RADIOACTIVITIES

NEWSLETTER OF THE ARGONNE AMATEUR RADIO CLUB

W9ANL

Volume XLVII, Number 11 **November 2006**

Club Meeting

Nothing received.

The Treasurer's Report

Nothing received.

REMINDERS

CLUB BREAKFAST: Always the 2nd Saturday of each month, 8:30 AM at:

Old◆Country Buffet◆

59th Street and LaGrange Road in LaGrange

CLUB NETS: Thru our Club Repeater 145.19.
SKYWARN NET: Mondays in season at 7 PM with Deni, W9DS.
THE CLUB'S 9PM NET: every Monday with Jack WA9FVP.
THE NIGHT PATROL: every night at 10:30 PM with Paul, W9FNM.
THE BREAKFAST CLUB: every morning at 8 AM.
THE NOONTIME NET: every weekday at noon.

Mil's Corner for November

Nothing received.

Top 10 Things That Happen When You Retire From The RF Group.

by Jack Albert (now retired), WA9FVP

At Tellabs and here at Argonne, in the spirit of David Letterman, I made several foolhardy attempts at comedy. At my retirement lunch yesterday I handed out 10 pieces of paper and each person read a joke from the top 10 list. Working in the electronics industry or if you're a ham radio operator you could probably relate to my Top 10 List. Hopefully, you will find this to be funny.

10. Your wife becomes your chief tech and every Friday morning at 09:15 she hands you your assignments for next week.

9. When you change a light bulb in the kitchen you LOTO (lock out) the light switch.

8. You tell your retired friends what you did at Argonne, and when you walk away they mumble to each other "Boy is he full of it".

7. You have a bad dream where your furnace goes out, but when you go downstairs to fix it, the furnace is a klystron and the heating ducts are waveguide.

6. Now I can surf the net all day!

5. That secret slush fund you had at the Argonne Credit Union now buys flowers for your wife's garden.

4. It's the Jerry Springer Show!

3. "We ain't got no badges. We don't need no badges. I don't have to show you any stinking badges!" (The Treasure of the Sierra Madre)

2. That meager 100,000 bucks in your Argonne retirement is more money than the RF group gets next year.

And the number one thing that happens when you retire from the RF Group

Boy do I miss that yummy food at the Argonne Cafeteria!

The Extended Double Zepp

by Deni, W9DS

Wanting a better aerial for 80 meters, I looked up Richard Fenwick, K5RR, article in December 1983 QST to refresh my memory. He built 3 element beams on 280MHz to explore element spacing and tuning. The maximum gain from a dipole is at 5/4 wavelength 3.1db gain over a ½ wave dipole. The double zepp results in a compact high gain yagi style with 3db more gain narrower beam width for the same number of elements, 3. Element tuning uses variable capacitors in parallel with fixed coils. All elements are 1.22 wavelength long. Driven element is fed through a coiled coaxial type of balun for balanced feed. The model director and reflector spacing of 0.15 and 0.2 λ then 0.175 and 0.225 λ and 0.25λ and 0.2λ was tuned only for maximum gain and max front to back ratio. Results correspond to those of usual parasitic arrays. Wide spacing equals less gain and front to back ratio and increased bandwidth compared to the 0.15 and 0.2 λ director and reflector spacing.

Closer spacings were out because of increasing narrow bandwidths were encountered. The 3 element yagi is 7dbd and the extended zepp beam was 10dbd. A 0.7dbd loss occurs when tuning for maximum front to back ratio and not highest forward gain. It's best to tune up first the director with reflector removed or open circuited. Director is tuned for maximum signal off the front or minimum signal toward the rear. The reflector tuned for maximum effect. Director is not retuned.

Measured at 280mHz performance of 3 element zepp:

Spacing Dir/Reflector	Tuning Condition	Gain dbd	F/B db	Input R Ohms	Bandwidth for 2:1 VSWR
0.15 & 0.20	max gain	9.8	17.3	25	1.0
0.15 & 0.20	max F/B	9.1	19.2	34	1.5
0.175 & 0.225	max gain	9.5	14.9	34	1.3
0.175 & 0.225	max F/B	9.0	15.9	39	1.8
0.20 & 0.25	max gain	9.5	9.3	31	1.1
0.20 & 0.25	max F/B	8.2	13.8	51	2.1

The values of inductance to tune the aerial is experimental suggest reactance of director 400 ohms reflector 600 ohms, plus or minus 50%. The author built a 3 element 10 and 15 meter beam on the same boom, were under construction as of this writing. No further information was found.

