

CQ *de* WA2LQO

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COMMUNICATIONS SYSTEMS (Continued from January 2012)

By Bob Wexelbaum, W2ILP

There are many codes described in the communications course text book. They all are based on some special requirements, but I'll not describe them in detail here. I'll just name them, and if you are interested you can look them up in Wikipedia, where the math involved with their generation may be studied. There are codes called Hadamard; Golay; Bose, Chaud and Hocquengham (BCH); Reed-Solomon (RS), and there are unnamed codes that were developed to work in a way that can correct burst or clustered errors by block or convolutional interleaving. With so many possible codes one might wonder why it is usually possible for hackers to decode the codes and read secret messages. The philosophy of the hacker is that any code that is generated by a computer may be decoded by another computer. Even when codes are changed automatically by the time of day, hackers have managed to decode them. It is not my purpose to delve further into this subject, but both the modulation method and the coding must be considered when security is important. The basic codes are at first considered to be used at baseband, but the codes themselves may control hardware in such a way that they change the modulation mode as well as modulate the transmitter's ultimate mode.

This brings us to the subject of SPREAD SPECTRUM (SS) which is mentioned in the last chapter of the Taub and Shilling Communications text. When I first read about SS it was considered ultra-secret and my original SS concepts were limited to switching RF sources so that signals could frequency hop. I bought an ARRL soft covered book titled "The ARRL Spread Spectrum Sourcebook." That book is now obsolete because it is mainly a collection of articles (mostly from QST and AMSAT) about ham experimenters who were trying to get the FCC to permit them to use SS on the ham bands. Most of their early modulation schemes were never approved although experimental permits were given to some hams for tests on microwave ham bands. The strange thing is that the digital modes that are now in use were developed by hams in Japan and South Africa, who usually partnered with American or British hams. Once their modulation modes were accepted by foreign governments our FCC was willing to accept them as international standards...More willing than accepting the work of American hams in AMSAT or TAPR! The introduction to the ARRL SS Sourcebook is written by a man named Robert C. Dixon. Dixon praised the work that the hams had accomplished but he lamented that he himself could never pass a Morse test and thus he hadn't become a ham. Robert C. Dixon became the world's SS authority when his book "Spread Spectrum Systems" was published in 1984. I once had that book but recently I bought a later edition called "Spread Spectrum Systems with Commercial Applications" that came out ten years later in 1994. (Amazon had it used for about ten bucks.) The uses of SS have advanced so greatly since 1994 that even this book's applications are becoming obsolete...but the communications theory of SS will never become obsolete, just as Claude Shannon's rule will never be altered.

To begin with: What is a Spread Spectrum System? This has been argued by many whose loose definition has not been exactly what others expected, and it is now recognized that only Dixon can indelibly define SS. I have had lots of trouble trying to justify exactly what a fractal antenna is and is not, and what a fuzzy system is and is not...but for SS I can now quote Dixon, who is the world's foremost authority.

I have defined what a spectrum is here and how an oscilloscope can show amplitude on the vertical axis and time on the horizontal axis, while a spectrum analyzer can display amplitude on the vertical axis and frequency on the horizontal axis. Every transmitting or modulating system has a characteristic signature that includes not only the frequency at which the signal is centered, but also the bandwidth of the signal when

