

Preface

"Gripping: The History of Radio"

If only the editor knew!

In the now defunct magazine Radio and Communications July 1999 issue, an article appeared about HF Moxon antenna.

I had the honor and pleasure to meet the author of this article, VK3BCY.

Morrison Hoyle now 90 years young, for personal reasons has sadly left the hobby, with this, most of his equipment was sold, I was fortunate to win at an online auction, his Daiwa rotator, more importantly I got meet the man that did a fair amount of work in the evaluation on the Moxon antenna design.

In the disposing of his equipment, Morrison offered to me his 1999, 20 Meter Moxon. Site unseen I agreed to purchase the antenna, this is the antenna featured in the article.

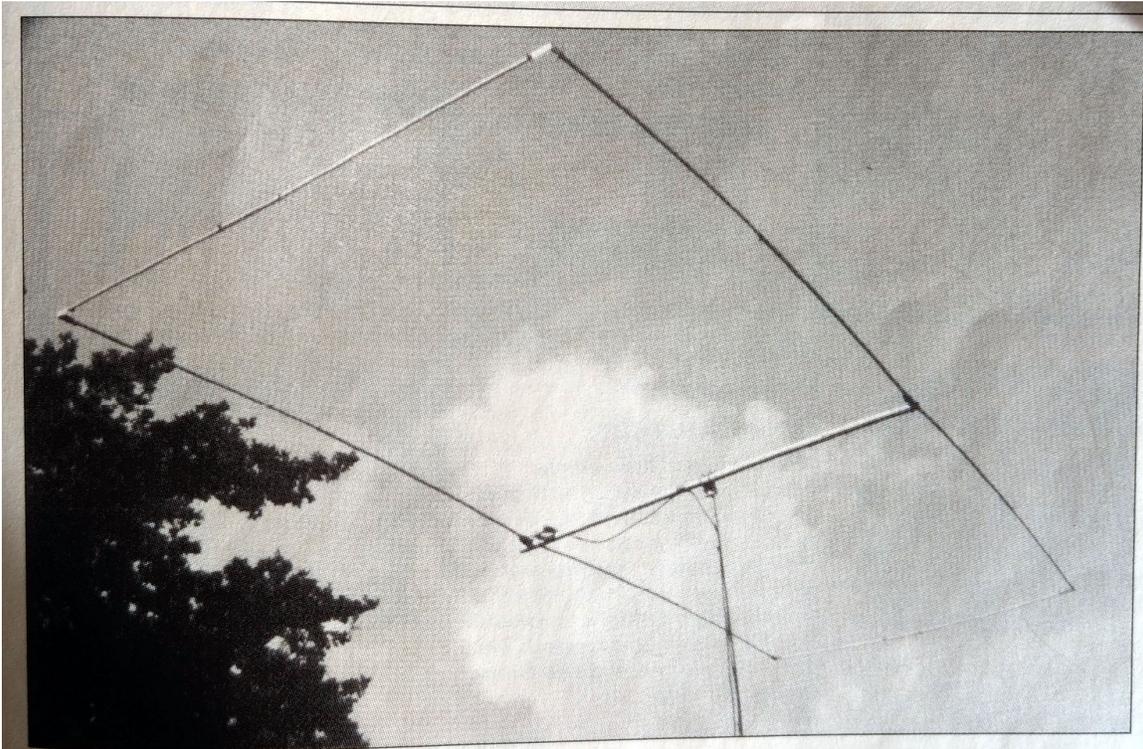
I have commenced restoring this antenna, having been in service for the past 20 years, aside from the usual corrosion of clamps and the like, the antenna is in very good condition, not withstanding that it lived very close to a main road in Melbourne, subjecting it to all sort of nasty corrosive agents.

Unfortunately along with the many of the likes of Morrison, that are leaving the hobby, a drain of knowledge not easily replaced is taking place. Magazines the likes of Radio and Communications no longer in existence, with very little to replace this source of information that once existed.

The hobby now suffers the erosion of knowledge, with little sources available to inform the new generations, sadly this decline continues. the many informative publications are now replaced by the confusion provided by "GOOGLE"

I sought permission from Morrison to reproduce his article, in recognition of his work, and that of others, in the creation of a cheap easy to build antenna, exhibiting high performance characteristics. He gladly gave his permission and blessing.

Morrison in his article sets out his experiences, but enough from me, here is Morrison own words.



