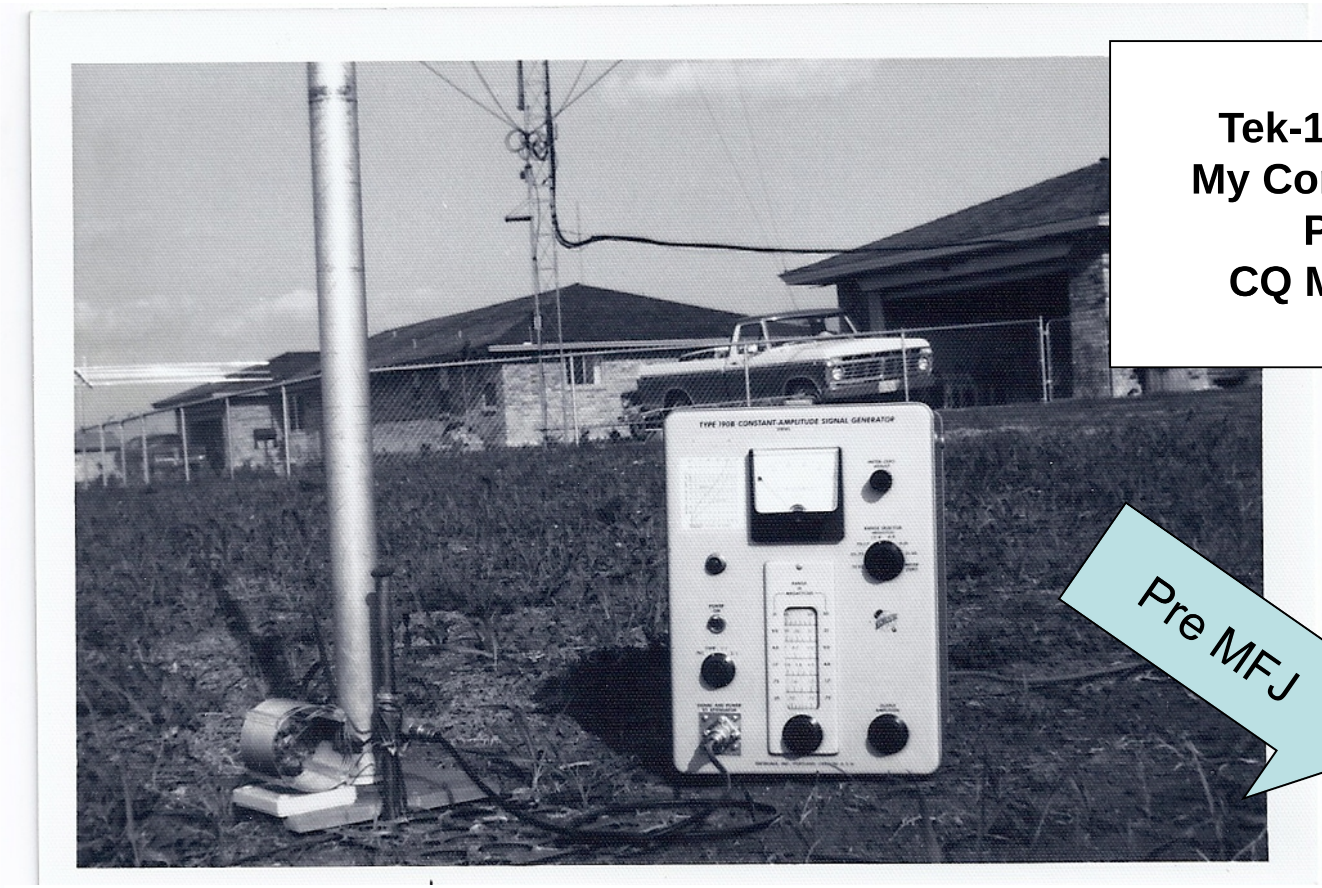
K5QY'S ANTENNA PROJECTS

-OVER 30 YEARS-

1) **Vertical Matching and Testing**
2) **2- and 3-Element 80 m Phased Verticals**
3) **2-Element 160 m Phased Verticals**
4) **160 m Receive Antennas**
5) **2-Element Phased 80 – 10 m Inverted Vees**
6) **Various Antennas and Other Projects**
7) **Various Magazine Articles**

EARLY ANTENNAS and PROJECTS

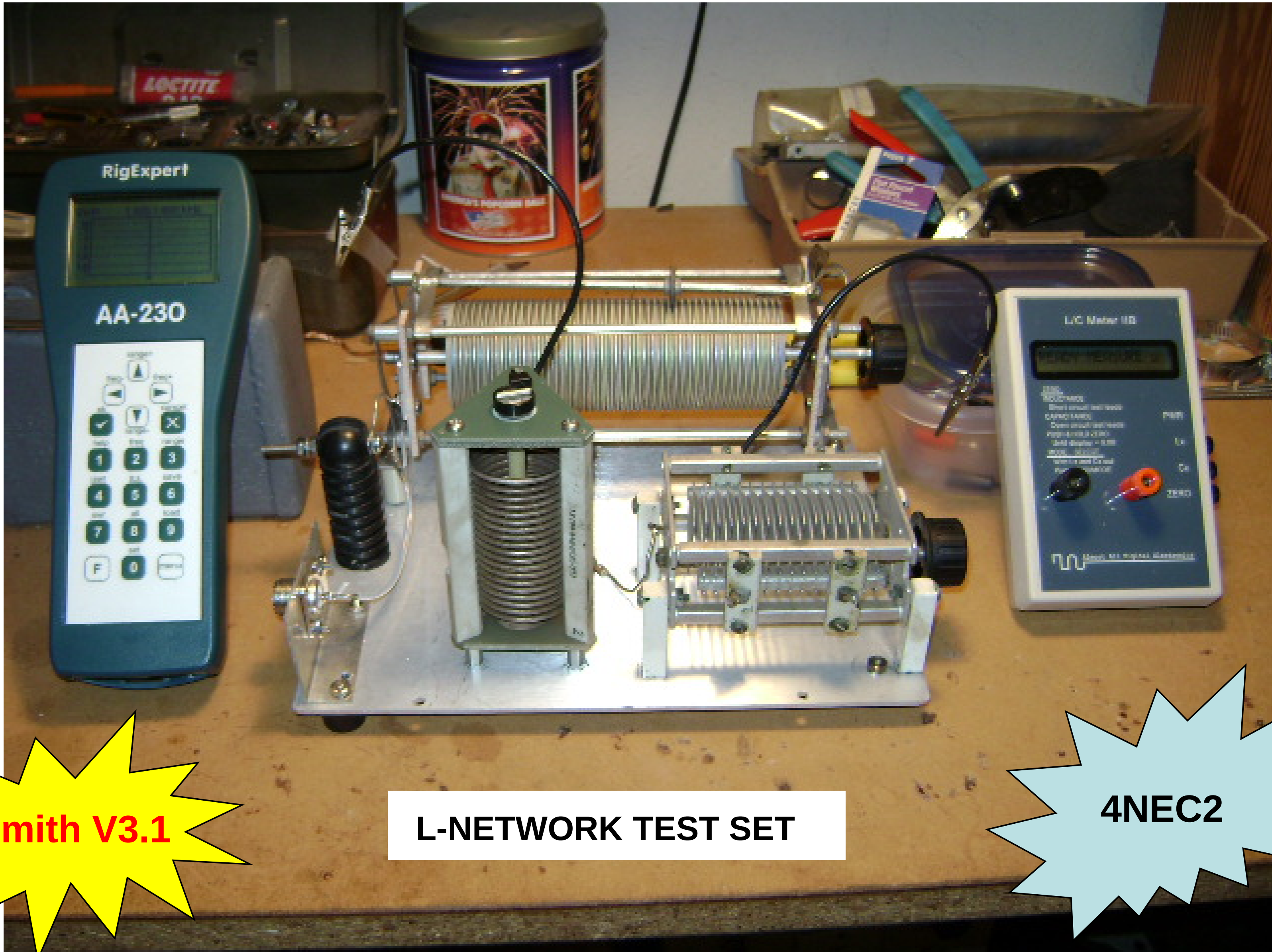


Tek-190B SWR Meter
My Construction Article
Published in
CQ Magazine (1977)