modulated by the intended signal waveform. A spectrum, as we speak of it, is the frequency domain representation of the signal, and for our present purpose, especially the modulated signal. Any signal may be presented in the frequency domain. This is accomplished by spectrum analyzers...but spectrum analyzers are not perfect because they are actually scanning receivers which have limitations. The theorist can however conceive of a perfect mathematically correct frequency domain. In fact mathematical operators can transform time domain functions to frequency domain functions and back again. We had talked of the Fourier transform which serves this purpose but I would rather not depend on presenting calculus or Fourier and Laplace transforms here to prove that when we modulate a signal with a $\sin x / x$ time function waveform we get a rectangular frequency spectrum and when we modulate a signal with a rectangular time function (pulse) we get a $\sin x / x$ frequency spectrum. If we modulate with a triangular envelope we get a $(\sin x / x)^2$ frequency spectrum. Here is the interesting one; - If we modulate with a Gaussian envelope in the time-domain we get a Gaussian frequency spectrum! Spread Spectrum is literally a wide frequency band; much wider than the minimum bandwidth required to transmit the information sent. Remember that theoretically a Morse (CW) signal has zero bandwidth, so any signal wider than zero that carries information at the rate of Morse could be a SS signal by this first definition. An analog voice signal for example, can be sent using AM in a bandwidth twice the information bandwidth itself. SSB or low deviation FM can transmit voice in a bandwidth comparable to the bandwidth of the signal itself. A SS system can take a voice channel with a baseband of only a few kHz and distribute it over a band many MHz wide. This can be accomplished by modulating the information to be sent together with a wide band encoding system. Dixon's simple example of SS is conventional FM in which deviation ratios greater than one are used. As in all other SS systems, a signal-to-noise advantage is gained by the modulation and demodulation process. For FM signals this gain advantage is called "process gain" it is: $3 \beta^2 (S/N)_{info}$, where $\beta = \text{deviation ratio or } \Delta f_{carrier} / f_{modulation}$, $(S/N)_{info} = \text{signal-to-noise ratio in the baseband or information bandwidth}$. The factor $3 \beta^2$ is the factor by which the FM signal-to-noise ratio exceeds the AM signal-to-noise ratio. Dixon says that wideband FM could be classified as an SS system technique because the RF spectrum produced is much wider than the transmitted information...But he backs off from this example by saying that in the context of his book only those techniques are of interest in which some signal or operation, other than the information being sent, is used for broadbanding (or spreading) the transmitted signal. I know that some of you are waiting for Dixon's precise definition of a SS system but you will have to wait until next month because I'm running out of space and can't include Dixon's famous four criteria here now.

(to be continued)

PRESIDENT'S NOTE by ED GELLENDER, WB2EAV

On January 8th we had the latest Ham Radio University at Briarcliffe College and it was, as always, interesting, informative, and fun. Unlike last January when we had lots of snow, this year it was a delightfully mild winter's day. If you haven't been to one, you should put it on your next year's calendar right now. It is usually the second Sunday in January.

At this year's HRU (as those in the know call it) they added something new; a club forum. The staff asked each of the local radio clubs to be sure to put together a presentation describing its activities, and in one session, every club had a chance to present itself to the audience. Unfortunately, there were few people attending who were not already familiar with all the local clubs. I gave the presentation for our club and it went well. To no one's surprise, however, none of the presentations brought forth a crush of people interested in joining. Actually, I am not sure that anyone joined any club at all as a result of this forum; I suspect we were literally preaching to the choir. I guess that the organizers will have to think about that for the next time.

Each club was asked to bring several things, including a club banner. The larger, better equipped clubs have them, but the smaller clubs like ours do not. When I told them that I did not have access to a banner, they told me to just make something quick and simple. I put together a computer printout on a sheet of 11 X 17 paper and glued it to an open manila folder. It looked OK as long as it was not compared against a real one.

73, Ed, WB2EAV

GRUMMAN AMATEUR RADIO CLUB
MINUTES OF GENERAL MEETING 1/18/2012
By Karen, W2ABK, Secretary

The meeting was called to order by Gordon at 5:40 PM

TREASURER'S REPORT – Ed, WB2EAV

Finances continue to be in good shape.

REPEATER REPORT – Gordon, KB2UB

Repeaters are working.

NET REPORT – Karen, W2ABK

Thursday night net at 8:15 PM on 146.745 MHz had one check in.

Thursday night net at 8:30 PM on 145.330 MHz had two check ins.

Sunday morning net at 7:10 AM on 7.289 MHz was noisy.

Sunday morning net at 8:15 AM on 14.289 MHz – Nothing heard.

Sunday morning net at 8:30 AM on 21.289 MHz – Nothing heard.

VE REPORT – Bob, W2ILP

There were no applicants. Therefore the January VE session was cancelled.

OLD BUSINESS

GARC dues are due. Those who have not yet paid please see instructions below.

NEW BUSINESS

We need programs and speakers for our meetings.

PROGRAM

We discussed the Italian cruise ship accident.

Gordon brought in a DVD on Marklin Trains in Germany and around the world. It showed how to build, paint, and operate model trains.

GARC NETS: HF: 7.289 MHz at 7:30 AM EST Sundays Net Controller: Eugene, W4JMX

As per Gene's recent message, operation on 14.289 MHz or 21.289 MHz may be attempted if 40 Meters is not usable. Comments or suggestions may be e-mailed to Gene. His e-mail address is:-
w4jmx@earthlink.net

2 Meter repeaters: Net Controller, Karen, W2ABK **Thursdays: 146.745 MHz at 8:15 PM, 145.330 MHz at 8:30 PM; Both repeaters -600 kHz, 136.5 Hz tone.** **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 map 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 Skating Rink Center.

