

How can you locate QRM source and fix problem with simple means ?

QRM (better called radio frequency interference - RFI) on amateur band HF and VHF/UHF is growing problem. You know well how the QRM can spoil the reception weak signal on VHF and UHF bands. Led Lighting, Plasma TV, Fluorescent tube lamp, Ethernet, Solar Inverter ...

Do you experience RFI and you are not locate source it?

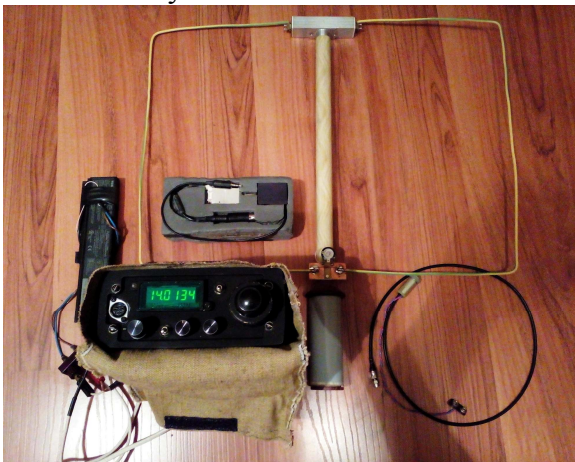
I will try to talk about my modest experience of “finding & fixing” RFI source.

For finding RFI on HF band I use small active loop with my portable Home made QRP transceiver. For VHF/UHF band I use also small active terminated loop with FM radio DJ-180. (more better to use FT-817 or Scanner Radio AOR or e.t.c).

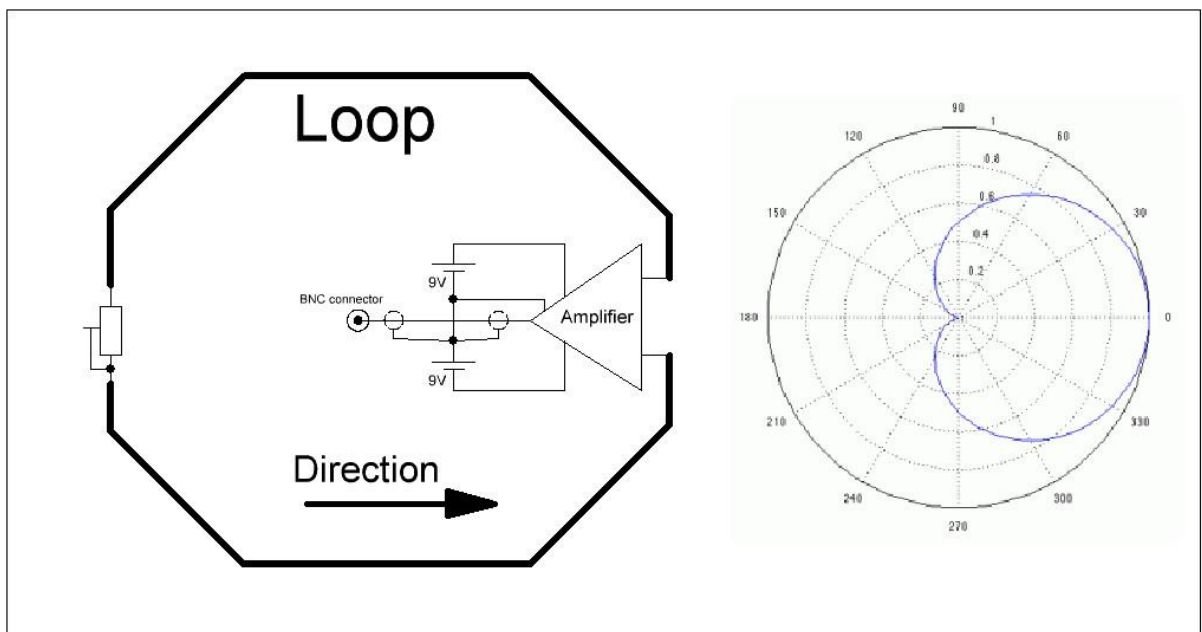
Small active loop has cardioids beam characteristics with deep minimum in beam pattern.

