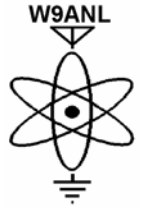


# RADIOACTIVITIES

NEWSLETTER OF THE ARGONNE AMATEUR RADIO CLUB



Volume XLIX, Number 5

May 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.

## Bruce Square Aerial

by Deni W9DS

This cheap single wire is for the DXers to hold QSO's in point to point work and in 1920s. It is so simple you make wire measurements and bends in the wire so that each vertical wire is in phase and radiates, whereas the electrically horizontal parts out of phase cancel. The

aerial should be 8 to 12 feet above ground due to higher RF voltages at the center of horizontal coupling sections can be dangerous.

The vertical energy from one of the vertical radiators will arrive nearly as soon as energy from the others at the DX receiving point. If this point is too far off aerial effective beam width, signal will be weak. The Bruce gives 1db of gain for each two vertical elements in the system. A vertical Bruce with 5 elements is said to have 4db gain. This type has no secondary lobes, less phase shift, and beam width for 5 elements appears to be 15 to 20 degrees. The vertical polarization gives lower angle of radiation. This is due to higher current points above ground.

The aerial can be 3 elements radiates broader waves. This aerial appeared as a 40 meter 5 element with 4db gain that is to say honest gain over one vertical element. Not over isotropic type. Gain figures published by sly aerial salesmen are mostly misleading. Dimensions are calculated from "stacked dipole" formula found in editors and engineers radio handbook. You keep dimensions so array will be self-resonant inside the band. When tuning the stub add or subtract wire from small horizontal end fed portion.

Small egg type insulators are used at tie pints. W7JLU, Bob Norris, built one, which was in June 1971 73 Magazine. It was for 40 meters. It used  $\frac{3}{4}$  wave open line matching stub using two wires 35' long. The stub must be adjusted for maximum RF on a field strength meter. Set meter between any 2 elements and put it far enough to see field indications. The feed line can go in any direction. Feed line can be an odd number of quarter waves long and you will find a 50 ohm point for coax at current point will be feeding this unbalanced system. The aerial beam width using only 3 verticals shows a broader beam width, about 20db wider.

Using the aerial from W7 land, JA's were worked several hours earlier than usual. Aerial is bidirectional; South Americans sound like locals, yet W signals are not too loud, thus showing as a worthwhile low angle radiator. Opening aerial at the third element on the Bruce made a WA in zone 18 and a KG6 both at an early hour. So beam width is sharpened up with more than 3

elements. Signals drop off as they arrive off the ends of the Bruce array.

The Bruce requires a pole 78' to keep bottom up off the ground so guests may pass under the wire. I have worked Englanders using such types along the coastline of England. Seems they lower in before storms hit the island and the "Bloke's" raise her back up after weather passes. The serba curtain is another type.

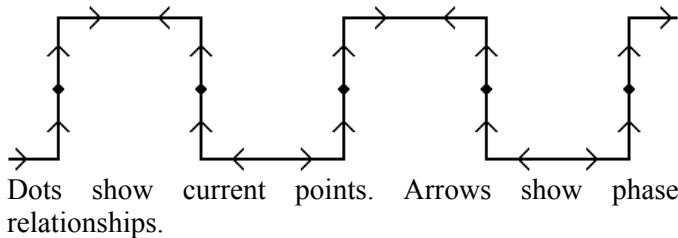


Fig.1

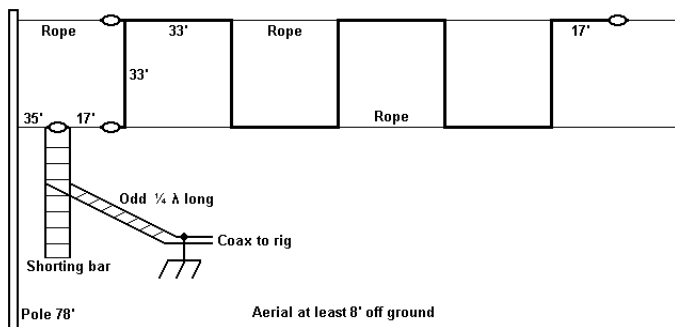


Fig.2

## What's Your Aerial Doing

by Deni W9DS

Aerial performance can improve with ground reflections. When aerials are close to earth, half radiated power goes directly into the sky, the other half gets bounced or (engineers use the fancy word reflected) by the ground before heading skyward.

