RADIOACTIVITIES

NEWSLETTER OF THE ARGONNE AMATEUR RADIO CLUB

W9ANL

Volume XLVII, Number 7 **July 2006**

Club Meeting

This month there will be an informal meeting at the Argonne Cafeteria (building 213, north end) on July 11, noon to 1:00. Associate members needing access to the lab should contact me (Jack Albert) on the Monday night 9:00 net or contact me via phone or email; check the roster. I'm hoping that everyone, including full members, can attend. It's a chance for all of us to meet during lunch.

The Treasurer's Report

by Jack Albert, WA9FVP

Members: East 18; Associate 37; Newsletter 6; Retired 13

Balances: Checking $3,509.35; Cash $0.00; ANL fund $30.00

Distributed as: Club $2,891.03; Repeater $563.32; Newsline $55.00

For the period Jun 1, 2006 thru Jun 26, 2006:

Income: Dues $8.00; Club $2.78; Rptr $3.53; Newsline $0.00; ANL $0.00

Expenses: Club $0.00; Rptr $1,652.97; Newsline $0.00

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 July

07	N9HQA	Jim	Park Ridge, IL
13	KB9ZFR	Kurt	Lockport, IL
16	W9EHC	Frank	Lyons, IL
20	KB9OOM	Louis	Melrose Park, IL
28	K9REM	Emil	Chicago, IL

Howard WB9IRH

by George, N9EJS – 6-12-06

He is disabled and living in the Brighton Gardens of Wheaton assisted living facility at 831 E. Butterfield Road, Apt. 315, Wheaton, IL 60187. Dale, NJ9E, a long time ham friend of his from Glen Ellyn, IL has recently obtained a loaner 2-meter rig for Howard, and a home brew J-pole antenna until something more favorable can be arranged. When Howard is feeling up to it, he frequents the Bolingbrook, DuPage and Wheaton repeaters and would like to hear from his ham friends there. For the present, he is unable to work the W9ANL repeater, although his goal is to be able to get back on it.

Howard would also really appreciate visits, and/or greeting cards. 73,

The Club President

It is obvious that the time that I must spend on the issues pertaining to my job here at Argonne is increasing every day. I have little or no time to avail myself for the role and responsibility of the club's president. This has troubled me greatly and I am very embarrassed about this problem concerning my failure to meet all my obligations. Please accept my resignation as the president. I will, however, continue as an active member and emergency communicator for the club and the Lab. If you see fit to retain me as a board member, I will do as much as possible to develop and implement emcomm at Argonne. Respectfully, *Mosh*.

Bruce Epperson, Vise President, has taken over as President.

The Repeater

by Jack Albert, WA9FVP – 6-16-06

Over the past two months there were several complaints about the repeater. It appeared that the receiver had sensitivity problems and several hams had problems checking into the Monday night net and the Night Patrol.

On June 14th Dick Konecny, Bruce Epperson, Torbin Lauristen, and I repaired the repeater. Dick brought a network analyzer and checked the duplexer. We couldn't

find anything wrong, but I did notice that the coax connectors on the cavities were only thumb tight. Bruce snugged them down with his Leatherman tool and the problem was solved! The repeater is working better now and there have been several good signal reports.

Now that the repeater is working better Howard, WB9IRH was able to resurrect the "High Noon Net". So if you are not busy during lunch, check into the net on the Argonne repeater (145.19). Howard will appreciate it.

With the duplexer connected to the receive and transmit ports, here are some measurements that we made. Receiver squelch sensitivity before the duplexer fix: 0.26 uV. Receiver squelch sensitivity after the duplexer fix: 0.19 uV. Transmitter output: 20 watts.

June Board Meeting Minutes

by Jack Albert, WA9FVP

Board meeting Minutes (for the news letter)

1) Most of the time was spent discussing the repeater, and like the TV commercial for the Bank of Scotland, Chuck made it happen! The board voted to purchase a new VXR7000XA repeater with cable, software, setup, & Diamond X500HNA antenna from AES for a cost of $1,653. The plan is, when the new repeater is placed in service, the old one will be used as backup.

2) We also discussed the "Antique Radio Road Show". It will be a club sponsored show where all Argonne employees can bring small radios for appraisals and restoration advice. Chuck wanted to do it in the Cafeteria conference room but Bruce thought that, because of liability problems, the Lab would not allow it. Chuck said that he would check into it. We voted on sponsoring the show and the vote was unanimous.