First Full-Size 80 m
Vertical

Pre MFJ

PRESENT DAY ANTENNA TEST EQUIPMENT



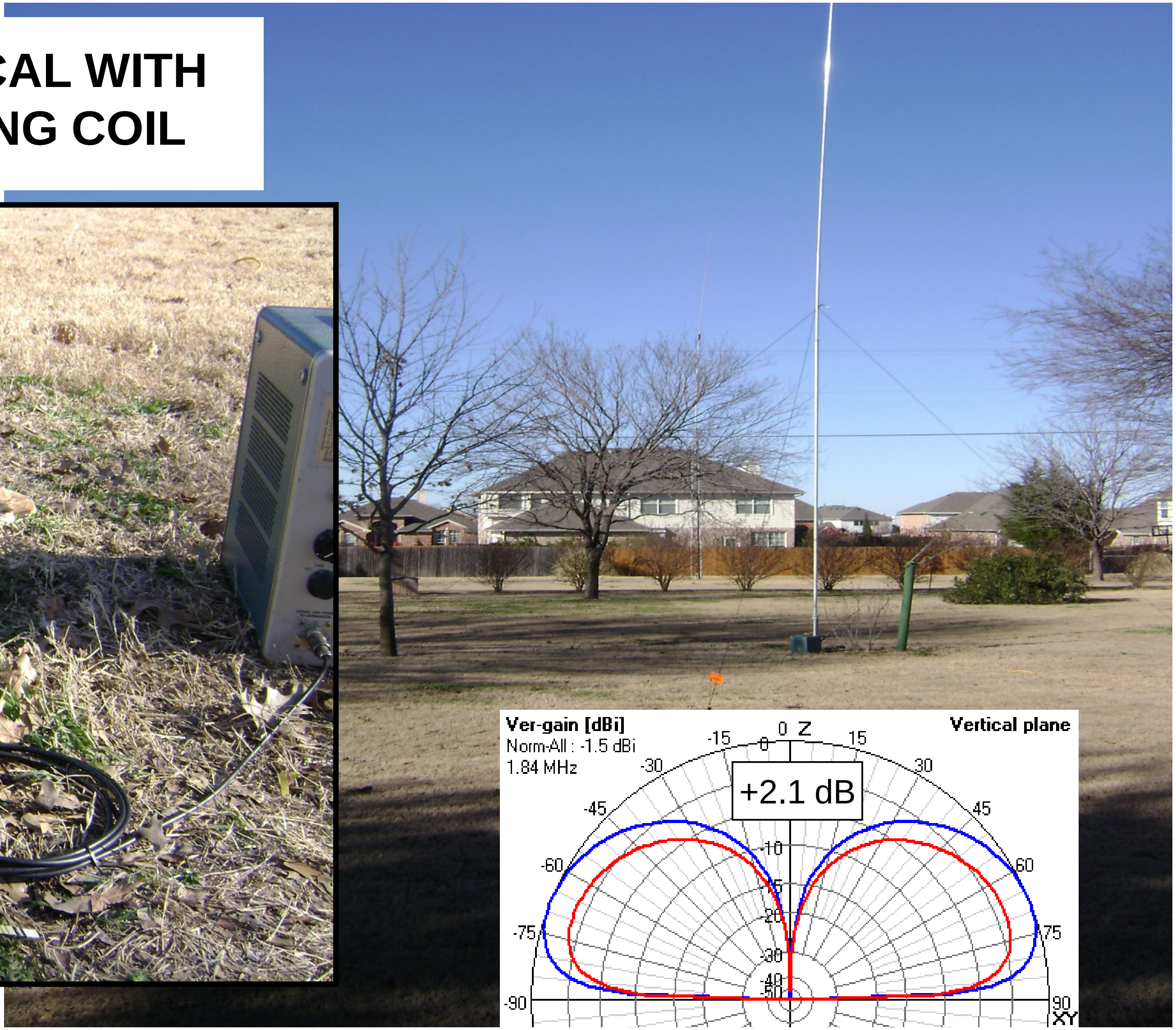
Smith V3.1

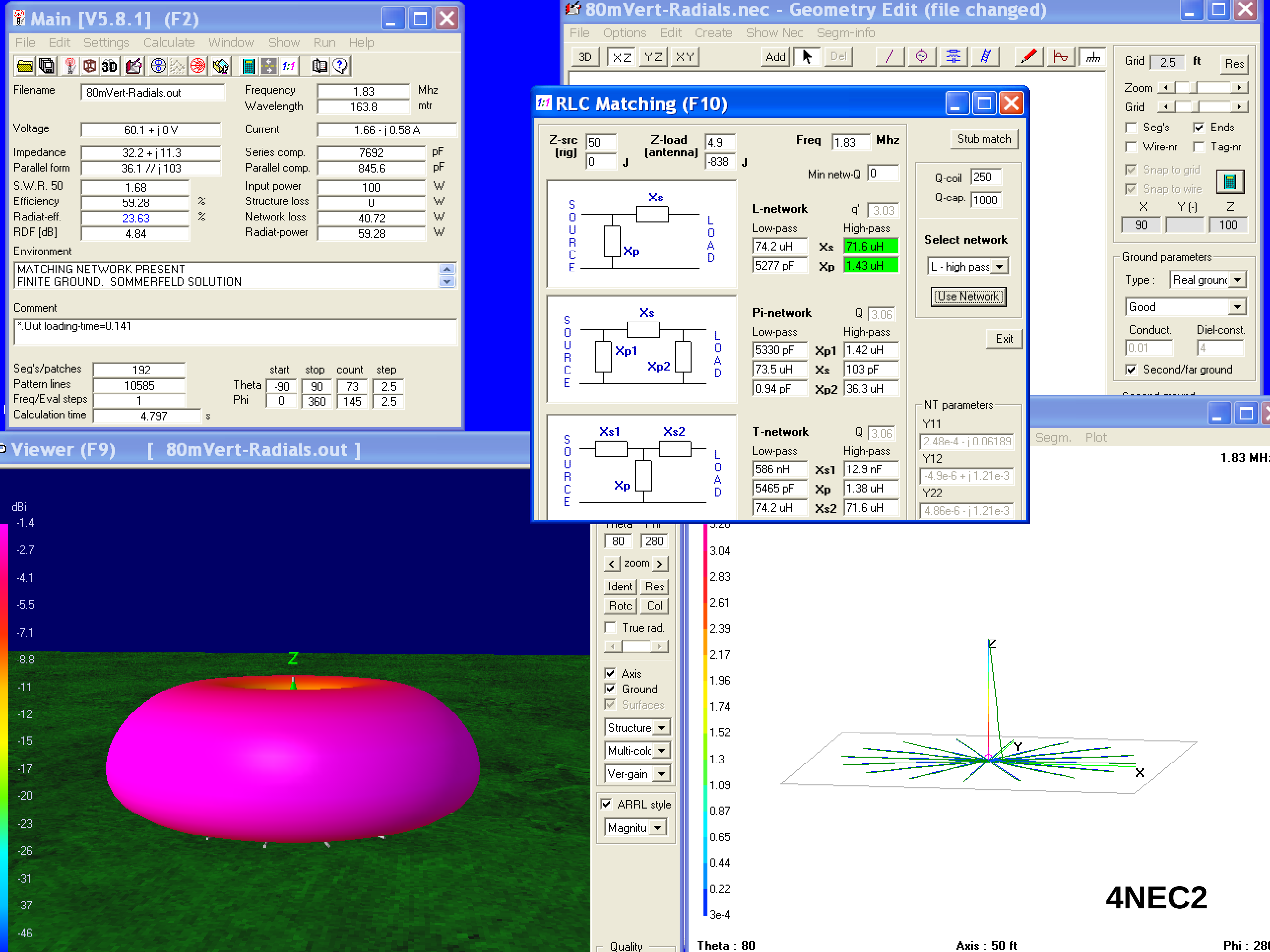
L-NETWORK TEST SET

4NEC2

50-FT VERTICAL ON TEST BASE

43-FT VERTICAL WITH 160 M LOADING COIL

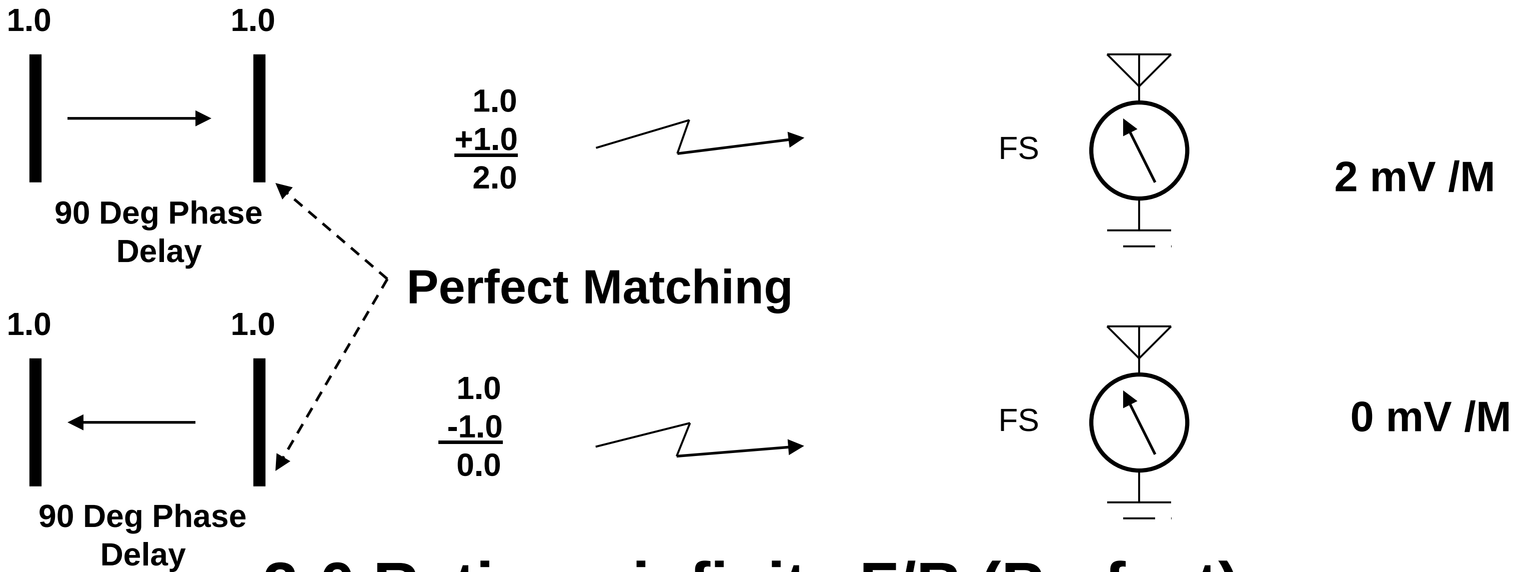



Main [V5.8.1] (F2)
File Edit Settings Calculate Window Show Run Help
Filename 80mVert-Radials.out
Frequency 1.83 Mhz
Wavelength 163.8 mtr
Voltage 60.1 + j 0 V
Current 1.66 - j 0.58 A
Impedance 32.2 + j 11.3
Series comp. 7692 pF
Parallel form 36.1 // j 103
Parallel comp. 845.6 pF
S.W.R. 50 1.68
Input power 100 W
Efficiency 59.28 %
Structure loss 0 W
Radiat-eff. 23.63 %
Network loss 40.72 W
RDF [dB] 4.84
Radiat-power 59.28 W
Environment
MATCHING NETWORK PRESENT
FINITE GROUND. SOMMERFELD SOLUTION
Comment
*.Out loading-time=0.141
Seg's/patches 192
Pattern lines 10585
Freq/Eval steps 1
Calculation time 4.797 s
start stop count step
Theta -90 90 73 2.5
Phi 0 360 145 2.5
80mVert-Radials.nec - Geometry Edit (file changed)
File Options Edit Create Show Nec Segm-info
3D XZ YZ XY Add Del
Grid 2.5 ft Res
Zoom
Grid
Seg's Ends
Wire-nr Tag-nr
Snap to grid
Snap to wire
X Y (-) Z
90 100
Ground parameters
Type : Real grounc
Good
Conduct. Diel-const.
0.01 4
Second/far ground
RLC Matching (F10)
Z-src (rig) 50 0 J
Z-load (antenna) 4.9 -838 J
Freq 1.83 Mhz
Stub match
Min netw-Q 0
Q-coil 250
Q-cap. 1000
SOURCE LOAD
Xs Xp
L-network q' 3.03
Low-pass High-pass
74.2 uH Xs 71.6 uH
5277 pF Xp 1.43 uH
Select network
L - high pass
Use Network
Exit
Xs Xp1 Xp2
Pi-network Q 3.06
Low-pass High-pass
5330 pF Xp1 1.42 uH
73.5 uH Xs 103 pF
0.94 pF Xp2 36.3 uH
NT parameters
Y11 2.48e-4 - j 0.06189
Y12 -4.9e-6 + j 1.21e-3
Y22 4.86e-6 - j 1.21e-3
Xs1 Xs2 Xp
T-network Q 3.06
Low-pass High-pass
586 nH Xs1 12.9 nF
5465 pF Xp 1.38 uH
74.2 uH Xs2 71.6 uH
Viewer (F9) [80mVert-Radials.out]
dBi
-1.4
-2.7
-4.1
-5.5
-7.1
-8.8
-11
-12
-15
-17
-20
-23
-26
-31
-37
-46
Z
80 280
zoom
Ident Res
Rotc Col
True rad.
Axis
Ground
Surfaces
Structure
Multi-colc
Ver-gain
ARRL style
Magnitu
Quality
Segm. Plot
1.83 MH
3.04
2.83
2.61
2.39
2.17
1.96
1.74
1.52
1.3
1.09
0.87
0.65
0.44
0.22
3e-4
Z Y X
4NEC2
Theta : 80
Axis : 50 ft
Phi : 28

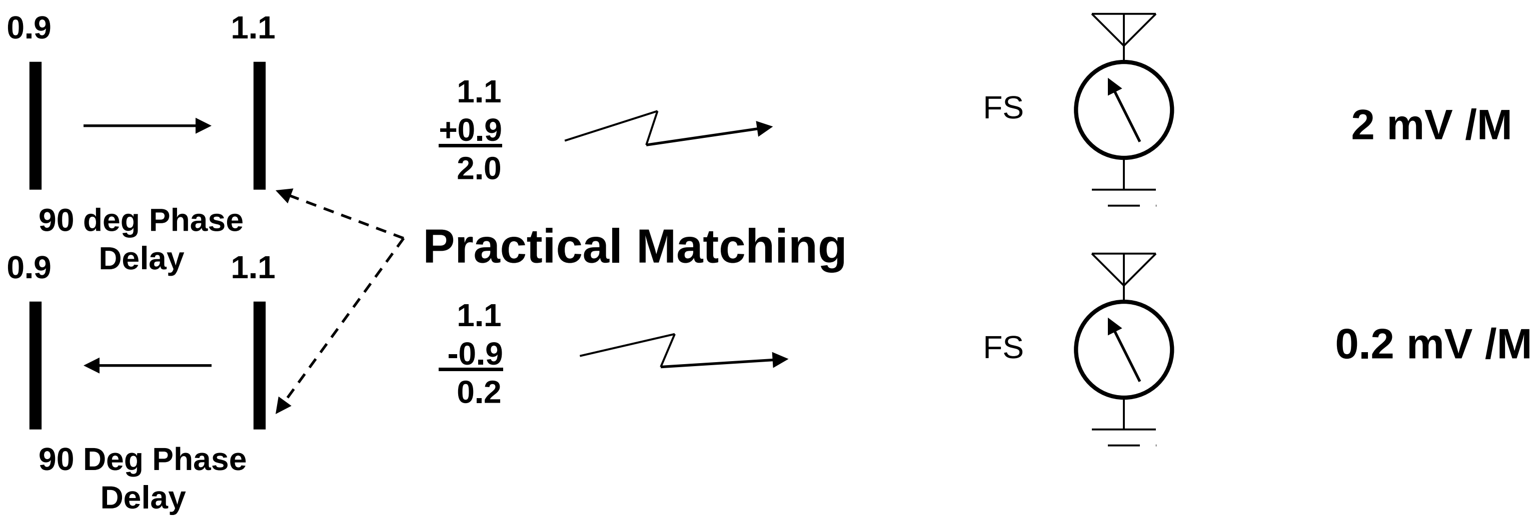
160/80/75/40 m REMOTE MATCHING NETWORKS

80 METER 2- & 3-ELEMENT PHASED VERTICALS (HyGain 18HT)

GAIN and FRONT-T0-BACK (W7EL's Notes On Arrays)



2:0 Ratio or infinite F/B (Perfect)



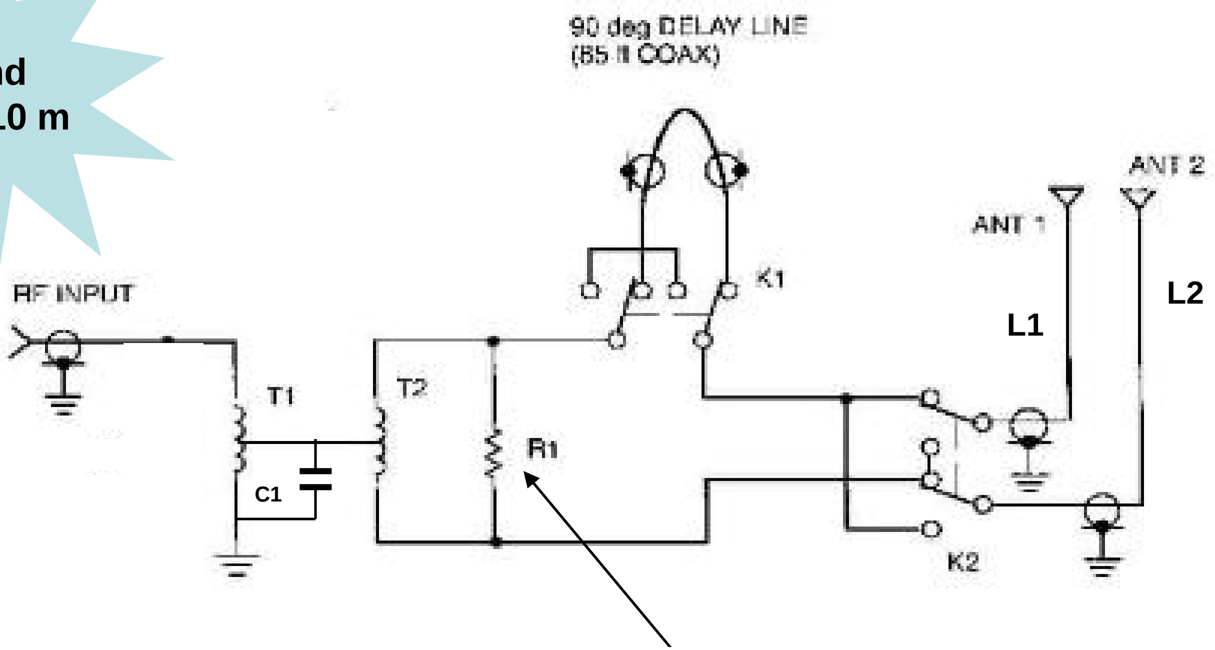
2:0.2 Ratio or 20 dB F/B (Real World)

K5QY MATCHING METHOD

TRANSFORMER POWER DIVIDER

ESI Omega-T 2000C BEAM Steering-Combiner
Construction Details in ARRL Antenna Compendium Vol 2
Steerable Arrays For The Lowbands -W5AH

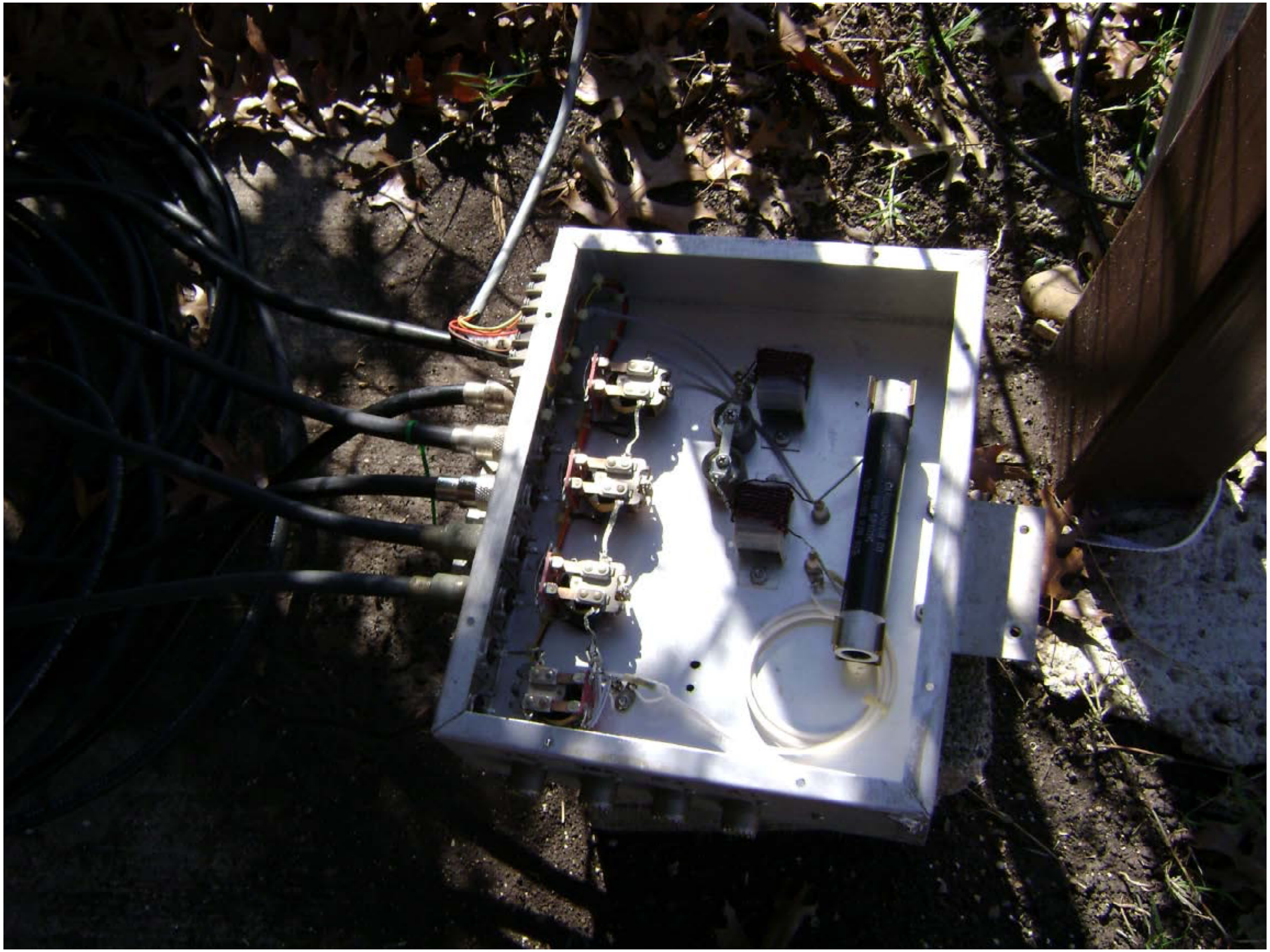
Broadband
160 m thru 10 m



L1 =L2

Worse case R1 dissipates approx .5 dB power (Approx 10%)

