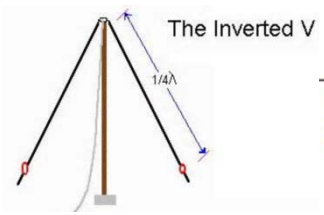
Presenters:

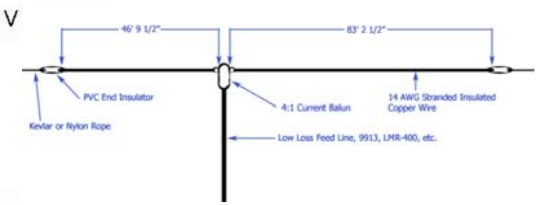
Slides 1 thru - 39 - Harold AD7QJ

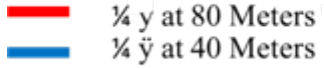
Slides 40 thru - 49 - Mike KD7GHZ

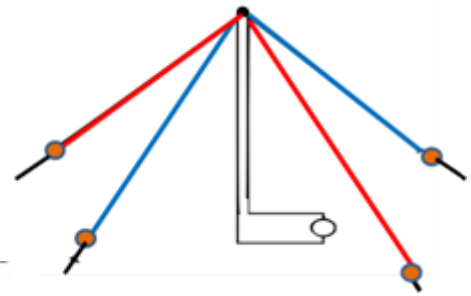
VHF Club November Meeting Presentation

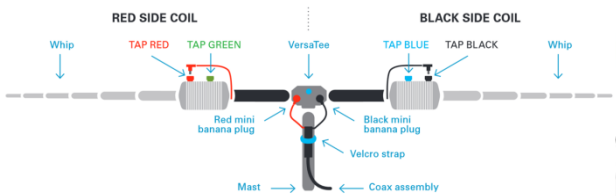
HF Antennas for Portable Operation

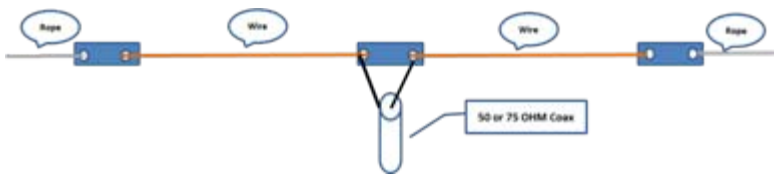




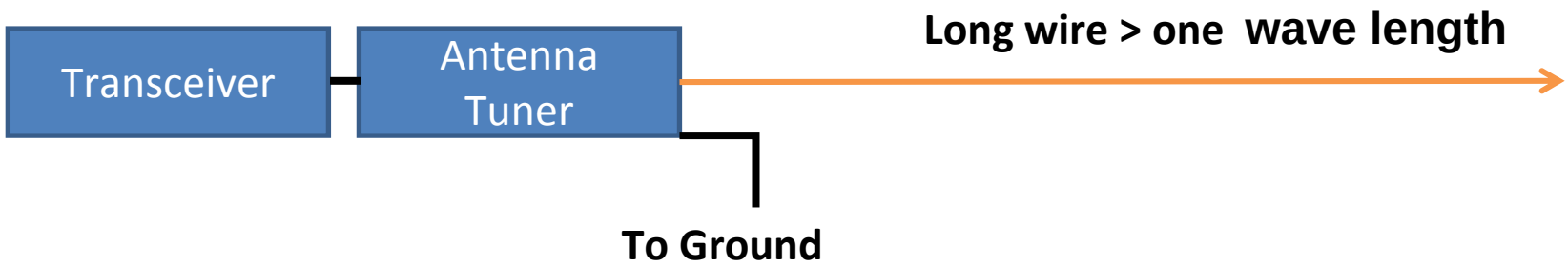








Basic Long Wire



Long wire can be any long wire or metal object:

Insulated or un-insulated wire

Electric Fence (turned off)

Un – grounded drain spout and Gutters

Antenna Tuner Required with internal or external Balun (9:1)

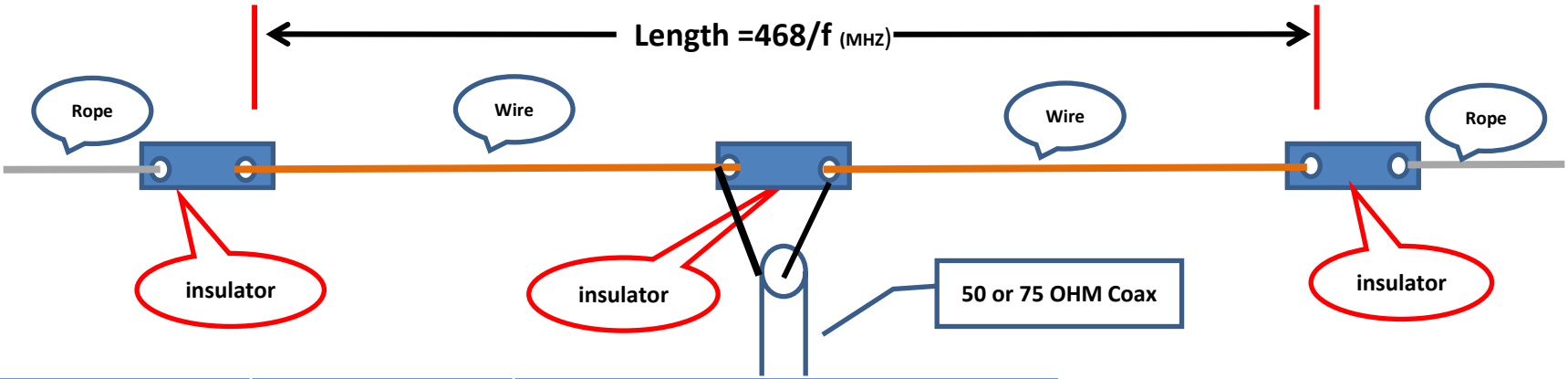
End fed 6-40 Meter multiband Matchbox HF Antenna

- Buy it for assembled with the Balun for $49 from the Honolulu Emergency Amateur Radio Club (EARC). It comes with 30ft of #18 stranded insulated wire and you can add additional wire for 80 and 160 Meters.
- You can also build it yourself (balun alone also available from Honolulu Emergency Amateur Radio Club)
- Can use as a sloper with only the far end raised on a pole or support.
- Requires an antenna tuner to obtain a match to 50 ohms
- A great Emergency or back pack antenna

End fed 6-40 Meter multiband Matchbox HF Antenna

- Their web site with purchase and information on construction is: http://www.earchi.org/92011endfedfiles/Endfed6_40.pdf
- Could be a club project to build them if there is enough interest.
- This is a great Emergency or back pack antenna

Simple Dipole Antennas

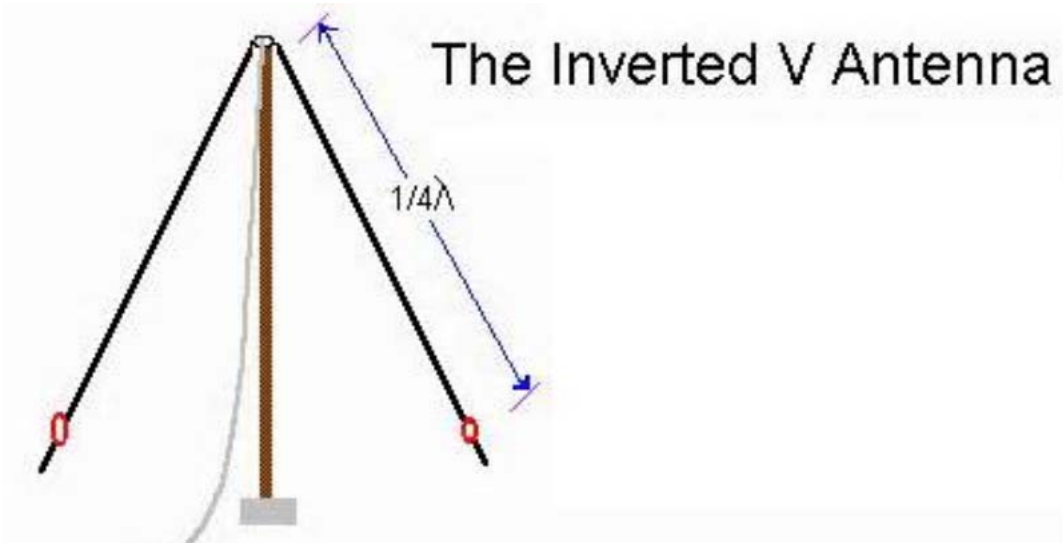


Frequency	Band	Dipole Length
3.875 MHz	80 Meters	468/3.875 = 120.77 feet
7.245 MHz	40 Meters	468/7.245 = 64.60 feet
14.250 MHz	20 Meters	468/14.250 = 32.84 feet
28.200 MHz	10 Meters	468/28.200 = 16.60 feet

ARRL Dipole Web Page:
http://www.arrl.org/files/file/Technology/tis/info/pdf/9106023.pdf

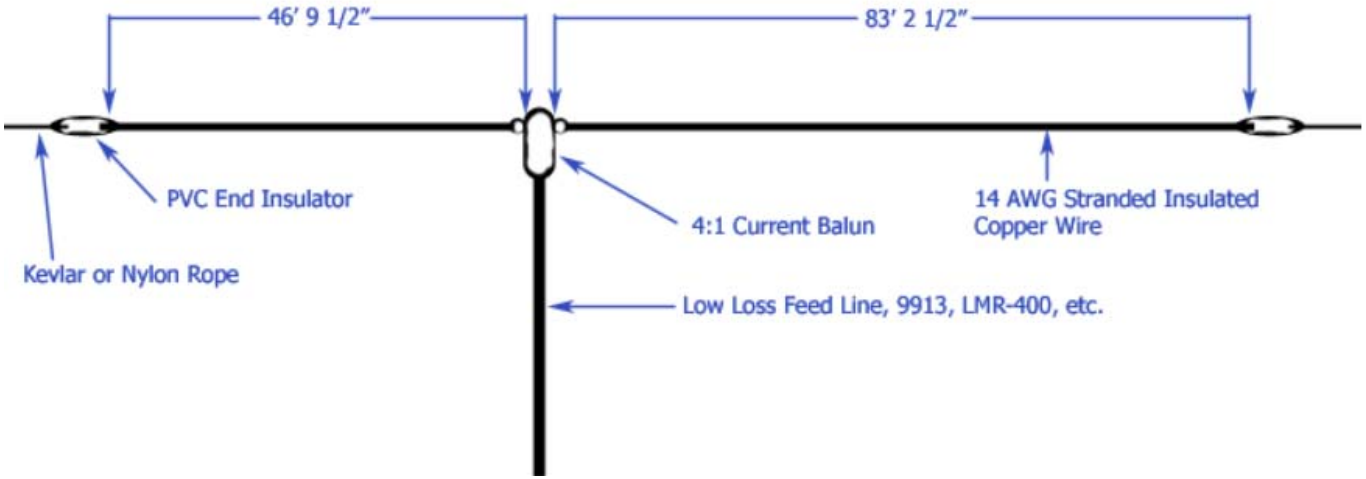
- ***Dipole Antennas have a characteristic impedance of 75 ohms (will be a 1.5:1 VSWR)***
- ***If properly adjusted in length they will not need an antenna tuner***
- ***Elements may be bent to accommodate the location.***
- ***Always start with elements 5% longer and cut equal lengths from both sides until a match at the desired frequency is obtained***

Variations on a Dipole



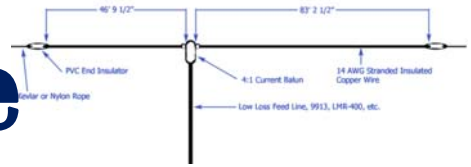
- This is a variation of a dipole if there is not enough room to extend the elements straight out

Off Center fed Dipole



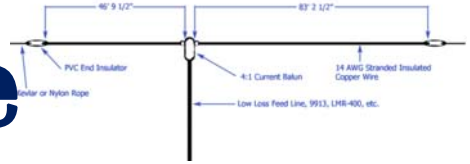
- For a dipole antenna cut to 3.6 MHz, take 468 / 3.5MHz and you get 130'. That is the overall length of a standard dipole. Normally you divide that in half to find the center feed point; however, we are feeding this 14% off-center, so add 14% to 50% and you get 64% for the longest leg which leaves 36% for the shortest leg.
- So, 130' multiplied by .64 (64%) gives the longest leg length of 83.2 feet. the shortest leg length is the remainder, or 46.8 feet.