Also in my bag is usually Current Probe for electromagnetic emission measurements on wires in the range 1 MHz to 150 MHz. I will talk how you can easy make this simple measurement equipment for finding RFI.

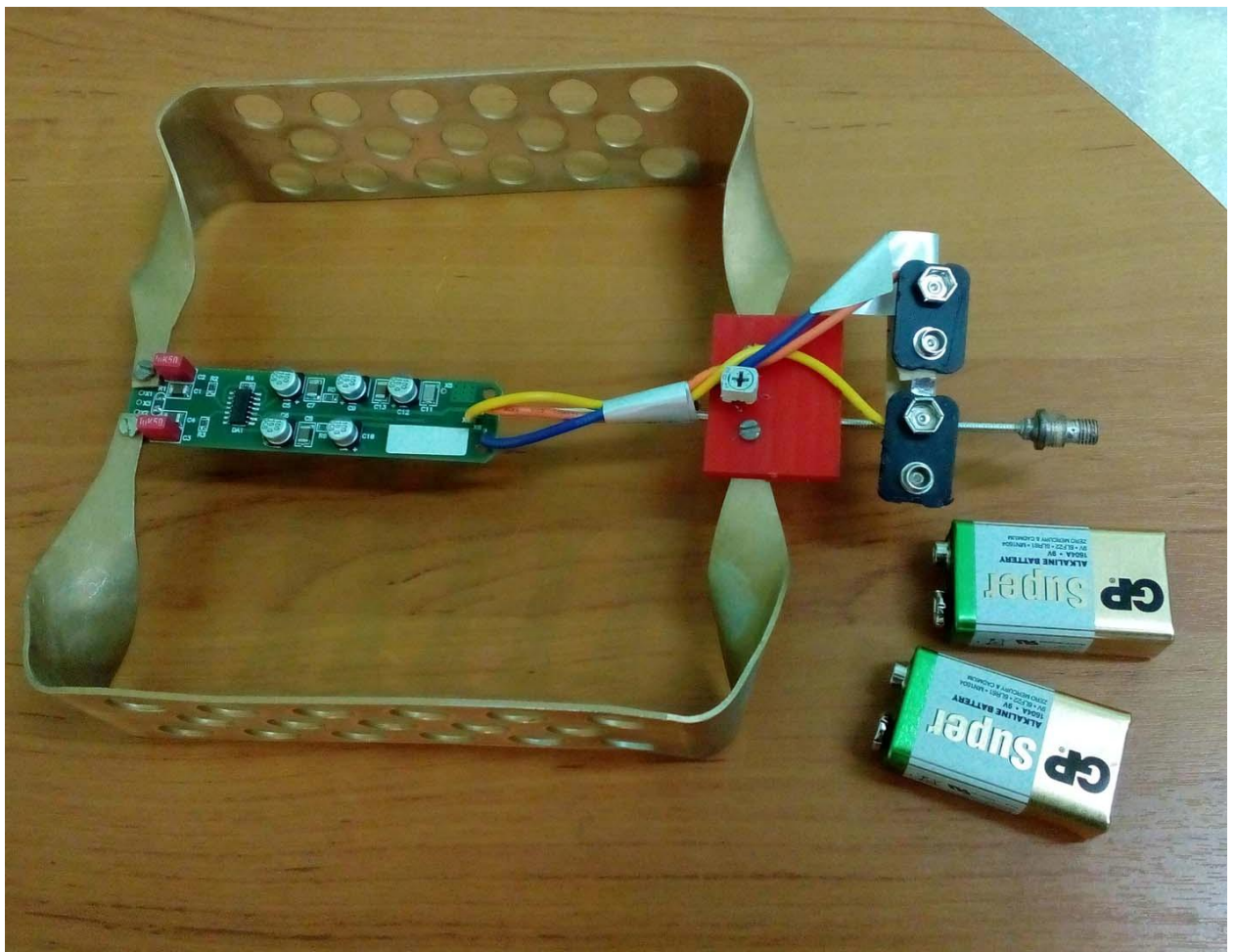
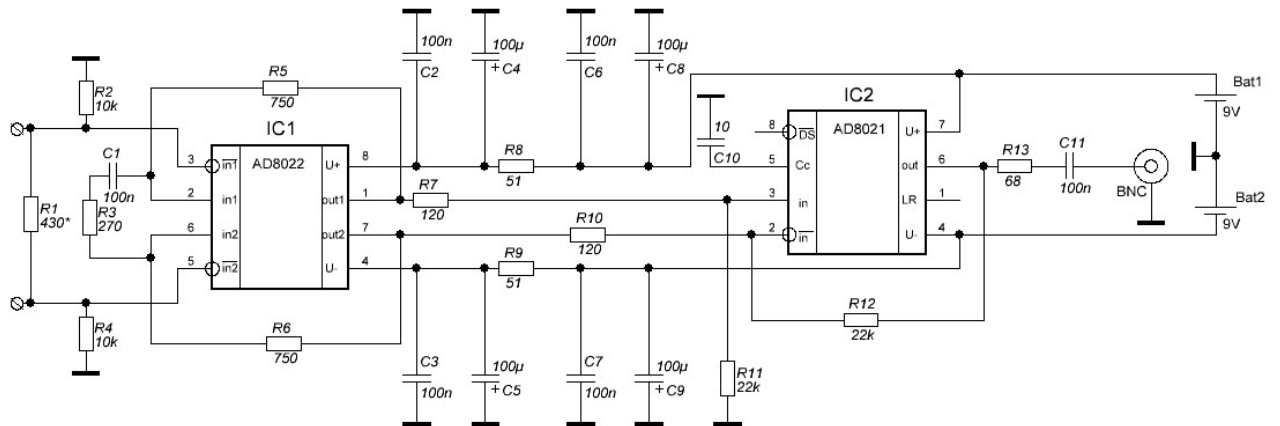
Look here my HF and VHF/UHF “fox-hanting” setup.



