Tex Swann's

antenna workshop

Taking time off from making or drinking coffee, Tex Swann G1TEX makes use of the tin.

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Editorial introduction: Tex's coffee tin antenna is thoroughly practical – I've used one for several years and can recommend it to readers. However, Tex hasn't been entirely truthful about making coffee in the office! In fact, most of his experience in catering comes from running what he calls the 'Tea & Coffee Swindle' at the **Poole Radio Club**. In return for a modest weekly payment (the 'Swindle') we get good tea and coffee, the club makes a nice profit while Tex keeps the empty tins to make antennas! **G3XFD**.

Ahh coffee, but what about the tin? That looks like an interesting recycling opportunity!

Fig. 1: When on coffee-duty at the Poole Radio Club, Tex started thinking about the possibilities of using the top of the coffee tin as an antenna. With a diameter of a little under 160mm, the outer circumference is around a quarter-wave on 144MHz. Time to let the mind wander round a few possible design shapes. Well it has to be round – doesn't it?

Don't Waste That Empty Tin – Make Yourself......A Coffee Time Antenna!

The *Coffee Time Antenna* that I'm about to describe, started off as I was idly(?) waiting for the kettle boiling as it was 'my turn' to make the coffees in the office. I looked as the rim of the 'tin' holding the coffee. Incidentally, the containers ceased being metal some time ago, the top (**Fig. 1**) and bottom being metal parts clamped onto a cardboard tube to form the container.

The flat ring forming the top was just under 160mm in diameter with an inner diameter of a little over 130mm. A quick calculation gave me the idea that this was a circumference of almost 500mm, which is just quarter-wave on 144MHz. So, would it work as a DDRR antenna?

If you've not heard of a discontinuous direct ring radiator

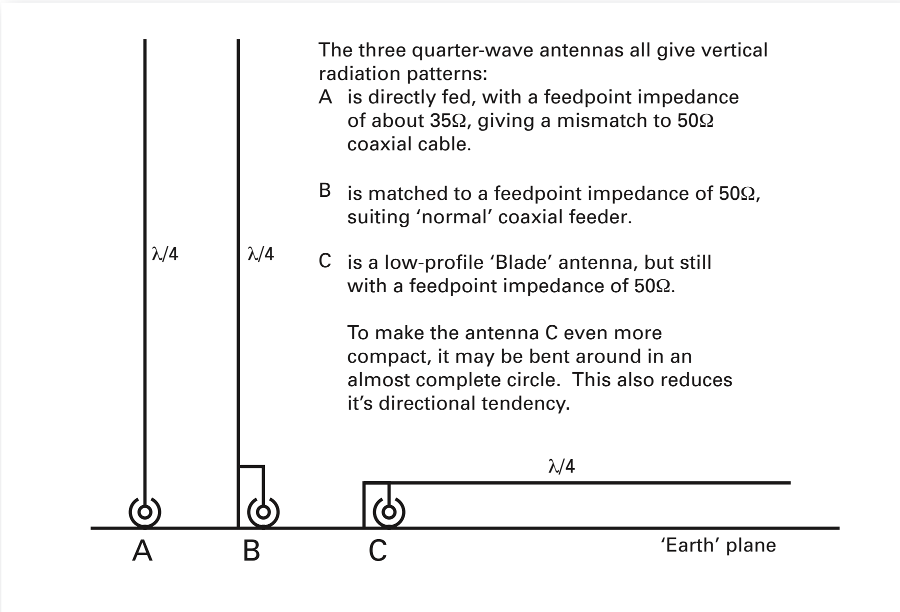

Fig. 2: The derivation of a 'blade' antenna in steps from a simple vertical quarter-wave Marconi antenna. The DDRR type antenna is only a variant of the last step, annotated as 'C'.