Off Center fed Dipole



- To calculate in the velocity factor for 12 or 14 AWG stranded copper, jacketed wire simply take the lengths and multiply them by .975 and you will get the "RF length" of your wire. (This is the real length you require for resonance)
- To build a working version of this Off-Center Fed Dipole, you will need to buy or build a 4:1 current balun, obtain a couple of end insulators and procure 132 ft of 14AWG jacketed stranded copper wire.
- Cut the 132' of wire to 84' 2 1/2" and strip back about 6" off of one end, each wire to make your balun connection and solder it.
- Measure from the far end of the wire back 6" mark that spot. This is the end of the wire where it passes through the insulator. You have a 6" tail to fold back, strip and solder to form the end of your antenna element.
- This has been calculated using 14 AWG stranded copper wire, with the jacket on. Do not use bare copper wire, or solid copper wire or you will not obtain the same results.

Off Center fed Dipole



The AI4JU 4:1 current balun mounted in an electrical box (ccover removed)

- You can buy one of these antenna systems from AI4JI, completely fabricated and ready to hang for $89.00 (domestic shipping included).
- You can buy a wound balun from AI4JI and put it in your own electrical box for $30 (domestic shipping included)
- Go to the web site http://www.ai4ji.com/Projects/ocfdipole.htm for more information or to order an antenna or Balun.

Off-Center Fed Dipoles

Practical Applications

From the work of N1IW

Why?

- Looking for solutions for low band antennas
- Was abused by a counterpoise as a child
- Looking for multiband solutions
- Traditional low band wire arrays use dipoles or inverted vees
- Applications to driven & parasitic arrays

Off Center Fed Dipole Basics

- Half wave resonant antenna at lowest frequency of operation
- Even Harmonic resonances
  (*V/I ratio is approximately constant*)
  - 160M: 160, 80, 40, 20, 17, 12, 10
  - 80M: 80, 40, 20, 10
- Fed 1/3 of the way from the end vs. in the middle
- Feed point impedance is approximately 200Ω
  - 4:1 current balun does the trick

OCFD Data

- 80M
  - Used for 10 years
  - 136 feet in length (located at abt 30 feet)
  - Fed 44.5 feet from one end
  - Resonant on 80M, 40M, 20M, 10M (no tuner)
- 160M (measured data)
  - Recent addition
  - 264 feet long (located at abt 80 feet)
  - Fed 88 feet from one end; 4:1 homebrew balun
  - 200Ω on 160M and 166Ω on 80M at resonance
  - 2:1 BW: >200 kHz on 160M, 260 kHz on 80M

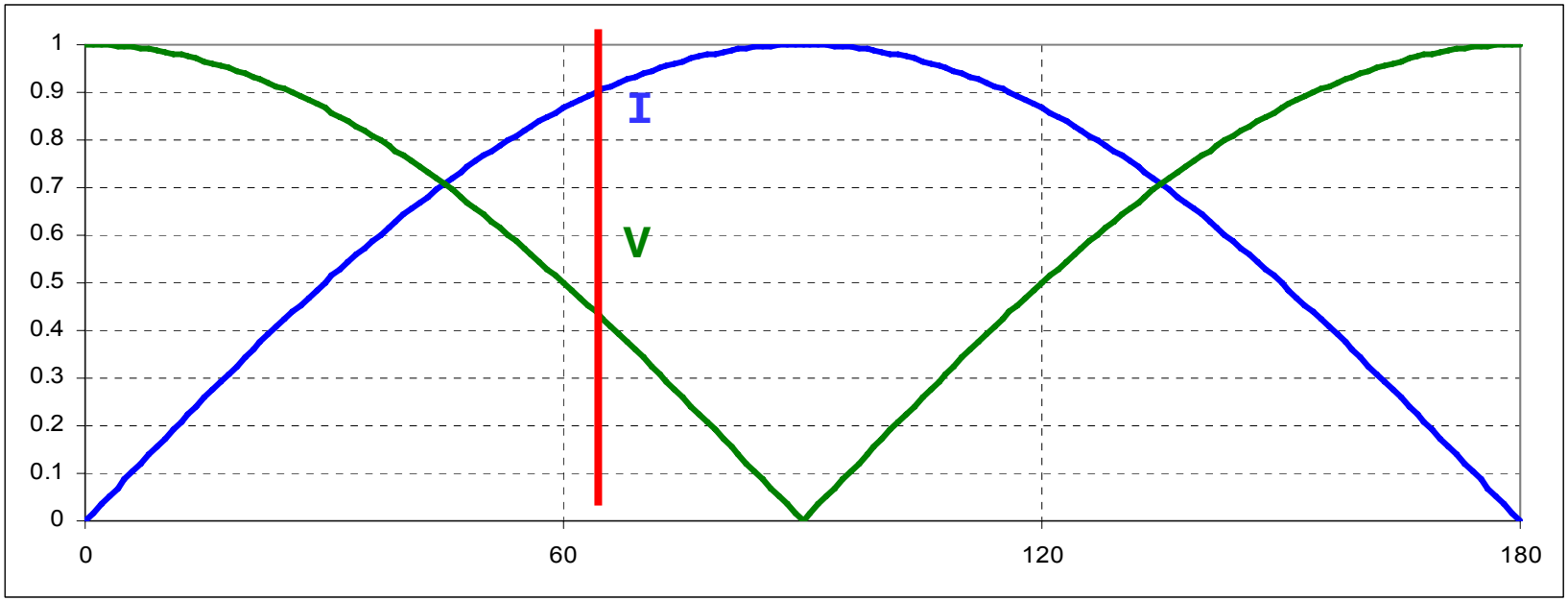
Why They Work

- It's just a dipole!

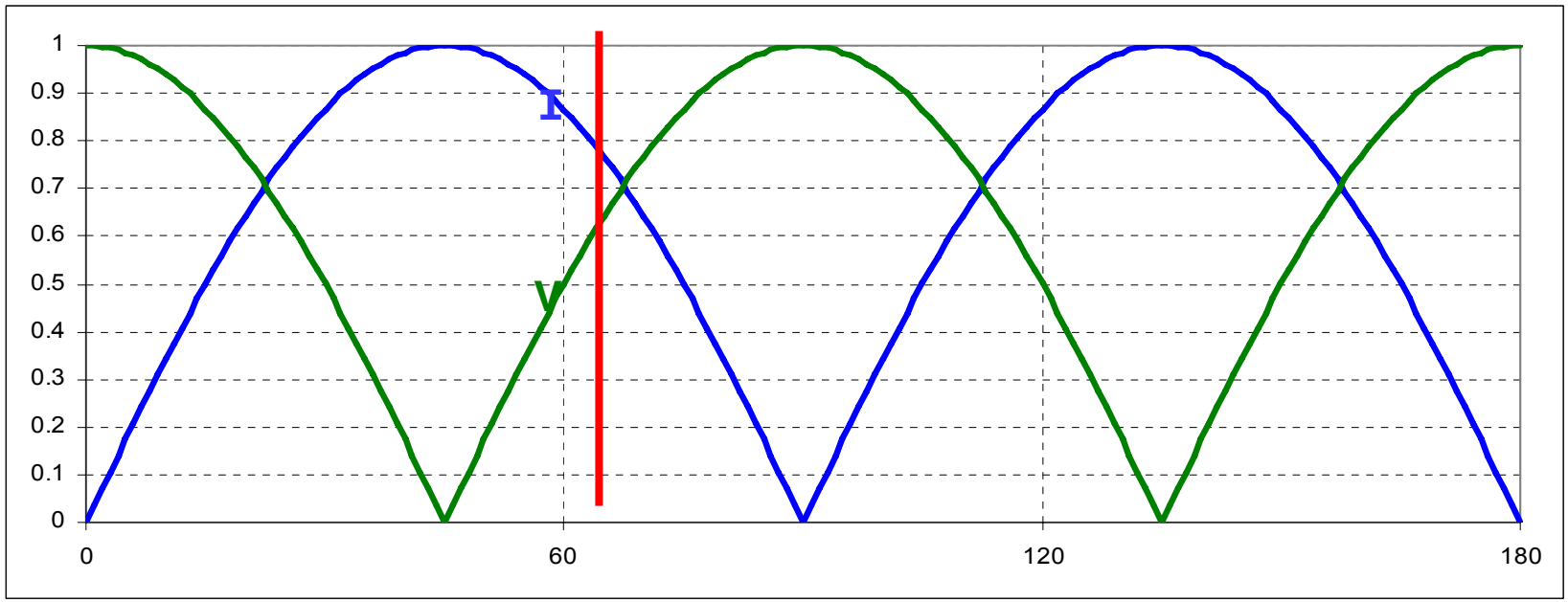
- But
  - ½ wave resonant element, then harmonic wire
  - Voltage/Current relationship at 1/3 feed point provides essentially constant ratio on even harmonics
  - Broadside null on harmonics

