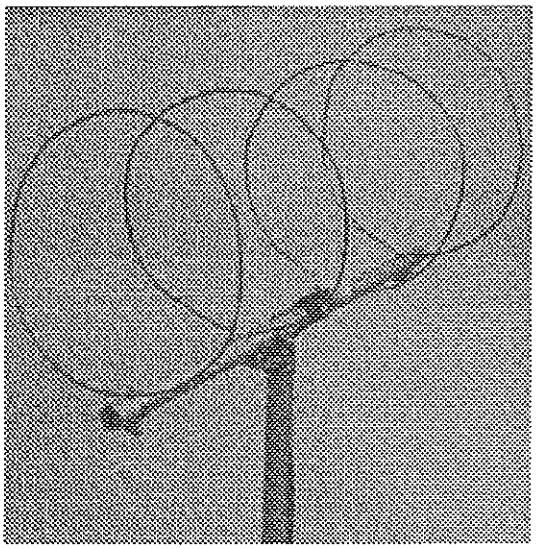
70cm Quad Antenna

The Very Best of D-i-Y RADIO

An Easy-to-construct UHF Beam

THIS IS A description of how to make an antenna with gain compared with the rubber duck or a dipole antenna. Additionally this antenna can be dismantled for carrying to a hill-top location and assembled with ease. Antenna gain is described in *D-i-Y Radio* Vol 4: No 5.



antenna uses wire loops. This is a very well known antenna in amateur radio and it is called a **quad**. Normally, these wire loops are square. For the lower frequency bands the elements are much larger and have to be supported on an X frame. In our case a quad antenna for 432MHz is very small so the elements do not need a supporting frame and can be made in a circular shape.

HOW DOES IT WORK?

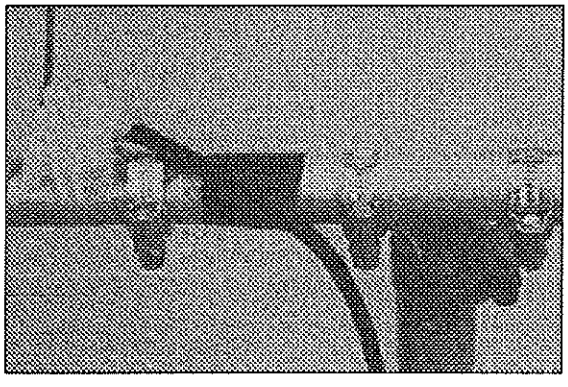
THIS ANTENNA USES the principle of the **Yagi parasitic array**. You can see a Yagi antenna on nearly every house in the UK, used for receiving television signals. Antennas have the same characteristics whether they are used for transmitting or receiving - that is why you can use the same antenna for transmitting or receiving on your rig. It is easier to describe the principle of the Yagi antenna as a transmitting antenna.

Although there can be quite a lot of elements used on a Yagi only one is connected directly to the coax cable and the transmitter, and is known as the **driven** element. The other elements, known as **parasitic** elements, because they are not directly connected to the transmitter, pick up the radio frequency (RF) energy from the driven element and re-radiate it. One of these elements is physically longer than the driven element and is called the **reflector**. The phase of the re-radiated RF, combined with the RF from the driven element causes it to be reflected away from the reflector element.

Other elements are made shorter than the driven element. The phase of the re-radiated RF from these elements, combined with the RF from the driven element, causes the RF to be directed towards these **director** elements.

The combined effect of all these elements is to cause the RF to be concentrated in one direction. By building the field strength meter, described on page 8, you will be able to experiment with this antenna and measure its **directivity**.

Instead of using straight elements as used in the Yagi this



Detail of construction method.

CONSTRUCTION

THE ANTENNA IS very easy to construct. The design allows you to use any type of metal tube or even wood for the antenna boom (the support for the elements) and the mast. The antenna elements are made from 14SWG hard drawn copper wire; you can use other gauges of copper wire. 16 SWG hard drawn antenna wire has been tried and worked very well. If you use thinner wire the antenna elements might get a bit floppy. All the separate parts of this antenna are fixed together using hose clips (sometimes known as jubilee clips).

The driven element is fixed to the boom using a hose clamp, with a white plastic connector block (with three terminals) to enable the coax to be connected to the elements. This element should be made 70mm longer than shown in **Fig 1**. The ends of the elements are then bent at right angles, formed into a loop and the ends pushed through the connector block and the screws tightened. The long 50mm end is formed into a loop and pushed back though the third connector. This loop is

used to connect the driven element to the boom. All this might seem a bit complicated but it is probably easier to see how it is done by looking carefully at Fig 1 and the photograph.

The parasitic elements should be made 40mm longer than the lengths shown in Fig 1. Bend the ends of the wire at right-angles and then form the wire into a loop. It is preferable, but not essential, to solder the ends of the wires together, which makes it easier to assemble the antenna.

