Potable Vertical Moxon for 14 MHz

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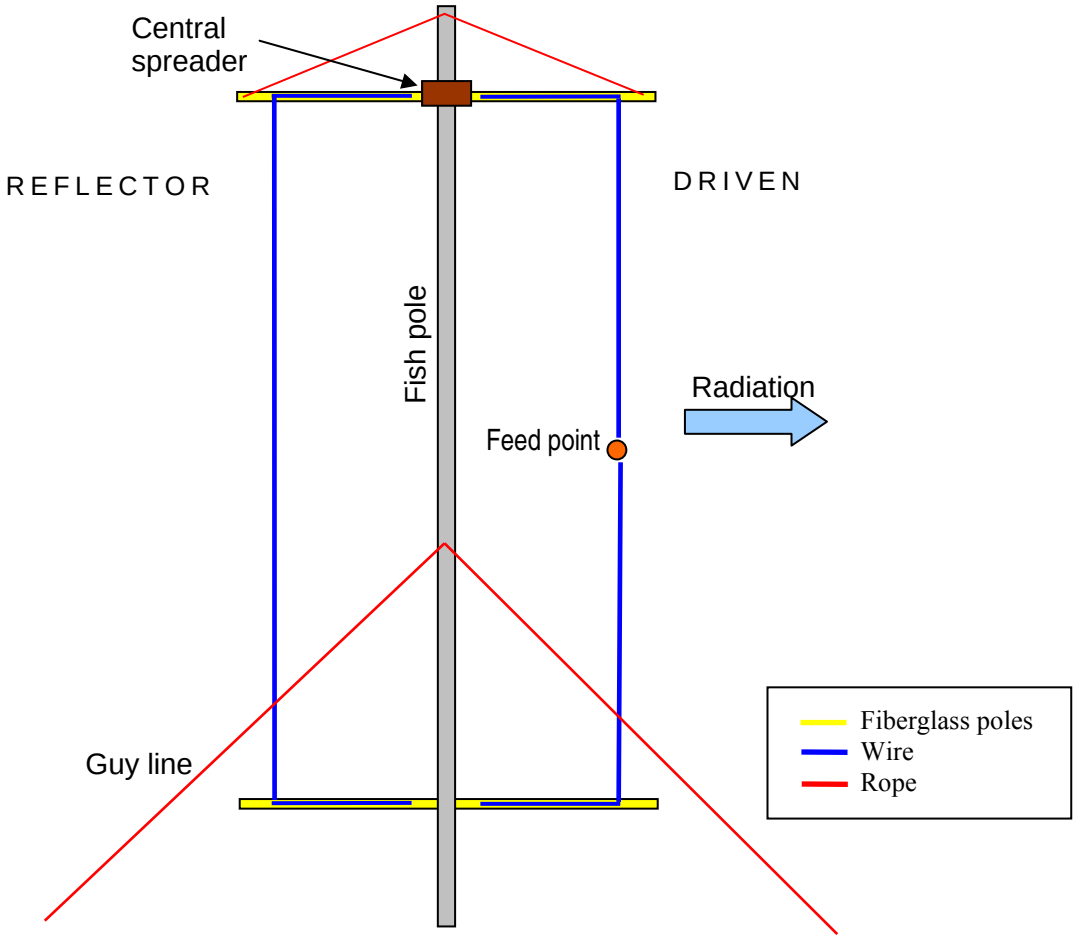
Introduction

Since I found the Moxon design on the web, I've prepared several of them with wire and simple fiberglass poles. Its results were always very good.
The ones I did before were for the upper portion of HF. Then I asked myself if I could build one for 20m band. Its overall length were a problem to consider putting up one horizontal supported by a weak fishing rod for portable operation.

Looking again through the web I found an alternative design using two fishing poles to hang the Moxon in a vertical configuration. I considered that a little tricky to keep them well separated and stable, and its erection would be as well complicated.
Then I thought, what if I can hang it with only one pole?
The following is the result of some experimentation that convinced me that Vertical Moxon is a feasible option, with some reduction of performance but yet very effective.