All kinds of schemes are against that reflecting wave because real earth is complex it will reflect some depending on conductivity, dielectric constant, frequency, and angle phase shift when wave is reflected. It gets complicated.

What should we use for our aerial; long wire, dipole, vertical, or sloper and inverted vee. How do we know what gain in db means? You read our dipole gives 6db gain over a perfect ground at the perfect height, but ARRL 1964 Antenna Book page 43 states the doublet or dipole theoretical gain of 2.14db over isotropic radiator, the gain of a real aerial over a half wave dipole can be referred to isotropic by adding 2.14db to the measured

gain, or if gain expressed over an isotropic antenna it can be referred to a half wave dipole by subtracting 2.14db. It is perfectly understood isn't it? So much for aerial gain. Don't believe every thing said about aerial gain. What counts is capture area.

Bigger the higher aerial really radiates the best. Let's take a 80 meter dipole up only 20 feet. We loose dbs, but it is usable out to 200 miles. Pour out the 2kw. So you see why verticals with lots of noise work out farther than low dipoles. Of course they work best  $\frac{1}{4} \lambda$  and higher up into the sky.

Can you get up a sloper that's a slanting vertical if you can't get up a dipole? These are slopping dipoles center fed. Works better than a vertical in some ways. It is a good performer. Radiates 2 direct waves opposite each other. Make coax center conductor tie to the upper half of the dipole. Shield goes to the lower half.

We have had reflected waves, which comes up out of the ground with the sloper cancels out the ground half. The best angle of slope is 55 degrees and provides maximum forward gain with some front to back ratio. But for best front to back ratios is a sloper  $45^\circ + 35^\circ$  or as low as 20 degrees. This is all at low angles of radiation.

Now that all said lastly an angle of  $70^\circ$  get us maximum radiation to either side. This occurs because the horizontal dipole maximum radiation is off its broad side. Some slope our dipole broadside radiation still is alive. This peak radiation can be used to advantage if you use a pair of slopers.

Two slopers work better if slopers are phased correctly and spaced  $\frac{1}{2} \lambda$  apart. How about 2 slopers connected at their tops on a pole and another 2 on the opposite side of the pole connected together for more coverage.

With four slopers equally spaced around the pole and any two slopers can be used to produce forward gain.

$\frac{5}{8}$  wave verticals above poor ground are better at all angles, especially at higher frequencies.

## 2 Delta Loops in Phase

by Deni W9DS

Thumbing through my articles, one popped out & hit the floor. It was an article by W8HXR whom I have listened to in a group on 80 meters. Well, his article was printed in the now defunct Ham Radio Magazine Aug 1981. Seems that Jerry was talking with Ken Bale, W7VCB, and Ken sent him a copy of a ZF special by ZF1MA in

Grant Ayman, B.W.I. It is a pair of connected delta loops suspended from only a 20 foot boom. So, Jerry, W8HXR, put it aside because 20 foot booms were difficult to come by and, not to mention, to erect. The beams fed at one corner creates vertical polarized radiation.

Now, Jerry thought that he could run the aerial using nylon rope from a 50 foot TV tower to a 48 foot mast and hang the aerial upside down. He had run single loops often for 20 and 15 meters suspended, but never two at a time. So, he could now hand up two loops in phase. He decided to use the ZF1MA aerial hung his way. Now, it is the improved phased delta loop array suspended by nylon line and doing away with the boom. Now the aerial is fed at the top, that's 36 feet off the ground, and keeps the high current point as high as possible.

How does the gain add up over the simple dipoles 2db? The feed point is at the upper base between the two triangles at the high current points. Now, a single delta has 2db over a dipole and close spacing of the second delta adds another 2db. 4db over is our gain so overall gain of an isotropic element is 6db actual gain! Not a guessing gain.

