South Florida DX Association

High performance RX antenna for a small lot

Jose Carlos N4IS

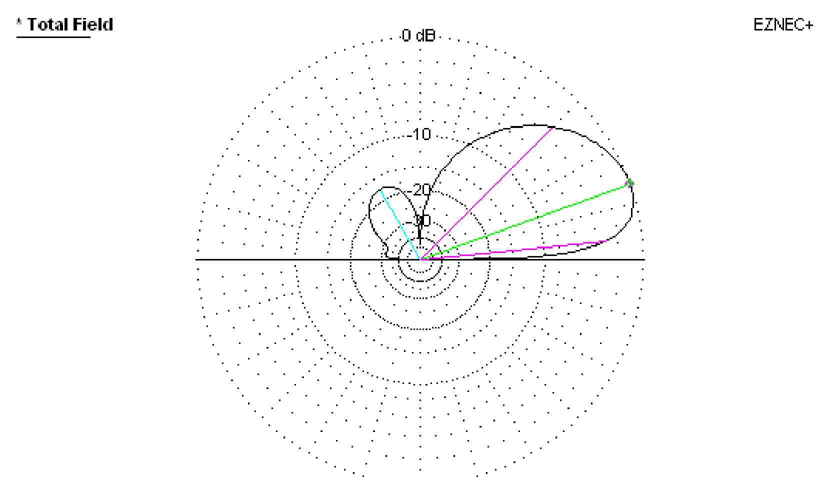
Receiver antennas for small lot

Basic concepts to receive weak signals

- Directivity & gain
- RDF
- Interaction and degradation
- Urban noise
- Receiver antenna definition

New olds receiver antennas

- Historic evolution
- Single direction EWE FLAG DHDL
- Rotatable antennas HWF VWF
- High performance RX systems Dual DHDL; QDFA



RX antennas not sensible for man-made noise

- TX antenna interaction
- Common mode noise
- TX/RX leaking
- Polarization filter HWF
- Twisted pair lines
- HWF single *loaded loop* construction
- HWF dual loaded loop construction
- Multiples *loaded loops* RX arrays

Basic concepts

Jose Carlos N4IS

RX antennas directivity & gain

- It all about signal noise ratio
- Minimum Detected signal “MDS”

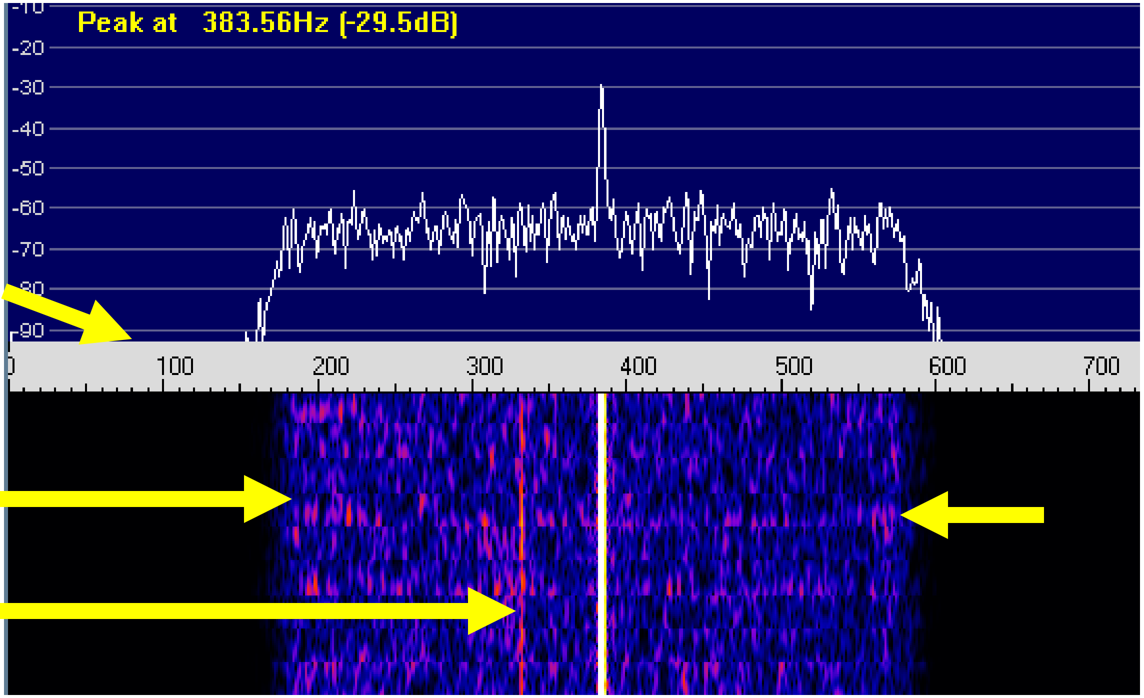
The ability to copy a weak signal depends mainly on the difference between the signal and receiver output noise

Signal 30db above noise

Noise floor

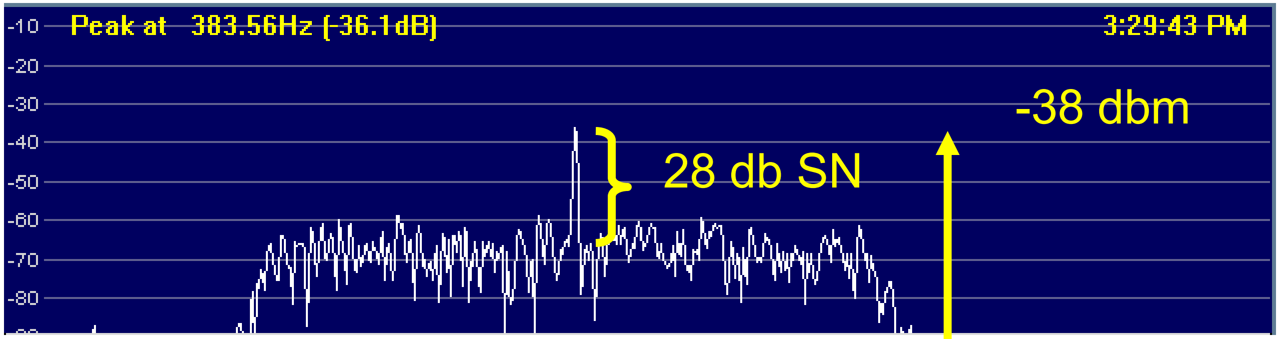
Bandwidth

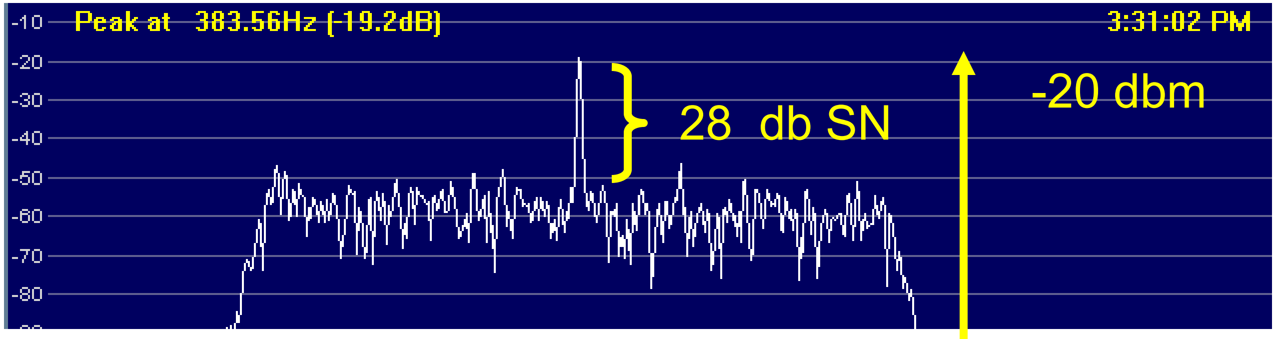
Signal at noise level



RX antennas directivity & gain

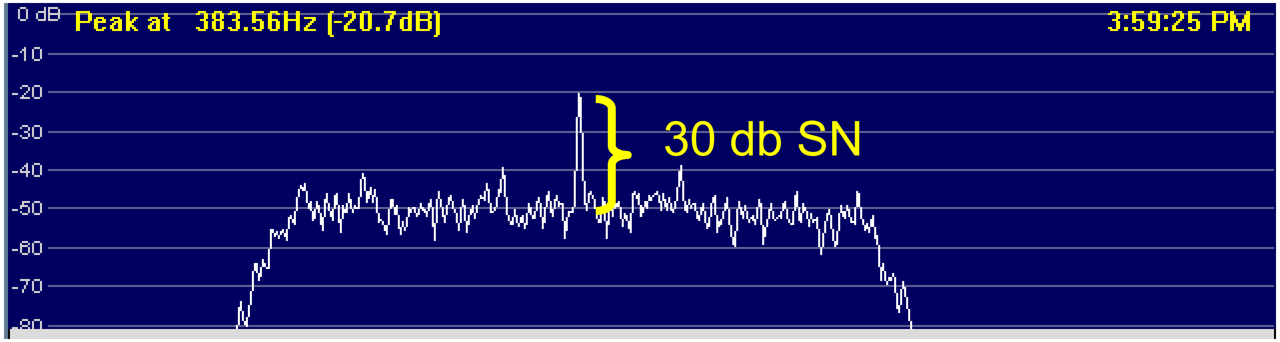
- The gain is the difference between an amplifier input and output intensity.
  - Adding a 18 db gain amplifier, the signal and the noise will increase 18db and the signal noise still will be the same.



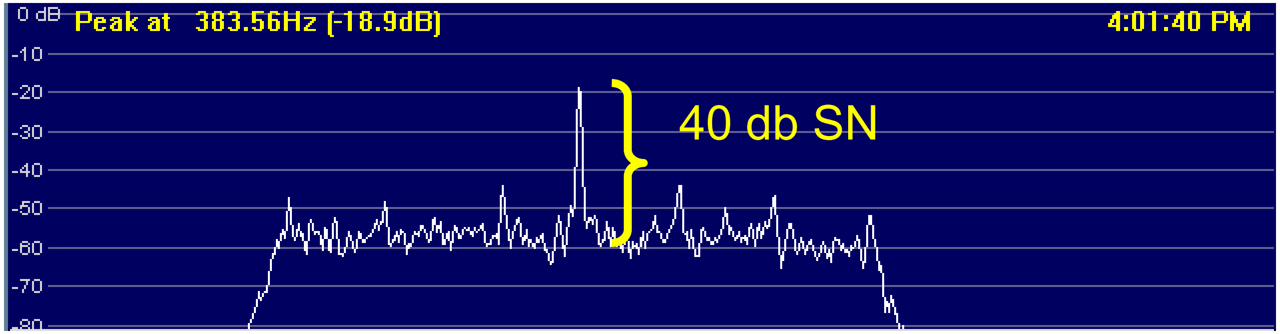


RX antennas directivity & gain

1840 KHz carrier received with vertical TX antenna



Same signal received with a Big Waller Flag

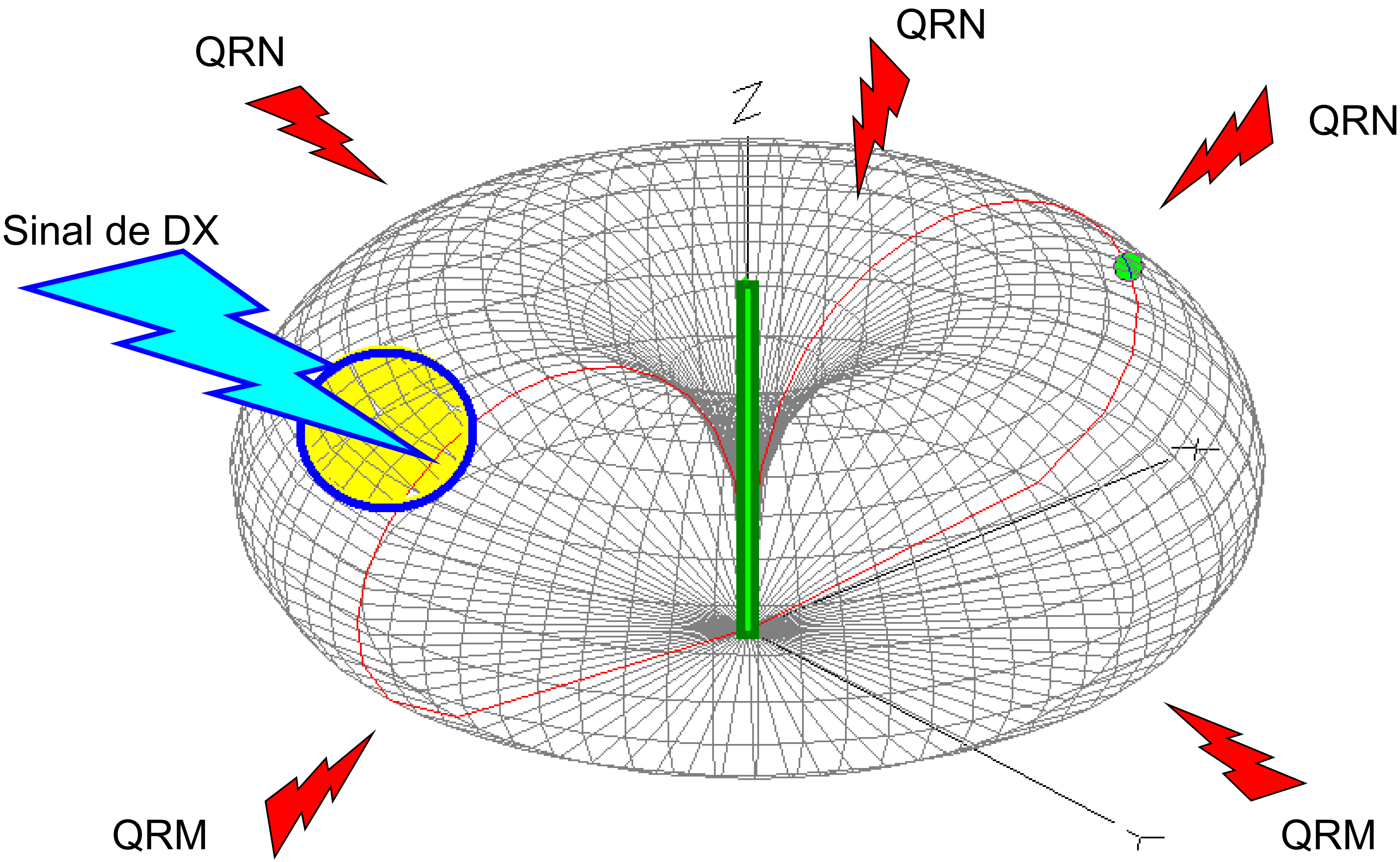


RX antennas directivity & gain

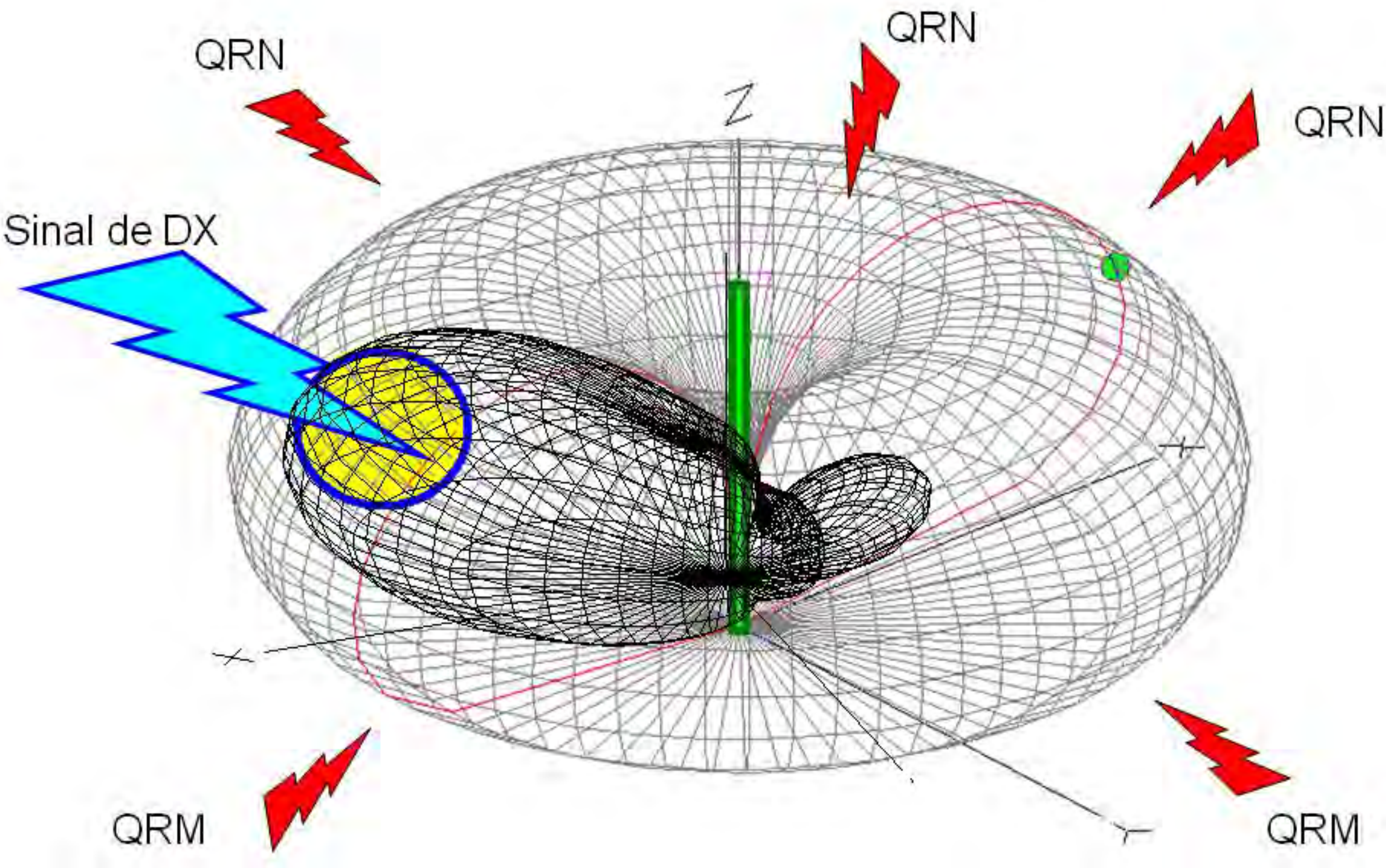
When the signal is above noise there is little difference on the audio. The receiver AGC will make the strong signal just more comfortable to copy but it should not be used for evaluation of the receiver antenna.