Scheme

This is how my Vertical Moxon looks like: (2,8m x 7,7 m):



Two are the key points making this antenna robust enough:

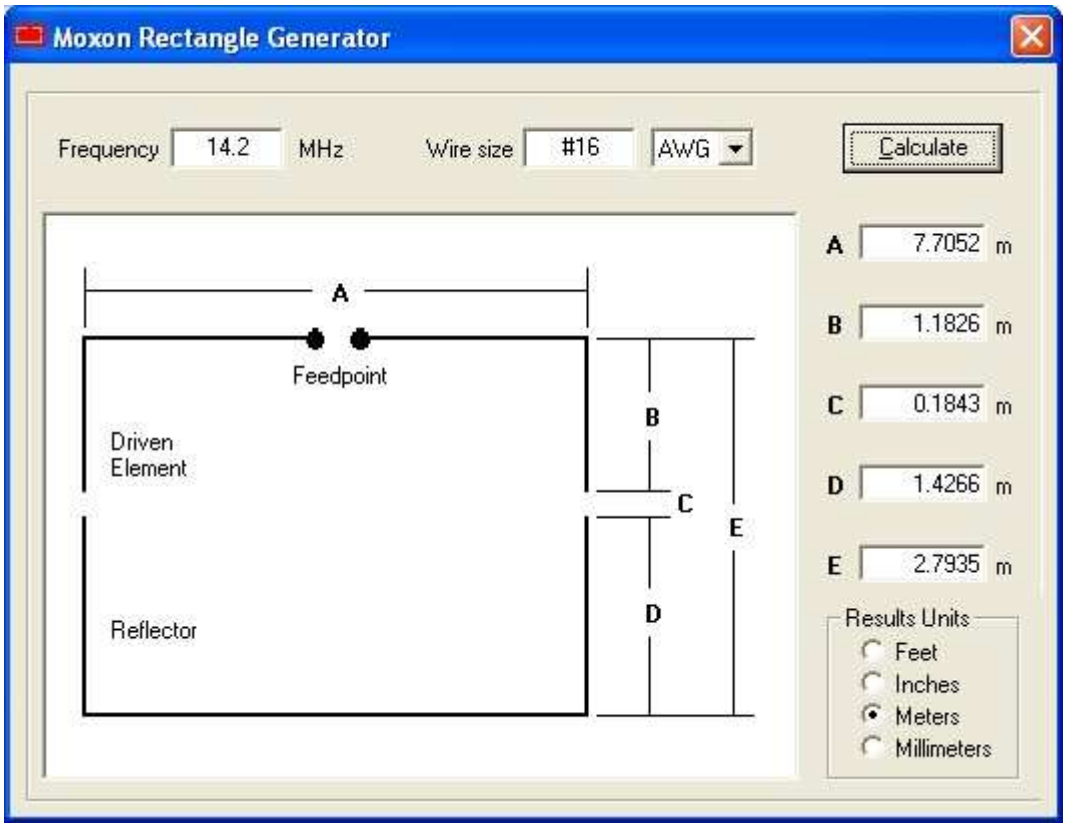
a) The upper part will support the Moxon. Therefore its necessary to add some guy lines to secure this fiberglass pole.

b) Its also mandatory having a central fishing pole support with guy lines to avoid excessive bent.

Dimensions

I used "MOXGEN" software from W4RNL (http://www.ac6la.com/moxgen.html).

The complete band ranges 14 to 14,35 MHz. SSB most common frequency is around 14.200, I used that as the center frequency to get the wire dimension.



