WIRELESS HILL BEACON

Delaware Valley Radio Association



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Meeting – February 13th 2013

The regular monthly meeting will be held at 7:30 PM on Wednesday, February 13th, at Our Lady of Good Counsel Church, on Upper Ferry Road at Wilburtha Road in West Trenton. The site is easy to reach from I-95 or NJ-29. Talk-in is available on the 146.67 (PL 131.8) and 442.65 repeaters. The directors meeting is 1 hour earlier at the club shack.

Meeting Minutes

Meeting convened at 7:35pm, after members and guests were introduced, president Dave asked for the committee reports.

1-Bob N2HX-the repeater has been off at times. Bob and Hy found that the battery connections to the repeater were faulty and they corrected the problem. Bob is borrowing some test equipment to further check out the repeater. If the 2m repeater is off, use the 440. He also plans to put echo link on the 2m repeater.

2- Lloyd, director of field day plans winter field day for Sun. Sept.26 and summer field day will be members using their own equipment. A prize will be given for the most contacts-date to be announced. Lloyd also has people coming to the shack Friday evening and Sunday 8-9pm. He gives code and licensing lessons and may get a possible 17 new members for the club.

3-Russ# will be in charge of painting the shack, the party may include some eagle scouts working on their community service project.

4-There was a discussion to erect signs to identify the location of the shack at the road entrance and in front of the shack.

5-A possible Ham-Cram was suggested as a money raiser to prepare for the licensing exams and to charge a fee of \$50 including \$18 for the book. Suggested time: Sat.10am to 1pm.

6-Treasurer Ron reports a balance of %1090., dues are coming in.

7-The annual BSA merit badge classes were held in Armstrong Hall at the college of NJ.Forty six scouts completed their requirements for the Radio merit badge.

8-A basic soldering class is scheduled at the shack for Sat. the 26th of Jan.

9-Tom will head the Audit committee required by our bylaws annually. He will need two volunteers.

10-During Sandy the Comcast internet was shut down, No RACES events were scheduled. ARRL sent transceivers to the shore areas. Races meetings are held on the last Monday of the month at 8pm except for May and Dec.

Races meetings can be monitored on simplex 147.57.

After refreshments a very interesting collection of telegraph keys was presented.

Submitted by Cal, KC2CKI

BALANCED LINES 2013 Installment 2 by Bob Schroeder, N2HX © 2013

THE STORY OF Q

When most people think of Q they think of that annoying character from the Q Continuum (marvelously played by actor John de Lancie) whose sole mission is to beguile Capt. Jean Luc Picard and the crew of the Enterprise. This essay, however, is about Q, the Quality Factor. In the February issue of **QST** magazine (page 37) there is a nice article about Q. Unfortunately, the author didn't go into sufficient detail about the derivation of Q and how it fits in with series resonant circuits and wire antennas.



The history of the quality factor (sometimes called the figure of merit) dates back to the days of vacuum tubes and series resonant circuits. As you know from your electronic theory studies, whenever a circuit involving inductance and capacitance is energized with any kind of AC current, the element of reactance enters into play. You may have had to solve for reactance as part of a theory exam or perhaps at your own workbench. You may recall seeing the term j ω . The imaginary number or operator j is the square root of -1 and the lower case Greek letter ω omega is the expression for $2\pi f$. When the voltage applied to a capacitor or inductor goes to any frequency above DC, reactance (X), and its counterpart, impedance (Z), get created.

Capacitors have little if any internal resistance, so the R they contribute to a series resonant circuit is negligible. Inductors, on the other hand, do have a finite amount of resistance associated with them, especially coils that have many layers of windings. That said, the definition of Q is:

L ω /R or 1/C ω R = Q or, written another way, X_L/R or X_C/R = Q

Below resonance, X is mostly capacitive. Above resonance, X is mostly inductive. The voltage across the coil or capacitor at resonance is equal to the voltage across the entire circuit multiplied by the factor Q.



Figure 1 shows a typical resonance curve for the circuit shown. As you can see, the sharpness of the curve in this example is best when R= 10, slightly broader when R= 20, and the widest when R= 30. In the days of vacuum tubes, designers would use this property of high Q as a voltage multiplier to derive voltage to drive the grid on a vacuum tube because the voltage at resonance (at low R, high Q) is greater than the applied voltage.



In Figure 2 we can define the property of bandwidth by looking at the RMS values of current with differing values of Q. Look at the range of frequencies on the X axis. The bandwidth (f_2 minus f_1) is wider and the resonance current is lower with the broad curve (low Q) than the high Q curve, which shows a narrower bandwidth and high Q. If you want to use the analogy, think of the RMS or 0.707 point on this resonance curve as being similar to the "3 dB point" of a power curve.

Whether you read the QST article or not, let me say something about energy "storage" in an antenna circuit. In the presence of pure capacitance or pure inductance, no power is dissipated as heat, and the energy stored at any time t in a magnetic or electrostatic field is turned back to the circuit at t+1. In reality, there is resistance loss in the dielectric of the transmission line and the radiation resistance of the wire antenna itself.