A good receiver antenna will provide copy of weak signals not present or buried in the noise on the transmit antenna

Directivity &   RDF

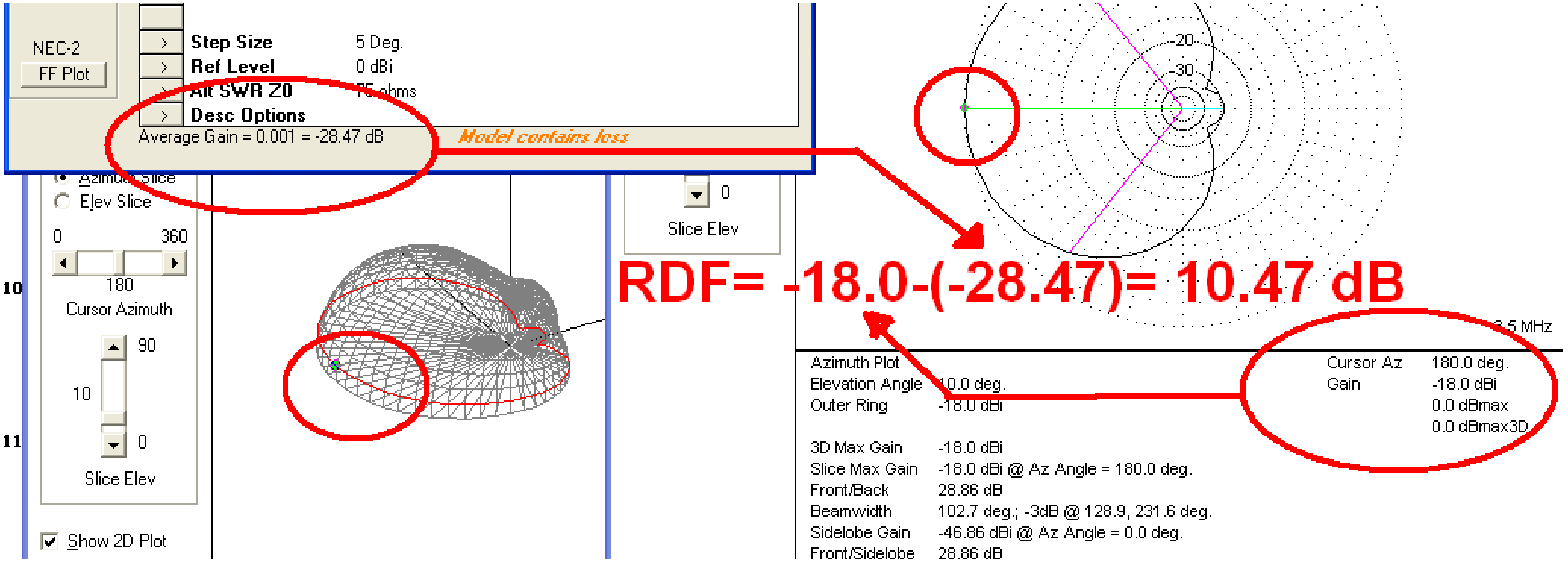


Directivity &   RDF

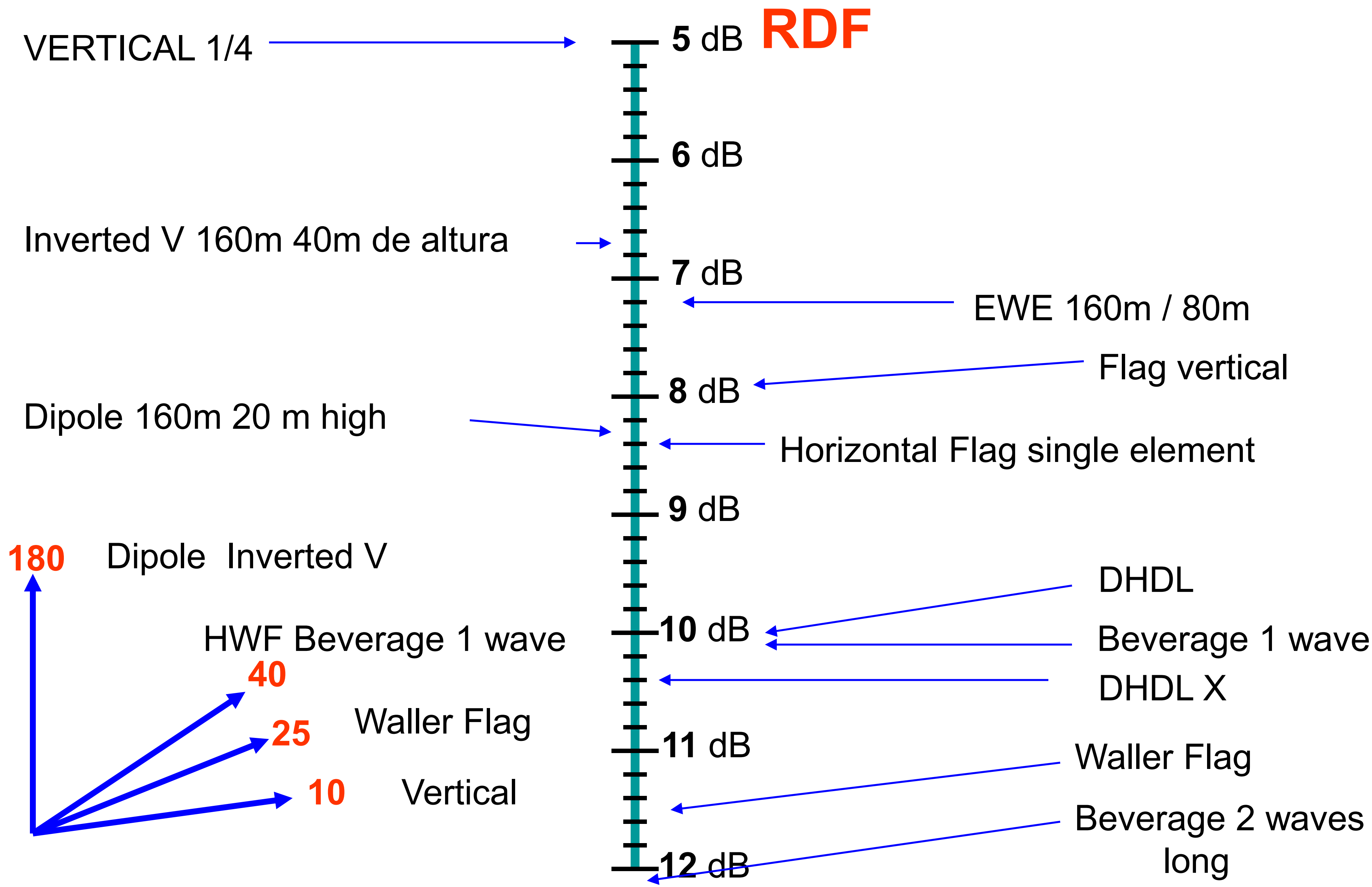


RDF

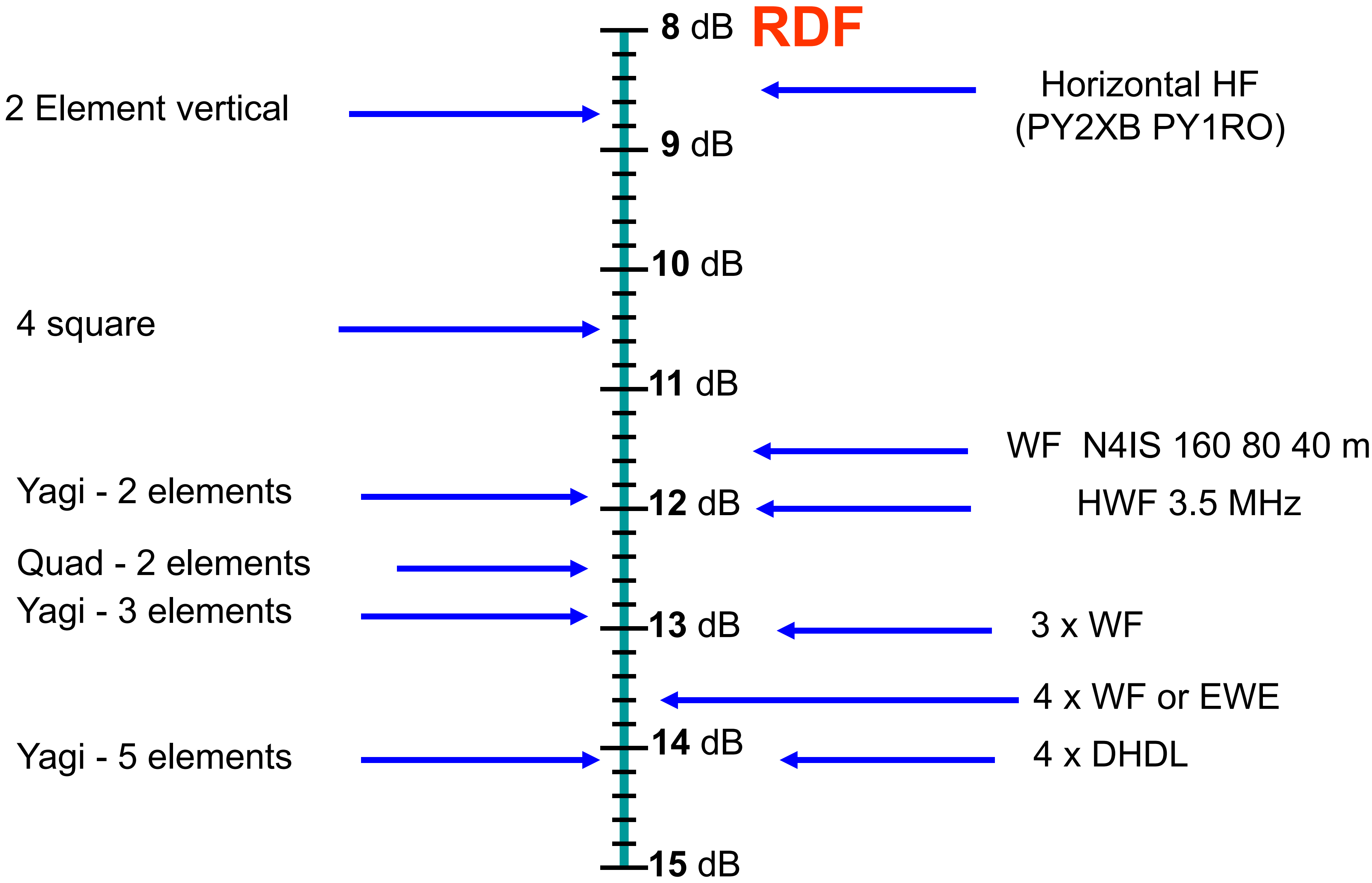
•RDF= Gain – Average Gain



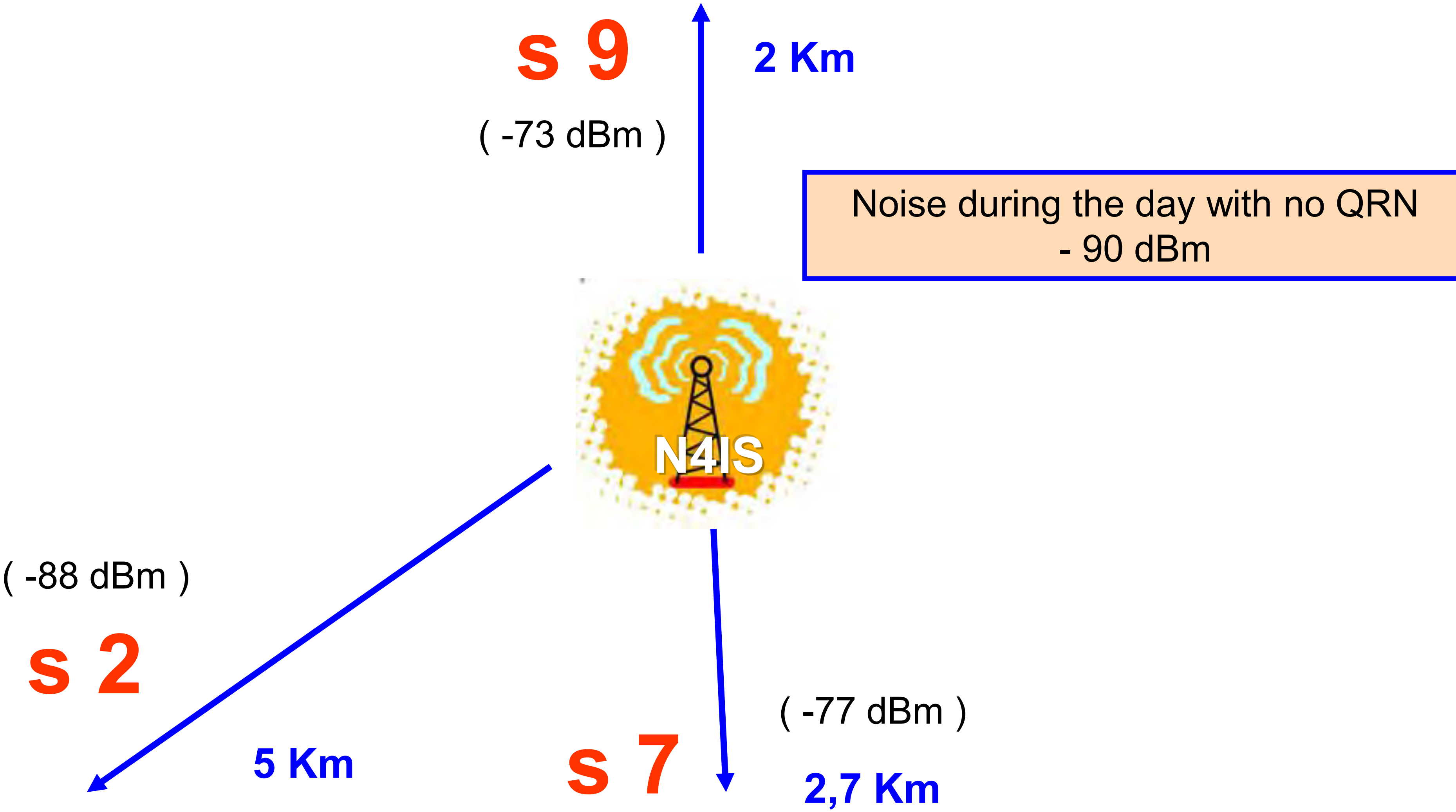
RDF for known antennas



RDF for known antennas



Power line noise at home



Standard S meter	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9
dBm	-121	-115	-109	-103	-97	-91	-85	-79	-73