Material listing

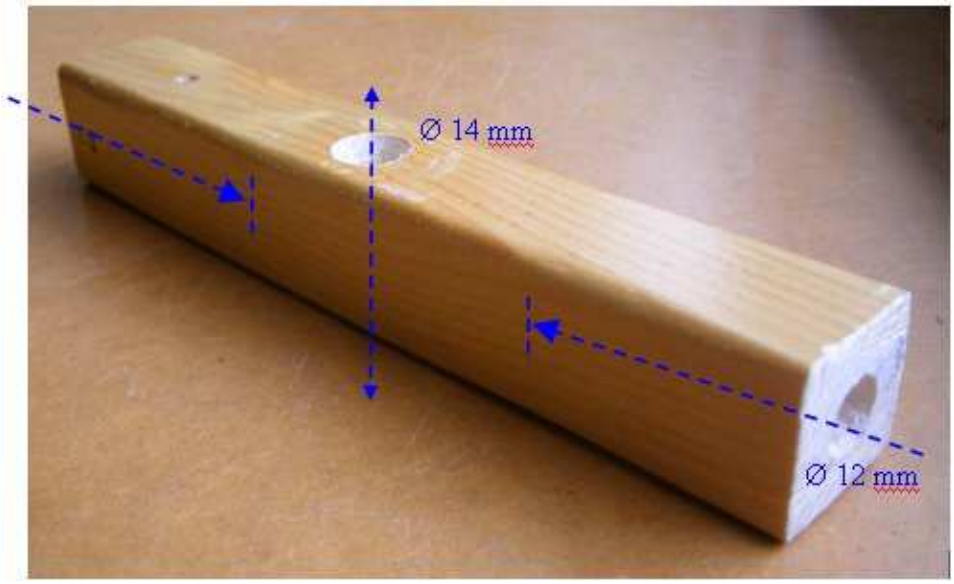
This is what I need:

- Fiberglass poles (used for kites): 4 poles diameter 12mm by 150 cm long,
- Small Wood square profile 30 by 30 mm (for the spreader),
- Common insulated (PVC) electrical wire 1,5 mm2 of section,
- Guying lines (hiking rope),
- Coaxial RG-58,
- A female SO-239 connector and a electric connector.

Step by step preparation

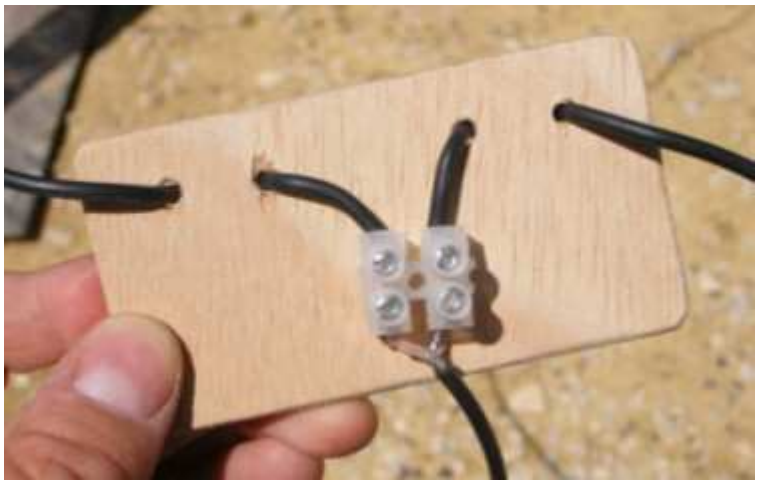
- First I prepared the wire: one wire 10,56 m long as the reflector and two wires 5,03 m long as the Driven.
- I prepare the spreader: a part 18 cm long in which I drill some holes:

Two non-passing holes diameter 12 mm,where I'll introduce the fiberglass poles. Avoid reaching the center of the spreader.



Then I drill a cross hole 14mm diameter to hang the spreader in the Fish pole.

- I prepare a small wood holder for the Dipole feed point. To avoid the wires pull from the feed point I drill some small holes the wire will cross along. I add an electric connector for the coax.:



(in this view the coax is a thin RG-174 I used for inicial testing)

- At the end of the Coax I add a female SO-239 that will be tied in the fish pole. Then I'll add a longer coaxial to reach the transceiver.

(Epoxi adhesive could be applied to seal the welding against corrosion)

- The upper guy line to support the weight is then prepared.

- I use Nylon ties to attach the wire to the fiberglass poles.
  Last, it's mandatory the use of a current choke Balun to avoid RF return to the transmitter. This could be done using several turns of the coax (open wire balun) but instead, I used a commercial one that has several ferrites (W2DU type).

- It's only left testing the antenna on the field!

Antenna Deployment

I'll use a 12 meter long telescopic fishing pole to hold my antenna.

In order to put it up, I follow these steps:

- I start with the fishing pole collapsed. I put up the spreader with its fiberglass rods. Then I put the upper guy line and using some Nylon ties I attach the wire to the rods. I have to keep both wires separate appart by 18 centimeter (I use a tape measure).