Beam Steering-Combiner With Coax Delay Lines

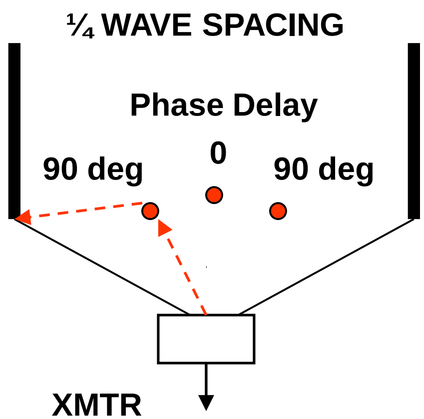


2-ELE VERTICAL ANTENNA SYSTEM

(COMPARED TO SINGLE ELEMENT)

← **ENDFIRE WEST**
+2.9 dB
F/B 20 dB

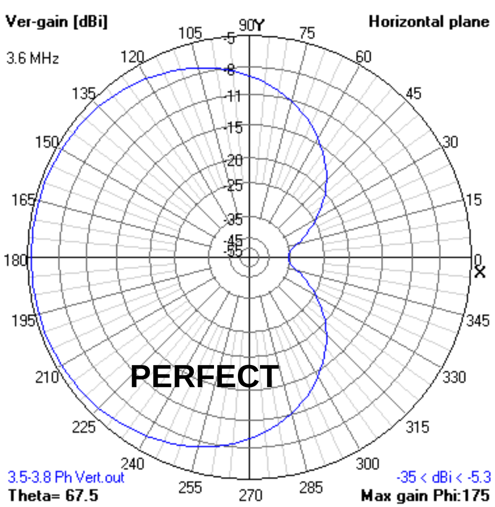
ENDFIRE EAST →
+2.9 dB
F/B 20 dB



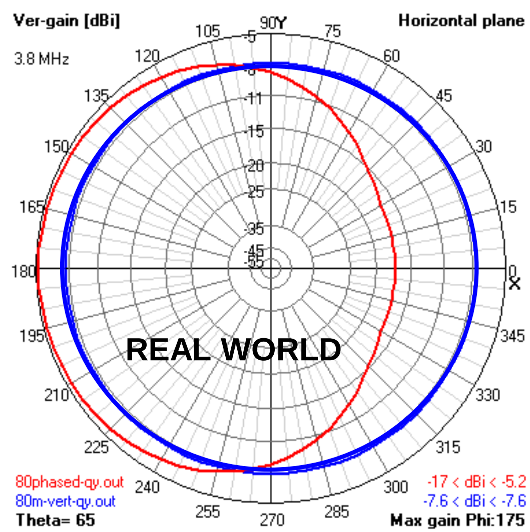
N

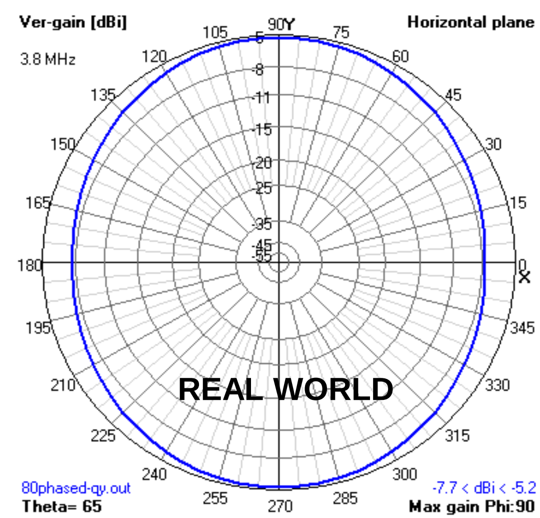
BROADSIDE
+2.9 dB
90 deg, -2.7 dB

S



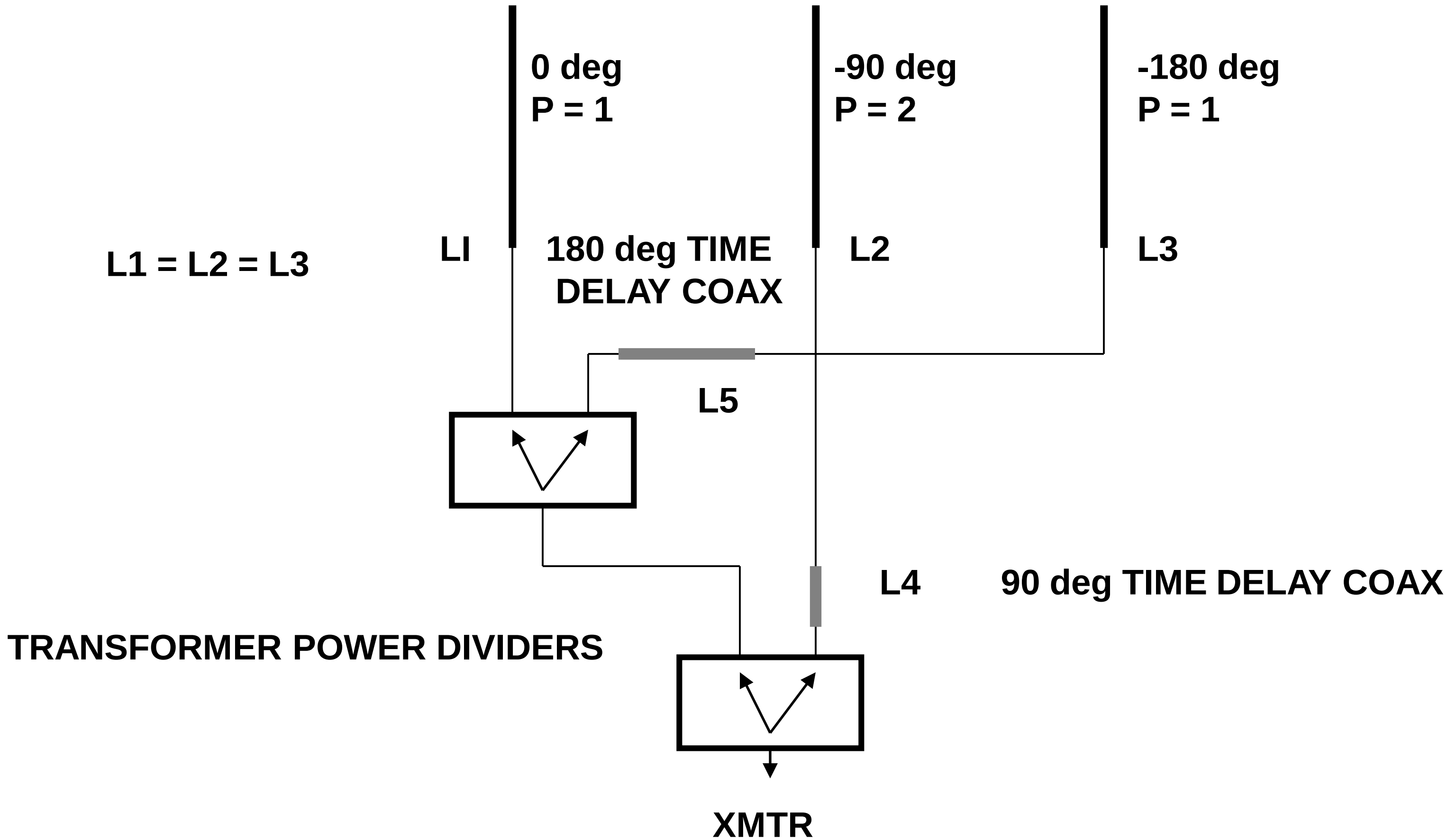
Endfire pattern feedpoint Z of approx 22 -j20 and 40 +j35 Ohms





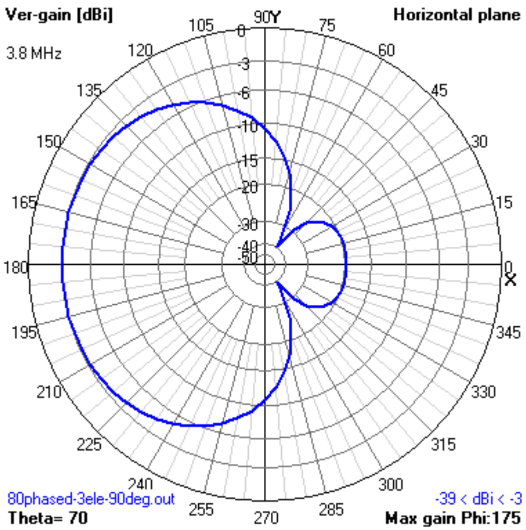
3-ele 80 m Phased Verticals

FEEDING 3-ELE HYTOWER SYSTEM



3-ELE VERTICAL ANTENNA SYSTEM

(COMPARED TO SINGLE ELEMENT)