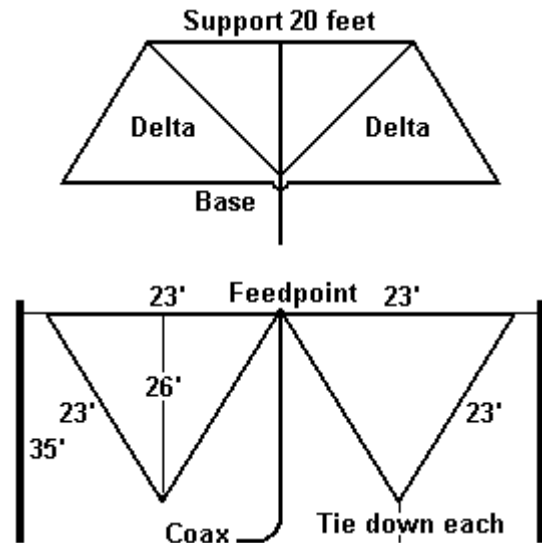
The aerial shows definite sharp lobes elongated on a Smith Chart at 90 degrees reference for them together. If loops are oriented so one lobe aims at Europe, the other lobe will be at South Pacific. If you live in Ohio or you orient loops for covering Japan and South Atlantic.

Jerry's loops were aimed at Antarctica in one direction and Europe, USSR, and Persian Gulf in the other. He had excellent results running phone patches between his house and McMurdo Station, Antarctica. It has performed well in DX pileups on the 20 meter band. Jerry said if he had more space he would use a feed system that provides horizontal polarization. Plus, the Bill Orr Antenna Handbook shows a delta loop fed in this manner yields a low angle vertical polarized signal.

Jerry goes on to say all the elements are spaced as close as possible (couple of inches) without overlap (0.33 wavelength, or 23 feet, center of base to center of base for the 20 meter band). Now wider spacing between these deltas can increase gain to almost double. Here are the numbers:

Spacing Wavelength	Feet	Meters	Gain (db)
0.33	23	7	2.0
0.40	27	8	2.8
0.50	34	10	4.0
0.65	44	13	4.8

The gains shown are in addition to the 2db gain for a delta loop over a dipole.



W8HXR goes on to say that more than 2 elements with 1/2 and 3/4 wave length spacing. Here are gains from ARRL Antenna Book:

# of Parallel elements	Half-Wave length spacing gain db	3/4 wavelength spacing gain db
3	5	7.0
4	6	8.5
5	7	10.0
8	8	11.0

He says a ham on a farm could set out six elements with half-wave spacing for 10db total gain, or with 3/4 wave length for 13db gain, suspended from trees or a row of telephone poles. Or, how about two arrays at right angles to each other with the intersection of two fence rows, leaving no farm land space.

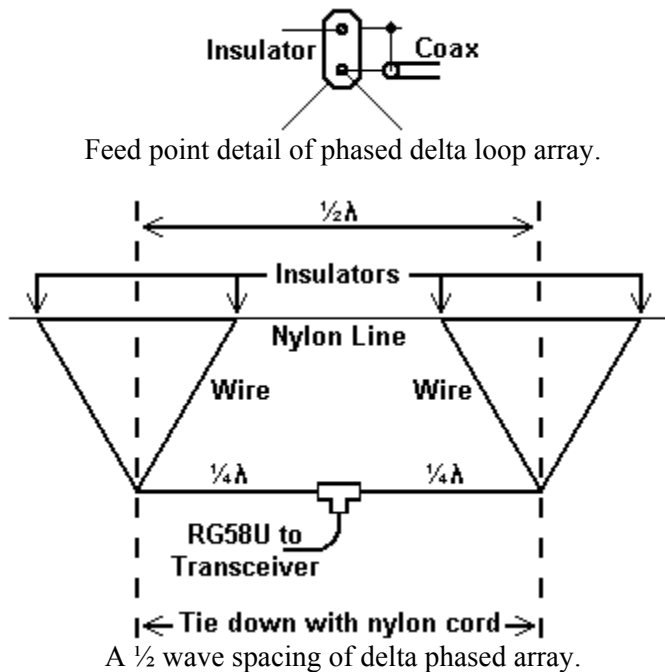
Antenna gain of 13db, spacing for 15 the meter band at 3/4 wavelength would be the same as half-wave spacing for the 20 meter band. Now, you could put 15 meter loops inside each 20 meter loop. How about that?