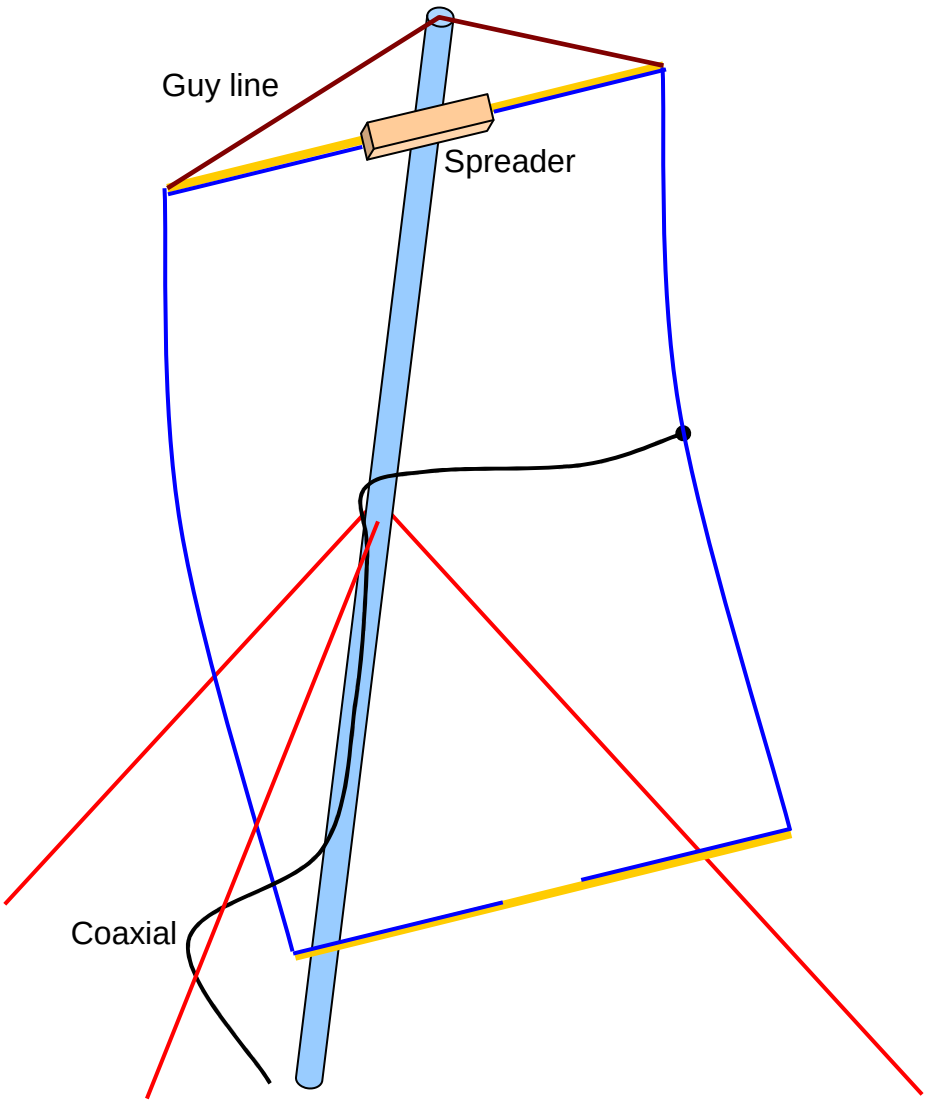
- I start deploying the pole.

- When I reach the center part of the pole (around 5 meter) I add a Nylon tie to clamp 4 guying lines.
Besides, I attach the Coaxial connection with the extension cable to reach my transmitter.

Unless it is a calm day without any breath, I will need somebody else with me to help me keeping certain tension in the guying lines as long as I deploy the pole.

- Once it is totally up I fix the guying lines to the floor using some pins (I used camping tent pins).

Ok, everything is ready.. Look at the following scheme of the assembly:



The downward fiberglass rods lies near ground due to gravity. I fix it to the fish pole to avoid its movement.

On-air testing

The first day I took the antenna for a testing trial my feeling was quite poor. The coaxial get detached out of the connector when raising it up and due to the absence of a portable solder I did my best to have a sufficient contact by hand.