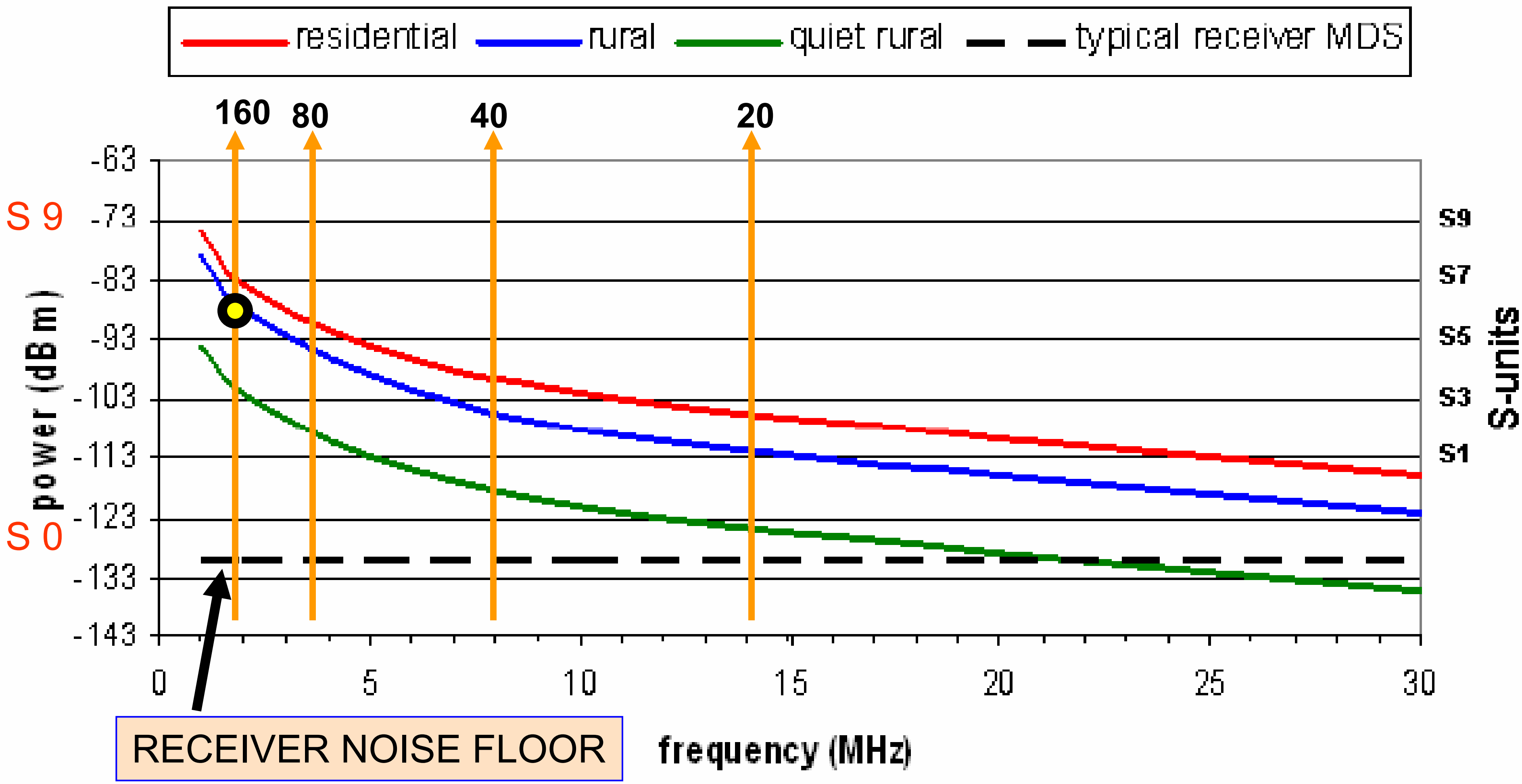
What we can really hear?

160 m	47 dBm	42	30
80 m	35 dBm	30	22
40 m	20 dBm	15	10

SSB **3 db** 2,5KHz CW **0 db** 100Hz

Man-Made Noise in a 500Hz Bandwidth

from Rec. ITU-R P.372.7 *Radio Noise*



New RX antennas

Jose Carlos N4IS

History of Flag RX antenna

1919 March 5, 1919, Roy A. Weagant, Chief Engineer of the Marconi Wireless Telegraph Co. of America, delivered a paper describing in detail his apparatus for the elimination of the great bug-bear of transoceanic wireless communication -- static interference. >> http://infoage.org/html/wa-1919-04-p11.html

1995 JF1DMQ wrote an earlier article about the Flag antenna in November 1995 in a Japanese magazine. His was only 3.3 feet by 16.4 feet long (1 by 5 m).K6SE's 160m optimized versions are 14 by 29 feet (4.3 by 8.8m).

1995 "Is This EWE for You?" (QST February, 1995, p.31) and "More EWES for You", QST January, 1996, p. 32) both by WA2WVL.

1996 The Pennant was originated by EA3VY and optimized for 160 meters by K6SE, who first wrote about them on the Top Band Reflector in 1998

1997 The K9AY Terminated Loop—A Compact, Directional Receiving Antenna By Gary Breed, K9AY

1998 W7IUV rotatable Flag and preamplifier >> http://w7iuv.com/

2000 QST Magazine, July 2000, page 34 for K6SE's classic article: "Flags, Pennants, and Other Ground-Independent Low-Band Receiving Antennas" ...

2003 NX4D developed the first dual flag vertical array

2006 N4IS developed the BIG flag vertical array >> www.n4is.com

2008 N4IS developed the Horizontal flag array

2009 Dr Dallas Lankford, wrote the Flag Theory and design the Quad Flag Array >> http://www.kongsfjord.no/dl/dl.htm

2009 AA7JV George Wallner developed the DHDL (TX3A) >> http://tx3a.com/docs/TX3A_DOUBLE_HALF_DELTA_LOOP.ZIP

2009 DOUBLING the Double Half-Delta Loop Receiving Antenna by Pierluigi "Luis" Mansutti IV3PRK >> http://www.iv3prk.it/user/image/..-rxant.prk_tx3a.pdf

Flag evolution

1919 **T**o a large and enthusiastic audience composed of radio engineers and scientists of prominence, at a joint meeting of the Institute of Radio Engineers and the New York Electrical Society, held March 5, 1919, Roy A. Weagant, Chief Engineer of the Marconi Wireless Telegraph Co. of America, delivered a paper describing in detail his apparatus for the elimination of the great bug-bear of transoceanic wireless communication -- static interference.

http://infoage.org/html/wa-1919-04-p11.html

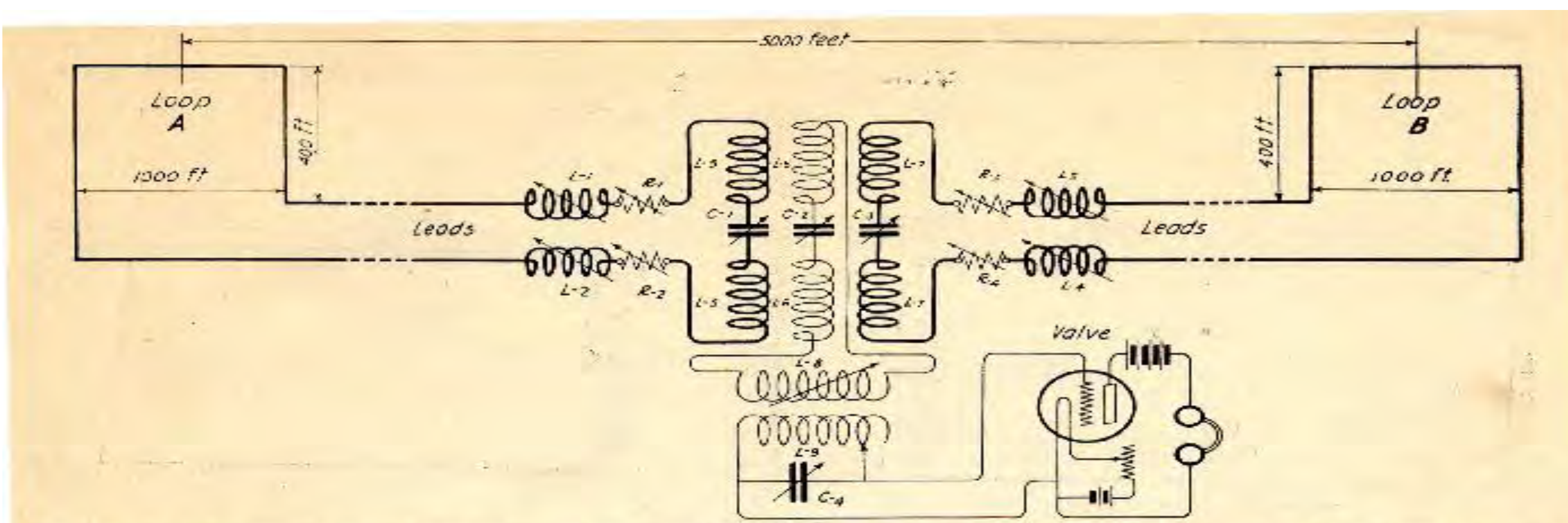


Figure 6—An early form of Weagant's system for eliminating static interference showing two single turn loop antennae spaced 5,000 feet apart. Each loop was 1,000 feet long at the base and 400 feet high. The leads from each loop were connected to the primary coils, L-5 and L-7, of the radio goniometer which were coupled to the secondary coil L-6. By rotating L-6, a position was found where the static currents neutralized and the signal currents were retained. This apparatus and antennae permitted the reception of signals from stations in Europe under conditions of static interference which with ordinary receiving apparatus and antennae would render reception impossible.

Wireless Age April 1919 Page 11

Antenas giratótias HWF VWF

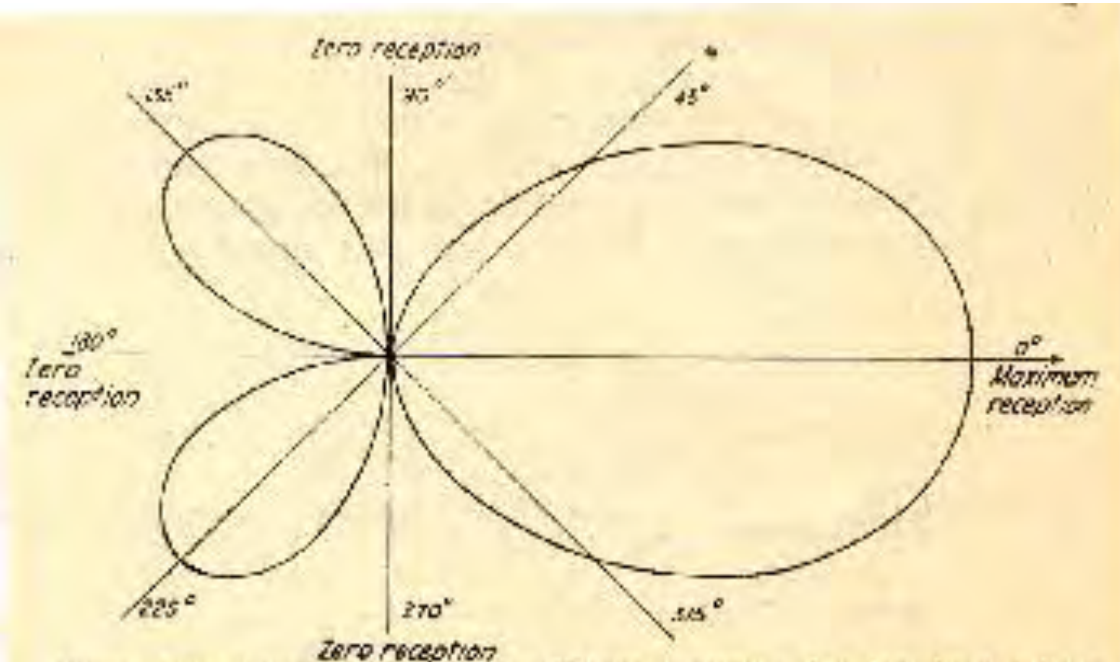
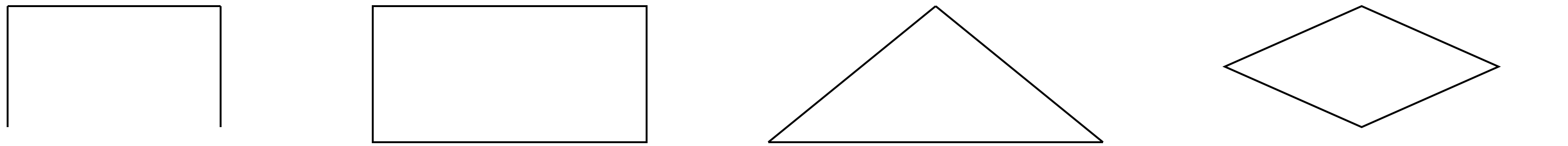
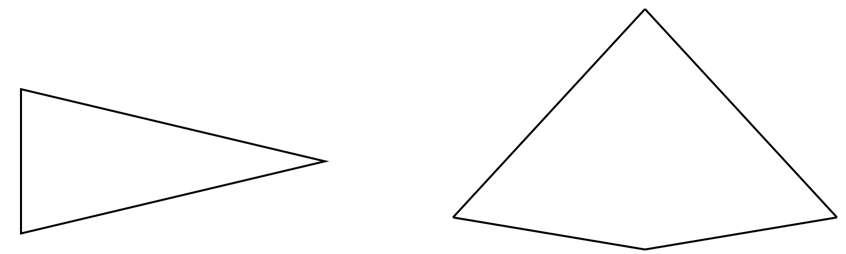


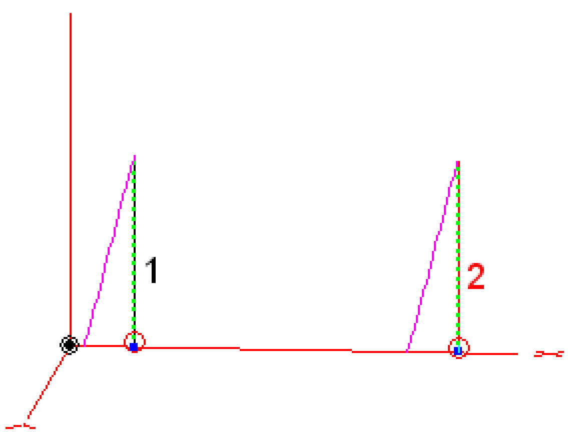
Figure 17—Reception curve of the Weagant system showing the uni-directional characteristic which may be obtained by proper adjustment of the phases of the currents in one loop. Maximum reception is obtained in directions extending through part of the first and second quadrants and minimum reception in the third and fourth quadrants. The line of zero reception may be swung through the third and fourth quadrants at will, by proper phase shifting

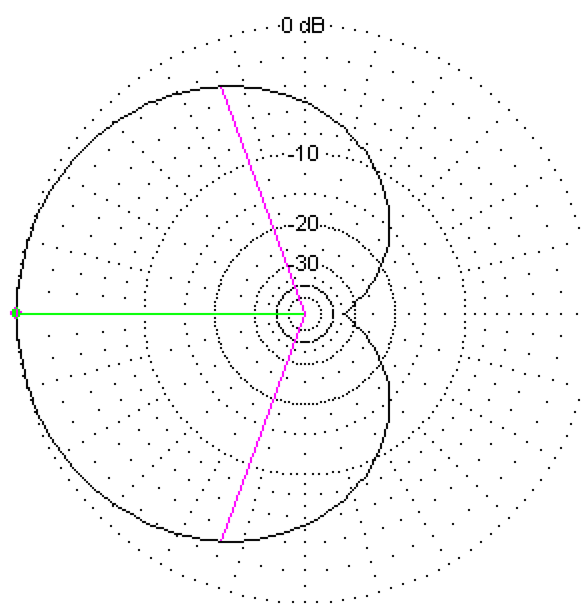
Flag EWE Delta Pennant etc.

