November 2021 R0

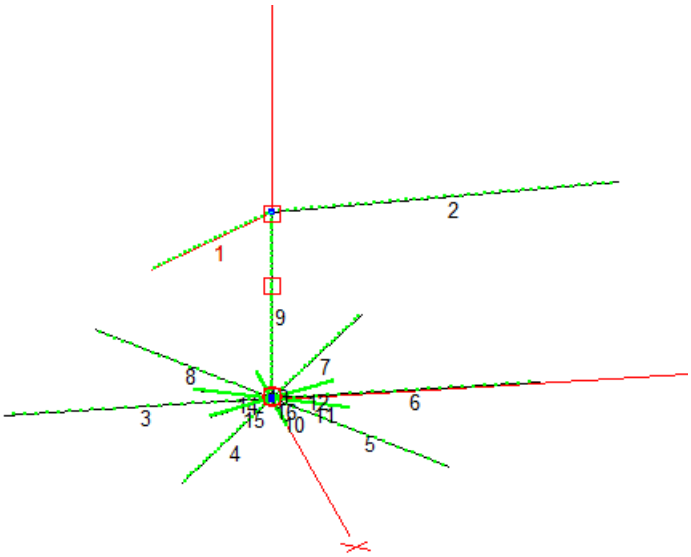
160M antenna improvements

I have some experience with an 80M OCF dipole antenna converted to a flattop Marconi [i] and worked against a set of inadequate radials from a suburban Halifax, Nova Scotia location, previous to my move to a new QTH in rural Nova Scotia. The Halifax location overlooks salt water and the Atlantic Ocean.

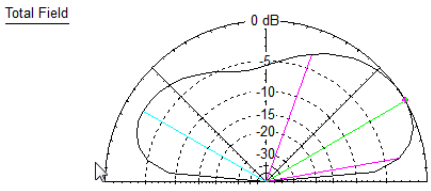
This antenna is surprisingly effective at working on 160M. Mostly used with CW and power, this antenna has sizable ground losses. The radial field is a hodge podge of around 10 random wires laying on the ground, between 30 and 60 feet long. The flat top OCF wire is at 50 feet.

It works fairly well, and favours the NE direction and Europe over the West. Western USA and Western Canada QSO's are rare.

Here is an EZNEC model of this antenna:



1. Length = 130 feet
2. Height = 50 feet at feed point
3. Gain lobe is towards short end of OCF wire
4. Radials modelled 4 inches from poor (rocky) MiniNec ground.
5. LC match located at feed point near ground



Elevation Plot		Cursor Elev	30.0 deg.
Azimuth Angle	270.0 deg.	Gain	-1.56 dBi
Outer Ring	-1.56 dBi		0.0 dBmax
			0.0 dBmax3D
3D Max Gain	-1.56 dBi		
Slice Max Gain	-1.56 dBi @ Elev Angle = 30.0 deg.		
Beamwidth	60.1 deg.; -3dB @ 9.9, 70.0 deg.		
Sidelobe Gain	-3.8 dBi @ Elev Angle = 150.0 deg.		
Front/Sidelobe	2.24 dB		

In 2018, I moved to a rural location on a lake [ii]. The new location is not close to the Atlantic Ocean and is closer to the center of the province. The OCF dipole was erected as

