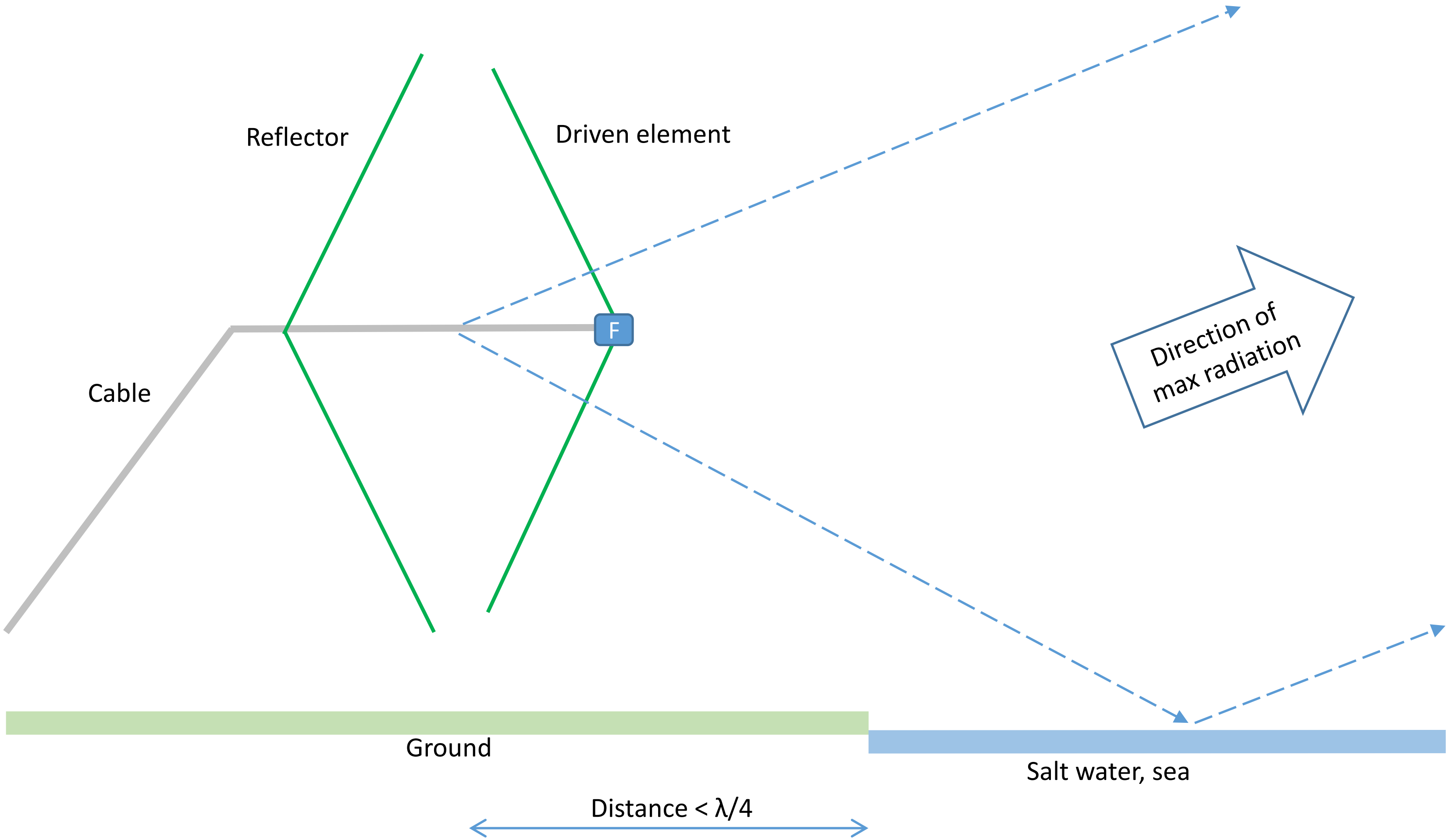
Vertical Dipole Array
VDA

An easy to build antenna for seaside locations

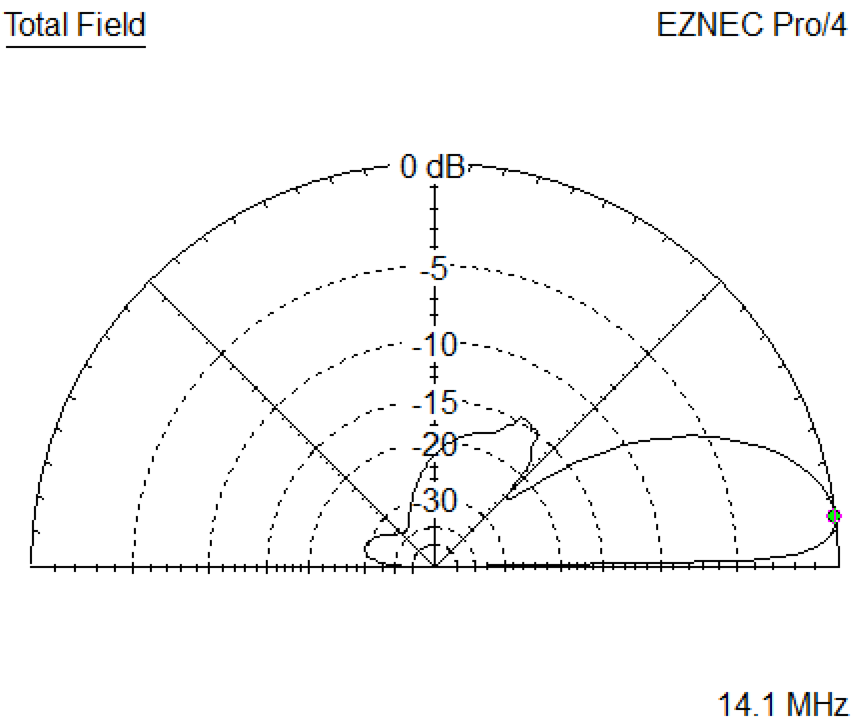
17m and 15m versions were used at 9M0O DX-pedition in 2016

