8 Bands - no outside antennas

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I came out of the Royal Corps of Signals in 1972. I was then just a keen SWL and any old bit of wire wrapped round the place seemed to pull the stations in. I have lived at this QTH which is in the middle of a small row of terraced houses, right in the centre of town, with my car park at the front and a bit of grass at the back throughout those 31 years. Council Offices are no more than 50 yards away and the main Church about 150 yards. However when I was licensed in 1980 it was a different ball game. Bits of bent wire got me out but it was always a struggle, a half size G5RV was erected and even that had to be bent and over the rooftop. My back yard measures 20 feet by 15 feet and my front the door opens onto the footpath. The half size G5RV never worked very well and I resigned myself to the fact that I would never put out a decent signal from here.

Then last year I read some articles about the Magnetic Loop Antenna and I decided to make one and see how it would work. I read several articles before I made one. One of the most informative was by Roberto Craighero I1ARZ and was published in *Radcom* Feb 1989 entitled "Electrically Tuneable HF Loop". Another very good one appeared in *Ham Radio Today* by George Metcalfe G6VS and was titled "Around the world in 99 inches" Both give full constructional details of a Magnetic Loop one metre in diameter.

Construction

The main loop is constructed from 22mm copper tube and you will need 8x 300mm lengths so you will need a 3mtr length of tube and 8x45deg fittings.

If you go to Home Base or B&Q these will cost nearly £4 each, so try your local Plumb Centre where they are half that price. The tube is cut using a pipe cutter, which is so much easier than using a hacksaw and gives nice clean, smooth cuts. Clean the ends with wire wool and then solder them into the 45deg bends using a gas torch. If you can do it outside on flat concrete you will get a nice flat octagon. The loop then needs fitting to a piece of timber about 4 feet long, a piece of 4x1 is adequate. This is to form the main vertical support.

As the centre of the loop is at zero potential this point could be used to fit a solid metal support. I attached my loop to the timber support using 22mm plastic standoffs. At the top centre of the loop a 20mm piece is cut out. The tuning capacitor is connected across this point. If high power, i.e. 100 watts is to be used then the capacitor needs to be wide-spaced as voltages as high as 5000V can develop across the plates. The value to cover 20–10m needs to be about 100pf with a minimum of about 7pf. The chosen capacitor is mounted on the support upright just underneath the gap at the top of the loop. I used braiding stripped from coax cable to make the connections and they want to be as short as possible. Make sure the joints are well soldered and mechanically sound.

The loop needs to be remotely tuned so a small electric motor is required to turn the capacitor; it needs to turn as slowly as possible, as slow as 1rpm. One of the easiest to get hold of is the little barbeque-spit motor; you can get them at a garden centre for about £3. These run off a 1.5V cell and turn quite slowly. Other sources could be model shops or radio rallies etc. You still need at least a 6:1 slow motion drive located between the capacitor and the motor. I used a barbeque-spit motor and I soldered twin wires onto the motor and made a small PSU for it using an lm317t. Using this and a dpdt switch I can reverse the motor and easily set the SWR quickly.

Methods of Feeding the Magnetic loop.

Although there are many methods of feeding the magnetic loop the two most common methods are the Faraday loop and the gamma match.

The Faraday loop consists of a small circular loop one-fifth the diameter of the main loop. It is constructed of coax cable, I used RG213.

The Faraday loop is a cross-connected loop, as in the diagram. The matching loop is mounted at the bottom of the loop opposite the capacitor and adjustment for minimum SWR is achieved simply by stretching or compressing the shape of the Faraday loop.

The gamma match is much simpler and easier to make and consists of a heavy gauge wire soldered to the centre pin of the SO239 socket at the base of the loop and this is bent over in a semicircle and soldered to a point about 6 to 7 inches away. The exact spot is a compromise for several bands and is found by experiment. I soldered a croc-clip to the wire so I could move the tapping point to achieve the best match and then finally soldered the wire to the spot found.

Setting the SWR

With the rig on receive the range of bands covered by the loop is easily found as tuning the capacitor gives a very sharp rise in band noise at resonance. Once the bands are known choose one near the middle of the range to set up the Faraday loop or gamma match and using low power with an SWR meter in circuit tune for a minimum reading. If this is not 1:1 then adjust the loop or move the tap of the gamma match until you get as low an SWR as possible. Check the other bands and adjust until a satisfactory compromise is obtained. My loop covers 20–10m and I have an SWR of less than 1.3:1 on all bands, 15 and 10m being the best with a 1:1 achieved. The other bands 20,17,12, all have a 1.3:1 or less.