Current Distribution on a Dipole

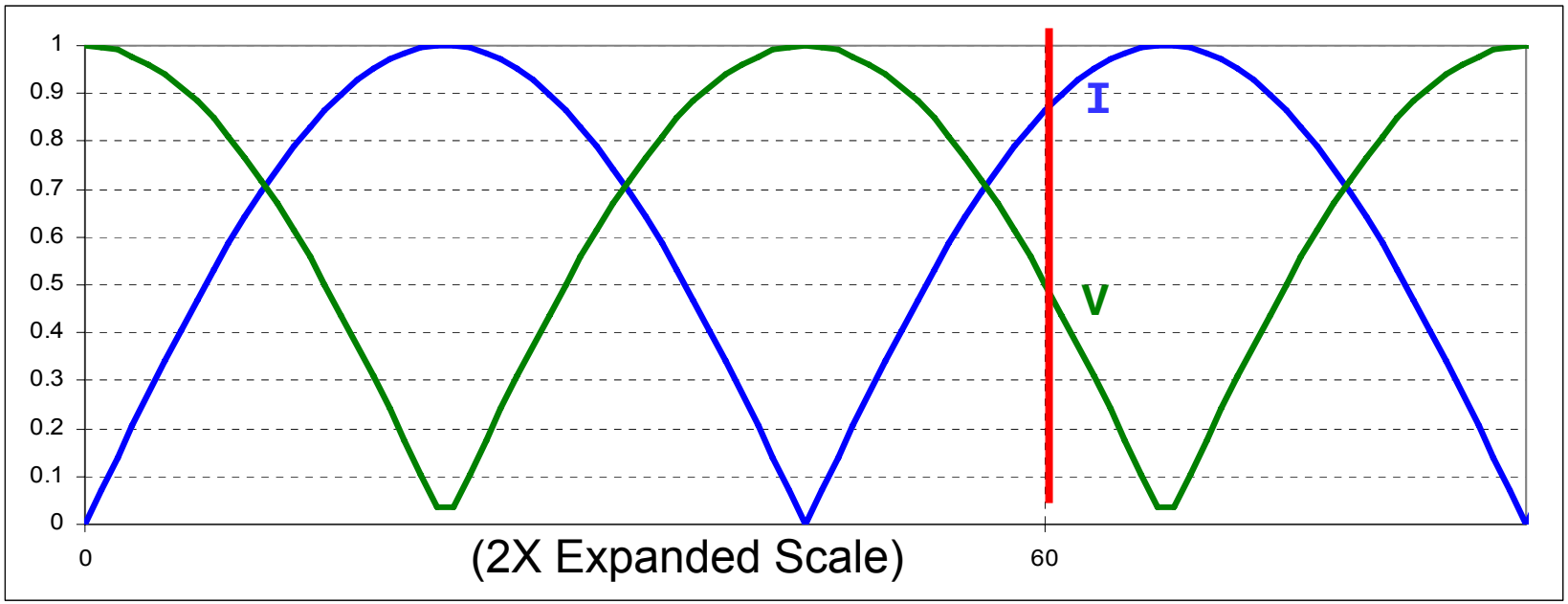
Current & Voltage at Fundamental



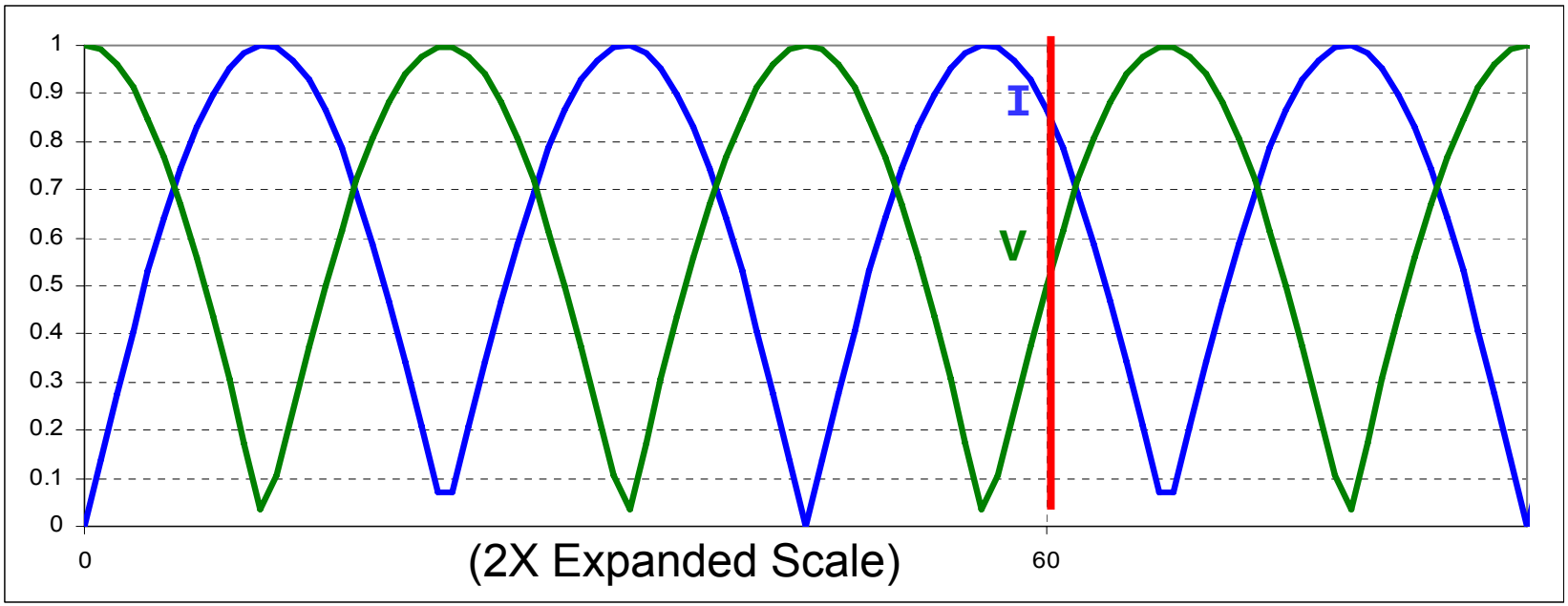
I & V at 2nd Harmonic



I & V at 4th Harmonic



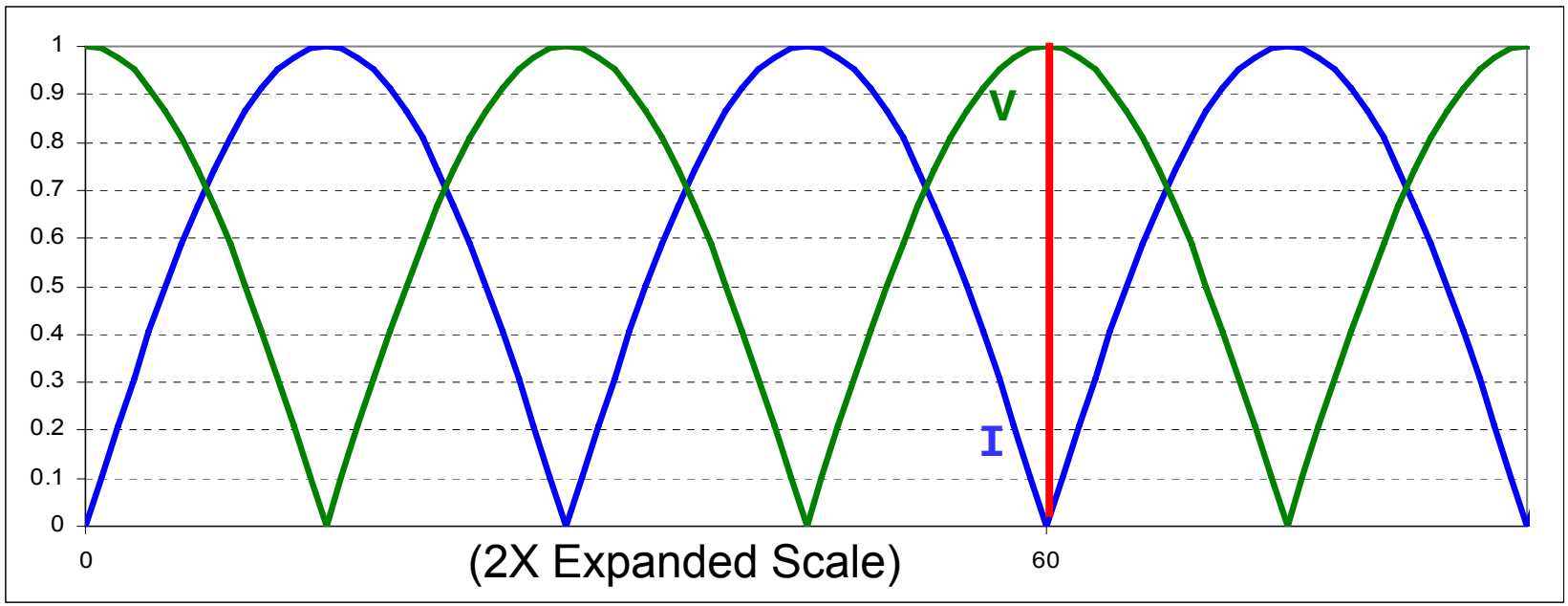
I & V at 8th Harmonic



But what about the 6th harmonic?

- Feed point is at a current minimum
- Very high impedance

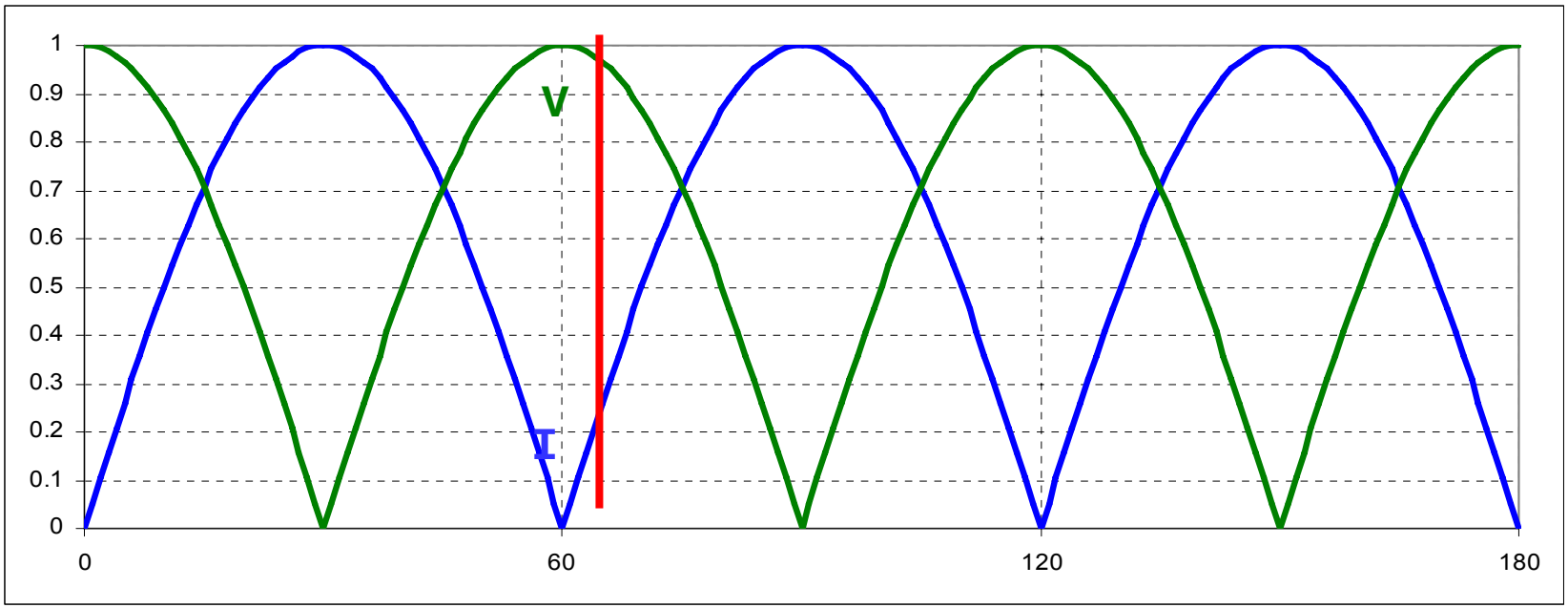
I & V at 6th Harmonic (Bad Dog!)