The Moxon Rectangle

An easily built, compact HF antenna with amazing performance

By Morrison Hoyle VK3BCY
July 1999

Do these considerations interest you?

- Low Cost to build
- Made from cheap materials, easy to build
- Simple to erect and support
- More bust and wind resistant than a Yagi
- No fiddly gamma or other matching problems
- Fits into areas too small for a full size Yagi
- Gain at low heights over 11 dBi
- Front to back ratio over 32 dB in free space

As incredible as these claims may seem , I have made a Moxon Rectangle and it seems to do all that was claimed for it.

The story of this antenna goes back to the veteran **G6XN, Les Moxon** who showed me his 'antenna farm' near Hindhead, Surrey in the UK a few years ago. Les is known to many VK amateurs for his book '*HF Antennas for all locations*'

published by the RSGB first in 1992 followed by several reprints and a later a later edition. Les has not to my knowledge described the 'Moxon Rectangle' but he has written about the VK2ABQ antenna.

Many amateurs including me have built the VK2ABQ and most have given as a bad job for a variety of reasons.

Unfortunately, many have followed a description of the VK2ABQ in G6XN's book which showed the separation between the elements as being maintained by coat buttons !

That was for a wire construction.

As Les conceded, that it was unsatisfactory, the spacing between the elements and between the tips of the elements are both critical and 'coat button' are far too close.

Construction

So what does the Moxon Rectangle consist of?

