2-el phased array for 40m DX-pedition special

This is an easy to build and erect antenna for DX-peditions and field days.

In a permanent installation one might use more radials and thicker radiator. In such a case dimensions will be a bit different. Also altering radial network height has some influence to optimum dimensions.

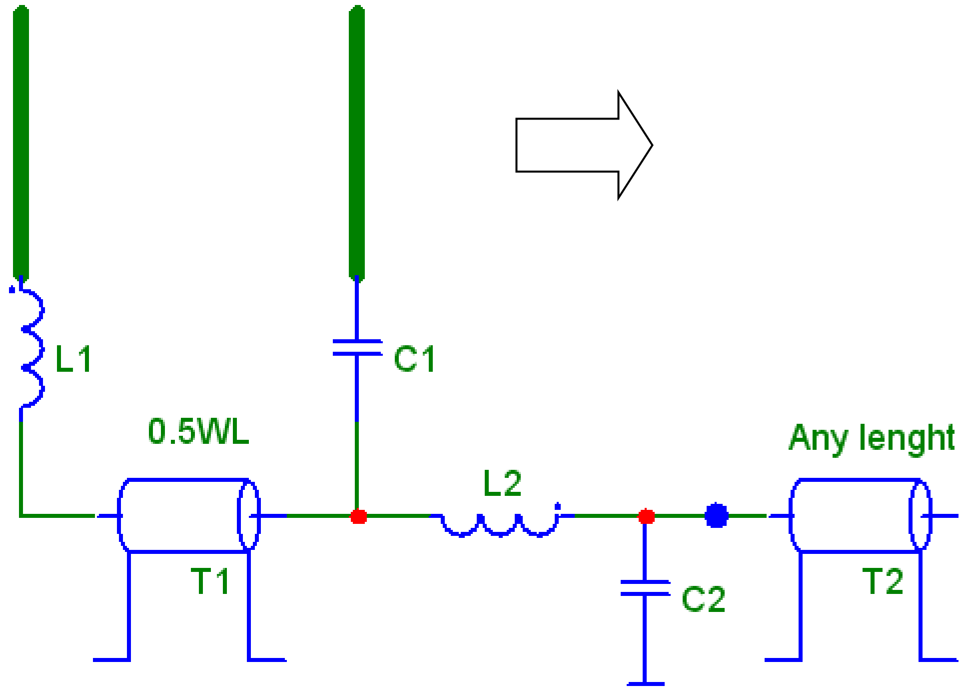
V1.1

Eznec file: 2vert7075-5d-wire.EZ

4 pages added to the end on 1.3.2022

Two element vertical

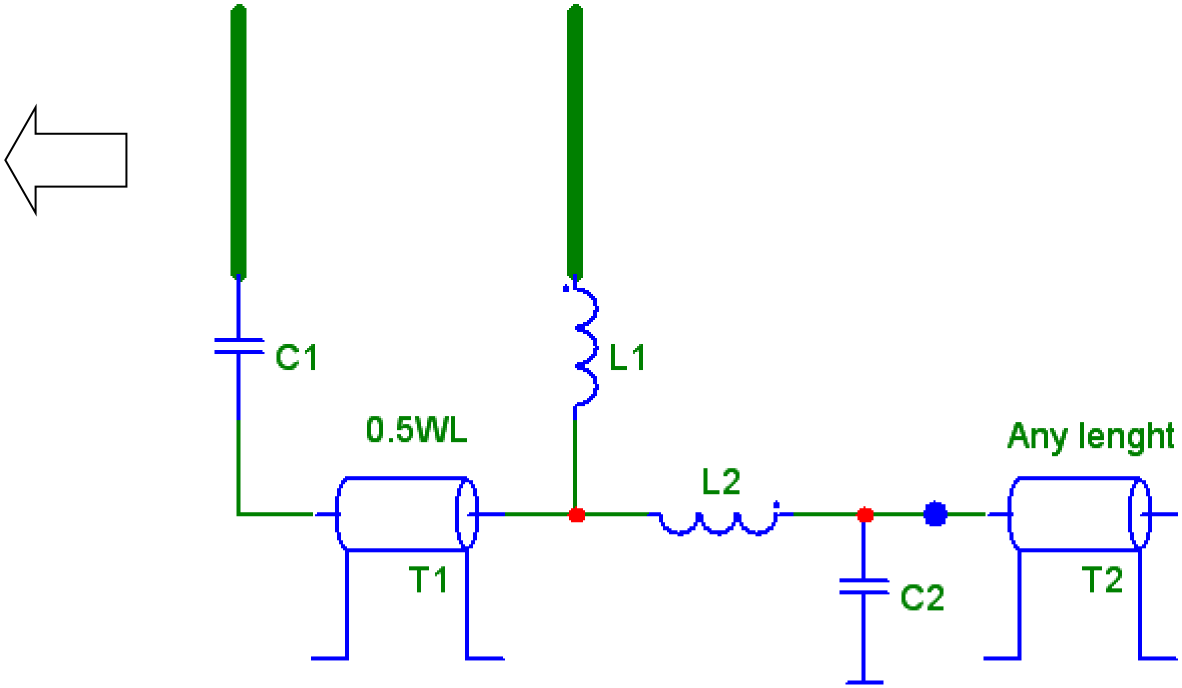
Spacing of verticals 0.15-0.25 wavelengths
Verticals radiators 0.25 wavelength long