N

BROADSIDE

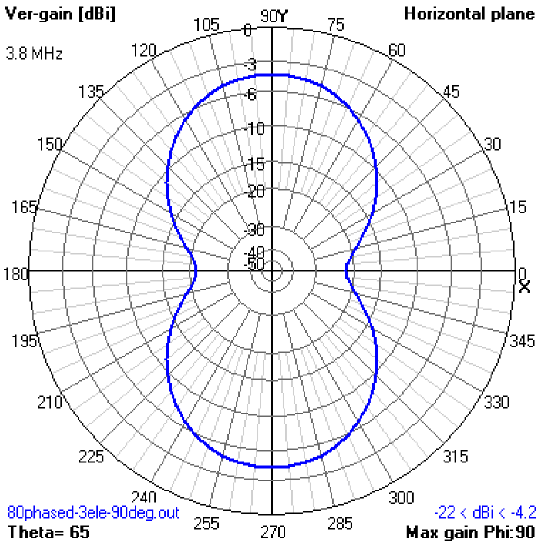
S

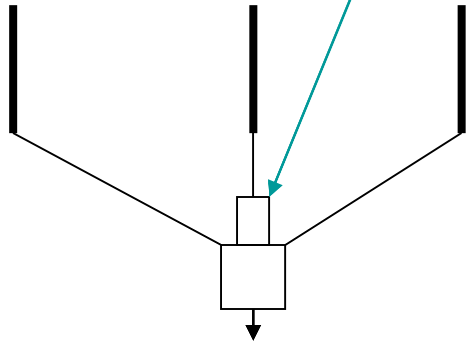
OPEN RELAY

4.1 dB
F/S -18 dB

CLOSED RELAY

2.4 dB
F/S -5.7 dB





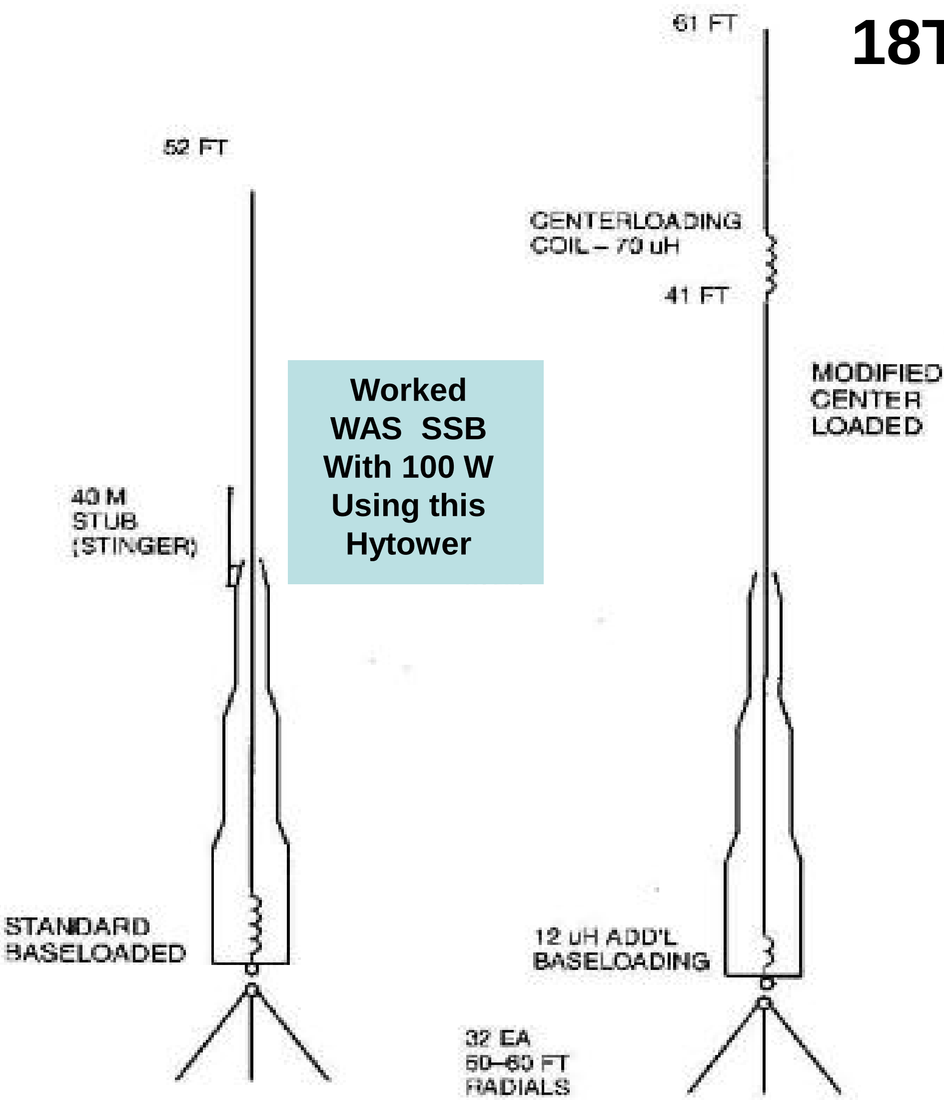
ENDFIRE WEST
+4.6 dB
F/B 12 dB

XMTR

ENDFIRE EAST
+4.6 dB
F/B 12 dB

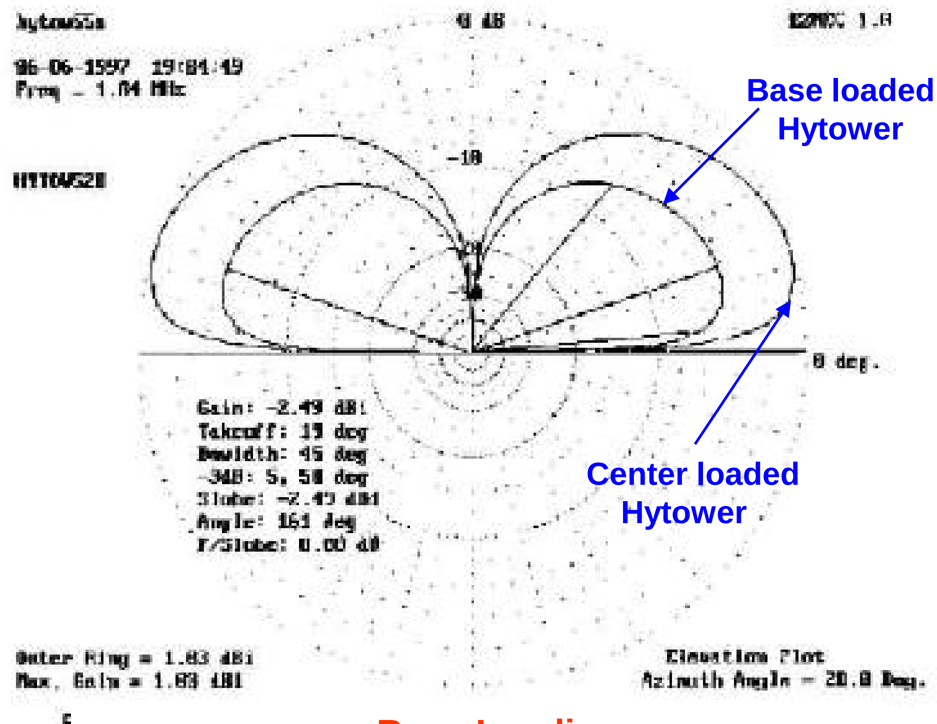
160 m PHASED HYTOWERS

18T HYTOWERS ON 160 METERS



Worked
WAS SSB
With 100 W
Using this
Hytower

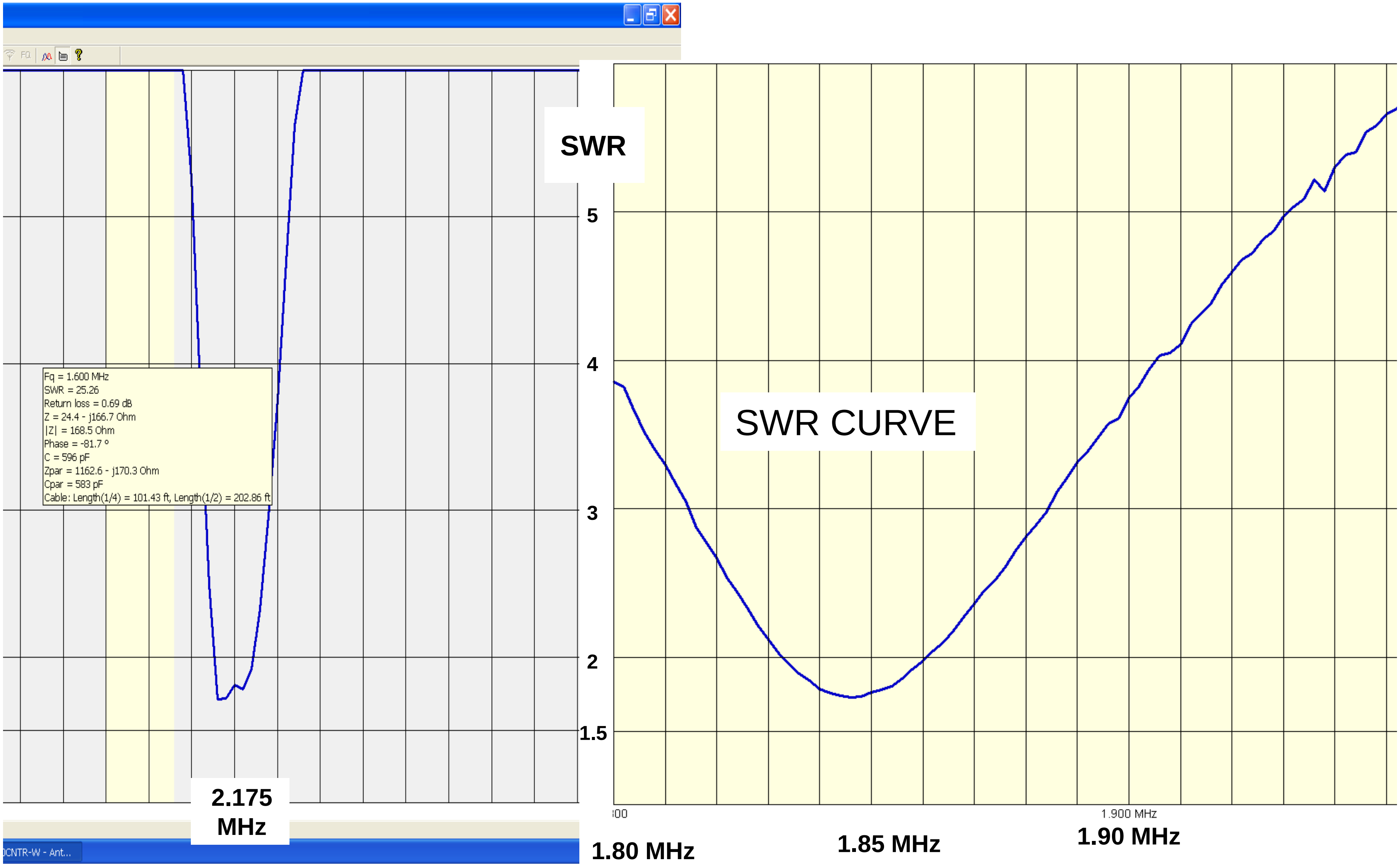
18HT HYTOWER FOR 160 METERS



Base Loading
Vs
Center Loading

+5 dB Improvement

160 Meter Centerloaded HyTower Verticals



EZNEC MODELS

Cable Loss per 100 ft = .84 dB @ 1.84 MHz
Cable Length = 320 Ft.
Calculated Loss = 2.7 dB
Power into Cable = 1200 Watts
Power out of Cable = 646.2 Watts
Gain of Antenna = .95 dBd

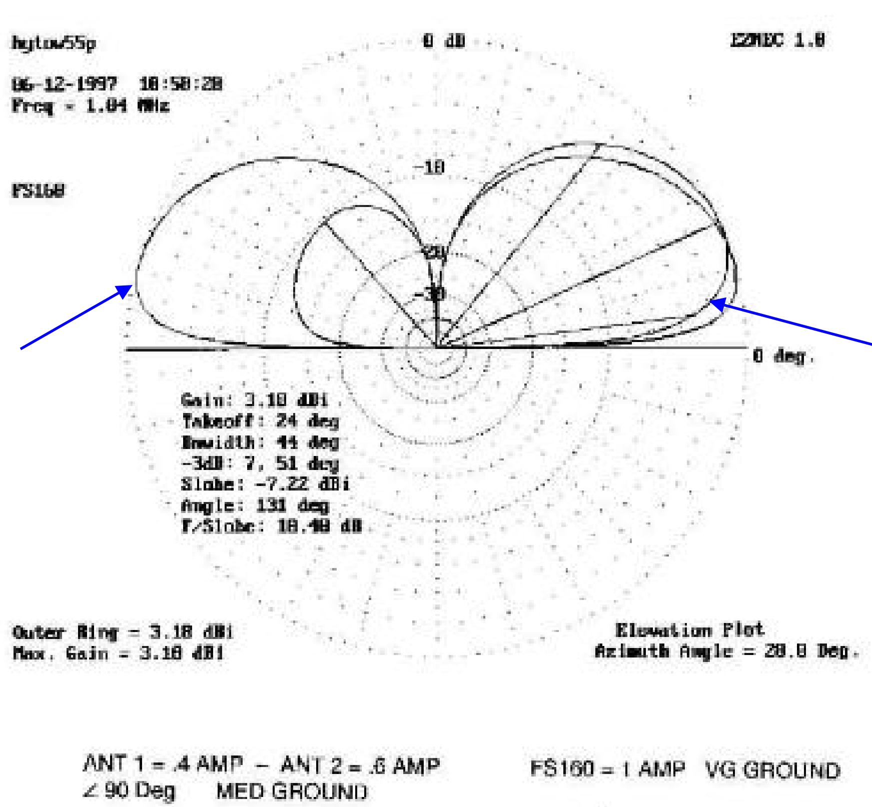
dBd = dBi – 2.15

Cable Loss per 100 ft = .84 dB @ 1.84 MHz
Cable Length = 140 Ft.
Calculated Loss = 1.2 dB
Power into Cable = 1200 Watts
Power out of Cable = 915.3 Watts
Gain of Antenna = -.48 dBd

ERP of Phased Verticals = 802.4 Watts

ERP of Full-Size Vertical = 819.6 Watts

Full-Size
160 m Vert



2-ele Phased
160 m Verts

Full-Size Vert
Vs
2 Ph Hytowers

160 Meter Front-To-Back Tests

band: 160m / mode: cw - Reverse Beacon Network - Windows Internet Explorer

http://www.reversebeacon.net/dxsd1/dxsd1.php?f=797

Favorites | DX Summit | band: 160m / mode:...

REVERSE BEACON NETWORK

welcome | main | dx spots | skimmers | downloads | about | contact us

show/hide my last filters

band: 160m / mode: cw

cancel filter selection / search spot by callsign

rows to show: 20

options:
show/hide

de	dx	freq	cq/dx	snr	speed	time
N7TR	K5QY	1827.1	CQ [LoTW]	8 dB	18 wpm	1129z 09 Sep
K8ND	K5QY	1827.1	CQ [LoTW]	9 dB	19 wpm	1127z 09 Sep
W4AX	K5QY	1827.1	CQ [LoTW]	18 dB	19 wpm	1127z 09 Sep
WA7LNW	K5QY	1827.1	CQ [LoTW]	24 dB	19 wpm	1121z 09 Sep
NQ6N	K5QY	1827.1	CQ [LoTW]	18 dB	18 wpm	1121z 09 Sep
KH6LC	K5QY	1827.1	CQ [LoTW]	2 dB	19 wpm	1120z 09 Sep
N0TA	K5QY	1827.1	CQ [LoTW]	20 dB	19 wpm	1120z 09 Sep
KQ8M-98	AA1K	1820.6	CQ [LoTW]	12 dB	18 wpm	1105z 09 Sep
JA4ZRK	HL5IVL	1823.5	CQ	29 dB	20 wpm	1058z 09 Sep
K8ND	AA1K	1820.6	CQ [LoTW]	24 dB	18 wpm	1057z 09 Sep
N4ZR	AA1K	1820.6	CQ [LoTW]	41 dB	18 wpm	1057z 09 Sep
W8WTS	AA1K	1820.6	CQ [LoTW]	19 dB	18 wpm	1057z 09 Sep
W4AX	AA1K	1820.6	CQ [LoTW]	9 dB	18 wpm	1057z 09 Sep
K1TTT	AA1K	1820.6	CQ [LoTW]	6 dB	18 wpm	1057z 09 Sep

