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The EasyLoop 14
A Portable Loop antenna for 14MHz

Maurizio Marti IV3XAZ describes a loop without tuning capacitors, that's proved useful over more than just the one band.

In 2008, I built a receiving magnetic loop antenna, starting from suggestions found in the, 21st. edition of the *ARRL Antenna Book*. After many thoughts, I decided to build a portable loop antenna, with a maximum loop diameter of one metre. I did not want to build any loop using a capacitor adjustment to tune over multiple frequencies.

In my cellar I found about three metres of Aircom Plus 50Ω low-loss cable, some RG- 58 cable and some coaxial connectors. As I've just bought an MFJ-207 h.f. s.w.r. analyser, to check out my antennas, I used this as an opportunity to learn and to compare results. The MFJ unit's a very useful tool and very easy to use.

The Aircom cable is quite rigid but, to build a quite perfect circle, needs rather more support. In a plastics store I found a solid, but very flexible 8mm diameter *pvc* rod 3m long and I taped it to the Aircom cable.

Centre Of Loop

Next, in the top, at about the 'centre' of the loop, I cut out a section of braid, some 300-400mm long to divide it in two, almost equal parts. These two sections of shield will add capacitance to the system, to tune the inductance of the loop. See drawing of **Fig. 1**.

Then I fitted the *pvc* rod ends into a short *pvc* pipe with an internal diameter of 10 mm, which forms the rod and cable into a circle. The result was an almost perfectly circular loop. I've taken the two ends of the loop and I connected shield to shield, shield to tip, tip to tip and so on.

Up to this point, everything had gone well, then it started to become a more difficult job... I tried many systems to couple the loop output with the transceiver and to match the impedances. Although deigned for the 14MHz band, I also wanted to use it on other bands.

I then cut some lengths of RG58 cable and I tried to create different stubs at the 'far' end of the loop **Fig. 2**, while the other end was still connected to the radio via 6m of RG58 cable. I tried several different lengths to try and find the best result for both the s.w.r. and the frequencies to use.

In short, I got some interesting results: The 1m. loop can be used on 3,5 to 3.8, 10.100 to 10.150, as well as 14 to 14.350MHz. It could also be used on 18.068 to 18.168 and 21 to 21.450MHz. Of course, when trying out these tests, I used the MFJ-207 first, to view the changes! Then I used my radio (a Kenwood TS-2000) at the 5W level to feed the loop.

Take Care Please!

Please be careful when trying these tests yourself: I found **two systems** to have low s.w.r. and now I'll explain them: Let's call the two loop terminals, **1 and 2** :

Terminal 1 is always connected direct to the radio, using any tuner. The radio should have an output of no more than about 5W. It takes only a few seconds transmission to check the readings.

On 14MHz: I've built a stub/loop as you can see in the heading photograph and I connected it to loop terminal 2. I checked out on transmit at 14MHz and the s.w.r. was about 1.6:1 – quite good. Now to explain how I achieved the other h.f. bands where I've found some interesting results!

I took a piece of 2.5mm^2 insulated wire 10m long with large, strong crocodile clips to both ends, I connected one crocodile at the ground of the PL-259 **Terminal 1** (the one connected to the radio) and I put the remaining wire along the room . I checked very low s.w.r. on 14 and 21MHz (1:1,5), and quite good (1:1,7) on 10MHz.

On 3.5 & 21MHz

In this second step I looked at the setup on both 3.5 and 21MHz. I disconnected the 10m of wire from Terminal 1's ground, and I connected the same length of wire onto Terminal 2's screen. Checking with the radio on 3.5 to 3.8MHz, again with only 5W on the radio, I found an s.w.r. of 1.5:1 It also was very good on 21MHz.

Please keep on mind that, whilst It should be possible to verify or improve these results, they were carried out in my cellar, about three metres under ground. This is a room that's about 7x4m dimensions and has a ceiling height of about 2.50m. The room has three plain walls and the fourth has two small windows near to the ceiling.

For the testing, the loop was laid horizontally on the table, which I think it is the worst way to check an antenna. Next, I set out to test the loop first on the attic and then outside.