And Odd Harmonics?

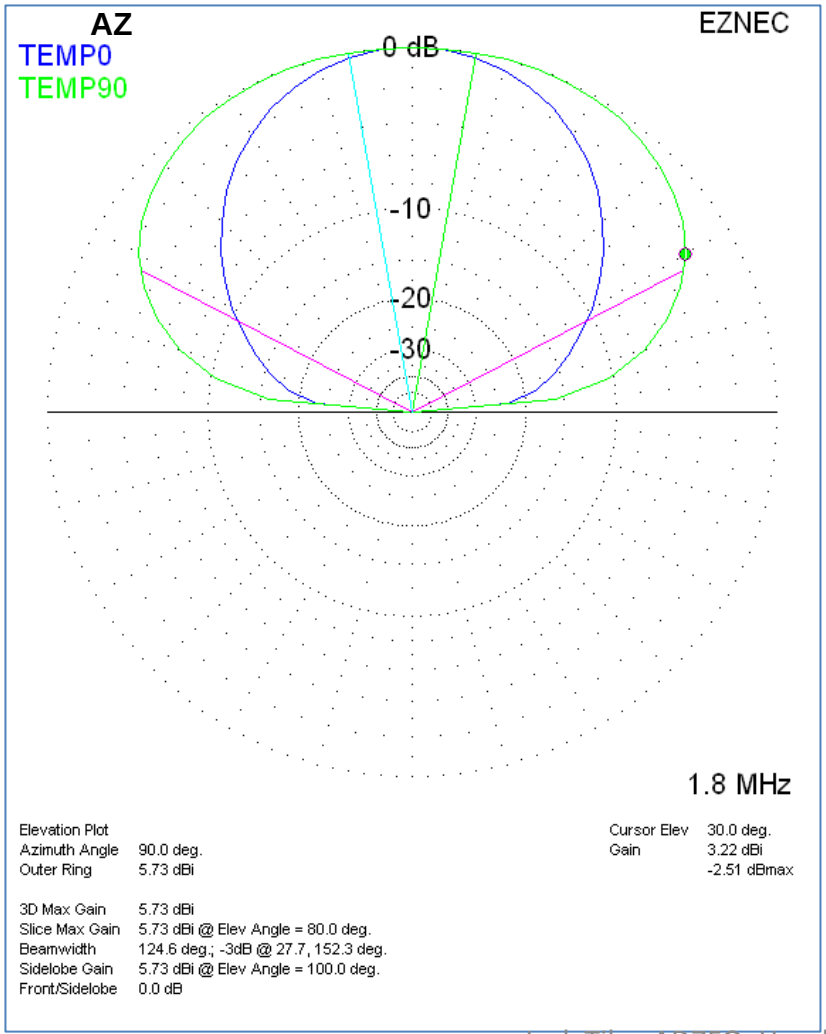
- Same problem: Current minimum

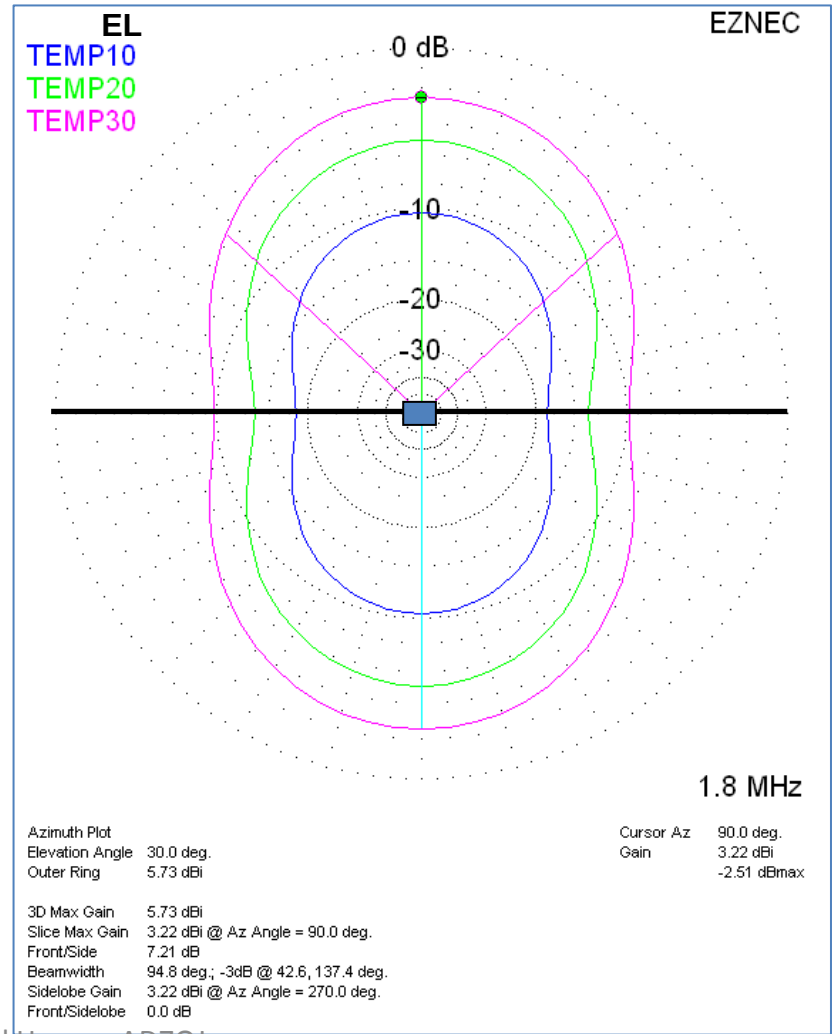
I & V at 3rd Harmonic (Bad Dog!)



