The MAGLOOP

A.K.A

Small Transmitting Loop

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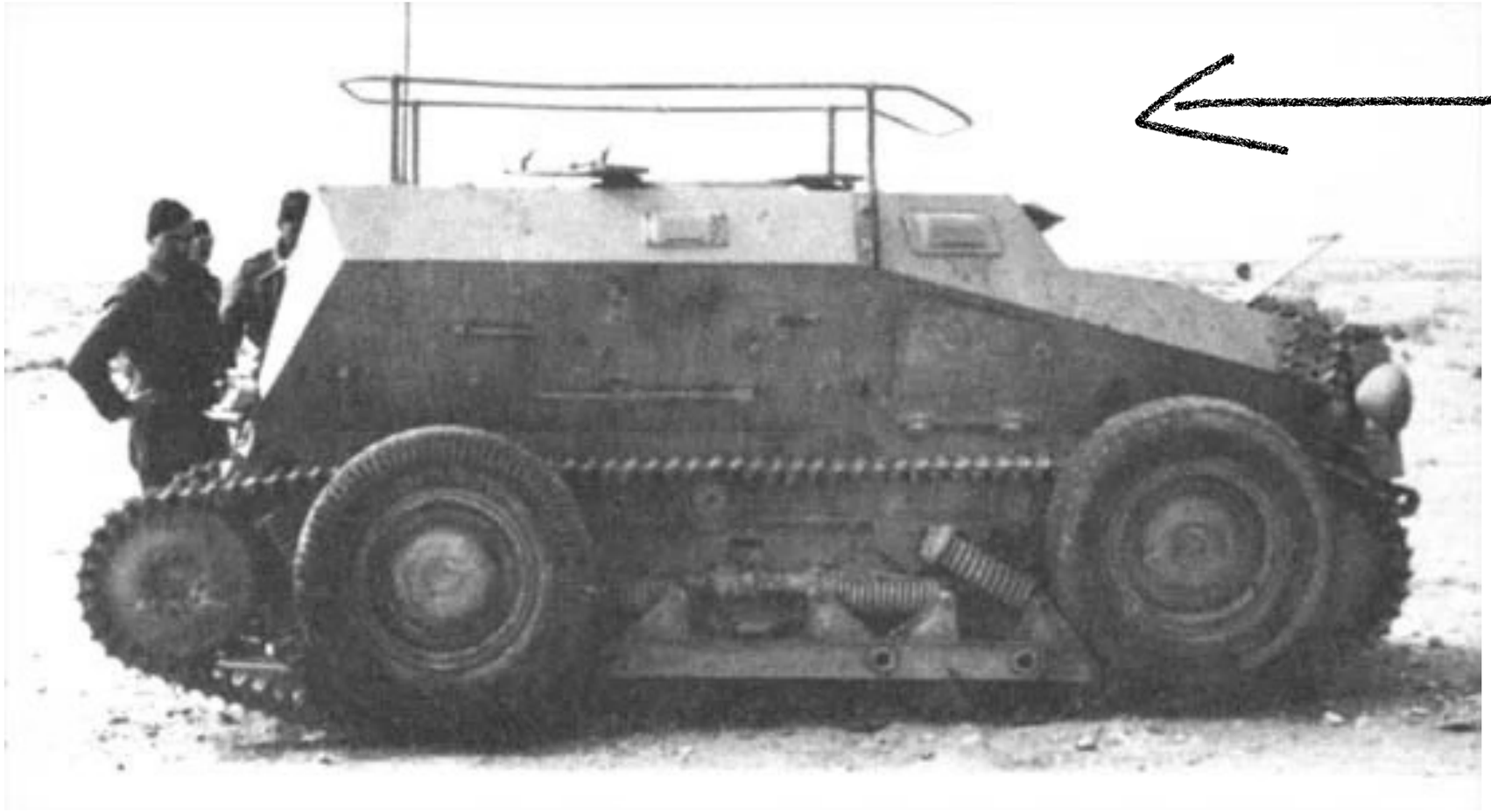
The headlines

- Magloop's circumference is >1/8th of a wavelength, but <1/3.
- Why "magloop"? Big RF current makes a strong RF magnetic field, makes a strong RF electric field. They produce a radio wave.
- The magloop has been around a long time. As good as a long wire, excellent for NVIS, very good for DX, v good urban RX.
- Great for /P. Small, light, quick to set up, only need 1m elevation.
- But high Q, high currents, high voltages, call for very good engineering
- The strong magnetic field is not good for medical devices.