15m VDA at 9M0O
in 2016

Vertical Dipole Array, the concept



Radiation pattern in vertical plan, 5m from shore line

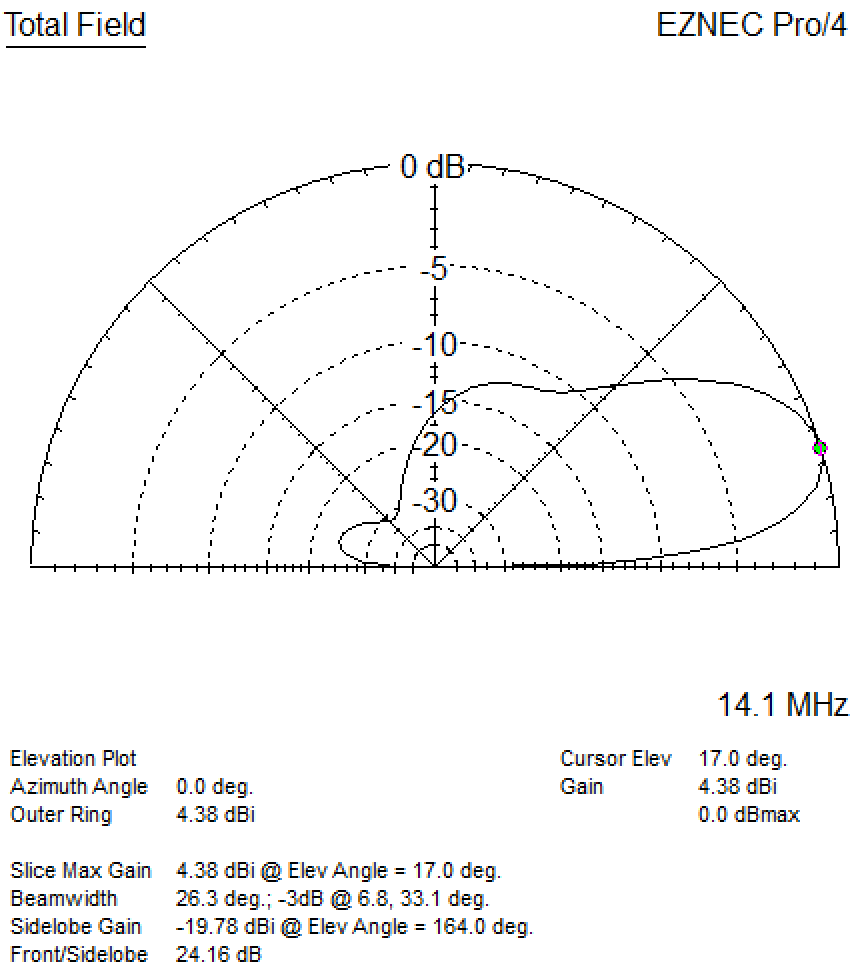


Elevation Plot		Cursor Elev	7.0 deg.
Azimuth Angle	0.0 deg.	Gain	9.8 dBi
Outer Ring	9.8 dBi		0.0 dBmax

Slice Max Gain	9.8 dBi @ Elev Angle = 7.0 deg.
Beamwidth	19.7 deg.; -3dB @ 1.6, 21.3 deg.
Sidelobe Gain	-4.76 dBi @ Elev Angle = 60.0 deg.
Front/Sidelobe	14.56 dB

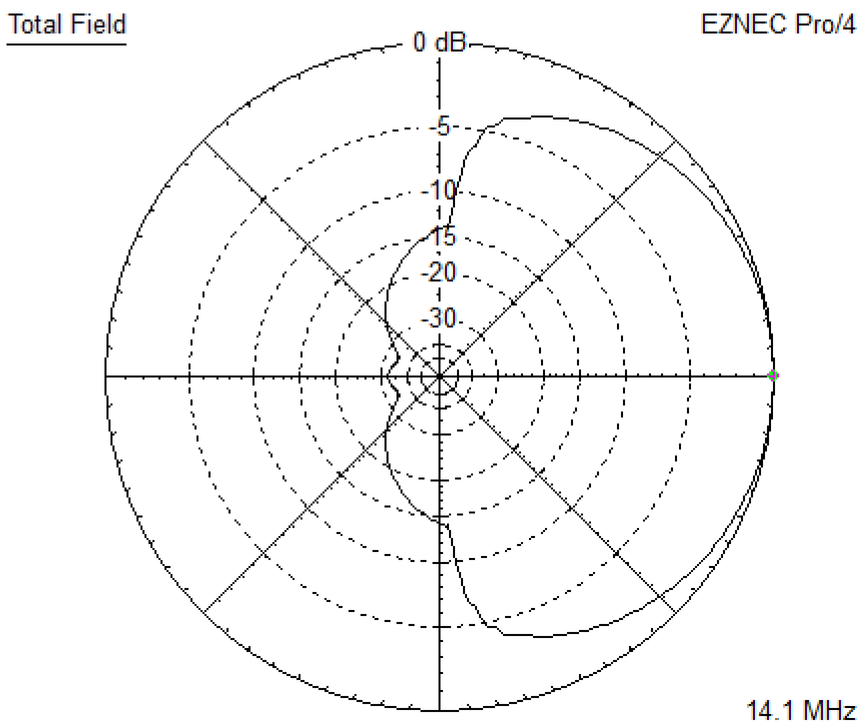
- Seaside instalation assumed.
- Antenna on average soil (0.005S and Ɛ=13) but shore line is in front of the antenna, at 5m distance, 1m lower. Water conductivity 2S and Ɛ=80
- Boom 6.4m above the ground

But, if the same antenna is above average soil…



- Without the influence of salt water antenna gain is 5.4dB less and angle of radiation 10 degrees higher
- Horizontal antenna would be better is this case