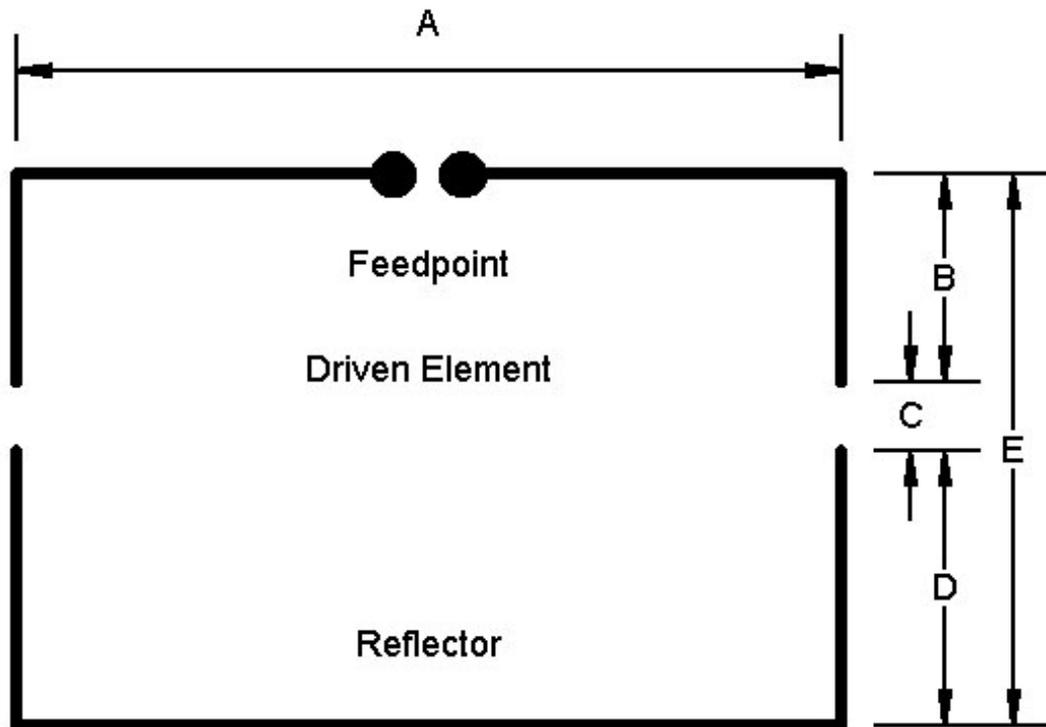


Figure 1

Moxon Rectangle Outlines

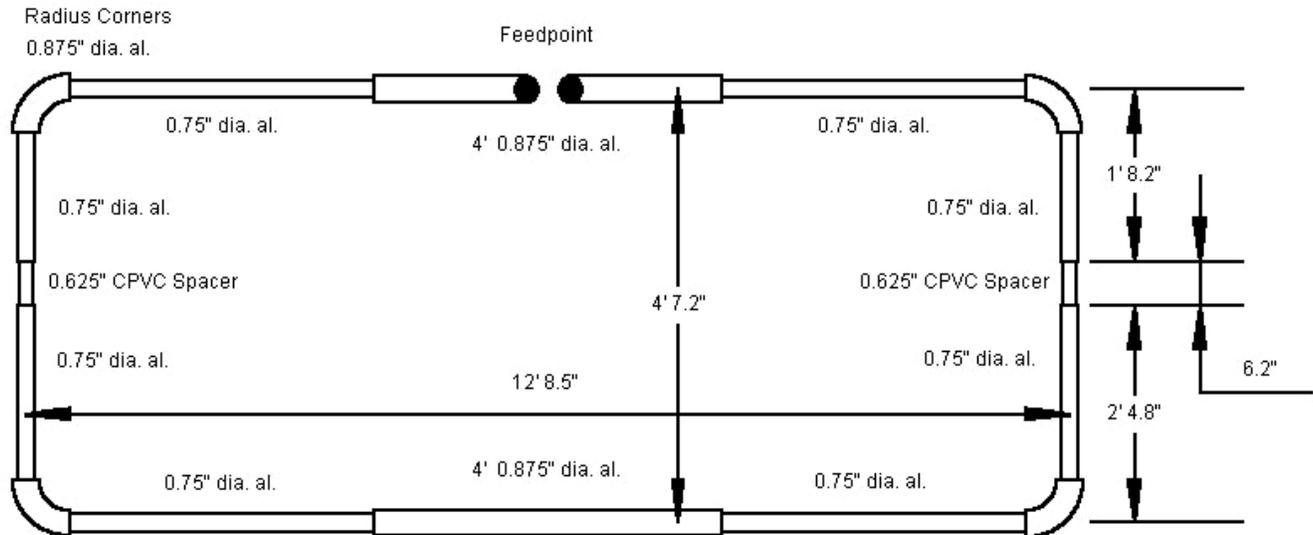
The first diagram and some of the following information is reproduced with permission from L B. Cebik, W4RNL, who has a wealth of useful information for the antenna enthusiasts at his web site

(Published Link is not existent for Info use the link below)

<http://www.antentop.org/w4rnl.001/mox20.html>)

'LB', as he is known, tells me that an extended article on the 10 meter aluminum version, with photographs will appear in the next volume of the *ARRL Antenna Compendium*.

I made a 20 meter version and found that scaling the lengths and spacing exactly by a factor 2 to1 worked perfectly first time. I had a lot of tubing from a nine element log periodic that came to grief in a storm, and I used some one-inch aluminum angle 1/8 inch rivets to form the corners, in fact, the tubing I used for my 20 meter antenna happened to be exactly the diameter shown in **Figure 1A** for W4RNL's 10 meter antenna.



General Outline: 10-Meter Aluminum Moxon Rectangle

- Notes: 1. CPVC = 1/2" nominal
2. Boom and boom-plates at builder's discretion

L. B. Cebik, W4RNL
June 20, 1997

Figure 1A

Some one inch PVC electrical conduit was fitted on the outside of the element tips to control the spacing rather than the 0.625 inch CPVC shown in the diagram as fitting inside the .75 inch tubing.

It cannot be emphasized too strongly that the spacing between the tips of the elements is crucial to good results.

Stainless steel worm drive clamps held all the other tubing joints as I expected to have to adjust lengths for optimum tuning. However, it worked so well straight away that others might find it easier and cheaper to use pop rivets throughout. I did experiment by adjusting the lengths but each time I came back to the original design dimensions.

I have only used a choke balun to connect the feed line as modeling shows the impedance to be not far removed from 50 ohms. The choke is about eight turns of RG213 with an inside diameter of 8 inches. The SWR on 20 meters is less 1.3 across the entire band.

You don't believe it? Well, I didn't either but I have checked it with three different methods and instruments!

