High Impedance Low Band Receiving Arrays

Dayton 2014

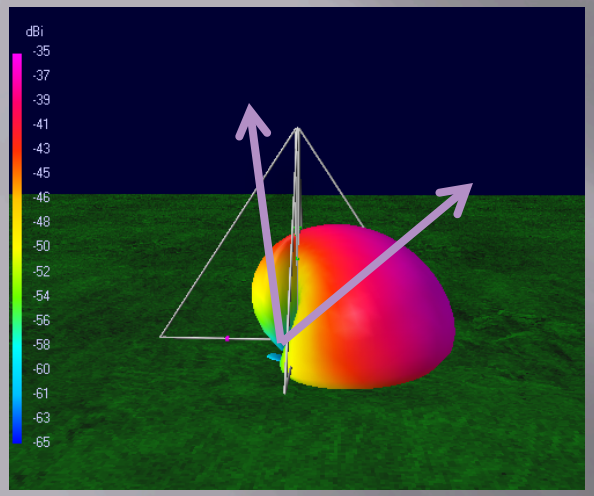
Lee Strahan K7TJR
CTO Hi-Z Antennas ™

Antenna Comp Chart

Antenna	Gain	RDF	Front/Back	Beamwidth
90 ft. top loaded TX vertical	1.4 dBi	4.9	N/A Omni-directional	360 degrees
K9AY loop	-25.6 dBi	7.2	11.5 dB.	163 degrees
4 square of K9AY loops	-22.2 dBi	9.1	18.9 dB.	58 degrees
10 Foot Dia. tuned loop	2.2dBi	4.0	6.8dB F/Side Bi-directional	105 degrees
Flag	-29.7dBi	7.4	22.8dB	146 degrees
Beverage 1000 Ft.	-6.4dBi	12.3	31dB	63 degrees
Beverage pair 1000 ft. 400 ft. space	-2.9dBi	14.6	40 dB	35 degrees
Beverage 910 Ft.	-5.3dBi	11.9	15 dB	64 degrees
Beverage 500 Ft.	-10.6dBi	9.0	23.9 dB	80 degrees
4 square Tx antenna	6.8dBi	10.7	25.5dB	99 degrees
Bsef Hiz vert array70x320	------amplified	12.9	28.8dB	51 degrees
Inverted vee 120 ft.	-1.08dBi	.6	N/A omni	360 degrees
2 element hiz 50ft space	-----amplified	9.0	35dB	137 degrees
TJR 8 element 200 ft circle Hi Z	-----amplified	13.45	44dB	53 degrees
TJR 4 element of 8 200ft circle Hi Z	-----amplified	10.8	19.7dB	80 degrees
330 ft circle 4 active of 8 Hi Z	-----amplified	12.3	20.8dB	54 degrees
Beverage 300 Ft.	-14.5dBi	6.5	9.9dB	89 degrees
Waller Flag	-54dBi	12.2	32dB	84 degrees
Shared Apex Loop Array ***	-35dBi	9.0 / 4 dir ONLY	25dB	80 degrees
*** other 4 dir down <2db RDF & lobe 50% wider				

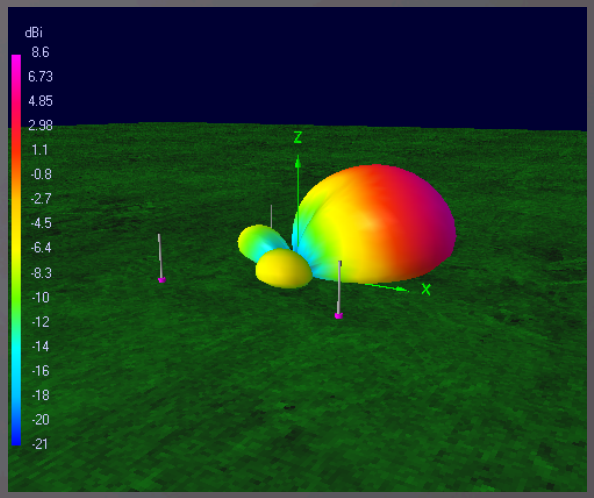
3D Color PLOTS –

how to read, learn and evaluate the data



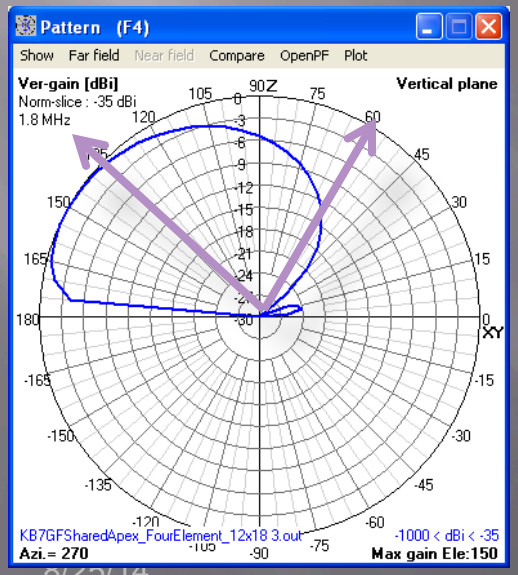
LEGEND: How to read plots

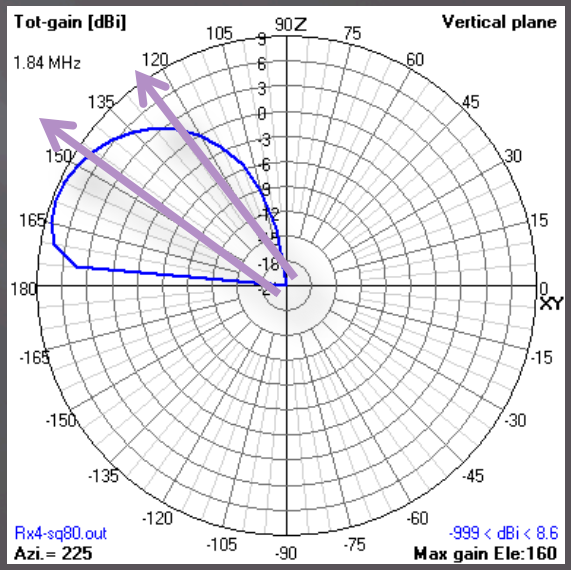
- Colors
- AZ/EL plane
- 4NEC2 and EI-NEC plots