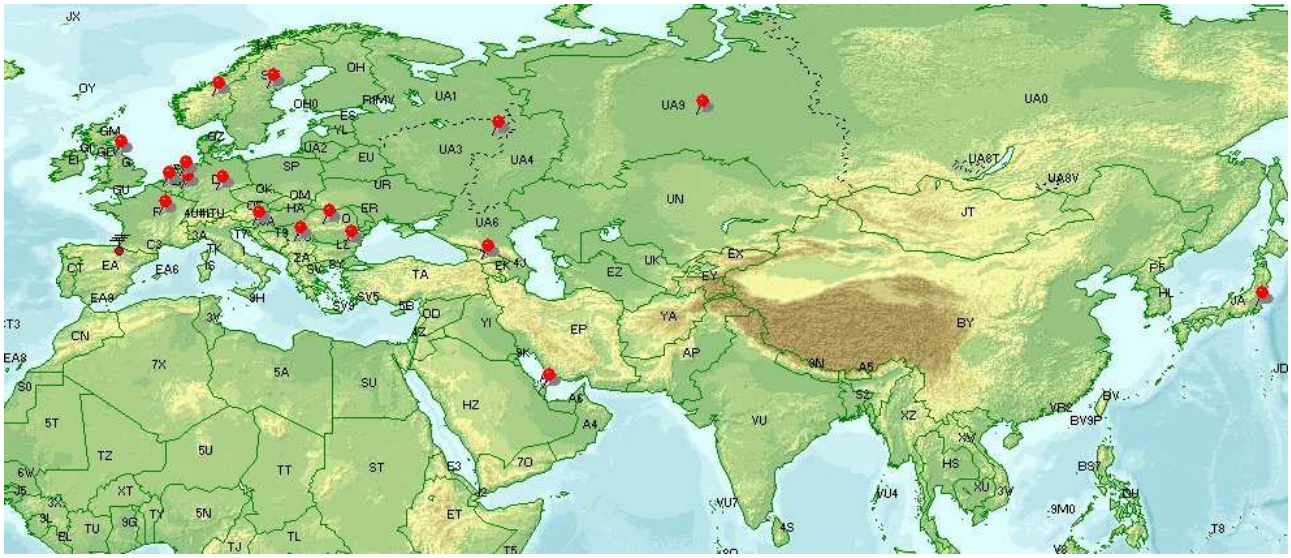
Besides, the resonant frequency of the antenna was below 14.000 so that in the SSB portion I had SWR readings of 4.
This phaenomena happens because of the PVC layer to insulate the wire. This layer tends to decrease the required length of the conductor compared with a bare wire for a certain frequency.

Testing on that day provided bad results with no distant contacts.

After dismantling the antenna and repair it at home (I removed about 8 centimeter in all the wire extremes) I soon got another oportunity to test the antenna.

Once I put it up I check SWR and get good values.
It was midday so I pointed the antenna heading West direction looking for Asia, because it was too early to succeed with stations in America.

Look at the attached picture to get a view of the entities worked in the next two hours. I used a Yaesu FT-857 and a car battery and ran 80 watts.



Entities (17):

F	ON	LX	PA	G	DL
LA	SM	S5	YT	YO	LZ
UE3	4L	UE9	A71	JA	

Best DX (JQ1QKK): IN92FE → QM06CG: 10495 km

Conclusion

After this test I'm again confident with the reliability of Moxon beams.

