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

- Reflector
- Driven element
- Cable
- Ground
- Salt water, sea

Distance < \lambda/4

Direction of max radiation
Radiation pattern in vertical plan, 5m from shore line

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

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

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**Total Field**

**EZNEC Pro/4**

![Antenna Gain Chart]

- **Elevation Plot**
  - Azimuth Angle: 0.0 deg.
  - Outer Ring: 4.38 dBi

- **Cursor Elev Gain**
  - 17.0 deg.
  - 4.38 dBi
  - 0.0 dBmax

- **Slice Max Gain**
  - 4.38 dBi @ Elev Angle = 17.0 deg.

- **Beamwidth**
  - 26.3 deg., -3dB @ 6.8, 33.1 deg.

- **Sidelobe Gain**
  - -19.78 dBi @ Elev Angle = 164.0 deg.

- **Front/Sidelobe**
  - 24.16 dB

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

- Seaside installation assumed.
- Antenna on average soil (0.005S and $\varepsilon=13$) but shore line is in front of the antenna, at 5m distance, 1m lower. Water conductivity 2S and $\varepsilon=80$
- Boom 6.4m above the ground
SWR, 20m band

Freq  14 MHz
SWR  1.47
Z  41.91 at -19.25 deg.
   = 39.57 - j 13.82 ohms
Ref. 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
- $R_1=R_2=5054\text{mm}$
  - $R_1+R_2=10108\text{mm}$
- $D_1=D_2=4803\text{mm}$
- $H_1=6400\text{mm}$ (boom level)
- $H_2=50\text{mm}$ (rope point)
- $H_3=12750\text{mm}$ (rope point)
- $S=1750\text{mm}$ (spacing=2$S$)
- $d_R=407\text{mm}$
- $d_D=473\text{mm}$
- $F=\text{feed point}$
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.

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Other bands
VDA 17m, wire Nevada Kevlar 32 D

Dimensions
- \( R1 = R2 = 3923 \text{mm} \)
  - \( R1 + R2 = 7846 \text{mm} \)
- \( D1 = D2 = 3725 \text{mm} \)
- \( H1 = 5100 \text{mm} \)
- \( H2 = 180 \text{mm} \)
- \( H3 = 10020 \text{mm} \)
- \( S = 1340 \text{mm} \)
- \( dR = 308 \text{mm} \)
- \( dD = 362 \text{mm} \)
- \( F = \text{feed point} \)
VDA 15m, wire Nevada Kevlar 32 D

Dimensions
- $R_1 = R_2 = 3347\text{mm}$
  - $R_1 + R_2 = 6694\text{mm}$
- $D_1 = D_2 = 3180\text{mm}$
- $H_1 = 4500\text{mm}$
- $H_2 = 265\text{mm}$
- $H_3 = 8735\text{mm}$
- $S = 1200\text{mm}$
- $dR = 287\text{mm}$
- $dD = 333\text{mm}$
- $F =$ 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

- \( R_1 = R_2 = 2501 \text{mm} \)
  - \( R_1 + R_2 = 5002 \text{mm} \)
- \( D_1 = D_2 = 2369 \text{mm} \)
- \( H_1 = 3500 \text{mm} \)
- \( H_2 = 180 \text{mm} \)
- \( H_3 = 6820 \text{mm} \)
- \( S = 870 \text{mm} \)
- \( d_R = 235 \text{mm} \)
- \( d_D = 270 \text{mm} \)
- \( F = \text{feed point} \)
VDA 17m, 5m from shore line
VDA 15m, 5m from shore line

Total Field

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21.25 MHz

Freq | SWR | Source # 1
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21 MHz | 1.67 | Z
Z | 41.3 at -26.08 deg. = 37.09 - j 18.16 ohms
| Z0 | 50 ohms

Elevation Plot

Azimuth Angle: 0.0 deg.
Outer Ring: 9.39 dBi
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
VDA 12m, 4.2m from shore line

Total Field

EZNEC Pro/4

24.925 MHz

Freq  | 24.85 MHz
SWR   | 1.14
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

Elevation Plot
Azimuth Angle  0.0 deg.
Outer Ring     9.36 dBi

Cursor Elev Gain 7.0 deg.
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

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VDA 10m, 3m from shore line

28.4 MHz

- **Elevation Plot**
  - Azimuth Angle: 0.0 deg.
  - Outer Ring: 9.15 dBi

- **Slice Max Gain**
  - 9.15 dBi @ Elev Angle = 7.0 deg.
  - 0.0 dBmax

- **Beamwidth**
  - 16.7 deg.: -3dB @ 1.9, 18.6 deg.

- **Sidelobe Gain**
  - 0.04 dBi @ Elev Angle = 50.0 deg.
  - 9.11 dB

- **Cursor Elev Gain**
  - 7.0 deg.
  - 9.15 dBi

- **SWR**
  - 2.13

- **Z**
  - 41.36 at -38.54 deg.
  - = 32.35 - j25.77 ohms

- **Reflect Coeff**
  - 0.362 at -107.04 deg.
  - = -0.1061 - j0.3461

- **Ret Loss**
  - 8.8 dB

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