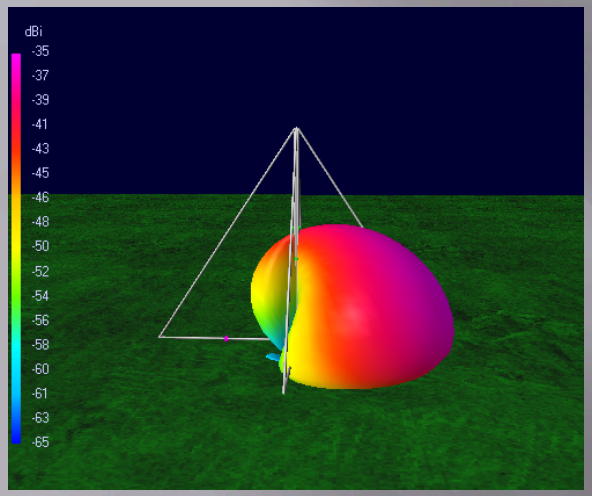
Arrow – high angle inclusion. Increase in NF poor SNR response.

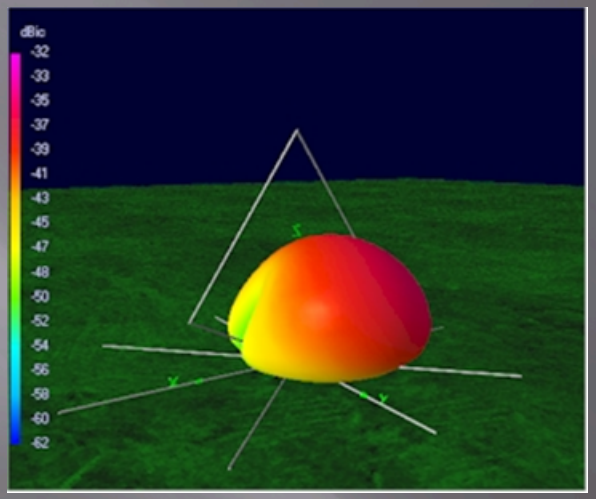
Narrower region. Less noise pick up, best SNR