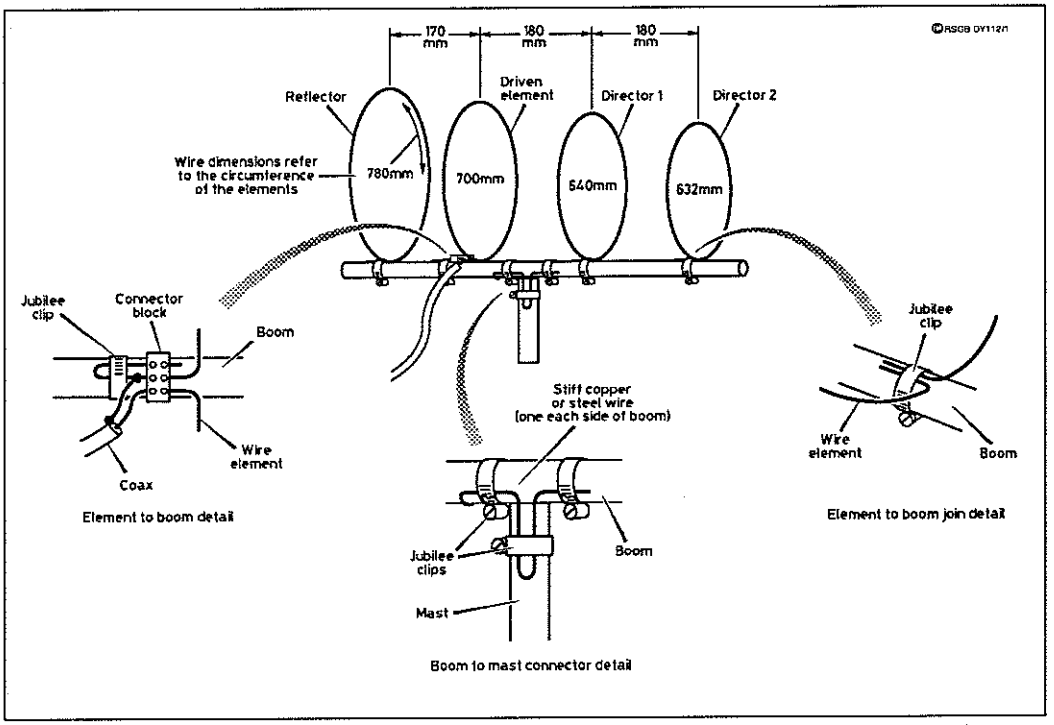


Fig 1: 70cm 4 element quad construction, with detail of how hose clamps are used in the construction.

The antenna is fixed to the mast using hose clips and wire as shown in Fig 1. Finally the coax cable is connected to the driven element connector block, with the braid of the coax connected to the end of the element fixed to the boom and the centre of the coax connected to the free end of the element.

You will have to fit a coax plug on the other end of the coax cable to suit your transceiver or SWR meter if you are using one. See for instance the *Novice Licence Student Notebook*, for information on how to do this.

TESTING THE ANTENNA

YOUR ANTENNA CAN now be tested. It is best to try antennas outside away from buildings where possible. At these frequencies signals bounce off walls and metallic objects and can give misleading results.

It is best to try the antenna on receive first. Switch on your rig using the rubber duck, or some other antenna that you normally use then tune around the repeater or beacon channels and listen for any signals that might be on. Now disconnect the normal antenna and connect the quad - remember that this antenna is directional so point the antenna at your local repeater if you know where it is. If you can hear a repeater and the signal strength varies as you turn the antenna then it would appear that it is working to some degree, particularly if the signal is stronger than with the original antenna. You should be able to locate the direction of the repeater if you didn't know where it was in the first place.

Now try it on transmit. It will be useful to have a 'standing wave ratio' meter (SWR meter), when the matching is good it generally means that the transmitted power is going to the antenna. This instrument is used to measure that the coax cable and the antenna are **matched**. If the meter reads 1:1 then the match is excellent. Provided the reading is less than 1.8:1 the match is acceptable. Some cheap CB SWR meters that have been tried gave good results on 70cm [1].

You can check the directivity of your antenna using a field strength meter (FSM). This instrument measures the level of RF energy around your antenna. How to construct one and how it is used is described on page 8.

REFERENCES

[1] The SWR meter and its use in checking UHF antennas was described *D-i-Y Radio* Vol 4: No 6.

MATERIALS

4 metres of 14 gauge hard drawn copper wire
Copper tubing
15 amp connector block
7 hose clips

A kit of parts comprising 5 metres of RG58CU coaxial cable, 5 metres of hard drawn copper wire and a coaxial plug (BNC or PL259) can be obtained from W H Westlake, West Park, Clawton, Holsworthy Devon EX22 6QN at the special price of £5. Please mention *D-i-Y Radio* when ordering.

The rest of the materials can be obtained from hardware stores.