Opposite voltage fed array by OH1TV

Two element vertical

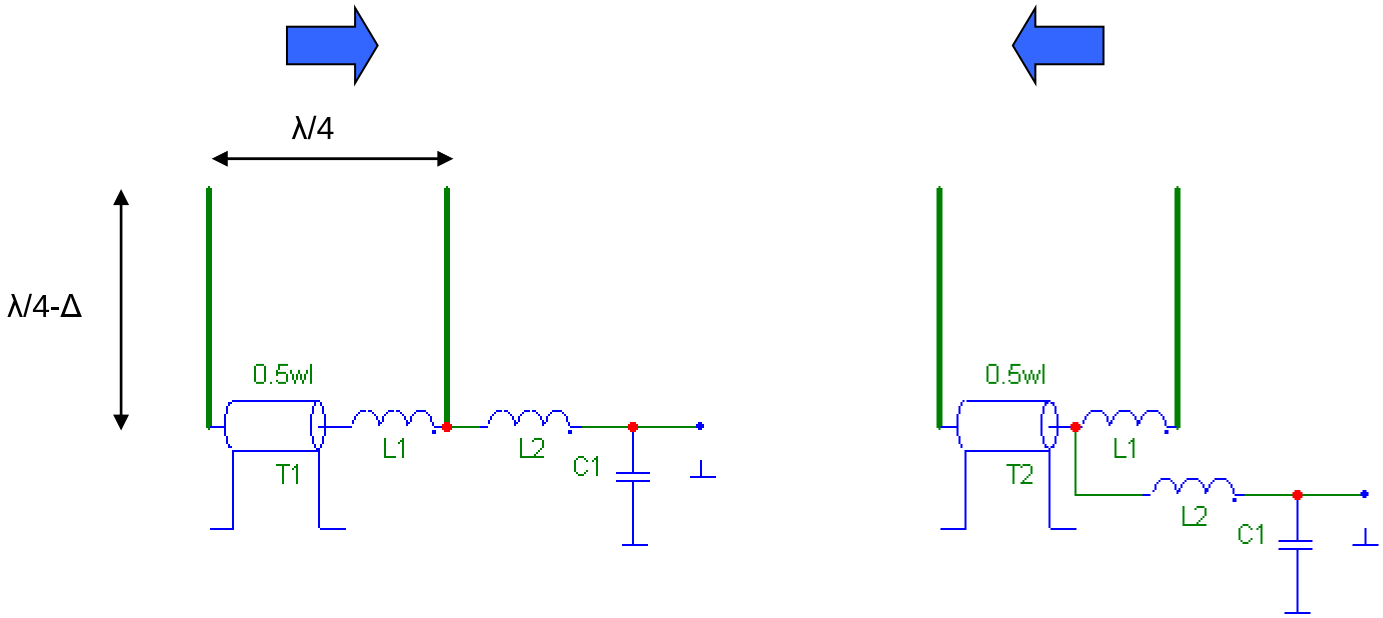
Spacing of verticals 0.15-0.25 wavelengths
Verticals radiators 0.25 wavelength long



Opposite voltage fed array by OH1TV

The concept

Opposite voltage feed-system
- Equal current amplitudes
- Current phase difference 107 deg