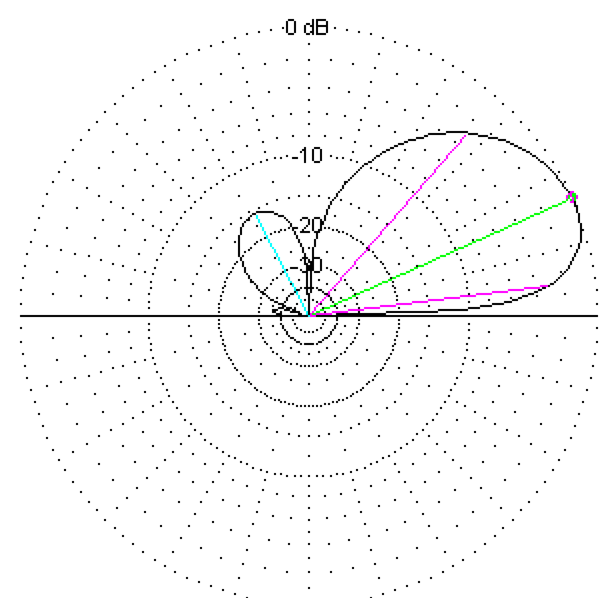


+ Resistor and Transformer

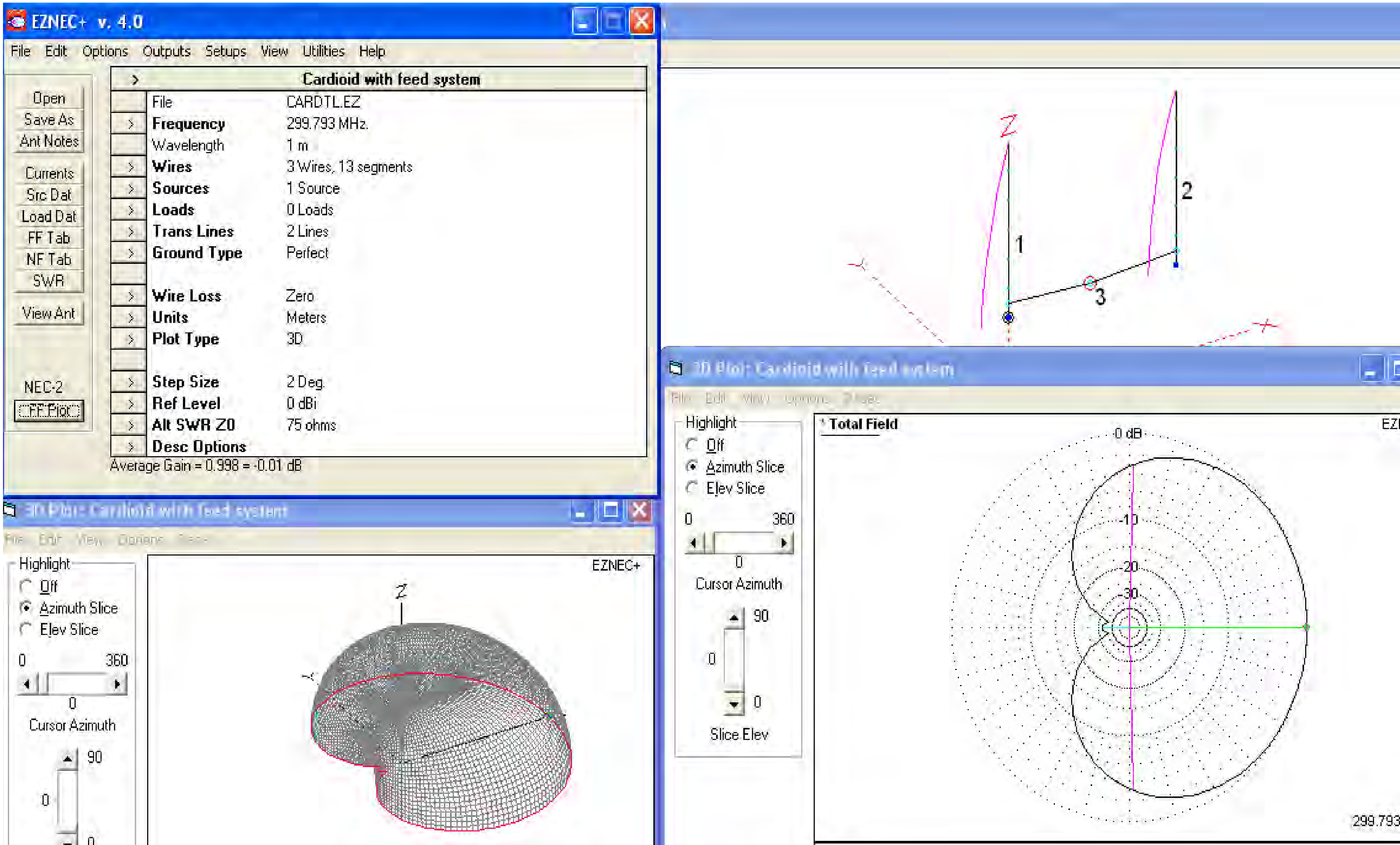




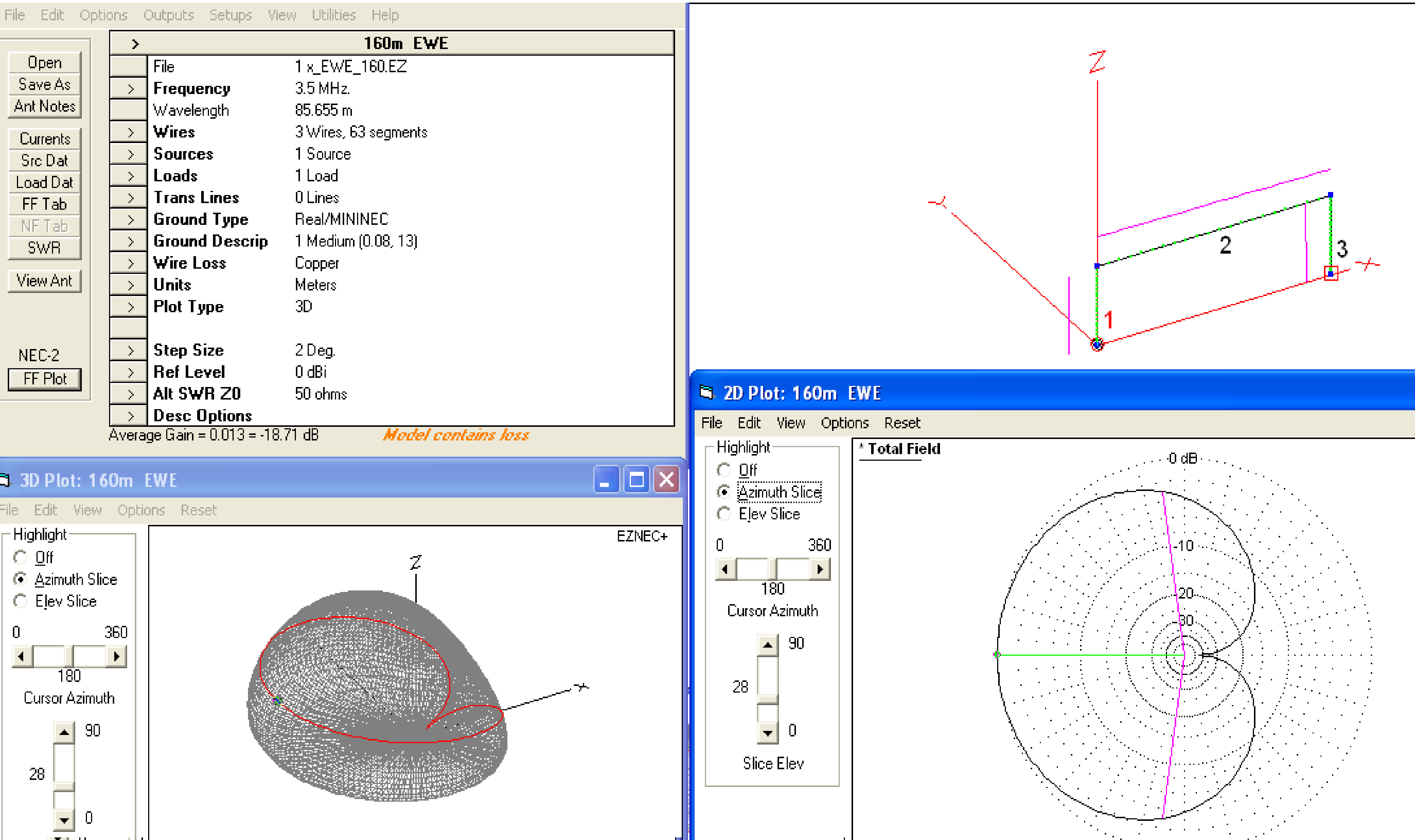




Two vertical in phase RDF = 8.25 dB

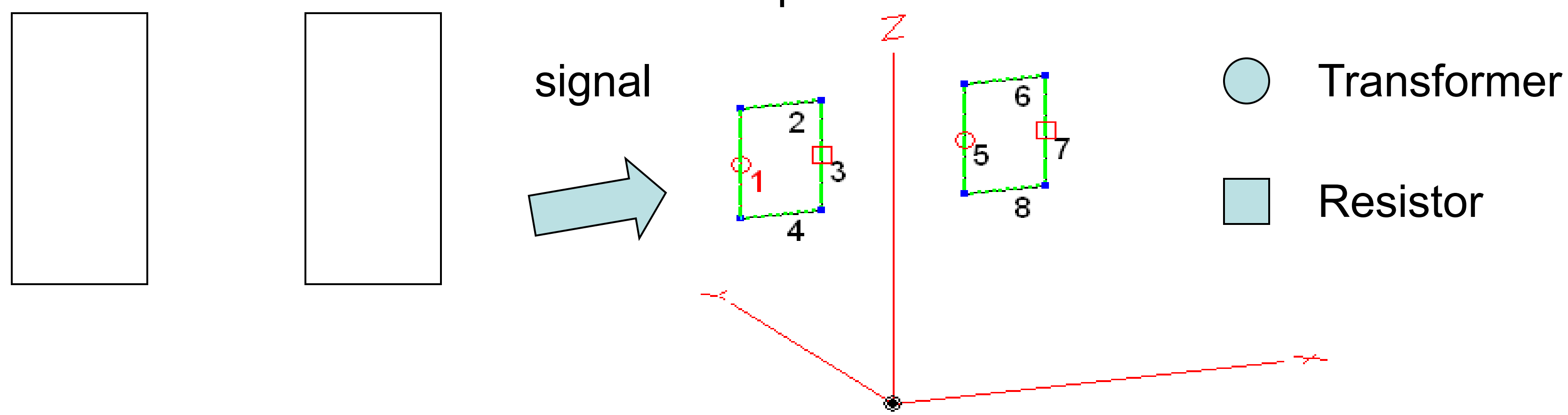


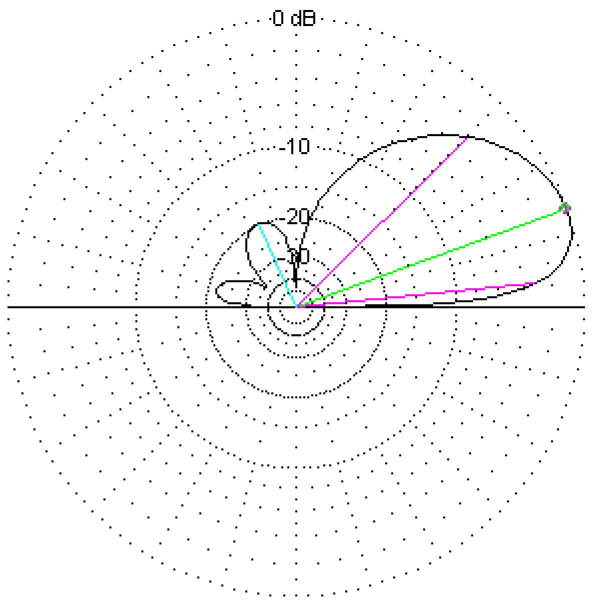
EWE RDF = 7.02 dB

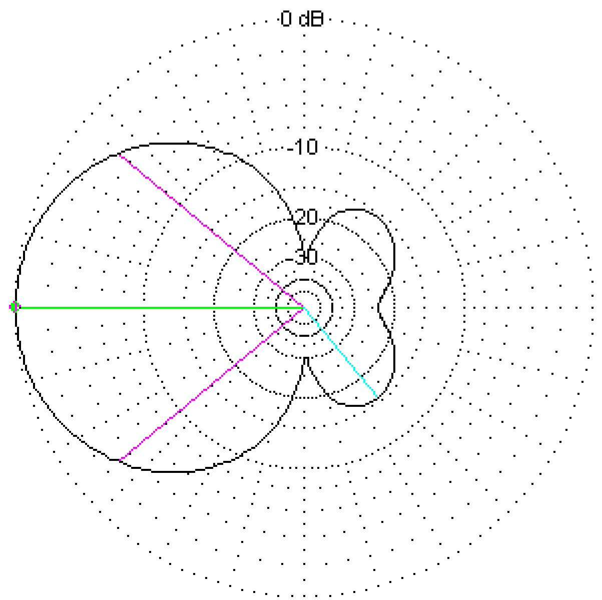


Flag Array Dual Waller Flag

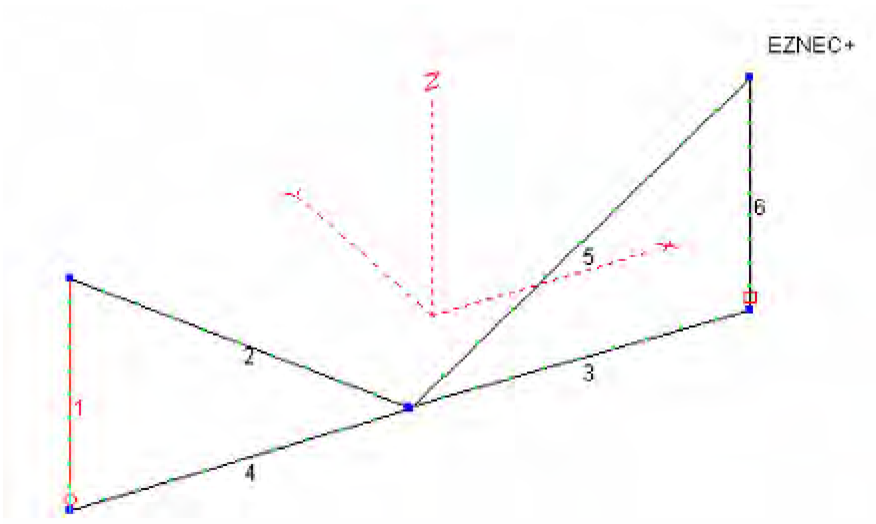
Two loops end fire

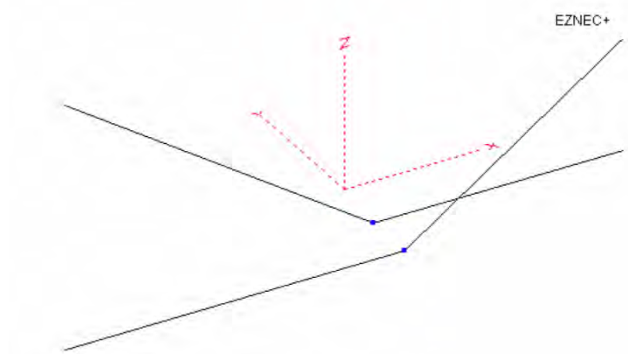


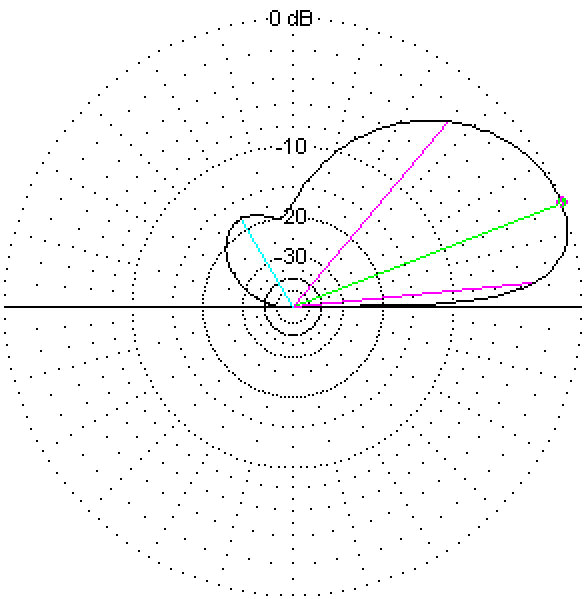


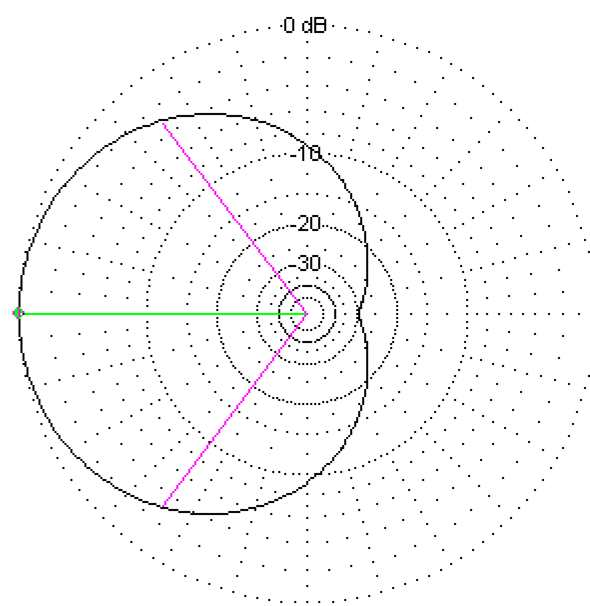


Dual Half Dual Loop AA7JV

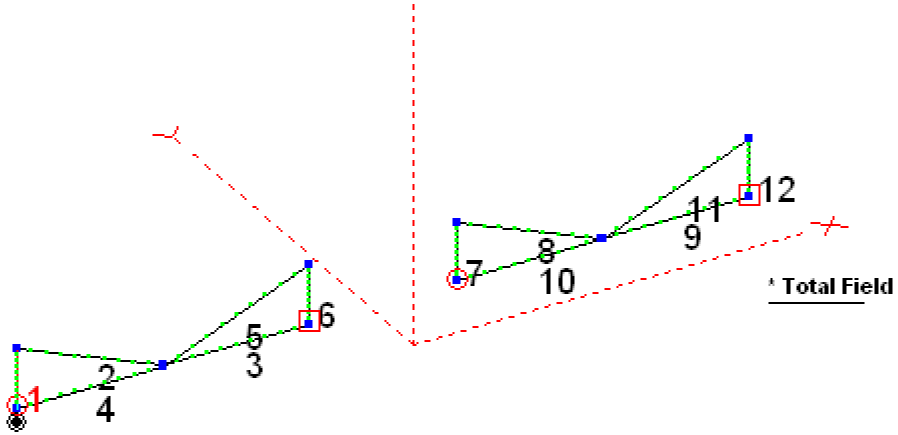