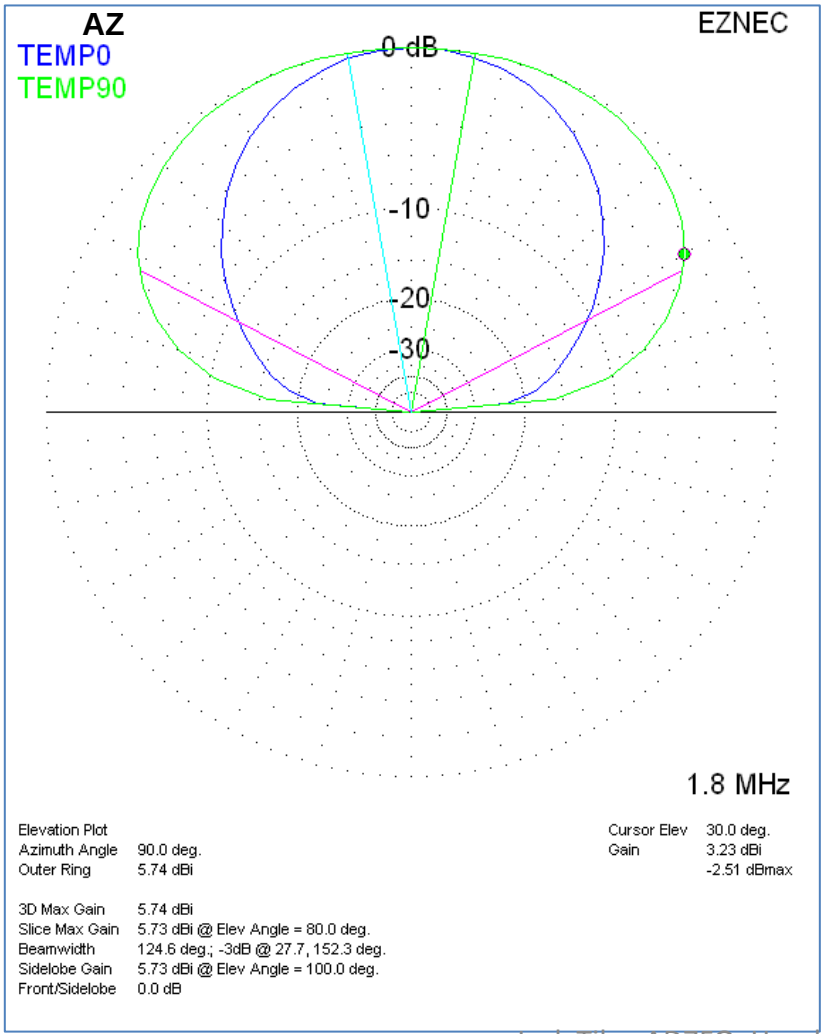
Basic Gain Plots

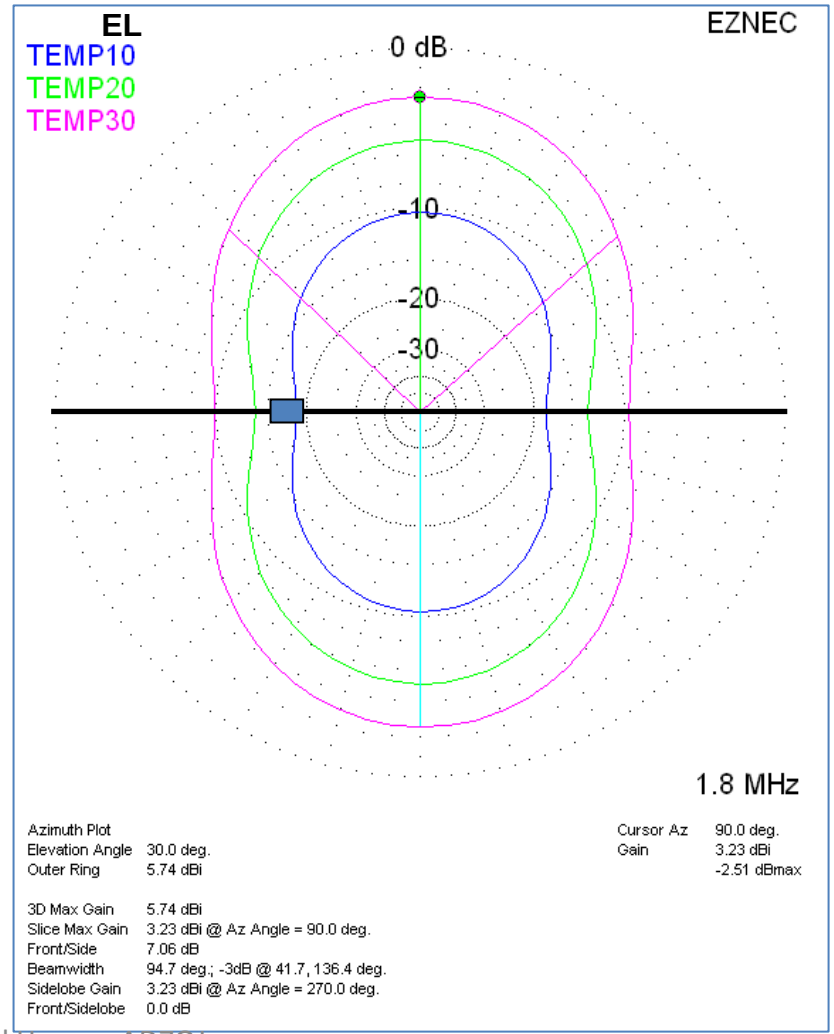
160M center fed dipole at 80 feet



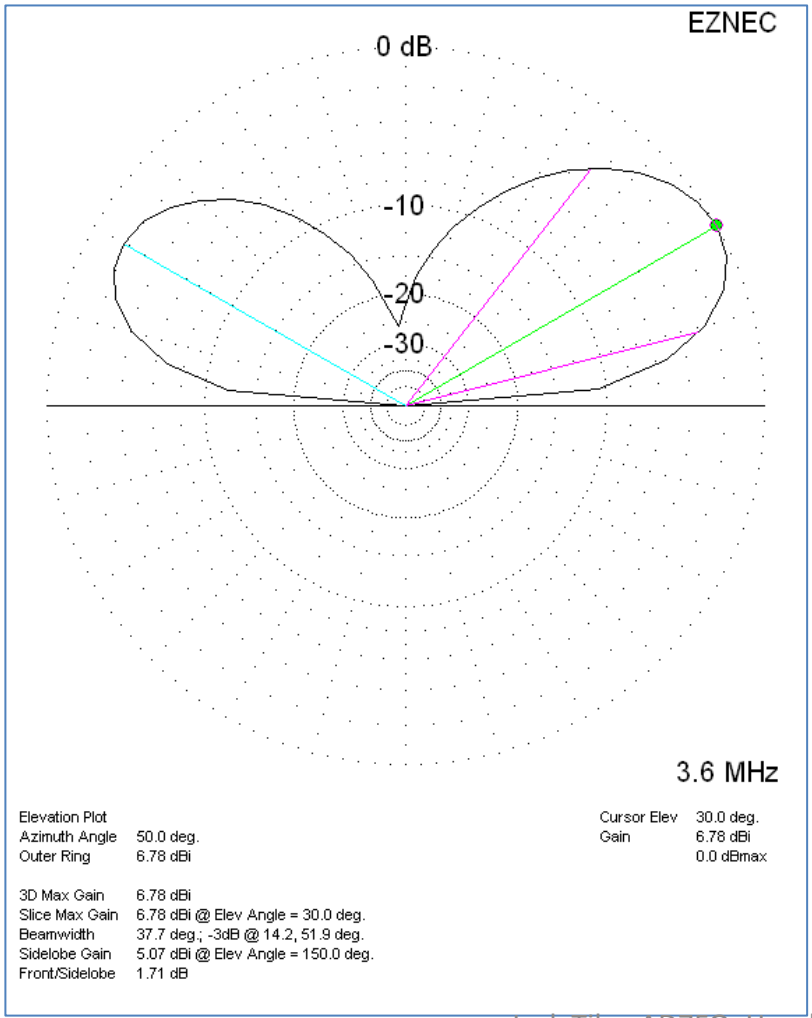


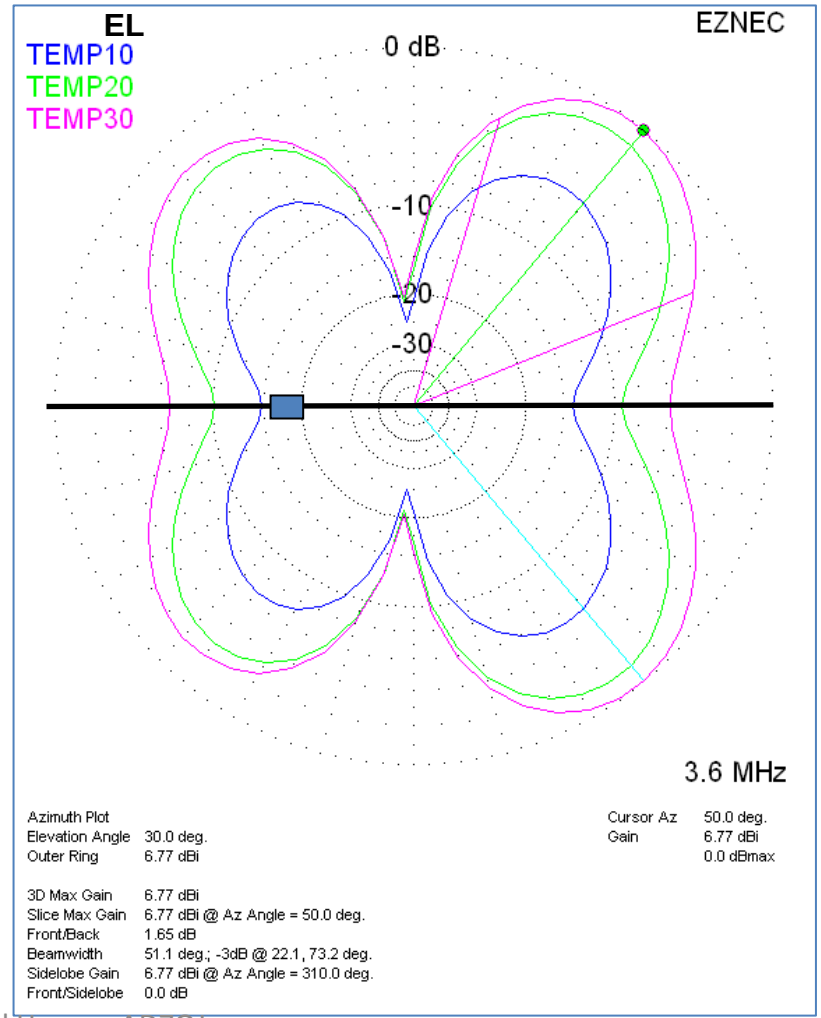
160M OCFD at 80 feet



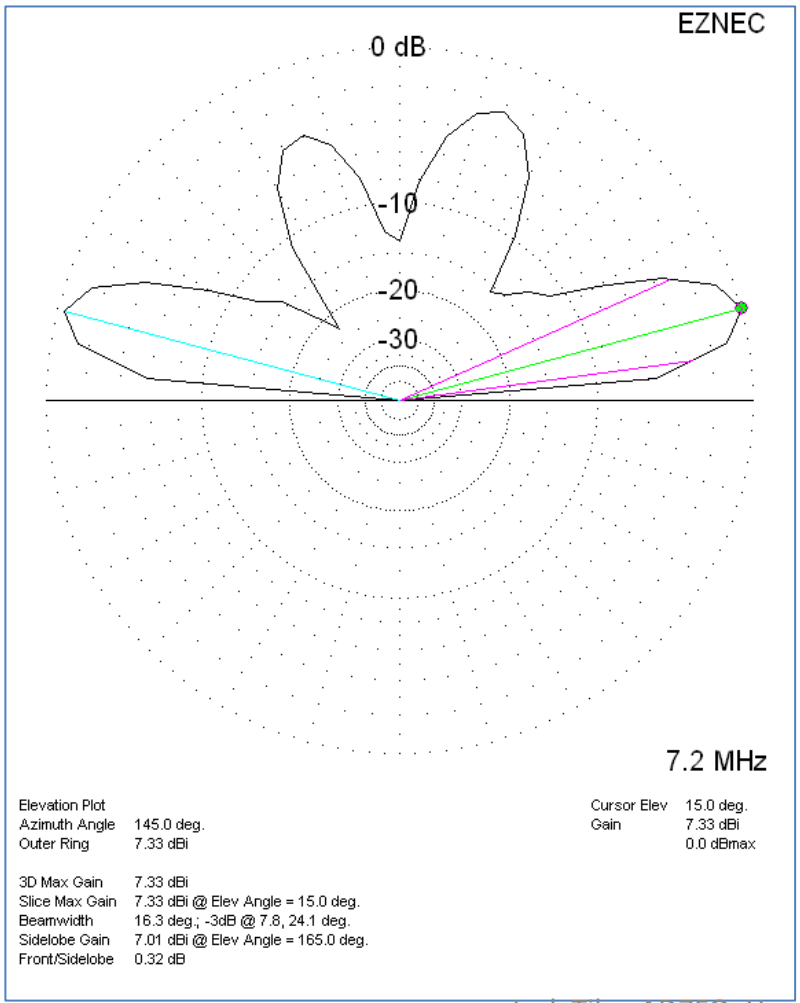


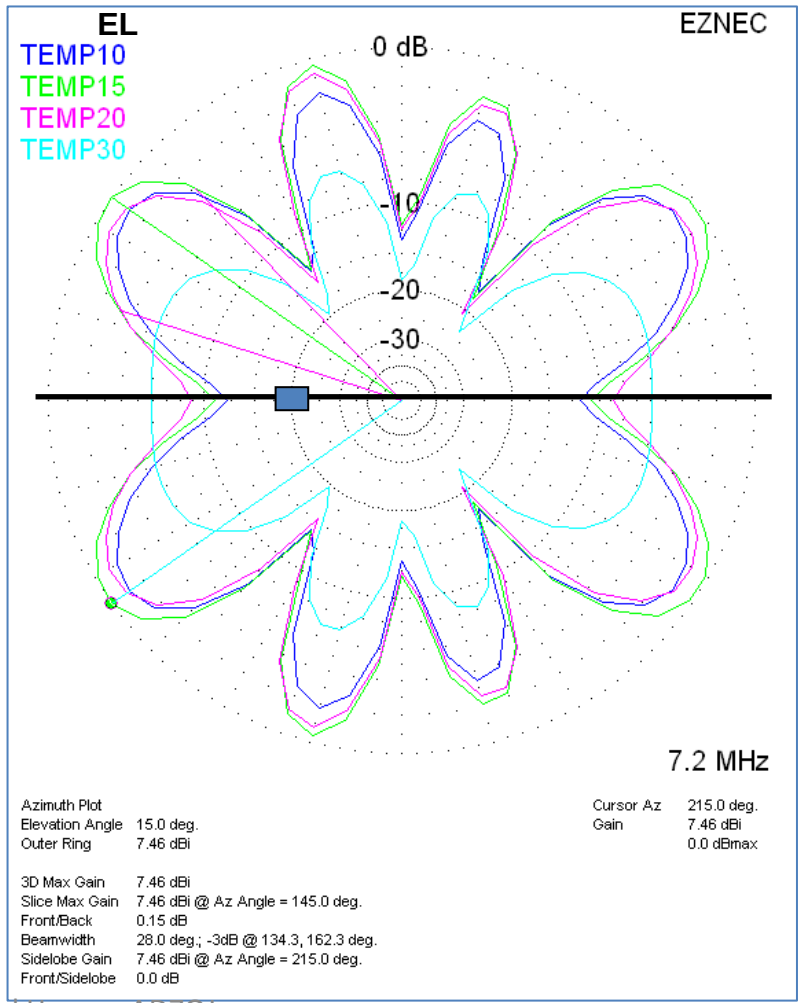
160M OCFD on 80M (x2)



