A Three Element Quad (plus a 2ele)

Brian Hummerstone, G3HBR

Issue 61, May 1999

I have been hooked on Quads since using them on HF field days many years. ago. From experience, I know that Quads significantly outperform most other aerials in difficult situations such as very low heights or indoors, in lofts etc. There is nothing special about my six-metre quad design but I have spent a fair amount of time tuning it up for maximum gain

.Details of both my home three element quad and my portable quad are at Figure 1 – element dimensions relate to their **total** length, ie the sum of the lengths of the four sides.

All the indications are that the three element is tuned close to the 'supergain' point. In fact I think I have gone a little too far and next time I take it down I may try reducing the director to 19' 5" (5.91m).

Construction Notes

G3HBR's quad spiders, made from shelf brackets with bamboo spreaders attached

Shape. Unless there is a compelling reason to do otherwise, it is best to stick to standard square or diamond shaped elements. If there are dimensional constraints in a loft for example, the elements can be mounted as rectangles, either tall and thin or wide and short, within reasonable limits. The vertical sides can be pulled in towards each other, batwing fashion, which can be useful to avoid close spaced (wooden) beams

Quad Arms. These are approximately 4' (1.2m) long, I use garden centre bamboos. Buy 5' or 6' ones and cut off the thin ends. To prevent splitting, they are bound between the joints with a couple of turns of black electrical tape. Weatherproofing is achieved by two or three coats of outdoor quality varnish. (Antique Pine is quite an attractive colour!).

Quad Spiders. If you possess proprietary ones, fine. If not, they can be made from shelf brackets, the smallest, cheapest ones you can find in your DIY store. If you use a square section boom, it's easy to fix the brackets. I use tubular booms and fix the brackets, with just a nut and bolt through the tail hole on each opposite pair of brackets. A self-tapping screw could be used for the front fixing, but I use a few turns of electrical tape secured with a couple turns of garden wire, the ends being tightly twisted together. You may want to use some hose clips for additional security. I have also used back-to-back lengths of aluminium angle (the sort sometimes used for edging worktops) for spiders.

Elements. Flexible wire is by far the easiest to handle. I use the lightest stranded copper I can get hold of. To attach the elements, again I use tape and wire. To join the loops, I just overlap the ends and twist them together. This works fine and allows adjustments to be made with ease. Soldered joints can go brittle and snap or develop high resistance although looking OK, but if you feel happier with them, go ahead when you have made your final adjustments.

Matching. Both the two- and three- element quads will match 50 and/or 70 ohm cable without any intermediate devices. I have always used direct feed. A simple centre insulator for the radiator is made of perspex with two brass nuts and bolts to secure the ends of the element and the feeder. The outer of the coax is stripped and braid separated to make this connection so it must be well taped-up to stop water getting in. It is a good idea to run the first inches of feeder uphill. I have added a choke balun in the last few years, I think there is less pick up of computer noises as a result and the outer of the feeder is dead to RF in the shack.

