70cm Quadruple Quad
by GW0VMW

The main drawback with quad antennas has always been their complexity (3 dimensional) and difficulty in assembly/disassembly for portable operation compared to the Yagi. This design and my development of it have circumvented these problems.

The same design could easily be adapted for use on a regular quad antenna for portable use on virtually any VHF/UHF frequency. The secret to the compact folding nature of the antenna is the combined use of rigid copper elements inter-spaced with flexible copper braiding. The copper braiding is simply the screen from RG58 coaxial cable stretched and flattened by hand.

Copper and brass are used, as electrolytic corrosion between the metals is negligible and brass makes good strong solder joints.

Plate 2. Dismantled and folded Quadruple quad antenna.

I used chocolate block connectors for the 4:1 balun and 2.5m of RG58 coaxial cable for the feeder reduce losses. The plastic boom is all that is required to make the whole structure rigid and was made from 2 pieces of 20mm plastic conduit with a joint near the middle. Make the joint first and then make a notch in one end for the fibreglass tube to clip in.

Cut to the required length so that when you make another notch in the other end you have to flex the fibreglass over. Another notch will need to be made halfway along to clip the middle tube in. Attachment to a walking pole/mast can be made using whatever method you prefer.

Fig 2. Horizontal radiation pattern of quadruple quad compared to a dipole (VHF Communications May 1971).

A suitable high gain 70cms antenna for SOTA operation was sought that did not have the drawbacks of a long Yagi antenna, principally a narrow beamwidth and bandwidth. This is important as operating from a hilltop on a relatively under used band requires as broad a catchment area as possible combined with high gain and a minimum of turning.

This may be part of the reason behind the low level of use by SOTA operators. Despite this problem however, 70cms offers excellent prospects for summit to summit and longer tropospheric contacts.

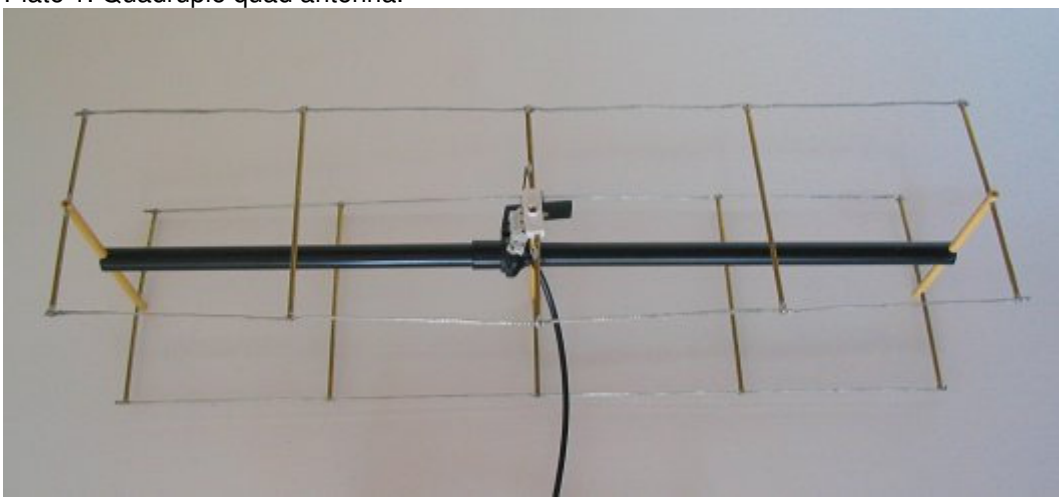
This compact portable antenna for 70cms was developed from an original design published in VHF Communications May 1971 for operation on 2m. The Quadruple quad (Plate 1.) is basically four, closely coupled stacked quad loops, with another four (larger) loops mounted 1/4 wavelength behind as a reflector. The antenna has a quoted gain of 11-12db over a dipole and a front to back ratio of 23db with a very broad (100 approx) frontal lobe (Fig 2.)

Other very important criteria are the low weight (8oz), compactness (Plate 2.), speed of assembly (30 seconds) and a good match into 50 Ohm coaxial cable. After much experimenting the latter was achieved with a simple delta match feed system with a 4:1 coaxial balun. This produced an SWR of +/- 1.5 and is quite different to the original article, which used 60W coaxial cable!