Samarium and Magnets, etc.

by Deni, W9DS

It seems magnets in microwave tubes are very costly made from platinum-cobalt alloy. Raytheon has made magnets from cobalt rare-earth element samarium. The new magnet is four times as most alnicos and twice as strong as platinum-cobalt magnets. These new magnets perform well in microwave tubes at 265 degrees centigrade. The new magnet can pick up 500 times its own weight. From June 1969 radio-TV Experimenter and Science and Electronics. Another article appeared in this same issue by George W. Lagus titled The Use of Ground in HF Circuits. Radio receivers have a ground terminal and aerial terminal. When only the single wire aerial is used and the ground terminal not used because the chassis is a large enough artificial ground by virtue of its one terminal capacitance much better reception ensues. So we stumbled upon the two kinds of capacitance. One terminal or two terminals.

Electrostatic theory tells us every single conducting body can serve as a charge reservoir. Single terminal capacitance can be illustrated by an insulated metal sphere able to hold a static charge of a single polarity and thus hold a static charge of a single polarity and our sphere has a capacitance of 10/9pf per centimeter of radius.

The larger a capacitance, less voltage is needed to get high frequency current to flow on your aerial, a dipole has some capacity as a charge reservoir. Look our dipole needs no ground, nor does a delta loop or any other loop type and they operate very well, but deprived of one element, the best current flows by using a terminal ground, thus a substitute charge reservoir characteristic of the missing aerial element.

Somebody figured the earth radius as 637 million centimeters, has a static capacitance of 707mf to ground. The genius Nikola Tesla (1857 – 1943) gave demonstrations of feasibility of electrifying large areas of land by ground propagation of high frequency currents. He was called a mad inventor. When he proposed a scheme of electrifying the while earth by taking advantage of its natural AC resonance. Unfortunately for Tesla, ground has too much HF power loss to be used efficiently as a one-conductor transmission line. Its main use is as an auxiliary capacitance or charge reservoir.

RF Indicator

by Deni, W9DS

A morning at the Saturday breakfast got old stories being told by W9ZEW. He used a fluorescent lamp for relative RF energy at the aerial voltage loop. For ½ wave dipole the point is at either end of the aerial. Rudy used a zepp aerial double wire fed line and had his fluorescent tube at the starting point in the basement. Hey, do you need to know the circuit values for your home brew tuner for a specific frequency range? Two formulas will do it for you: 1) C = dC / (F22 / f12-1): Where f1 is the lowest frequency desired in MHz, DC is the range of the variable capacitor in the circuit, and C is the total circuit capacitance in pf at F2. 2) L = 25,300 / f2C: Where L is the inductance of the coil in uH, f is the highest frequency desired in MHz, and C is the capacitance found in the first formula. The above formulas will show how much coil inductance and how much capacitance are necessary in order to tune the designed range with a given variable capacitor. An example of putting the formulas to work.

On hand is a 9 to 10 pf variable capacitor that is to be used in a 40 meter band spread circuit. What value of coil will be needed? Substituting in the first formula: C = 9 / (7.32 / 7.02 -1) = 9 / (53.3 / 49 -1) = 9 / (1.09 –1) = 9 / .09 = 100pf. Now how to find the value of L, we substitute in the second formula: L = 25,300 / (7.32 * 100) = 25,300 / (53.3 * 100) = 7.75uH. The value of C obtained by this method includes the capacitance that the tubes and wiring contribute, so these should be

subtracted from the calculated figure in selecting the shunt capacitor.

Broad Band 10 Meter Yagi

by Deni, W9DS

I was thumbing through a few articles and this one fell out onto the floor. I picked up Ham Radio Magazine May 1990. It appeared in Bill Orr, W6SAI, Ham Radio Techniques. A 3 element beam covers 1.7mHz of ten meters 28.5 past 29.3. It depends on your chosen frequency. Bill Orr writes that a yagi optimizer program by Brian Beezly, K6STI, can provide answers for perplexing yagi design mixture of trade offs.

The secret is to find the best combo of gain, front to back ratio, and SWR with a given bandwidth. Our beam has 1.5db less gain than a narrow band design, but has 4.74dbd at the design frequency. Front to back ratio averages 17db and SWR 1.75 to 1 across the band.

