About the antenna type

Terminated veeBeam is a Traveling Wave type antenna with wide frequency range and fair gain on higher frequencies. With narrow apex angles (angle between radiating elements) and suitable mast height veeBeam gives up to 7dBi gain with low takeoff angle (angle respect to ground). VeeBeam suits best for medium to long range communication to fixed direction... it takes time to turn wire beam. VeeBeams are commonly used as tactical directional HF antennas.

Balun

Antenna is fed with open feed line or coaxial/balun. Typical antenna impedance is 600Ω to 900Ω. With this proto we used 1 to 16 balun producing 800Ω output impedance. Balun details on appendix.

Radiators

Radiator wire length should be over one wavelength long at lowest operating frequency. With long wires you get more gain. Antenna works also on lower frequencies, with low SWR, but then the performance drops. In practice it is best to select the wire length according the available space. Normally each radiator length is from 30m up to 150m. With this proto we used 33m wires, each; proto works best on 14 MHz and up.

Terminators

Radiator's far ends are connected to ground with low-inductance resistors. With this proto we used a pair of 400Ω/60W resistors. The terminators should handle about 30% of transmitter power and must be cooled properly. With proto's 800Ω antenna impedance the ground electrodes may be rather simple; we even tested the SWR with 1m long copper rods (glay ground). On dry grounds it may also need to use counterpoise wires, directly below the radiators.

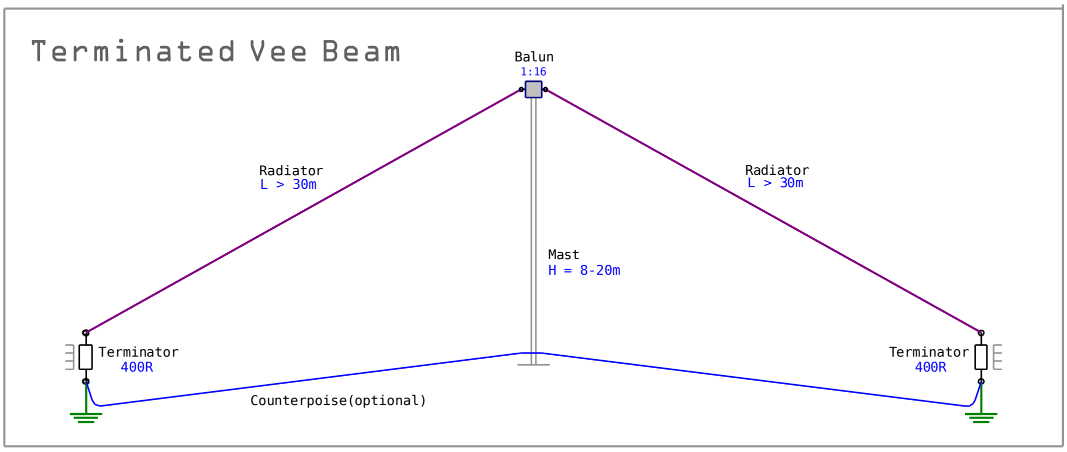
Radiation beam

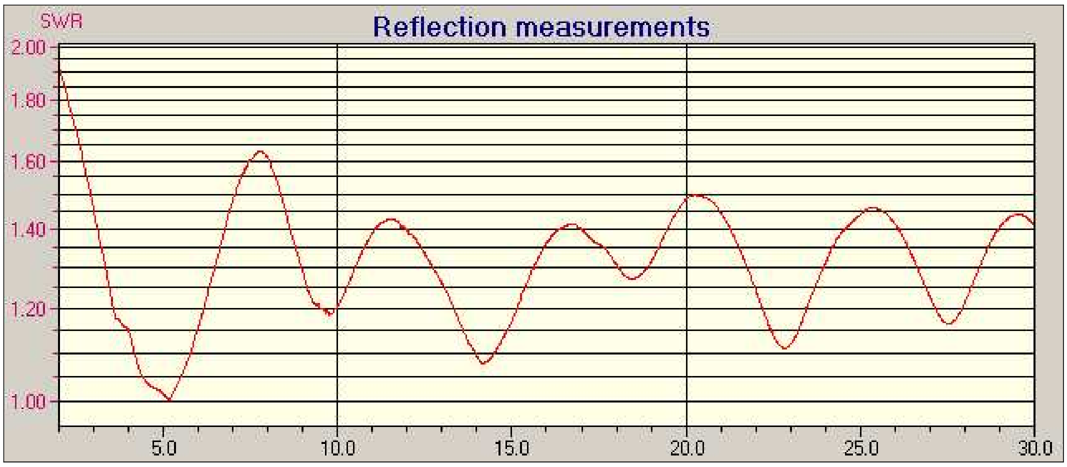
You can fine-tune the antenna properties by adjusting mast height, apex angle and radiator length.
The mast height should be between 8 to 20 meters; this affects to takeoff angle on higher frequencies. With proto we used 9 meters, which seems to be too low.
The apex angle affects to horizontal beam width. With small angles the horizontal beam is narrow. Typical angles are from 40° to 90°. With 180° apex angle you get omnidirectional pattern, similar to inverted V dipole with NVIS properties.
Usually it's best to use some simulation program, like NEC. At the appendix there are simulations of this proto; these simulations use average ground type.