The following morning, I checked the Easyloop indoors. I took the antenna up to the attic (about 10m above the ground). There I have a small 6 x 6m room and the ceiling is about 2.5m high. There is also a very small window, so I put the loop close to it.

I checked the antenna and the various results are very similar to the previous day's results. The coaxial feeder cable, was now 20m long and I noticed some variation on the s.w.r. on 14 and 21MHz. On these two bands, I found the s.w.r. lower around the high part of bands (14.3 and 21.35MHz). However, the s.w.r. had risen to around 3:1 s.w.r. in the c.w. segments of both bands.

But because the results on 14MHz are quite good, I decided to 'leave well alone'. It might be possible to improve the matching by shortening the stub to adjust the s.w.r., but I didn't try it out.

After lunch, I took the antenna to my very small backyard (3 x 10m) and put it on the branch of a small tree, about two metres above ground. In this case,

I needed just 13m Westflex 50Ω feeder cable. The results were very similar to those I'd found earlier.

Checking With An ATU

After all these tests, I wanted to check the system with my tuner, which is is an MFJ-994-B Intellituner, with a capability of up to 600W p.e.p. (300W on c.w.) So, with the loop still, outside and fed via the 13m of cable, using around 10-12W, I checked all the bands from 1.8 to 30MHz. Using the MFJ tuner, I was able to match all bands quickly. At 3.5 to 3.8MHz the s.w.r. could be quickly reduced to 1:1.

The only problem I encountered, was at 1.840MHz, where the s.w.r. stubbornly remained at around 3:1. But I think that for this band it's a better option to use a more suitable antenna. If this isn't an option, then consider using QRP power levels.

Trying Some QSOs

Using the MFJ tuner I started trying out some QSOs. First I began with the 7MHz band, where I had two 'local' QSOs here in Italy. The first one was with **Patrizio Principato IZ1NDZ,** (in San Remo, Liguria north west Italy), who was using about 500W to an inverted 'V' dipole 30m high, He sent me a 57/58 RS and I sent him 58/59. My power level was about 70W.

With some fading (QSB) on the path, Patrizio and I checked out two antennas, where I checked the EasyLoop against my Diamond BB-7V wide-band antenna. The comparison was good, because the loop (2m from the ground, remember!) had about one S-point less on the TS-2000's S-meter.

Some ten minutes afterwards, **Maurizio Ciofani IK6RPR**, in L'Aquila - Abruzzo (in the centre part of southern Italy), sent me a 5&5 to 5&9 signal, after asking about his own, which was similar. From my location in Udine (JN66NA – in north east Italy) it's more or less, about 600km to both San Remo or L'aquila. So, I think the small loop is producing good results.

Then I turned to the design band of 14MHz, with a QSO using 50W of PSK31 and using *MixW 2.19***.** I called twice and immediately an RK6 station replied with 599, but, for some reason the radio would not transmit in reply back to him. After the enforced break in the QSO while I tried to find and fix the problem I tried again. But the RK6 station had vanished.

So, after finding and repairing the macro, that had caused the problem, and having been unable to find the RK6 I started with, I called **Viktor Skripnik US5EQ** in Nikopol, in the Ukraine. Viktor came right back to me, sending me RST599 (though I think this may have been 'generous') and I sent him RST579 in reply.

Further Results

Now for some further results. On a day that was cool and sunny, I placed the Loop on the roof, just over the v.h.f./u.h.f./s.h.f. antennas. This time is was on the lightweight rotator, about 12m above ground. I could now compare it with my Diamond BB7-V vertical base antenna.

Incredibly, I found I could hear some signals on the loop that I was unable to hear with the vertical. Perhaps, as it reacts to the magnetic field, more than the E-field, it helps to pick out to these signals from the noise.

