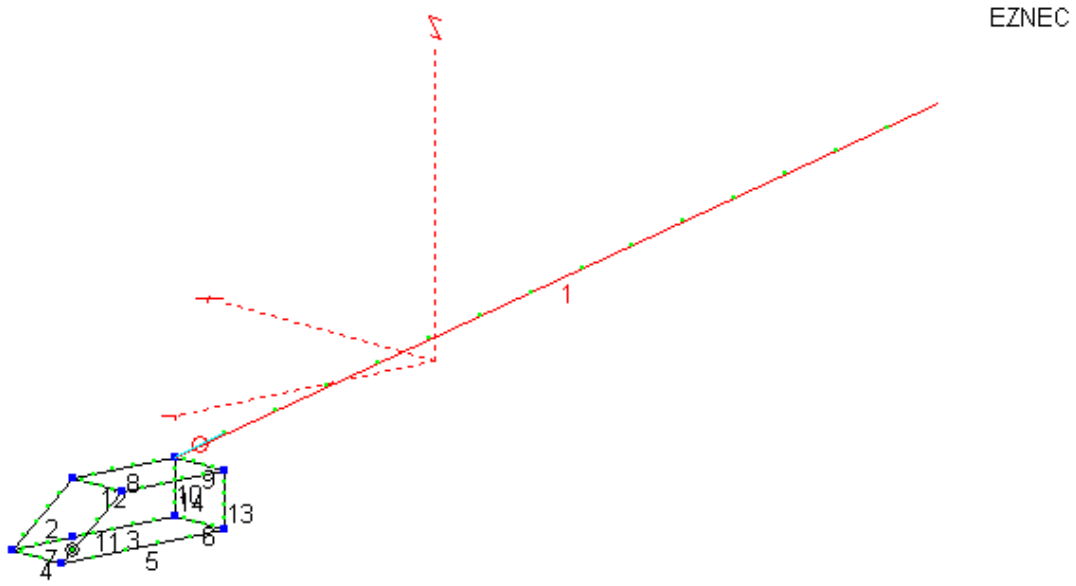
Long Wire Antenna on SUV, Pickup or Minivan

The following is an analysis using EZNEC. As a general disclaimer, the results of a modeled antenna are never perfect. The model will give a pretty good feel for antenna performance, but actual results will probably vary from the output of the model.

General

The goal is a temporary (not mobile) antenna mounted on a medium sized vehicle. The far end of the long wire might be suspended from a tree or a fiberglass pole. Wire 1 is 76' long and the far end is about 20' above ground. The feed point is located at the bottom of wire "1", shown by the red dot:



The analysis on the following pages includes the 3 dimensional plots, the SWR and feed point impedances and maximum gain azimuth plot. Average ground conditions are modeled.

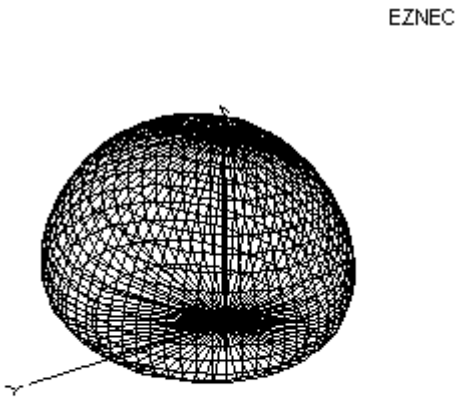
Conclusion:

On the lower frequency bands, 80, 60 and 40 meters this antenna is an NVIS (near vertical incidence skywave) antenna, best for short-range operation and may be a good performer for emergency communications. On the higher bands there are significant lobes, some with moderate gain, but the takeoff angles are still fairly high.

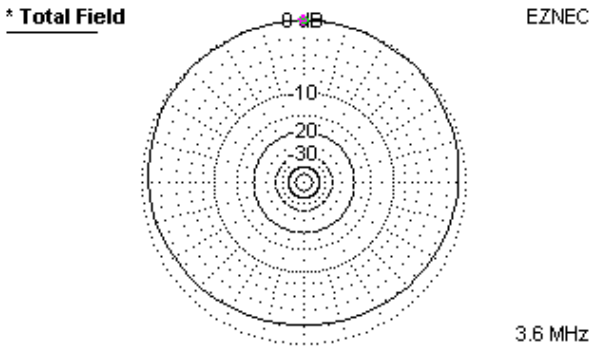
This is a random wire antenna and is not resonant on any amateur band. A suitable tuner or matching network is required. A 9:1 impedance transformer may be beneficial on bands above 80 meters.