The design calls for 1 inch diameter aerial elements and optimum SWR response is best with a hairpin match and split driven element. If gamma match is used, SWR rises to 2.5 to 1 at the band edges. The resonant frequency is 28.5 but best the match is adjusted for 28.975mHz. The elements tip sections of 0.875 inch diameter. Elements mount on top of a 2 inch diameter X 0.65 inch tubing boom 11 feet 6 inches with U bolts and rectangular mounting plate 2 x 6 inches. Driven element is insulated from the bolts and plate by an insulating segment cut from PVC plastic water pipe. The 2 halves of the element are joined by a wood dowel plug sprayed with acrylic to protect it from water.

The reflector is 17 feet 10 inches spaced 74 ½ inches from the center of the driven element and made of 1 inch diameter of 0.058 inch wall tubing. Each element center sections are 12 feet long. The driven element is 16 feet 0 inches long spaced 60 inches from the director, which is 14 feet 8 inches long. Using the hairpin match, the variables are the inductance of the hairpin and reactance of the driven element. The element is cut 6 inches shorter than resonance. The final length is given as 16 feet. Its 10.76uH adjust at 28.475mHz. Its length is 24 ¾ inches on one side 2 inches spaced from the opposite side each end of this #10 wire goes through drilled holes in each driven element one half section to pass wire through the whole tube and adjusted back and forth until adjusted at 28.975mHz.

The hairpin length isn't critical. The beam can be touched up by adjusting the element length. That's all there is.

Coaxial Cable Aerial Traps

by Deni, W9DS

I saw it for the first time in May 1981 QST authored by Bob H. Johns, W3JIP, whom applied for a patent. He made and sold these. So much for that. Parallel tuned circuit is inductance L is tuned to resonance by a capacitor made from a piece of coax the capacitance existing in a length of coax capacitance between the inner and outer shield and center wire of the cable. Thus, the cable is wound on a form. The upper end of the braid has become the right side of the inductor and the lower end has looped around and joined the aerial wire and inner conductor from the other side of the coil to become the left end of the inductor.

Note the inner wire of coax is cross-hooked up to the outer braid at the opposite end of the coil; this is essential. Now, if it were soldered to the braid at that point there would not be a capacitor formed since no voltage difference would exist by transformer action. All points would have the same voltage. Aerial traps made this way are hi Q desired for multi-band aerial because at lower frequencies than the one to which it is tuned, it becomes a loading coil.

A coax trap: The braid of the coax cable is used to form a coil, wound on plastic tubing, soldered to 14 copper weld wire, which is looped through the insulator and used for attachment to the aerial wire. At the high hand side of the trap, the inner conductor separates from the braid and passed through the inside of the trap. At the left end of the trap it is soldered to the braid and aerial wire forming the cross connection. The inner conductor emerging from the coax at the left of the trap is held in place by means of a hole drilled through the coil form; no solder connection is made.

To make a trap several inches of coax jacket, cut away braid loosened center conductor, and dielectric fed through a hole in the loosened braid. 2 pieces of wire should attach to egg insulators they are tie points for aerial wire and traps and capacitance between them will be part of the complete trap. Once again. The cable braid is passed through a hole in the polyethylene tubing at the right hand side of the coil and soldered to one piece of the copper wire on the insulator. The center conductor passes through another hole in the coil form 90 degrees beyond the first hole and is routed through the egg insulator beside the other piece of copper wire and solders to it at the opposite end. This is the cross connection. Determine the number of turns of cable to be. Wind them onto the coil form. Once again, separate the braid and center conductor. Pass the braid through the hole in the form and solder to the copper wire at the

left hand of the coil. Drill a diagonal hole into the wall of the coil form and the free end of the inner conductor of the cable placed into it to provide a degree of stability and electric isolation; this end is left unattached.

The coils can be tuned to frequency using gdo by spacing with aid of a grid dip oscillator by spacing coil turns on the form. Adjustment 5 to 10 percent is possible. Traps tuned secure in position. Use tape to weatherproof trap.

Coax traps are small don't offer a lot of loading inductance on lower frequency bands.

Little Rhombic T2FD QRP

by Deni, W9DS

The next aerial is a baby rhombic T2FD presented by W8VFT Xenia, Ohio resident published in 73 Magazine May 1984. I am familiar with this one. He made it for QRP and is non-resonant. I saw the QST 1949 or CQ 1951 article don't remember which. Mine didn't work. CQ published antenna roundup in 1963 it contains 2 articles about the T2FD aerial.