NV
OH
GA
UT
CA
HI
CO

West

East

West

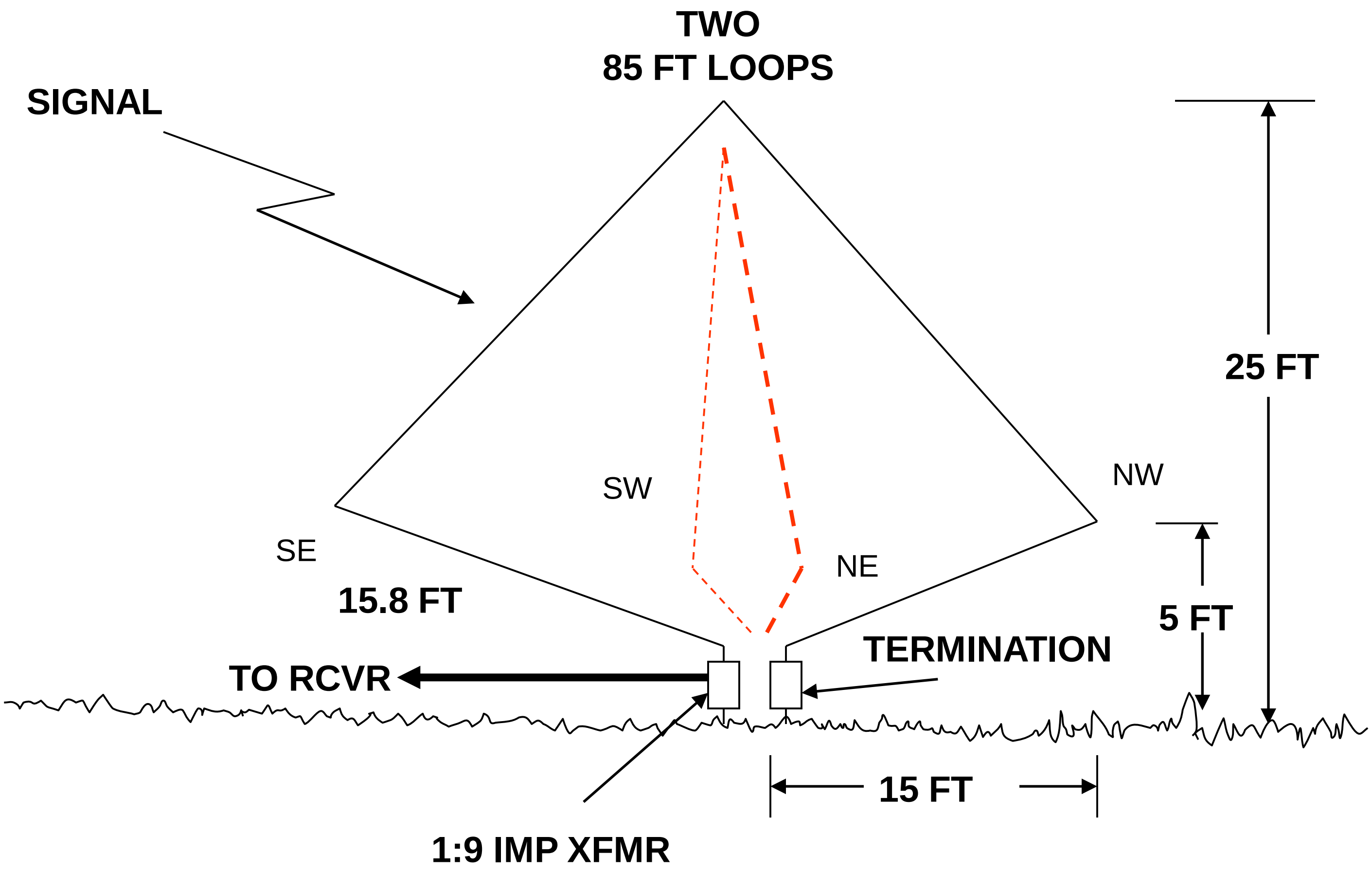
160 m RECEIVING ANTENNAS

BEVERAGE ANTENNA

K9AY RECEIVING LOOP ARRAY

Encouraged By Steve Bartz -AD5UQ

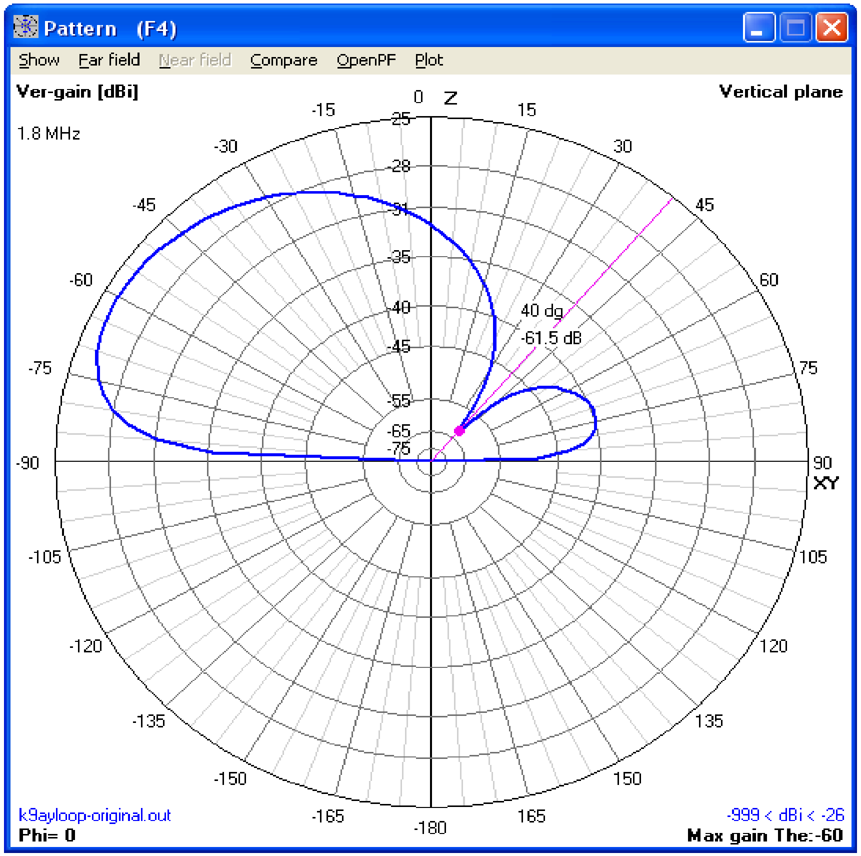
Matching



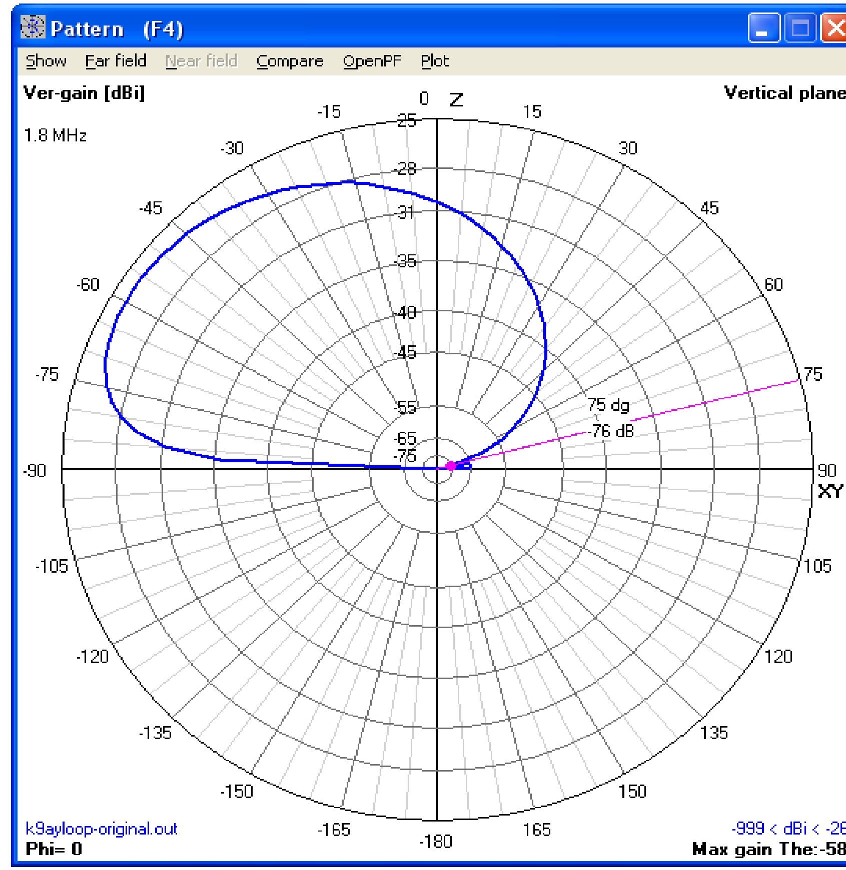
K9AY RECEIVING LOOP

4NEC2 MODELING OF K9AY LOOP

Modeled by Tom McDermott -N5EG

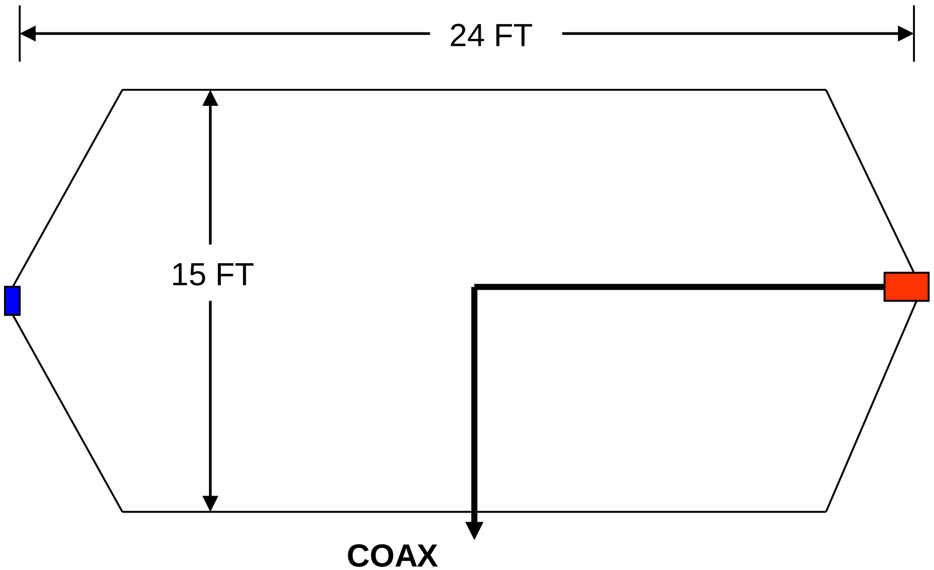


500-OHM TERMINATION



390 OHM + 1000 pF TERMINATION

ROTATABLE HEXAGON FLAG RECEIVING LOOP

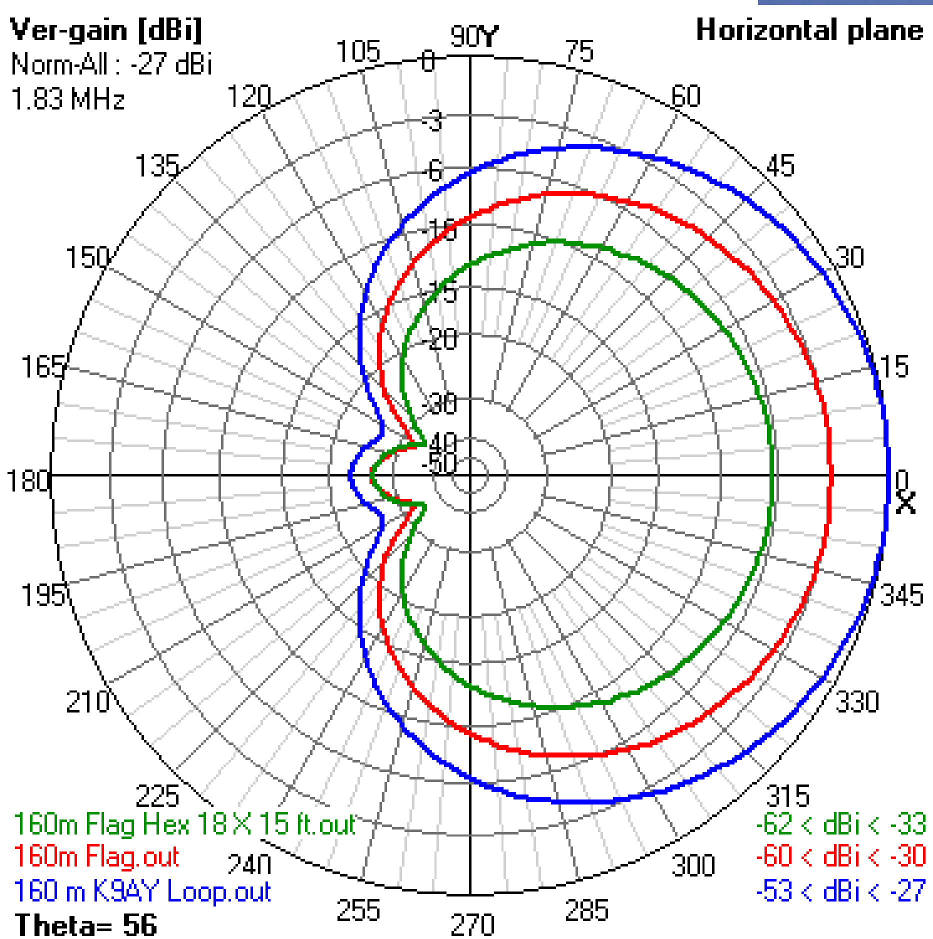


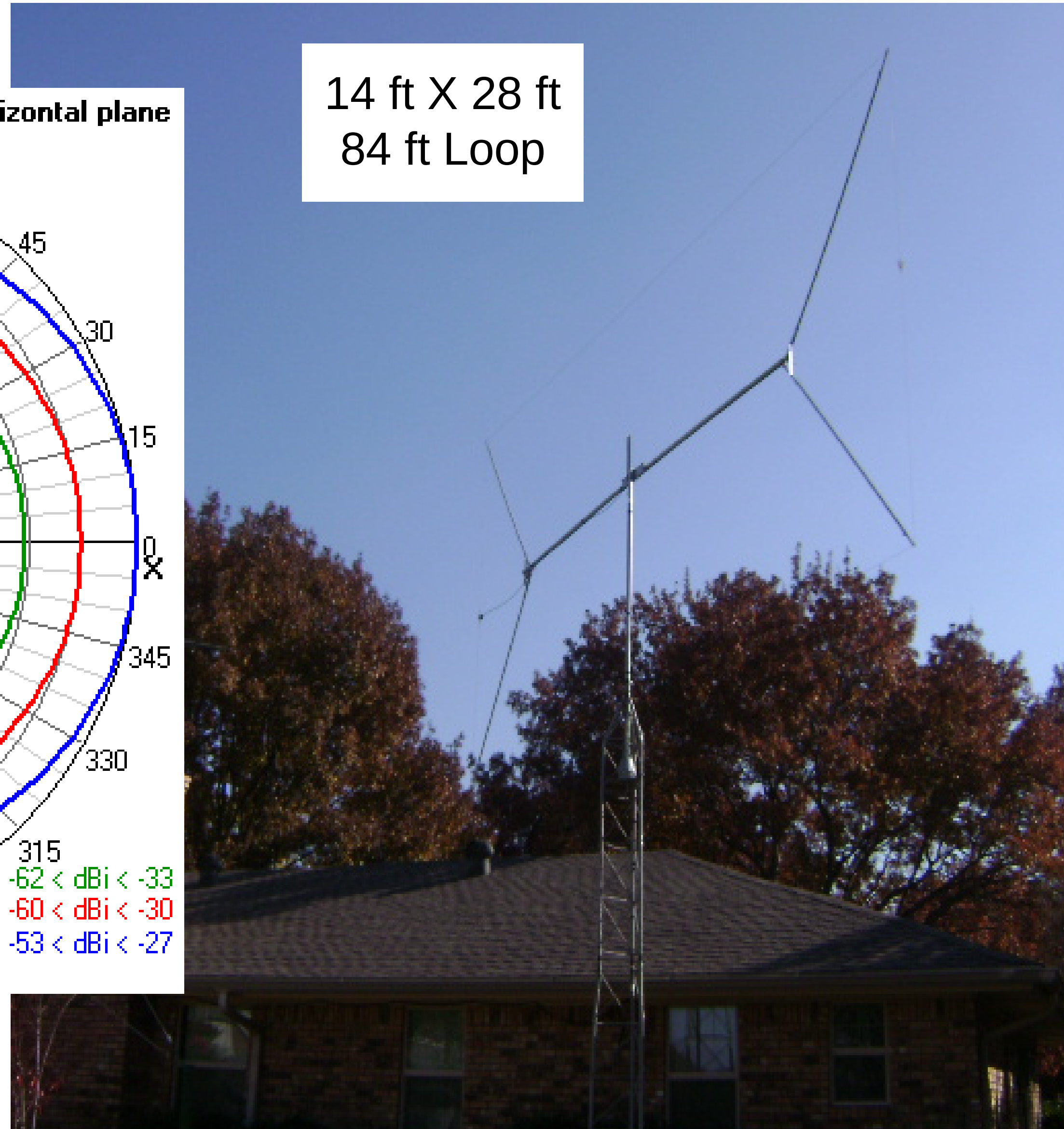
66 ft Loop

850-OHM
TERMINATION

13:1 BINOCULAR
FERRITE TRANSFORMER

ROTATABLE W7IUV FLAG RECEIVING LOOP

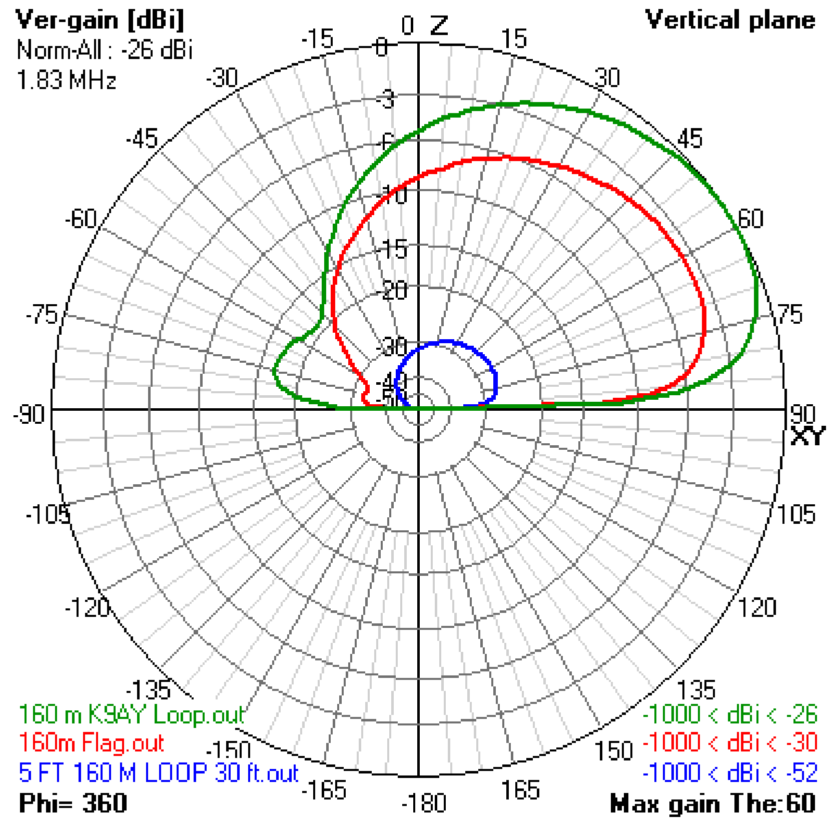




W2PM MINI DIAMOND LOOP

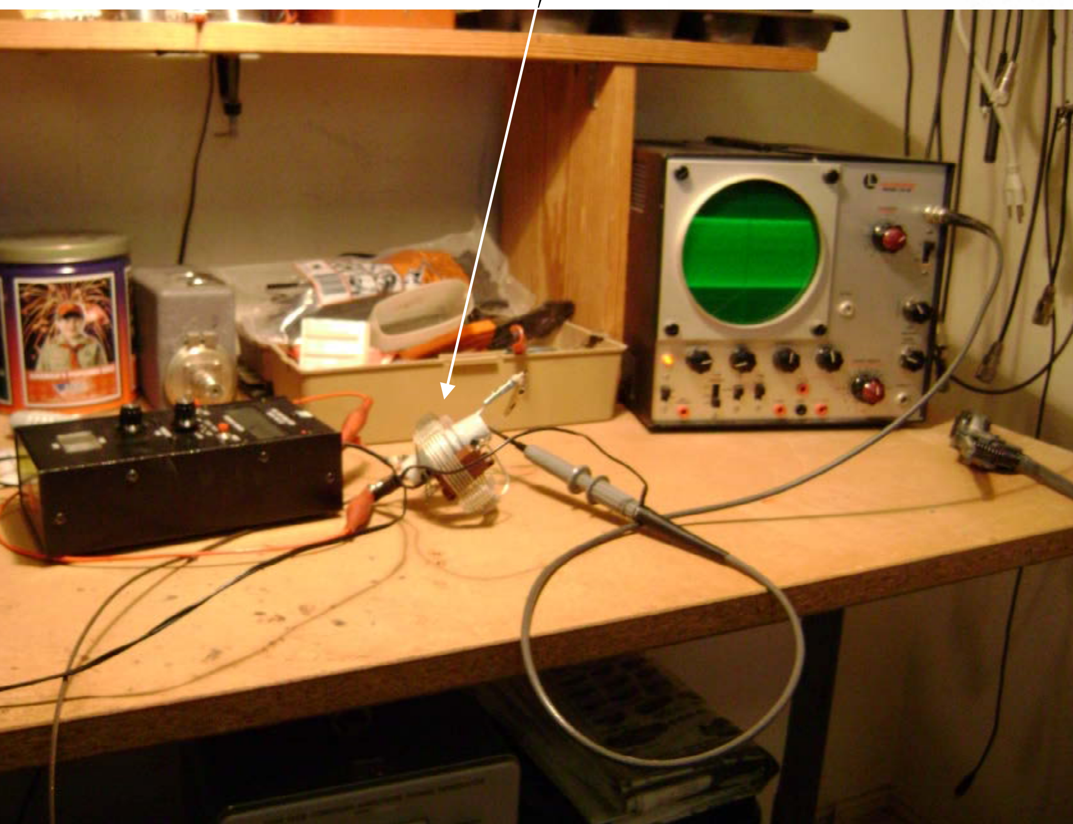
5 ft X 5 ft Mini Receiving Loop