WEBSITE: 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

2012 MEMBERSHIP DUES ARE DUE

Dues are the same as last year: \$20 each, or \$25 for two members who reside at the same address. Retirees living out of town need pay only \$10. We are now offering an introductory \$10 rate to new members, which should be included with a membership application form. Checks should be mailed to: Grumman Amateur Radio Club, P.O. Box 0644, Bethpage, NY 11714-0644.

INTERNET LINK OF THE MONTH FOR INTERNERDS

It has been my policy to only post stuff that was originally written by GARC members or myself in this newsletter. However, I get inputs from other clubs that are often more optimistic than my own prattle. Here is one from another ham club's newsletter editor that I believe may be of interest, and it is a positive way of interesting new hams into our hobby...especially the types who like to do it themselves. The links included can be your Internerd Links for this month. -w2ilp--

AMATEUR RADIO FINALLY JUMPS ON THE MAKER BANDWAGON

By Dan Romanchik, KB6NU

Over three years ago, I wrote that amateur radio should do more to associate itself with "The Maker," or "do it yourself" (DIY) movement. (www.kb6nu.com/lets-get-on-the-maker-bandwagon/). Well, it finally looks like it is going to do just that.

Just before the first of the year, the ARRL unveiled its DIY campaign (www.arrl.org/news/arrl-launches-new-diy-campaign). The most visible part of the campaign is the video (www.youtube.com/ARRLHQ), but there are also some other bits, including: A flier to be handed out to interested persons, Buttons that say "Ask Why I DIY with Ham Radio," and a PowerPoint presentation and speaker's notes that you can use to give a presentation to an amateur radio club or a non-ham group. These items are available from the ARRL website, www.arrl.org/DIY.

"CQ Magazine" is also on board and is jumping into the DIY bandwagon. They recently announced that they will run a quarterly "Maker" column, written by Matt Stultz, KB3TAN. Stultz is the founder of HackPittsburgh, a "hackerspace" or community workshop for Makers in Pittsburgh, PA. He has been a ham since 2009 and has integrated amateur radio into many of HackPittsburgh's activities. Stultz's first column, titled "We Are Makers," will appear in the March issue of CQ Magazine.

In 2006 there was a Maker Faire, hosted by "Make Magazine" (www.makerfaire.com) in San Mateo, CA. Since then Maker Faires have also been held in Austin, TX, New York, NY, and Detroit, MI. Maker Faires are showcases for all kinds of crazy projects that people are working on. Hams have a presence at these events. This year an amateur radio group participated in the flagship California Maker Faire. The theme of which is The Arduino (www.arduino.cc), Applications in Amateur Radio. Michael, NE6RD, who is organizing the presentation, has lined up several very cool projects. On the face of it, this may not seem very exciting, but my twist on this is that instead of directly keying a transmitter, I plan to have the Arduino actuate a solenoid that will press a straight key. That should make the project more visible.

Hams like to claim that we were the original Makers and Hackers. We certainly have a long history of DIYing. Let's show these upstarts exactly what ham radio is capable of. Perhaps, in the process, we'll even get a few of them to join us.

PUZZLE

This month I will give you another cryptogram to solve:

Y OCVF UL JV P ZVDPK MPTJIVN, JOU ALR Y WOCU TPSV TVAUPI JVUC . UZPU'C ZLR

Y ILCU TK TYAF. -CUVDV PIIVA--

The solution for the January 2012 cryptogram is: THE SECRET OF LIFE IS HONESTY AND FAIR DEALING. IF YOU CAN FAKE THAT, YOU'VE GOT IT MADE. -GROUCHO MARX--

This puzzle was indeed a challenge because somewhere along the way JFY became JYF making "The" become "Teh". Aside from that error, there was no space left to solve the puzzle in the newsletter so it had to be copied elsewhere.

