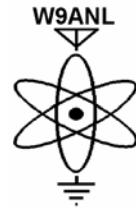


# RADIOACTIVITIES

NEWSLETTER OF THE ARGONNE AMATEUR RADIO CLUB



Volume XLIX, Number 2

February 2008

## Club Meeting

Unless otherwise noted, AARC general meetings are the second Tuesday of the month at the Argonne cafeteria at a table on the north end of the room. Any club member is welcome. To arrange for a gate pass contact Bruce Epperson at epperson@aps.anl.gov phone 630-252-3495 or Chuck Doose at doose@aps.anl.gov phone 630-252-6037.

## The Treasurer's Report

by Chuck KB9UMF

Nothing Received.

## REMINDERS

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

***Old♦Country Buffet♦***  
59<sup>th</sup> 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.

## The Collinear

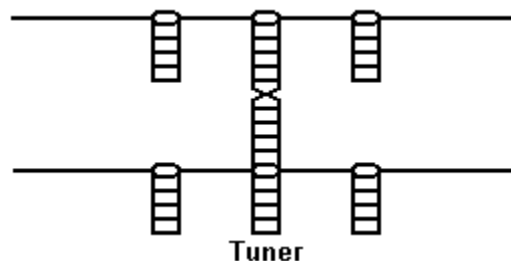
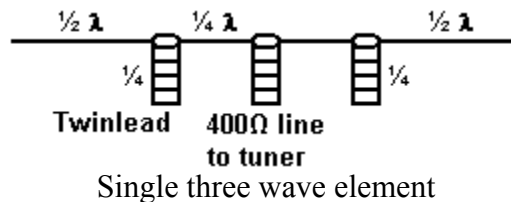
by Deni W9DS

Not everyone has cramped spaces for living and small apartments; even so, HF frequency aerials can be modified for the higher frequencies, and use open wire aerials. Yes, #12 wire or large aluminum elements can certainly be employed in construction of UHF aerials

and they approach the TV like aerials of today. So you do the math and build an aerial of this type for the enjoyment of it.

The aerial design frequency is the 20 meter band for CW, but can be designed for the phone band using open wire line, 400 ohm is ideal. You need a balun, impedance match, and coax 50 or 70 ohms. The feed point impedance is 150 to 200 ohms. For one collinear, 2 poles / tree trunk or mast is needed. It is bidirectional. Adding another element, we could make an end-fire array and it doesn't require critical tuning. Use of very close spacing of elements won't sacrifice performance. I have heard them coming out of England on 15 meters very strong signals.

The big problem Hams here want plug-in and play. This is roll your own balance line input. You need a tuner as mentioned; a good radio ground is required. This aerial takes up more space in the yard at HF; 6-meters shouldn't be to hard, but who hears anybody on 6 anyway? When ten meters comes back, this will work just fine. Ten meters requires 16' per 1/2 wave element and 3 half-waves equals 48' with feed line open wire at the center of the aerial one and a half waves either side of the feed line. Two open wire baluns are made 1/4 λ from feed point using insulators and 300Ω feed line for the 1/4 wave element; see drawing. Using 2 elements of 3 waves will bring 7.7db gain over a earth dipole. The bidirectional radiation pattern with half power only 25 degrees away from line of maximum radiation (perpendicular to the elements).



End fire array: Twist feed line or aerial won't function. Radiation would be straight up; 90 degrees. Spacing between collinears is given  $\frac{1}{8} \lambda$  length. This may be varied +100% to -50%.

DX can still be worked 45 degrees off the line of major radiation. The phasing sections of each collinear are meant to be keeping wrong way currents off the horizontal elements. This out-of-phase feeding gives significant gain in the plane of the elements and perpendicular to the elements. The array is fed at a current loop. The gain for 2 is 1.9db for 2 elements 3.2db for 3 elements 4.3db for 4 elements 5.3db and 6.3db for 6 elements. Using a pair of out-of-phase collinears adds 4.5db to these figures; thus, our gain array is about 3.2db and 4.5db more for the second array, equals 7.7db. Optimum spacing between end fired collinears is  $\frac{1}{8}$  wave and between  $\frac{1}{15}$  to  $\frac{1}{4} \lambda$  spacing without gain loss.

its place. Lost db of the aerial can be found in lossy coax. So that the DX runs 200 watts at you and only one microvolt reaches your receiver by  $P=E^2/R$ , a meager fiftieth of a microwatt or 160db less than came out of the DX aerial. So, it is the extra care via your aerial and coax and other losses that will get you the DX contact. Believe me every decibel counts in these aerials best gain and front/back ratio. Thus, a practical reflector can be made small in terms of wavelength yet be very effective.