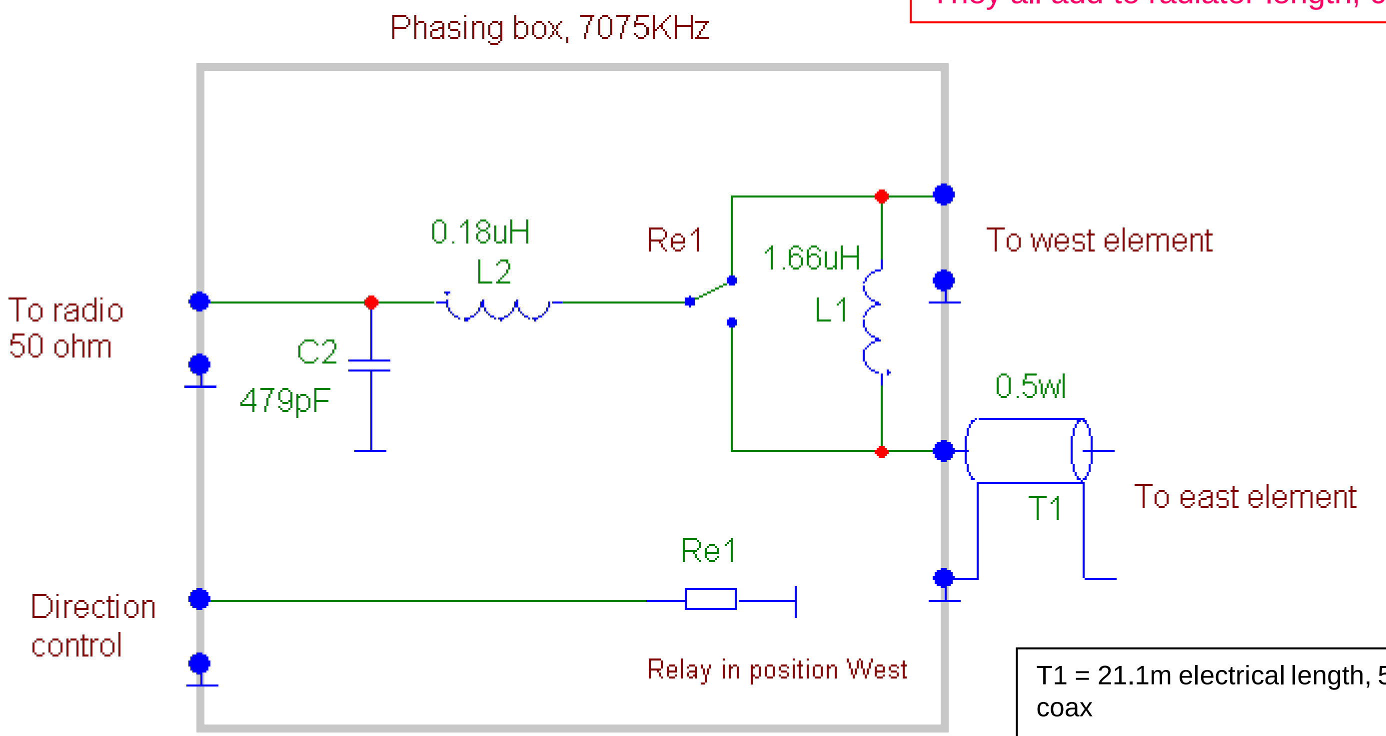


Radials are not shown here

Phasing box, 2-el verticals 7075kHz

Related Eznec:2vert7075-5d-wire.EZ

Very short wires shall be used on RF path
They all add to radiator length, change tuning

