Four Metre Portable Operating Group Antenna Stick Construction and Test

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Introduction

There has been an increased interest recently in the South West Hertfordshire RAYNET Group in developing antennas that are suitable for portable use, especially those that may be used in remote, mountainous areas where they support Scout activities. Two members of the group have constructed "Portable Operating Group" or POG antennas for use on two metres. The original design for this was by Graeme G4NVH, the details of which can be found on his web site, www.g4nvh.net.

In recent months, the introduction of low cost four metre transceivers into the amateur radio market encouraged the design and construction of a four metre POG that can be taken easily into the hills. A lightweight mast was also needed, for which a SOTA pole was adapted by removing part of one of the upper sections to introduce a wooden spigot to support the antenna. The SOTA (Summits on the Air) pole is a fibreglass roach pole, otherwise used for fishing and is available from the SOTA website, www.sotabeams.co.uk. These poles contain no carbon fibre, which is important, as unwanted conductivity to ground and other effects may occur where carbon fibre is present.

Design and Construction

The design of the lower half of the 4m POG (*Fig 1*) was based on the original G4NVH design with almost all dimensions simply doubled. The exceptions were the length of the telescopic section, of which more under tuning, and the use of the same 21.5mm overflow plastic plumbing pipe as the original design. The aluminium foil was replaced by a heavier duty aluminium sheet with an adhesive backing. The dimensions that were used are shown in the diagram below, which has been taken from the G4NVH website with thanks. Differences are shown in red. The length of foil used was 778mm.

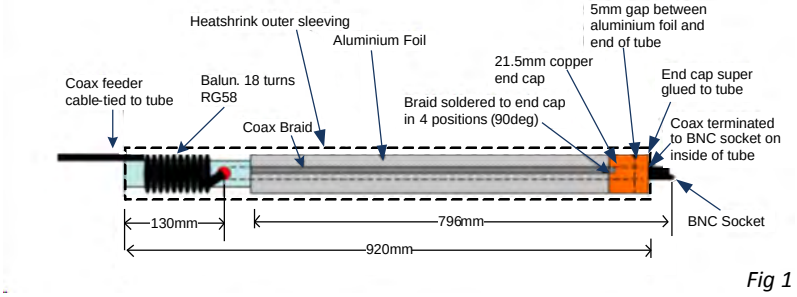

Fig 1

The telescopic section was procured from Maplin under QT34M, being a Moonraker part number MRW-112. After testing and adjustment, the lower section was covered in heat shrink sleeving to protect the working elements. Care needs to be taken when using the heat gun, as the plastic outflow pipe can become distorted.

Tuning

The tests were conducted with the invaluable help of Alan G4KUF, who very kindly gave up his time, his expertise and equipment to allow them to happen.

The antenna was mounted on a SOTA pole that had been modified by cutting one of the upper sections, so that a wooden spigot of the right size to fit inside the outflow pipe could be fixed into the top. The antenna was lifted approximately four metres above ground level to ensure that no ground effects were introduced.

The telescopic top section was set initially to 1130mm, double the length proposed by G4NVH, and was then varied as shown in the *Table 1* below and the frequency at which the minimum VSWR was obtained. This resulted in choosing 1245mm as the optimum length, giving a VSWR of 1.31, which, whilst not perfect, was considered to be adequate for normal operation. An 18 turn coil was used for these tests, being twice that of the original 2m design.

Whip Length (mm)	1130	1170	1250	1280
Min VSWR	1.42	1.35	1.31	1.30
Frequency	72.60	72.10	70.50	69.80

Table 1

The graph below (*Fig 2*) shows the figures from the table.

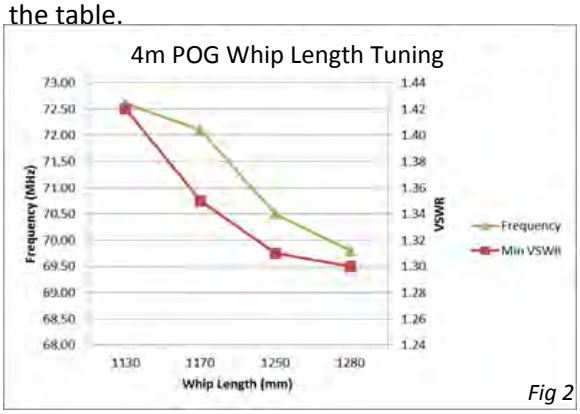

Fig 2

The number of turns was then investigated to try to understand the effect of variation. *Table 2* below shows the results:

Turns	17.50	17.75	18:00	18.25	18.50
Min VSWR	1.33	1.32	1.30	1.34	1.35
Frequency	70.70	70.70	70.50	70.40	70.50

Table 2

The graph below (Fig 3) illustrates how critical the exact number of turns is. The exact reason for the shape of the curve was not fully understood. 18 turns was chosen for the final antenna.