Radiation pattern in horizontal plan, elevation angle 7deg, 5m from shore line

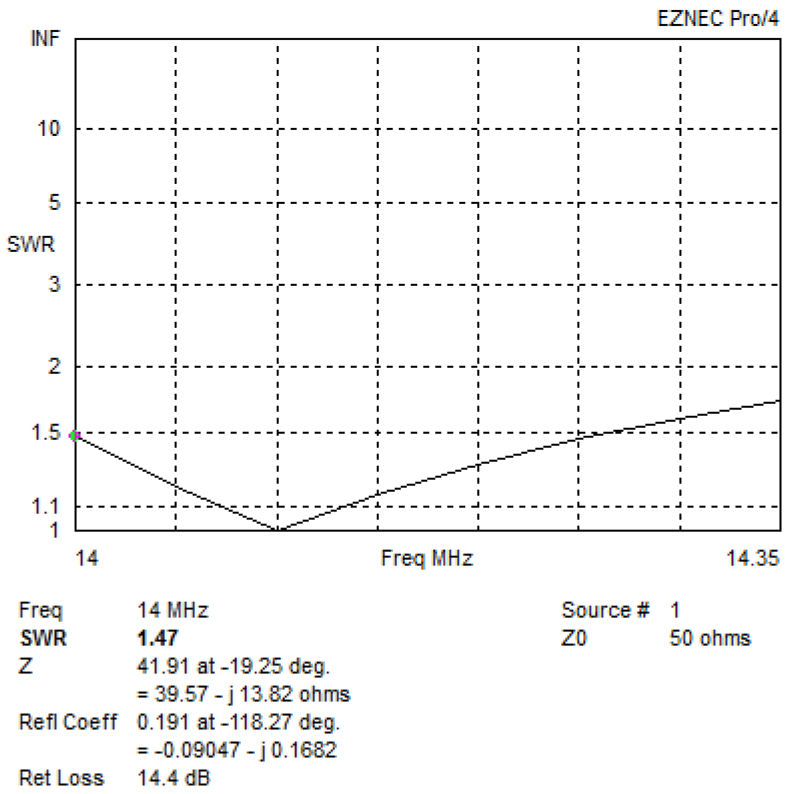


Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	7.0 deg.	Gain	9.8 dBi
Outer Ring	9.8 dBi		0.0 dBmax

Slice Max Gain	9.8 dBi @ Az Angle = 0.0 deg.
Front/Back	32.11 dB
Beamwidth	136.2 deg.; -3dB @ 291.9, 68.1 deg.
Sidelobe Gain	-3.89 dBi @ Az Angle = 88.0 deg.
Front/Sidelobe	13.69 dB

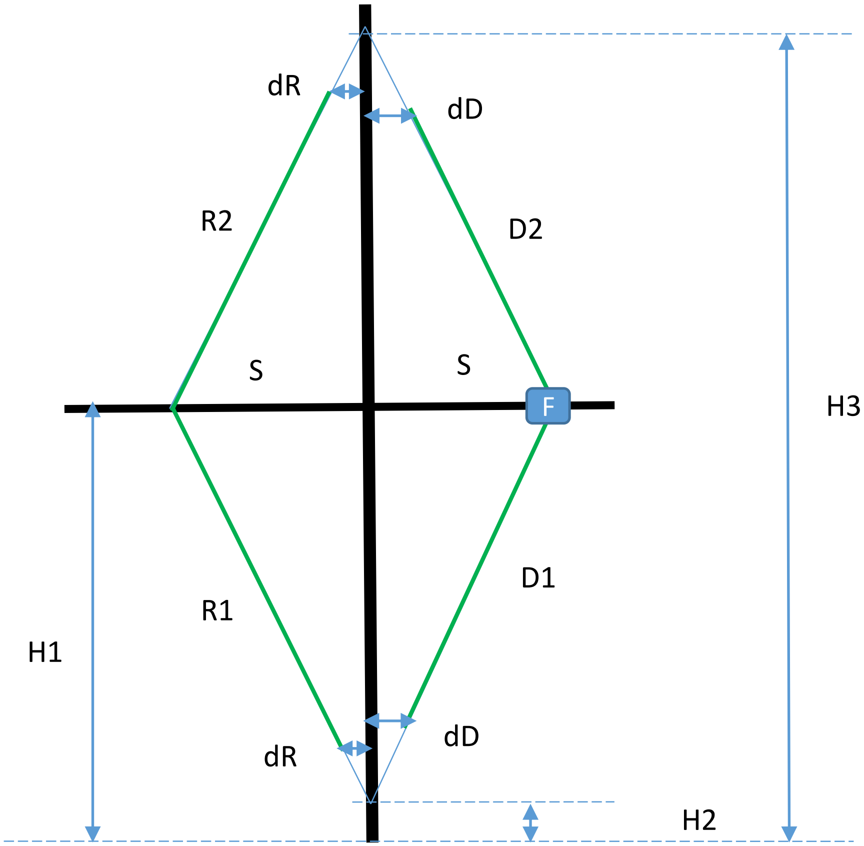
- Seaside installation assumed.
- Antenna on average soil (0.005S and Ɛ=13) but shore line is in front of the antenna, at 5m distance, 1m lower. Water conductivity 2S and Ɛ=80
- Boom 6.4m above the ground

SWR, 20m band



EZNEC Pro/4
INF
10
5
SWR
3
2
1.5
1.1
1
14
Freq MHz
14.35
Freq 14 MHz
SWR 1.47
Z 41.91 at -19.25 deg.
= 39.57 - j 13.82 ohms
Refl Coeff 0.191 at -118.27 deg.
= -0.09047 - j 0.1682
Ret Loss 14.4 dB
Source # 1
Z0 50 ohms