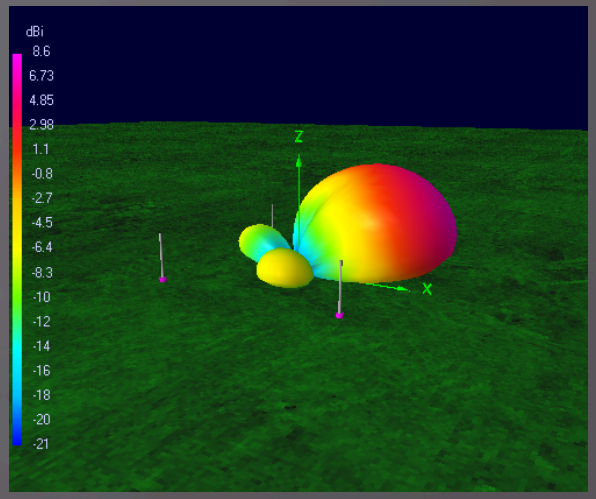


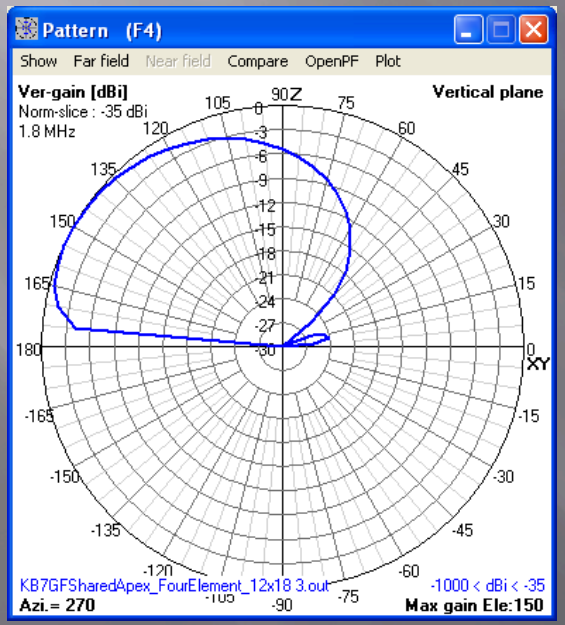


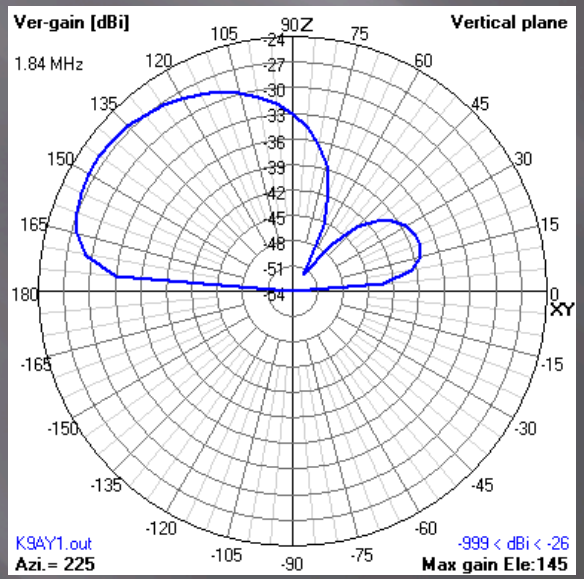
Vertical Vs. Loop Comparison

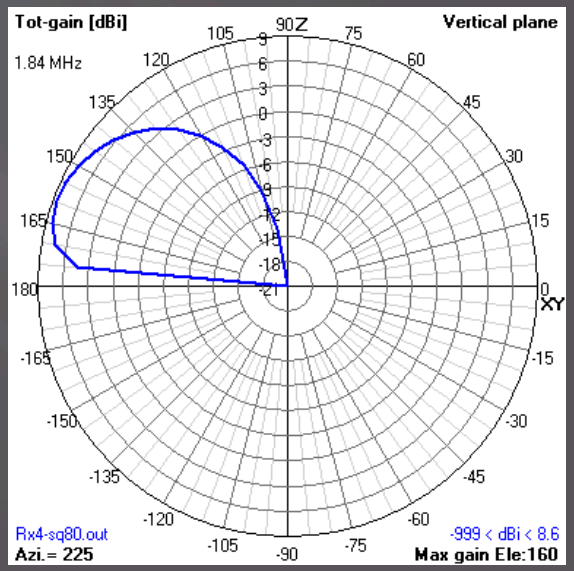










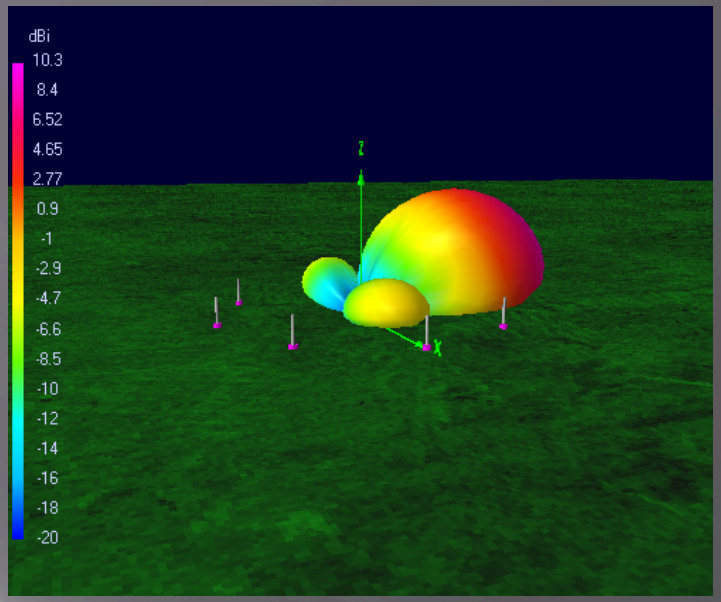


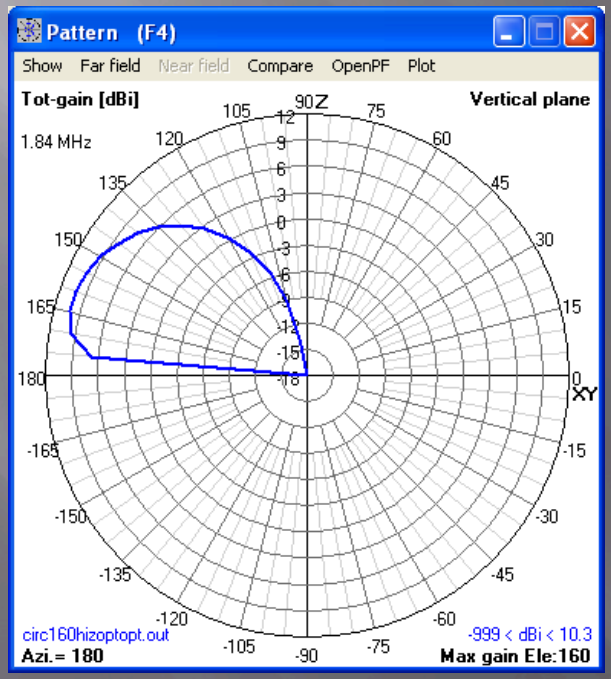
Selected Design

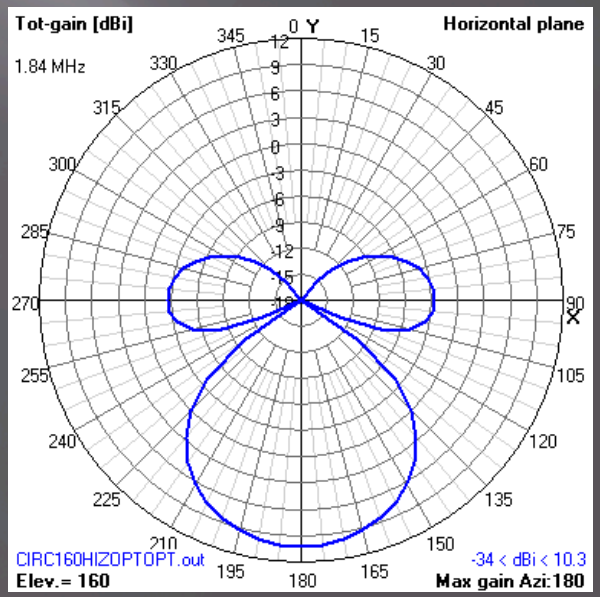
Design Goals:

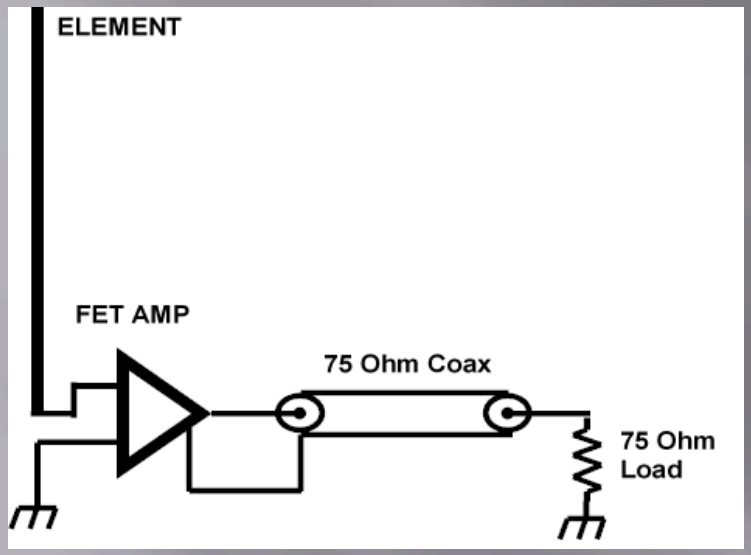
- RDF 13.45 Front to Back at least 20 dB.
- Use high impedance elements
- 8 Elements providing 8 directions
- All 8 Elements ACTIVE