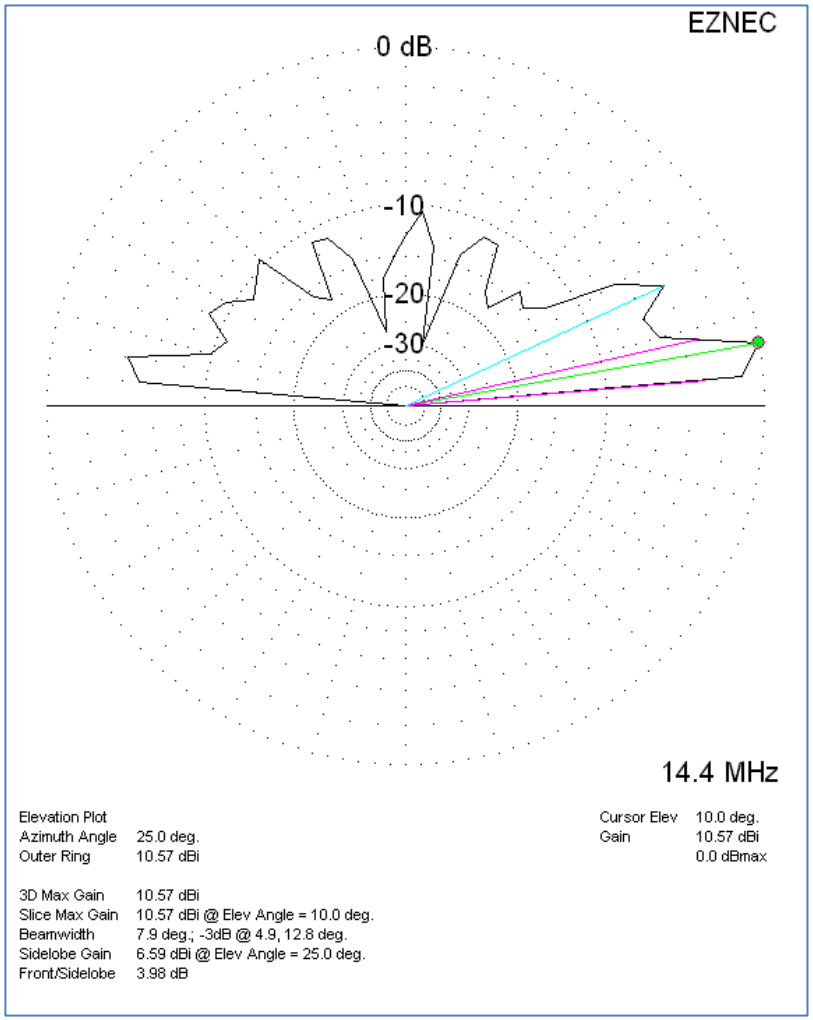


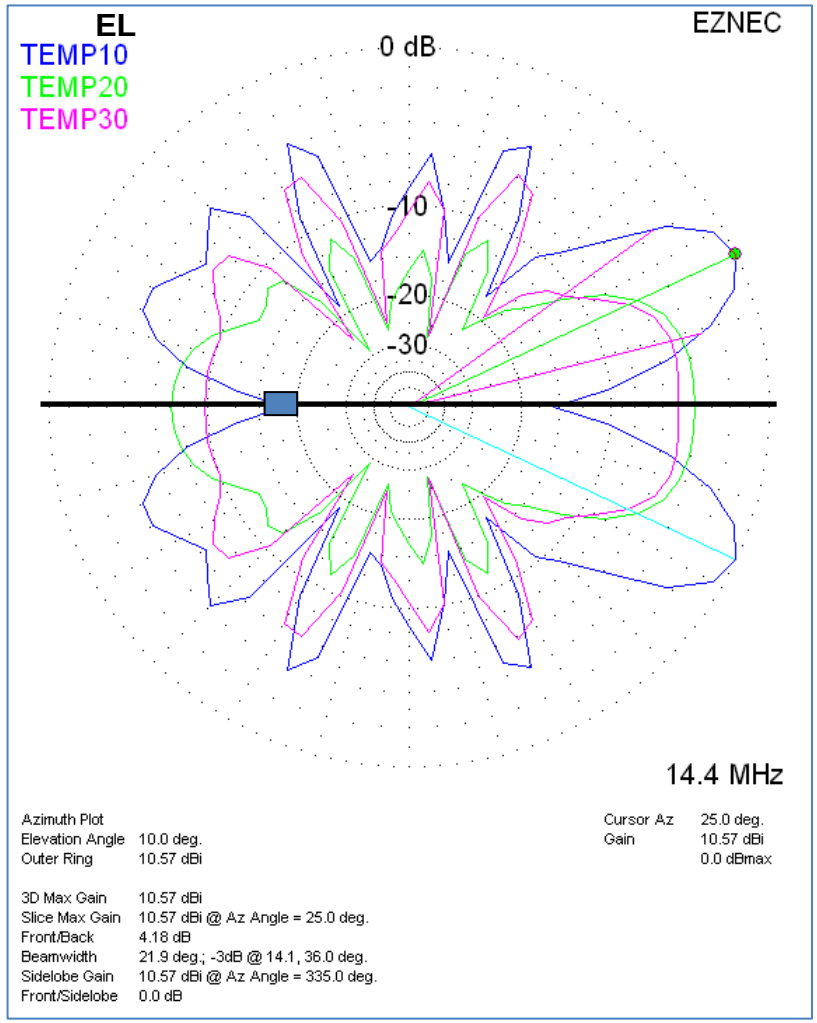
160M OCFD on 40M (x4)



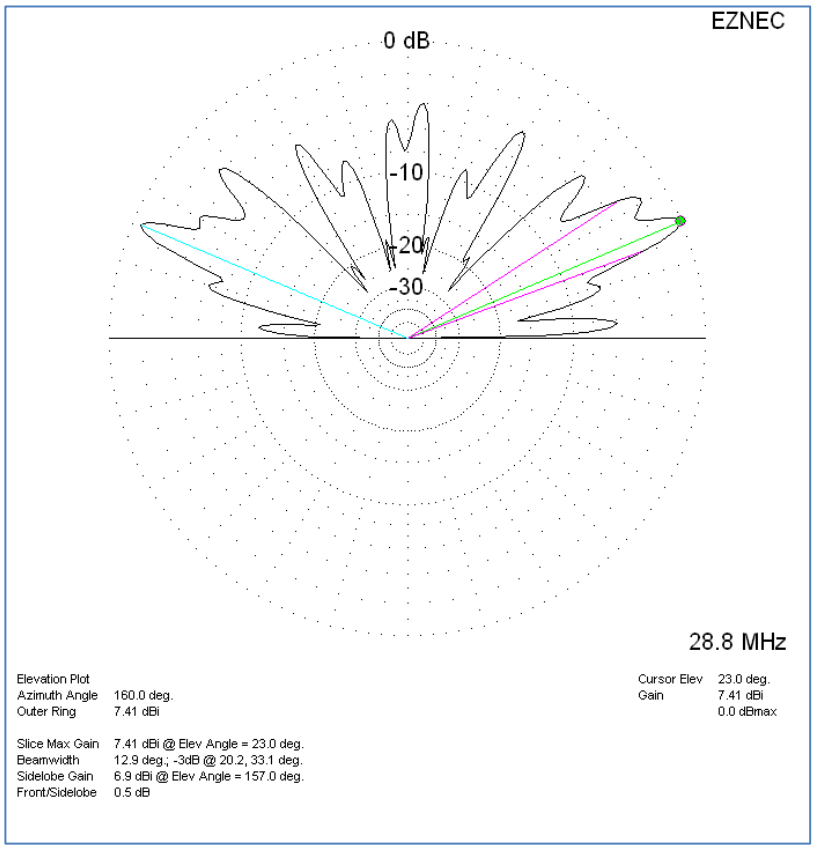


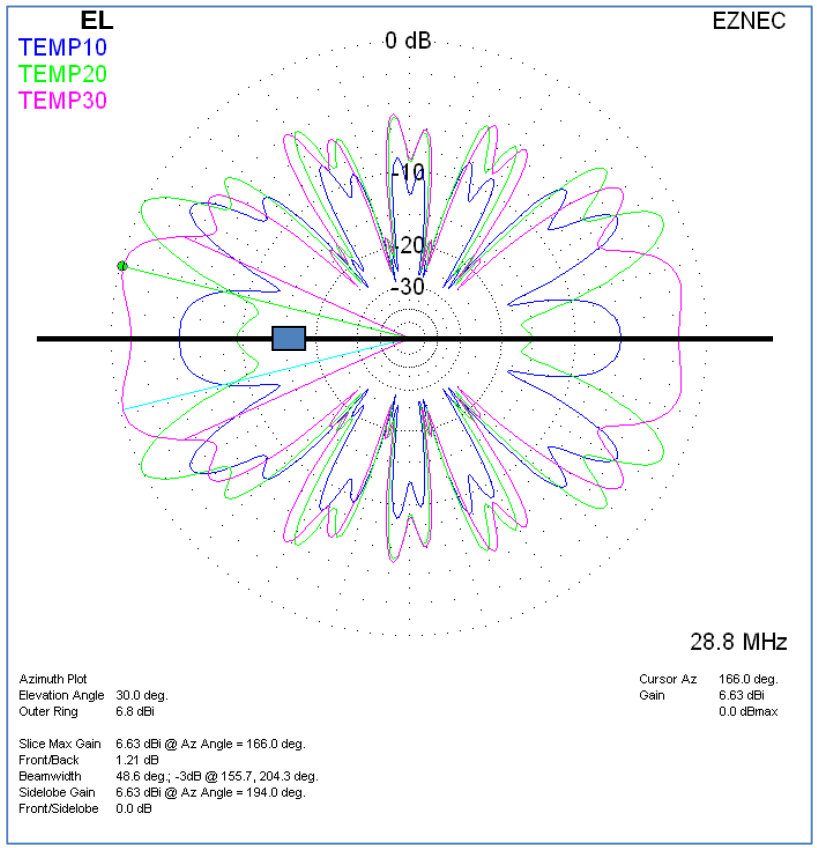
160M OCFD on 20M (x8)





160M OCFD on 10M (x16)