A BIT OF HISTORY

Erwin Rommel's command vehicle, North Africa, WW2



Not a luggage rack

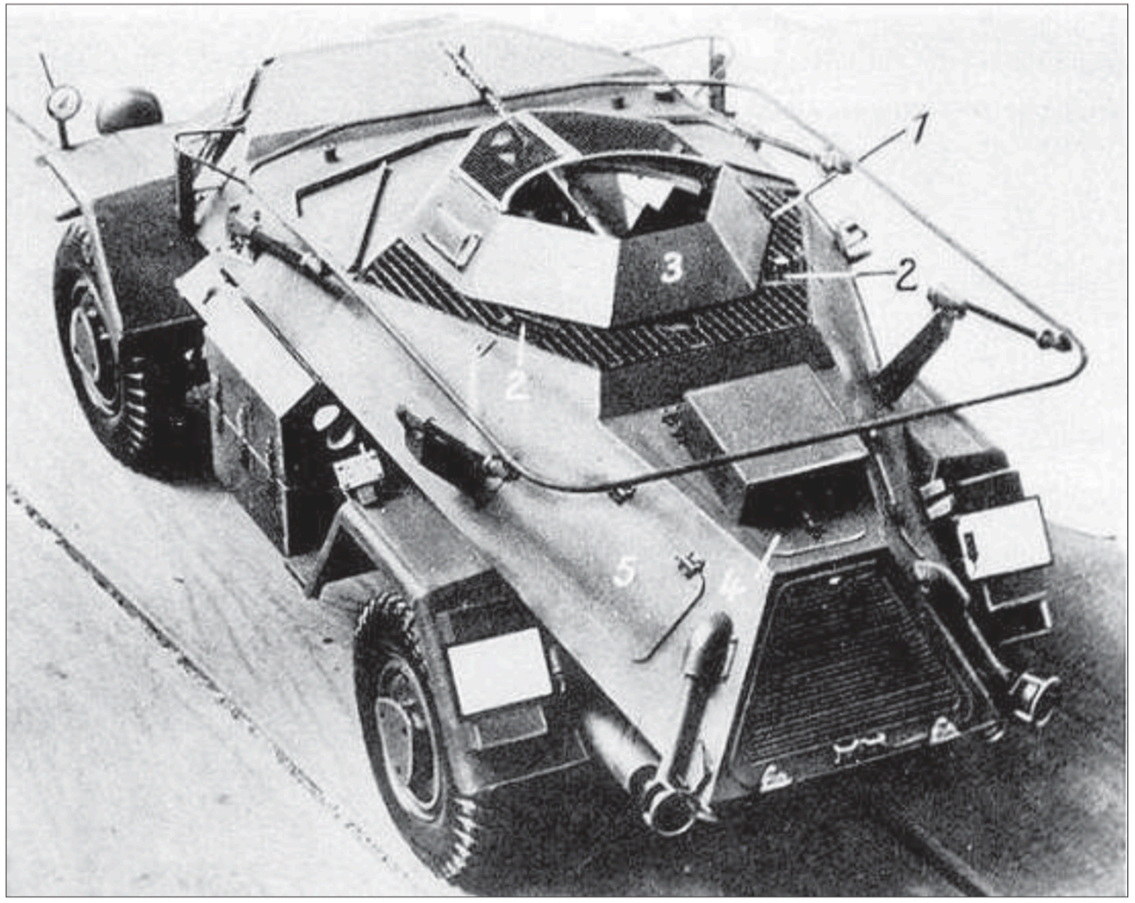


Fig. 1 Sd.Kfz-223 wheeled communications/liaison vehicle circa 1935 used for ground to air coordination. note the "frame" (horizontal loop) high frequency antenna that generates NVIS (sky-wave) signals that provide terrain independent radio communications using NVIS signals over corps/theater size areas. Aircraft flying low-level reconnaissance and attack missions passed their information to this facility for further relay via radio, telephone, teletype or messenger to command and control facilities similar to modern U.S. Army Tactical Operations Centers. Communications were self contained and operable both fixed and on-the-move.

Fig. 8 (Above) A Russian tank with a guard-rail-like small loop. Note the plane of the loop is horizontal.

Fig. 9 (Left) A Russian communications vehicle with two vertical loop elements.

Fig. 10 (Below right) An Israeli army vehicle with two half-loop elements. The vehicle structure completes the loop. This is a somewhat primitive research and development effort by Chelton in France. Using the vehicle as part of the loop is not without challenges. The loss resistance of the vehicle will be much higher than copper or aluminum conductor (the resistance of steel is more than six times that of copper), and the effect of the high radio frequency currents on vehicle components and equipment requires evaluation.

