NEWSLETTER ARCHIVES

Fun and Games with the G3LZH Miniature Loop Antenna
Peter, G4FYY

6 January 2001, 9:30 pm.
Telephone Conversation with Stewart, G3YSX

I don t believe it I heard myself saying to Stewart G3YSX. A loop that size just cannot work. It contradicts common sense and basic antenna theory. Size is important with HF antennas. An HF loop only 12 inches diameter made from thin wire? This sounds more like witchcraft than science.

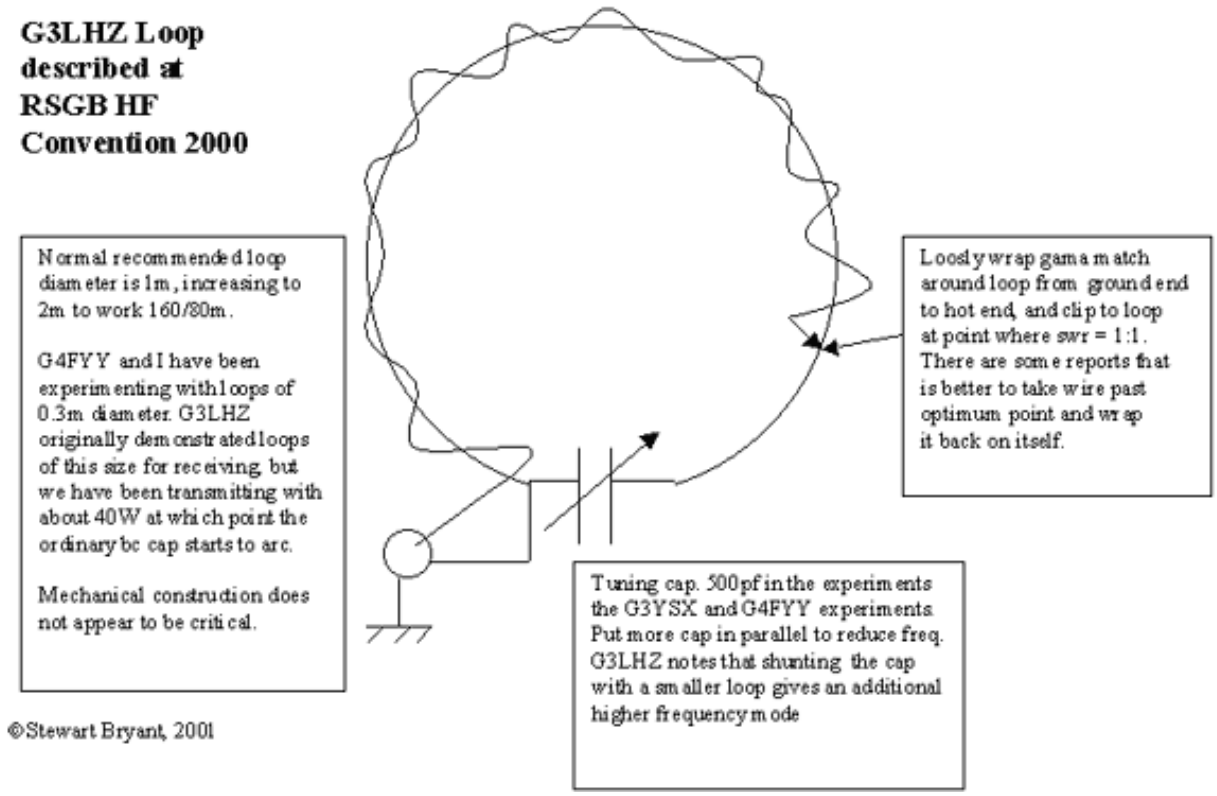
Build one and try it said Stewart. So I did just straight away after finishing the phone call with Stewart. It took all of 30 minutes, 25 of which were spend rummaging in the shed for bits of wire, a tuning capacitor and an insulated extension spindle. Actually putting it together took just 5 minutes on the dining room table.

Stewart had described the general arrangement over the phone. Take one metre of copper wire of sufficient thickness to support it s own weight when bent into a loop, one Rx tuning capacitor (of the valve radio variety, 500 pF) with 6-inch insulated extension shaft and knob , a short length of coax (to connect the loop to the rig), about one meter of PVC covered wire and a crocodile clip.

Form the copper wire into a loop and solder the ends to one section (500pF) of the tuning capacitor. One end of the loop connects to the stator and the other to the rotor.

Now connect the outer braid of the coax to the frame of the capacitor and solder the inner of the coax to the length of PVC wire. Wrap tape over the joint.