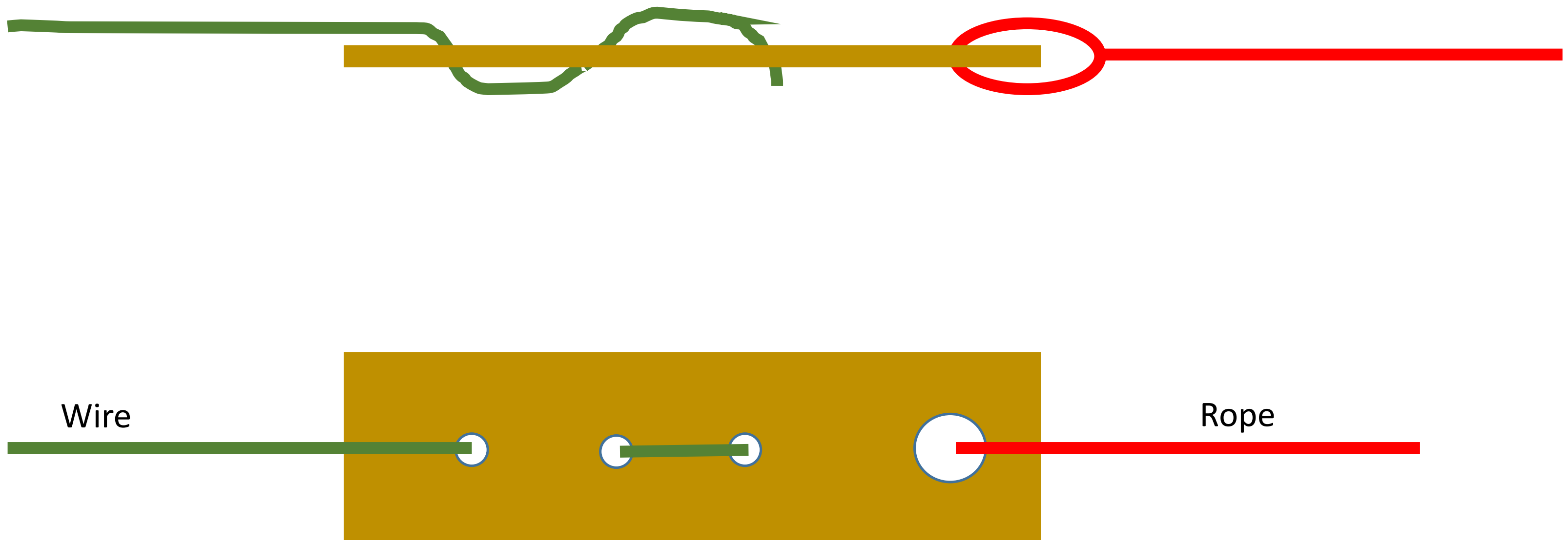
VDA 20m, wire: Nevada Kevlar 32 D



Dimensions

- R1=R2=5054mm
    - R1+R2=10108mm
- D1=D2=4803mm
- H1=6400mm (boom level)
- H2=50mm (rope point)
- H3=12750mm (rope point)
- S=1750mm (spacing=2S)
- dR=407mm
- dD=473mm
- F=feed point

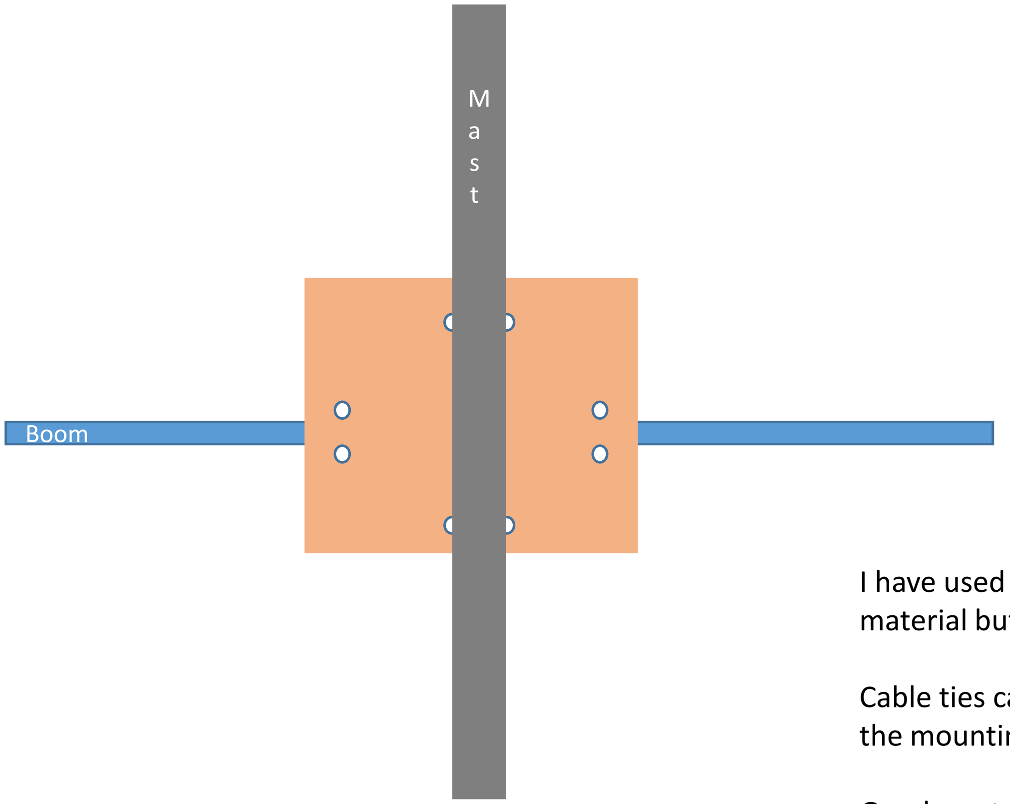
Wire end isolators



Isolator material: plastics or Pertinax

Do not use eggs or otherwise bend the wire ends as this will change tuning, requires different dimensions.

Boom to mast bracket



I have used 5mm thick Pertinax plate as bracket material but any stiff enough material is ok.

Cable ties can be used to fasten mast and boom to the mounting bracket

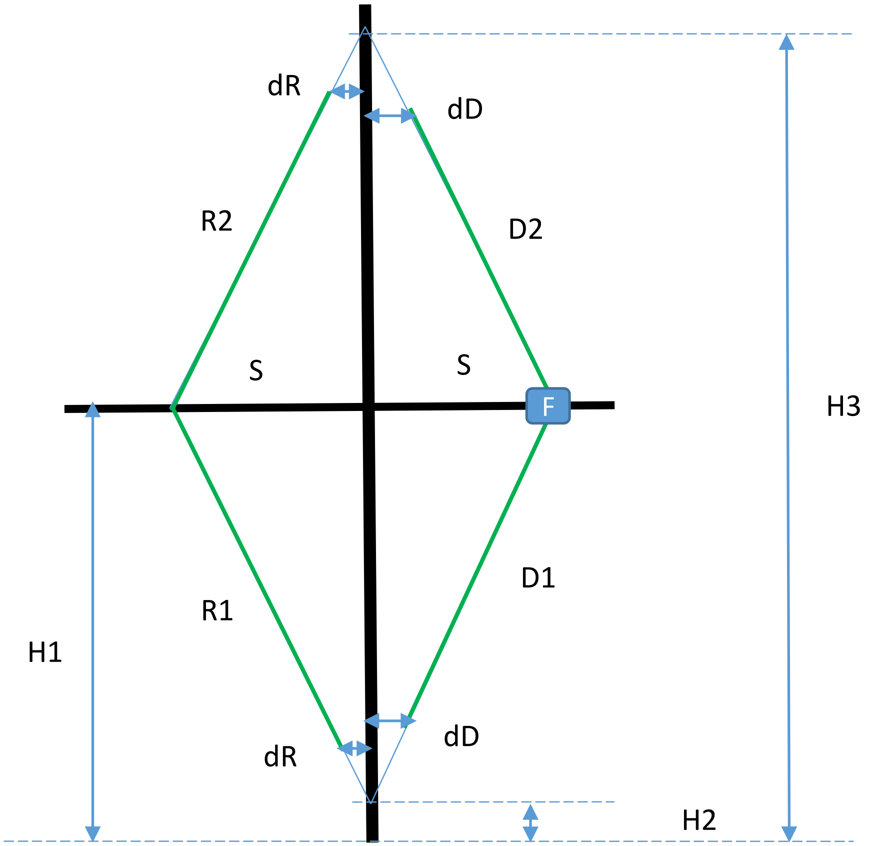
Good masts are available for example from Spiderbeam. For the boom a glass fiber fishing rod is excellent.