Israeli Comms Vehicle

A LITTLE BIT OF TECHNICAL STUFF

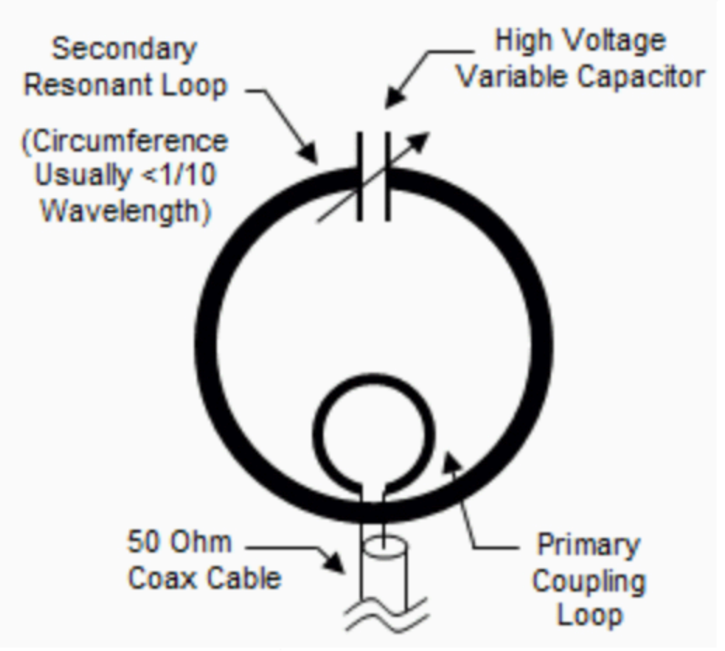
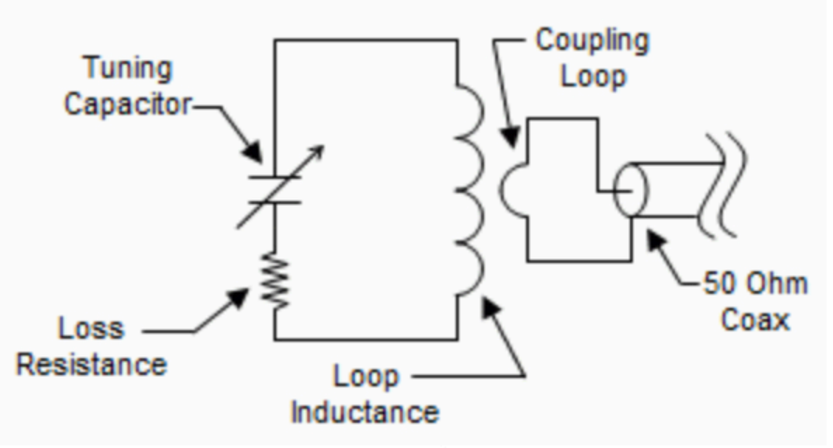


Diagram of a Small Loop Antenna



Equivalent Circuit [3]

Big RF from small aerials

- Long aerials with low current produce the same field intensity as small aerials with high current.
- To produce a large field intensity, a small aerial needs a structure to promote a big RF current.
- A small, closed loop can do that because its radiation resistance is small, and because out-of-phase currents are minimised.
- However, the RF current can still be limited by two things - inductive reactance, and the loop's net (total) resistance.

Ensuring that big current

- The loop is an inductor with inductive reactance. This is countered with a series capacitance to make the loop resonant. At resonance, net reactance is zero and the Q is high.
- The loop also has resistance, the total of its low radiation resistance and its structure's loss resistance. This can be less than one Ohm.
- So the nature of the loop plus good engineering promote huge RF currents and thus large RF fields from a small structure.

Does it work?

- Yes it does. Small antennas trade off bandwidth with efficiency. High bandwidth means low efficiency.
- But at resonance, a magloop's Q is very high, and the bandwidth is very narrow. So **ALL** the power is radiated, except the energy absorbed by the conductor and lost in the capacitor.
- All this emphasises the need for careful engineering.