The schematic of the active loop is shown in the figure below

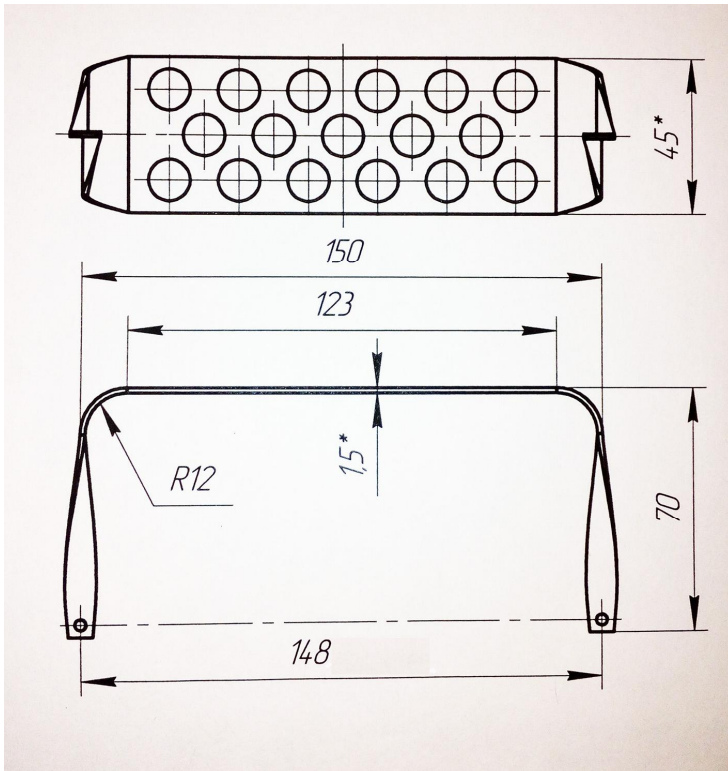


Low noise amplifier for active loop (can be use from 1 MHz to 150 MHz) is instrumentation amplifier with high open-loop gain, high common-mode rejection ratio and high input impedances. You need tune resistor in loop for maximum ratio of Front/Back in direction of loop. Resistor R1 must be equal resistor in loop. Operational amplifiers from Analog Device AD8021 and AD8022.

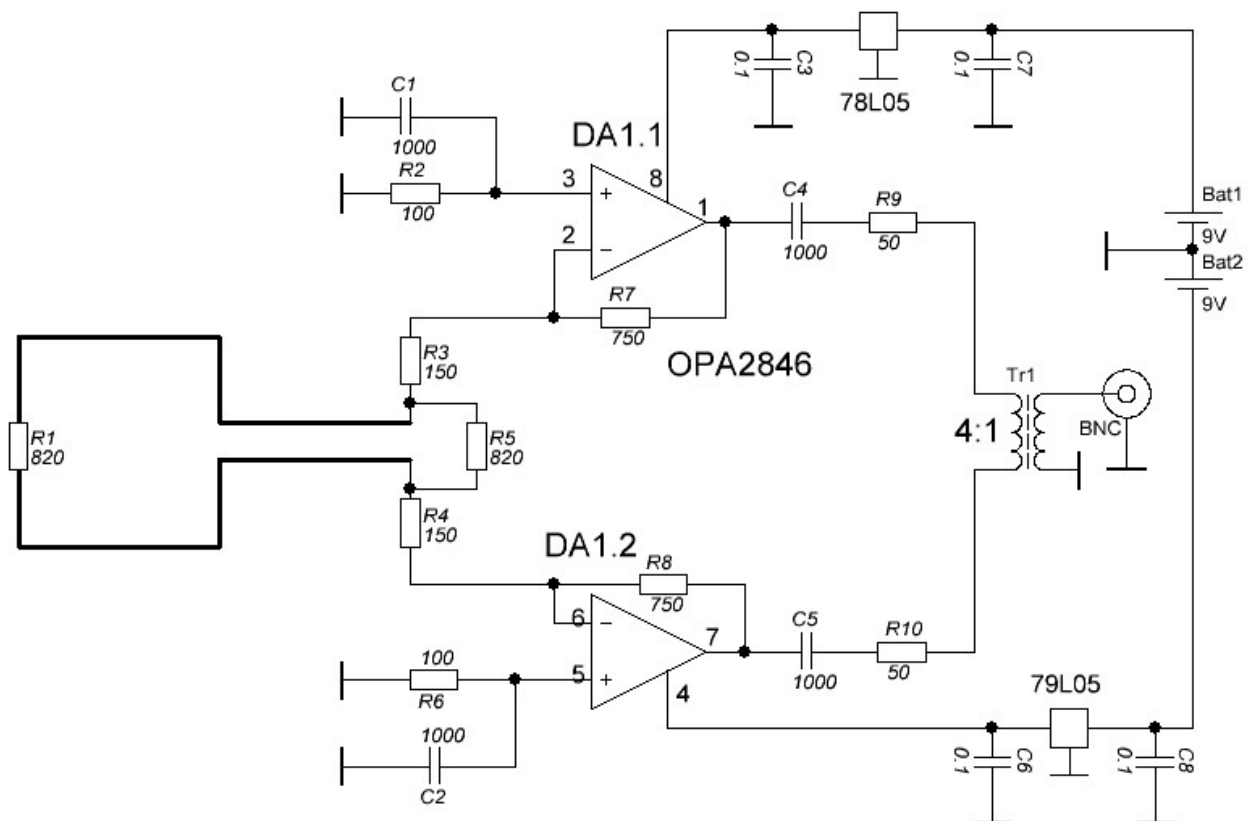


Terminated Loop 30-200 MHz with balanced preamplifier (without case).

