Antennas

PETER DODD, G3LDO
37 The Ridings, East Preston, West Sussex, BN16 2TW
E-mail: g3ldo@ukonline.co.uk

The GM4UTP multiband antenna showing the inverted-V configuration. The antenna also supports a single quad element for 10 metres.

IF YOU DO NOT have an ATU and you wish to operate on all bands, you need a multiband antenna that presents a near to 50Ω feed impedance on all bands. The G5RV is often the first antenna to come to mind, but an ATU is essential when using this antenna with a transceiver having a solid-state PA.

One solution is to use several dipoles fed in parallel from the same feed line. The length of each separate dipole is a half wavelength for each band so that each dipole presents a good impedance match to the feed line on the band for which it is intended and a poor match on all the others.

However, placing several dipoles in parallel can present some mechanical problems and there can be considerable interaction if the ends of the dipoles are spaced too close together. The ends of the dipoles must be arranged so they are far apart as practical. The only multiband dipole that I have used [1] is the example shown in **Fig 1**.

The multi-element structure is supported by the lowest-frequency dipole. Each dipole in the parallel-fed combination may be supported from different directions if different directions of radiation are desired and the space is available. This also has the advantage of placing the ends of the dipoles some distance apart. The ends of the lowest frequency dipole can be bent to fit into an available area if necessary, but the length will have to be increased slightly above the normal dipole length to get the lowest SWR.

TWO OTHER SOLUTIONS

IF MORE THAN three parallel dipoles are used, using the construction method shown in Fig 1, the structure becomes complicated and difficult to manage. One solution is to use the G3BDQ 10-way ribbon cable arrangement, which is described and illustrated in [2]. This cable is 13mm wide and only 1.3mm thick and each of its conductors is made from 14 x 0.13mm tinned copper strands.

The cable can be obtained in complete lengths of up to 50m and a multiband antenna can made from a 40m section. The antenna is constructed by cutting away the unwanted parts of the cable. For this antenna to work, around 20% of each end of each higher frequency dipole is arranged so that it hangs down and away from the next supporting lower-frequency element.

This antenna, in common with other multiband arrangements, uses the inverted-V configuration with a single pole to support the centre insulator and coaxial cable feeder. Even so, the ribbon cable antenna will require some support because the weight of all the elements is carried by the lowest-frequency dipole. G3BDQ used 1mm diameter nylon cord, which was stitched into the multi-way ribbon cable with a packing needle using 500mm long 'stitches'.

Stewart, GM4UTP, uses a more rugged parallel dipole design. This arrangement uses the lowest frequency dipole to support the higher-frequency dipoles using spacing insulators made from 11mm plastic electrical conduit. The construction is shown in **Fig 2** and in the photo. The 24MHz dipole is not shown in Fig 2, but if included the element length each side of the centre insulator is 2.84 metres.

The antenna is configured as an inverted-V with the weight of the centre insulator and the 1:1 balun mounted on a 10m high aluminium scaffold pole. Low centre-band SWRs are possible if some time is spent tuning each dipole. This can be achieved by arranging the ends of the elements so that they are clear of their support insulators by about 200mm. The dipole lengths can be reduced or increased by folding back the end and securing with plastic tape.

The resonances of these dipoles can be interactive - when you adjust one it affects the resonance of the others, so be prepared to have to re-resonate elements.

A similar arrangement is described by K0GPD [3]. In this design all the spacer insulators are made the same length and a nylon cord is run from the end of the highest frequency dipole to the end of the multi-wire sections of the antenna to improve mechanical stability.

REFERENCES

[1] *Backyard Antennas*, Peter Dodd, G3LDO (available from RSGB Sales).
[2] *Practical Wire Antennas*, John D Heys, G3BDQ (out of print).
[3] 'A Great 10 Through 40 Portable Antenna', Edward L Henry, K0GDP, *The ARRL Antenna Compendium, Volume 1* (available from RSGB Sales). ♦

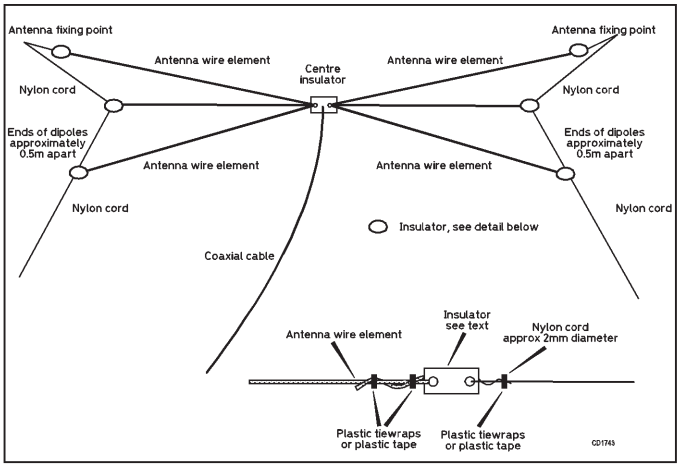

Fig 1: Dipoles can be connected in parallel using a common coax feeder. Interaction can be minimised by keeping 500mm spacing or more between the ends of the wires. Each dipole end support should be adjusted to keep all the dipoles reasonably tight, which keeps them looking tidy and prevents them from getting tangled when they blow around in the wind.

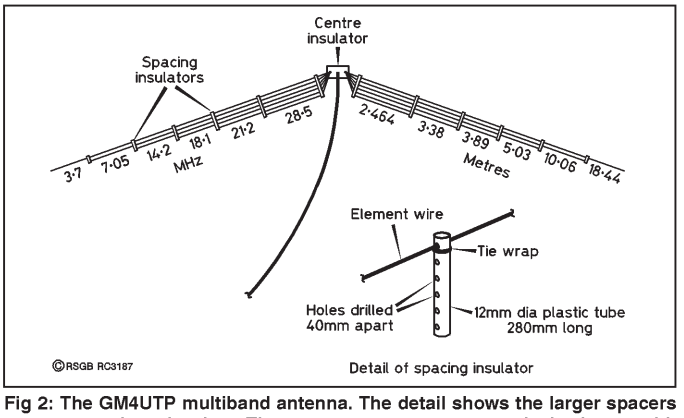

Fig 2: The GM4UTP multiband antenna. The detail shows the larger spacers to accommodate six wires. The outer spacers are progressively shorter with holes drilled for five, four, three and two wires respectively.