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G0BPS

G4TPH Mag-Loop antenna

How well did these well-packed magnetic loop antennas perform?

SMALL IS GOOD – BIG IS BAD. When first asked to review the G4TPH **[1]** Mag-loop antenna, I was expecting a rather large box to arrive. Imagine my amazement when the postman dropped off a box just 500 x 100 x 100mm (20 x 4 x 4in). What kind of magician had put a 20m Mag-Loop inside such a small box? I have been playing with antennas for over 20 years with many of my ideas being published in other magazines. However, I had never had the opportunity to play with a Magnetic Loop, so what is this antenna, what is a magnetic loop?

Wikipedia tells us that: *"Magnetic loop antennas (also known as Small Transmitting / Receiving Loops) have a small antenna size compared to other antennas for the same wavelength. A magnetic loop is one in which the current amplitude is constant round the circumference, and it is therefore small enough to avoid a significant standing wave in the current distribution. The antenna is typically smaller than 1/4 wavelength in circumference at the intended frequency of operation".*

A search of the internet came up with many, many other references as can be seen at the end of this article. W2BRI **[2]** gives some wonderful examples of loops he has built; Jeff K9ESE **[3]** tells us that you need plumbing skills, whilst closer to home, G4FON **[4]** uses film canisters and wire. GW0TQM's **[5]** pages are also an excellent source of information where he says 'small is good – big is bad!'

A Magnetic Loop is a coil, usually of copper but also occasionally of aluminium, with a capacitor added to bring the whole thing to resonance. It is not the same as a large resonant loop in that the diameter of the magnetic loop is smaller than 1/4 wavelength and will not resonate on its own. Copper piping has over 20% more efficiency according to some software. Of course, more efficiency means it will work better and it is also a lot easier to solder and can be found at your local DIY shop. However, aluminium is far lighter and just as easy to bend and drill.

G4TPH MAG LOOP. On opening the box, I found not one but two antennas and all the other component parts – truly amazing. **Photo 1** shows the contents of the box as it arrived. For the ML-20, there were eight bars of aluminium alloy each 400mm long with holes at each end, the coupler and the tuning unit along with all the bolts, shake proof washers and wing nuts to assemble the unit.

PHOTO 1: The contents of the box as it arrived.

PHOTO 2: The feed point uses ferrite transformer to couple the feed line to the loop.

PHOTO 3: One bar of the loop passes through the ring.

I started with the ML-20 and in all it took just over 10 minutes to assemble and tighten the nuts. (The assembly is so simple that even a child could manage it and, to prove it, I later gave the ML40 to my 6-year-old great nephew to try). Two of the bars are attached to the tuning box by the fitted bolts. These are then, in turn, fitted to another bar until the loop is formed with just one more connection to be made. The matching load unit is then slid over one bar and the final connection made to form the circle.

The feed point is unusual (**Photo 2**) as it uses ferrite transformer to couple the feed line to the loop. The ferrite ring is fitted into the box around the hole so that one bar of the loop passes through the ring (**Photo 3**). The tuning unit comprises a 50pF variable capacitor (**Photo 4**) and is fitted to the two open ends of the loop (**Photos 5 & 6**). The loop is then tuned by a changing the value of the capacitor. An increase in capacitance will bring the resonance of the loop lower in frequency; a lowering in capacitance will make the loop resonate higher.

These are not self supporting units but can be hung from anywhere, even a curtain hook in my conservatory sufficed. We are told that the unit should be erected and set about 30cm above ground being held up by non conductive string, etc. I found that leaving the antenna hung from the ceiling in the conservatory overnight was not good as the shape of the loop became more of an elongated vertical diamond. I eventually put the shake proof washers between the bars (**Photo 7**) to help stop the tendency of the ML40 to fold up with the weight of the extra four alloy bars. During the next few days, it held its shape well. It is essential that all the wing nuts are fully tightened so that the loop maintains its physical shape and also to maintain the 'Q' of the antenna.

As they are both sold as QRP antennas, I didn't fire up the TS950SD but brought my trusty 10 watt Elecraft K2 into play and connected that to the antenna via a SWR bridge. Here was another small problem. The connector on the load box is a BNC and like most amateurs all my patch leads were

either PL259 or 'N' type. A coupling was soon located in the 'junk box'. Currently at my home, I have just three main HF antennas, a long wire about 30m long fed against a counterpoise, an OCF doublet about 20/40m and a four element Cushcraft at about 12m.