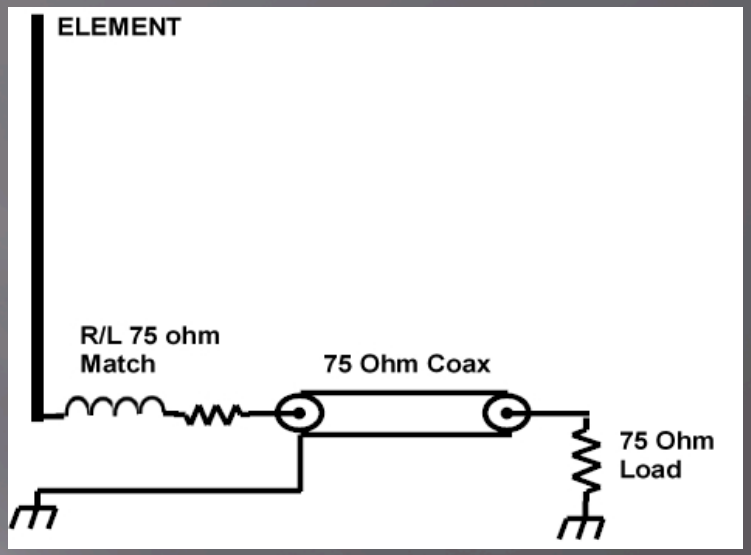
Requires at least 1-2 degree phase accuracy
Requires at least 1-2 % amplitude accuracy