Experiments by E.B. Moullin, Radio Aerials, Oxford, 1949, showed slight difference between an infinite reflector and one over  $\frac{4}{5}$  wavelength in height and  $\frac{1}{2}$  wavelength in width. Performance drops off slowly beyond this point. Screen height at  $0.2\lambda$  is 20db front to back ratio. For material, use a wire grid, it will appear the same as a solid sheet if the inductance of the wires are equal and opposite to mutual inductance between them. The element is a grid reflector. Spacing of wires (filaments) is  $S=15d/4$  where S is the spacing and d is the diameter of the wires. This is a bulky network. It had been found regardless of wire size, filament spacing of  $\lambda/40$  or less results in the same polar radiation pattern as the theoretical dictated one.

The tuning stub on driven element was moved for lowest standing waves every time spacing changed causing inductance variations with inter-filament spacing. The original 2 element 15 meter beam with parasitic element tuned director was spaced  $0.11\lambda$  from driven element. A forward 4db gain and F/B ratio of 12db was realized as a compromise.

The parasitic element tuned as reflector spaced  $0.15\lambda$  had 12 lengths of #15 solid wire each same length and strung parallel and spaced 10 inches ( $1/50 \lambda$ ) apart. Compared to a dipole, the new array proved to have 5db gain and front to back ratio of 20db.

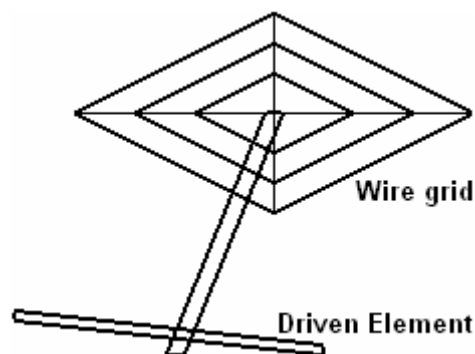
### Maximum Yield for Home Brew Yagi's

by Deni W9DS

Facing problems of limited space? Steve Burns, WA3CXG wrote an article in July 1973 Magazine. He had only a row house. Sounds like he lived in a townhouse or top floor condo where he could get to a roof. Long yagis & cubical quads had disadvantages.

The screen reflector is used VHF and UHF TV a larger array can be adapted. So we are left with 2 elements for 15/10 meter bands. Small parasitic arrays don't maximize forward gain nor front to back ratio or band width.

However, using a screen reflector element of moderate size for the user can obtain near better gain and better front-to-back ratio than with a single slender element in



**The Reflector:** Insulators from ends are not shown. Mast not shown.

## Ham Radio 14MHz Burns Seawater

by Deni W9DS

Here we go again. Retired radio-TV station owner John Kanzius (ham call unknown) in search of leukemia cancer cure built a machine that succeeded to burn salt water. He contracted leukemia in 2002. John Thought he could seed cancer blood cells with nanoscopic metal particles hit them 14MHz radio waves and kill the cancer cells without hurting the good cells.

During one test an accident created the event that happened. When bombarding a salt-water solution in a test tube an assistant running the apparatus, Kanzius curious struck a match after bumping the tube resulting in lighting solution like a propane flame. Putting the incident on the blogosphere in a TV format has brought out crackpots raging debates over this discovery.

This brings to my mind an article I read in the news of some magazine probably in the late 40s or 50s that an inventor ran a car engine on one gallon of gas and water from Detroit to Florida 3,000 miles, and that oil companies got the formula paying him to keep his mouth shut giving the inventor 1 million dollars. This has bugged me for years. Why don't we use water for energy? This proves my theory. I'm a steam advocate! I know gas and oil is crap. Kills more people with cancer breathing fumes for years from coal, which is pressurized trees and vegetation. Just take a trip to the Chicago coal mine at Chicago Museum of Science and History and see for yourself why miners die from the dust.