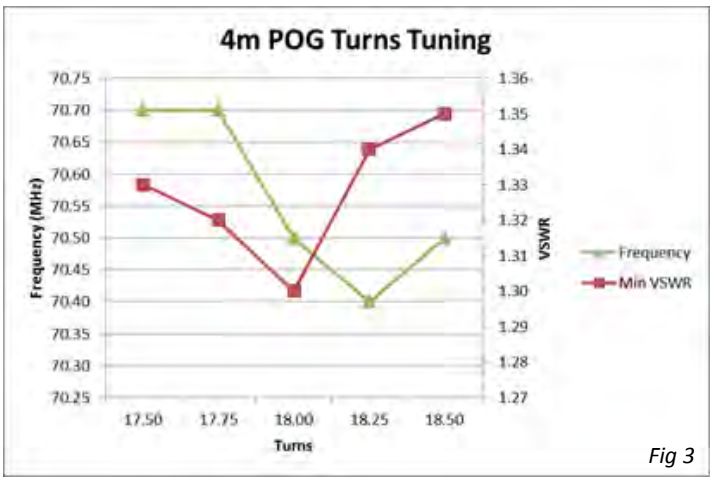

Fig 3

Throughout all the tests, resonances were found 68.1MHz and 77.1MHz. Variations between tests were small and considered to be no greater than the expected experimental error due to the test equipment. It was interesting to note that the antenna did not actually resonate at the operating frequency but that the 18 turns provided the point of minimum SWR.

During the coil turn test, the frequency of minimum VSWR remained constant. Only the SWR varied.

A plot of the results, using an Array Solutions AIM4170 Antenna Analyser, is shown in Figure 4 at the end of this report.

Finally, just as a final cross-check using a second test instrument, the figures below (*Table 3*) were obtained with an *MFJ269* HF/VHF/UHF Antenna Analyser. This revealed the following:

MFJ269 Analyser Results	
RE	38Ω
XE	4Ω
VSWR	1.3
Frequency	70.54MHz

Table 3

This provided added confidence that the tests had been carried out correctly and that the settings obtained (and recorded) during tuning using the AIM4170 were correct.

Conclusion

The basic dimensions for the lower section of the 4m POG work well at twice those of the 2m original design by G4NVH.

The number of turns for the coil is critical. Again twice the number for the original 2m design worked exactly.

The best possible VSWR was found to be 1.31 at a frequency of 70.50MHz, which provides a workable, but not absolutely ideal, antenna for the four metre band.

The optimal length for the telescopic section was found to be longer than double the original at 1245mm. This length is also critical. Tip: to avoid having to take a tape measure into the field, the length can be marked on the outside of the lower part of the POG.

The antenna is probably not suitable for operating from a rucksack whilst walking due to its height and potential frangibility, especially where there may be overhanging obstructions, such as branches. It is entirely suitable for static operation from a hill top or elsewhere. Any mast will require robust support just below the point where the antenna is mounted. ❑

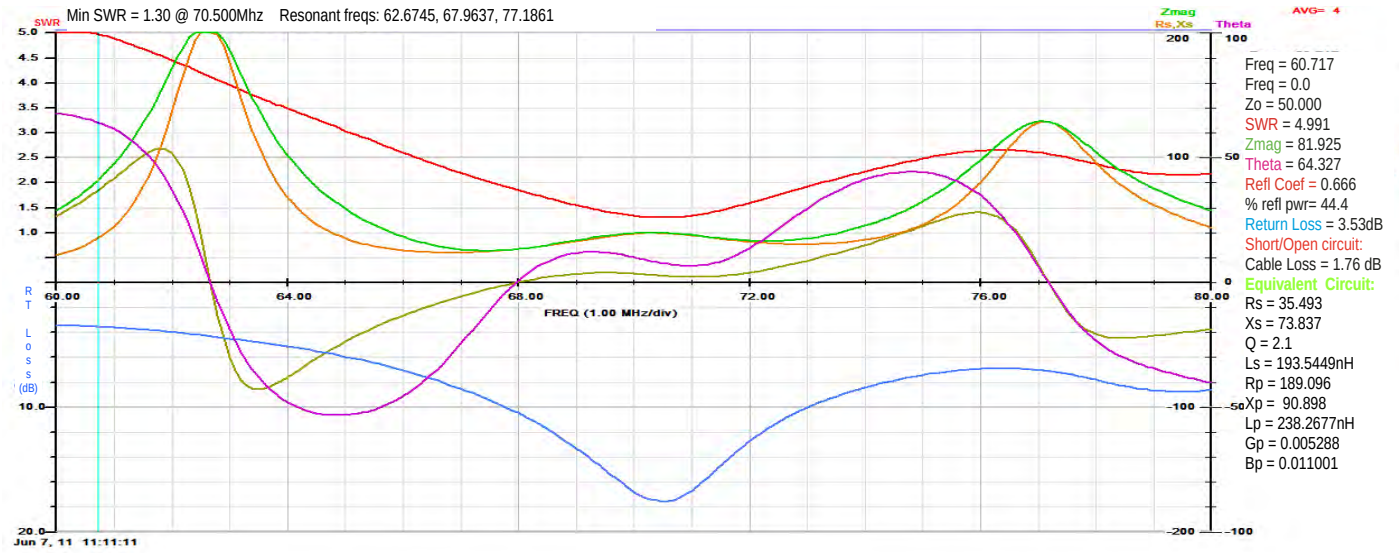

Fig 4