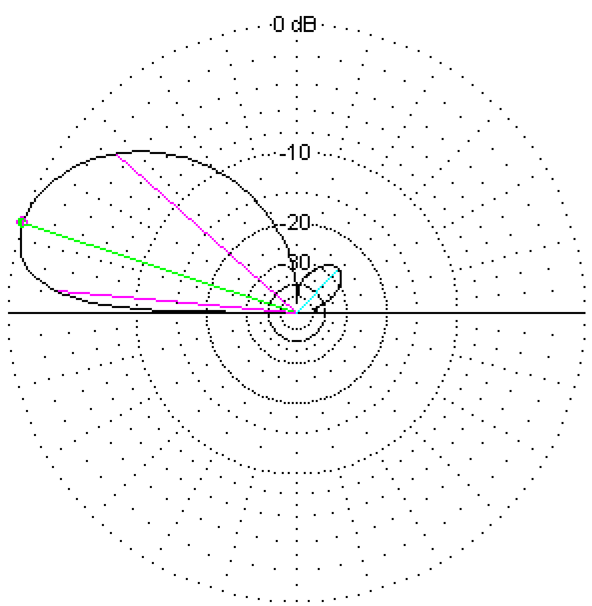


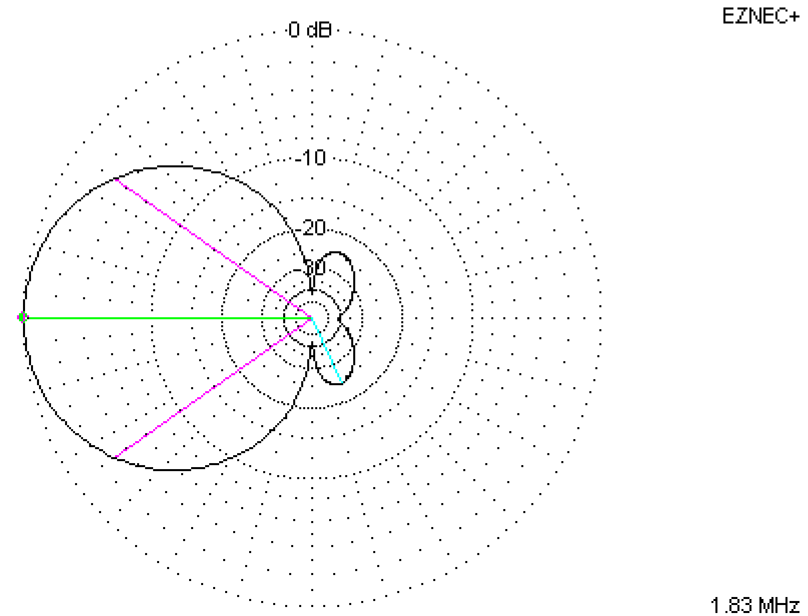




Dual DHDL Quad WF

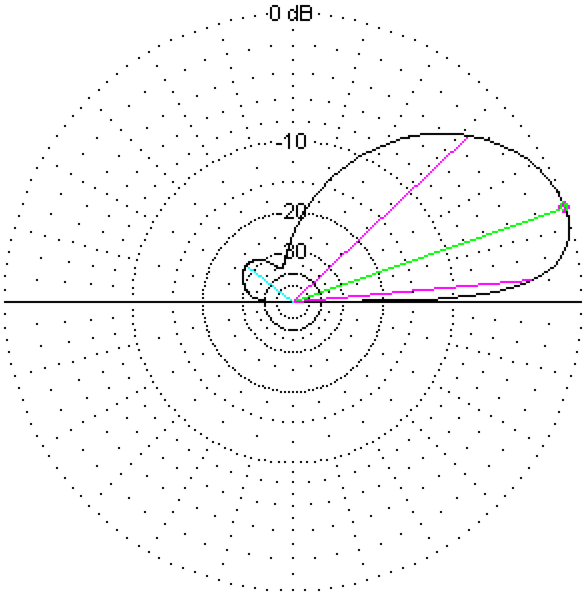


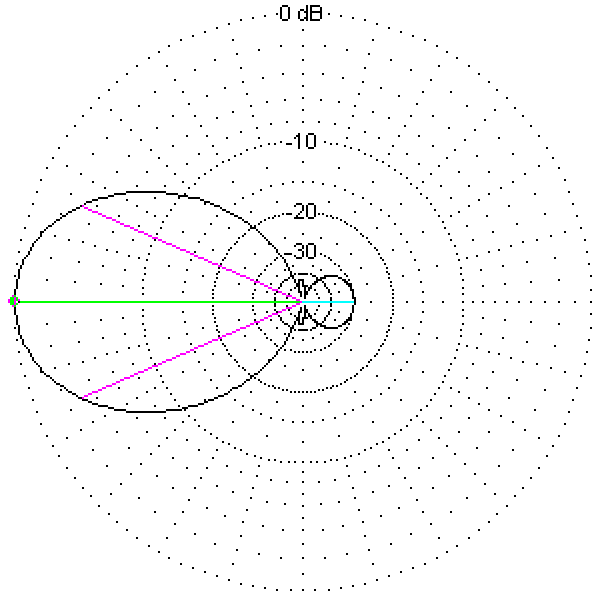


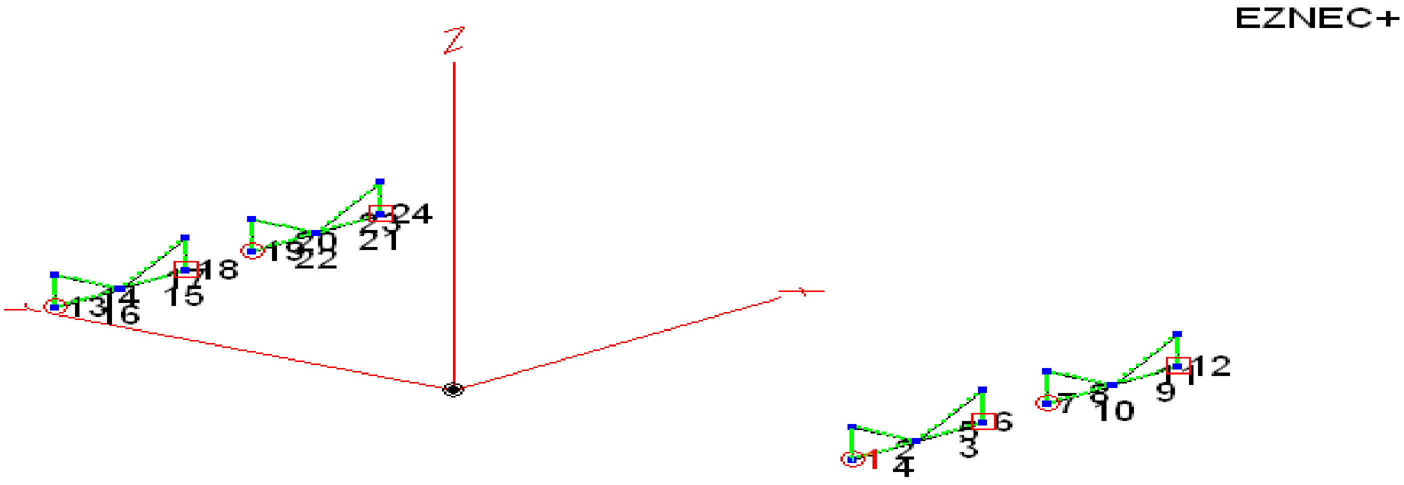


Azimuth Plot		Cursor Az	180.0 deg.
Elevation Angle	18.0 deg.	Gain	-37.51 dBi
Outer Ring	-37.51 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	-37.51 dBi		
Slice Max Gain	-37.51 dBi @ Az Angle = 180.0 deg.		
Front/Back	41.1 dB		
Beamwidth	70.5 deg.; -3dB @ 144.8, 215.3 deg.		
Sidelobe Gain	-61.46 dBi @ Az Angle = 294.0 deg.		
Front/Sidelobe	23.95 dB		