So the time nears when we can tell the oil and plastics industry, which kills us, to go out of business by not using their products. We need better clean environment. We are moving slowly. Yes, to John Kanzius and his kind of experiments and his theory of deposits that sodium chloride weakens the trigger between oxygen and hydrogen atoms in H<sub>2</sub>O! A simple spark ignites flammable hydrogen gas molecules generating intense heat and this powers engines of the future!

Now the search goes on at M.D. Anderson Cancer Center in Houston, TX and Pittsburg, PA Medical Center using John's technology in the cancer fight of animals. Read more in November issue of the Journal Cancer.

Success always seems just around the corner. Read the December 2007 issue of Popular Science.

## Loops in England

by Deni W9DS

It was reported from England that tests on small loops that efficiencies were 10%. That's 100 watts into loop an get 10 watts out as reported in the IEEE Journal of Aerials. Tests run with one-inch copper tubing 3 feet in diameter. For 100 watts input the radiated power was 18 watts at 5.1MHz and 0.25 watts at 3.6MHz.

The principal author Alan Boswell said, "Loops must be judged against performance of alternatives, taking into account constraints imposed by space. That is why small loops enjoy a steady level of usage in radio systems." You must live with what you put up.

How about the lying about gain aerials on the market these days? Marketing a 42 inch 2 meter antenna at 6dbd gain and 96" at 9dbd? Well, since 42 inches is a half wave dipole and dbd expresses gain of an aerial in comparison to a half-wave dipole. Dah! So, another half wave dipole has 0dbd. Where does this dipole get its 6dbd gain? Who is the sucker here?

What about the 96 incher? Well, two collinear dipoles right next to each other connected 180 degrees phasing section. ARRL says aerial has 1.6dbd gain. But the marketed manufacturer claims 9dbd. Where does the extra 7.6db come from? Thin air maybe. How about hot air from gross manufacturing income.

Have you heard about the Carolina Windom? Don't believe everything in advertising. They don't stress negative points. Remember no aerial can generate power. Do you believe the myth that a free space half wave aerial has full output at all frequencies that radiates at all angles and has 2.1 db gain? Hogwash!

If any aerial has gain then it puts out the power you put into it and a bigger signal in the aerial's favored direction, but radiates weaker signals in other directions. No aerial conceived can have a big signal in all directions. Advertising literature can be deceiving. An aerial cannot put out a strong vertical wave and horizontal wave. It is either one or the other. W4RNL has a study he made of vertical radiation from horizontal aerials. Radiation patterns after careful analysis modeling showing weak vertical radiation patterns by making field strength measurements of polarity.

When conditions are right you can work the world. I have done it with a simple Windom 160 to 10 meters built cheaply with wire, insulator, tape measure, open wire or twin lead, and balun at rig. A vee can beat out

my Windom on some bands. No aerial is best in all directions unless you rotate it into all directions.

The cross field aerial is another apple pie in the sky type of wide band all band high db 100% horizontal vertical all field radiator. Keep your bucks in your pocket. Roll your own!

### **Horizontal Loop Comments**

by Deni W9DS

An article in June 2007 World Radio written by Vernon Gibbs, W4JTL, discusses the horizontal loop. Vernon has tried cloud warmers and some good aerial performers. It seems the 83 year old fox has come to the conclusion that "aerial efficiency" is what counts. Counting on aerial gain in decibels or called "db" is most misleading; the manufacturers use this criteria of how good their aerials really are performing. This aerial can absorb much RF and turn it into heat loss. We want efficiency not heat loss.

To get aerial efficiency we want to know the ratio of power radiated to power lost. That is power going into the aerial and the power coming out of the aerial. So we get resistance losses. Efficiency type takes a form of capture area or pick-up efficiency. This varies with frequency. For example an 80 meter half-wave dipole has 2500 times more energy than a 2 meter half-wave dipole.

Deciding on one aerial is finding aerial capture area and efficiency via configurations of verticals, quads, deltas, horizontal loop, or G5RV type. It makes no difference. What is the aerial efficiency? A horizontal wire #12 copper wire resistance of 2 ohms per 1000 feet we use 272 feet that equals a half ohm DC resistance. We make an 80 meter loop with that footage.

