Coaxial Trap Capacitors

Capacitors for antenna 'traps', must handle high voltages. John Share G3OKA, shows you how to make eminently suitable traps from coaxial cable.

In recent years the construction of traps for a 'Trap dipole' has become quite difficult due to the shortage of suitable fixed capacitors. It's well known that coaxial cable can be used as a capacitor and its voltage rating is also known, for example RG8U has a capacitance of 100pF/m (30.5pF per foot). The insulation properties are also quite good, as it has an insulation breakdown of at least 5kV. However, the lengths of coaxial cable required would seem to preclude exploiting this idea.

As a rule of thumb trap capacitors have a value of 1.5pF per metre of wavelength of the desired band. So, a trap for the 24.9MHz (λ=12m) band would require a capacitor of about 18pF. If this capacitance value is to be made from RG8U coaxial cable, its length would be 180mm (18/100 in metres) or a little over seven inches when using imperial measurements.

Similarly to create a suitable version for the 18.1MHz (λ=17m) the capacity needed for the trap, would be 25pF. To create this capacitance value some 250mm of RG8 cable is needed. Both of these physical lengths are rather long to make into an effective and small trap. But there's no reason why the capacitor cannot be made up from a number of much shorter identical lengths connected in parallel.

Let's now look at how to produce, say, a 6pF capacitor, which would need 60mm of cable. Firstly, cut a 100mm length of RG8U coaxial cable. Then strip away 20mm of the outer insulated covering and tin the screen. Using a craft knife, or perhaps a small plumber's pipe-cutter, trim back the tinned screen to leave about 5mm of the inner insulator exposed. (Make sure to trim the inner conductor flush with the end of the insulation).

Remove the remainder of the jacket and tin the screen about 55-65mm from the first end, then cut through the tinned screen so that overall it's 60mm in length. The illustration, **Fig. 1**, shows the completed 18pF version. Finally cut the centre insulator back to about 10mm in length. These dimensions do not need to be exact, a steel ruler will be sufficiently accurate.

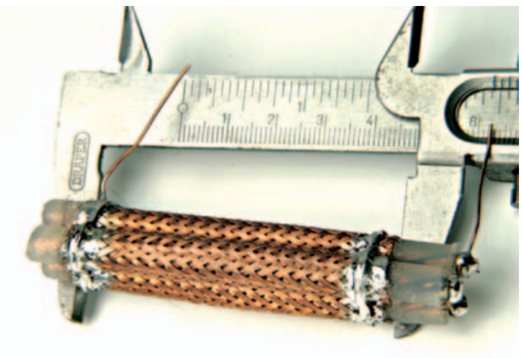

Fig. 1: Three short lengths in parallel make up the 18pF capacitor as described by John G3OKA. This 'capacitor' has been tested to a d.c. voltage of 12kV.

Fig. 2: The 'screen' ends of the coaxial capacitors are soldered together, note that the inners are extended by 5mm or so.

Using bare copper connecting wire (fuse wire works well) bind the sections together as shown in **Fig. 2** and then check that they will fit inside the plastic tube. Solder a short length of heavy wire (that from domestic power cable will be suitable) to the screens. Now you can solder the other tinned ends of the screen together. A further heavy wire connects the centre conductors together as shown in **Fig. 3**.

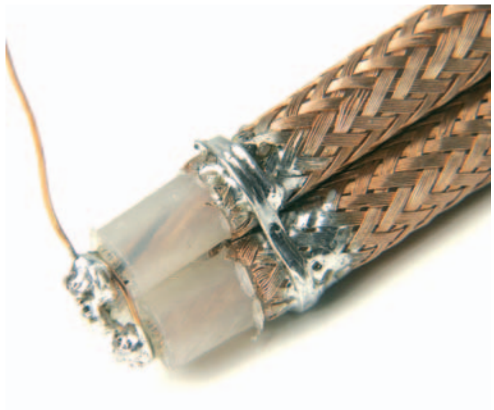

Fig. 3: At the 'inner' ends the screens are soldered together. The inner conductors are connected together separately.

The coil former, **Fig. 4** was made from scrap plastic tube 27mm outside diameter, and with a wall thickness of 2.5mm. A groove of 2.5mm per turn (10 turns per inch) was cut using a lathe to ensure that the coil winding did not move and change the value of the inductance when subjected to the elements. (There are alternative techniques).

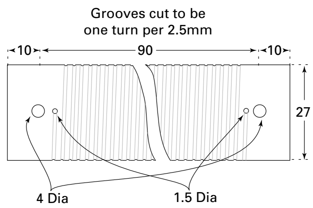

Fig. 4: The trap inductor former, made from 27mm outside diameter plastic tubing. The grooves keep the winding firmly in place, see text for more details

I use enamelled copper wire, or bare 1mm or 1.5mm wire stripped from house wiring cable to wind the coils. Insulated connecting wire could be used in an extreme case, but I find that it tends to be too thin. The trap should be temporarily assembled with the capacitor inside the tube, and the maximum number of turns of scrap wire wound onto the former and held in place with some adhesive tape. Solder the coil and capacitor ends together to create a temporary parallel tuned circuit.

A grid dip oscillator (g.d.o.) is then used to find the resonant frequency of the trap and the number of turns reduced until resonance is achieved in band centre. Note the number of turns for resonance at the desired frequency, then drill two small holes in the former at the correct place. This 'test' winding is discarded and a new permanent one is created using the same number of turns.

Before waterproofing is applied, it's an idea to recheck the resonance of each trap. It's essential that the traps are made waterproof, rainwater will find the smallest opening and ruin hours of work. There are many sealants but some will attack copper. Servisol Silicone Adhesive Sealant (from RS Components, Farnell and CPC) is widely used for sealing electrical connections against water penetration. One tube will be more than sufficient for around half a dozen traps.

By using this method, I've made traps for 28, 24, 21, 17 and 14MHz bands. All of which have performed fully to expectation and handled a typical 100W transceiver with no obvious signs of distress. Try it yourself! **PW**