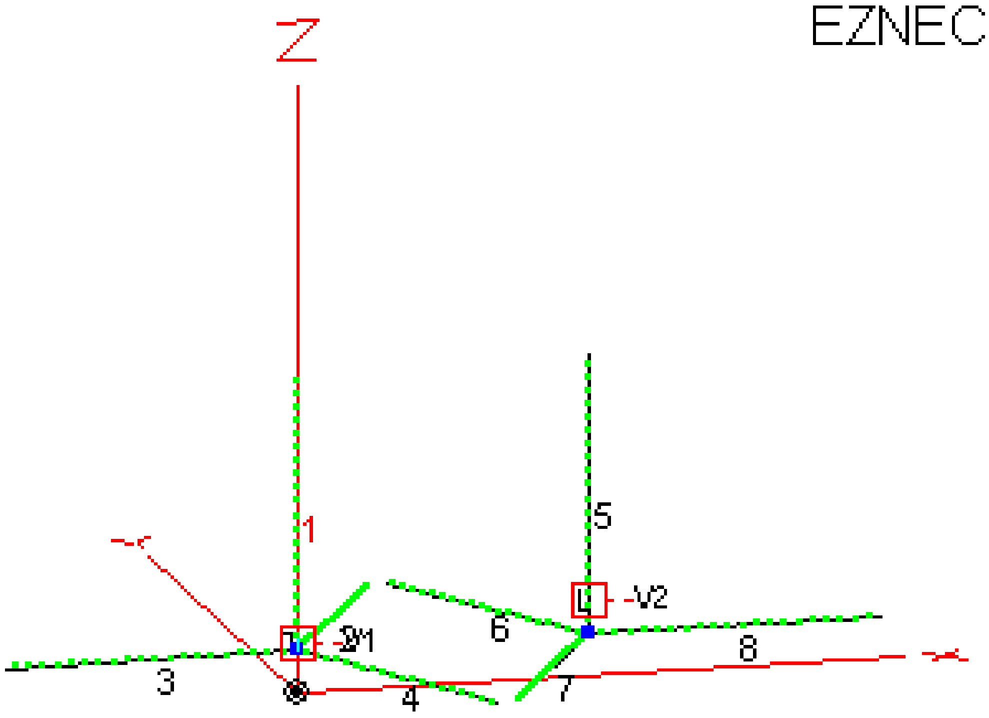


T1 = 21.1m electrical length, 50 ohm coax

If v=0.66, length =13.925m

Current baluns with ferrite beads in both ends of the cable

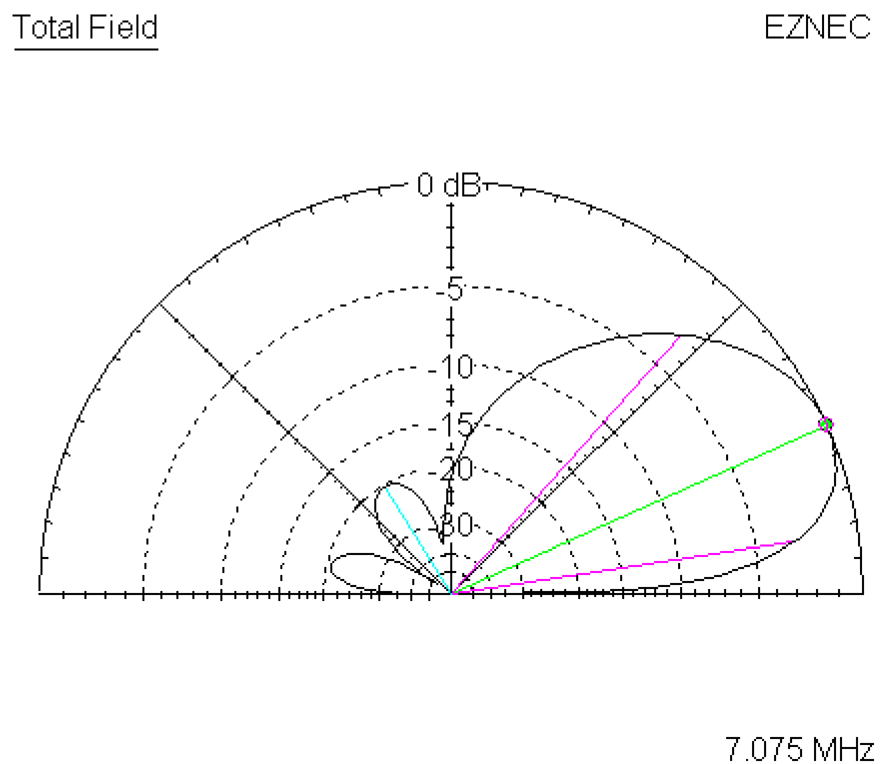
2-el phased vertical array for 40m



Vertical pattern 7075kHz

Normal ground

0.005S, 13

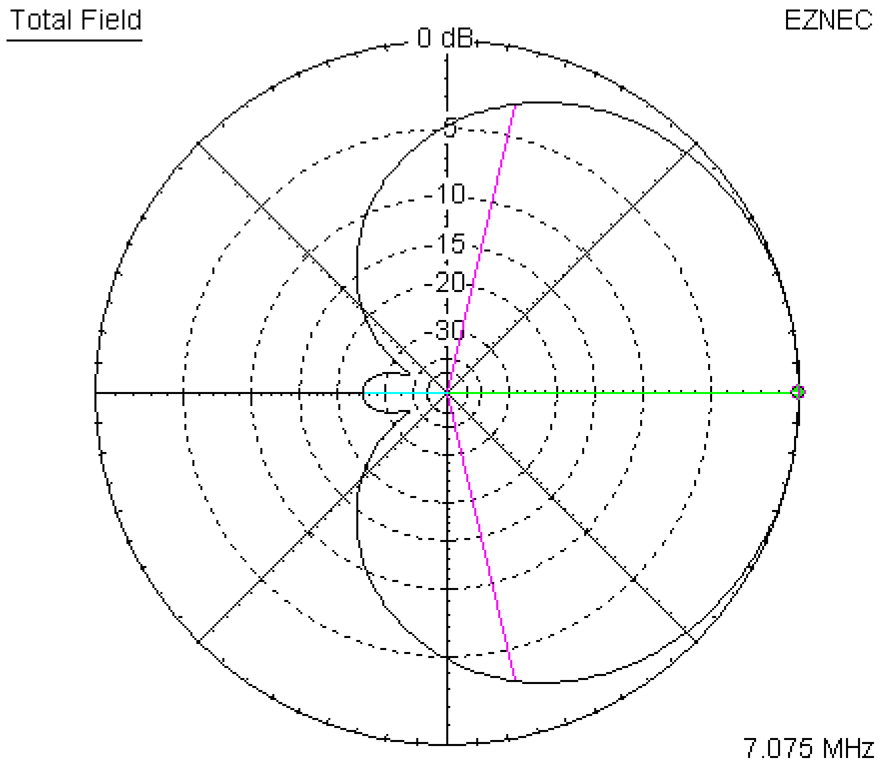


Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 3.45 dBi

Cursor Elev 24.0 deg.
Gain 3.45 dBi
0.0 dBmax

Slice Max Gain 3.45 dBi @ Elev Angle = 24.0 deg.
Beamwidth 40.0 deg.; -3dB @ 8.5, 48.5 deg.
Sidelobe Gain -16.88 dBi @ Elev Angle = 122.0 deg.
Front/Sidelobe 20.33 dB