We take into consideration ohmic losses caused by poles or towers holding aerials up, gutters on the house, electric wires, phone lines, and the ground. The loop has about 4 ohms loss. This gives us about a 96 percent radiator so we get 96 watts out for 100 watts input. That's good efficiency. You can see aerials aren't amplifiers. If the horizontal loop were stretched out it would be called a folded dipole. The higher aerial radiation resistance in relation to ohmic resistance the more efficient the aerial will be. Did you know that physics of aerial engineering today is the same as it was in the 1930s. Look aerials steer the power into a narrower field pattern concentration.

Aerials aren't magic they steer whatever power there is left after ohmic losses in one direction and less in

another. I see ms users of horizontal loops have a lot of praise for their performance in working DX and locals, and stopping man-made noise.

An advantage in loop high frequency operation is lowering the vertical radiating lobes. Say our 80 meter loop is up 40 feet. The radiation angle is 90 degrees cloud warmer with one wave length; 45 degrees on 40 meters, 35 degrees at 30 meters, 23 degrees on 20 meters, and 11 degrees on 10 meter band. The greater the enclosed area of the loop, the better the performance.

Downside: Loop is a target for lightning and static electricity. So, be able to disconnect equipment. A 160 loop is an aerial hard to beat. A 2 wave 160 loop 1040' of wire will make you king on 160 meters. Feed with ladder line at center for best performance. A 160 loop uses 520' of wire for full wave, but at 80 meter, 2-wave loop has been made not a cloud warmer.

### **Another Loop Tale**

by Deni W9DS

April 2005 World Radio carried an article written by WA5FRF, Steve Cerwin. He contends the long wire and loop are related and they are with advantages and disadvantages. Theoretical study shows there combined can result in many band omni-directional RF propagation pattern, nice impedance on harmonics, and low take off angle with suppressed vertical radiation. It stops static build-up, rain noise, good rejection of out of band signals. The only problem is that the aerial is big.

The long wire is operated at a resonant length only with odd number of half wavelengths. There will be low impedance in center of any one of half wave sections. There will be many lobes on each side of aerial as there are half wavelengths. So the wire radiates only in some directions not in others.

The loop aerial circumference can be square, rectangle, triangle, or other shape. The square in vertical pattern one wavelength offers 2db over a dipole. Also can be a triangle or delta loop. Now the one wavelength loop, dubbed cloud warmer, has omni directional pattern and low noise. Now at second harmonic or 2 wave loop has a low take of angle and creates an overhead null and at longer harmonics the horizontal lobes get lower take off angles.

Evidence shows that triangular loop patterns show better omni directivity. Still this loop needs 2 wavelengths not to be a cloud warmer. For the 160 meter band, long wire triangle up 60' will cover 2 wavelengths using a 3 acre tract of land. One popular long wire loop data 2 wavelengths long calls for a 40 degree triangle loop and 160 degree dipole.

<p><b>ARGONNE AMATEUR RADIO CLUB</b>  P.O. Box 741  Lemont, IL 60439</p> <p>————— <b>Officers</b> —————</p> <p><b>PRESIDENT</b> Bruce Epperson KA9H  <b>VICE PRESIDENT</b>  <b>SECRETARY</b> Kurt Boerste KB9ZFR  <b>TREASURER</b> Charles Doose KB9UMF  <b>DIRECTOR</b> Dick Konecny K9IB  <b>DIRECTOR</b> Torben Lauritsen KF9MI  <b>DIRECTOR</b> Charles Doose KB9UMF  <b>DIRECTOR</b> Tim Smith N9UEB  <b>DIRECTOR</b> Dale Travis AG9H</p> <p>e-mail: w9anl@bigfoot.com  www.bigfoot.com/~w9anl</p>	<p>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.</p> <p>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.</p> <p>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.</p>	<p>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 20<sup>th</sup> of the preceding month.</p> <p>EDITOR Dale Travis AG9H  EVENTS  SKYWARN ACTIVITIES Deni Lamoreaux W9DS</p> <p>Please send club and editorial correspondence to the club address, or to travisdj@bigfoot.com Please include "AARC" in the subject.</p>
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