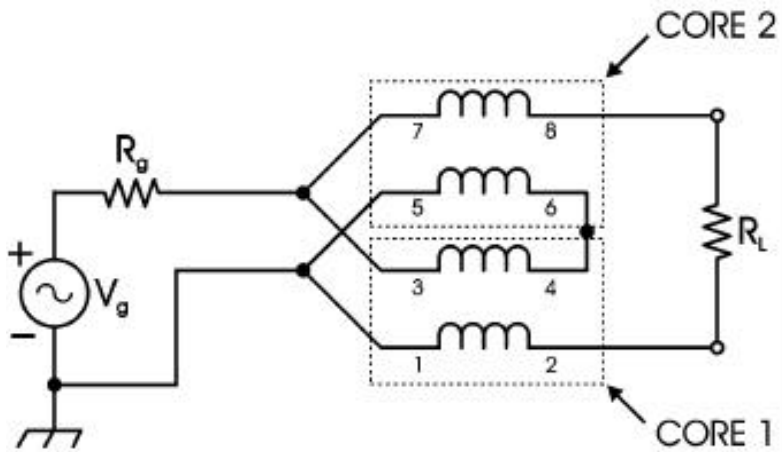




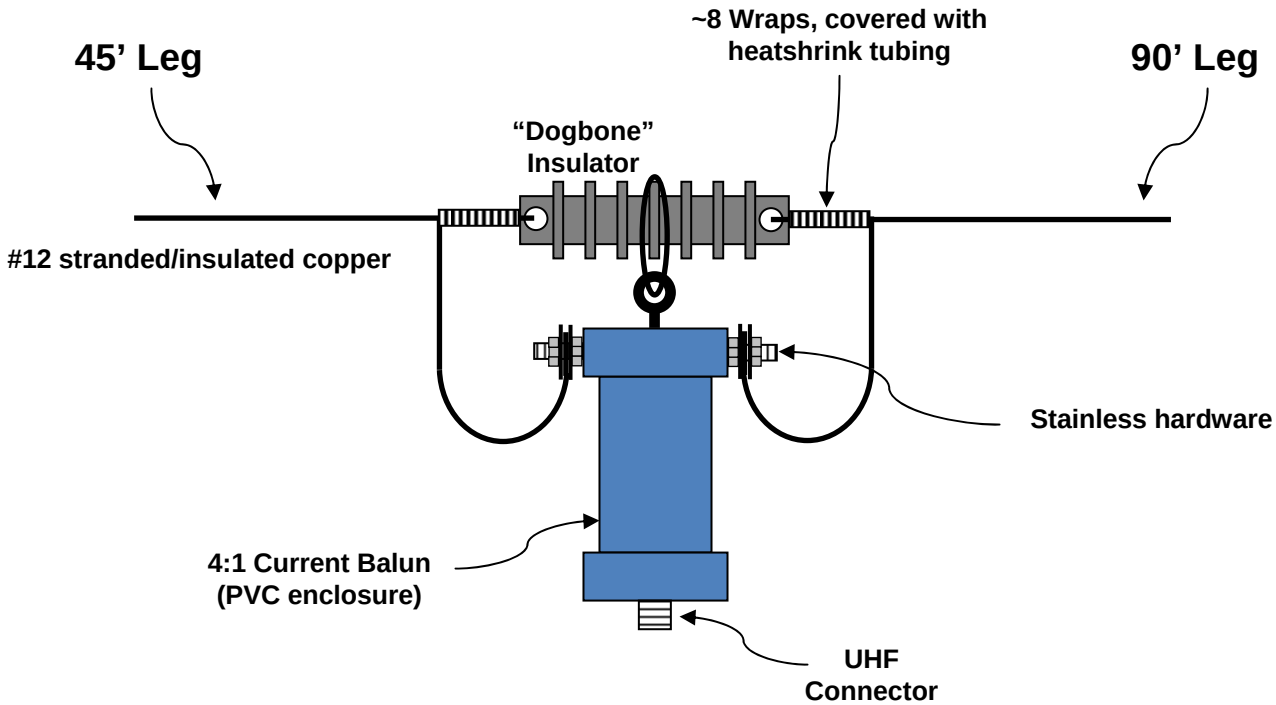
Geometry/Height

- Old 80M design: 45.3 ft, 90.7 ft; 30 ft high
- New 160M design: 88ft, 176 ft; 80 ft high
- Both use 4:1 Guanella balun design
  - 80M variation: 45/65 ft flat+26 ft dropper
- Feed point impedance at resonance drops as effective height above ground decreases
  - Recommend 1/3 λ up for 4:1 balun to work well

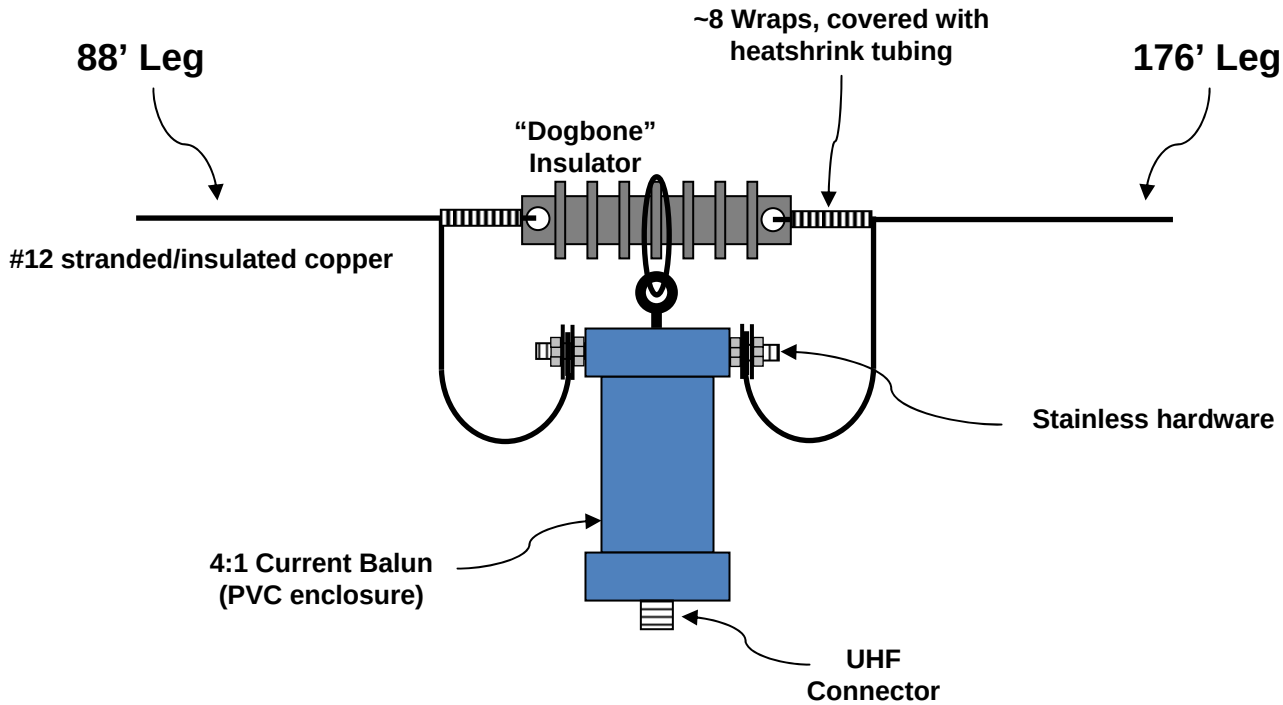
4:1 Guanella Current Balun



80M OCFD Construction Detail



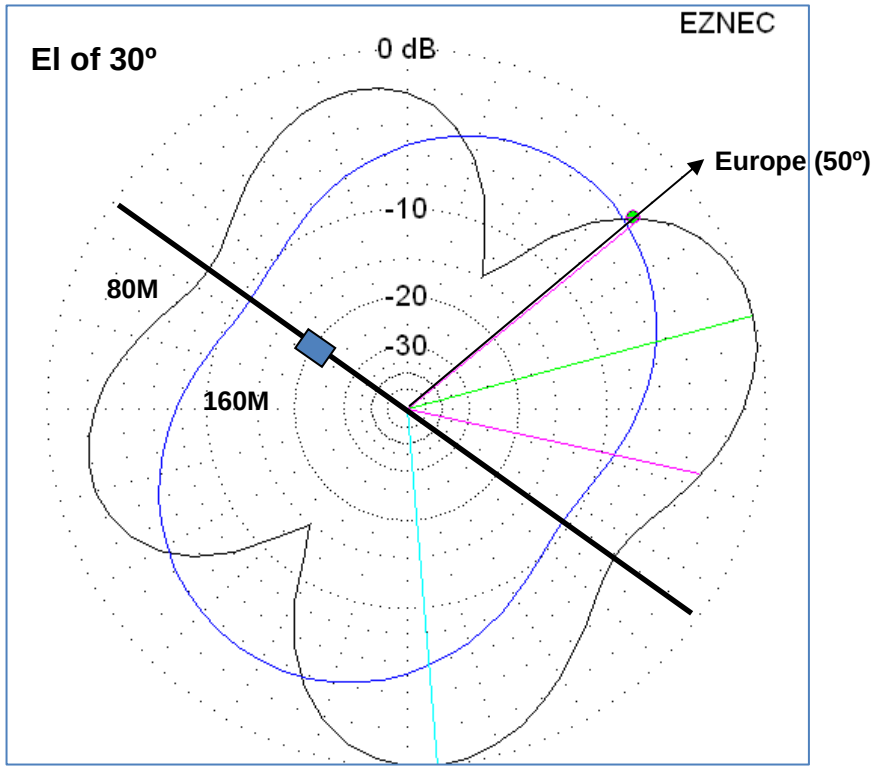
160M OCFD Construction Detail



OCFD Orientation Issues

Single 160M OCFD at 125º, 160M/80M

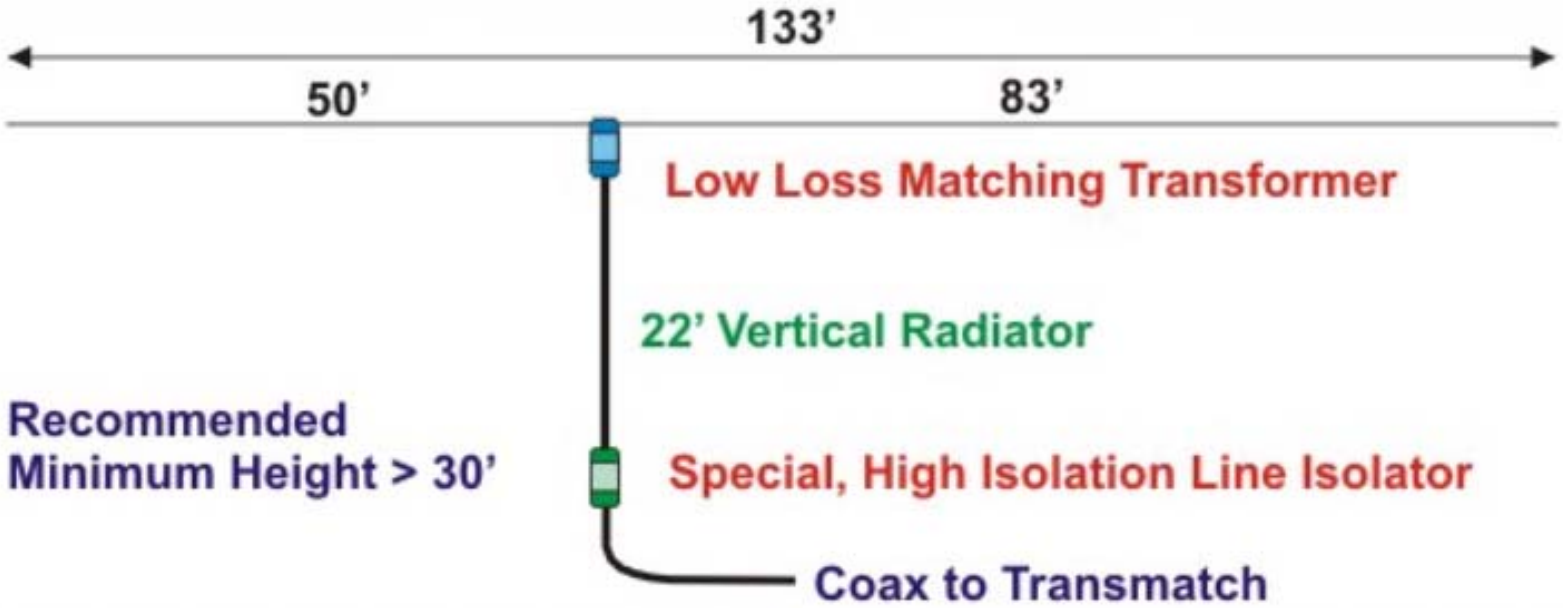
- How to deal with the broadside null…
- Rotate antenna to achieve best gain compromise