3) Bruce said that he would write a paragraph for the newsletter explaining the presidency of the club.

4) We briefly discussed the membership drive and I explained efforts to create a list of Hams that are currently employed at Argonne. The purpose of the list is to inform everyone that Club is still active and that we have meetings and to entice everyone to join.

5) Dick Konecny discussed last weeks repeater maintenance and gave me a copy of his notes but I left it at home. I'll scan it at home and email it to everyone tomorrow.

⅞ or ⅝ Two Meter Vertical

by Deni, W9DS

Having wondered why the ⅞ λ aerial isn't popular, we have to take a look at the problems of gain, tuning, matching, position on the vehicle, and overall complexity. All of the work has been done by others in New York by a group of FM mobile enthusiasts and compiled and presented by Gilbert Boelke, W2EUP, in an article in April 1970 73 Magazine.

The ¾ λ whip in tests proved to be almost the equal of the ⅝ wave whip. The ¼ λ whip, ½ λ whip, and ¾ λ whip didn't lite a candle to the ⅝ whip except to a ⅞ λ phased vertical which is hard to get right on using a coil and capacitor values to phase it. But, is it not easier to operate, and with a ⅝ λ, easiest to build? That phasing job is trial and error. Let's see what the gain differences are. Things are simple if we take the same kind of aerial at both ends of a path. Now test a aerial ⅝ λ measuring the gain from a ⅝ λ aerial transmitting. In this case the gain is double, because the gain is doubled being the same aerial type in receiving another ⅝ λ aerial. In this case gain was 6db. The half wave whip was 3.6db and number one, the ⅞ phased vertical at 8.4db.

The ⅞ phased vertical modified the current distribution resulting from insertion of a series capacitance at a point ⅜ wavelength from the aerial top changes the current so that more of it flows along its length than without the added capacity. It was finally determined that the ⅝ λ was 3db and the ⅞ phased aerial was 4db gain.

20, 15, 10 Meter ½ Wave Vertical

by Deni, W9DS

This article shows how small area can fit a tri-band full ½ wave vertical. It stretches 33' straight up and 6 inches separation from each other. The 20 meter aluminum pipe center feeds the 3 bands. A 1 inch OD aluminum 3' pipe is set 1 foot into the earth to support the whole aerial. On top inserted into the pipe center a drilled 5/16 inch hole for coax to run to transceiver. This pipe is plastic plumbing ¾ OD. The 20 meter aluminum is 8' 1" OD bottom section placed into ¾ OD plastic bottom insulator. Then telescope an 8' ⅞ aluminum section with pipe overlap 6" slit 1" with hacksaw slide ⅞ into 6 inches and hose clamp it tight.

Now at the top of this ⅞ section comes the center insulator ¾ inch center drilled 5/16 to bring out feed line coax RG58U. Then second ⅞ OD 8 foot section slit and clamped top of insulator both sides hose clamped tight. The top of this section ¾ OD aluminum 8' section slit hose clamped. Remember the six inches overlap. At the

top end, plug opening using rubber cap. Take 450 ohm strained feed line for 10 and 15 ½ wave dipoles. Cut from stock ¼ wave on each band. Separate the 1 inch spaced wires 450 ohm line cutting exactly in center so you have two coated ¼ wave wires for each band plus an extra 10 inches for pruning. Next you will use stand off insulators 6 inches from the 20 meter aluminum acting as a mast now for these two bands. Clamp-on TV standoff insulators should work nicely.

These dipoles are on opposite sides of the mast. Dipole needs to be tight on each opposite side. Bring coax up through top hole running up the tube. Separate shield from center conductor cut away plastic from center conductor [don't short it to shield]. Take conductor put it over the top of insulator so it contacts the aluminum and slide top hose clamp over the conductor tighten. Slide shield under bottom hose clamp tighten coat with weather proofing compounds guy wires are 45 degrees outward so as not to detune these two bands.

Keep feed line from decoupling by non-resonant lengths in line. Lengths that are ok nine feet, 27, 39, 57, and 75 feet can be used ok. This is ok for moderate power. 1500 watts requires an RF choke placed at the bottom of the mast. Wrap 20 turns of the coax around 2 inch OD plastic pipe securing with electrical tape.

It is possible to add two more bands opposite each other with a total of 5 bands. Forget the resonant lengths and go with the RF choke.