Performance at 80 Meters (3.6 MHz)

3D Plot:



Maximum Gain Plot (70 degrees elevation):



Azimuth Plot		Cursor Az	90.0 deg.
Elevation Angle	70.0 deg.	Gain	6.68 dBi
Outer Ring	6.68 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	6.68 dBi		
Slice Max Gain	6.68 dBi @ Az Angle = 95.0 deg.		
Front/Back	2.1 dB		
Beamwidth	?		
Sidelobe Gain	< -100 dBi		
Front/Sidelobe	> 100 dB		

SWR and Feed Point Impedance:

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Long Wire on SUV 1/31/2007
12:31:03 PM

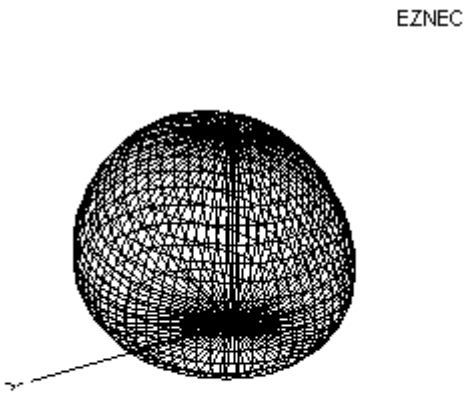
---------- SOURCE DATA ----------

Frequency = 3.6 MHz

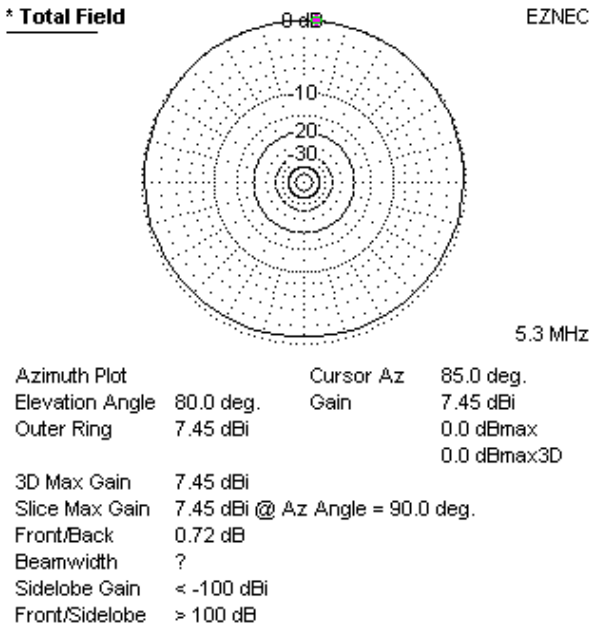
Source 1 Voltage = 15.03 V. at -70.85 deg.
Current = 1 A. at 0.0 deg.
Impedance = 4.93 - J 14.19 ohms
Power = 4.93 watts
SWR (50 ohm system) = 10.967
(450 ohm system) = 91.369

Performance at 60 Meters (5.3 MHz):

3D Plot:



Maximum Gain Plot (80 Degrees Elevation):



Azimuth Plot		Cursor Az	85.0 deg.
Elevation Angle	80.0 deg.	Gain	7.45 dBi
Outer Ring	7.45 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	7.45 dBi		
Slice Max Gain	7.45 dBi @ Az Angle = 90.0 deg.		
Front/Back	0.72 dB		
Beamwidth	?		
Sidelobe Gain	< -100 dBi		
Front/Sidelobe	> 100 dB		

SWR and Feed Point Impedance:

EZNEC ver. 4.0

Long Wire on SUV 1/31/2007
1:34:09 PM

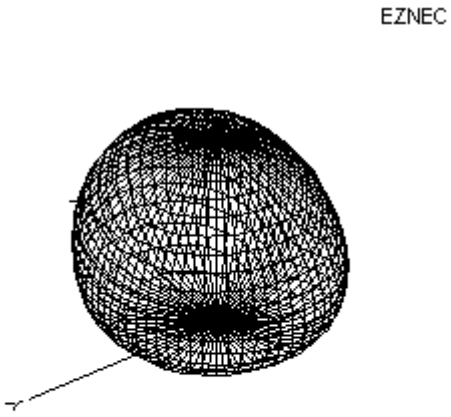
---------- SOURCE DATA ----------

Frequency = 5.3 MHz

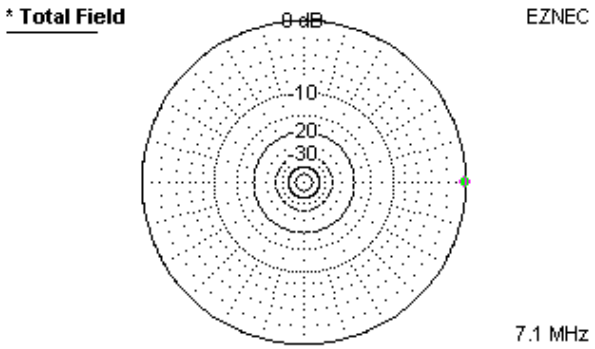
Source 1 Voltage = 768.1 V. at 86.51 deg.
Current = 1 A. at 0.0 deg.
Impedance = 46.72 + J 766.7 ohms
Power = 46.72 watts
SWR (50 ohm system) > 100
(450 ohm system) = 37.667

Performance at 40 Meters (7.1 MHz):

3D Plot:



Maximum Gain Plot (90 Degrees Elevation):



Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	90.0 deg.	Gain	7.34 dBi
Outer Ring	7.34 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	7.34 dBi		
Slice Max Gain	7.34 dBi @ Az Angle = 0.0 deg.		
Front/Side	0.0 dB		
Beamwidth	?		
Sidelobe Gain	< -100 dBi		
Front/Sidelobe	> 100 dB		

SWR and Feed Point Impedance:

EZNEC ver. 4.0

Long Wire on SUV 1/31/2007
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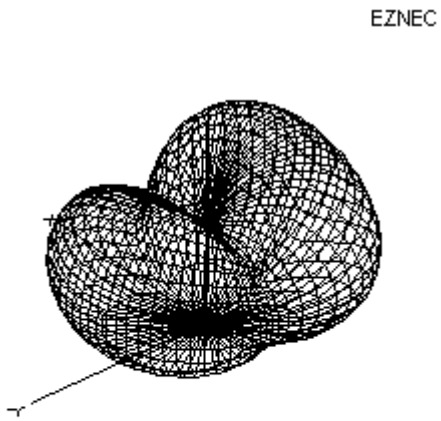
---------- SOURCE DATA ----------

Frequency = 7.1 MHz

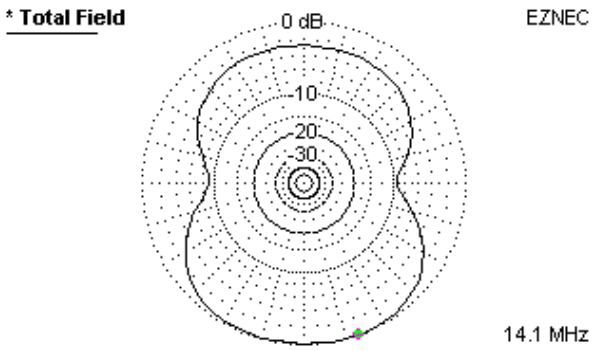
Source 1 Voltage = 1648 V. at -81.78 deg.
Current = 1 A. at 0.0 deg.
Impedance = 235.8 - J 1631 ohms
Power = 235.8 watts
SWR (50 ohm system) > 100
(450 ohm system) = 27.479

Performance at 20 Meters (14.1 MHz):

3D Plot:



Maximum Gain Plot (55 Degrees Elevation):



Azimuth Plot		Cursor Az	290.0 deg.
Elevation Angle	55.0 deg.	Gain	6.65 dBi
Outer Ring	6.65 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	6.65 dBi		
Slice Max Gain	6.65 dBi @ Az Angle = 290.0 deg.		
Front/Back	2.68 dB		
Beamwidth	122.6 deg.; -3dB @ 209.1, 331.7 deg.		
Sidelobe Gain	3.97 dBi @ Az Angle = 105.0 deg.		
Front/Sidelobe	2.68 dB		

SWR and Feed Point Impedance:

EZNEC ver. 4.0

Long Wire on SUV 1/31/2007
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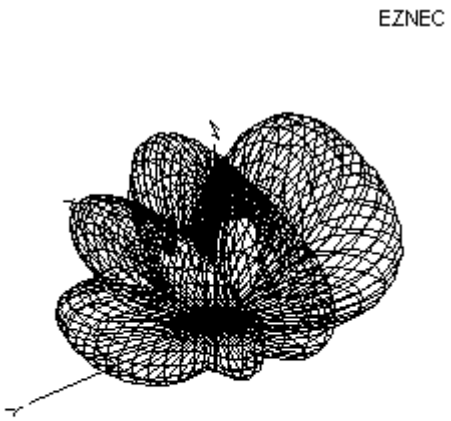
---------- SOURCE DATA ----------