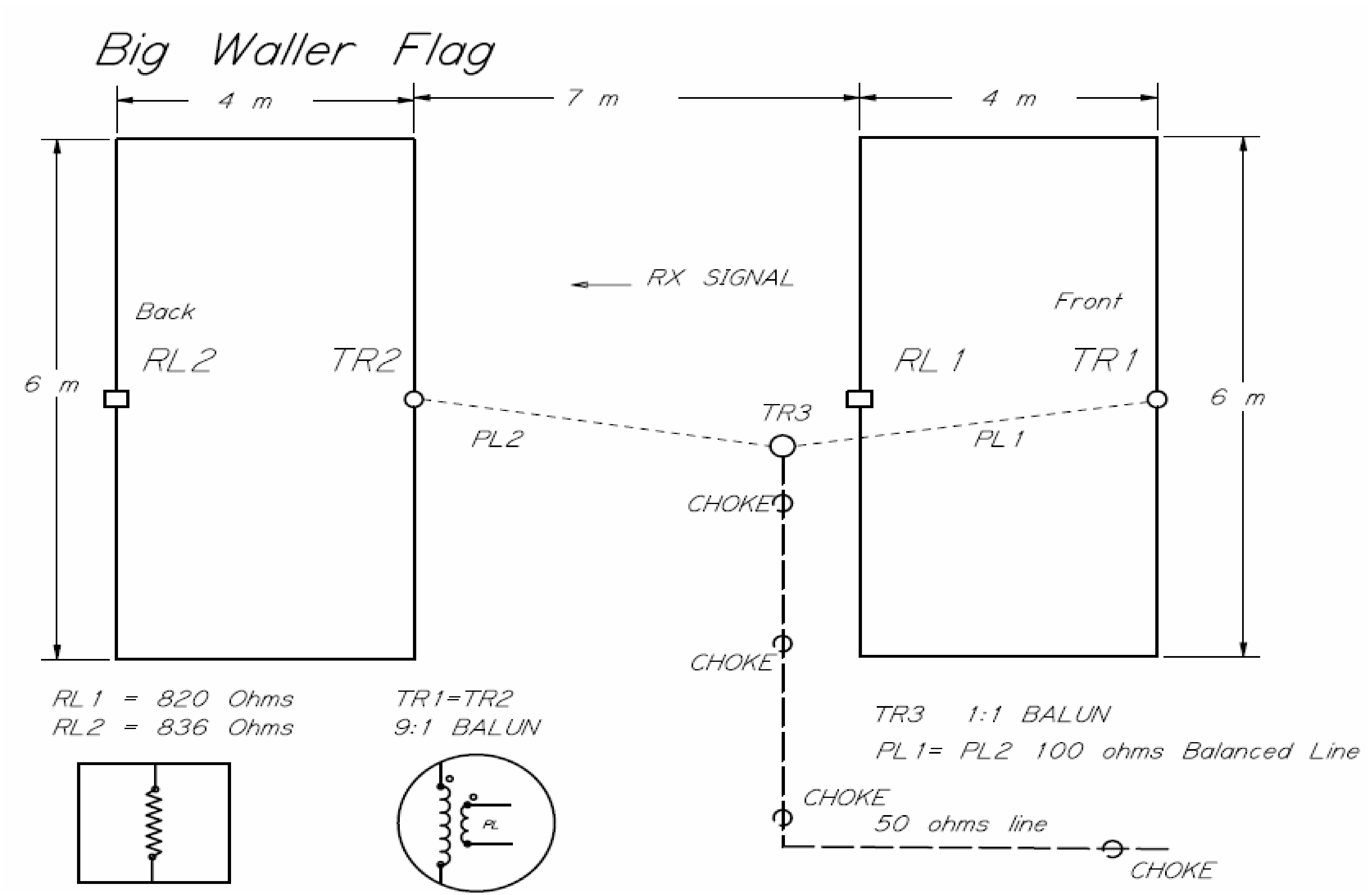
QUAD DHDL and Quad WF



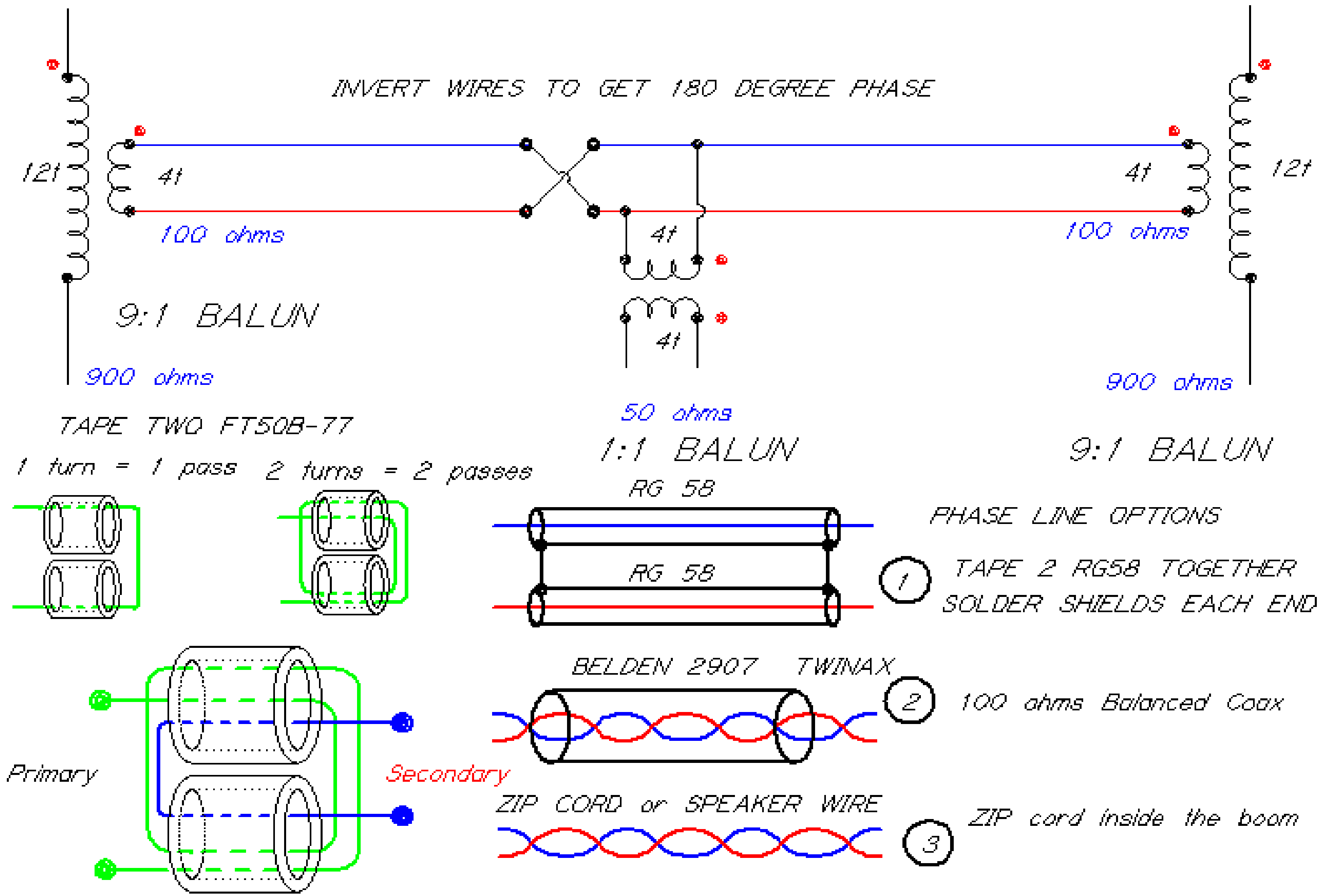




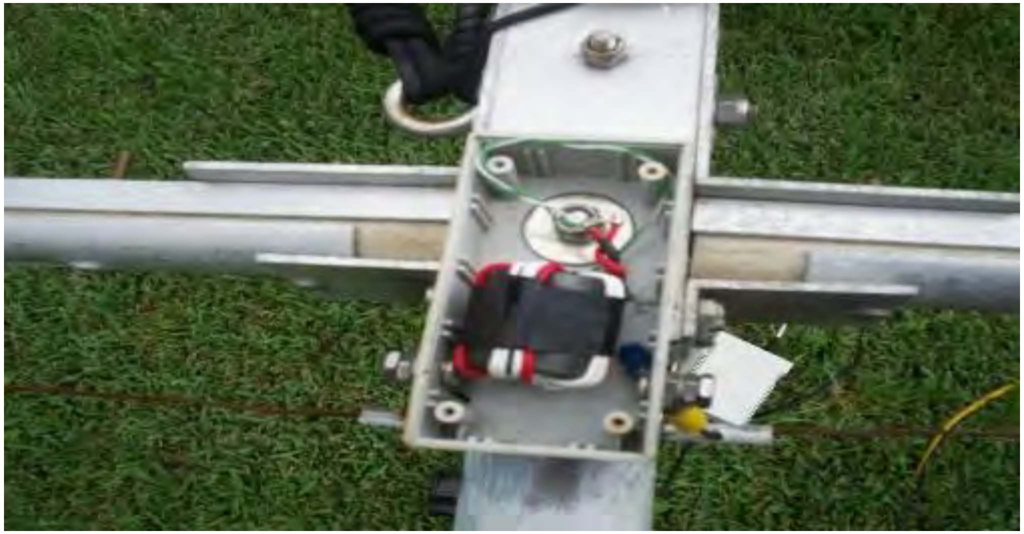
Twisted pair



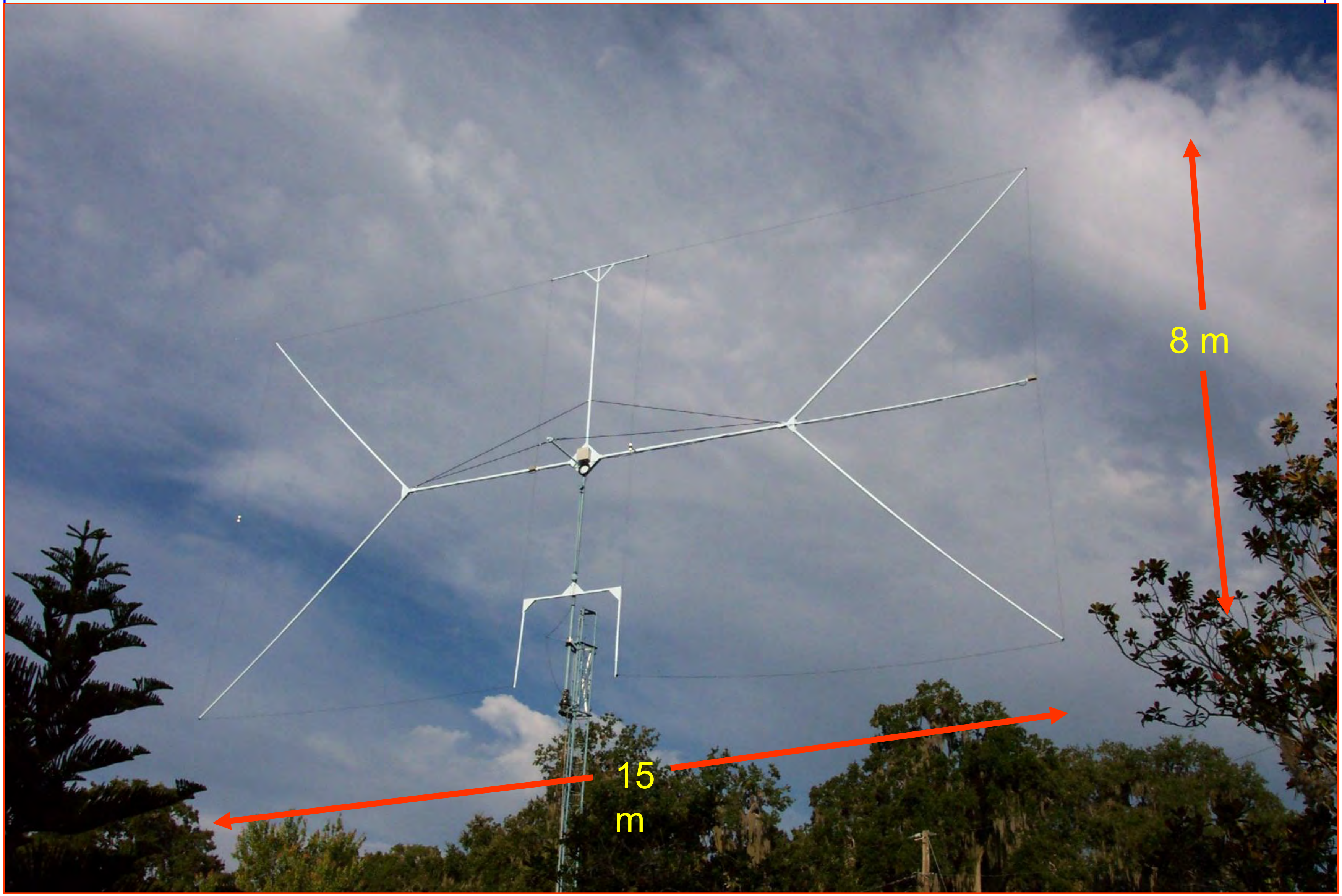
Waller Flag feed system



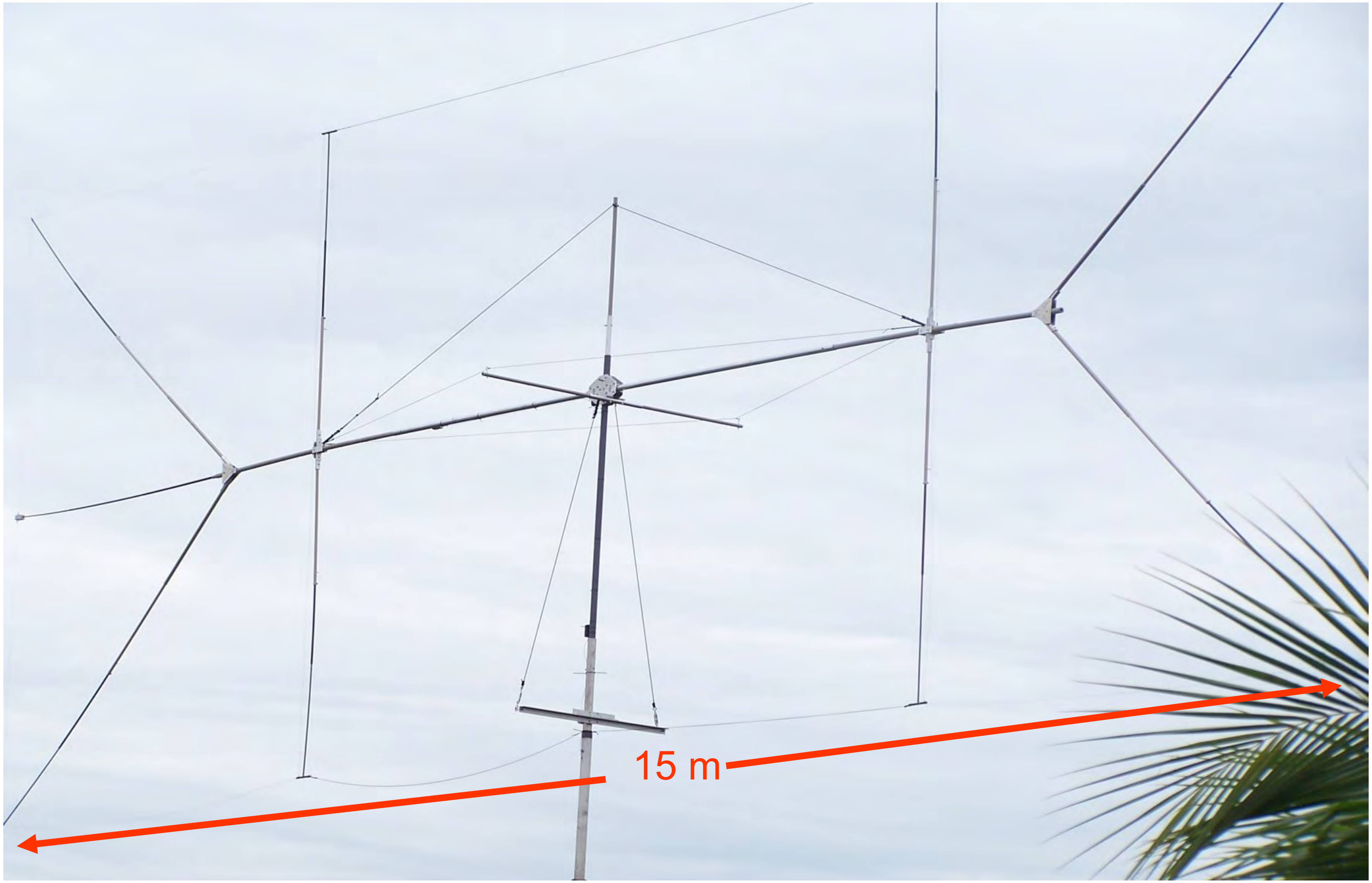
Transformer 9:1



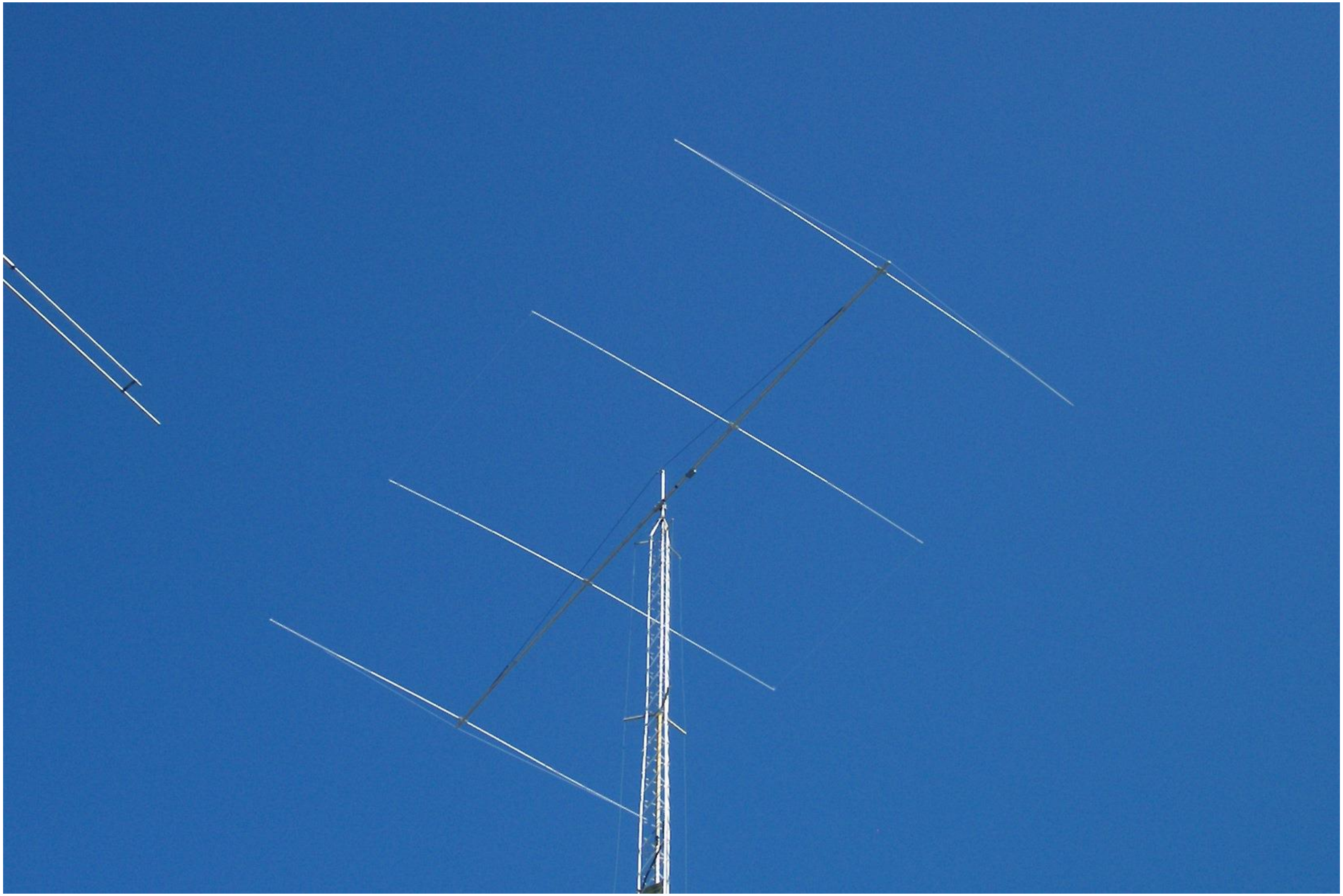