Idea taken from an article presented in 73 Magazine October 1982 by W1GV/4, Stan Gibilisco.

⅝ wave for HF

by Deni, W9DS

It's an antenna that's been around for a while. The ⅝ wave is most loved by VHFers because of the gain overall. The only aerial that beat it by a db or two is the ⅞ wave phased vertical that I wrote an article about. R.L. Crawshaw, WA0NGV, introduced me to the HF qualities just like on VHF. His article appeared May 1970 73 Magazine with little fanfare. The two meter repeaters with FM was coming into its own.

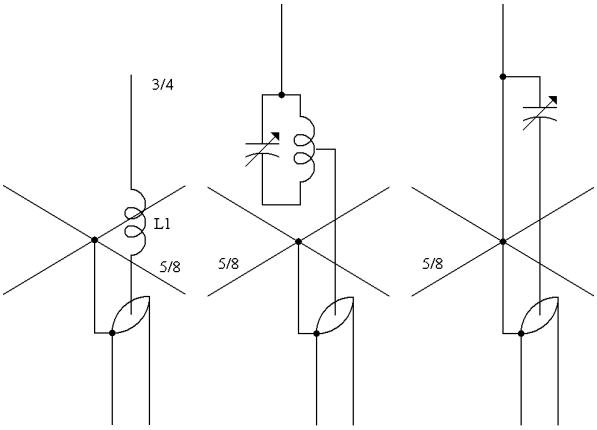
So to see an article on the ⅝ wave probably went unnoticed. The real deal is 2 ½ times as tall as the most simple short ¼ wave vertical. The big improvement is at a very low angle of radiation 20 to 10 degrees with much improved reception. I have operated on ten, 15, and 20 meters using one full wave aerial. I fed each at the ¼ wave from the bottom point using RG59U I believe. The wires were lamp cord lashed at the top and pulled over a limb 50' high. The aerial performed very well on DX. The aerial angled to the east and yet had fine singles to the South Shetlands, Falkland Islands, South Georgia Islands, South Orkney Islands, and South Sandwich Islands with SSB contacts over a few years. When I couldn't hear 'em on the Windom, I pulled them in on the vertical. I have trees approaching ninety feet, but my arm just can't make that high throw any longer. Tsk Tsk.

Back to the ⅝ wave and the WA0NGV article. The earliest publication appeared in 1924 proceedings of the institute of radio engineers says K7DBA. Here I thought it was something more recent. The ⅝ wave has 3db gain over a ¼ wave vertical in theory, because the way they are being used much of the gain is lost. When installed on an HT results in greater coupling of RF energy into the operators hand and face compared to a ½ wave HT whip.

The ⅝ λ is non-resonant with high reactive load impedance unsuitable for direct feed point connections. What to do? We can use open line or transform this impedance into a 50 ohm non-reactive feed point. Connect coax shield to 4 legs ⅝ wave length radials and add a coil in series with the whip now base tuned to ¾ wavelength no change in radiation pattern. This is a resonant length which will closely match 50 ohm coax. SWR should be 1.2 to 1. SWR improvement comes by dropping the radials 30 degrees below horizontal. It will be broad banded. Another feed system parallel resonant circuit tuned to operating frequency with feed point tapped at a low impedance point on the coil. This provides high impedance feed to base of radiating element and a direct ground connection for lightning. Grid dip the coil capacitor by taping the coil and tuning the variable capacitor to frequency. It won't be quite as broad banded. Last method is using a gamma match. Using a series capacitor feed point tap variations combined with series capacitor adjustments can get you 1 to 1 SWR.

Shunt feeding towers we have heard about, the full radiator length is 585 / freq in mHz. The decoupling radials should be ⅝ λ at the high end of the band and the decoupling radials should be a minimum of ¼ λ at the low of the operating band. Decoupling radial length feet 240 / freq in mHz.

All coils to be space wound with large wire or tubing and the length to diameter ratios are 4 to 1, better if 2 to 1. Capacitors are high quality ceramic insulated or wide air-spaced variables for power capability. The coax feed tap point invariably is quite close to ground end of the coil.