GARC Officers

President: Ed Gellender, WB2EAV M/S:X08-14 516-575-0013 edward.gallender@ngc.com
or wb2eav@yahoo.com

Vice President: Gordon Sammis, KB2UB Retiree 631-666-7463

Secretary: Karen Cafalo, W2ABK 631-754-0974

Treasurer: Ed Gellender, WB2EAV (see above)

WA2LQO Trustee: Ray Schubnel, W2DKM Retiree

1 Yr. Board Member: Jack Cottrell, WA2PYK Retiree 516-249-0979

2 Yr. Board Member: Dave Ledo, AB2EF

2 Yr. Board Member: Jack Hayne, WB2BED

2 Yr. Board Member: George Sullivan, WB2IKT

Newsletter

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Editor: W2ILP 631-499-2214 w2ilp.radio@gmail.com or w2ilp.radio@yahoo.com

Contributing writers: All GARC members (we hope). To submit articles or ham equipment advertisements contact the editor. Articles will only be edited when permission is granted by the author.

GARC Webmaster

Pat Masterson, KE2LJ Retiree 813-938-4614 Pat-Masterson@tampabay.rr.com

GARC VE Exams

We normally 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 in room: Long Beach #5. Ham Exams are: Element 2 – Technician, Element 3 – General, Element 4 – Amateur Extra Class. All applicants must pre-register by contacting W2ILP. Time and location of exams are subject to change. If there are no applicants VE sessions will be cancelled. The fee for 2012 remains \$14 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 an upgrade should bring 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-VEC or W5YI-VEC <http://www.arrl.org> or <http://www.w5yi.org>. All VECs use the same Q & A pools.

Commercial FCC Radio Operator Exams

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

Editorial

We have not had any applicants for our December and January VE sessions. This lack of applicants may be due in part to two problems. Potential applicants getting their information from the GARC website have been getting my old address which changed over a year ago when I quit using Cablevision for my ISP. Another problem arose when the ARRL stopped posting our schedules on their website. Their VE manager was initially avalanched with many VE schedules from all locations. Because we use W5YI-VEC, we may have had a lower priority, and we missed getting our January 2012 information posted on the ARRL's lookup listing in time for the January session. Both problems have been rectified now so if we don't get any applicants for February, I may have to find other excuses. I attended the HRU 2012. The weather was ideal. In contrast to previous HRUs, there was no snow, rain or ice to prevent anyone from attending. In fact, the weather was so good that folks may have skipped it to enjoy other outdoor sports or hobbies elsewhere. There still was a fair turnout, but many of my acquaintances who had been at previous HRUs weren't there this time. The familiar banner of the QCWA Chapter was conspicuous in its absence.

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THE TRUTH ABOUT HEDY LAMARR by W2ILP

Having read two of Hedy Lamarr's biographies, and one autobiography which Hedy supposedly wrote herself but later claimed was a ghost-written exaggeration, I have found many inconsistencies. There were several explanations as to why and how Hedy had left Austria. She originally had claimed that her first husband, Fritz Mandl, had kept her prisoner and she had to pose as her maid in order to escape from him. In a sexier version, she posed instead as a prostitute to escape from her husband. In both cases she claimed that she was unable to take most of her valuable possessions with her. The truth is that Hedy's parents and her first husband were Jewish, which left them at risk from the Nazis. Like many wealthy Austrian Jews they posed as Catholics until they could leave. Hedy was offered a job in Hollywood by Louis B. Mayer, and her husband moved to South America where he resumed munitions manufacturing, dealing with both the axis and the allies during WWII. Initially the separation may not have been meant to be final but each went their own very different ways. Her father died of a heart attack soon after his bank was confiscated by the Nazis, and Hedy went to great expense to get her mother to England, then Canada, and finally to the U.S.

Except for a few Jewish actors she worked with, Hedy never told anyone she was Jewish; not even her own children. Her first child was said to be adopted, but was rumored to be Hedy's, fathered by one of her lovers. She had two other children by one of her husbands. As Hedy aged and her beauty faded she was no longer offered movie roles. She was caught shoplifting small items in California and then in Florida, possibly just to keep her name in the press, as she owned a fine collection of valuable art work that she refused to sell.

You cannot learn much about Hedy's work on Spread Spectrum communication from any of her biographies. They were written for people who read romantic novels or movie magazines, and were very vague on technical matters. The relationship with her alleged co-inventor musical composer George Antheil is also both puzzling and hazy. There are multiple versions of how they met, why Hedy invited George to her home, and what Antheil's Hungarian wife thought about Hedy...but enough said about that subject. Robert Dixon, who as mentioned earlier in this issue is the authority on Spread Spectrum, does not give any credit to Antheil or Lamarr, although they did manage to get a generic patent that proposed such a system without specifying any practical applications or mathematically explaining any theoretical advantages.

--w2ilp