Radiation patterns

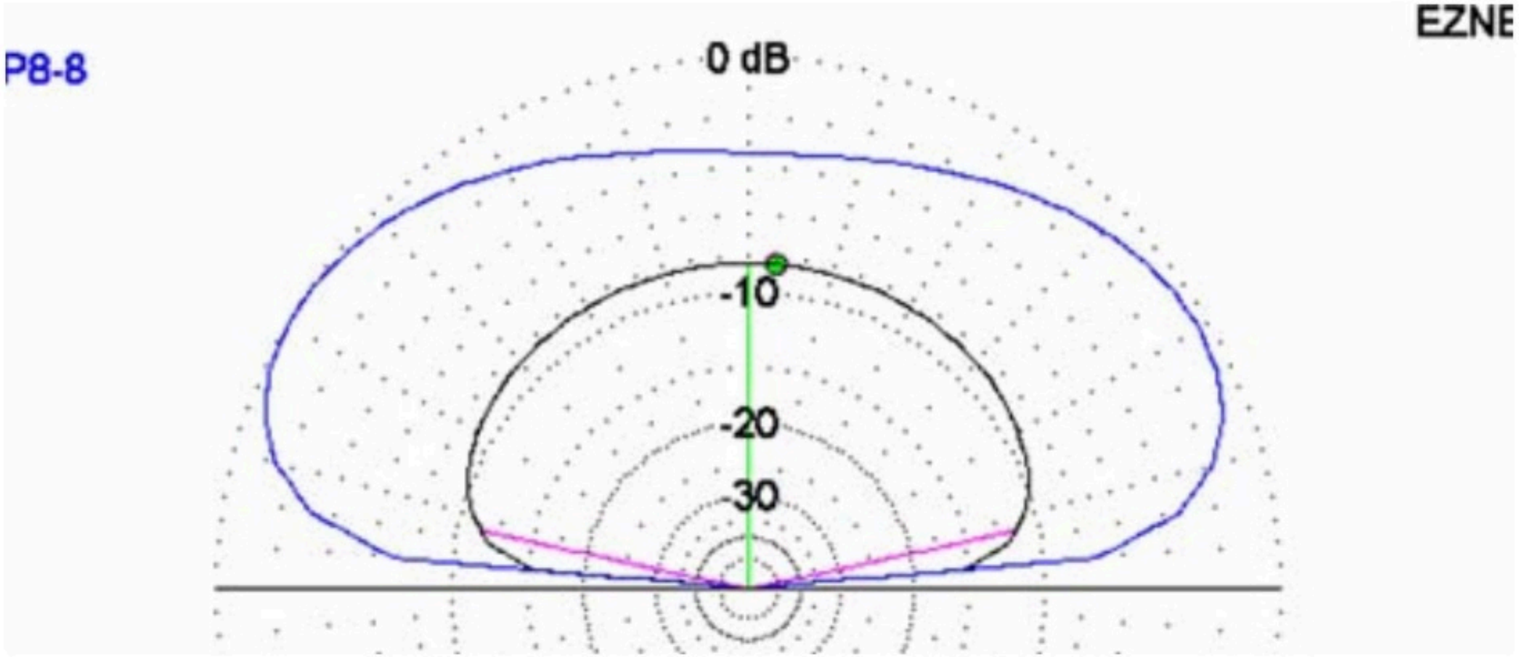


Fig. 4 – a vertical small loop cut for a high frequency of 8 MHz with patterns shown for 2 MHz (inner trace) and 8 MHz (outer trace). Note the NVIS-compatible pattern at both frequencies. In this case there is about 5 dB difference in vertical gain although there is more than 10 dB difference in gain at lower angles.

Vertical Orientation, Looking at the loop. From the side

Horizontal Orientation-
The loop is on its side, and best sited on, eg, a balcony.