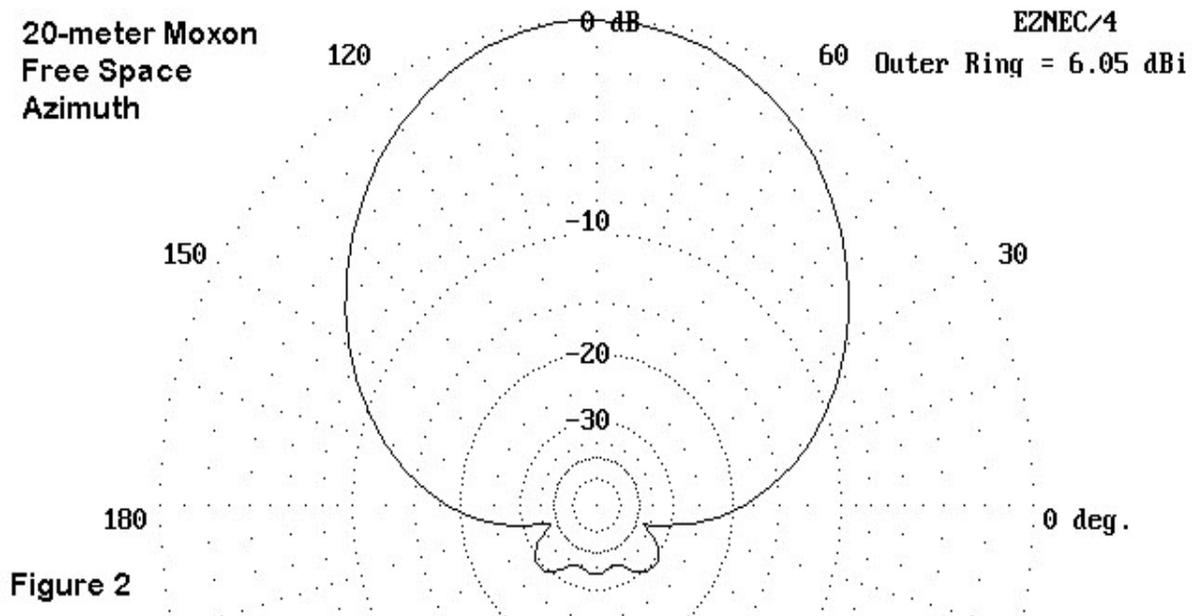
Compare a two-element Yagi for 20 meters with a longer 'boom' and with elements spanning 33 feet, free to flap in the wind, with the Moxon Rectangle spanning only 25 feet and the elements tips firmly held by spacers creating a much more rigid structure.

W4RNL gives this table of dimensions for other bands but cautions users on differing element length to diameter ratios. (Refer to figure 1)

| Band | Frequency | A | B | C | D | E |
|------|-----------|-------|------|------|------|-------|
| 10 | 28.50 | 12.44 | 1.94 | 0.41 | 2.41 | 4.76 |
| 12 | 24.94 | 14.22 | 2.22 | 0.46 | 2.76 | 5.44 |
| 15 | 21.20 | 16.72 | 2.63 | 0.52 | 3.25 | 6.40 |
| 17 | 18.12 | 19.56 | 3.10 | 0.59 | 3.80 | 7.49 |
| 20 | 14.17 | 25.00 | 4.00 | 0.72 | 4.85 | 9.57 |
| 30 | 10.12 | 35.00 | 5.60 | 1.00 | 6.80 | 13.40 |
| 40 | 7.15 | 49.56 | 8.01 | 1.33 | 9.63 | 18.97 |

Performance

An Illustration of performance is given by the modeling done using EZNEC Pro, again thanks to W4RNL, and reproduced in figure 2, below



As the comments, "...all of the models use 1#14 AWG copper wire, although the various factors that contribute to the Moxon pattern tend to cancel out as wire size increases. Hence, a tubing model will have dimensions close to those for a thin wire model. However, it will exhibit broader SWR bandwidth. As noted above, the SWR of my antenna is excellent.

If you don't have a rotator and your antenna is pole mounted, supported from the eaves of your house as mine is, you can make the Moxon Rectangle reversible by making both elements the driven element length, switching between them and loading the one acting as the reflector with a coaxial stub.

Multi-band operation would obviously be a major attraction but all information and modeling to date indicates that the Moxon Rectangle is not amenable to this unless you introduce some de-tuning of the elements not in use.

However, building more than rectangle above the other in a Christmas tree fashion would be worth trying and is my next project.

I first tested my project at 10 feet above the ground not far from a tower with a four element

full size 20 meter mono-band Yagi on a 30 foot boom elevated at 55 feet.
The difference over several days working long path G stations was only 1 to 1.5 S-Points.
I now use the rectangle at only 18 feet up in a Melbourne suburb. With 100 Watts, S9 reports
are not uncommon from reliable reporters on the other side of the globe!

So pull down those G5RV's, bits of wire, trap verticals and other mediocre performers.
Try the Moxon Rectangle! I hope you'll be as happy with the results as I am

/-----/

Many thanks to Morrison Hoyle for his kind permission to reproduce his original article
73' S
VK2YMU