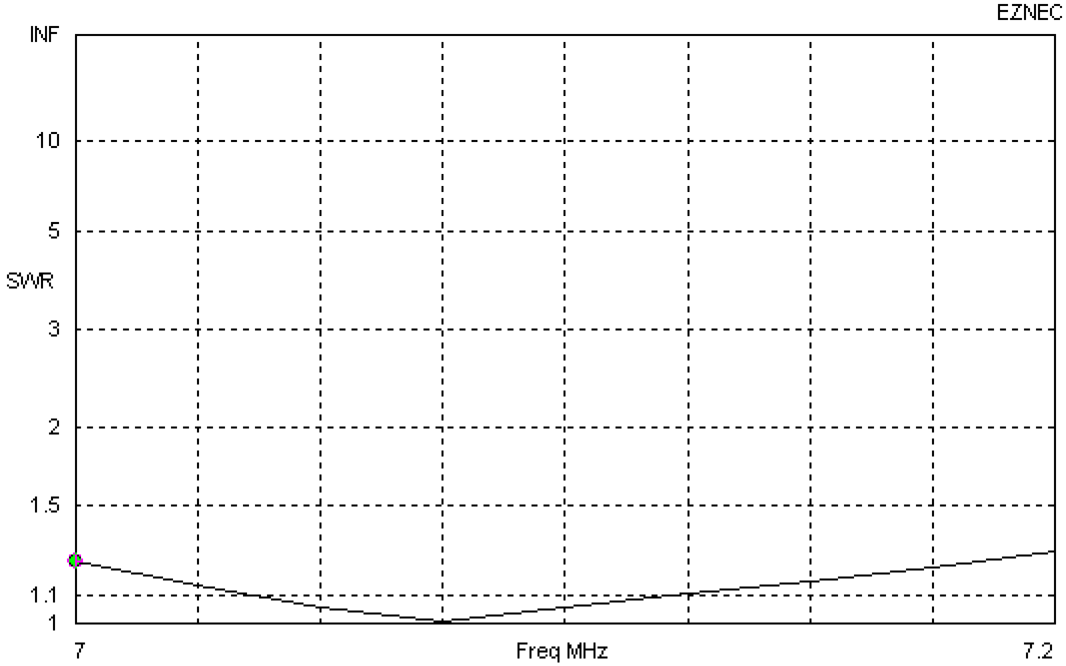
Horizontal pattern on 24deg elevation



Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	24.0 deg.	Gain	3.45 dBi
Outer Ring	3.45 dBi		0.0 dBmax

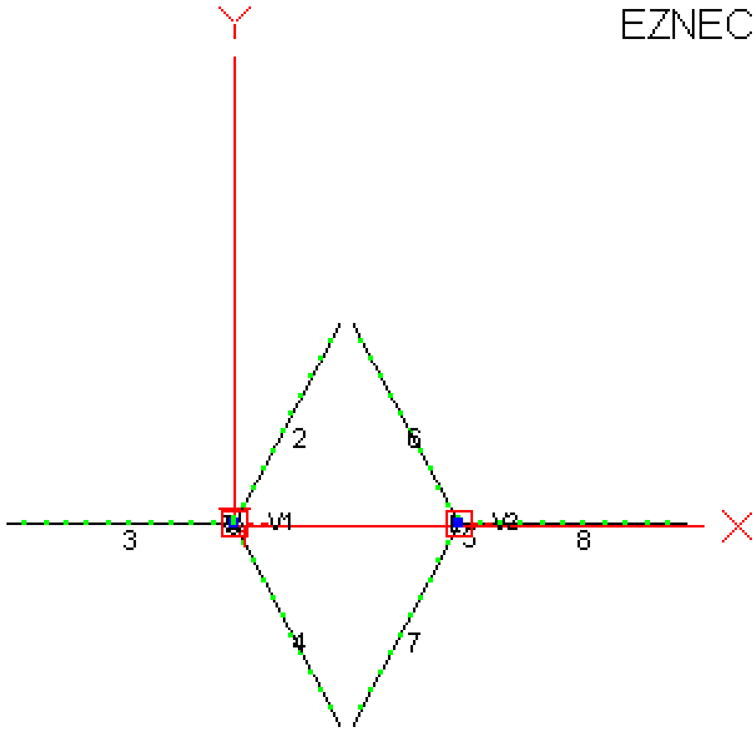
Slice Max Gain	3.45 dBi @ Az Angle = 0.0 deg.
Front/Back	24.46 dB
Beamwidth	153.2 deg.; -3dB @ 283.4, 76.6 deg.
Sidelobe Gain	-21.01 dBi @ Az Angle = 180.0 deg.
Front/Sidelobe	24.46 dB

SWR



Freq	7 MHz	Source #	1
SWR	**1.23**	Z0	50 ohms
Z	41.55 at 5.6 deg.		
	= 41.35 + j 4.052 ohms		
Refl Coeff	0.1044 at 152.35 deg.		
	= -0.09249 + j 0.04846		
Ret Loss	19.6 dB		