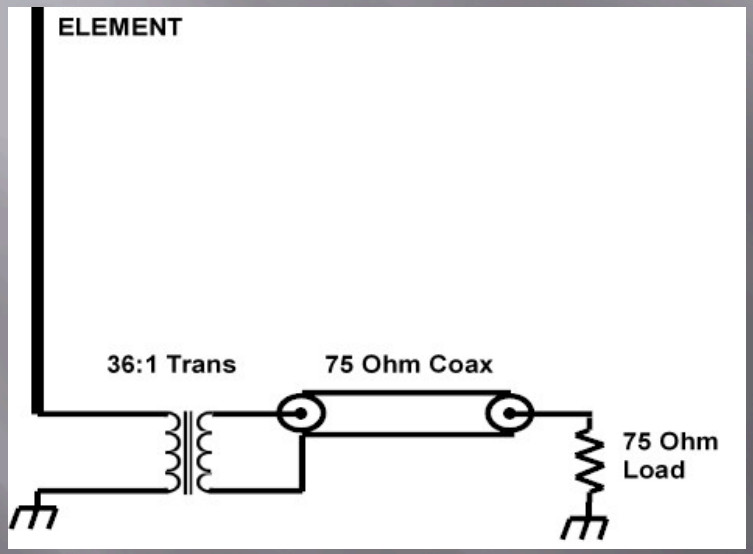








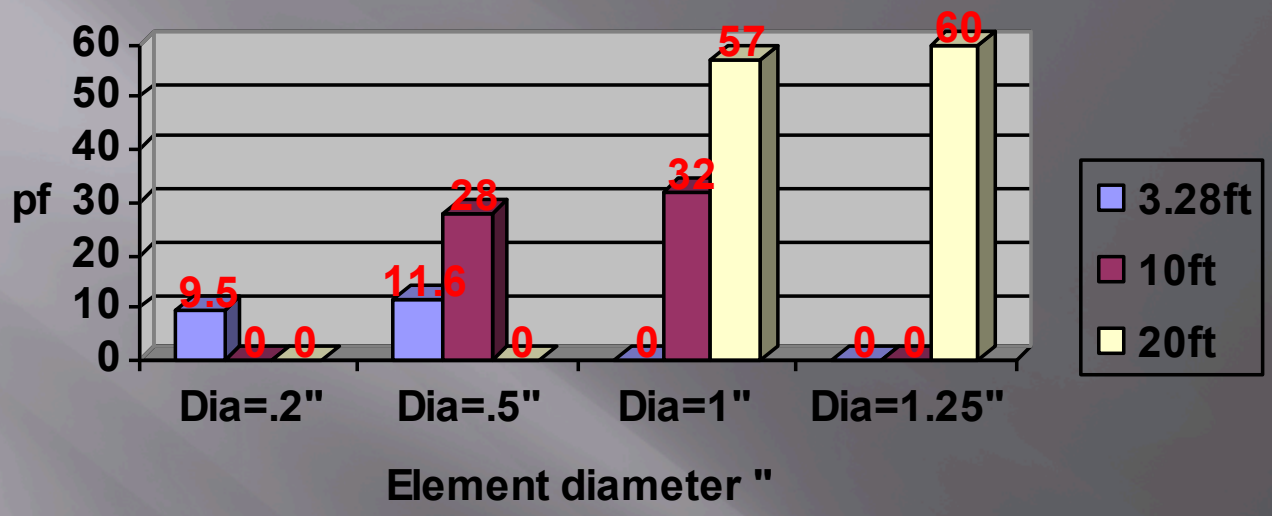




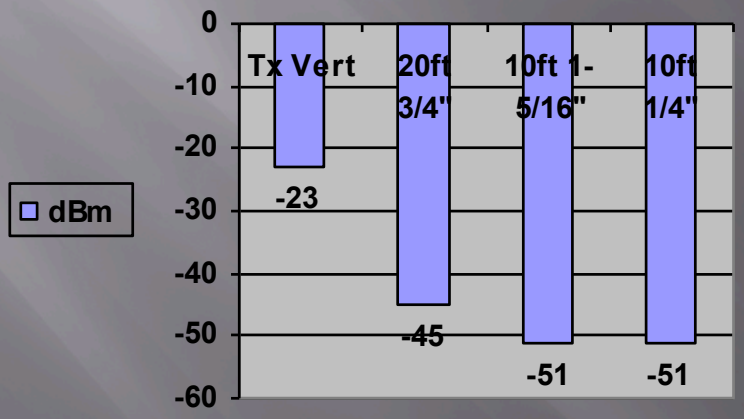
Element Phase and Gain Stability Tests

High impedance was the choice

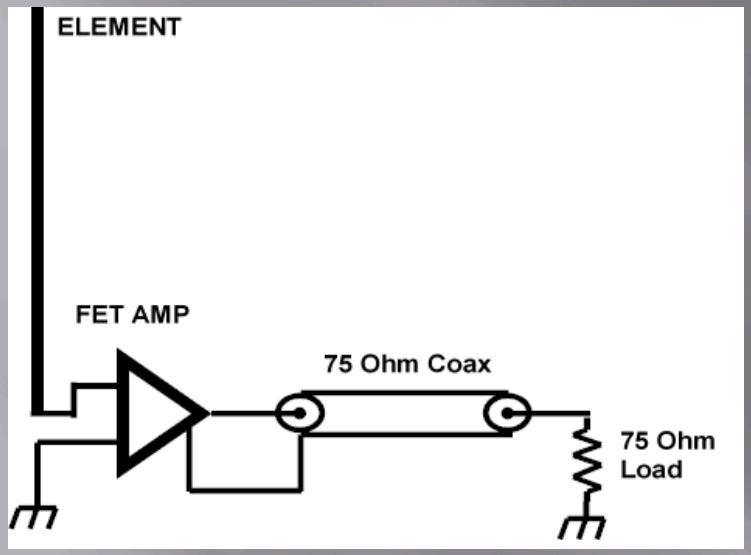
Element source Capacitance

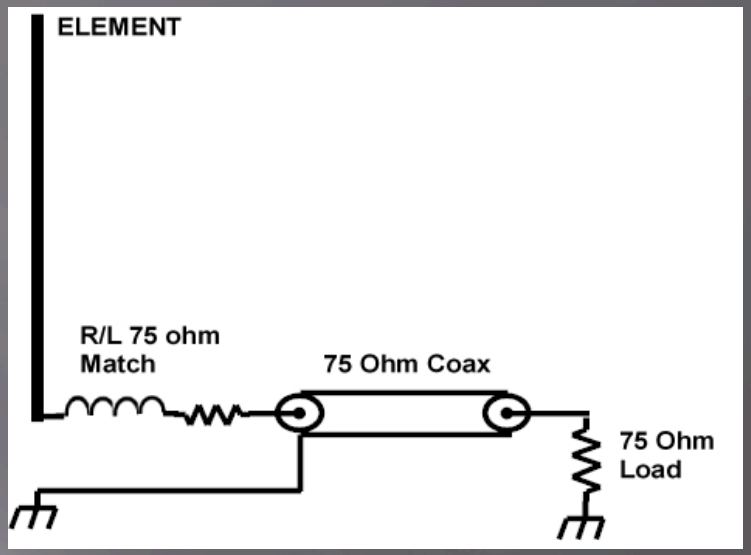


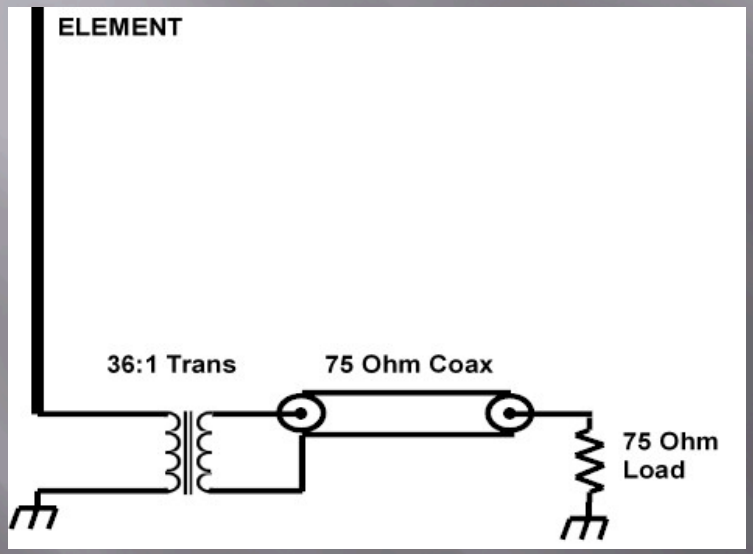
Output Levels



Actual transmitting test over 4.2 miles.