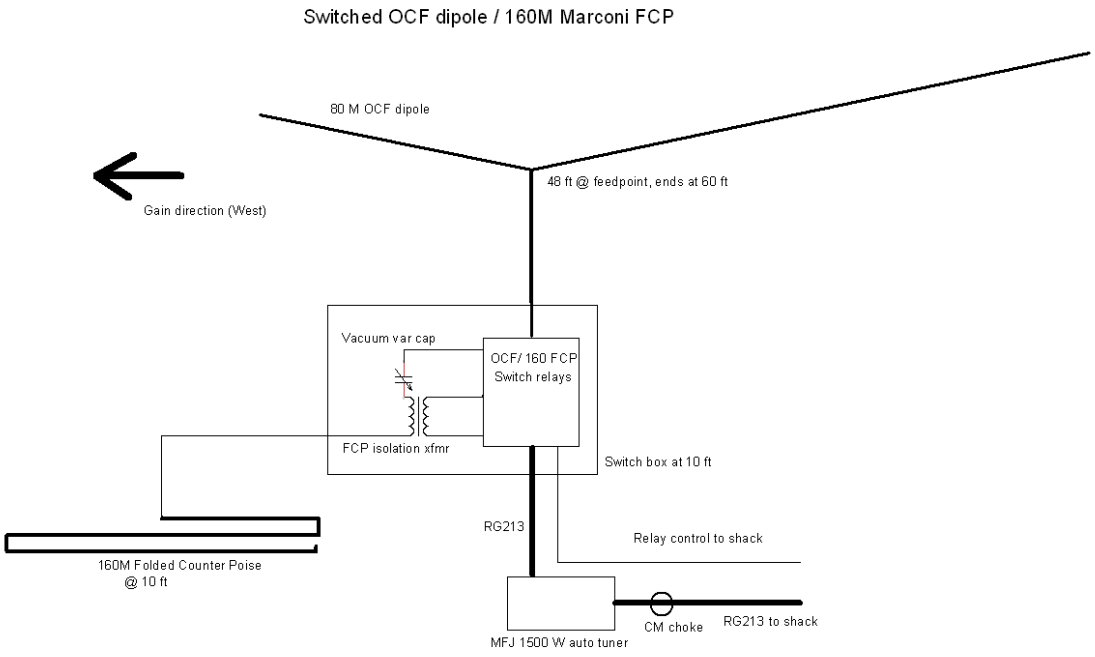
it was at the old QTH, but with slightly less elevation, and the forward lobe aimed to the West. Again, this antenna worked OK and I left it alone until this year.

2021 Upgrades

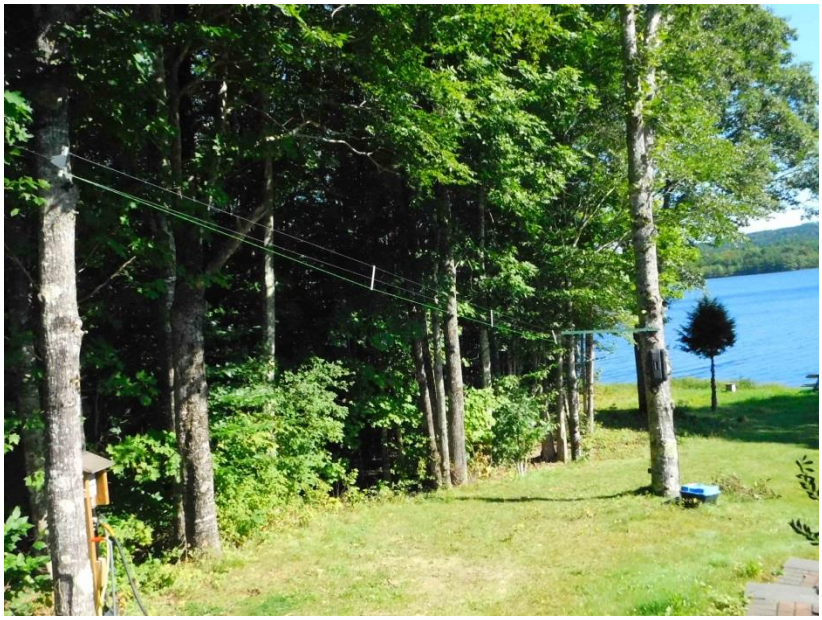
Having some space available at this new location has allowed me to build and upgrade some of my antennas for HF use. It is time for 160M upgrades.

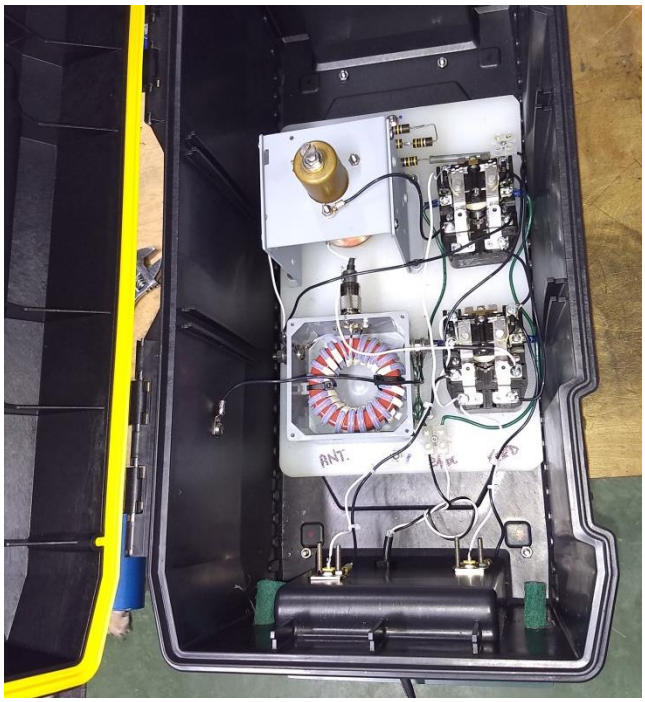
VA1RST installed the 160M Folded Counter Poise (FCP) [iii] on his inverted L. It previously worked against a limited radial field. Like many others, VA1RST reports substantial improvements in his signal. His L favours the NE direction from Halifax.