Dimensions

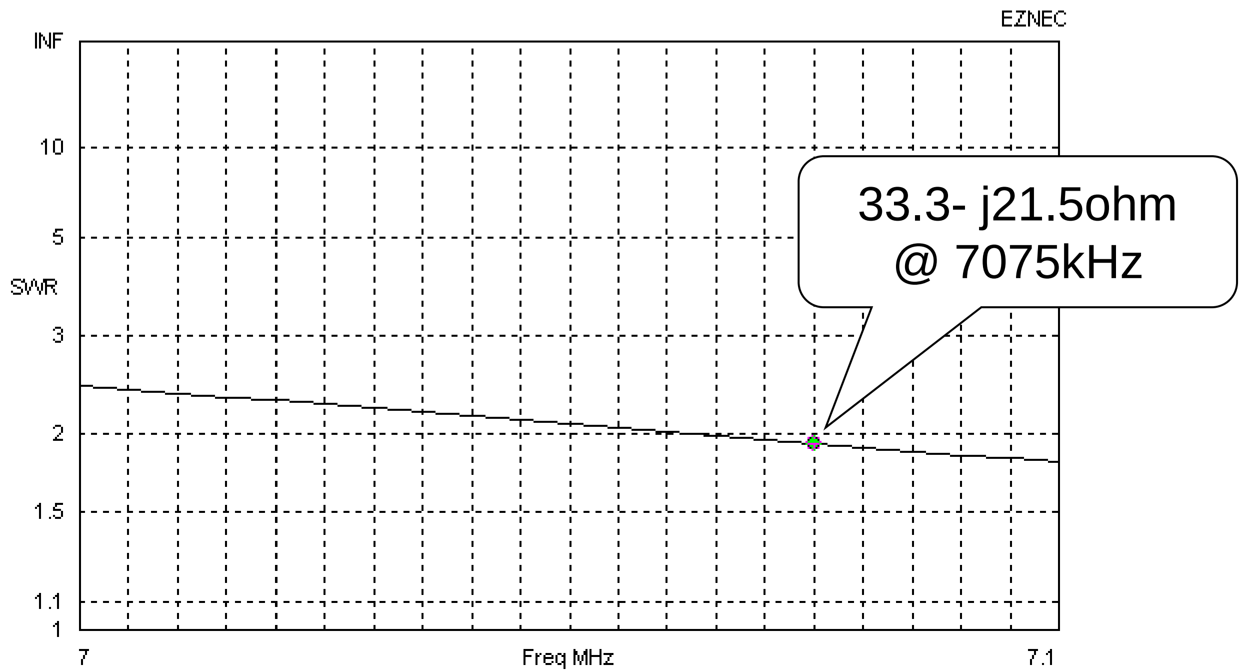


- Element spacing 10.50m
- Radial material dia 2mm cu
- 6 radials, 3 for each element
- Radial length 10.70m
- Spacing between radial 2 and 6 tips 0.50m
- Spacing between radial 4 and 7 tips 0.50m
- Radial height 1.5m

- Radiator length 10.24m dia 2mm wire
- Single element impedance on 7075kHz 33 - j21.5ohm
  - Single element resonance 7220kHz

