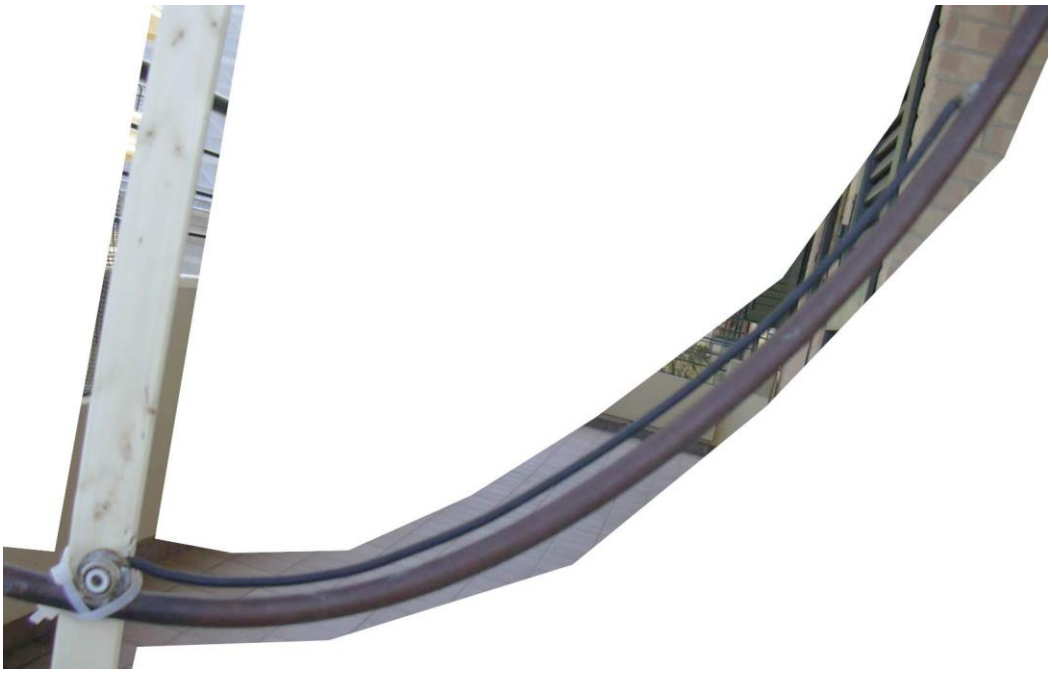
20 Meter Circular Magnetic Loop

by Maurizio Malaspina - IW6DFW

My operating conditions are:
- Radio IC-7000 @ max power (100W)
- 20m of RG58 A/U coax --> more or less 75 percent of power to antenna @ 14MHz
- antenna placed on a camera stand on my 2nd floor balcony. 74cm height from the floor.
- ROS 1:1 (tuned manually... acting on the capacitor)

The antenna is a circular loop built with a copper tube (outer diameter 14mm, thickness 1mm).

The overall diameter is more or less 1m... in the reality, because of the strong wind that made it
fall to the ground, now it's elliptical and 96 x 85 cm. To be accurate the linear length of the copper
tube is 290cm and the air gap where the variable capacitor is welded is about 4.3cm measured
on the axis of the tube, in the middle (this measurement is not critical at all!!!), so if the circle was
ideal the diameter will be 93/94cm (less than 1m!).
As you can see from the pictures below,



the gamma match is a simple 48cm piece of RG58/U with the inner conductor and the shield
shorted together then welded respectively on the central of the SO239 connector (which the metal
casing threaded, directly soldered on the copper tube, inside the circle, in the lower position)
and on a point of the tube, inside the circle (watching from the connector front, on the right).
This simple wire gamma match is unconstrained.

Finally, on the top in picture shown above, is welded a variable tuning capacitor, a butterfly capacitor (it's important to avoid sliding contacts in the perspective to use an ATU in the future, to avoid sparks due to the high voltage generated). Its range is [41,117]pf measured between the two external fixed plates, moving the electrically insulated rotor. Each capacitor (measured between the single plate and the rotor) is [40,190]pF. Follow that a little residual stray capacitance in the range

of [20,22]pF, depending on the rotor position. The air spacing between the plates of the rotors and each stator is between 1/1.2mm.

I report the most significant QSO (for QRB and/or QRP) performed from my station of Macerata (Italy) QTH locator JN63RH below:

Note-- All dates below were in 2012. Times of contacts removed for web page width control and text size.

Call	Country	Band	Mode	QRB	My Power	His Power	RST sent	RST received
JA1OJJ	Japan	17M	USB	9523km				
UP0L	Kazakhstan	20M	USB	4200km	75w	75W	57	55
C06LC	Cuba	15M	USB	8585km	75w	100W	59+10	
WB2REM	Florida	17M	USB	8247km	75w	100W	51	
K1IED	U.S.A.	12M	USB	6704km	75w	100W	53	55
OH8X	Finland	10M	USB	2560km	75w	40W	55	
KC1XX	U.S.A.	10M	USB	6595km	8w	75W	59	59
UR5FLP	Ukraina	17M	PSK31	1411km	75w	75W	59	59
OH6MM	Finland	17M	PSK31	2343km	1w		599	599
					3w	5W	599	599

Under these conditions I can work with a 1:1 SWR 20m, 17m, 15m, 12m, 10m with increasing band width. As I have already anticipated, this is an high Q antenna, so the band within a 1:4 SWR is only 20/30KHz on 20m up to 90/100kHz on 10m.

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I've also built a 2m loop, shown below.....very simple, cheap and good performance!

- Loop: circumference 77cm, material copper pipe 1/4" x 0.8 mm

- Coupling with tx: via gamma match

- Tuning Element: homemade variable capacitor dielectric lexan

- Connector: SO-239 panel welded to the loop

- Total weight: about 100g

- Tested with 50W (FM)

Ideal for indoor use (within the QTH) as it fits perfectly in the range 144-146MHz even from

inside the house.

Characteristic of high directivity, high Q and noise rejection

It can work both vertically and horizontally polarized.

In the case of the 2m antenna, the directivity features is more evident. With local repeater you

could go from 9+60dB, down to 2,3dB simply rotating it of 30 degrees. Also it is simple to compare H and V polarization: try it to believe!!!

I hope my experience will encourage you to experiment with this little and magic antenna:
you could build one rugged and place it on the top of your roof with the rotor and an homemade
ATU!!!

I am proud to share this information with you!

ciao dall'Italia!!!
73
Maurizio Malaspina - IW6DFW

P.S. feel free to contact me for further information about the loops and also on the F5SWN 20m EH antenna I've built, shown below.
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