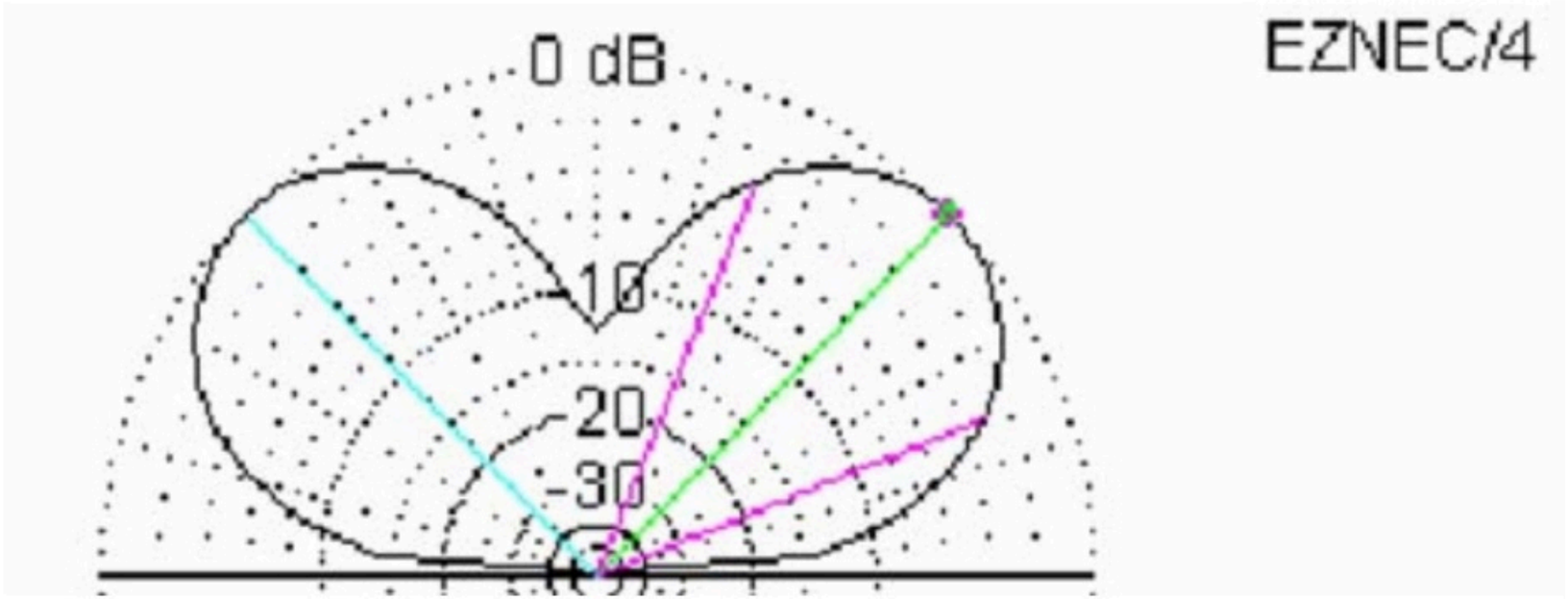
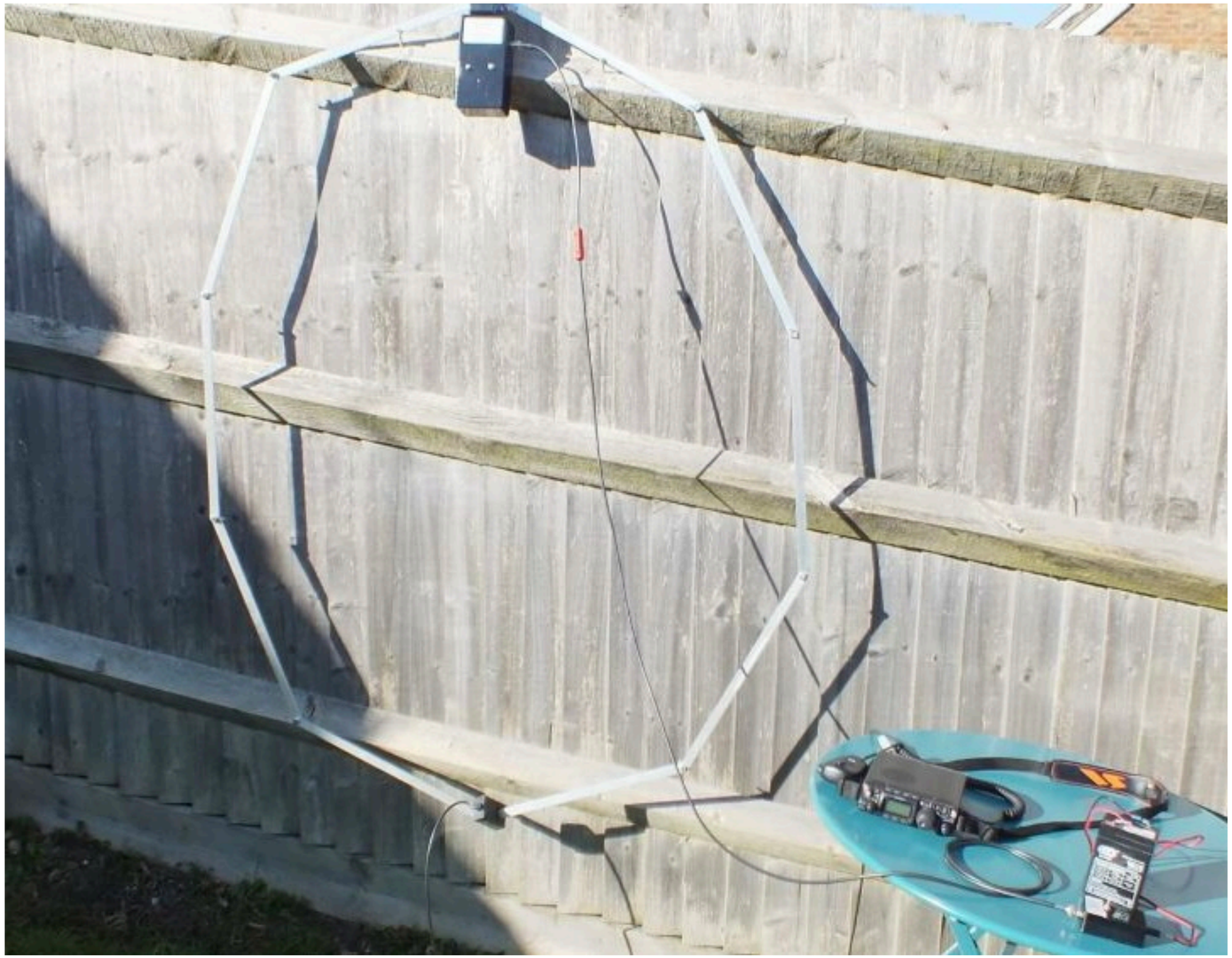