Impedance when one element alone

or the other open

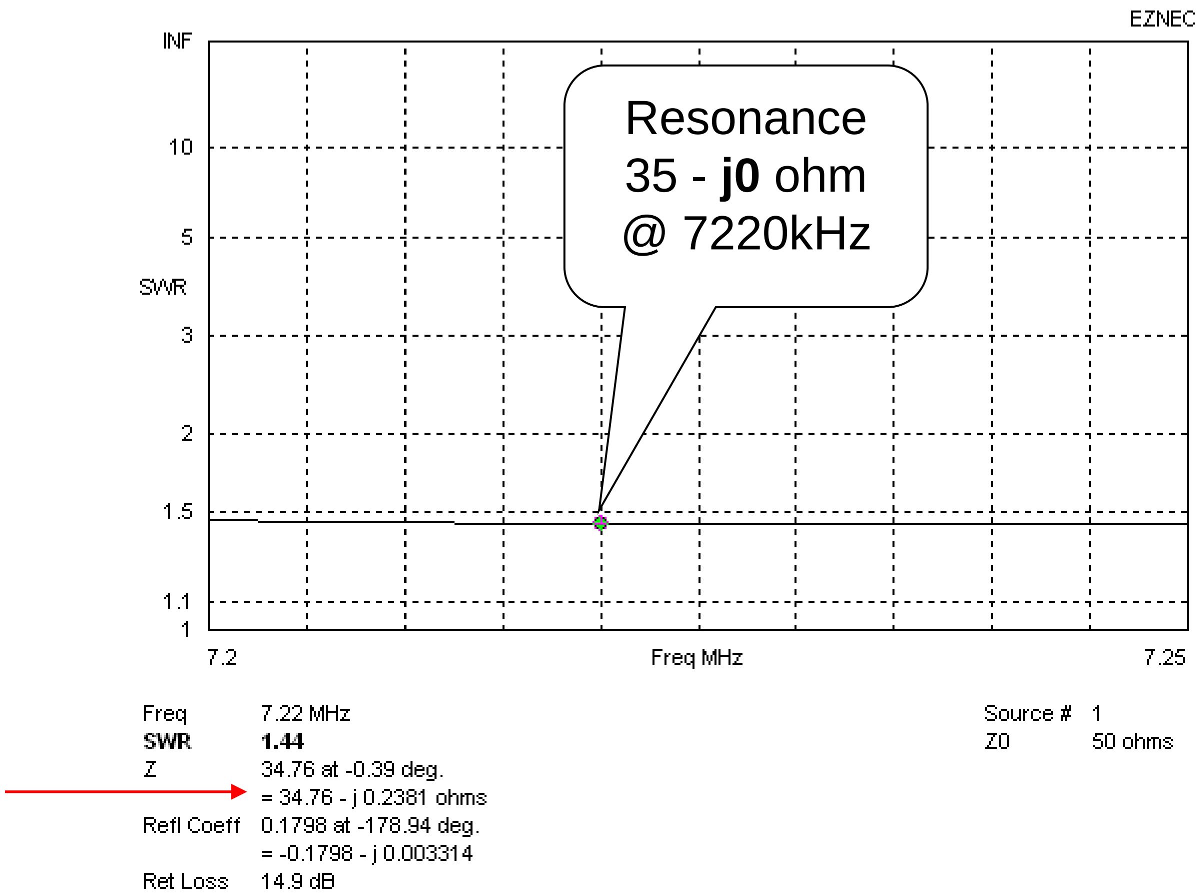


Freq	7.075 MHz
SWR	**1.93**
Z	39.61 at -32.87 deg.
	= 33.27 - j 21.5 ohms
Refl Coeff	0.3168 at -113.41 deg.
	= -0.1259 - j 0.2907
Ret Loss	10.0 dB