Starting at the coax cable end of the loop, loosely wind the PVC wire around the copper wire loop (in the long path direction) for approximately ¾ of the circumference. Then cut the PVC wire leaving a couple of inches free and connect the crocodile clip. Clip the crocodile clip onto the loop at about 270 degrees from the start of the winding. The exact tapping point is critical and will be adjusted later.
Finally, fit the appropriate connector for your rig s antenna socket to the coax cable and the job is done.



In practice on Receive

10:00 pm, 6 Jan 01 Dining Room.
It was getting a little late, but just time, I thought, to see how the loop would tune using my MFJ259 Antenna Analyser. The loop tuned from about 5MHz to 30MHz. Resonance was very sharp as might be expected. By carefully adjusting the position of the crocodile clip, it was possible to achieve a perfect 1:1 VSWR match. Now that was interesting and I began to feel that this loop really was going to be something out of the ordinary. Time to check the loop as a receive antenna!

10:10 pm 6 Jan 01. Upstairs bedroom. 40 metre band. Window sill.
I felt myself repeating the well known Victor Mildrew phrase under my breath I don t believe it! as I peaked for maximum noise. This loop was performing like an active antenna. In disbelief, I re-connected the main station antenna sky-loop . Signals were less than two S points stronger on the main antenna. From an earlier calibration of the TS940, I knew this represented about 8 -10 dB. Somewhat encouraged and feeling my scepticism fading, I tuned to 20 metres. The loop peaked up on noise, but it was late in the evening and the 20m band had closed.

08:00 am, 7 Jan 01 Upstairs Bedroom. Listening on 20.
20 metres was wide open. I connected the loop, peaked for noise on receive and to my astonishment, heard ZL s and VK s coming through at Q5. Alternatively connecting the receiver to the main station antenna and the miniature loop showed that the miniature loop could hear everything that could be heard on the main antenna. (The simple acid test for all antenna experiments is that if background noise increases when the antenna is connected to the receiver, then all signals above the noise level will be heard, irrespective of actual antenna efficiency).

Stewart had said he had had a QSO with a station in Kosovo when running 35 Watts into his version of the miniature loop antenna, (35 Watts was the maximum he could use before the capacitor flashed over). It was time to try the miniature loop on transmit.

08:20 am, 7 Jan 01 Upstairs Bedroom. Tuning for transmission
Using the built-in VSWR meter on the 940, I carefully tuned the loop and adjusted the tapping point alternately until a 1:1 match was obtained. Surprisingly, moving the tapping point a couple of inches either way seemed to have little effect on the tuning point. This made adjustment very easy. I found I could run about 40W before the capacitor flashed over, but only when the loop was tuned for 1:1 VSWR. At 14.2MHz, the 940 gave an indicated bandwidth (where the VSWR was 1.5:1) of just under 90kHz. However, I suspected that the transmitter power was winding back under mismatched conditions. My suspicions proved correct when I repeated the measurement using the MFJ 259. This time, I measured the VSWR 1.5:1 bandwidth as 23kHz . The loop wire was slightly warm after tuning and at one occasion, I noticed some temporary discoloration of the copper wire around the crocodile clip, indicating local heating. It is important to make a good connection here.

08:30 am Time to call CQ!
In the spate of 20 minutes, I worked EA1IM, HB9WU and EU2MM with the loop stood on top of the 940, about 3 feet from the window. Power was about 40W. Reports were 5-9 both ways in each case. Again, I found myself muttering the Victor Mildew phrase. Something weird is happening here that I can t explain.

09:00 am Another telephone call to Stewart, G3YSX
Stewart did not seem at all surprised about these results. I suggested that perhaps the small loop was coupling into the main station antenna. Well, that would be easy to check. Just connect a low power Wattmeter to the main station antenna and watch for any indication when transmitting on the miniature loop. There was nothing! Not even a flicker of a needle.

Conclusions

I have to congratulate Professor Mike Underhill for his work on small loops. I regret not having been able to attend any of his club talks on the subject and I am not surprised that Mike s work has been viewed with some incredulity by the classical antenna die-hards (of which I was one). But now I too would say if you don t believe it, try it ! I am sure there are unexplained processes going on, and maybe the surprisingly excellent results are a result of some secondary RF coupling into the house wiring, central heating pipes etc. Or maybe Mike is right and classical antenna theory needs a major overhaul. But whatever the reason, there is no denying that the miniature loop works.

Try it yourself and see! Peter, G4FYY

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