**Comparison Mini Receiving Loop
vs
Hex Flag and K9AY Loop**



PHASED INVERTED VEES

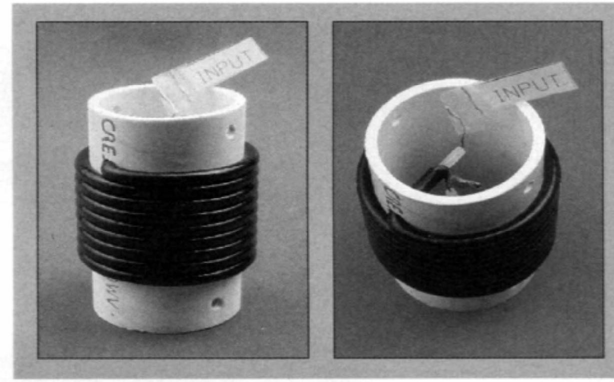
Homebrew L-C Trap

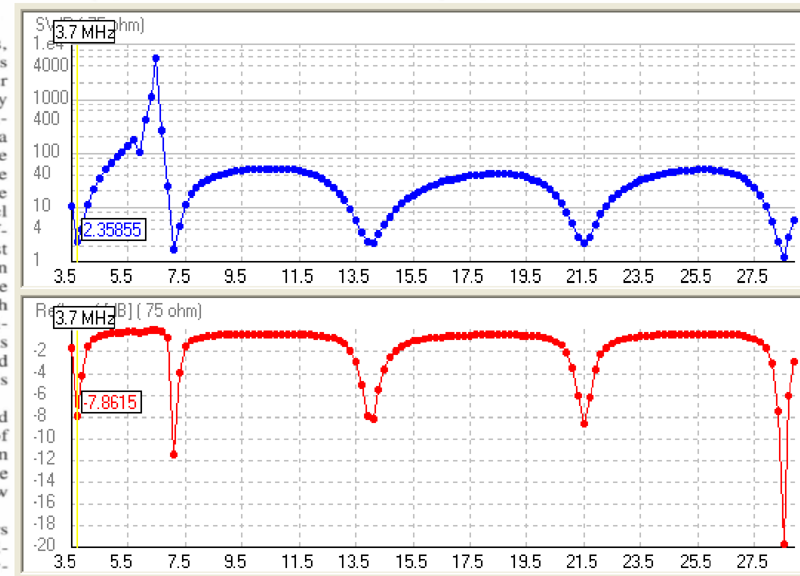


Two New Multiband Trap Dipoles

W8NX details a new coax trap design used in two multiband antennas; one covering 80, 40, 20, 15 and 10 meters, and the other covering 80, 40, 17 and 12 meters.

By Al Buxton, W8NX
2225 Woodpark Rd
Akron, OH 44333





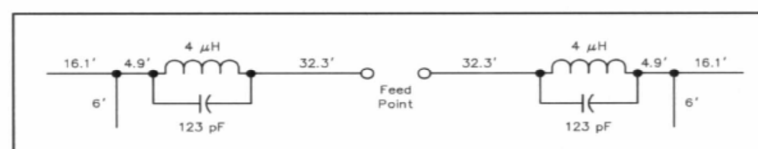
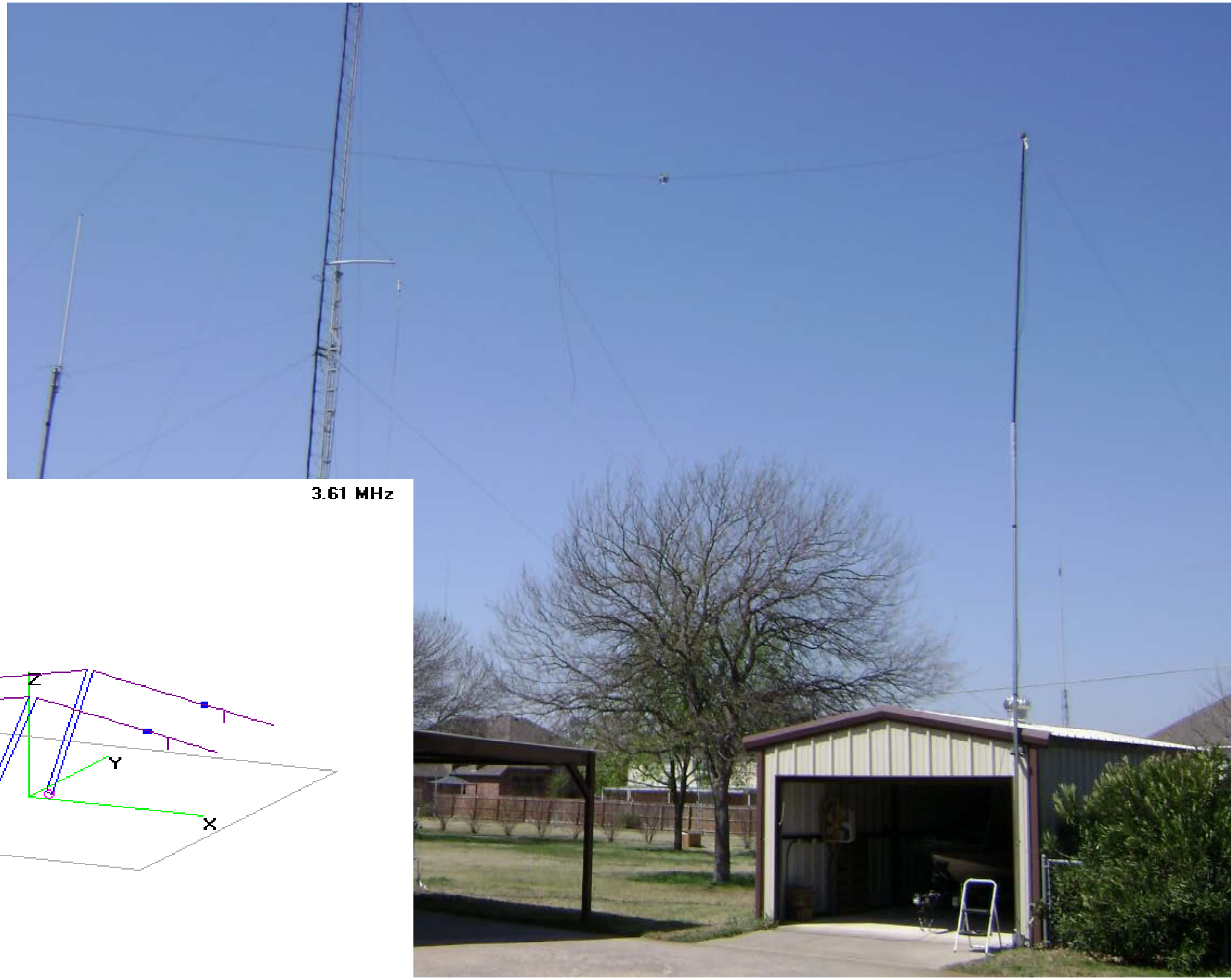
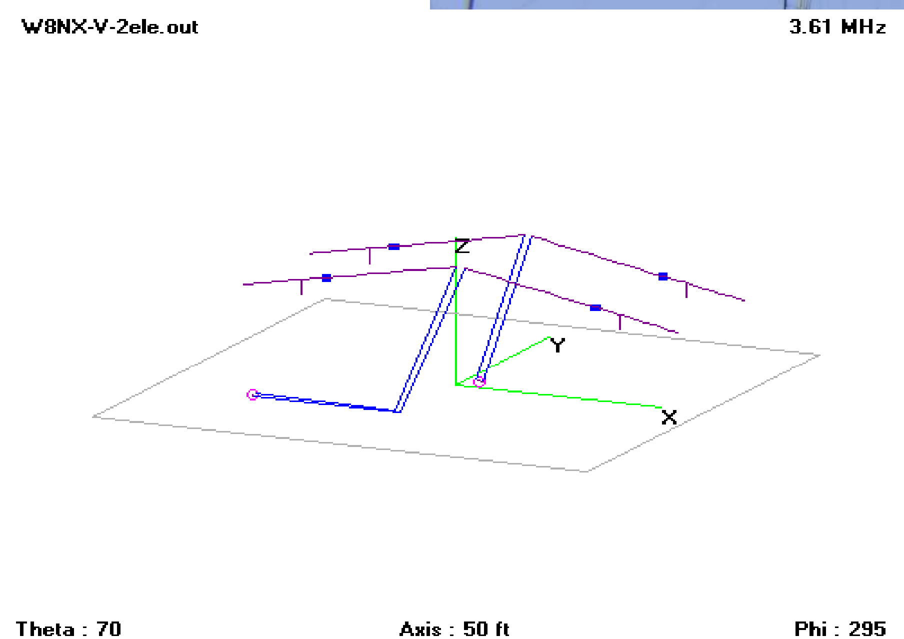
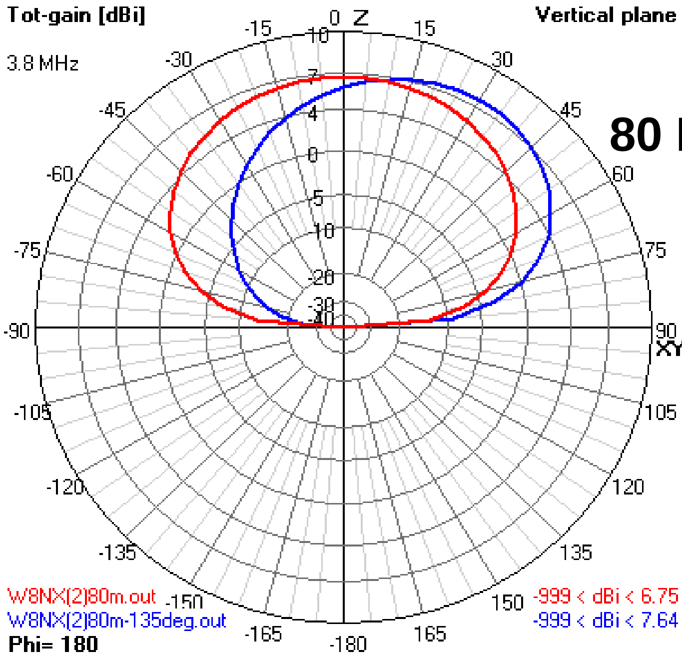


Figure 1—A W8NX multiband dipole for 80, 40, 20, 15 and 10 meters. The values shown (123 pF and 4 μH) for the coaxial-cable traps are for parallel resonance at 7.15 MHz. The low-impedance output of each trap is used for this antenna.