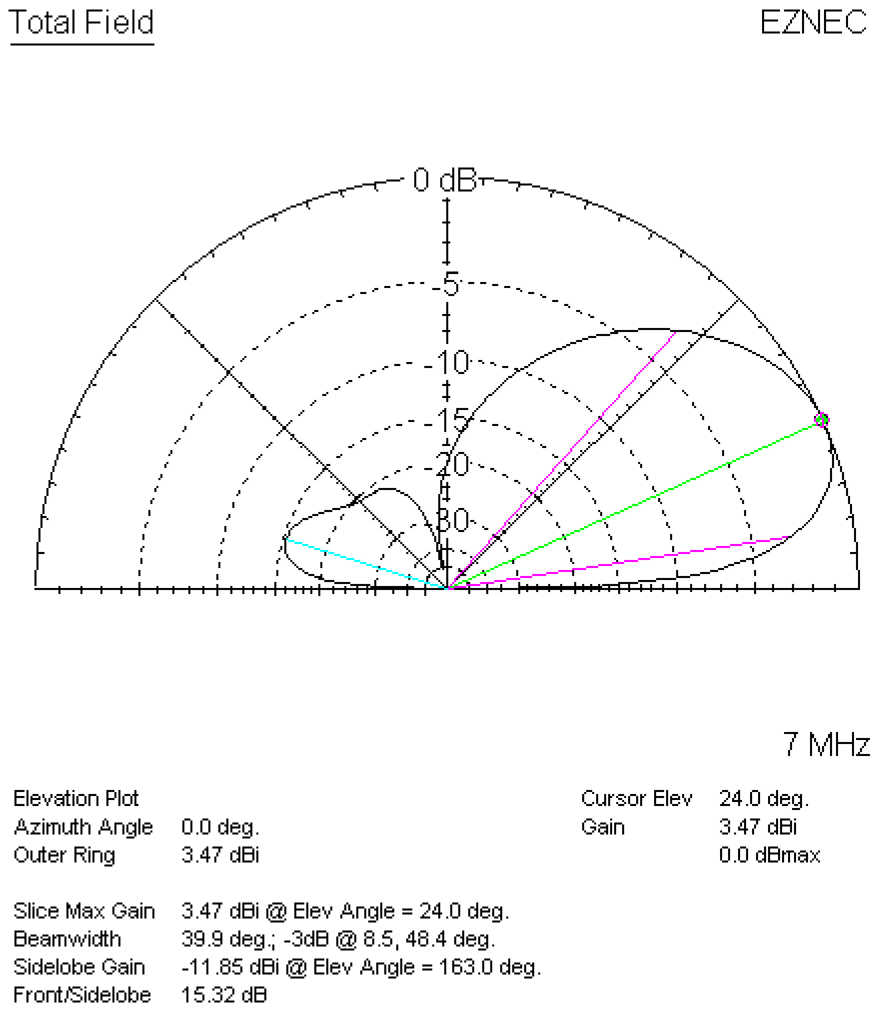
Source # 1
Z0 50 ohms

Impedance when one element alone

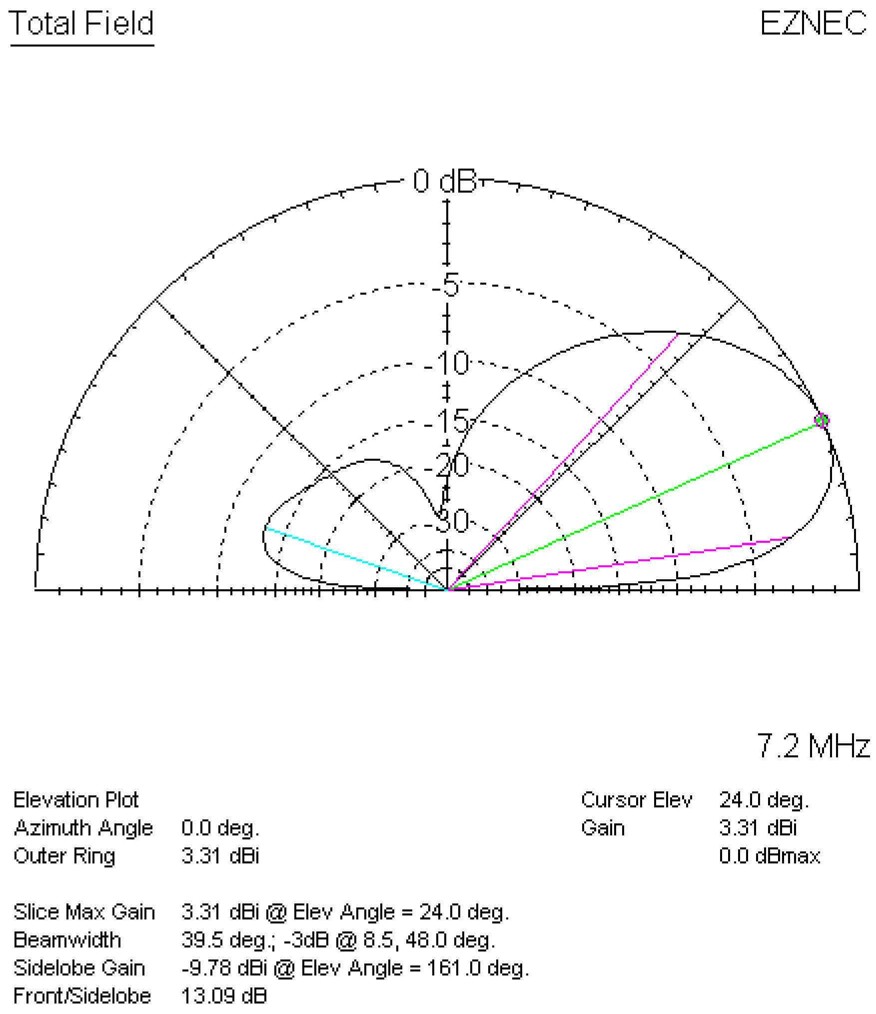
or the other open



Vertical 7000kHz



Vertical 7200KHz



Some advice for building the antenna

1. Use good current balun at the antenna feedpoint, also on both ends of the half lamda cable. For example10 pcs Amidon FB-31-1020 on coax. Material 43 ferrite can be used too: FB-43-1020, or similar. The coax cables shall not act as radials.
2. Dimensions are calculated for non-insulated wire. If you use insulated wire, wire lengths shall be shorter. Also wire diameter has its effects, thinner wire leads to longer dimensions. If you have Vector Network Analyzer, best way is to measure element feedpoint impedance and set the reactance to the required –j 21.5 ohm value on frequency 7075kHz. That measurement is best done when only one element is erected at time. The measurement shall be calibrated to show impedance at the very feedpoint of the element.
3. L-network L2 and C2 has only influence to impedance, not radiation pattern. Can be trimmed as needed.
4. Radiation pattern (phasing) in this construction depends only on dimensions of the elements and coil L1.
5. These wire lengths doesn’t take into account possible wire termination to an egg insulator, where cu wire is twisted around the egg. This adds end capacitance and makes the wire electrically longer. A simple way is to use insulators as described in my VDA story, Project 62,
6. Small changes downwards in frequency can be made my adding wire lengths, same amount each. You can calculate that with normal wavelength formulas.

Portable 2-el 40m vertical, built by EA1DAV

The phasing box

Portable installation for contest by Jesus, EA1DAV

Comments by Jesus, EA1DAV

Jesus had built this antenna for the 2022 ARRL International DX-CW-contest. After the contest he gave following comments:

“The antenna worked very good, my previous experience was with Christman phasing. Your design is much more easy to build, to adjust, and the on the air tests are, for me, also better.”