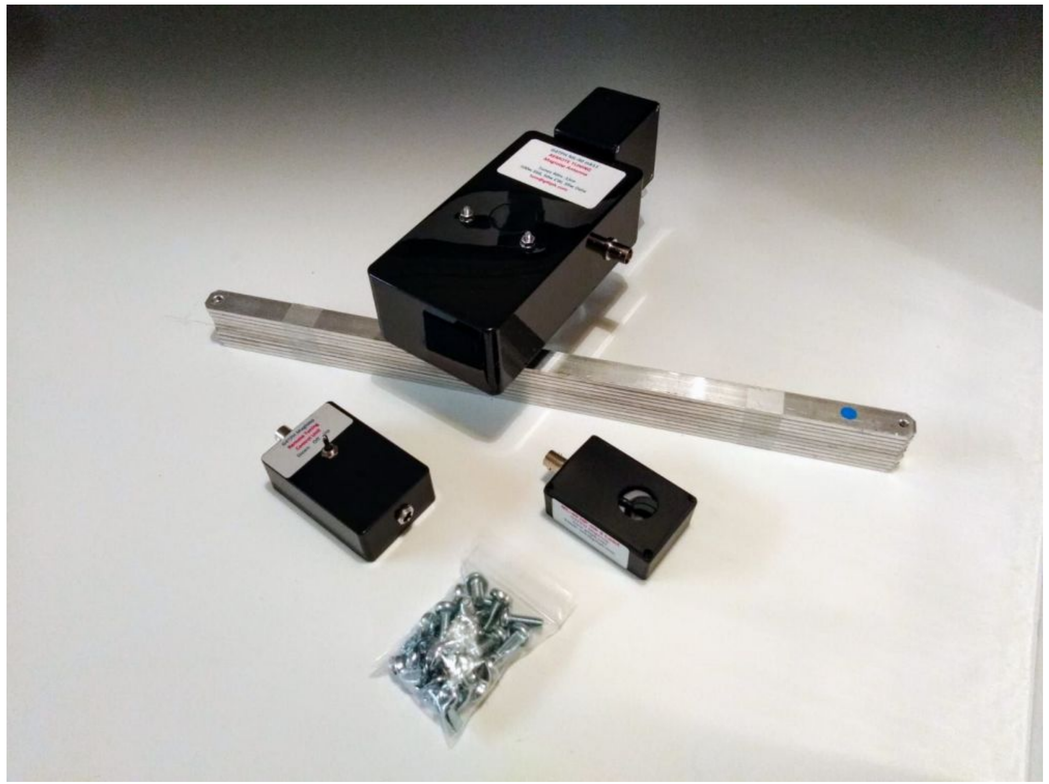
Fig. 5 – The pattern for a horizontal small loop includes an overhead minimum which reduces NVIS effectiveness, but what's missing in the overhead is radiated at lower angels useful for ground wave or long-haul paths.

Loops and RX

- In a high noise location, loops hear more than beams on HF, because they don't hear much of the QRM's predominant E field, but they do hear the H field from a weak signal.
- They're about 10-20 dB better than a long wire, and even better than a vertical.
- The loop also has its own band pass pre-selector because of its high Q and narrow bandwidth
- And, by rotating in the vertical plane, you can null out nasties.