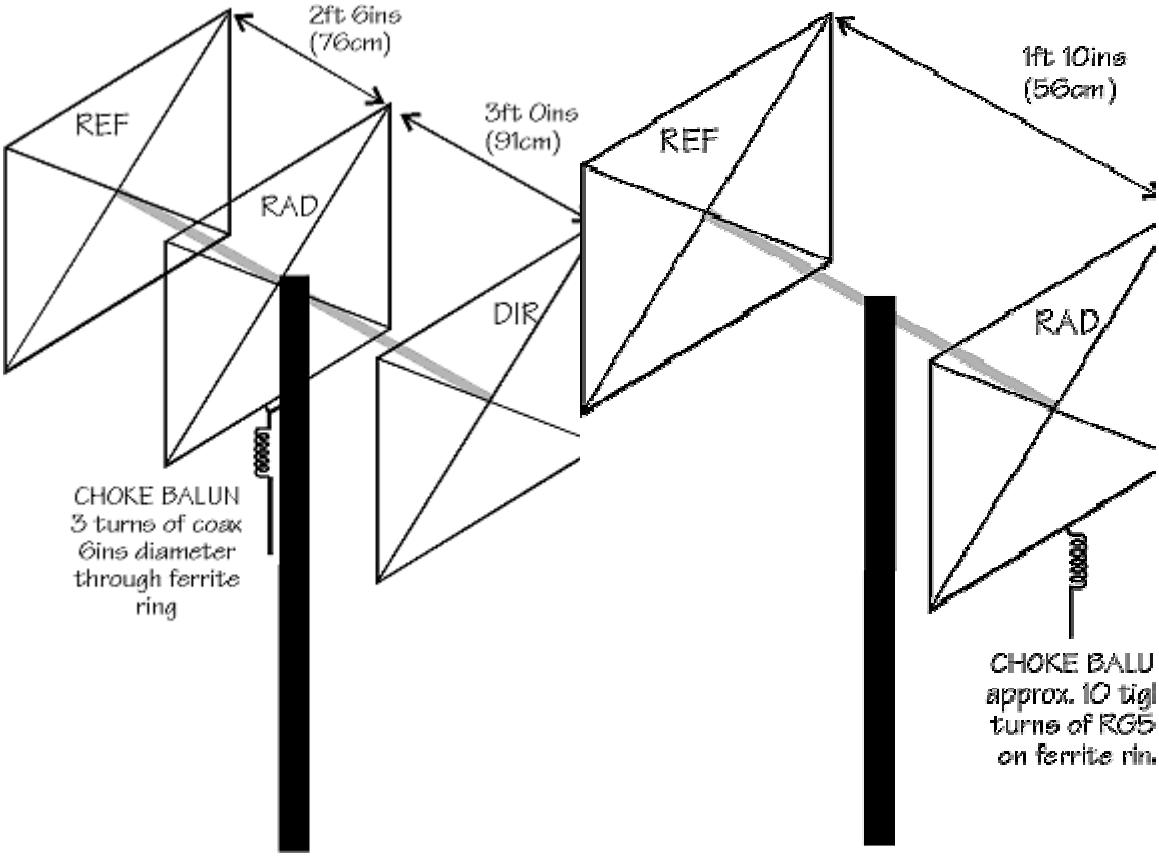

Figure 1. Dimensions for G3HBR's two- and three-element quads

Tuning. A good set of dimensions to start off with is Reflector 21' (6.4m), Radiator 20' (6.1m) and Director 19' (5.8m). Apart from adjusting the radiator for minimum SWR at your favourite frequency you may find this is a good enough quad for you. It'll certainly give you a better bandwidth than my final dimensions. Anyway, here goes:

Step 1. Adjust radiator for minimum SWR. If tuning up at around 6' (2m) agl as I do, tune at the bottom of the band ie 50.0000001 if possible.

Step 2. Increase length of director an inch or two. Check gain on beacon, local signal and/or reading on field strength meter.

Step 3. Re-check frequency of minimum SWR, adjust radiator as necessary.

Step 4. Reduce length of reflector an inch or two. Check gain on beacon, local signal and/or reading on field strength meter.

Step 5. Go back to Step 1 and repeat the whole process until things start to get worse, then undo the last change.

Step 6. Put the antenna up to its full height and check frequency of minimum SWR. If it has gone too high in frequency, take the antenna down again and lengthen the radiator a little (you should be able to guess how much without too much trouble). I suppose a purist would make proportionate adjustments to the other elements too but I don't think it's worth the effort.

Step 7. Work the DX.

In case you are wondering, I don't use stubs because I find they are a nuisance

Bonus. While you are at it why not add four-metre loops as well? I use the dimensions from the RSGB Communications Handbook ie reflector 173" (4.39m), radiator 165" (4.19m), director 157" (3.99m). Apart from tweaking the radiator for best match at 70.2MHz, I have made no attempt to optimise and it works fine with a little less gain than the six-metre quad and a little better front-to-back ratio.

Footnote. Since writing the above I have taken the three-element quad down, but instead of readjusting it I have replaced it with a 4 element version.