATEUR RADIO CLUB  
MINUTES OF GENERAL MEETING 9/15/2010**

By Karen, W2ABK, Secretary

The meeting was called to order by Gordon at 5:30 PM.

**TREASURER'S REPORT – Ed, WB2EAV**

Finances continue to be in good shape.

**REPEATER REPORT – Gordon, KB2UB**

N2NFI is looking for a satellite station.

Most of the copper grounds that were stolen at the Hauppauge site were replaced.

**NET REPORT – Karen, W2ABK**

Thursday night net on 145.330 had a few check ins.

**VE REPORT – Bob, W2ILP**

Due to a lack of applicants, there was no VE/CE session in September.

**OLD BUSINESS**

We need programs and new ideas for our meetings.

**NEW BUSINESS**

George WB2IKT explained “White Space” on the air and why it is being sold.

**PROGRAM**

A good old fashioned meeting about ham radio, climbing tower experiences, antennas, and latest equipment. Extra Class exam questions and answers were explained.

Gordon, KB2UB brought in a 10 minute CD to keep us updated on some of the latest changes and a reminder about FCC rules and regulations.

The meeting was adjourned at 6:15 PM.

**GARC NETS:**

**40 Meters: 7.289 MHz at 7:30 AM EST Sundays;** Net Controller: Eugene, W4JMX

**2 Meters (via repeaters): 146.745 MHz (-600 kHz; 136.5PL) at 8:15 PM Thursdays**

**145.330 MHz (-600 kHz; 136.5PL) at 8:30 PM Thursdays**

GARC Net Controller Karen, W2ABK

**ARES/RACES NETS: Mondays**

**MEETINGS**

General Meetings of the GARC are held on the third Wednesday of each month, starting at 5:30 PM, at the Ellsworth Allen Park in Farmingdale. Driving directions and maps can be obtained from <http://www.mapquest.com>. It is suggested that the GARC web site be checked to be certain of meeting location, which may change after this newsletter is distributed. Board meetings are held a week before the General Meeting at the Bethpage Community Park and Rink.

### **WEB SITE**

The GARC web site can be found at <http://www.qsl.net/wa2lqo> . Webmaster is Pat Masterson, KE2LJ. Pictures of GARC activities, archives of newsletters, roster of members, and other information about the GARC may be found there.

### **INTERNET LINK OF THE MONTH FOR INTERNERDS**

You may have seen men climb radio towers in the past, but if you have not seen the video link I am addressing here... You ain't seen nothing yet! The address is:

<http://www.youtube.com/watch?v=3wsPd5U8mBQ>

This shows two men climbing a 1786 foot tower. To appreciate how high that tower is you may compare its height to that of the Empire State Building, which is only 1453 feet tall. I am too scared to venture on the roof of my house. I was afraid to climb my 70 foot tower, which held a Mosley tri-band beam. My number two son climbed it when we had to dismantle it about 18 years ago. He took apart the antenna and rotator on its top, before we winched it down. I was afraid to watch him...but I managed to take a few pictures of the event, just to prove that he did climb the tower. Watching the guys climb the 1786 tower was thus an immense contrast. Although the weather was a bit foggy, at the top of the tower you could see the curvature of the horizon. (proof that the Earth isn't flat.) You might muse about the "What ifs...?" involved. What if there was a heavy rain storm and lightning when the guys were at the top? What if either of them had a belly ache or a nature call? What if one of the bolts that they had to step on was loose? They did make it OK. I guess if they had to climb much higher they would have needed oxygen masks.

### **PUZZLE**

This month I won't give you a cryptogram to solve. Instead I will give you a physics problem. I'll provide the answer in next month's newsletter. Be careful when you solve this problem, because it isn't as simple as it might appear to be at first glance.

There is a truck that weighs just slightly more than the weight that would allow it to safely go over a bridge. The cargo on the truck consists of a cage full of a large number of big heavy birds. If the birds are all forced to fly can the truck make it across the bridge? *This is a theoretical physics problem. No numbers are given in a problems of this type because it is a test of your knowledge of physics concepts; not a math test.*

Solution to the September 2010 Cryptogram:

**THERE ARE WORSE THINGS IN LIFE THAN DEATH. HAVE YOU EVER SPENT AN EVENING WITH AN INSURANCE SALESMAN?**

--WOODY ALLEN--

**GARC Officers**

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To submit articles or ham equipment advertisements, contact the editor.