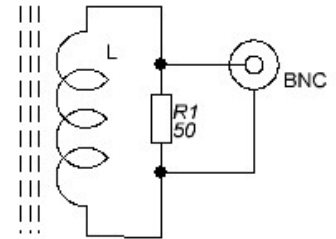
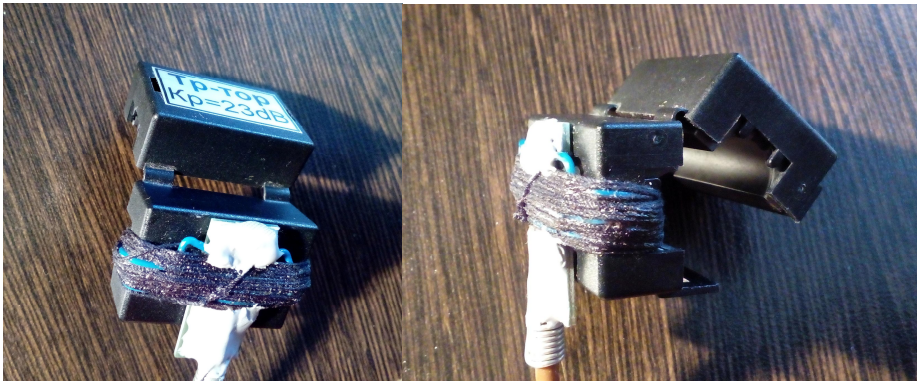
Size for making side of loop see below



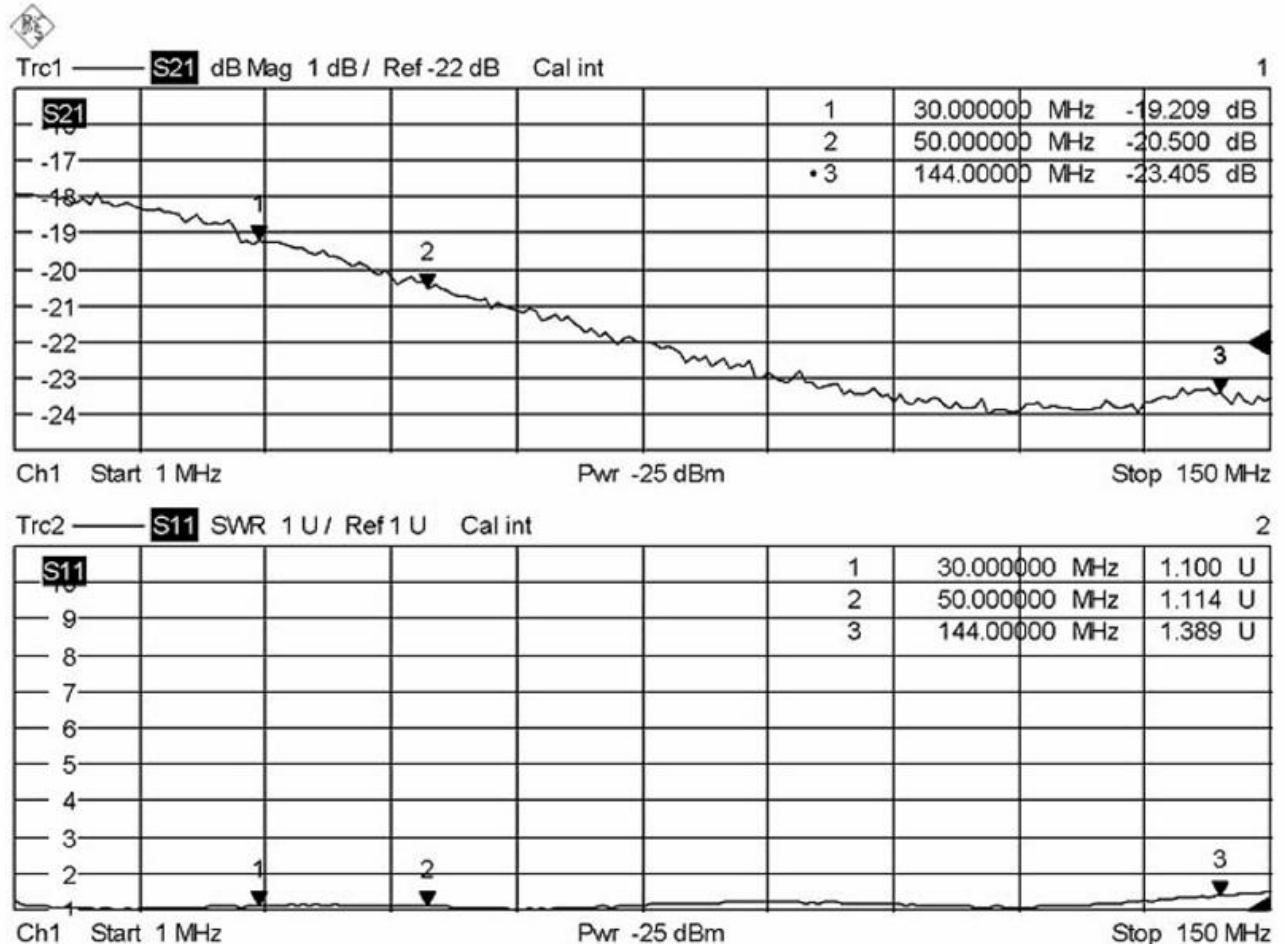
If you want to use Terminated Loop to 500 MHz , you need to use preamplifier with operational amplifier, with has bigger bandwidth, OPA2846 from Texas instrument for example.