NX4D BIG Vertical Waller Flag



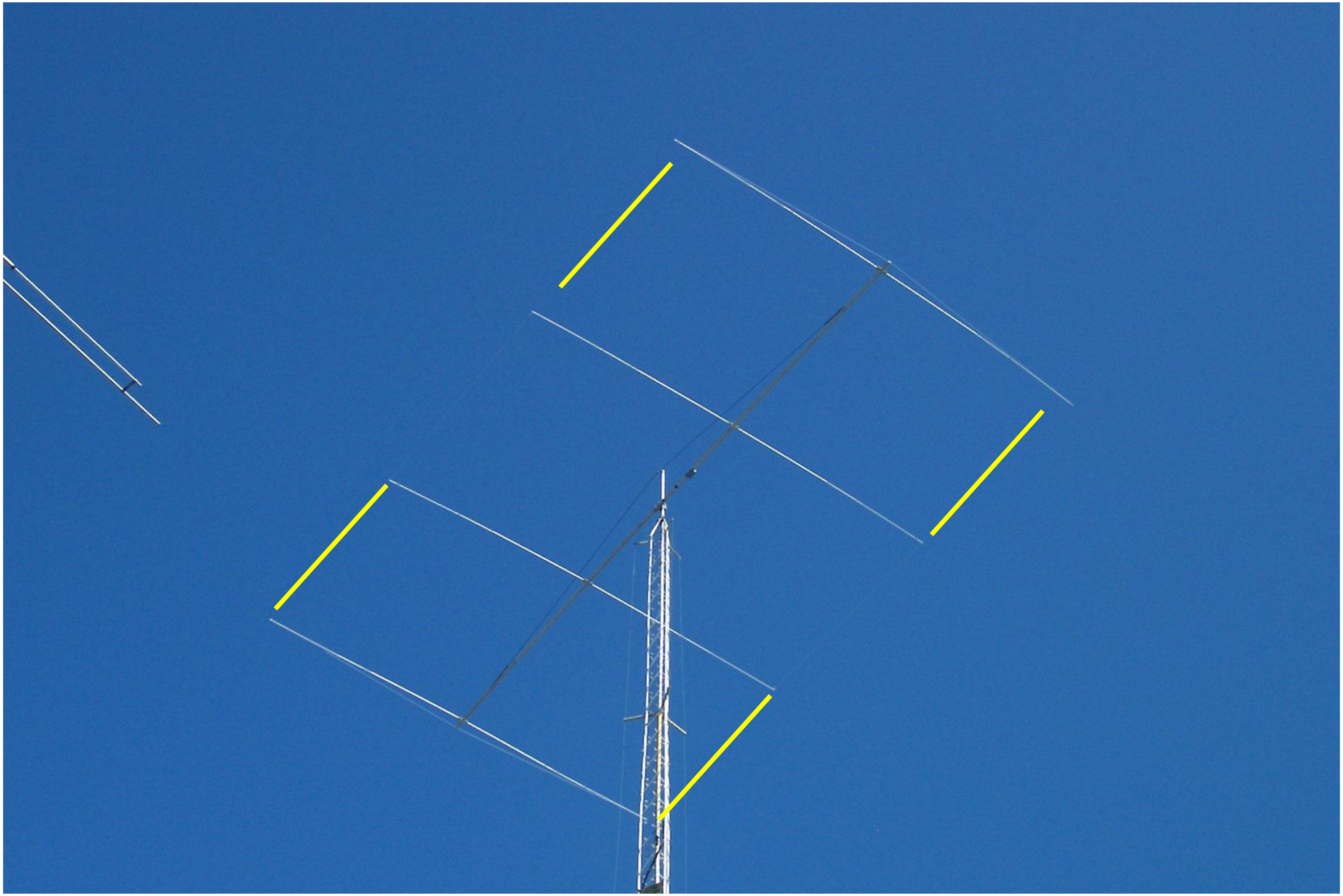
N4IS Vertical Waller Flag VWF



N4IS Horizontal Waller Flag HWF

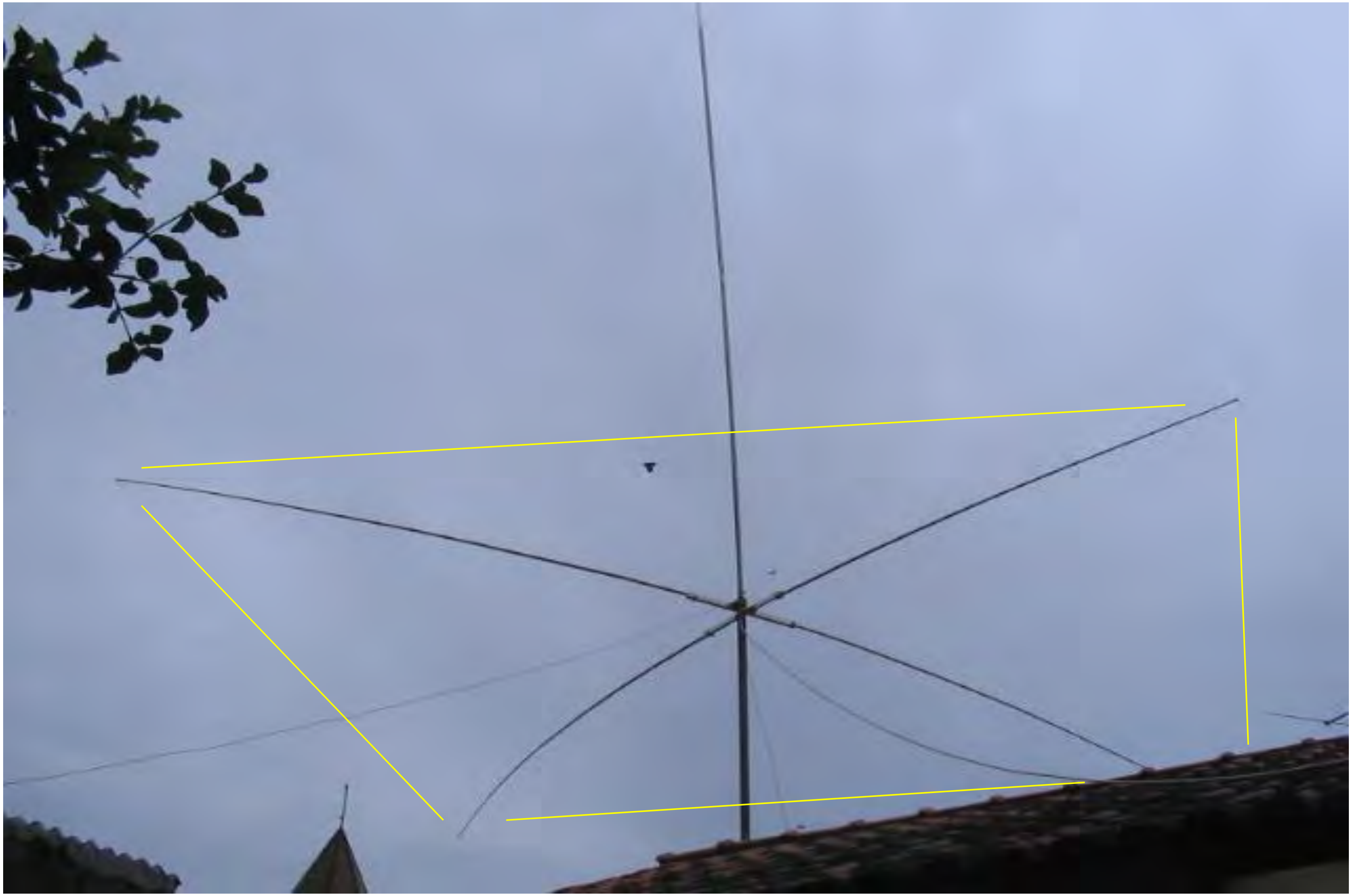


N4IS Horizontal Waller Flag HWF

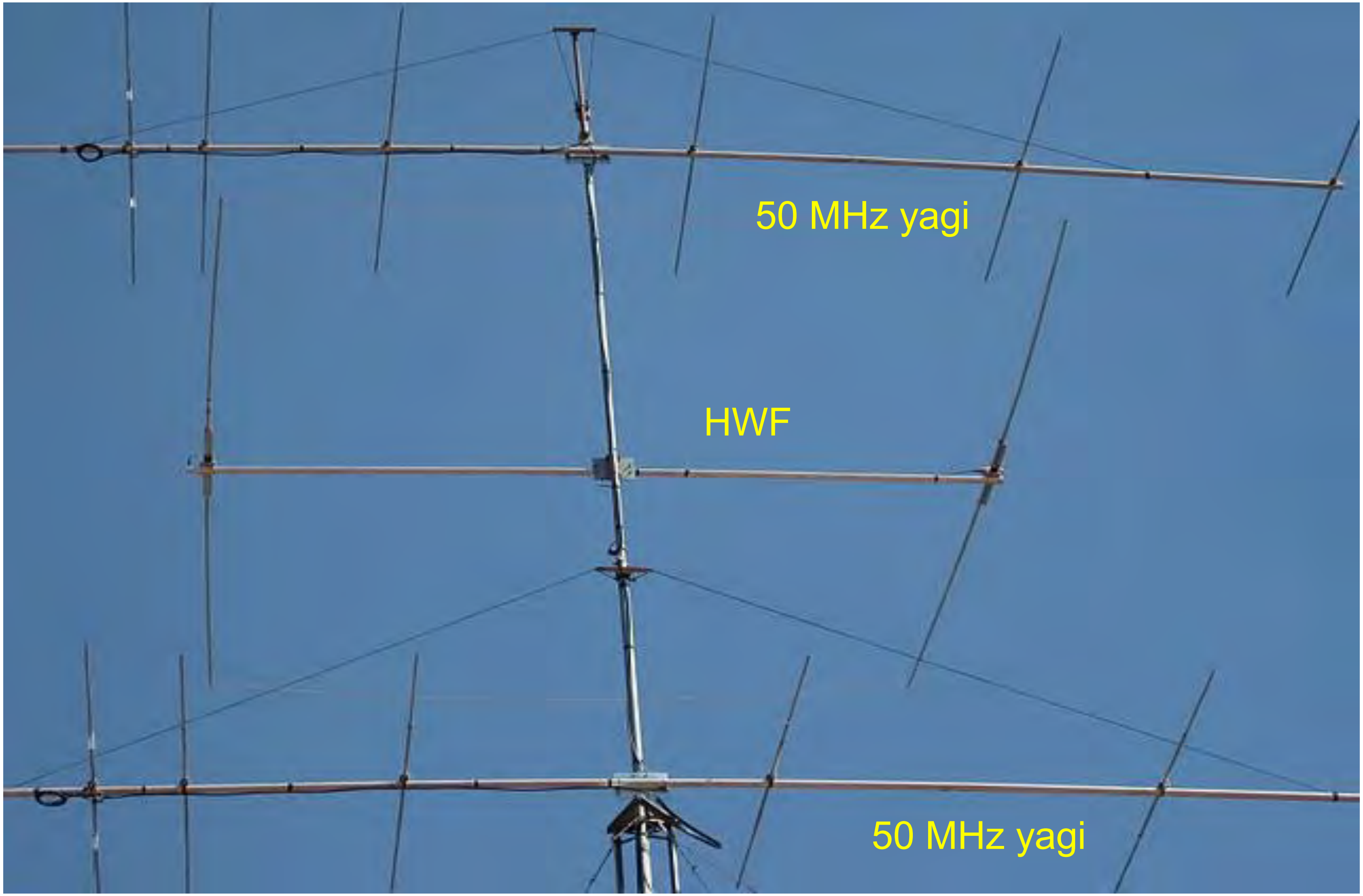


PY1RO single HWF

PY1RO single HWF



PY2XB Single HWF



N8PR WF with polarization rotation.