Articles will only be edited when permission is granted by the author.

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**GARC VE EXAMS**

We normally continue to proctor exams for all classes of ham licenses on the second Tuesday of each month, starting at 5:00 PM. The exams are given at Briarcliffe College, 1055 Stewart Avenue, Bethpage, NY, (formerly a part of the Grumman complex) Room: Long Beach #5.

Present Ham Exams are: Element 2 - Technician, Element 3 - General, Element 4 - Amateur Extra.

All applicants must preregister by contacting W2ILP (see above). Time and location of exams are subject to change. If there are no applicants exams may be cancelled. The fee for 2010 is \$14.00 for all exams taken at one sitting. New, first time applicants should be aware that their Social Security Number will be required on the application form unless they register with the FCC for an FRN. Applicants for upgrades should bring both their present license and a photocopy of it. All applicants should bring picture ID such as a driver's license.

Study material may be bought from the ARRL or the W5YI Group by contacting:

<http://www.arrl.org> or <http://www.w5yi.org>. All VECs use the same Q & A pools.

**COMMERCIAL RADIO OPERATOR FCC EXAMS**

We are certified by the National Radio Examiners to administer exams for all classes of FCC commercial radio operator licenses. All Commercial Operator License Examiner Managers (COLEMs) use the same Commercial License Q & A pools. Adminstrating fees vary. For information or to register contact W2ILP.

**EDITORIAL**

As you can see I have changed the format on this page. I hope that this will continue to provide what is called the "boiler plate" information; most of which need not be changed every month. I welcome your comments in any case. I don't have much to write about here. I admit that I talk too much and have written enough in this month's newsletter...so enuf sed for now.

73,

W2ILP (I License People)

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### **HOW DID THE WAG AWARD BEGIN?**

The GARC no longer issues WAG award certificates, but some of our members have asked about how WAG began, so I researched old "CQ de WA2LQO"s for information about this subject, as well as information about the history of the GARC nets. I found an article by Zac, WB2PUE in the April 1996 newsletter which enlightened me. Zac recalled that at the January 1976 GARC meeting, Ray, W2ZUN and Joe, NIIL (formerly WA2HSQ) suggested that the GARC increase the traffic on our nets by issuing an award, similar to awards issued by other clubs. The other clubs called such awards WAM (Worked All Members), but the GARC award would be called a WAG award (Worked All Grumman). To earn a WAG a ham would have to prove that he or she had worked a number of GARC members. The specific requirements were detailed in newsletters. Initially Bert, K2DOD was elected to be caretaker of the award listings and to establish the ground rules. Eventually Zac took over the task of keeping the QSL records and issuing the certificates. The first recorded contacts were via the Bethpage 2 Meter repeater and also on 2-meter simplex. A 75 Meter phone net ran from Feb. 15, 1976 through December 31, 1978. A 15 Meter Wednesday evening net ran from March 17, 1976 through May 12, 1976. Zac listed some of the notables who were: W2DKM, WB2BNY, W2WDD, W2HGV, W2ZVJ, W2III, W2BBC, K2KNC, W2ZUN, WB2AMU, WA2HSQ, WB2EJU, W2JYL, W2OMO, AN2MFY, WB2HFT, K2LOT, WA2TFW, K2TGC, K2AAN and WA2JLM. When Jim, WA2WDD moved to Florida, the 40 Meter net was born and it was first logged on Sunday morning, June 9, 1979. It still runs. Its initial purpose was to get the retirees who lived in the south into the activity. A 20 Meter net was run by Hank, W2ZZE from the club station. Check-ins included KF5HD from New Mexico, KG8QV (formerly W2BBC) from California, and some former Northrop hams. Zac admitted that he might have missed many other WAGs, and he wanted to hear about it from the editor. Zac commented that past President Jack, AD4N had an outstanding signal on 20 and 40. And So...that was the rest of the story!

--w2ilp--