So why do we need to care about Q? Whether you use vacuum tubes or not, there are two important reasons. First, we just learned that series resonant circuits at high Q have voltages much higher than the applied voltage. For safety reasons, it is important to know that there can be lethal voltages and currents flowing inside of a tuning network (a.k.a. matchbox) when at resonance. On

some models, you may notice that the tuning shafts connected to the front panel controls are made of fiber or some other non-metallic material. When tuning a network, these knobs are all that separates you from high RF and lethal voltages. This is why you should NOT tune your matchbox under full power! You only need a watt or two to deflect your in-line wattmeter or grid and plate meters. (Plus, you won't melt your output tubes and burn out your plate choke!) Once you've obtained a decent match, then you can apply full power and go on the air.

The other reason for knowing about Q is because it is directly related to the diameter of your antenna wire (measured in circular mils). A thick wire has less Q and more bandwidth than a thin wire, which has high Q, and narrow bandwidth. Or in other words, f_2 - $f_1 = fR/Q$ where R= bandwidth.

Let's say your property has only enough space to erect a 40m wire antenna. And let's say you enjoy operating the popular phone net on 7.272 MHz. This antenna will have a length of 64 feet, 4 inches. But you live in an area that requires you to put up a "stealth" long wire that your neighbors won't be able to see, so you use some very thin magnet wire. No problem- the antenna will still work; however, the bandwidth either side of 7.272 MHz. will be narrow compared to using a much thicker wire. This means that you will have to re-tune your transmitter if you operate above or below the antenna's design frequency. Had you used a thicker antenna wire, your "leeway" would be greater.

References: <u>Principles of Radio</u> (Henney) 3rd. Ed. (1938), <u>Fundamentals of Radio</u> (Everitt) (1946), <u>Essentials of Radio</u> (Slurzberg & Osterheld) (1948), <u>ARRL</u> <u>Antenna Book (</u>1949)

PHONE PHREAKS REDUX

In the September 2012 issue of the *Beacon* I wrote a piece called "Striking A Familiar Note". It was about AT&T and the techies who hacked into the long distance network via the 2600 Hz. note from a Cap'n Crunch whistle. Now there's a new book on the subject. It's called *Exploding the Phone* by Phil Lapsley. (Grove, \$26, 431 pages)

I haven't had a chance to read it yet, but from what the reviews say, it's a fairly comprehensive history about Phone Phreaks, including such famous ones as Steve Wozniak and Steve Jobs. Also mentioned is "Captain Crunch" himself, John Draper.

Once I've read the book, perhaps I'll write a review of it myself. In the meantime, don't wait for me. If the subject appeals to you, by all means go read it now!

THE HIDDEN KEY OF CORNELL

Should you ever happen to visit the campus of Cornell University in Ithaca New York, be sure to stop by the statue of its co-founder, Ezra Cornell (1807-1874).

When you reach the statue, take a look behind it. Engraved into the plinth right behind his knees is a telegraph machine. Besides being a carpenter and entrepreneur, Cornell also worked for Samuel F.B. Morse and became the founder of the Western Union Company. The first telegraph link was between Baltimore and Washington. The ribbon-cutting ceremony took place on May 24, 1844, and the first words transmitted over the system were: "What hath God wrought?".

All for now. Comments invited.

Bob Schroeder, N2HX Past President, DVRA

DVRA Nets

2-meter & 70-cm nets on the club repeaters 146.670 pl 131.8, 442.650 pl 131.8

2-Meter Nets: The Pepper Net 10:00 PM Daily Mercer Co. Emergency Net 7:30 PM Tuesdays KB2EGI, coordinator.

70-cmNets: The Pepper Net 9:00 PM Daily

Training & Upgrade Classes

Don Wright, AA2F, periodically holds Technician and General classes. Classes are held at various locations. Call Don at 609-737-1723 to register.

Logbook of The World

Mike AB2IO reports that the current W2ZQ LOTW stats As of: 12/27/2012 # of QSOs 16,555 # of LOTW QSLs 5,099 Latest QSL matches 12/27/2012 2009-03-08 13:42:54 2008-02-17 14:02:26 rd3dt 20M SSB 14.18660 EUROPEAN RUSSIA rd3dt 20M CW 14.02055 EUROPEAN RUSSIA 2007-02-17 13:28:32 2006-10-29 16:15:14 2006-06-25 04:53:59 EUROPEAN RUSSIA rd3dt 20M CW 14.016 21.352 3.500 EA3DUM 15M SSB SPAIN UNITED STATES OF AMERICA WA2MCR 80M SSB

Fame and Fortune Await

Want to become rich & famous – write an article for the DVRA Beacon. Fame among local hams almost guaranteed – fortune is up to you (and your luck in Powerball). Deadline for submission is one week before the monthly meeting (that would make the deadline the first Wednesday of the month). For details contact Alex / AB2RC – ab2rc@ab2rc.net