Once constructed the whole antenna comprises of just 3 pieces to assemble, a 2-piece split

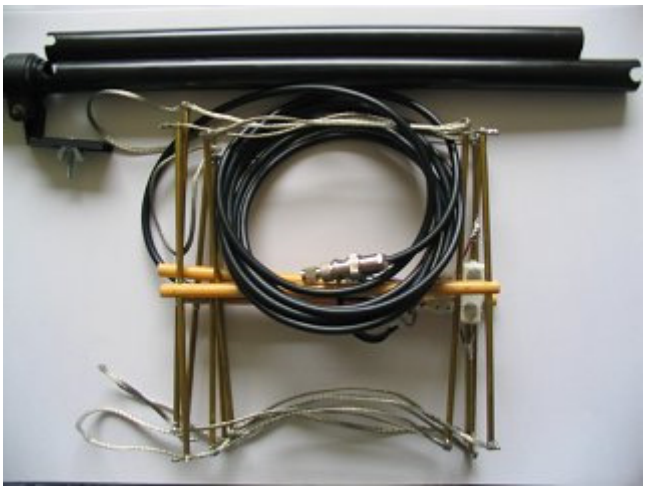
boom providing rigidity for the folding antenna. Antenna can be mounted for horizontal or vertical polarisation.

Plate 1. Quadruple quad antenna.



Materials required.

2m x Brass tubing 4mm dia
6m x RG58 coaxial cable
0.75m x 20mm dia plastic conduit
1 x 20mm dia plastic conduit joint
57cm x 8mm dia fibreglass rod/tube
20cm x 14/16swg solid copper wire
24cm x RG174 coaxial cable
Choc block connectors
Plastic block
20 x 3mm brass screws



Critical dimensions -

Spacing between Reflector and Driven element 1/4 wavelength (17.5cm)
Driven element (length of brass tube) 17.5cm x 5
Reflector element (length of brass tube) 19.3cm x 5
Spacing between brass rods 1/4 wavelength 17.4cm
Length of braiding required 70cm x 4
4:1 Balun- 1/2 wavelength RG174 = 35cm x 0.66 velocity factor = 23.1 cm

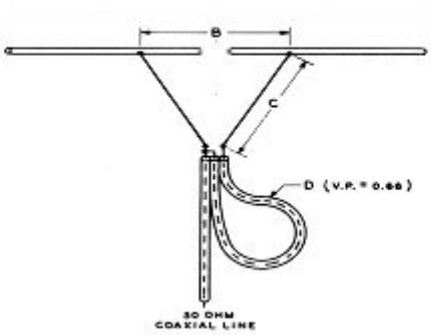
Construction of the antenna is quite straightforward. First cut the brass rods to length. Next cut 3 pieces of fibreglass rod/tube about 19cm long and drill a 4mm hole each end spaced 17.5cm apart for the brass director and reflector rods to make 3 H shaped structures. Next cut 4 lengths of RG58 coax 70cms long and strip off the outer jacket and remove the tinned copper braiding.

Stretch the braiding and pull between thumb and forefinger to make a flexible flat strap. Push a brass screw through one end of the braiding and solder to the end of the brass rod from one of the H sections.

Measure 17.5 cm along the braiding and attach the next brass rod and then the next H section and so on. Remember the only difference between the reflector and driven element is the length of the brass rods. Note :- The brass rods are allowed to rotate in the fibreglass and can be prevented from moving from side to side with a blob of solder on each side of the rod.

The feed-point was made, by cutting the centre of the middle driven element brass rod. An insulated plastic block was inserted and a delta match feed with 4:1 balun soldered to the element (Fig 2).

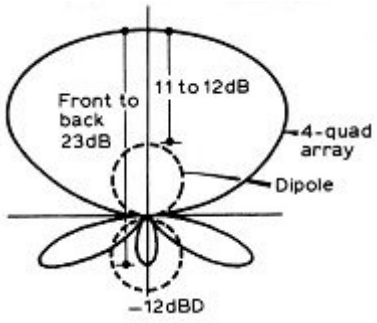
Fig 2. Delta match and 4:1 coaxial balun feed (modified from Orr & Cowan 1990).



BAND MHz			B		C		D	
	IN	CM	IN	CM	IN	CM	IN	CM
50			22.0	55.9	15.0	38.1	79.0	200.7
144			6.5	16.5	4.0	10.2	27.0	68.6
220			4.2	10.7	2.7	6.9	18.0	45.7
432			3.0	7.6	1.5	3.8	9.1	23.1

On air tests revealed that the antenna is very much directional and outperformed all my other 70cms antennas except my 17 element Yagi.

The light weight and compactness means I have no worries about carrying it around in my rucksack and it can very quickly be deployed for action.


Front to
back
23dB
11 to 12dB
4-quad
array
Dipole
–12dBD