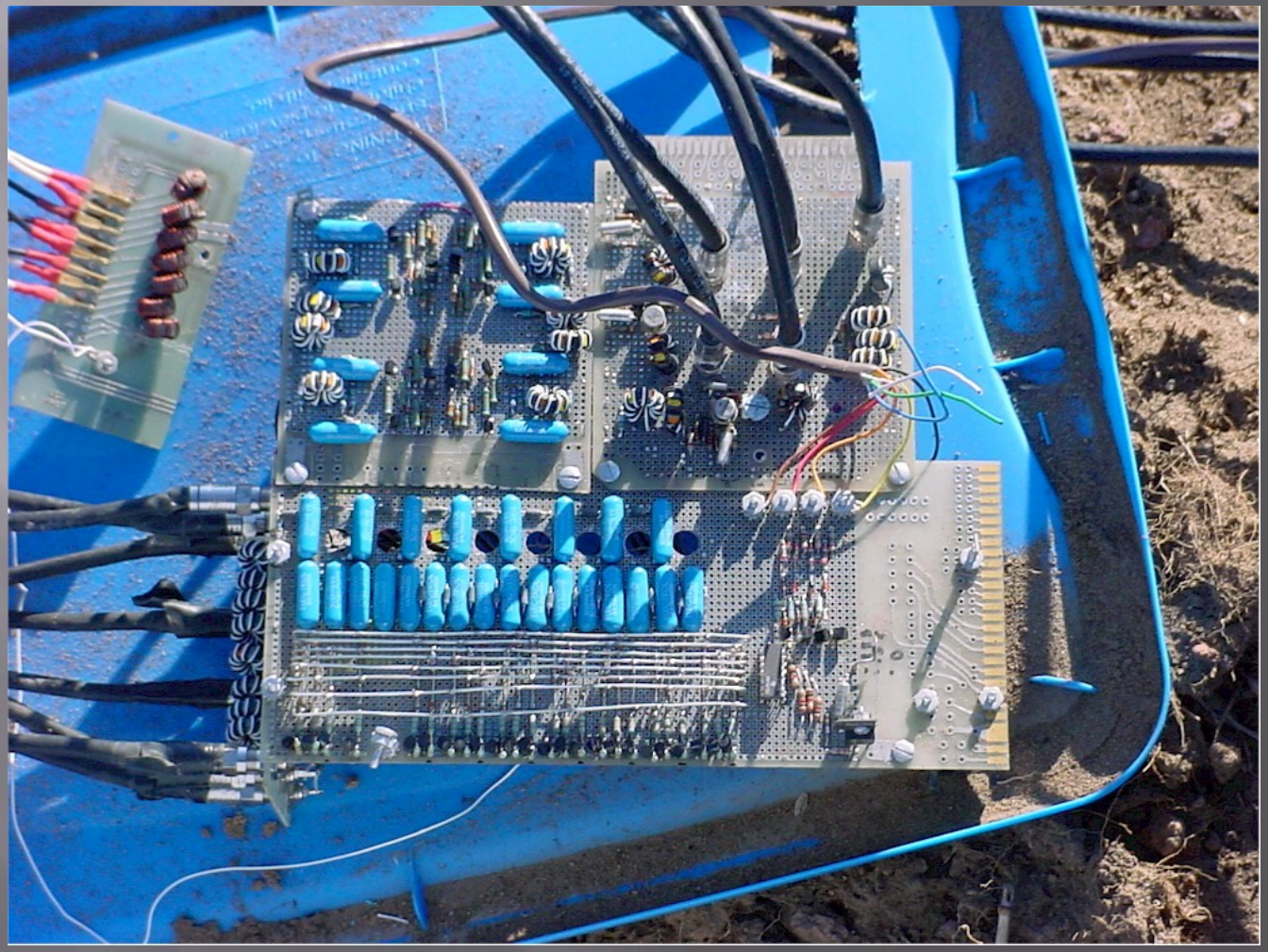




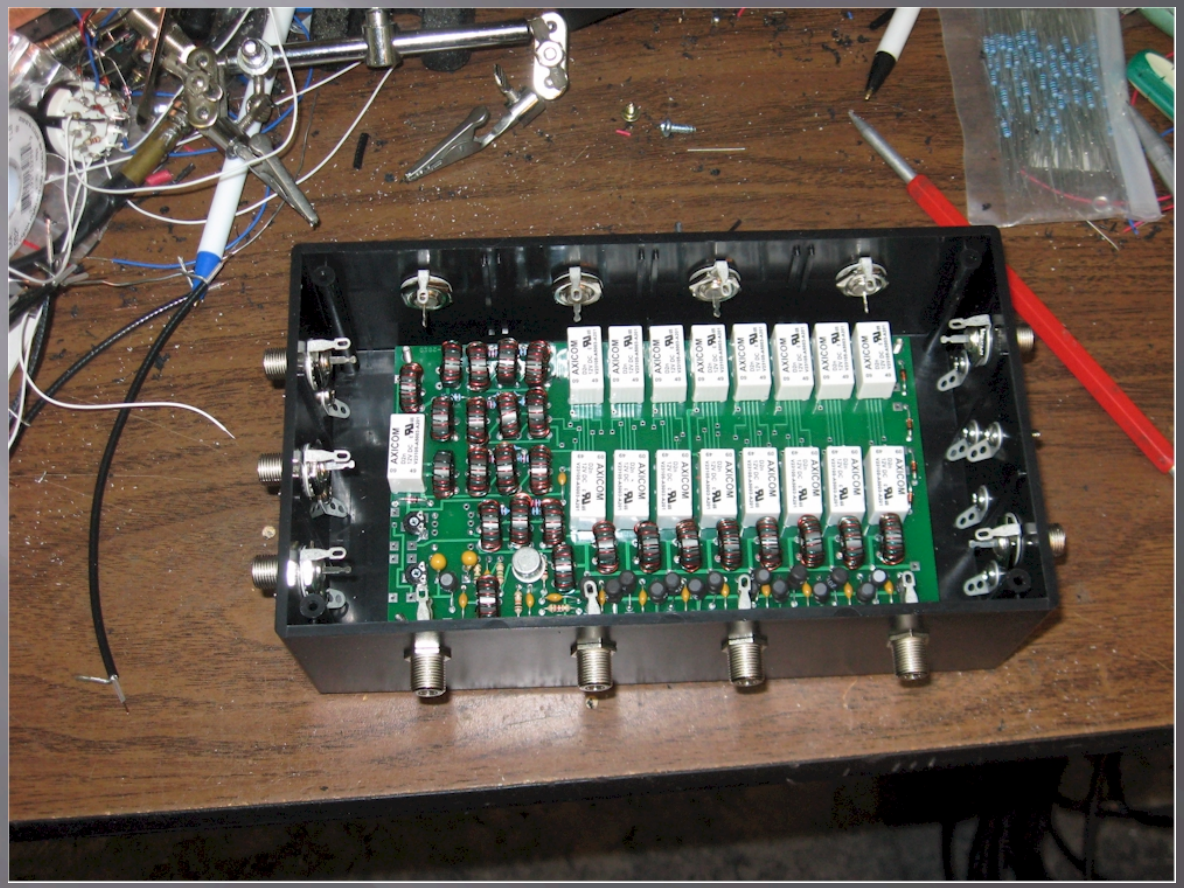
Element Phase and Gain Stability Tests

High impedance was the choice

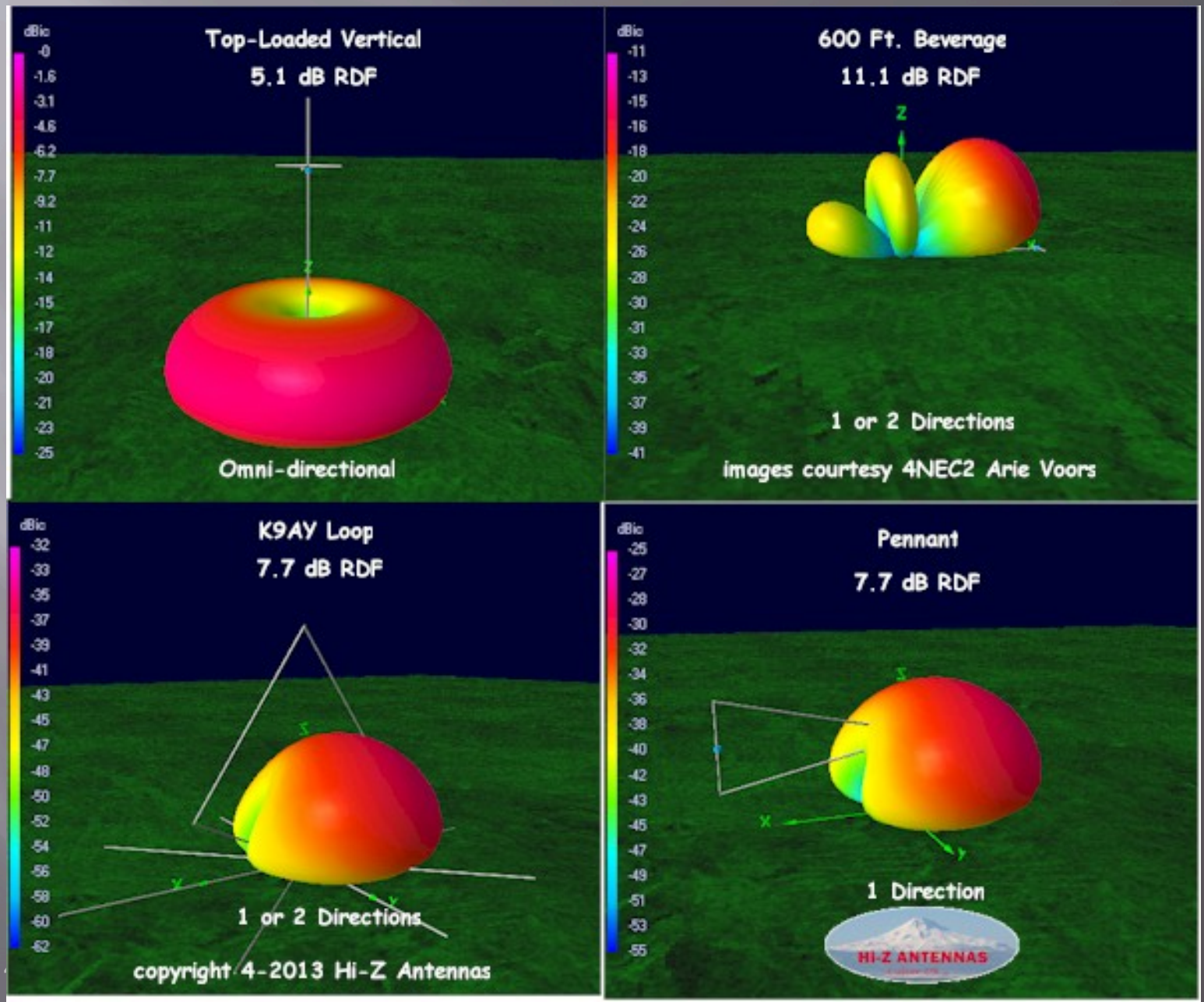
First Working 8 Element Array Controller



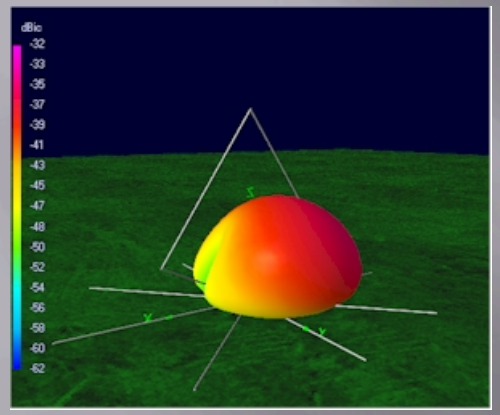
Modern 8 Element Controller



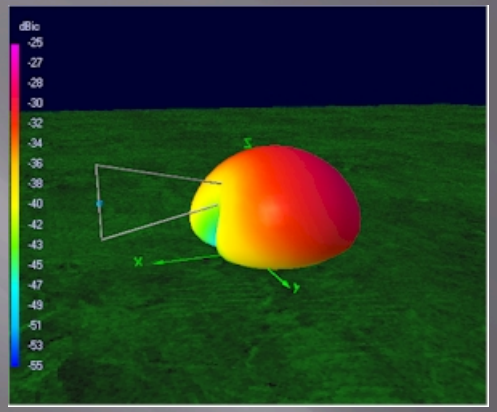
The BASICS


Top-Loaded Vertical
5.1 dB RDF
Omni-directional
600 Ft. Beverage
11.1 dB RDF
1 or 2 Directions
images courtesy 4NEC2 Arie Voors
K9AY Loop
7.7 dB RDF
1 or 2 Directions
copyright 4-2013 Hi-Z Antennas
Pennant
7.7 dB RDF
1 Direction
HI-Z ANTENNAS