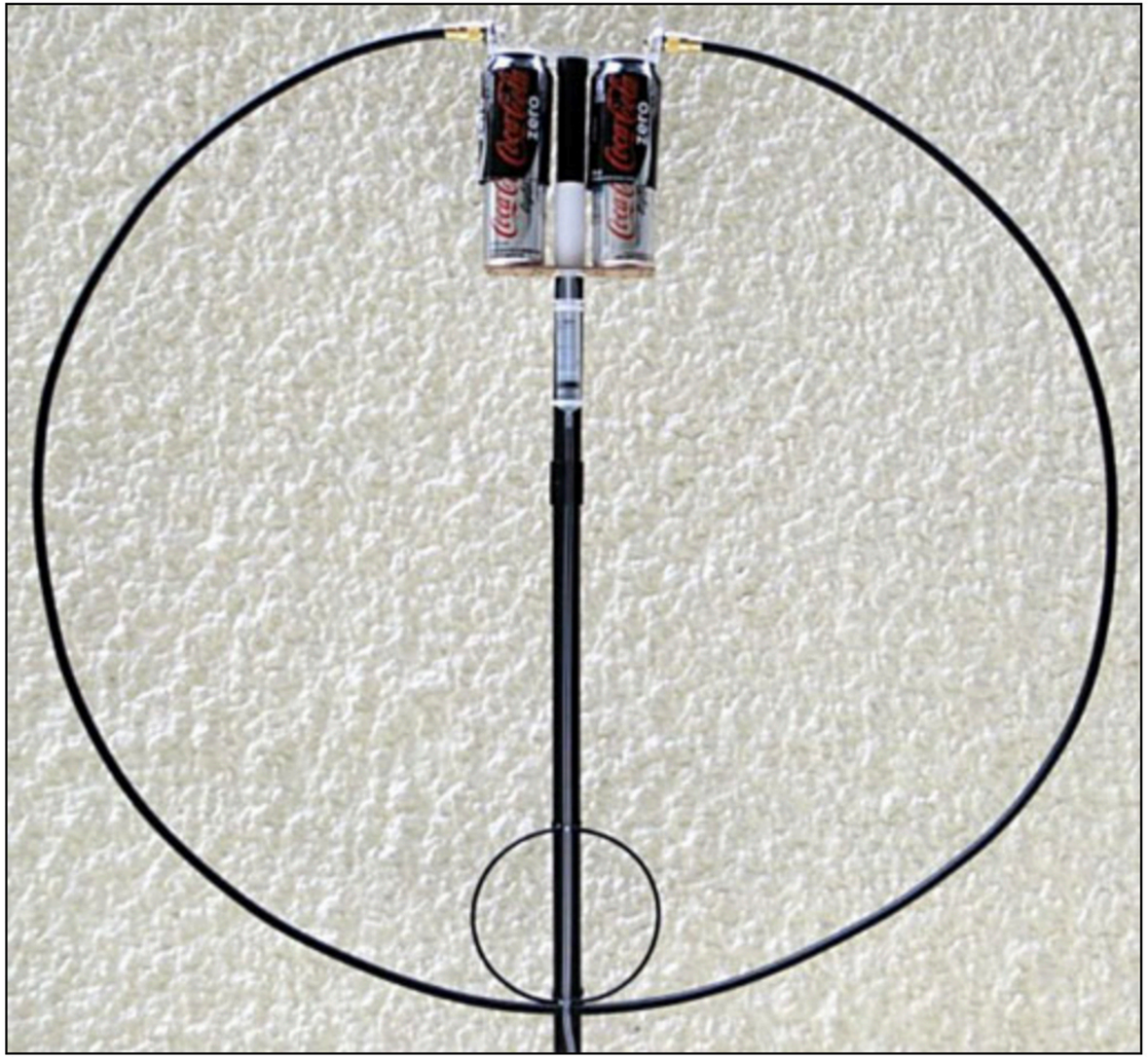
Real loops



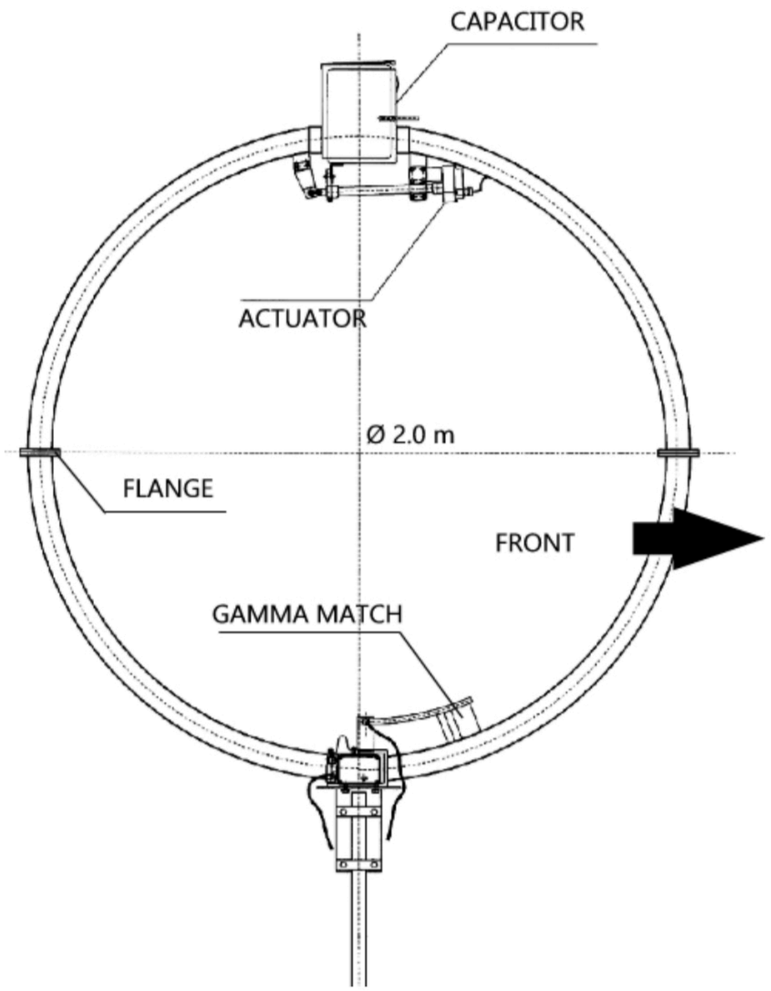


G4PTH

THE COKE LOOP



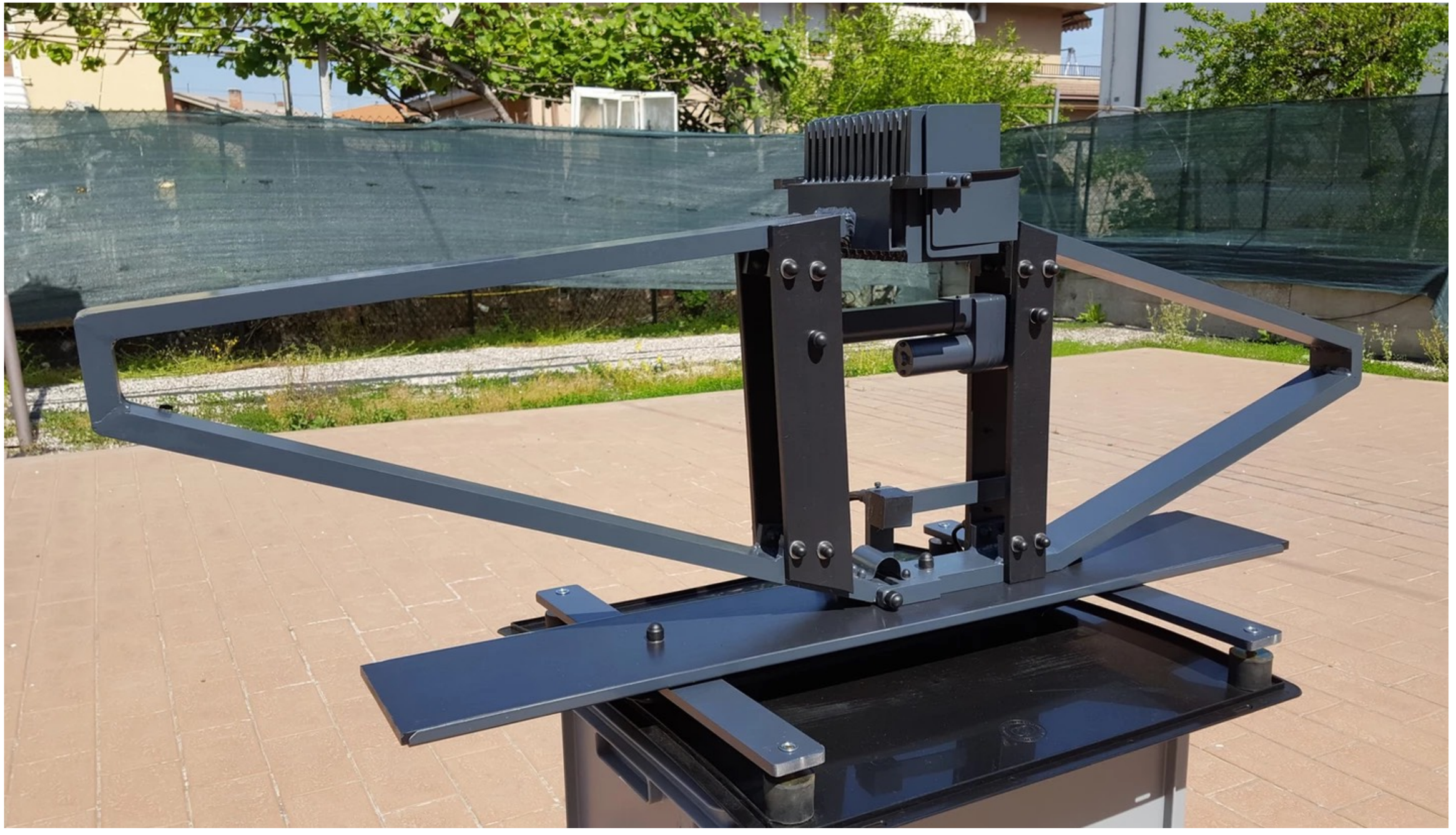
Ciro Mazzoni MIDI Loop



Electrical specifications

Continuous frequency coverage 3.5-14.5 MHz
S.W.R. 1.2:1 (typical)
Front to back ratio: 6 dB
Front to side ratio: 25 dB
50 Ohm input with gamma match short circuited (electrostatic discharge protection)
Negligible noise and harmonics
L = 4.5 µH Q = 1.500 a 3.5 MHz
C = 560 pF a 14 KV r.m.s.
Power rating: 300 W from 3.5 to 7 MHz **
800 W from 8 to 14.5 MHz**
Bandwidth: 4 KHz @ 3.5 MHz
6 KHz @ 7.0 MHz
10KHz @ 14.0 MHz
Gain compared to λ/2 dipole (1 point "S" = 6 dB):
- 4 dB @ 3.5 MHz
- 0.3 dB @ 14.0 MHz

HORIZONTAL RADIATION PATTE



COMROD

NAVAL HF LOOP ANTENNA

- HF shipboard loop for NVIS communications
- 1.6-30MHz
- Specifically designed for naval ships
- Reduce co-site interference
- Easy installation
- Superior HF performance and low cost compared to standard Naval NVIS