Each delta loop has feed impedance of 120 ohms, so a pair so 60 ohms. For more loops, the impedance should be with each feed line being the same length. Four loops, 30 ohms with SWR of 1.7 to 1 and six loops with SWR 2.5 to 1. This isn't difficult to match. It behooves you to use a 1 to 1 balun at each feed point.

W8HXR said South Atlantic, Caribbean, and South America boom in during daytime, pinning the S-meter 60db over 9. Nightly, Antarctic boys are over S-9.

If you are up to making a unidirectional beam, you stretch a director or reflector element or both, about 8 feet from the center of the array. Use a single wire 31' 2" for the director and 34' 6" for the reflector. The arrangement will, of course, lower the feed point impedance, making some sort of tuner or matching section to reduce the SWR. All new rigs are non-tolerant of high SWR.

A word of caution: Polar map is essential for pointing directions. A ham put up a ten element Bruce array, used a regular orthogonal map and completely missed his objective.



## Counterpoise or Radials

by Deni W9DS

I have read that John L. Reinartz, "Father of Shortwave Radio", when in November 27, 1923 during that evening, two-way QSO took place between America and France. It took place successfully via a new invention.

The counterpoise was used as for the second part of the balanced aerial system. Prior to that night, a capacitive ground was used not successful at all. Thus, after that everyone used elevated arrays of one or more insulated wires under the main aerial. This was used for ten years by Hams and commercial interests. As this counterpoise was used a pattern of radial wires were used as artificial ground under a quarter wave or less vertical aerial.

After 1937, counterpoise slowly disappeared by a study by George Brown so detailed that the results were used

to be rules by the FCC for AM broadcast stations. So, other developments were squashed for 40 years, like the counterpoise, the elevated ground screen.

It has been found that there is a direct relation between current level in the counterpoise radials and conductivity of the ground under them. An elevated counterpoise of 50 wires produced a very efficient ground system.

A counterpoise system operates more efficiently. Less loss in collecting return currents and steer them to base of aerial than has a buried radial ground system. A ground system of fewer than 50 elevated radials may be as efficient as more than 100 buried radials. These radials can be 6 to 10 feet over ground and parallel to it, radial length 100 feet long. The vertical is at the center of 50 foot radials all around it.

I haven't seen any other studies, but I believe counterpoise and elevated radials work better than buried radials regardless of what any one says.

On ten meters I ran a 3-element Radio Shack ten meter wide spaced beam. Outside on top of my chimney was the beam. In the attic oh! About 3 feet under the roof I rolled out fence wire all over the beams not quite as long as the length of the house. It sure did a very good job. I didn't solder anything. I just spread roll after roll until I thought I had enough wire up there.

My success on ten meters, I believe with 240 countries speaks for itself. From China, Bouet Island, Australia, Russia, Europe, and all zones I owe Radio Shack thanks. Beam cost 34 bucks in the 1980s. And, let's not forget my ground screen, but it is gone now; so is the beam (in a very windy storm a tree limb broke her back and gamma match).

## Parastat Aerial

by Deni W9DS

This new aerial appeared in 73 Magazine May 1983 authored by N6LAM, Fred Boldvan. A dipole wasn't putting gain where he wanted it to do. Fred discovered a double dipole type of aerial.

The parastat can be mounted on a door in fashion of the slot aerial or outside on a flat non-metal surface. A dipole in the form of a square radiator forms a U and second dipole upside down fitting inside the U, but a little smaller than the full dipole dimensions. Active details are vertical polarization and zero broadside null. Radiation resistance is 38 ohms. Essential to use a grid dip meter and sensitive field strength meter for tuning and pruning.

<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>
--	--	--