After connecting everything up I set the rig on my favourite part of the 20m band and listened to the noise floor at about S2, rotating the antenna didn't change this much but by using the tuning control I was able to increase the noise level substantially and by tuning the rig to a station could raise or lower the received signal by turning the antenna quite easily.

First, with the Loop set on 20m, I found a strongish signal and set the tuning on the loop for maximum noise, then as instructed retuned for lowest SWR by fine tuning the tuning unit. Every time I tried this it worked. OK it was fiddly because I had to stretch out to avoid my body influencing the tuning but it worked! This is one of the problems inherent with all loops. Your body influences the tuning of the loop. Back to the workshop and cut a small notch in the end of a long piece of scrap wood. This enabled me to tune the loop with much less interference from this large body!

Compared to both the long wire and the OCF antenna, the loop was quieter with signal much lower than on the wire antennas but the noise floor was also significantly lower. Typically, the wire antennas were showing signals S8 with a noise floor of S4 on the loop this changed to S6 but virtually no noise so, in fact, an increase of signal to noise ratio.

OK, I didn't work any great DX, most of the contacts were within Europe but remember, we are at the bottom of the sunspot cycle.

40m MAG LOOP. So; to the 40m version, as mentioned construction is a doddle taking just a few minutes with me overseeing the assembly of the load and the tuning unit. This time the tuning unit uses a 450pF variable capacitor. Whilst the ML20 is about 1m diameter, the ML40 is about 1.5m. Carrying the larger (about 5 foot) one about is not easy to maintain its shape unless all the nuts are tightened really well. (See above).

Although I had an MFJ Antenna Analyser, I decided to try out the two antennas following the instructions given. These instructions are quite brief but, as the designer says, a picture is worth a thousand words and the four photographs on the reverse of the instructions tell it all. I found that by following the instructions carefully a low SWR could be found but that hand capacitance on the tuning knob acted on the SWR.

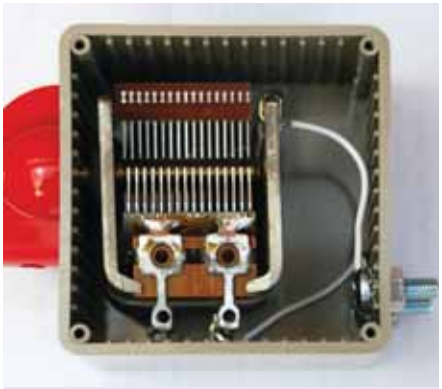

PHOTO 4: The tuning unit comprising a 50pF variable capacitor.

PHOTO 5 & 6: The tuning unit is fitted to the two open end of the loop.

PHOTO 7: Shake proof washers were fitted between the bars.

Using my Antenna Analyser, I found it extremely easy to set up these tuning units for my part of the band. Although getting the low SWR point was sometimes quite time consuming it was always worth it.

ML40 SWR		ML20 SWR	
40m	1.3:1	20m	1.5:1
30m	1.5:1	15m	1.5:1
20m	2:1	10m	1.2:1

Out in the open air in the garden, I used some long lengths of timber to provide a support and hung the antennas about a foot above ground as recommended. In this configuration the antenna performed better than indoors with the SWR dropping to under 1.5:1 on all bands.

CONCLUSIONS. The downside: because it is built of aluminium alloy it will corrode quickly if left out in damp weather or rain. The joints must be cleaned on a regular basis to obviate surface corrosion as the efficiency of this antenna will plummet if not cared for.

The good: These antennas are so very easy to put together and are excellent as a receive antenna. Because of the inherent limitations of its size it will rarely outperform a full size antenna – but if this is all you are able to put up it will provide hours of fun! Value for money is another real bonus for me, the ML40 is just £72.00 and the ML20 £70.00. Other loops cost much more than this and cannot be dismantled. Please note though; these antennas are for a maximum of 15 watts output only.

My 'normal' holiday antenna is a length of wire strung out as high as possible and, of course, there are not always trees or high buildings available. I have used a fishing pole to support wires, I have even used kites. This is a great idea from Tom, G4TPH, and as it packs down so very small and it is perfect as a holiday antenna.

I just wish I had thought of it.

Thanks to Tom, G4TPH, for the loan of the two antennas. They are both available from his website or contact Tom at T Brockman, 1 Dalby Crescent, Newbury, Berks RG14 7JR. E-mail: tom@g4tph.com.

REFERENCES

[1] www.g4tph.com/
[2] www.standpipe.com/w2bri/
[3] www.eciqrp.org/magloops.html
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[5] www.geocities.com/gw0tqm/magloop/magloop.htm