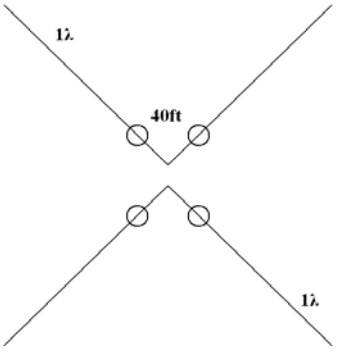


1) ⅝ λ Base Loaded to ¾ λ With Series Inductance
2) ⅝ λ Vertical Parallel – Tuned Circuit Feed
3) ⅝ λ Grounded Vertical Gamma Match Feed

The 75 Foot Square Aerial

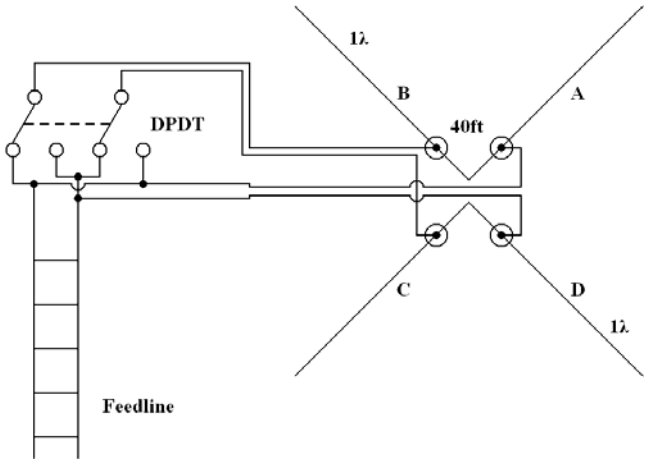
by Deni, W9DS

It was in November 1965 that Ray Hoffman, W4TDI, was published in 73 Magazine. He had dreams of rhombics, but settled for 75 feet square to put up his X beam. He used one pole 40 plus high. From this pole the aerial is two Vee's. Each leg (4) has an insulator so it's independent of each of the switching pairs, which gives an effect like rotating the aerial. All four wires are terminated near ground level. Sloping the legs provides more gain at desired angles. This increases capture area.



O Equals 1 Insulator

If each leg is one wavelength long, then the tilt angle is 45 to 50 degrees and the height is ½ wavelength. The angle between adjacent wires is 90º and 45 degree tilt angle. On 20 meters the gain is 3 to 5 db over a dipole. The aerial covers 75 feet between legs with center 40 feet high. A rhombic has out of phase currents in its adjacent legs. A tuned system can be ideal using 450 ohm feed line to relays. Switching the feed point 90 degrees. See drawing. Legs A and D are permanently connected to the feed line and to the cross-connected fixed pole of the relay. Legs B and C are connected to the moving arms of the relay. For one direction leg A and B are connected and legs C and D are connected. When the relay is actuated, legs A and C are connected and legs B and D are connected which switches the directive pattern 90 degrees.



The beam is oriented east – west and north – south on the lot. Copying Florida comes up to 20db and Europeans direction 15db. Working aerial on 80 meters no change when relay activated. 40 meters noticeable change in directivity when switched. 15 meters just like 20 meters. The author pumped 1 KW into the wire and it didn't melt or make any funny noises were seen or heard. Legs A & D both go to the feed line and the cross connected fixed poles of the relay. B & C are moving arms of the relay.

Ten meters 3 Element Cross Beam

by Deni, W9DS

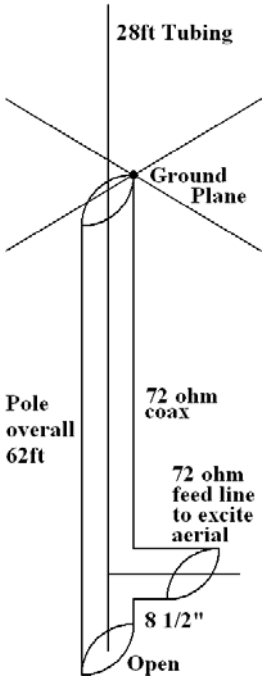
An interesting concept by K6CT, George Messenger, who wrote about it in 73 Magazine Oct 1961. It' a double gamma matched fed turnstile yagi. One element horizontal the other vertical elements. The objective is a circular pattern that provides improved performance in oblique planes. The elements and spacing were fixed at maximum gain, but slightly shaded areas were down 5db. All director elements are 15 feet 5 inches. The horizontal and vertical driven elements 15 feet 5 inches, and reflectors 17 feet 4 inches. Spacing director to driven elements 7 feet 7 inches, driven element to reflector 4 feet 10 inches. The boom length 13' and 2 inches in diameter. 3 elements each 12 feet long 1 ¼ diameter aluminum. Then 2 outer pieces telescope into center piece these are 6 feet long 1" diameter aluminum. At 28.650 element length reflector 17' 4" driven 16' 5" director 15' 5". Gamma rods 3/16 inch aluminum tubing 24" long. Adjustable strap for verticals 21" at 125mHz. Horizontal 20" at 93 ohms ¼ wave phasing coax RG63U 7' 3". Spacing between gamma rods and driven element 4". At aerial end all coax shields connect to the mast the