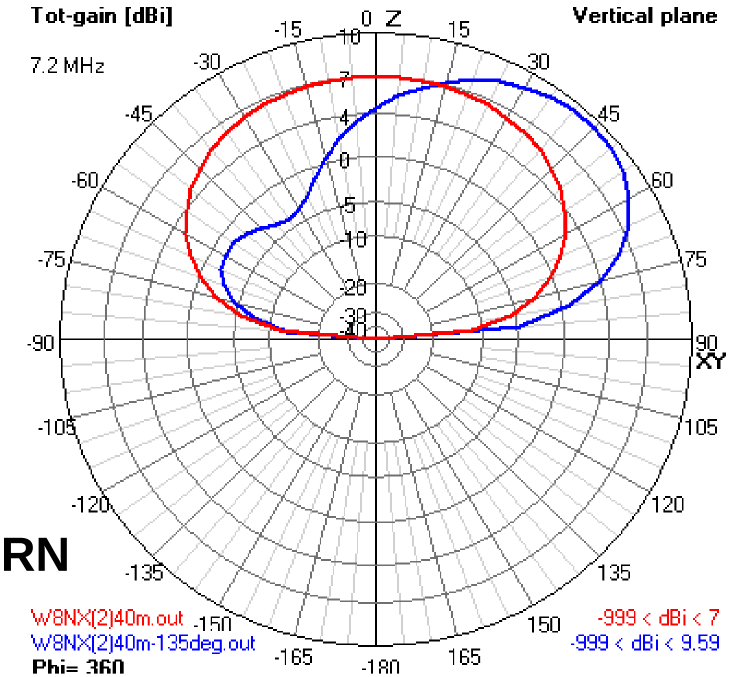
Two W8NX 80 -10 Meter Inverted Vees
Spaced 32 ft and 38 ft High



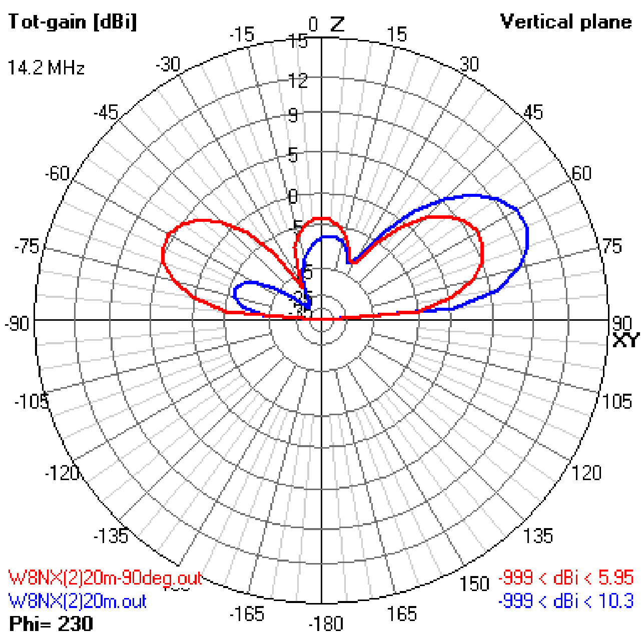




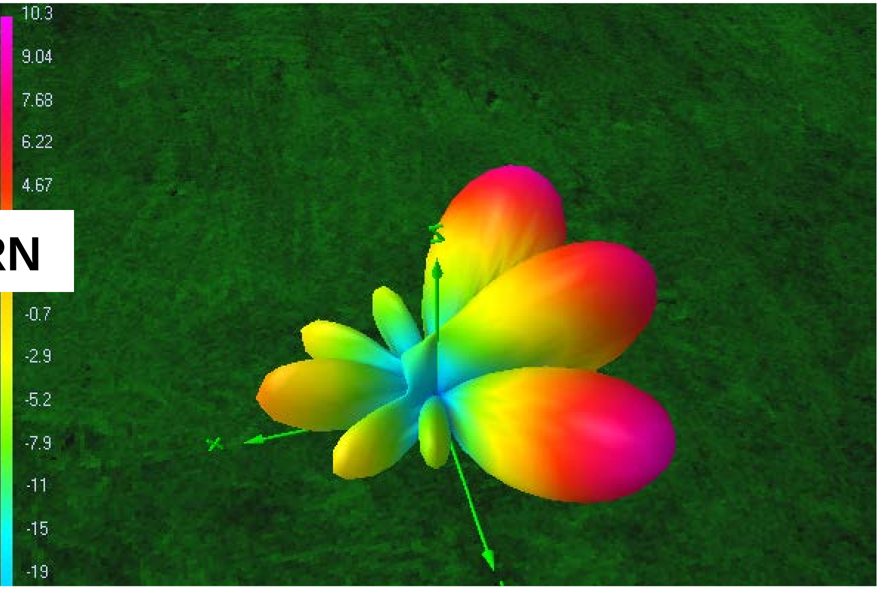
80 M PATTERN



40 M PATTERN

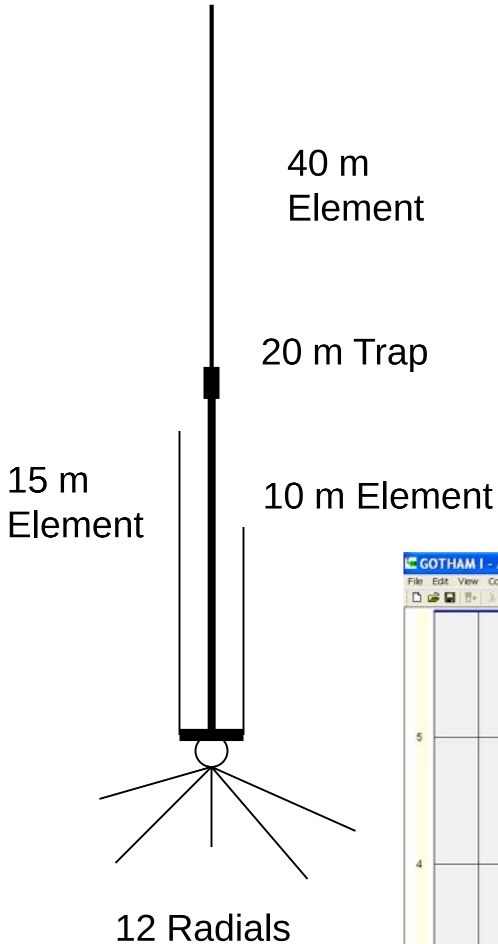


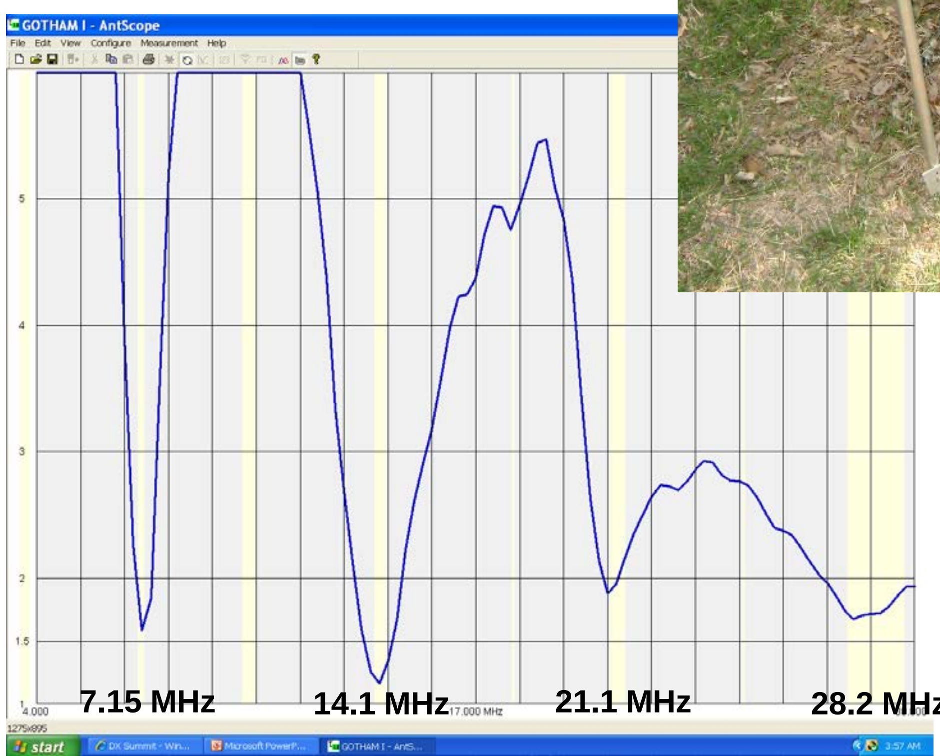
20 M PATTERN



OTHER ANTENNAS and PROJECTS

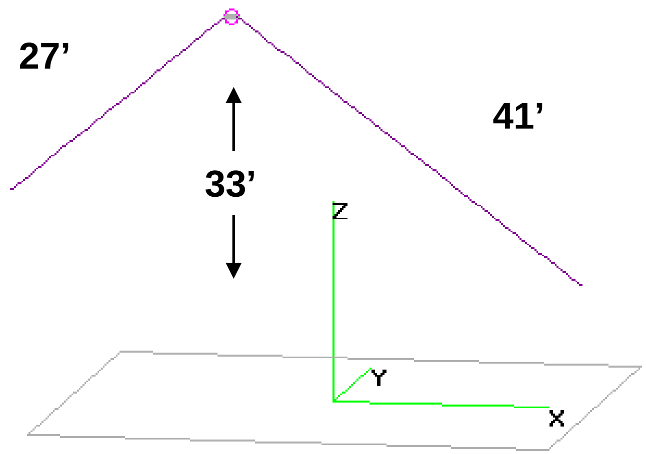
My 40/20/15/10 m 4-Band 29 ft Homebrew Vertical
Parallel Elements