Proto antenna properties

Frequency range	2 to 30MHz, optimized for 14 to 30MHz.
VSWR	1.0 to 1.9 full range, 1.3 typical
Power	60W carrier, 200W SSB/CW
Gain	0 to 5.3dBi @ 14 to 30MHz
Efficiency	30 to 48% @ 4 to 50MHz
Radiator length	L=33m, each
Mast heigth	H=9m
Apex angle	80°
Balun	1:16, 50:800Ω
Terminator	400Ω, each

MHz	Efficiency	Takeoff	Gain
4	31%	57°	-9,0 dBi
10	47%	35°	-0,4 dBi
20	48%	20°	3,7 dBi
30	48%	16°	5,3 dBi

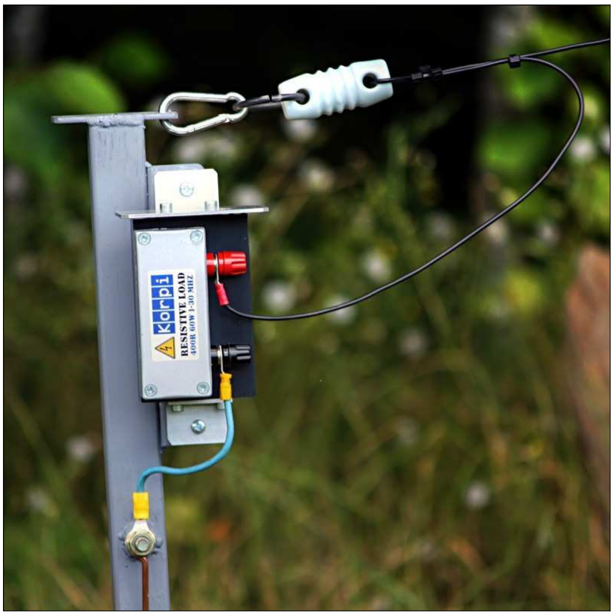




Triple coil Balun, 50Ω to 800Ω , documents on appendix

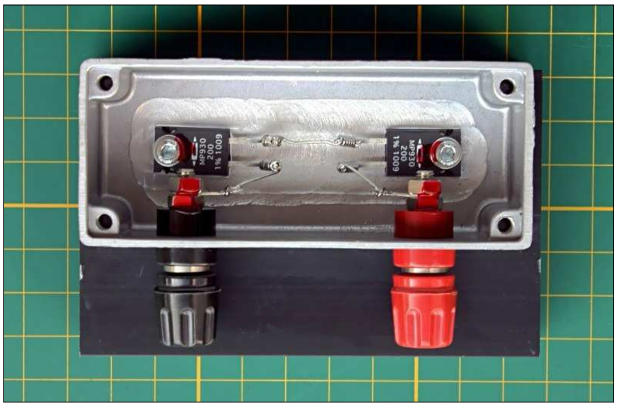
Nylon insulators were used to insulate the box from support pole.