mast bolts at the center of gravity on the boom. This keeps the vertical driven element 14" from the mast, the mast clamps to boom on opposite side from vertical elements, which keeps mast away from immediate plane of the vertical elements. K6CT guess his cross aerial gain of some 10db gain.

UB5UG's 5 Band Vertical

by Deni, W9DS

July 1966 73 Magazine carried this article by W8FAZ. I was curious about this Russian aerial, because the drawing showed the lines of standing wave distribution for harmonically related curves that assume theoretical powers for each band it covers. It is multi-banded, needs no switching or traps, and only one feed line. On 80 meters it's a ¼ wave vertical with 4 horizontal wires acting as a capacity hat and that's good for 80/40 low angle DXing. On 20 and 15 meters the ground plane is ½ wave on 20 meters and ⅝ wave aerial on 15 meters. Ten meters also has good results. It works like the horizontal windom all band aerial. The vertical length is made of 72 ohm coax cable and so is the feed line. The feed point is 8 ½ inches off the bottom. The vertical is open ended cable that runs 63 feet vertical to 4 radials 20 feet ⅛ inches each. The vertical section is 1 ½ inch tubing 28 feet. The aerial is 62 feet to a pole and the tubing is above that so total is 90 feet. UB5 says it works best on 20 and 15 meters with 72 ohm transmission line.



UB5UG

W8RTU Vertical Dipole

by Deni, W9DS

The W8RTU vertical appeared in World Radio July 2000. The article has a graph showing the radiation resistance with height in wavelengths of the center of the vertical half wave and wavelength above perfect ground. The vertical dipole is 40 feet. The aerial can stand a full KW of power if number 12 copper wire is used. Using coax center feed put shield to the bottom ¼ wave element and center conductor from the 52 ohm feed line soldered to the top wire. No radials are required. At the feed point the author saw fit to put a 7 turn RF coil to keep RF off the feed line. He uses an aerial tuner. Contacts made with Japan 7,400 miles from Florida and 5,000 miles from T32 East Kiribati.

W8RTU using mini prop V2.0. The 3 signal hops to T32 at 5 degrees angle and 4 hops to Japan. With the verticals bottom up 0.1 to 0.2 wavelength from ground. So, on 20 meters the bottom end should be 7 to 14 feet off earth and at 0.6 wavelengths above ground has a vertical lobe from zero to 20 degrees with maximum at 5 degrees.

So, if you haven't the length for your horizontal aerials DXing, try this vertical with the lowest angles which can be hardly be seen and hidden out of sight.

75 Meter ⅝ λ Zepp Goes DXing

by Deni, W9DS

I found this copy of 73 Magazine that has no month or year, but the author is Carl Crumley, N4VD. The aerial has a top hat which is made of 1" x ½ x 6 wooden slats number 12 copper wire soldered to each wire of the coil it is a capacity hat. You need SWR bridge and grid dip meter. A variable capacitor 10pf to 250pf wide spaced. L1 bottom coil 12 turns 14 solid copper wound on 2 inch form tapped 4 turns from bottom for coax feed line Space wound to a OW moving tap over entire length for low SWR C1 if needed 365 pf per section broadcast-type variable a LL sections may need to be paralleled for maximum capacity. If resonance is not obtained with one or two sections. Radials 60 feet long each buried 1" down. L2 35 turns 14 copper wound on 4 ½ inch form, space wound for a tap for tuning.

The aerial is hung between 2 trees suspended on a rope pulley at the center pulls up the top hat one foot above the coil L2 L2 at the base of aerial is tapped by the coax feed line center conductor. A capacity; hat was placed onto the rope and top coil a foot or more below the capacity hat found a dip at 5.4 mHz the ¾ wave point he relied on the ¾ wave dip for further adjustments. A few more turns were added to the inductor L1 and resonance dip at 4.5 mHz found the aerial was ¼ wave at 1.5 mHz and ⅝ wave long at 3.8 mHz the band width is narrow it

makes the DX window alright. N4VD first on the air test on 75 meters SSB received 5 by 8 plus 5 over S-9 report from G3KFT then DJGTK broke in and said N4VD was 5 by 9.