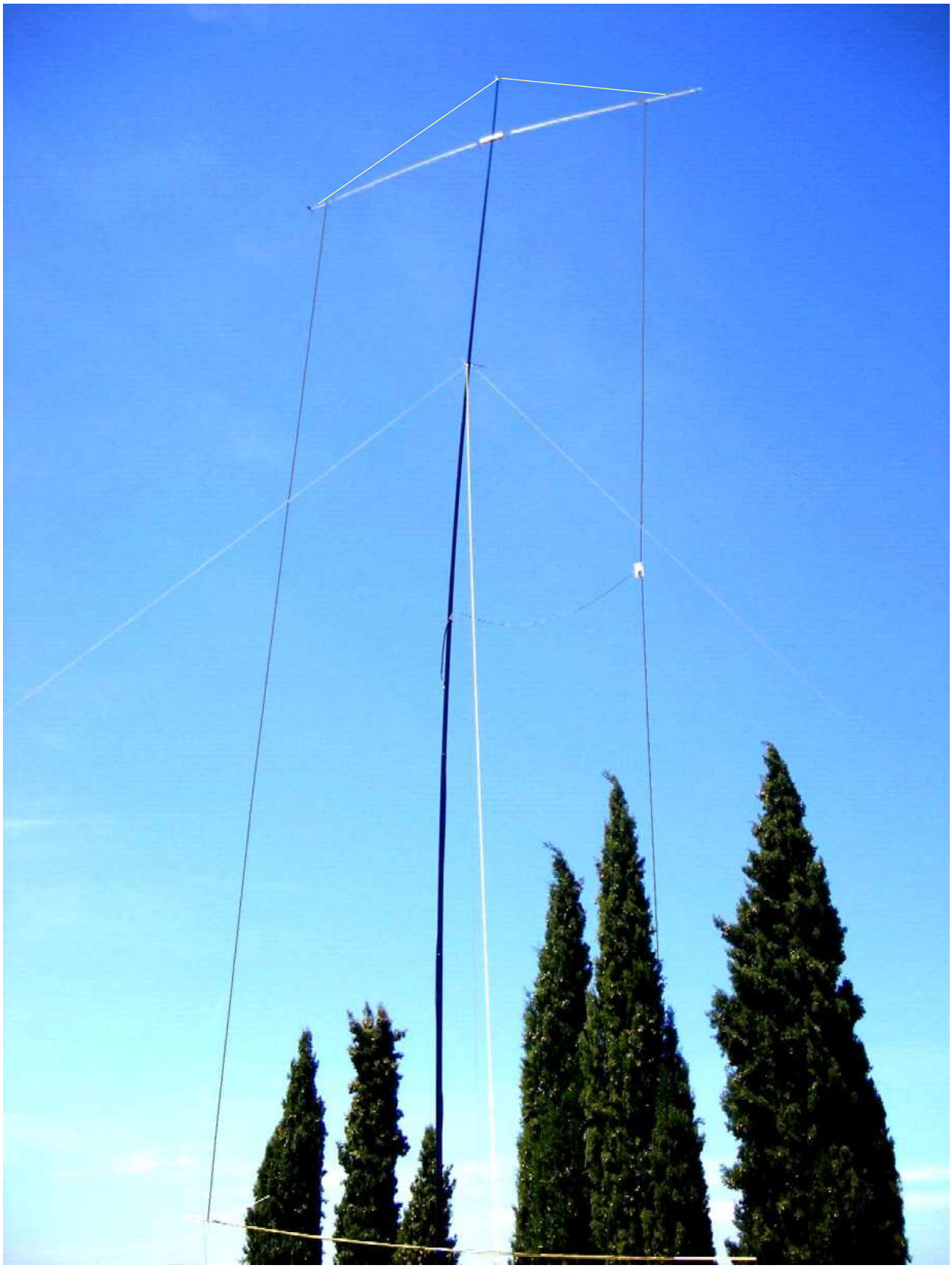
• Cons: the only one I found is that in this Vertical configuration, I can not rotate the antenna due to the guying lines in the middle. I can only have a play of about 90º. I will have to choose prior of its deployment wher to point this antenna.
In any case, I find this desing is an improvement when compared to the two fishing poles version.

Probably the best use of this antenna is for an specific Contest (ARRL, Oceanía…) or for certain short expedition.

If you have any doubt or trouble don't hesitate to ask me: ea2bd@yahoo.com
http://ea2bd.ure.es

Good luck and best 73! Ignacio
June 2009.