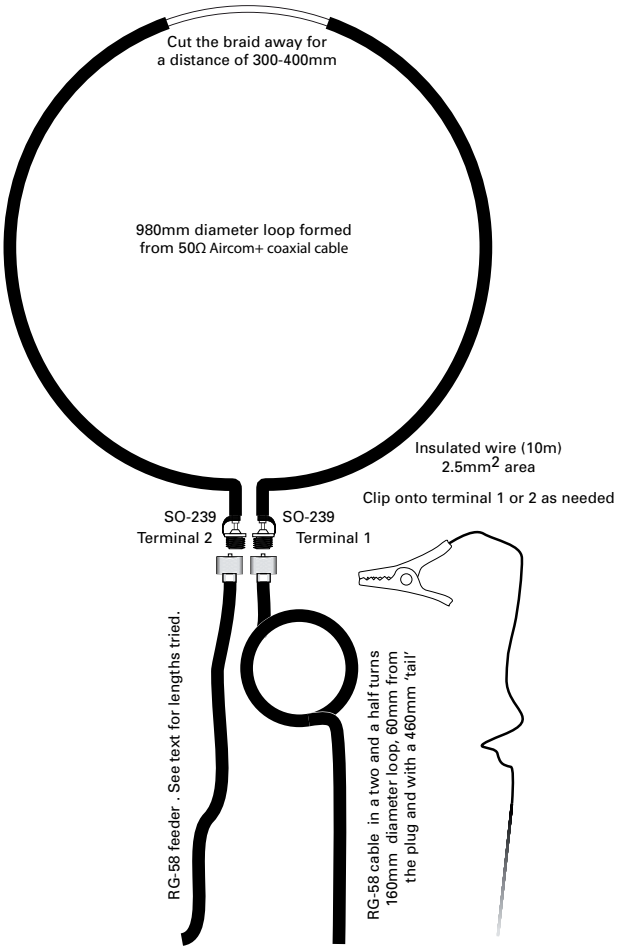

Fig. 1: These two sections of shield will add capacitance to the system, so helping to tune the inductance of the loop.

The s.w.r. readings on 7, 10 and 14MHz were about 3:1, which is not very good. But, using my MFJ -994B Intellituner between the TS-480 and the loop, allowed me to get down to unity s.w.r. The feeder cable this time is about 25m long.

Using power levels from 5-130W and using PSK31 and RTTY, during a recent winter month's activity I had around 25 QSOs of over 1500km. The best ones being with ZS2ND at around 8100km.

All in all, I'm more than happy with the results of the loop antenna. So, why don't you have a go at one? If you'd like to contact me about this design, then I'm on E-mail at: **mmarti@libero.it** or **IV3XAZ@arrl.net**

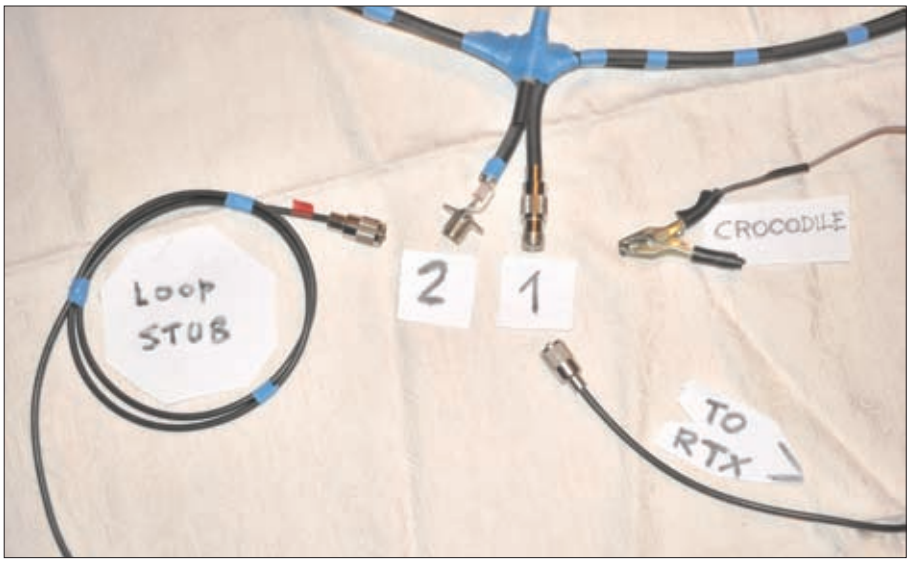

Fig. 2: A little more detail of the parts that may be connect together for operation on different bands.