Some notes

- Wire lengths R and D are from the boom center line.
- My suggestion is that wire ends are not bent around an egg or so. The dimensions are not valid in such a case.
- Good choice for the driven element center isolator is a commercial isolator with UHF-connector. The coax center conductor is connected to the upwards going wire.
- Current balun is at least 3 pcs Amidon FB-43-1020 or similar on the coax cable next to the feed point.
- Cable route to the feed point is from the back of reflector, along the boom. Cable influence is then minimal.
- An easy way to fine tune SWR is to adjust distance between element lower ends.
  - Bringing them closer to each other resonant frequency goes downwards, and the opposite
- Cable ties are good for temporary installations. They fix everything in this antenna.
- Spiderbeam telescoping masts are good for this antenna. Fishing rod is good for the boom.
- **Salt water** makes angle of radiation low. Also losses in ground reflection are low and antenna gain therefore close to 10dBi.

Other bands

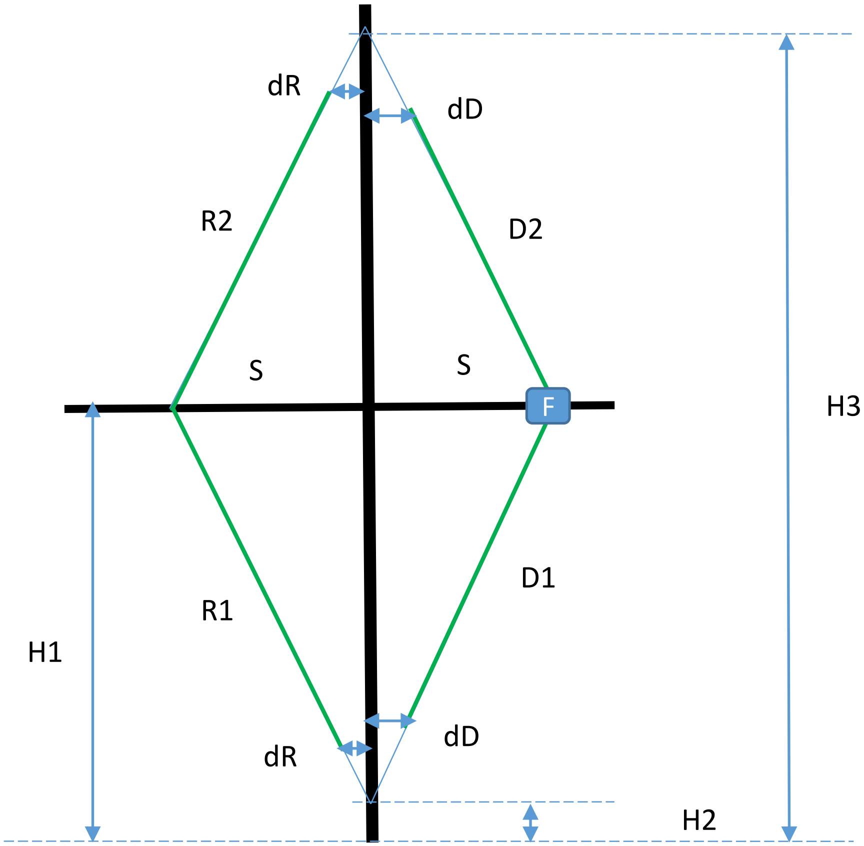
VDA 17m, wire Nevada Kevlar 32 D



Dimensions

- R1=R2=3923mm
  - R1+R2=7846mm
- D1=D2=3725mm
- H1=5100mm
- H2=180mm
- H3=10020mm
- S=1340mm
- dR=308mm
- dD=362mm
- F=feed point