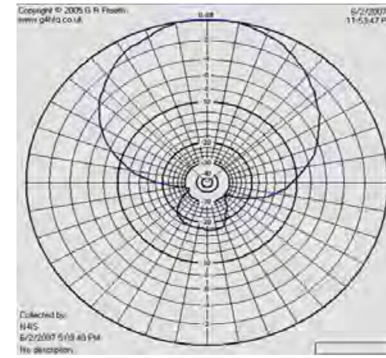
N2NL WF all PVC

W8VVG WF

TX3A (AA7JV) DHDL

G0JHC DHDL

N4IS all metal WF 2009

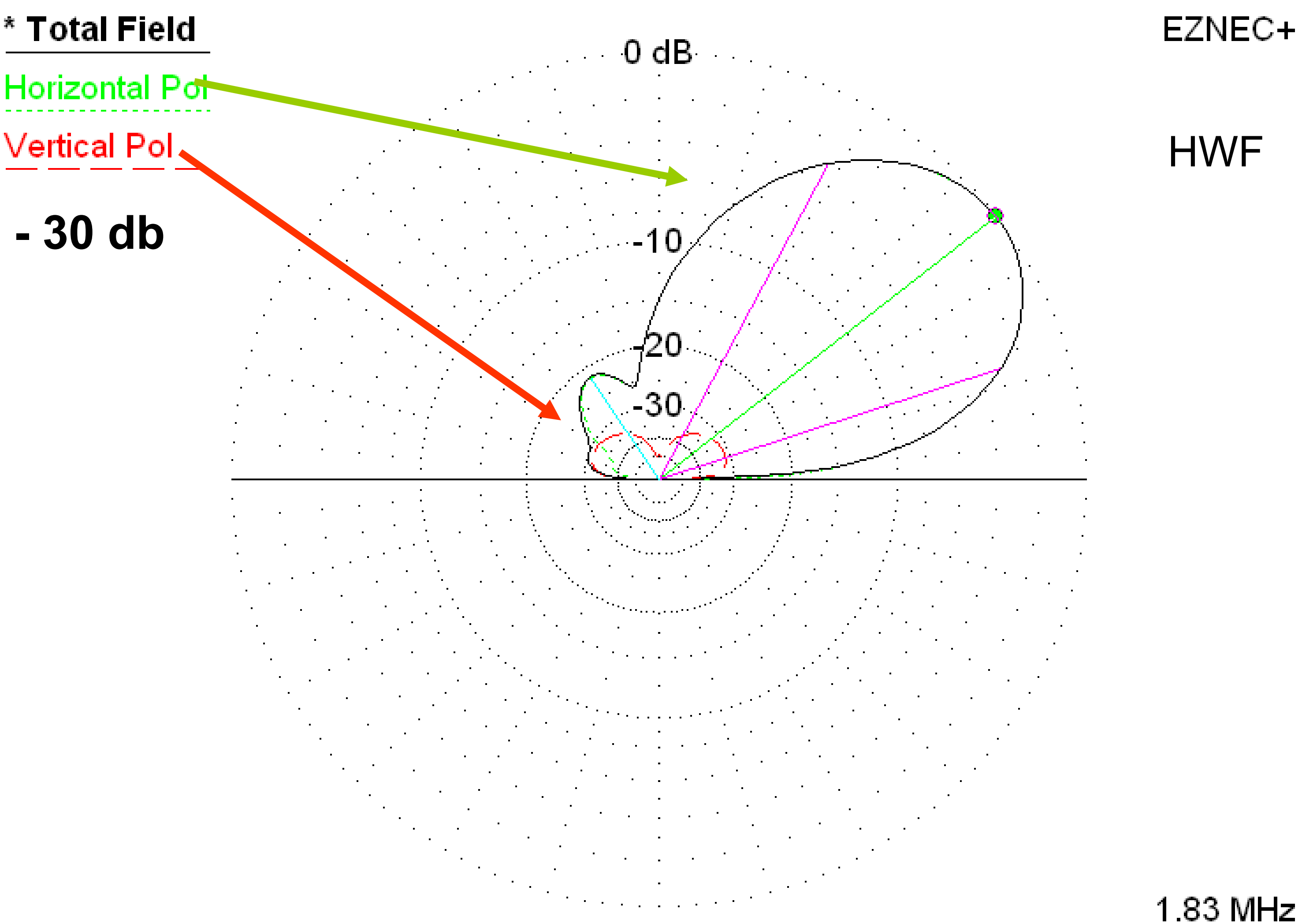


South Florida DX Association

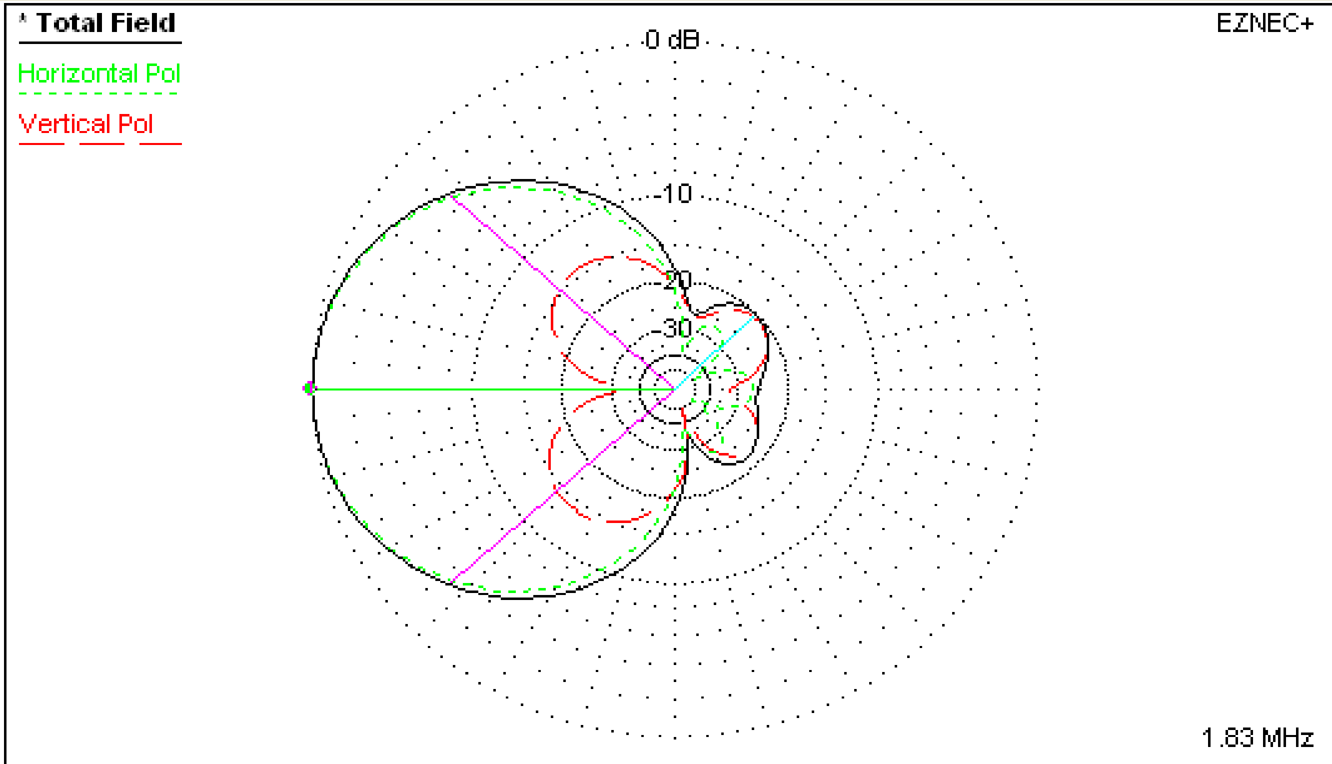
New solution to fight power line noise

Jose Carlos N4IS

Polarization filter HWF

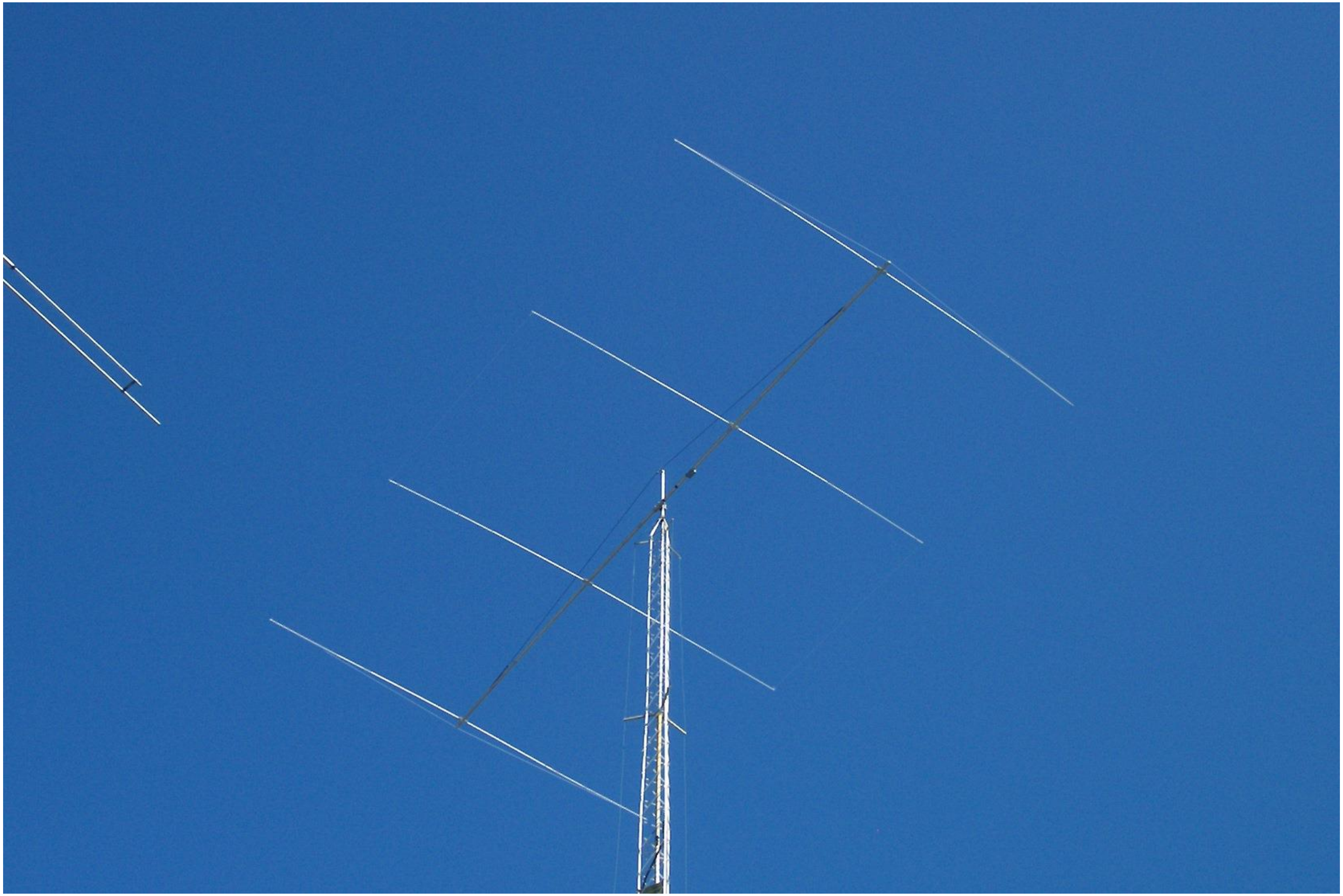


Polarization filter HWF

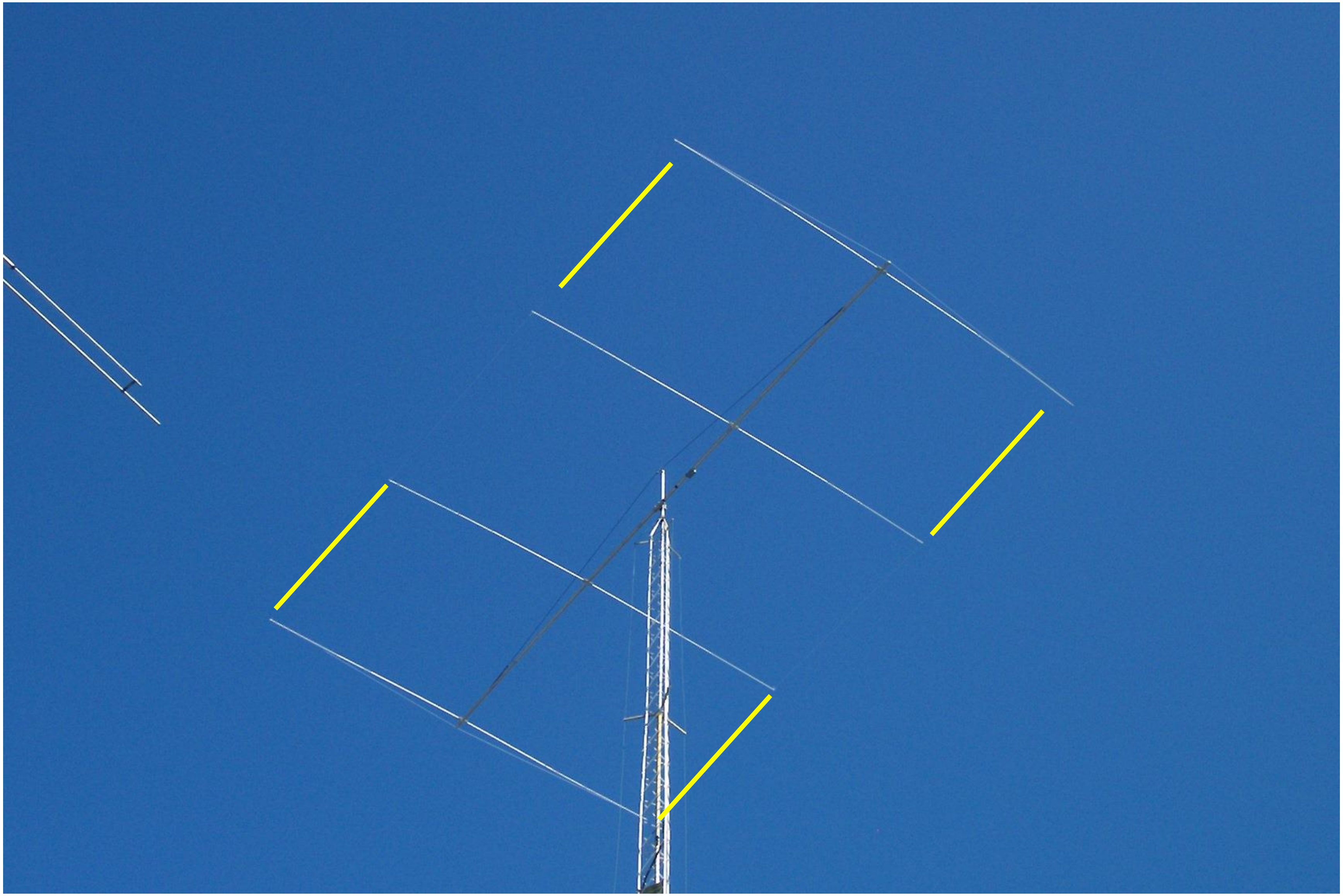


Azimuth Plot		Cursor Az	180.0 deg.
Elevation Angle	38.0 deg.	Gain	-50.47 dBi
Outer Ring	-50.47 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	-50.47 dBi		
Slice Max Gain	-50.47 dBi @ Az Angle = 180.0 deg.		
Front/Back	25.31 dB		
Beamwidth	84.1 deg.; -3dB @ 138.0, 222.1 deg.		
Sidelobe Gain	-70.61 dBi @ Az Angle = 44.0 deg.		
Front/Sidelobe	20.14 dB		

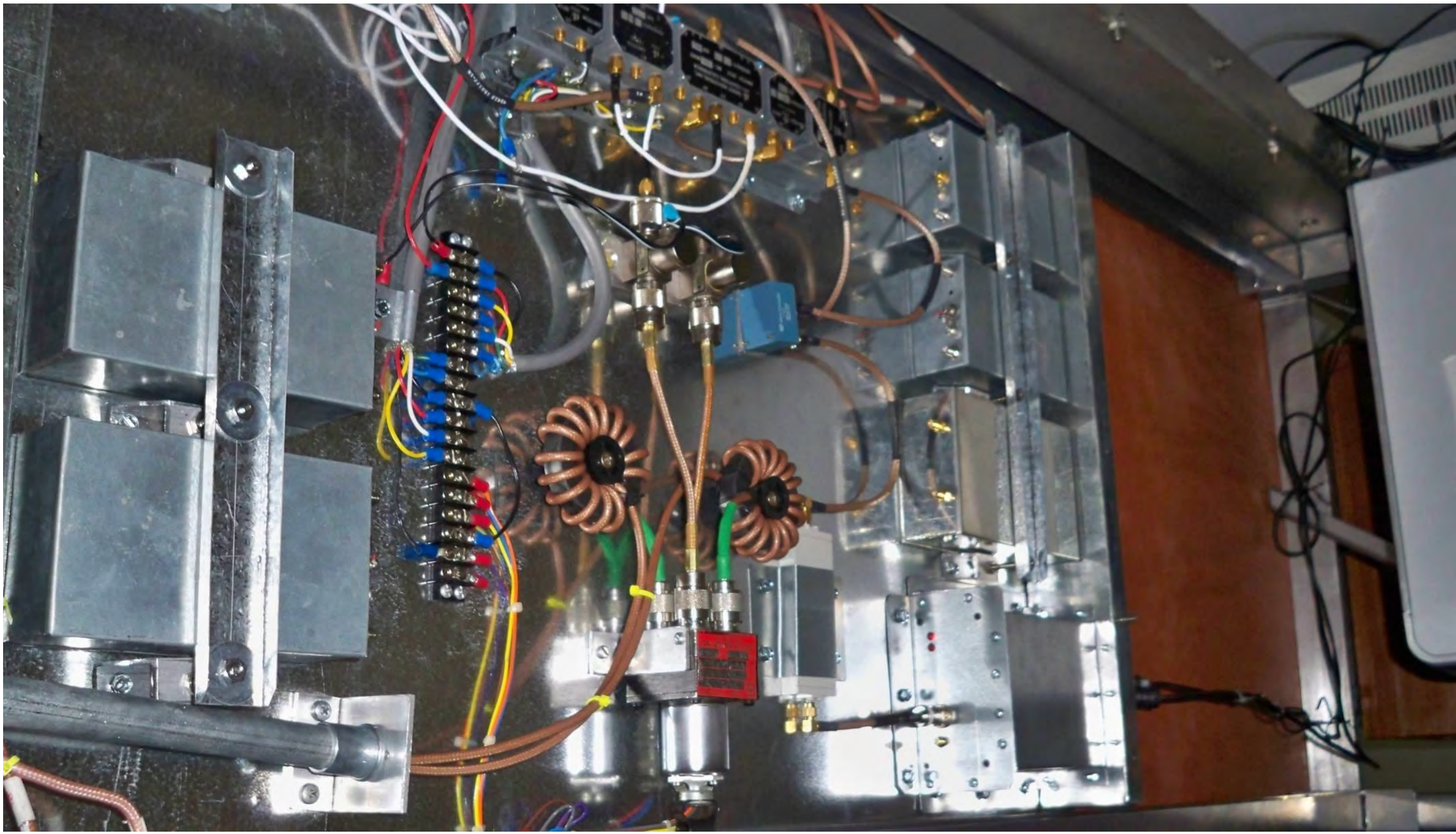
N4IS Horizontal Waller Flag 2012



N4IS Horizontal Waller Flag 2012

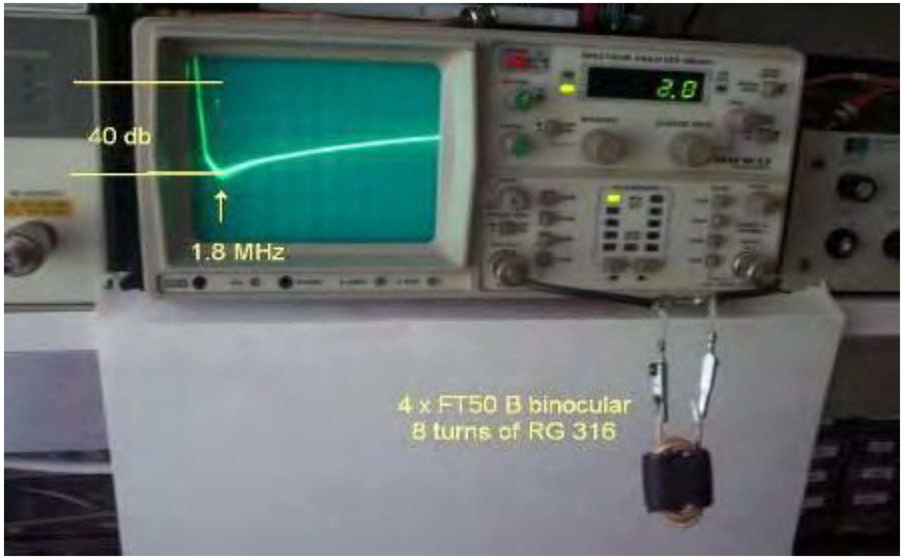


N4IS preamps



RF CHOKE

http://www.yccc.org/Articles/W1HIS/CommonModeChokesW1HIS2006Apr06.pdf



http://audiosystemsgroup.com/publish.htm

Coaxial Transmitting Chokes
Jim Brown K9YC

http://audiosystemsgroup.com/RFIHamNCCC.pdf

AC filter at N4IS

AC filter at N4IS

Don't need to move out in the woods, just improve your receiving system and enjoy the good stuff.