3 Bands With Vangorden Engineering HQ Center Insulator

by Deni, W9DS

Bill Clarke, WA4BLC, whose call now belongs to the whole Clarke family wrote his, article in 73 Magazine May 1984. Notice the advantages of his aerial. Broad banded aerials without tuning or switching bands, no lossy coils, traps, or stubs. Can be designed for any band you choose. Using one feed line it takes a few hours to build. He didn't want any special length feed lines.

The center insulator lugs has the bands ¼ λ elements attached and the use of braid as a flexible connector line braid 3 per side is soldered to the 14 gauge or 12 copper wire with an 8 inch overlap on itself.

We have 10 HF bands 160 to 6 meters. Chose any 3 for this special center insulator more than this gets clumsy to handle. Hang the aerial high enough to be out of the way of tangles. Height for dipoles is thirty feet and up. Hanging inverted Vees the angle between legs must never be less than 90 degrees best make it 100 degrees for the best effect or the signal cancellation will take place. Use wire end insulators and the lowest height being up eight feet for safety sake. Each leg length must be the same or symmetry will be lost and don't run the feed line parallel to the wire aerial. Feed line can be any length with no problems.

Band	¼ λ length in feet
160 low	126.5
160 high	120
80 CW	62.6
80 SSB	60.5
40 CW	33.1
40 SSB	32.3
30 CW	23.2
20	16.5
17	12.6
15	11.0
12	18.9
10	28.2

2 Element Vertical Beam

by Deni, W9DS

Concepted by W0VM, Bill Stocking, his article ran in 73 Magazine May 1983. Bill loves open line feeders because of odd ball aerial wire lengths, coax can't handle it easily. It's given verticals radiate RF at lower angles to the horizon than horizontals and that's why in those cases verticals made the DX contact that horizontal beams are unable to make. W0VM made a 2 element 20 meter beam bottom up 40 feet on tower top. It was made of 2 bamboo fishing poles using a driven element and reflector held by some 1 x 2 inch lumber. The reflector 37 feet and the driven element 35 feet. The open wire feeders fire the aerial up with low losses. The aerial loads up on 15 and 10 meters and the aerial radiates well as a tri-band vertical. It's all in the open feeders and the matchbox at the operating position.

Old timers used a series of ways to match their transceiver and line. The matchbox contains any type of coil arrangement so not to promote wrong way matching were the tuner becomes a power sucker and not a power resonator. Resonance is what is happening when tuning the rig with its 50 ohm output it must match the feed line via a match box which does the work matching aerial to feed line. Capacitance provides another kind of reactance variable to counter react the inductive reactance and lower the signal losses as the traveling wave races to the ends of your aerial. Happy hamming.

On the Square Aerial

by Deni, W9DS

This aerial has been around for a while and be adopted for 6 meters and 2 meters. It uses, at HF, open line feed. The bi-square is 4 half waves in phase 4db better than a dipole and bidirectional or hang 2 on one pole and get 360 degrees coverage. It is 2 wave lengths forming 4 sides ½ wave each. Its shape is in a diamond, top open, 2 inches separation using an insulator. It is terminated in a ¼ wave stub shorted and 4.7 feet on 6 meters and at 52mHz 9.46 feet per ½ wavelength long. A pole 15 feet high is used to hang the bi-square form. Stubs are held apart by TV standoffs. You can run the stub up the pole and tuned to 52mHz. Find the spot on the stub where a low current bulb has maximum brightness. That's where you make the stub short bar and solder. Connect twin lead feed line 300 or 450 ohm type then move the feed line up and down the stub until you like the SWR.

Now matching 300 ohm feed line to coax. A half wave 72 ohm coax with a velocity factor of 0.66 times the length equals the length of this match. Take the 72 ohm coax and make it into a loop and the outside shield is soldered together. The transmitter 72 ohm coax line connects braid to loop braid and center connector to one center conductor of the loop. This is like a balun. A re-entry transformer multiplying 4 times the impedance of the coax 288 to match 300 ohms. The array is horizontally polarized. Add a reflector and gain rises to 8db. A favorite of W8LIO but written for 73 Magazine August 1961. By W8GUE/6 this would even work on two meters!

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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.

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