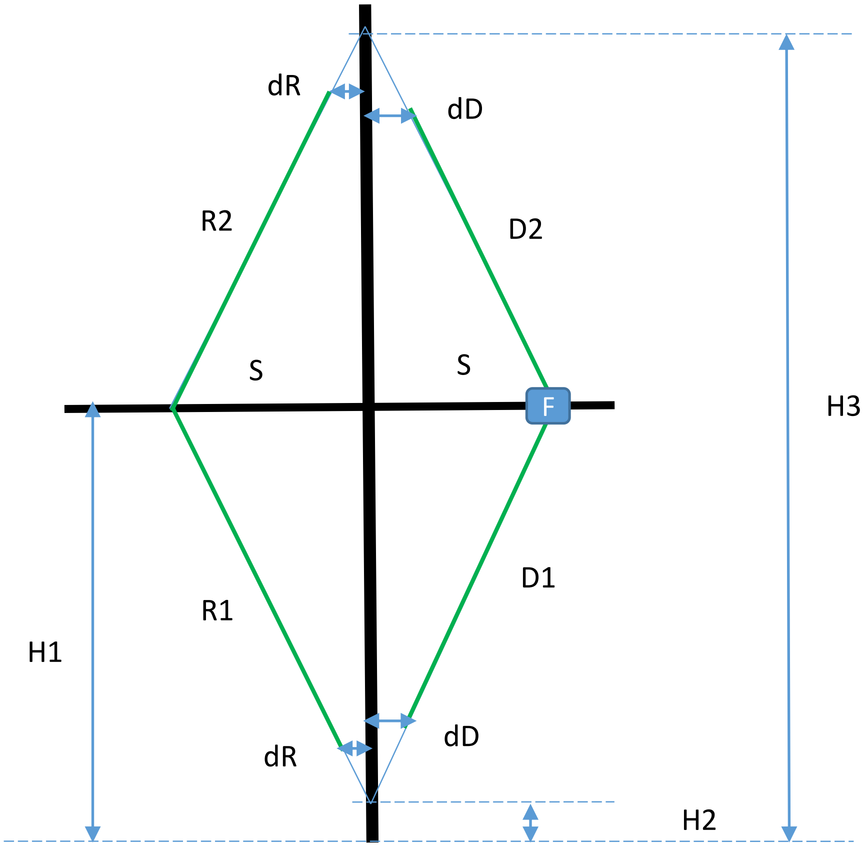
VDA 15m, wire Nevada Kevlar 32 D



Dimensions

- R1=R2=3347mm
  - R1+R2=6694mm
- D1=D2=3180mm
- H1=4500mm
- H2=265mm
- H3=8735mm
- S=1200mm
- dR=287mm
- dD=333mm
- F=feed point

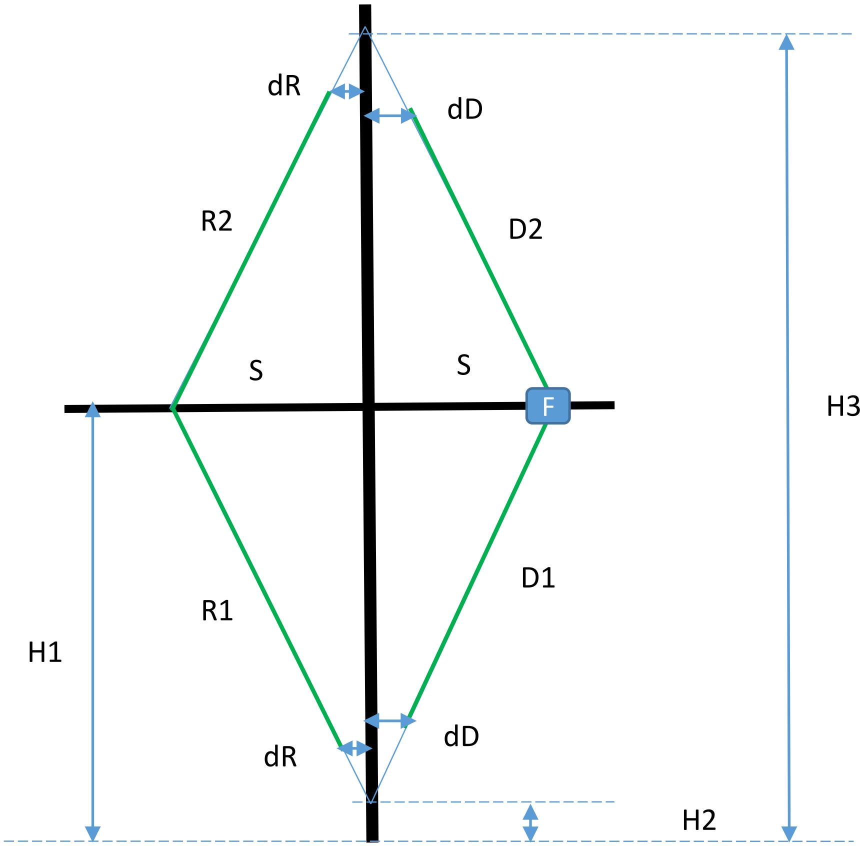
VDA 12m, wire Nevada Kevlar 32 D



Dimensions

- R1=R2=2854mm
    - R1+R2=5708mm
- D1=D2=2708mm
- H1=4100mm
- H2=265mm
- H3=7935mm
- S=990mm
- dR=277mm
- dD=313mm
- F=feed point

VDA 10m, wire Nevada Kevlar 32 D



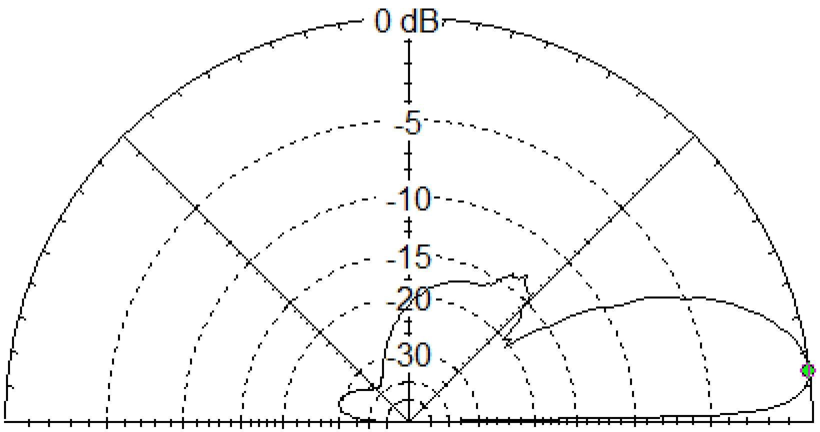
Dimensions

- R1=R2=2501mm
  - R1+R2=5002mm
- D1=D2=2369mm
- H1=3500mm
- H2=180mm
- H3=6820mm
- S=870mm
- dR=235mm
- dD=270mm
- F=feed point