Current probe has been making from Clip-on Ferrite Clamp. You need only setting this Current Probe to power cord or Ethernet cable for testing level RFI from this line.
 Current Probe can be making very easy - 7-8 turn wire over half of Ferrite Clamp and this coil must be shunt resistor 50 Ohm.



I tested my Current Probe by VNA - about 23 db K factor this transformer on 144 MHz and K factor 18-24 db from 1 to 150 MHz . SWR is also good.



With these simple devices you can find and determine the source of RFI inside or outside your shack. Usually, internal RFI is big problem. You need to check each wire (power line, computer line, Ethernet cable and e.t.c) by Current Probe. You need to check frequency by frequency and wire by wire for find and fix problem (for example by Ferrite Choke). Replace all switching supplies in your shack with linear supplies. Apply common-mode chokes and filters to AC Power lines and DC control line.

If you previously found the azimuth of external RFI you need to take a scanner (any receiver), turn on the active antenna and find two or three azimuths on the RFI. The intersection of these azimuths gives an approximate location of the RFI source.

Try to find LED lights ! LED lights contain switching power supplies and can make many RFI !

Well ! You could find bad device or wire-QRMer ! What do we do next ?

First way – remove the device-QRMer, or turn it off (if you can do it)

Second way – replace it with less RFI noisy

Can you do it ? Not ? Then – ferrite core choke as filter RFI.

Please look very good article by Jim Brown (K9YC) “Understanding How Ferrites Can Prevent and Eliminate RF Interference to Audio Systems “ and article “RFI, Ferrites, and Common Mode Chokes For Hams”.

You can set ferrite core choke to power line (beware high voltage !), to Ethernet cable, to digital phone line and others wires.

If you found LED lights with RFI noise and can not replace them – is bad news. But you can use many ferrite bead on power line of LED lights (beware high voltage !) for minimization RFI noise.

If you found noise from Ethernet's cable, you need apply ferrite chokes on this cable every 2-3 meter long. It can be help you.

Also you can look article by Gary Johnson (NA6O) “Locating and Killing Receiver Interference”.

I wish you success with finding and fixing noise RFI !