9 bands in a small garden

Getting out on the HF bands from cramped spaces.

By Louis Varney, C.Eng. MIEE. AIL. G5RV.

For the amateur who wishes to operate on all the HF bands from 1.8 to 28 MHz but who has very limited space, the problem of what kind of general purpose and effective antenna to use is not an easy one. However, given a total garden length of 50 to 60 feet, there are a number of possibilities and two of them which have been tested by the writer have given very satisfactory results. Their design, construction and performance are described in this article; but first let us consider the constraints that such a relatively small garden length imposes.

Constraints

The two basic types of simple antenna that are capable of radiating effectively nearly all of the HF energy fed into them are, as is well known, the horizontal dipole and the quarter-wave vertical, the latter either using a ground plane or a really effective low-resistance earth system. Unfortunately, both these types are impracticable for the 1.8 and 3.5 MHz bands for the majority of amateurs. A horizontal $\lambda/2$ dipole for 1.8 MHz is about 260 feet long and should, ideally, be supported at half a wavelength above ground. For 3.5 MHz its length would be about 128 ft and it should be supported at that height above ground for optimum results. A vertical $\lambda/4$ antenna for 1.8 MHz would need to be at least 100 feet, even if used with a top loading capacity 'hat'. If used as a GP, the radials would each need to be 130 feet long. For operation in the 3.5 MHz band these figures would, of course, be halved. Clearly, all these requirements are quite impossible for the vast majority of radio amateurs. Even those of us who are fortunate enough to have long gardens which can accommodate a $\lambda/2$ dipole for top-band cannot hope to support it at anything like the optimum height above ground. It should be remembered that the effects of supporting a $\lambda/2$ dipole at heights considerably lower than a half-wave above ground are twofold:—

(1) The radiation resistance at the centre of the dipole, nominally about 75 ohms, rises slightly to about 80 ohms at $\lambda/4$ above ground and at $\lambda/8$ high it falls to about 35 ohms.

(2) The polar diagram of the radiated power is modified, especially in the vertical plane where the energy tends to be concentrated at very high zenithal angles, unsuitable for DX working.

Two Possible Solutions

First, the half-size G5RV antenna, shown in **Fig. 1**, will work very efficiently on the seven highest frequency bands — 7, 10, 14, 18, 21, 24 and 28 MHz provided that it is used in conjuction with a suitable ATU. On the 1.8 and 3.5 MHz bands it should be used as a Marconi T type antenna, again with a suitable ATU. On these two bands the radiation efficiency, compared with that of a dipole will, of course, be reduced but, nevertheless, it will provide coverage of the UK and Europe with licensed power inputs to the transmitter on CW and SSB. **Fig. 2** shows the arrangement recommended for operation on the 3.5 MHz and **Fig. 3** shows the ATU for 1.8 MHz. Second, a simple end-fed wire antenna may be used, again with a suitable ATU. It is important to use as long a length of wire as possible in the prevailing circumstances. A minimum overall length of 100 feet, including the down-lead right to the output terminal of the ATU, is recommended if operation on the 1.8 MHz band is required. However the overall length may be reduced to 68 ft for operation on 3.8 MHz and above. It should be noted that, for successful operation on 1.8 and 3.5