VDA 17m, 5m from shore line

Total Field

EZNEC Pro/4

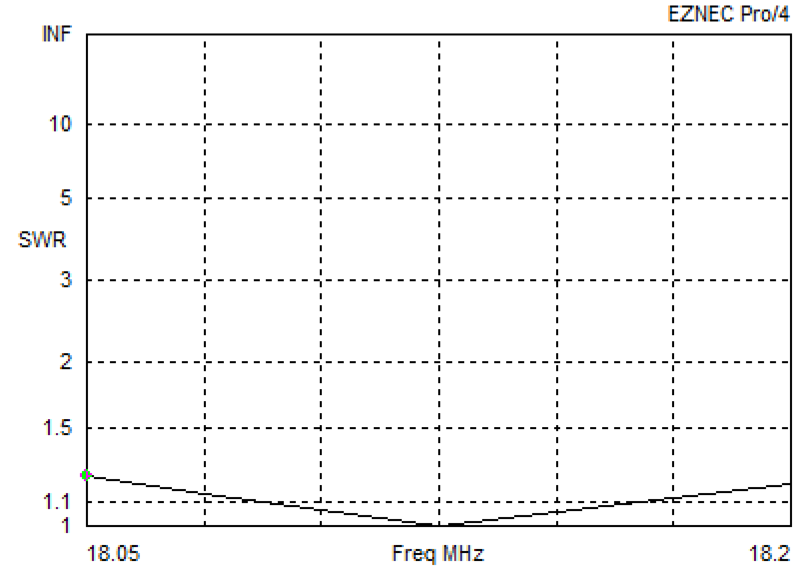


18.12 MHz

Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 9.49 dBi

Cursor Elev 7.0 deg.
Gain 9.49 dBi
0.0 dBmax

Slice Max Gain 9.49 dBi @ Elev Angle = 7.0 deg.
Beamwidth 18.8 deg.; -3dB @ 1.7, 20.5 deg.
Sidelobe Gain -3.58 dBi @ Elev Angle = 51.0 deg.
Front/Sidelobe 13.07 dB

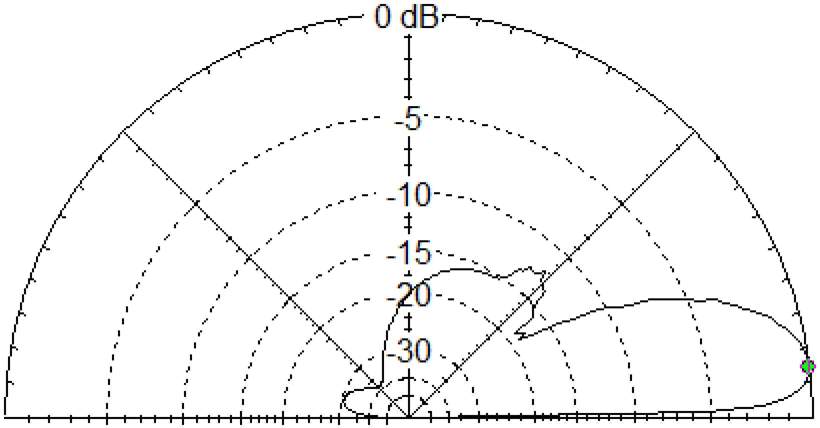


Freq 18.05 MHz
SWR **1.22**
Z 44.66 at -9.4 deg.
= 44.06 - j 7.294 ohms
Refl Coeff 0.09973 at -124.74 deg.
= -0.05683 - j 0.08195
Ret Loss 20.0 dB

Source # 1
Z0 50 ohms

VDA 15m, 5m from shore line

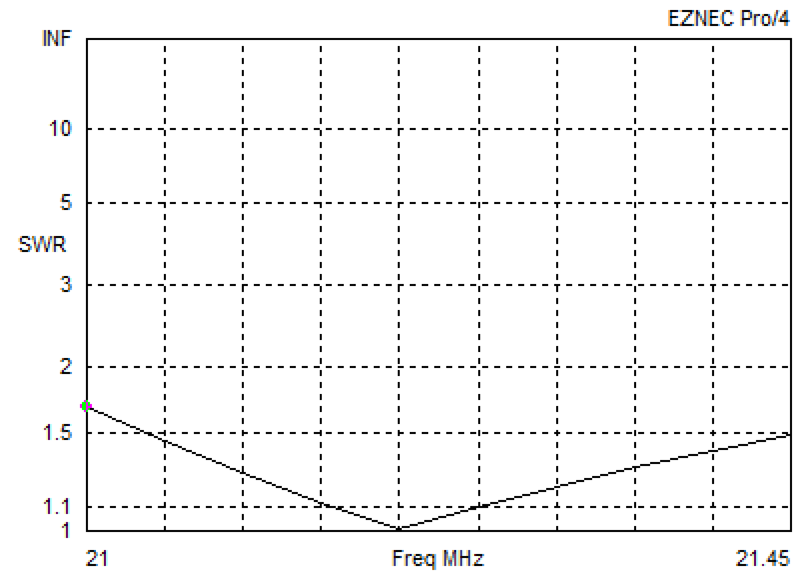
Total Field EZNEC Pro/4



21.25 MHz

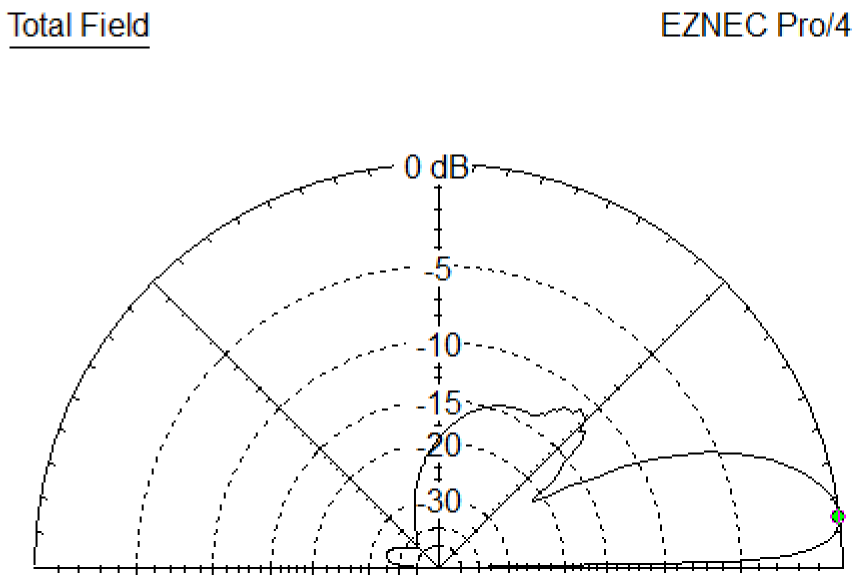
Elevation Plot		Cursor Elev	7.0 deg.
Azimuth Angle	0.0 deg.	Gain	9.39 dBi
Outer Ring	9.39 dBi		0.0 dBmax

Slice Max Gain	9.39 dBi @ Elev Angle = 7.0 deg.
Beamwidth	17.9 deg.; -3dB @ 1.8, 19.7 deg.
Sidelobe Gain	-2.67 dBi @ Elev Angle = 47.0 deg.
Front/Sidelobe	12.06 dB