Balun box in 9 meters height, apex angle 80°



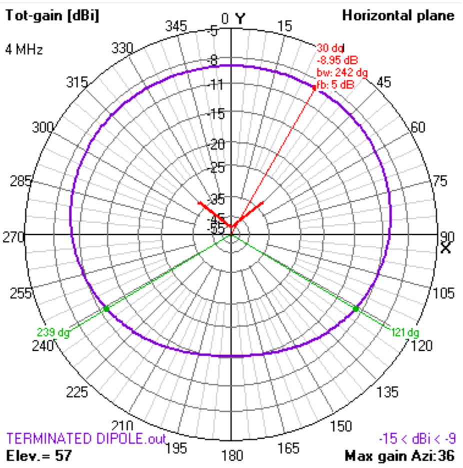
Terminator box is assembled into support pole, 1m above ground surface (above snow level). For grounding we used some meters of 16mm^2 copper wire buried 1m deep into the clay ground. The radiator wire is stranded 1,5mm^2 equipment wire with PVC insulation. Notice that the RF voltage on 800Ω line is near 2kV with 100W carrier power.

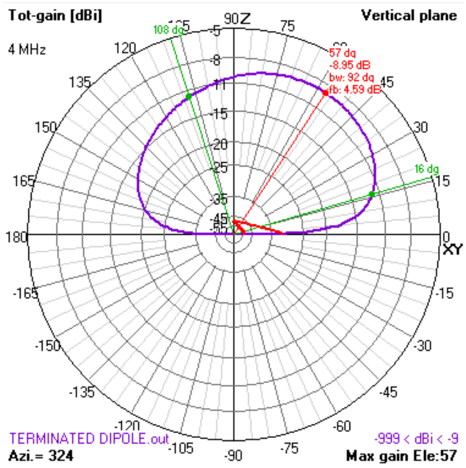
Terminator

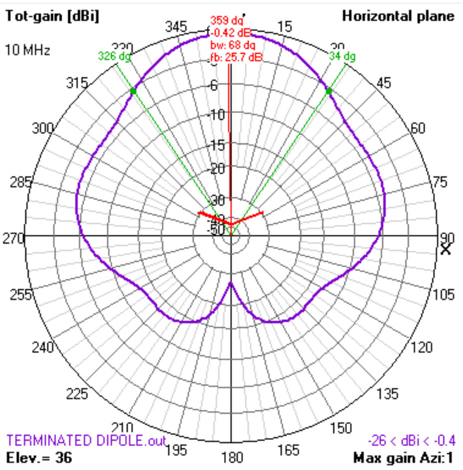


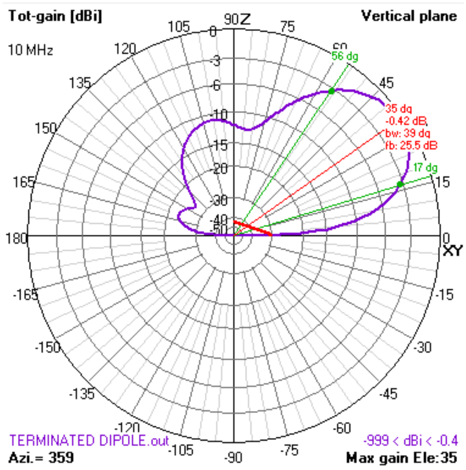
Resistors 2 x 200Ω fitted serial into Al box and heatsink of 2.5K/W. Thick film resistor type is **Caddock MP930-200Ω**.
Resistors are able to handle about 15W carrier power, each, so that resistor enclosures are below safe temperature of 100°. This means about 200W TX power used with normally compressed SSB or CW.