Frequency = 14.1 MHz

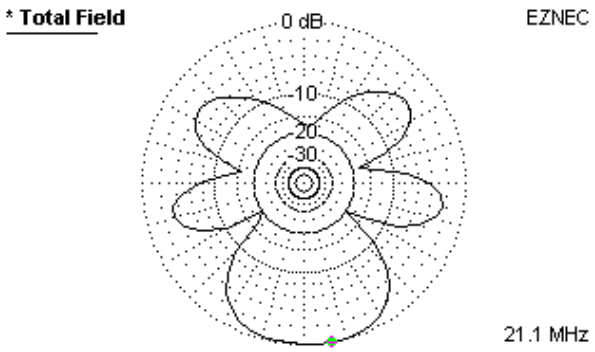
Source 1 Voltage = 849.5 V. at -72.43 deg.
Current = 1 A. at 0.0 deg.
Impedance = 256.5 - J 809.8 ohms
Power = 256.5 watts
SWR (50 ohm system) = 56.442
(450 ohm system) = 7.879

Performance at 15 Meters (21.1 MHz):

3D Plot:



Maximum Gain Plot (45 Degrees Elevation):



Azimuth Plot		Cursor Az	280.0 deg.
Elevation Angle	45.0 deg.	Gain	8.63 dBi
Outer Ring	8.63 dBi		0.0 dBmax
			0.0 dBmax3D

3D Max Gain	8.63 dBi
Slice Max Gain	8.63 dBi @ Az Angle = 280.0 deg.
Front/Back	14.93 dB
Beamwidth	73.2 deg.; -3dB @ 235.4, 308.6 deg.
Sidelobe Gain	6.2 dBi @ Az Angle = 350.0 deg.
Front/Sidelobe	2.44 dB

SWR and Feed Point Impedance:

EZNEC ver. 4.0

Long Wire on SUV 1/31/2007
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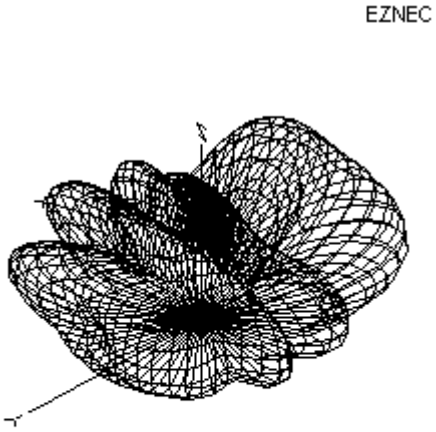
---------- SOURCE DATA ----------

Frequency = 21.1 MHz

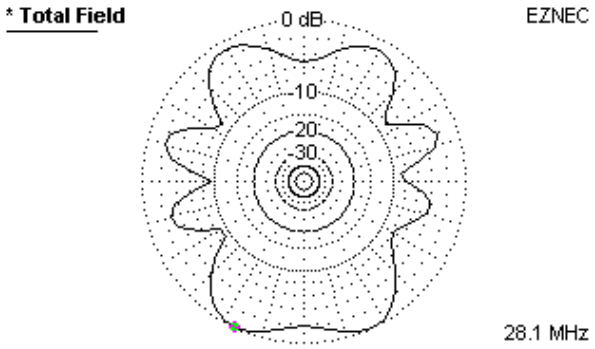
Source 1 Voltage = 417.2 V. at -49.6 deg.
Current = 1 A. at 0.0 deg.
Impedance = 270.4 - J 317.8 ohms
Power = 270.4 watts
SWR (50 ohm system) = 12.984
(450 ohm system) = 2.728

Performance at 10 Meters (28.1 MHz):

3D Plot:



Maximum Gain Plot (30 Degrees Elevation):



Azimuth Plot		Cursor Az	245.0 deg.
Elevation Angle	30.0 deg.	Gain	6.42 dBi
Outer Ring	6.42 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	6.42 dBi		
Slice Max Gain	6.42 dBi @ Az Angle = 245.0 deg.		
Front/Back	1.5 dB		
Beamwidth	85.7 deg.; -3dB @ 226.8, 312.5 deg.		
Sidelobe Gain	6.39 dBi @ Az Angle = 295.0 deg.		
Front/Sidelobe	0.03 dB		

SWR and Feed Point Impedance:

EZNEC ver. 4.0

Long Wire on SUV 1/31/2007
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---------- SOURCE DATA ----------

Frequency = 28.1 MHz

Source 1 Voltage = 349.9 V. at -58.37 deg.
Current = 1 A. at 0.0 deg.
Impedance = 183.5 - J 297.9 ohms
Power = 183.5 watts
SWR (50 ohm system) = 13.545
(450 ohm system) = 3.662