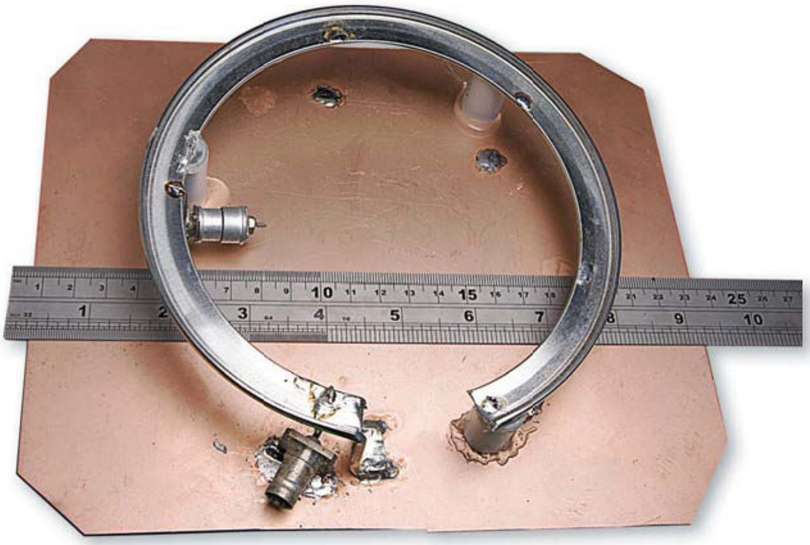

Fig. 3:The finished item with a 300mm ruler for size comparison. The solder 'blobs' around the ring are earlier tuning points that failed to work well – or even at all.

Fig. 5: The ring, split and bent to shape, The 'foot' bend is 6-10mm wide, and the other bend in the opposite direction, to form the 'knee when assembled is 25mm from the foot bend.

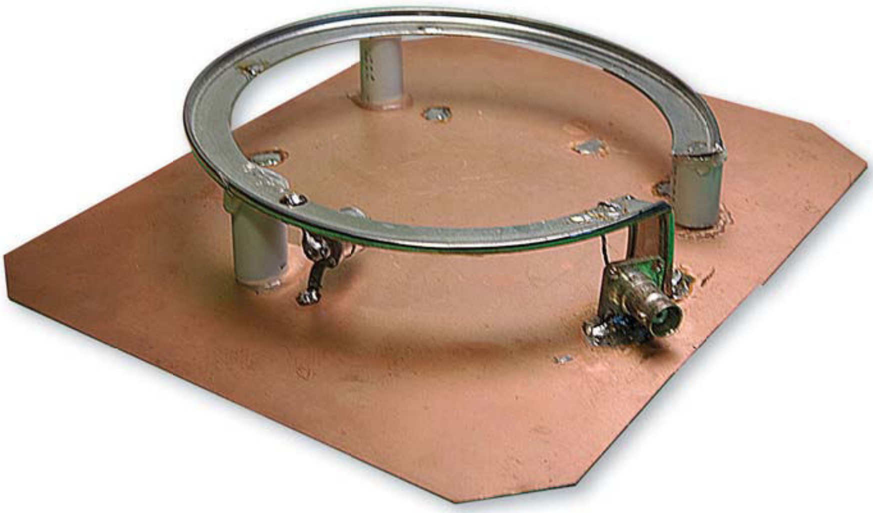

Fig. 4: This three-quarter view shows how the DDRR antenna is assembled on a piece of p.c.b. material slightly larger than the ring itself. Ideally it should be even bigger!

(DDRR) antenna before, I've shown how it can be considered in **Fig. 2**, which shows the derivation of a 'blade' antenna from a simple quarter-wave vertical Marconi type antenna. The blade antenna (C in Fig. 2) has a vertical polarisation, but suffers in that it transmit well outwards from the sides of the element, but has little or no radiation off the ends.

By bending the blade antenna in an almost complete circle, the DDRR antenna, **Fig. 3**, has a much more

Fig. 6: The feed-point of the inner of the BNC socket is attached about 12mm from the knee bend of the antenna element. When I build another version, I'll mount the BNC socket from the underside of the p.c.b. material.

omni-directional radiation pattern. Look at the photographs of Fig. 3 and **Fig. 4** and you should be able to see the layout of the antenna I've created.

To form the coffee tin top into the antenna element, make a cut across the ring, and make two bends as shown in the photograph of **Fig. 5**. The 'foot' bend is about 6-10mm wide, and the 'knee' bend a further 25mm around the ring. These bends can be difficult to get lined up and the clamping rim of the ring makes it rather difficult to bend accurately – but persevere!

You'll also need three 25mm lengths of some insulator for supporting the ring to stop it 'flapping around' in use, as this alters the matching quite drastically. In practice, use three short length cut from 15mm plastic water piping. The ends should be clean-cut and 'square'.

As the antenna is in effect a section of transmission line, it needs an 'earth-plane' to form the other 'side' of the line. And for this I used an off-cut of printed circuit board (p.c.b.) material that I had to hand. This material make soldering easier, though you could use almost any metallic material that you can make electrically good connections to. It should be a little bigger than the size of the ring itself!