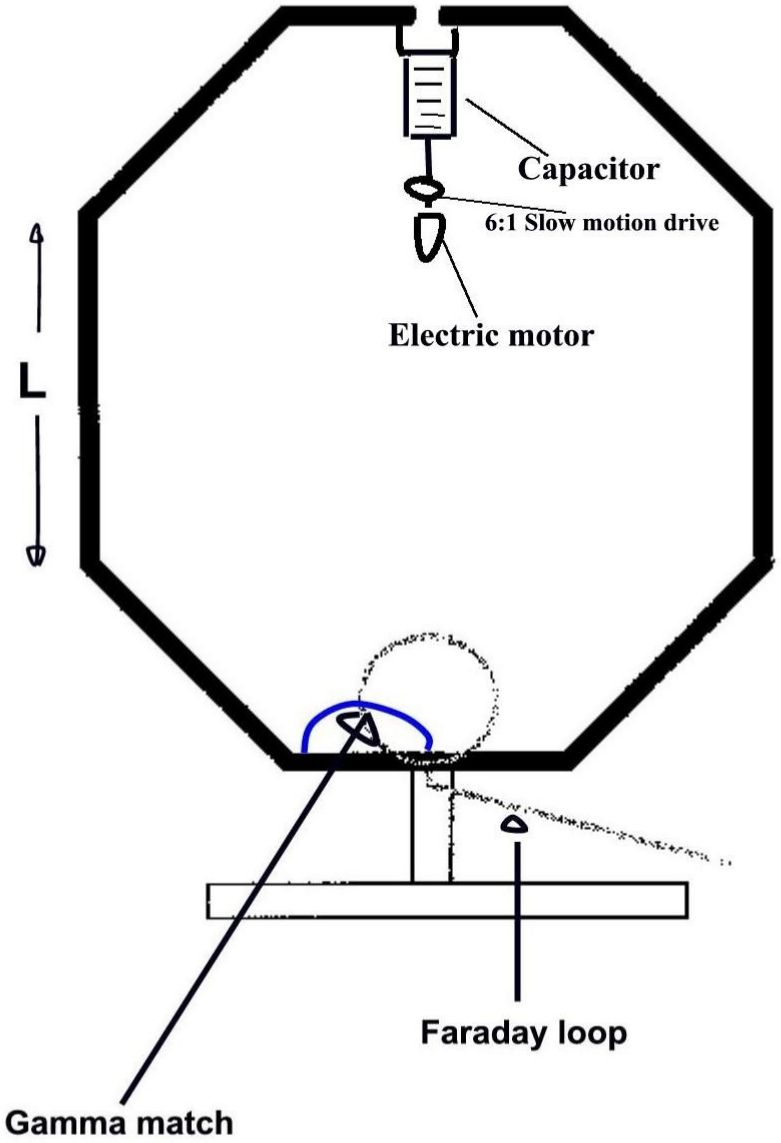
In Use

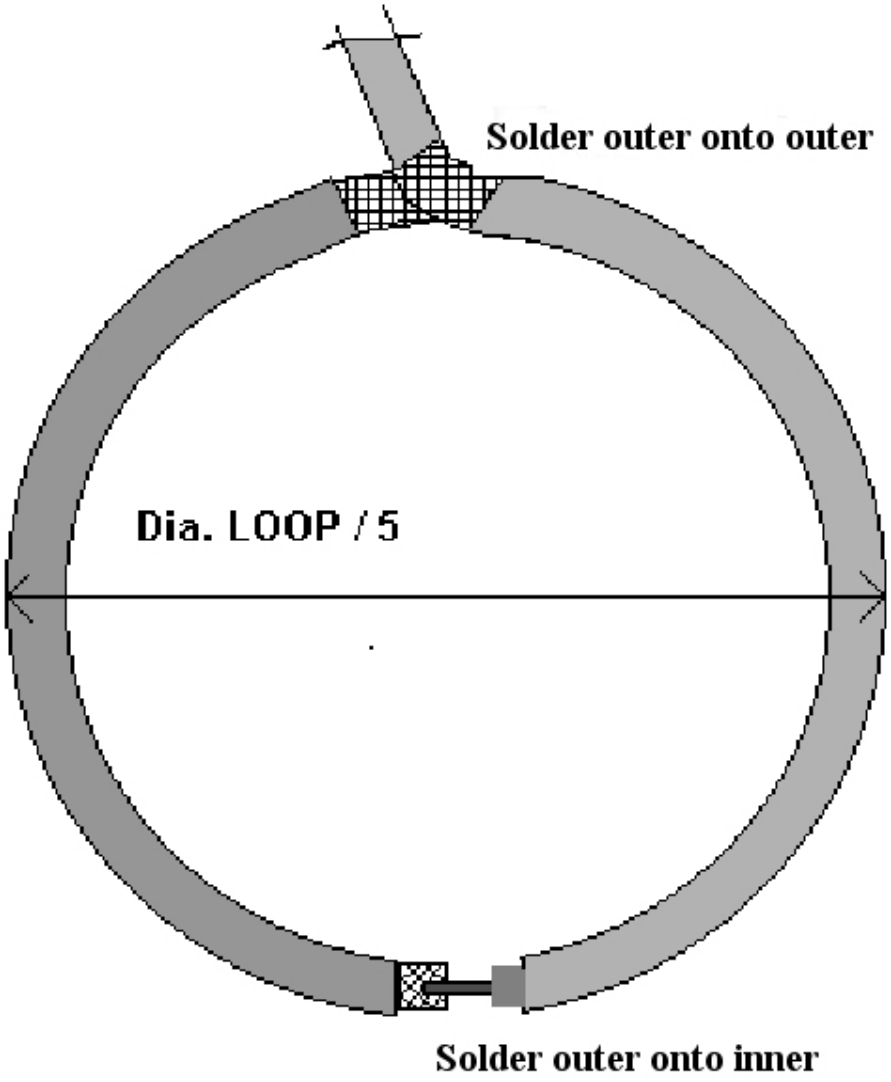
I have built another loop similar to the one described and it is larger at 1.3m and it covers 40/30m. I have used a gamma match on this one and I get 1.2:1 SWR across both bands. I am using another loop on 80m., which is just a lash up at the moment. It is 5feet in diameter and I have been amazed at the reports from the UK and Europe using just 10 watts. I have started to make a 6ft.6in magnetic loop from 22mm tube and it covers 80/40/30m. Initially it will probably only run about 25 watts as I have yet to locate a wide spaced capacitor for it but if the lash up one is anything to go by it will give a good account of itself from inside my loft.