Disclaimer…

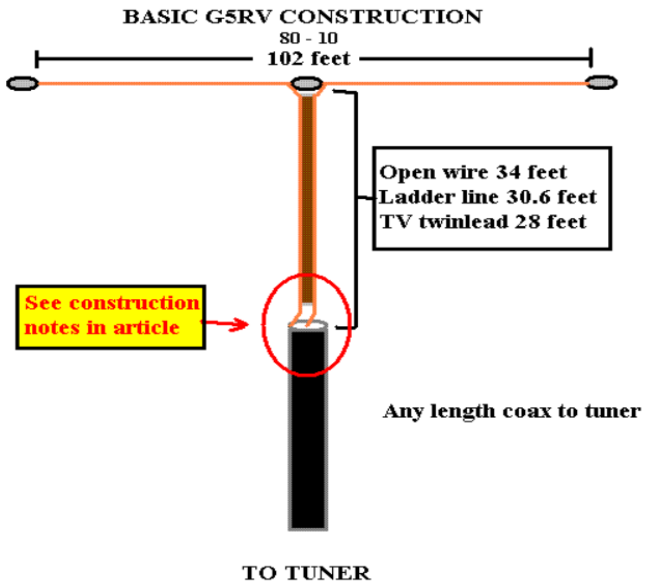
- Your mileage may vary
- Batteries not included
- Some assembly required
- Professional driver, closed course
- Void where prohibited
- Do not dispose of in fire
- Taxes, titles, license fees extra
- 10M band openings longer than 2 hours require immediate medical attention

The Carolina Windom ($130 for 80-6 Meter on sale)



- This is an off center dipole with a vertical radiator
- Available from Antenna Works for approx. $130 (80 thru 6 meters) http://radioworks.com/
- Construction Details http://www.m0ukd.com/Carolina_Windom/
- Requires an Antenna Tuner

The G5RV ($ 79.95 radio works)

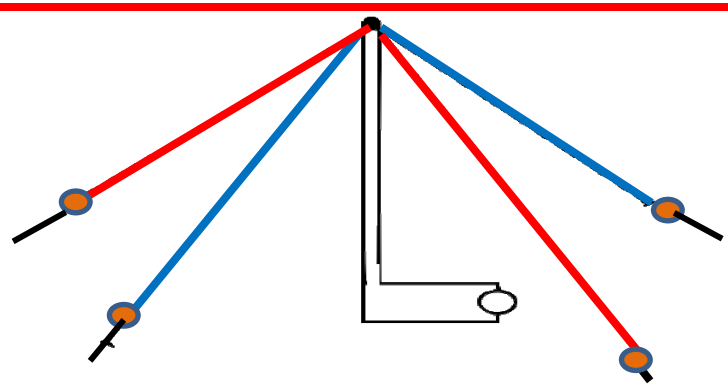


- Available from Antenna Works for around $80 http://radioworks.com/
- Construction details at http://www.hamuniverse.com/g5rv.html
- Ladder line portion must be kept clear of conductive objects like metal siding, wet trees. etc.
- 80 thru 10 meters
- Carolina Windom will give better performance on all bands

The 40/80 meter NVIS Antenna

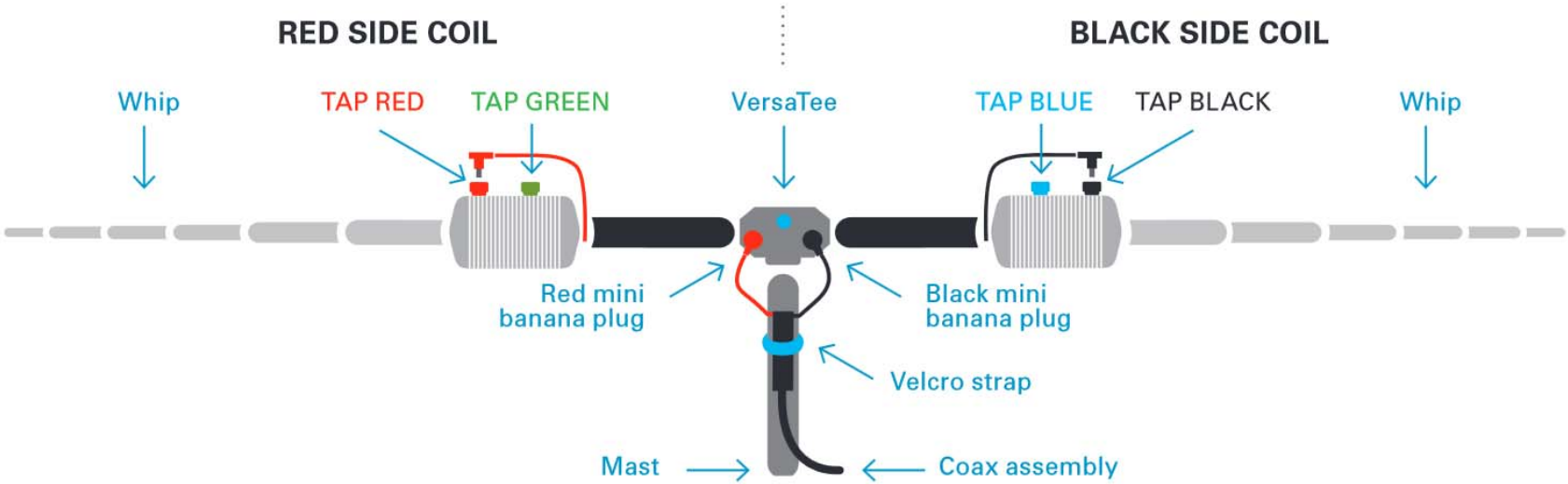
¼ y at 80 Meters

¼ y at 40 Meters



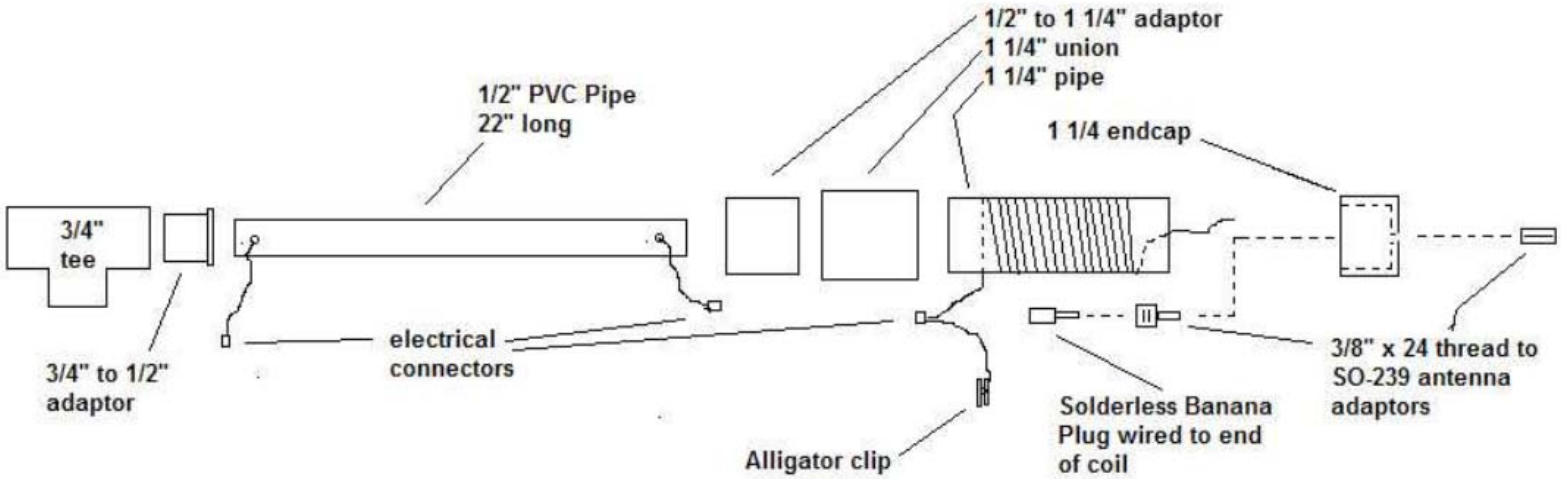
- Affectionately known as the *"Sky Warmer"*
- It is simple to make and raise
- A short range antenna for a radius of 300 miles, regardless of terrain
- Legs must be insulated from the ground
- Center support Pole is << ¼ wavelength, typically 25 ft. or less
- Make for other bands by changing the length of the elements

The Buddipole ($199 Basic Kit)



- Basic kit is 40 to 10 Meters (Loading coil available to extend to 80 Meters)
- Very Portable (need tripod or pole to mount it on)
- Web Site http://www.buddipole.com/

The Home-Brew Buddipole



- A Buddipole antenna can be home built using PVC Pipe, wire and whip antennas; many sites for home brewers.
  - http://www.w2swr.com/pdf/homebrew-buddipole.pdf
  - https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnx3M2ZmaG9tZXBhZ2V8Z3g6NzQ2Y2FmMDYzZTA2YjUzZg
  - http://www.hamuniverse.com/AE5JUHomebrewBuddipoleVariant.pdf

Ham-stick Antennas

- Basically a ¼ wave loaded Vertical
- Single Band antenna
- Multiband operation requires multiple antennas
- Tunable for your specific frequency with Narrow Bandwidth
- Can operate without an antenna tuner
- Excellent Mobile antenna (vehicle is the counterpoise)

Ham-stick Portable Dipole

- Simple portable dipole antenna with two Ham-sticks and dipole antenna mount bracket
- Operated near the ground it can be an NVIS Antenna
- Can be set up for vertical or Horizontal Polarization

Screwdriver Antennas (Tar heel 300A $440, 80-10M)

Screwdriver antenna manufacturers:
Tar Heel antennas
http://www.tarheelantennas.com/
Larry's antennas
http://www.kj7u.com/
Scorpion antennas
http://www.scorpionantennas.com/

- A very popular Mobile antenna
- High Q antenna (narrow band)
- Must be tuned whenever you change frequency
- Loading coil is motor driven to make mobile tuning easy
- Tune button controllers available with for some antennas and radios.

Super Antenna

- Basically it is a manually tuned loading coil (screwdriver) antenna for 40 meters through 70 cm (80 meter coil available)
- Ground plane required (four wire counter poise supplied with antenna)
- Could be mounted on a vehicle or metal fence as the ground plane
- Web page http://newsuperantenna.com/

The Bottom line

- Portable HF antennas **can be** simple and inexpensive
- They can be electrically loaded (coils added) to reduce the physical size
- Can be used for both portable and fixed operation
- Build, borrow or buy one and experiment to see what works for you then build or buy one for your go kit.
    - Determine what bands you want to operate on
    - How far do you want to communicate (local or DX)
    - Dipoles and long wire antennas are “cheap” and easy to build
    - Dipoles can be made into multiband antennas with additional insulators and wire

Lets Experiment, Learn and Have Fun