I decided to build an FCP, having a particularly convenient setup to do so. The K2AV instructions recommend 10 feet elevation for the FCP. I use my OCF dipole on 80M and up when not in Marconi flat top mode. I chose to build a new switch box mounted on my main OCF support (an oak tree) to allow easily switching between 160 Marconi mode with the FCP, and regular OCF dipole mode. The switch box is mounted at the same height as the FCP. At ground level, below this box is an MFJ high power auto tuner device.



The vacuum variable helps bring the impedance of the flat top OCF closer to 50 ohms. A 4:1 SWR is available at the output coax. The auto tuner matches this to the shack coax. There is a static bleeder network at the top of the match box.



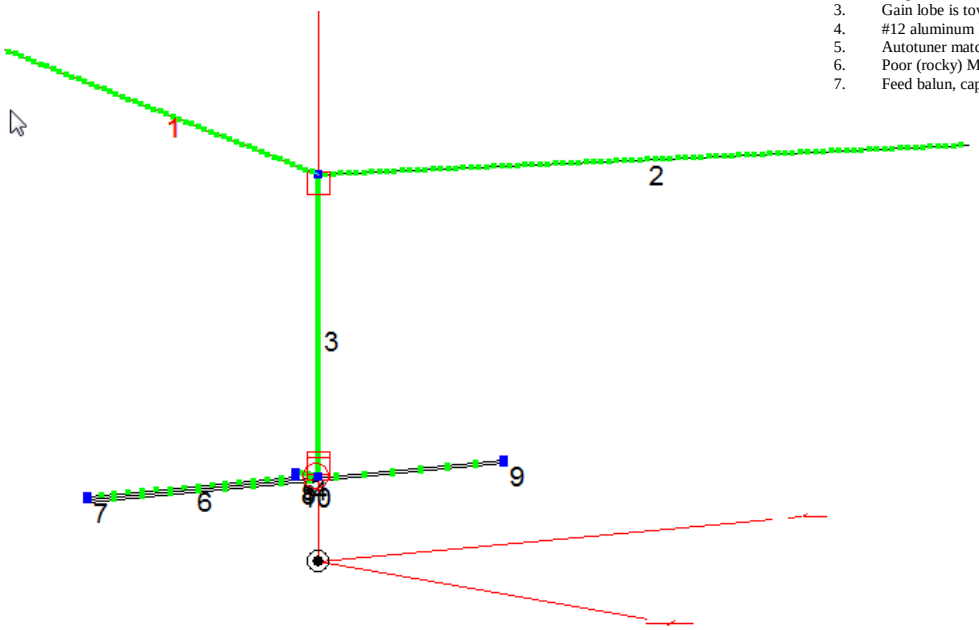


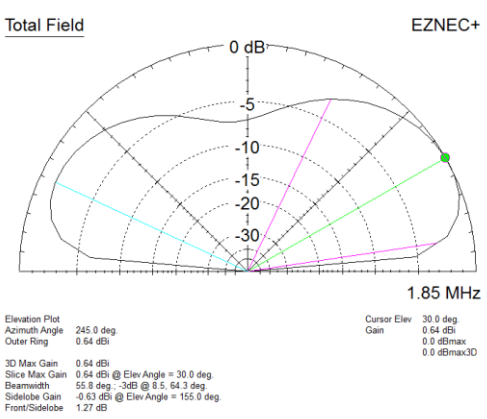
Mk1 and MK II FCP

K2AV recommends #12 copper for the FCP. I could not easily locate any #12 copper at the time of building, but I could find #12 aluminum wire.