Freq	21 MHz	Source #	1
SWR	**1.67**	Z0	50 ohms
Z	41.3 at -26.08 deg.		
	= 37.09 - j 18.16 ohms		
Refl Coeff	0.2504 at -113.63 deg.		
	= -0.1004 - j 0.2294		
Ret Loss	12.0 dB		

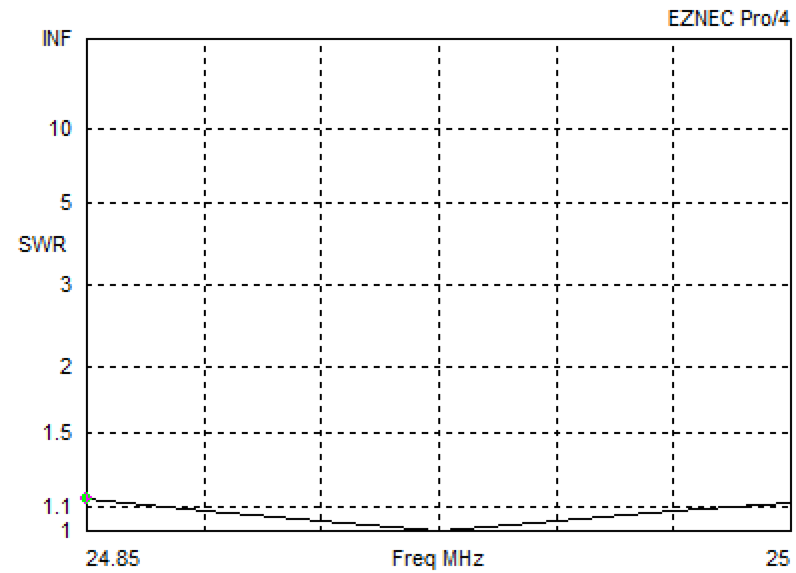
VDA 12m, 4.2m from shore line



24.925 MHz

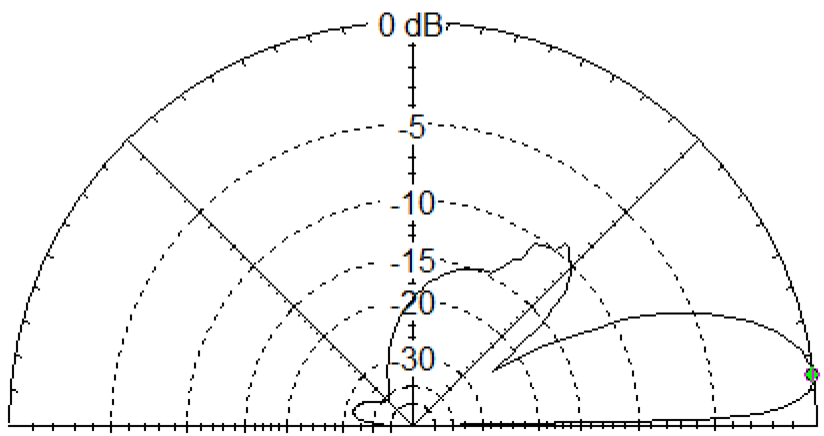
Elevation Plot		Cursor Elev	7.0 deg.
Azimuth Angle	0.0 deg.	Gain	9.36 dBi
Outer Ring	9.36 dBi		0.0 dBmax

Slice Max Gain	9.36 dBi @ Elev Angle = 7.0 deg.
Beamwidth	17.2 deg.; -3dB @ 1.8, 19.0 deg.
Sidelobe Gain	-1.64 dBi @ Elev Angle = 48.0 deg.
Front/Sidelobe	11.0 dB



Freq	24.85 MHz	Source #	1
SWR	**1.14**	Z0	50 ohms
Z	46.24 at -5.7 deg.		
	= 46.02 - j 4.592 ohms		
Refl Coeff	0.06324 at -128.21 deg.		
	= -0.03912 - j 0.04969		
Ret Loss	24.0 dB		

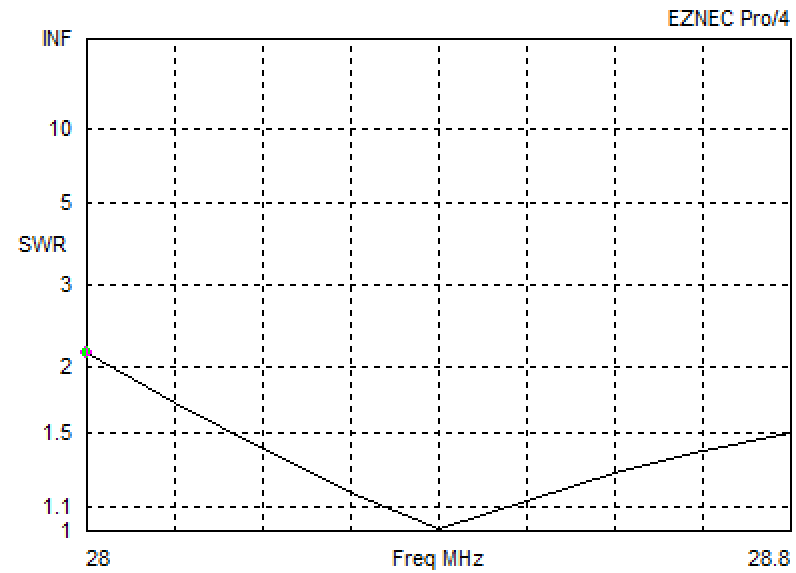
VDA 10m, 3m from shore line



Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 9.15 dBi

Cursor Elev 7.0 deg.
Gain 9.15 dBi
0.0 dBmax

Slice Max Gain 9.15 dBi @ Elev Angle = 7.0 deg.
Beamwidth 16.7 deg.; -3dB @ 1.9, 18.6 deg.
Sidelobe Gain 0.04 dBi @ Elev Angle = 50.0 deg.
Front/Sidelobe 9.11 dB



Freq 28 MHz
SWR **2.13**
Z 41.36 at -38.54 deg.
= 32.35 - j 25.77 ohms
Refl Coeff 0.362 at -107.04 deg.
= -0.1061 - j 0.3461
Ret Loss 8.8 dB

Source # 1
Z0 50 ohms