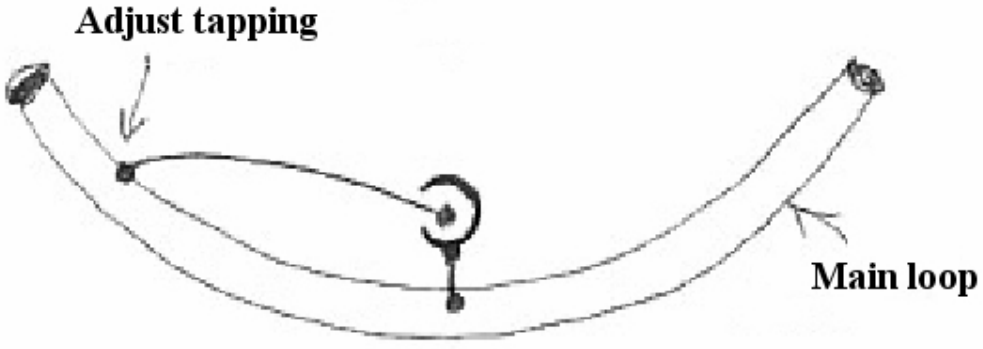
I have worked VK/ZL and most USA call areas, VE and all over EU and out into Asia with the 1m HF loop. All the UK and EU has been worked on 40 with the 1.3m loop and Stateside has been worked with it on 30m. On the 5 foot lash up loop I have worked all the UK and into F, DL, HB9, LA, OH and OE with 10 watts. Not bad for antennas located inside the loft.

So if outside antennas are out for you why not try a small magnetic loop, take it from me they work.

Magnetic loop.
L= 300mm for 20-10mtrs
500mm for 40/30mtrs 750mm for 80/40/30 mtrs.




Solder outer onto outer
Dia. LOOP / 5
Solder outer onto inner


Adjust tapping
Main loop