Although it's difficult to get a good picture of such big wire antenna I leave here a couple:



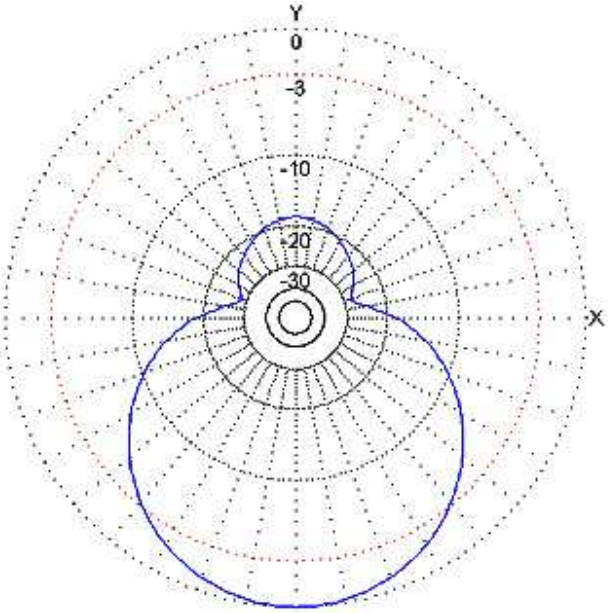
I was lucky for having my sunshade with me!

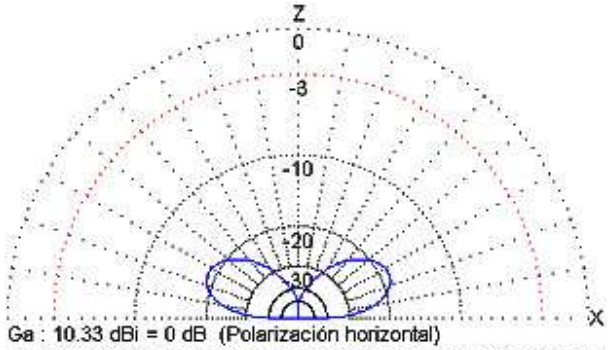
APPENDIX: Radiation pattern simulation

Before building the Vertical moxon I did a comparison of pattern between the Horizontal and the Vertical versions to check what were the difference. I used Mmana software for that purpose

Moxon Horizontal (10 meters over ground):

Ga:10,33 dBi at 24º elevation, Horizontal polarisation.

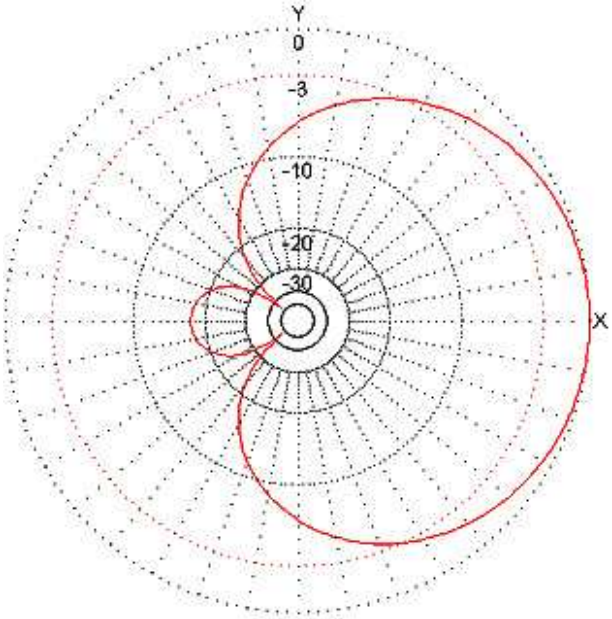


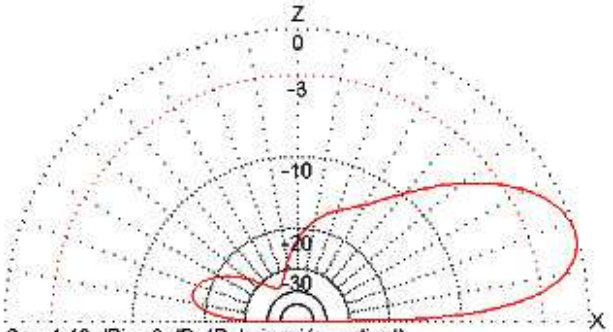


Ga : 10.33 dBi = 0 dB (Polarización horizontal)
F/B: -13.30 dB; Posterior: Azimut 120 grados, Elevación 60 grad
Frec: 14.150 MHz
Z: 53.265 + j9.943 Ohm
ROE: 1.2 (50.0 Ohm), 11.3 (600 Ohm)
Elev: 44.4 grados (Tierra real :10.00 m Altura)
(For elev.angle 24.0 grados Pico:10.3 dBi)