A properly designed, constructed, and sited small MLA of nominal 1m diameter will equal and oftentimes outperform any antenna type except a tri-band beam on the 10m/15m/20m bands, and will at worst be within an S-point (6 dB) or so of an optimised mono-band 3 element beam that's mounted at an appropriate height in wavelengths above ground.

Leigh Turner,VK5VLT

Pevensey beach,
august 1, 2020

Serial	534017401			Log Date	2020-08-01 10:14:32 UTC
QSO Start	2020-08-01 10:04:00 UTC			Confirmed	2020-08-23 19:10:01 UTC
QSO End	2020-08-01 10:04:00 UTC			Contest	n/a
ge	Serial	0		Serial	0
on	Station Class				

	QSL-TO			QSL-FROM			
Station	ZS1OPB			M0RYK			
Op	Robert Lock			Michael S D Granatt			
QTH	Cape Farms Western Cape			TUNBRIDGE WELLS			
State							
Country (DXCC)	South Africa			England			
Frequency	18.150 MHz (17m)	Mode	SSB	18.150 MHz (17m)	Mode	SSB	
Power	0 W	RST Rcvd	4/0	5 W	RST Sent	5/8	
Coordinates	-33.603129 S, 18.518378 E			50.812500 N, 0.375000 E			
Grid	JF96gj25	Distance	9554km (5936 mi) @ 165°	JO00et	Distance	9554km (5936 mi) @ 345°	
County							
Continent	AF - Africa	IOTA		EU - Europe	IOTA	EU-005	
Zones	ITU 57	CQ	38	ITU 1	CQ	14	
QSL Via							
QSL Card	Rcv Date -			Sent Date -			

Good sites for starters:

aa5tb.com

alexloop.com