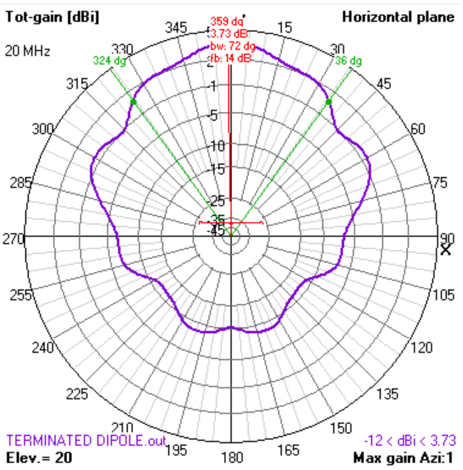
VeeBeam

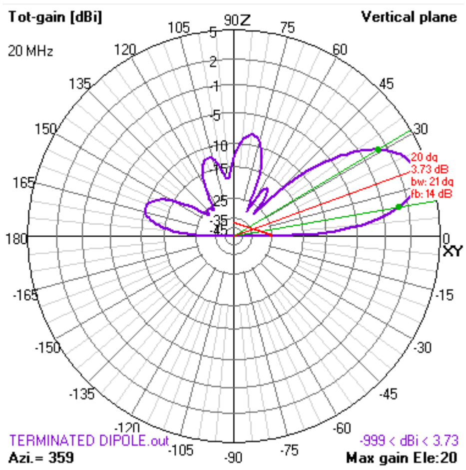

Tot-gain [dBi]
Horizontal plane
4 MHz
30 dg
-8.95 dB
bw: 242 dg
fb: 5 dB
239 dg
121 dg
TERMINATED DIPOLE.out
-15 < dBi < -9
Elev.= 57
Max gain Azi:36

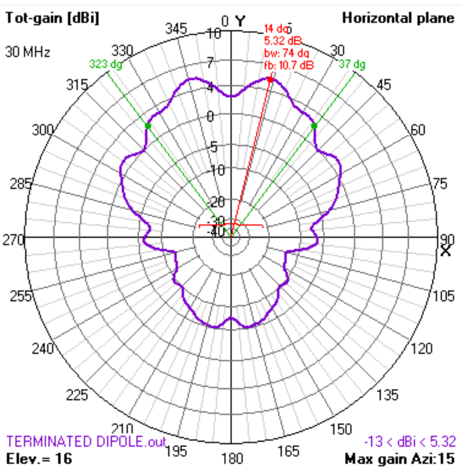

Tot-gain [dBi]
Vertical plane
4 MHz
108 dg
57 dg
-8.95 dB
bw: 92 dg
fb: 4.59 dB
16 dg
TERMINATED DIPOLE.out
-999 < dBi < -9
Azi.= 324
Max gain Ele:57

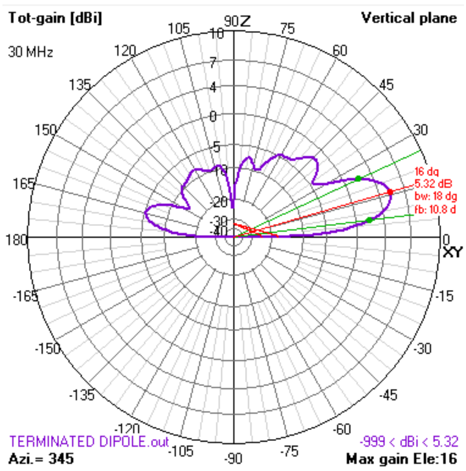

Tot-gain [dBi]
Horizontal plane
10 MHz
359 dg
-0.42 dB
bw: 68 dg
fb: 25.7 dB
326 dg
34 dg
TERMINATED DIPOLE.out
-26 < dBi < -0.4
Elev.= 36
Max gain Azi:1


Tot-gain [dBi]
Vertical plane
10 MHz
56 dg
35 dg
-0.42 dB
bw: 39 dg
fb: 25.5 dB
17 dg
TERMINATED DIPOLE.out
-999 < dBi < -0.4
Azi.= 359
Max gain Ele:35


Tot-gain [dBi]
Horizontal plane
20 MHz
359 dg
3.73 dB
bw: 72 dg
fb: 14 dB
324 dg
36 dg
TERMINATED DIPOLE.out
-12 < dBi < 3.73
Elev.= 20
Max gain Azi:1


Tot-gain [dBi]
Vertical plane
20 MHz
20 dg
3.73 dB
bw: 21 dg
fb: 14 dB
TERMINATED DIPOLE.out
-999 < dBi < 3.73
Azi.= 359
Max gain Ele:20


Tot-gain [dBi]
Horizontal plane
30 MHz
14 dg
5.32 dB
bw: 74 dg
fb: 10.7 dB
323 dg
37 dg
TERMINATED DIPOLE.out
-13 < dBi < 5.32
Elev.= 16
Max gain Azi:15


Tot-gain [dBi]
Vertical plane
30 MHz
16 dg
5.32 dB
bw: 18 dg
fb: 10.8 d
TERMINATED DIPOLE.out
-999 < dBi < 5.32
Azi.= 345
Max gain Ele:16