The difficult part is the non-inductive center resistor which absorbs the transmit power; needs a rating of 35% of the transmitter input power. This aerial is a sloper folded dipole. Designed for 300 ohm feed line. The resistor is 390 ohms at 20 watt rating. Best erected so that the top pole and bottom 6 foot pole form an angle of 20 to 40 degrees tilt for omni directional communications. This one is 30 degrees 35 foot pole and 40 feet to the short 6 foot pole. This aerial was designed for 80 meters with total length little over 90 feet. The wires of the dipole have a 2 foot 10 inch separation. 8 wooden dowels rod 3 feet long keep the aerial aligned or it won't work right – that was my problem – ¼ inch dowel and 2 foot dowels ½ inch diameter for end support. 5 porcelain insulators will be needed one for center and 2 at each end. The terminating resistors sit smack center in the middle of the top wire at the bottom attaches the 300 ohm feed line. This aerial will operate from 80 to 10 meters and all of the new bands. You need a balanced tuner 300 to 52 ohms would do fine. Each side of center is 46 feet 10 inches.

T2FD Basic Design Data:

1. The length of each leg from the center is equal to 50,000 divided by the desired frequency in MHz and then multiplied by 3.28. Answer is in feet.
2. The spacing between radiating wires is equal to 3,000 divided by the lowest desired frequency in MHz and multiplied by 3.28. Answer is in feet.
3. The sloping angle from non-directional pattern should be 30 degrees.
4. Terminating non-inductive resistor must have a rating equal to 35% of the transmitter input power. 73's

The "L" Withit

by Deni, W9DS

KC9EUY chats with me most on a weekly basis. We have discussed tuners and the reactance difficulties, therein, I found K4KI whom had the same problem and he wrote about it in 73 Magazine March 1980. Dave, KC9EUY, has designed a two meter ⅝ wave whip for his truck and is engaged in a 160 meter aerial, horizontally polarized. We chat on 80 meters and I have my troubles loading into my 160 meter dipole. My tuner doesn't have enough capacitance to match everything up. Only 120pf variable capacitor for each the transmitter and the aerial. The coil has many taps and coils are power loosers, but a necessity for matching. So, K4KI used a fixed inductance of 19.2uH at 3.75mHz. He came up with the idea of a small fixed coil in series or parallel with a variable capacitor.

By formula, you compute the maximum inductive reactance, XL = 283 ohms, and with a 250pf condenser has 170 ohms capacitive reactance maximum. Thus, the two shall meet and be resonant someplace. How is this done? 192uH has 453 inductive reactance and our 250pf variable has to reduce the capacitance value to match the inductive value of opposite values = reactance match at 453 ohms. We have zero ohms and resonance at our frequency and RF passes through our tuner. The aerial accepts our signals and we make our contacts. We can handle any configuration with the coil tapable and variable capacitor in series for ¼ wave length aerials.

When I had gotten a junk ARC-5 transmitter, I took the roller coil and one of the pair of 250pf variable capacitors moved on top the stripped ARC-5 transmitter, and used that combo as my HF RF tuner for the various aerials. I used like the windom and Marconi. Various aerials were tried, but the roller coil was in poor spirits as it sparked, sputtered, and smelled. It was cleaned, but made no difference. After years of ownership, I gave it away to a friend whom had asked me over for a thanksgiving dinner a long with items I won't be using any longer and that's better than taking it to a hamfest. No one would know it's antique value. It could be a back-up tuner in a pinch.

By the way, that thanksgiving dinner was the best since the one mother had prepared back in the early 1990s. 73's

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MEMBERSHIP is open to all who are interested in amateur radio. This club is sponsored by Argonne National Laboratory. Employees of ANL or DOE-Chicago are eligible for full membership. Auxiliary membership is available to non-employees.

W9ANL/R is an open repeater, coordinated on 145.19 MHz (-600 input). The AARC repeater has been in operation on this frequency pair continuously since February 5, 1982.

CLUB NETS: 2 meter fm 1) Regular, every Monday evening at 9:00 and 2) the Night Patrol every night at 10:30, both on W9ANL/R. The Peanut Whistle Net (PWN) every Sunday at 1:30 p.m., and many evenings at 8:30 p.m. on 1932 kHz (cw/am/ssb), QRP.

RADIOACTIVITIES is published monthly by the Argonne Amateur Radio Club as a nonprofit newsletter intended only for the use of its membership. Material appearing here does not represent the official position of Argonne National Laboratory or the U. S. Department of Energy. Please give credit to the author and to Radioactivities or the Argonne Amateur Radio Club, when using original material published here. Deadline for submissions normally is the 20th of the preceding month.

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Please send club and editorial correspondence to the club address, or to travisdj@bigfoot.com Please include “AARC” in the subject.