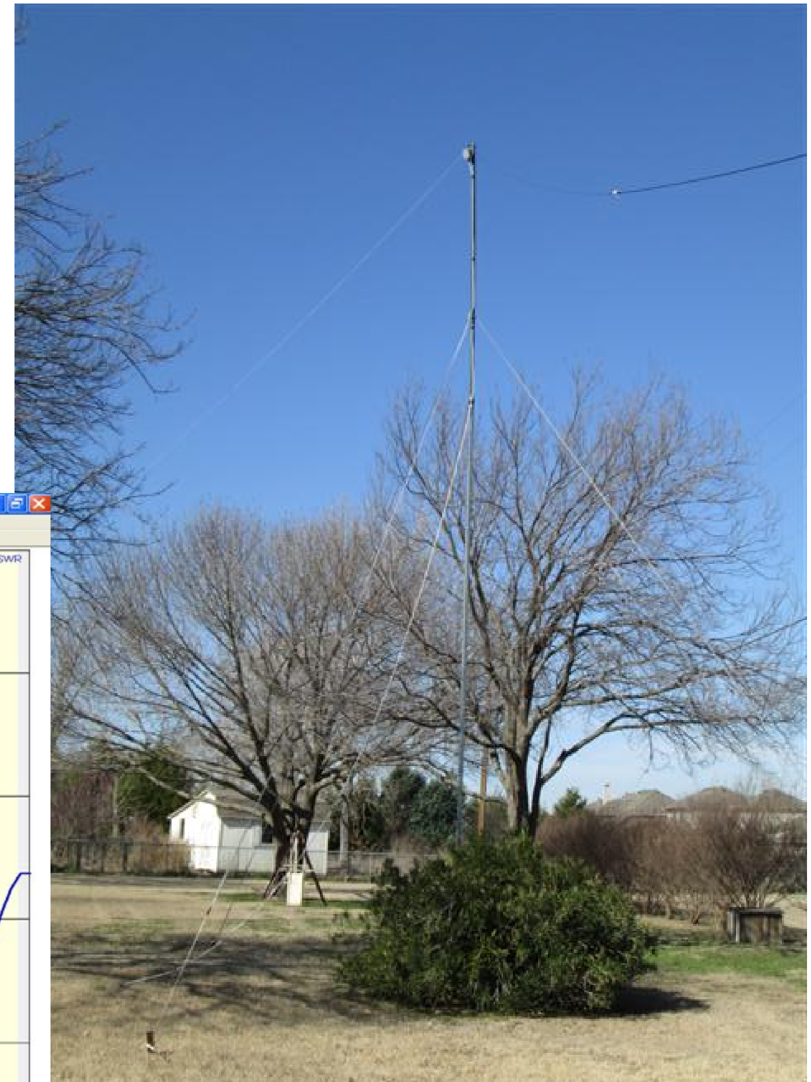


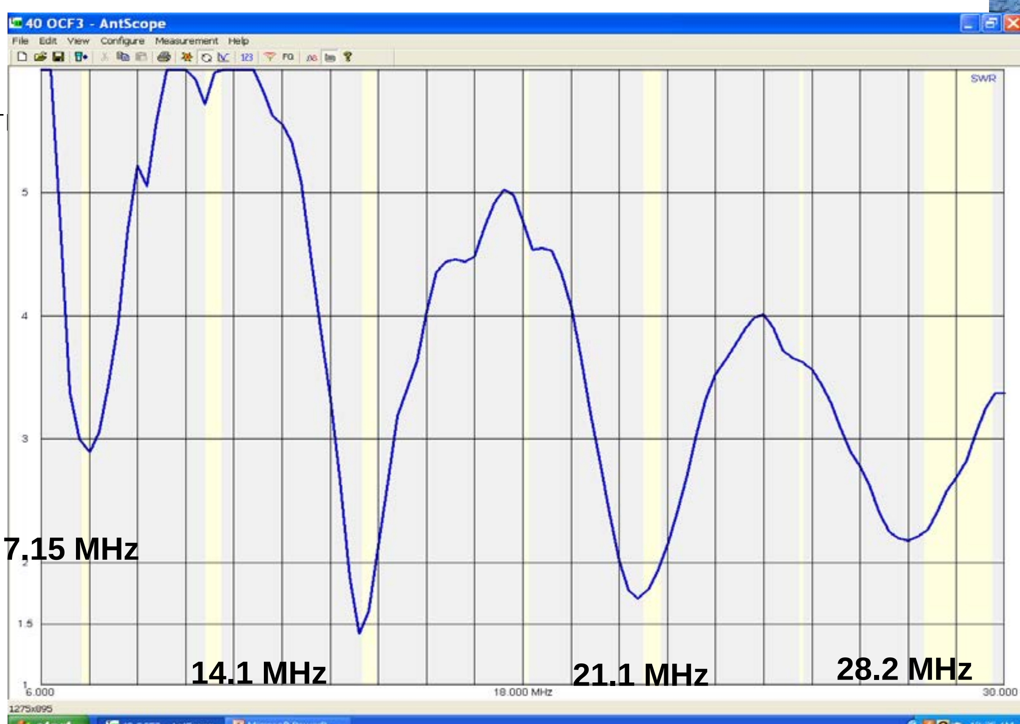


40m OCF Vee.out 7.15 MHz

K5QY Computer Modeled 40-10 m OCF Inverted Vee



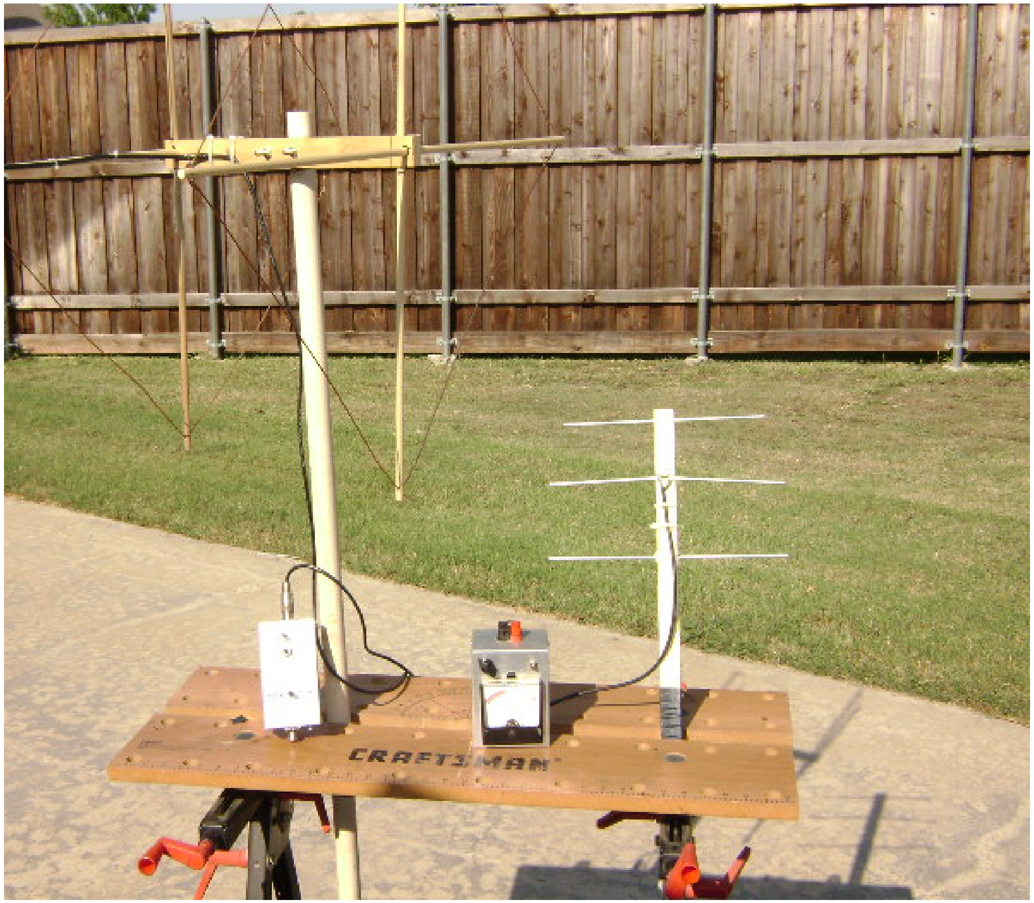




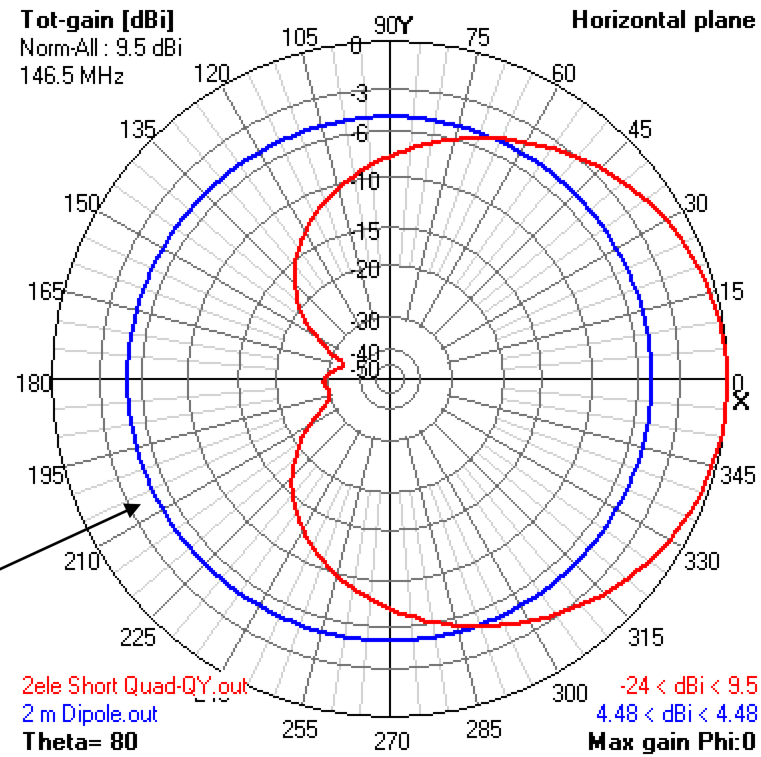
OTHER ANTENNAS and PROJECTS

$10 HOME DEPOT 80/40 m TRAP

OTHER ANTENNAS and PROJECTS



Fox Hunting 2-meter Quad
with
2 MHz Offset Attenuator
432 MHz 3-ele Yagi, and
Field Strength Meter



Vertical Polarized Quad Vs
VP Dipole at 7 ft Height

CQ MAGAZINE –APRIL 1977

Dick Sander K5QY
110 Starlite Drive
Plano TX 75074

Make Antenna Tuning A Joy

—instant swr bridge

Vswr measurement is widely used by radio amateurs for adjusting and matching their antennas. This article shows how I save myself a lot of walking and how I tune my antennas. I started out with a model 190B Tektronix constant amplitude signal generator, which is easy to obtain now on the surplus market. I modified the signal generator slightly, built a 50-Ohm resistance bridge, and merged them to come up with an extremely stable and accurate vswr bridge. If you don't want to modify your generator, you could build only the resistance bridge portion.

The 190B signal generator is perfect for this vswr bridge because of its constant output level, which means that once the incident (forward) voltage is set, you can tune a very large frequency band without needing to readjust every few kilohertz or so. And there are other advantages. The frequency range covers 160 through 10 meters. With my generator-bridge arrangement, everything is complete in one package, so it's handy to use. Because of its low output level, there is no QRM radiated into space.

First you'll need a schematic of the signal generator to study. The following steps describe how to modify the signal generator and install the resistance bridge:

1. Remove the external attenuator pad and its socket from the unit. (Note which pins the wires are on.) Fabricate a 1½-inch-square aluminum plate to mount an SO-239 rf socket, and attach the socket to the unit.

2. Drill a 5/16-inch-diameter hole midway between the power switch and the SO-239 rf connector. Refer to Fig. 1. This hole will be for the vswr function switch. (See schematic for parts list.)

3. Remove V50, a 12AU7 tube used as the meter amplifier, and discard it.

4. Build the 50-Ohm resistance bridge according to the schematic shown in Fig. 2.

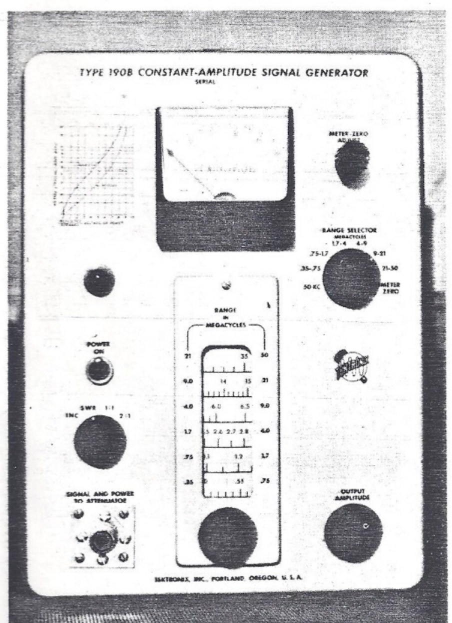


Fig. 1. Completed vswr bridge using modified Tek 190B generator.

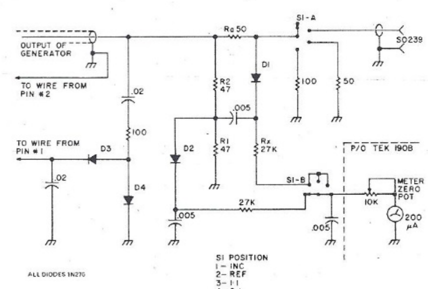


Fig. 2. This is the circuit of the 50-Ohm resistance bridge. R1 should match R2. RX should be trimmed so that incident (fwd) voltage equals reflected voltage. The 1:1 and 2:1 positions of switch S1 are simply 50-Ohm and 100-Ohm resistors to ground. When switched in, these positions give a quick self-check of the unit. D3 and D4 are the feedback diodes for the Tektronix 190B generator. All diodes = 1N270.

HAM RADIO –APRIL 1983

remote control hf operation

An Apple II and Collins KWM-380 talk to each other via the telephone

You can have remote high-frequency radio operation from a TouchTone™ telephone. In this article I explain this design, including the interface used to control the radio and computer; the interface plugs into the radio and computer without modification to either. A remote operator can thereby use a telephone to turn on and off primary power; use a private access code; tune the radio to any discrete frequency or scan up and down; transmit; and have optional fm radio capability. The interface has a safety shutdown feature in case the power or telephone is interrupted.

The remote system is illustrated by the block diagram in **fig. 1**. The center of the system is the interface control, which includes a phone patch, a dual tone multi-frequency (DTMF) decoder, audio amplifiers, and control logic. I use a Rockwell-Collins KWM-380 transceiver with the control interface option, and an Apple II Plus microcomputer with an eight-bit input/output card. A regular phone-answering unit detects the telephone ring. A ring-detection circuit could be incorporated into the interface control, but I prefer having a tape recorder tied to the system for logging. A twelve-button TouchTone™ keypad provides local control. A primary power relay, that includes transient protection, turns on the KWM-380 and the Apple. The phone-answering unit and interface control remain on at all times. An interface device that connects between the Apple's game port and the KWM-380's frequency-control interface connector provides frequency control. An optional fm audio-decoder is also included to provide additional system control and operation from a VHF/UHF fm radio.

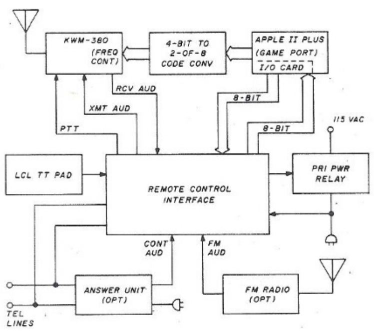


fig. 1. High-frequency remote-control system block diagram.

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system operation

For testing, replace the telephone line with a 900-ohm resistor to provide balance to the hybrid. **Fig. 9** is the BASIC program. The program as listed will not autoboot; after the program is typed in and saved, insert a new disk and type: **INIT HELLO**. Apple DOS will create an autoboot disk. If the radio and Apple are off, push the digit 6 on the local TT keypad for five seconds. This allows U1A to charge the 10-μF delay capacitor to set latch U1C and U1D and enable relay K4. System power will now be on. Line 70 is the three-digit access code; this can be changed at will. I use 789 in this program.

Enter the access code and the program menu, which give prompts to each of the functional subroutines that will appear. This portion of the program is lines 400 through 540. There are six

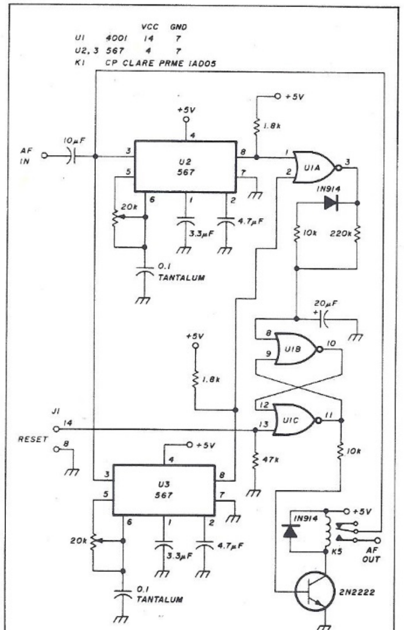
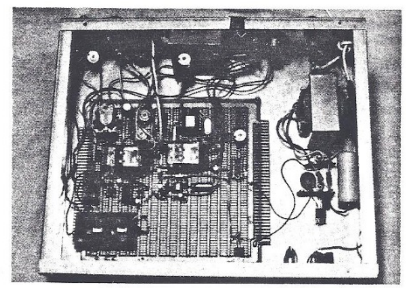
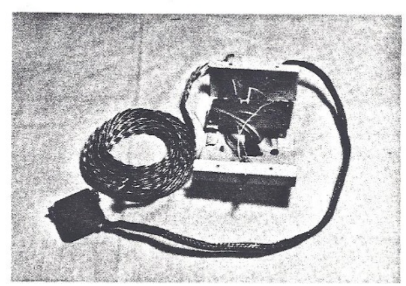


fig. 8. Optional fm audio-decoder schematic diagram. Any pair of tones can be selected. The tones must be held on for about eight seconds before relay K1 pulls in. This permits the system to be operated by an fm radio or telephone link.

This picture shows all the components that compose the high-frequency remote-control system. See fig. 1 for the block diagram.



This picture shows the remote control interface. This unit contains a phone patch, a DTMF decoder, level amplifiers, control logic and relays. See fig. 4 for its schematic. Note that space is available on the circuit board to fully remote the KWM-380.



This picture shows the frequency interface. It connects between the KWM-380 control interface connector and the Apple game port. See fig. 2 for its schematic.

CQ MAGAZINE –MAY 1984

$2.70 per dB, not a bad trade off! Here's how K5QY solved his 20 meter antenna problem for only $27.00 and a little ingenuity.

Rotate That Side-Mounted Antenna

BY DICK SANDER*, K5QY

Recently I decided to experiment with a 20-meter beam and side-mount it on my tower to see if there would be any improvement in signal strength. I did this so that if a DX list should occur, I would stand a better chance to get on it. I found that from my QTH (Texas) to the east coast, sometimes there was as much as 10 dB improvement. I also found that sometimes Europe was as strong at the lower height as at the taller height. Later, I turned the beam to the Caribbean with similar results. Since I couldn't climb the tower each time I wanted to change direction, a rotatable side mount was necessary.

Being neither a super mechanic nor rich, I took the hardware-store approach. Having recently purchased a heavy-duty rotator to replace my previous one, I had the most expensive part that is needed; everything else came from the hardware store. Fig. 1 shows the assembled side mount and the parts needed to build it and contains sufficient explanation for assembly. I had the joints spot-welded after assembly. The top hinge is formed by a 1½-inch, 90° elbow that is well lubricated and not tightened down completely. My cost, excluding the rotator, was $27.

My 20-meter beam is a three-element; about 120 degrees rotation is all I'm able to obtain, because the driven element is too close to the mast clamp (fig. 2). A four-element beam with greater spacing between the driven element and mast clamp could permit as much as 270° rotation. The load on the tower and rotator does not seem to have any ill effects. Caution must be exercised while turning the antenna, because it is possible to drive the antenna into the tower. I have not built any limit switches, but they easily could be inserted in series between the motor leads if extra safety is desired. My tower is Rohn 45. The dimensions reflect this size tower, but the same design can be scaled to whatever tower is used.

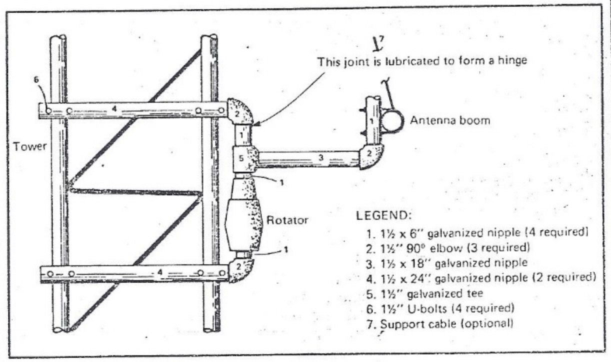


Fig. 1– Side-mounted rotator assembly and parts list.

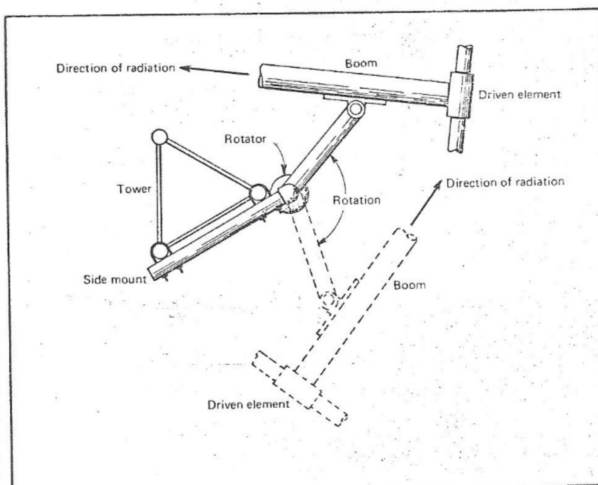


Fig. 2- Top view showing approximately 120° rotation for a three-element beam, while keeping it as far away from the tower as possible.

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THE END

K5QY's Antennas

http://mysite.verizon.net/k5qy/