I made the feed-point from a BNC chassis socket that I had to hand.

Fig. 7: The 'beehive' trimmer is around 30pF at maximum, but only a few picofarads were required to tune the antenna, when mounted around a quarter of the way around the loop as shown here. Moving the position closer to the feed-point would mean more capacitance was needed to achieve resonance.

As it was silver-plated it soldered easily, though an iron with a lot of heat capacity is needed. That should be soldered as close to the 'foot' and 'leg' of the antenna as possible as you can see in **Fig. 6**. The inner of the BNC socket is soldered about 12mm from the 'knee' of the ring. The position of this tapping point affects to impedance matching.

Tuned & Resonant

The next problem is to actually bring the antenna into a tuned resonant state. And to do this a small value of capacitance is needed, it's actual position can depend on several factors. I eventually ended up with a small 'beehive' variable soldered about quarter of the way around the loop from the 'knee' as you can see in the photograph of **Fig. 7**. Just out of focus, around the nearer edge of the ring are two solder 'blob's where I tried earlier attempts at tuning the ring.

I did try a variety of other tuning methods including making capacitors up from p.c.b. material and mounting them on a short adjustable 'legs'. But those attempts proved to be very difficult to adjust and keep adjusted.

The 'screen-grab' of **Fig. 8** is the s.w.r. curve of the finished unit as shown in the photographs. The 2:1 bandwidth of the antenna is 144.4 – 146MHz, with the lowest s.w.r., of 1.4:1 occurring at 145.26MHz. No doubt with a bit more fiddling with the matching point and tuning, I could achieve a better s.w.r. but I felt that this was good enough to prove a point!

The antenna does suffer a little from proximity of other objects near the earth-plane, but the antenna was just thought of as an enhancement over the basic 'rubber-duck' antenna of a small hand-held. So, when 'thrown' up on top of a wooden cupboard or wardrobe, it works well, Which was what I aimed at.

Now has that (Poole Radio Club) kettle boiled yet? ●

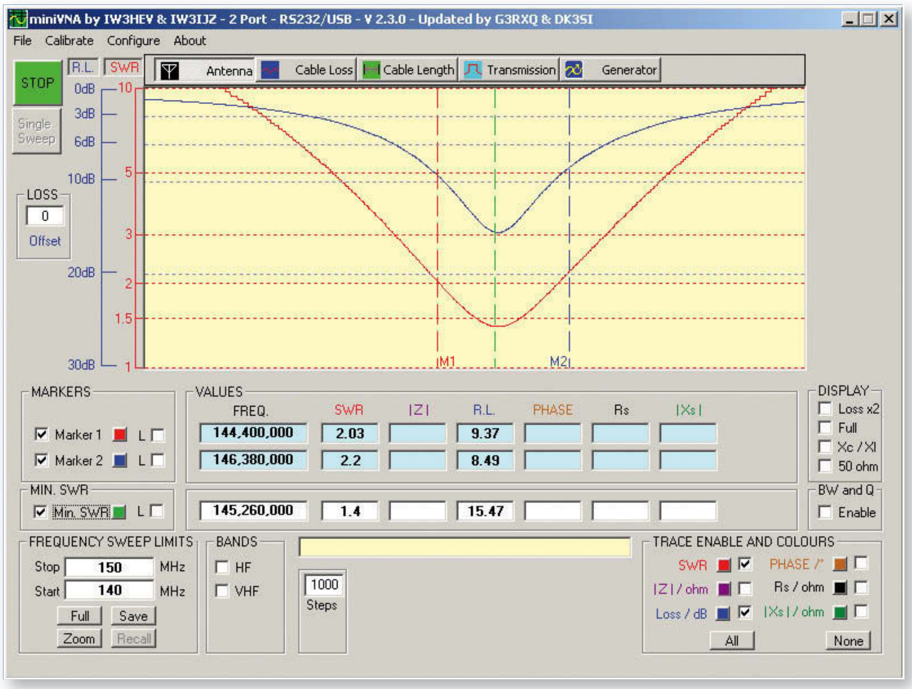

Fig. 8: A 'screen-grab' while using the MiniVNA antenna impedance analyser and its software to tune and check the s.w.r. of the completed antenna. The 2:1 bandwidth is 144.4 – 146MHz, with the best match occuring at 145.26MHz, almost in the middle of the f.m. band section, thus suiting the original idea of a simple and cheap antenna to improve a hand-held radio.