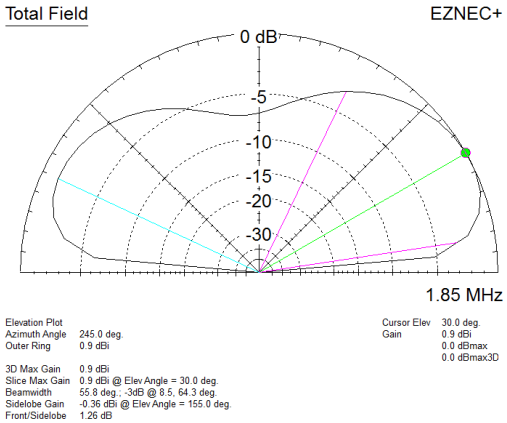
I modelled the FCP setup with aluminum and copper wire and noticed there was only a .3 dB difference in radiation from the antenna, using the identical ground conditions as my original EZNEC model. I built one with aluminum and trialled it. At same time I ordered #12 hard drawn copper wire for a MKII comparison.

1. Length = 130 feet
2. Height = 48 feet at feed point
3. Gain lobe is towards short end of OCF wire
4. #12 aluminum FCP
5. Autotuner match located at feed point near ground
6. Poor (rocky) MiniNec ground
7. Feed balun, capacitor and FCP transformer included





MK I: Aluminum wire in model



MK II: Copper wire in model

Note the model suggests very little difference in radiation with all copper or all aluminum.

The MK I aluminum counterpoise works quite well. I used the Reverse Beacon Network (RBN) for many tests. SW and W directions are favoured and the RBN testing reveals improved signal strength at the beacons compared to the previous ground radial version.

The MKII version is an all copper FCP, and the RBN testing reveals exactly the same signal strengths at the same beacon. From these results, it appears aluminum is OK to use if copper is hard to obtain. Note, all testing is at 800 watts from the rig.

HD8R (Galapogos Island expedition) on 160M answered first call. However, Europe and the NE direction are still a problem.

The Stew Perry warm up event also shows improvement to the West, compared to the pre FCP antenna.

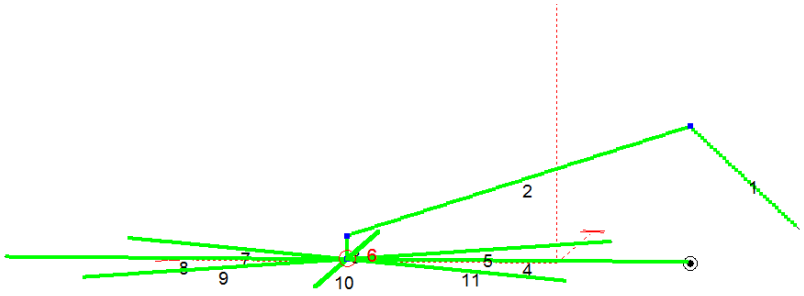
Another 160M antenna needed for NE direction.

DX to Europe is a desire for me. But I do not want to lose the utility of the OCF dipole when not using the Marconi 160 mode. I do have a 38 ft wooden mast in another area of the property with an unused halyard. Could an inverted L or some sort of sloper be used to gain an advantage over the OCF/Marconi antenna to the NE ?

After a lot of modelling experimenting, I decided there was a suitable antenna that shows promise for gain the NE direction. This is a L/sloper configuration, but the far end is not grounded, and the gain end is terminated in a short mast insulated from the ground. The short mast, in this case a 2" piece of aluminum pipe, is important to the model. I have assembled this antenna in an area that has tractor traffic in the nice weather. Since I am willing to confine the use of this antenna to the fall and winter months, I am willing to roll up radials and the transmission line during the spring and summer.

The antenna consists of a 6 ft piece of aluminum pipe, a 100 ft and a 38 ft #14 sloper wire and 9 radials lying on the grass consisting of 4 x 95 foot wires and 5 x 60 foot wires. The antenna is not connected to a ground rod, but a lightning arrestor is connected to the antenna and a pair of ground rods at the pipe section. The pipe section is insulated on a glass wine bottle support.

A suitable LC match is contained in a box at the base.