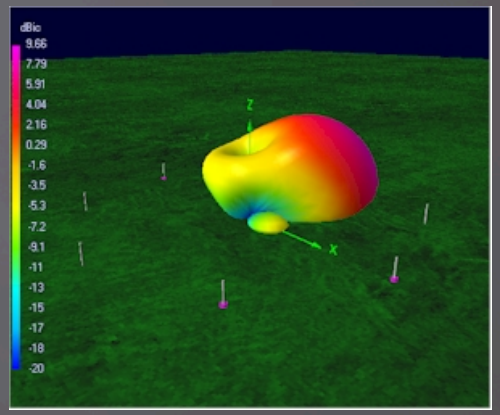
3D Plot Comparisons



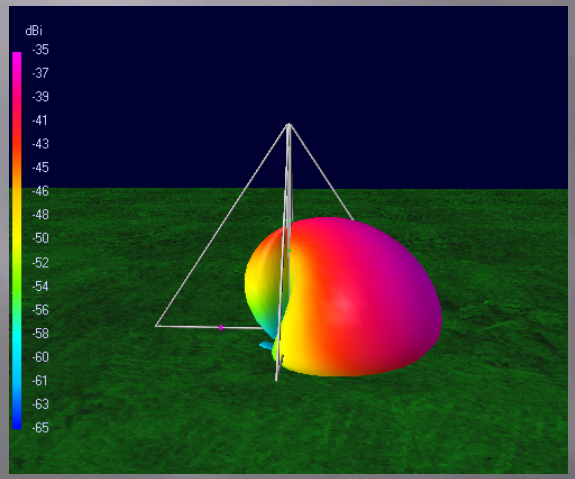
K9AY Loop



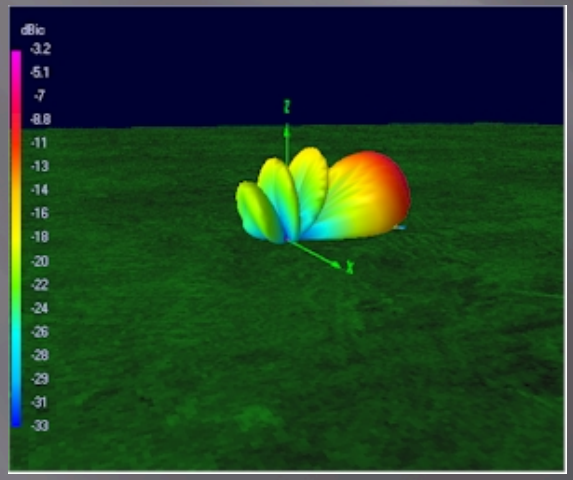
160 Pennant



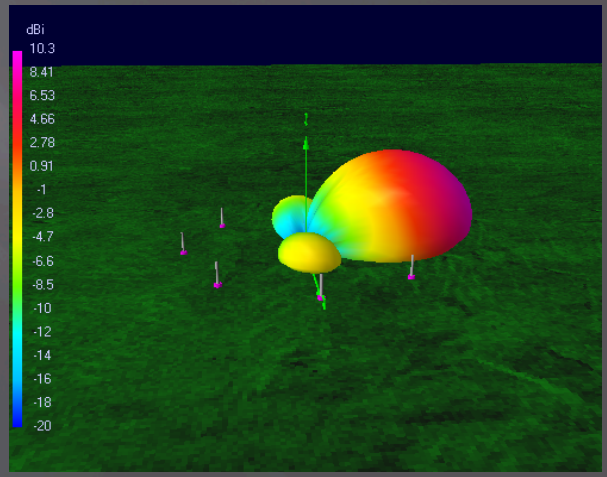
8el BSEF



Shared Apex Loop

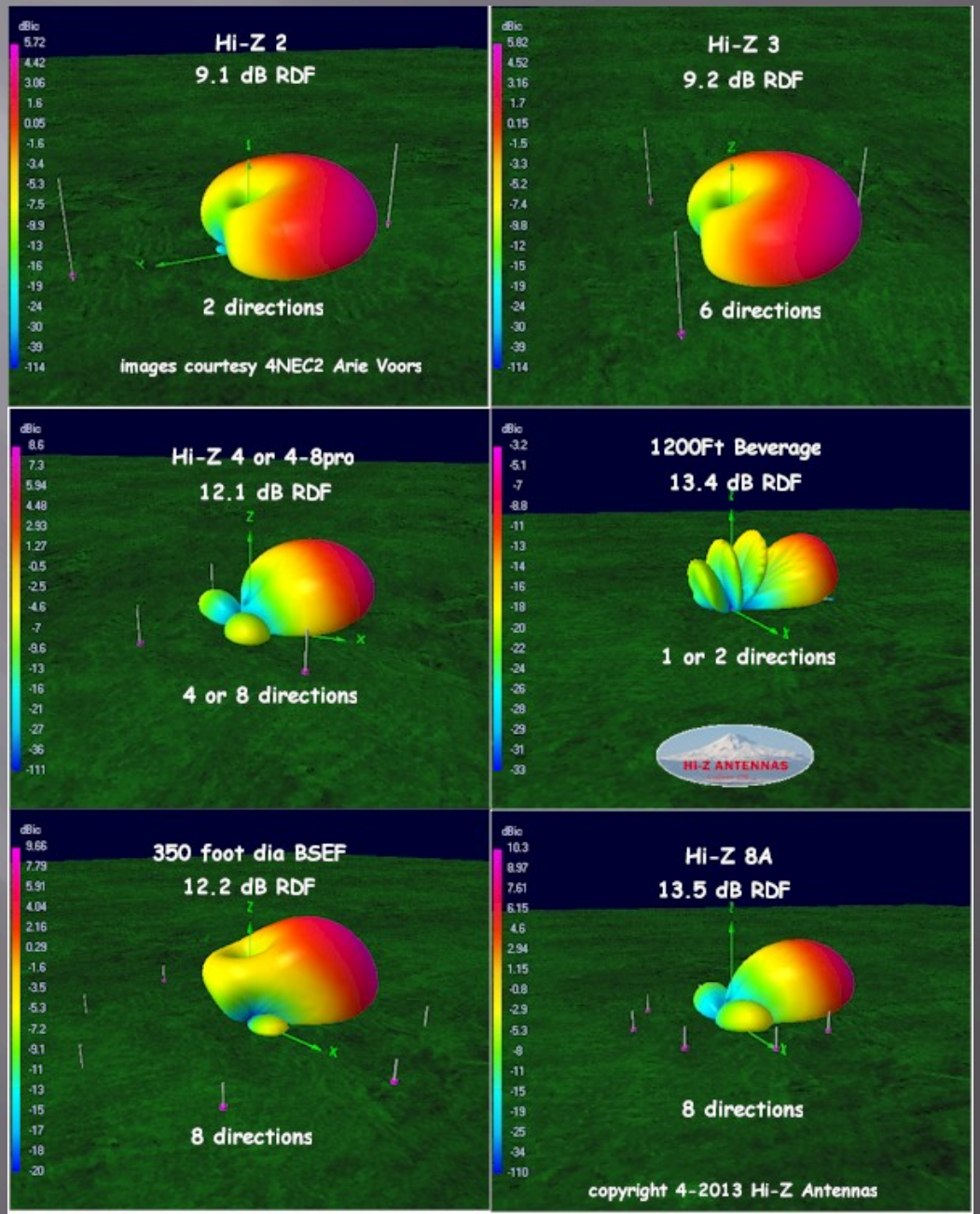


Beverage



Hi-Z 8A-160

The Bigger RX Antennas



SUMMATION

The high impedance elements are well suited to build low-angle high performance receiving arrays. Care must be taken in accuracy of the layout and connecting cable lengths. These arrays work best over uniform ground.

Work is going on now with spectacular results by making arrays of arrays with very large RDFs.