The "space miser" coax loop antenna for eighty metres

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The 80 metre amateur band (3500-3700 kHz) is a popular band for local and 'egional use, unhampered by the problems that beset the 40 metre band above and the 160 metre band below. Novice licensees are not permitted on either of these bands and the 80 metre band remains the lowest frequency band common to both Novices and "full"-calls. The biggest problem about using 80m, though, is the sheer size of any reasonable antenna. Here's a solution.

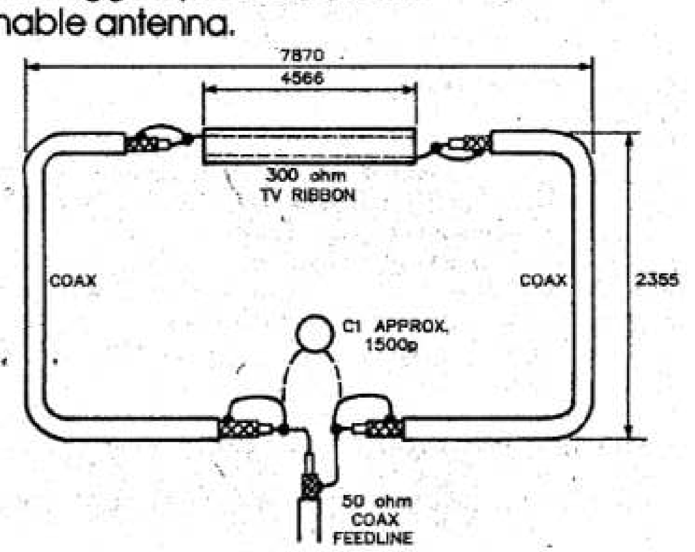

Figure 1. The general form and dimensions of the antenna. Now you can see why it's called the "space miser"!

TO ANYONE with a modicum of experience in experimenting with or building antennas, the realisation dawns sooner or later that loops wrap up an electrically large antenna into a physically small space. Where space to fit an antenna is at a premium, a loop should be considered first.

"Loading" an antenna with capacitance or inductance also brings about a reduction in physical size, but often presents practical difficulties. In addition, these devices tend to restrict the operating bandwidth of the antenna and reduce an already low efficiency.

Possibly the best compromise in terms of space reduction, reasonable efficiency and bandwidth I have come across for an antenna designed to operate at the bottom end of the HF bands is the loaded loop constructed of coax cable, originally described by James Taylor W2OZH in the early 1970s. The design achieves reported efficiencies of 8-10 % where capacitively or inductively loaded verticals and dipoles are fighting to achieve efficiencies in the range of 1-5 %. Taylor's loop provides a close match to 50 ohms – great for today's rigs with solid state finals that demand this for maximum efficiency and output, and typically maintains a low VSWR over bandwidths of 100 kHz.

The Taylor loop

The general arrangement is shown in Figure 1, dimensioned here for the 80m band, centred on 3575 kHz, the middle of the Novice segment. It is a rectangular loop, as you can see, mounted vertically and with the feedpoint placed in the centre of one of the long sides (the lower side for convenience). It requires only around one-fifth the length of a dipole and only a few metres height (and you always need some height for an antenna). Hence, the "space miser" name!

The "secret" of Taylor's loop lies, firstly, in the use of coaxial cable as a low resistance conductor of relatively large diameter and comparatively low weight (compared to tubing). Secondly, it is capacitively loaded, to physically reduce the loop dimensions, using TV flat ribbon cable as a "distributed" capacitance that is also part of the radiator. Cunningly simple, and quite effective.

The loading reflects an inductive impedance at the feedpoint which can be readily compensated for with a parallel, low voltage capacitor. Note that, essentially, only the outer conductor of the coax in the loop is used, the inner conductor may be ignored or shorted to the braid.

The antenna can be mounted at low heights, with the lower side only a metre or so from the ground, and still achieve good performance. It can be mounted on the side of a building (wood or brick – no metallic cladding!) or strung between suitable supports. So it's versatile.

Construction

For the radiator, you will need around 17 metres of coax and some five metres of 300 ohm flat TV ribbon; the common type, not the 'low-loss' type with slots punched out of the plastic between the conductors. You can use virtually any coax you can lay your hands on; it doesn't matter if it's 50 ohm, 70 ohm or whatever. Use the 9 mm diameter coax, such as RG8 or RG213, if you can, as the larger diameter achieves a greater operating bandwidth. If you don't need, or can live with, less bandwidth then the smaller diameter RG58 or RG59 ("TV coax") is quite adequate. The feedline, from the antenna to your rig, needs to be 50 ohm coax, though.

This antenna cannot be hung on its own, as the joints at the feedline and TV ribbon would not support the weight. It is best to secure the loop between two parallel rope supports, as illustrated in Figure 2. This shows two wooden pole supports bolted to fence posts, placed to fit the antenna between them