Moxon Vertical (the downward part is at 2 meter over ground):

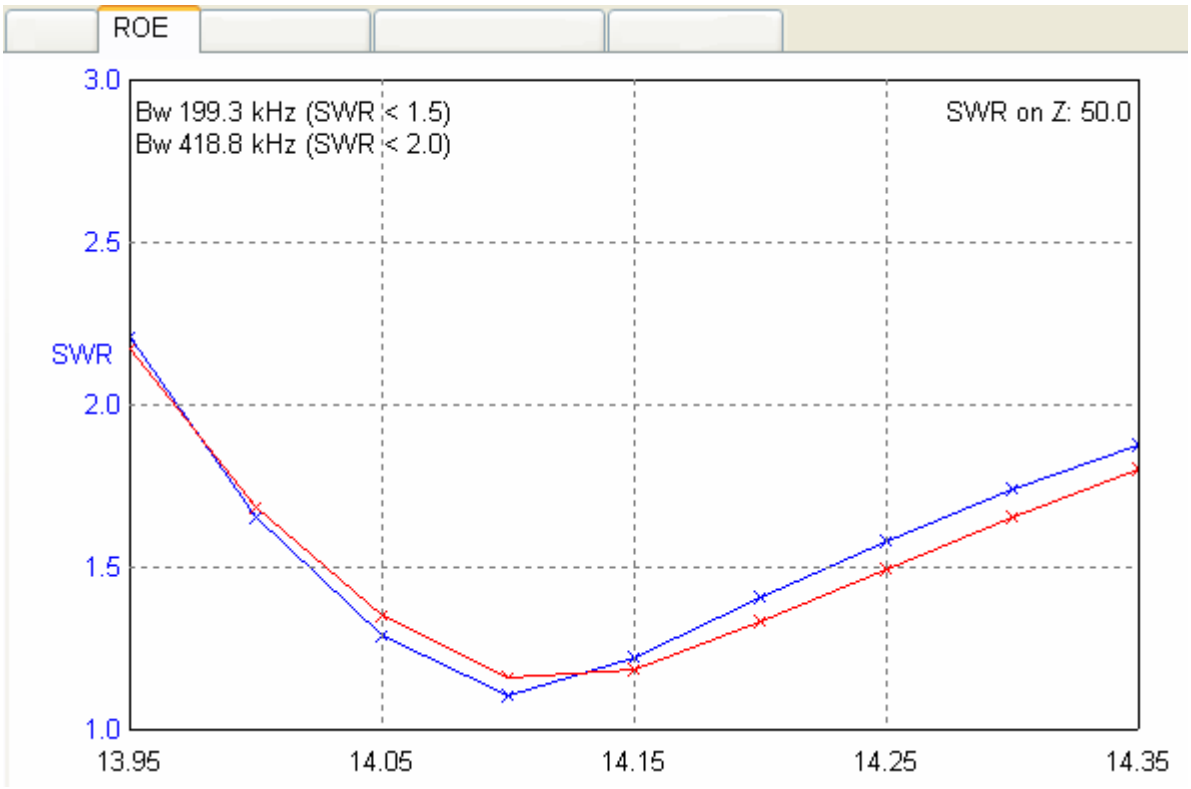
Ga 4,49 dBi at 18º elevation, Vertical polarisation.





Ga : 4.49 dBi = 0 dB (Polarización vertical)
F/B: 14.67 dB; Posterior: Azimut 120 grados, Elevación 60 grados
Frec: 14.150 MHz
Z: 48.363 + j8.218 Ohm
ROE: 1.2 (50.0 Ohm), 12.4 (600 Ohm)
Elev: 17.9 grados (Tierra real :2.00 m Altura)
(For elev.angle 18.0 grados Pico:4.5 dBi)

It's confirmed certain gain decrease, although the elevation pattern is going down helping for DX. The Vertical version has also more round pattern forward when compared to the Horizontal version wich radiates more concentrated to the front.



Moxon design shows its good behaviour: both Horizontal and Vertical versions show their big bandwidth and SWR stability: all band below 2.