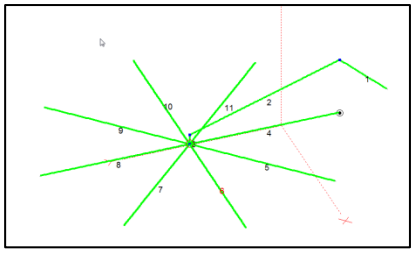


1. Length = 138 feet
2. Height = 38 feet at mast
3. Gain lobe is towards short mast
4. #14 wire
5. LC match located at feed point near ground
6. Poor (rocky) MiniNec ground
7. 9 radials lying on ground. (modelled at 6" height)

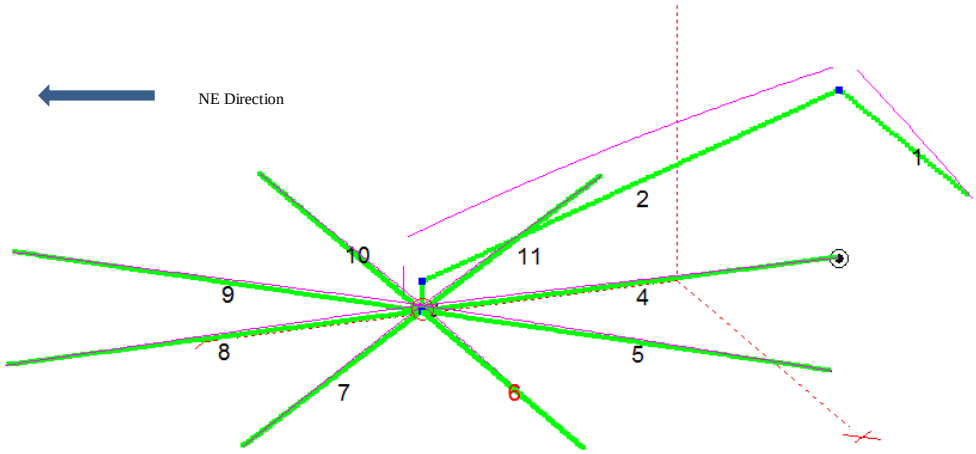
The EZNEC model:

LC match at base

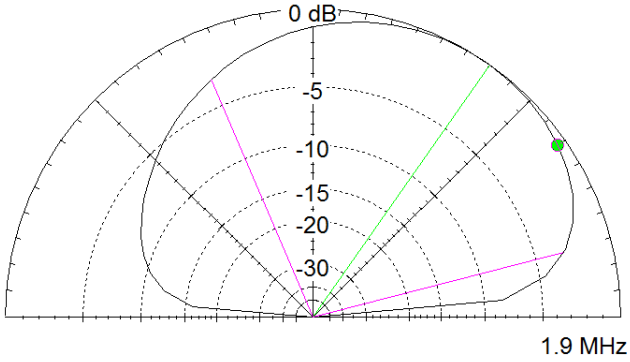
Radial view



Model with current distribution



Total Field EZNEC+



1.9 MHz

NE Direction

Elevation Plot	
Azimuth Angle	90.0 deg.
Outer Ring	5.72 dBi
3D Max Gain	5.72 dBi
Slice Max Gain	5.72 dBi @ Elev Angle = 55.0 deg.
Beamwidth	98.8 deg.; -3dB @ 14.4, 113.2 deg.
Sidelobe Gain	< -100 dBi
Front/Sidelobe	> 100 dB

Cursor Elev	35.0 deg.
Gain	5.25 dBi
	-0.47 dBmax
	-0.47 dBmax3D

Testing:

RBN and on the air testing confirms this antenna favours the NE direction. Eu QSO's have been made easily. RBN tests show approx. 5 to 6 dB lower signal strengths to the SW and West compared to the FCP flat top OCF. The EU direction readings with the L sloper were not indicated at all with the FCP OCF Marconi.

What does it all mean ?

I like the results with the switched Marconi mode of the OCF dipole. There is clearly a quantifiable gain in output with the FCP to the West of my QTH.. And the low sloper-L mode antenna with radials, even with it's attendant ground losses is a good antenna to solve my need for an antenna looking to the NE direction at this QTH.

There would be an advantage to having an FCP for this second antenna as well, but since the field location is used for other purposes during the growing season, the roll up radial version is a workable compromise.

Aluminum can be substituted for the FCP if you can't easily locate suitable copper.

Fairly simple, and low lying L antennas can still be effective on 160 M

I am looking forward to the ARRL 160 contest in December to give both of these antennas a better evaluation

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[i] *The Allure of Top Band… and Doing Something About It ! Or.. the Birth of the "WindoVert" :* http://www.ve1zac.com/The%20Allure%20of%20Top%20Band.htm

[ii] *A New QTH, and a New Loop Array at VE1ZAC / VE1ZU* http://www.ve1zac.com/A%20New%20QTH%20and%20Loop%20Array%20at%20VE1ZAC%20Aug%2023%202020.pdf

[iii] *Original FCP construction article and notes, updated.* https://k2av.com/