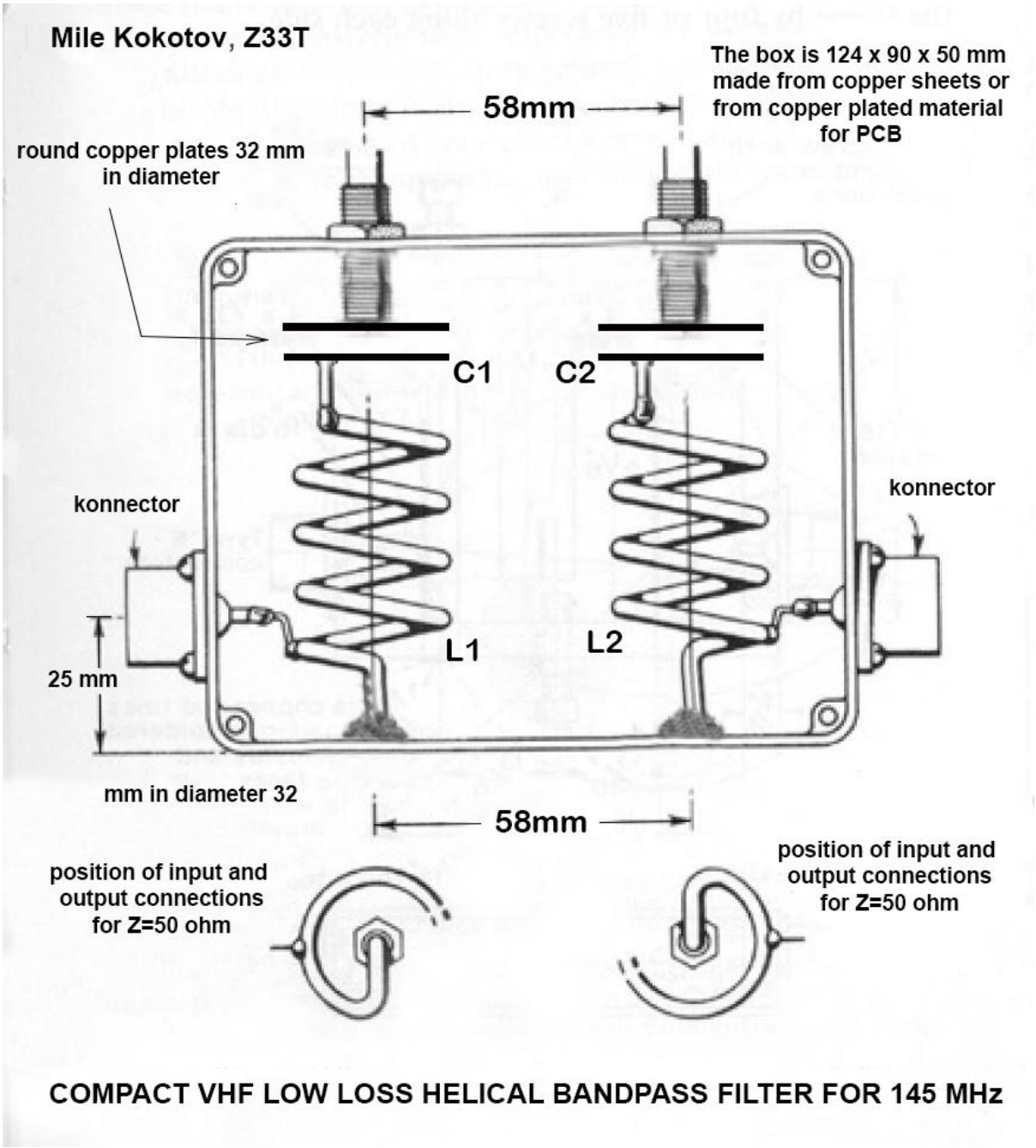
VHF LOW LOSS HELICAL BAND-PASS FILTER (FOR 145 MHz)



Build this VHF Low Loss Band-pass Helical Filter and Improve VHF receiving ability of your VHF receiver dramatically !

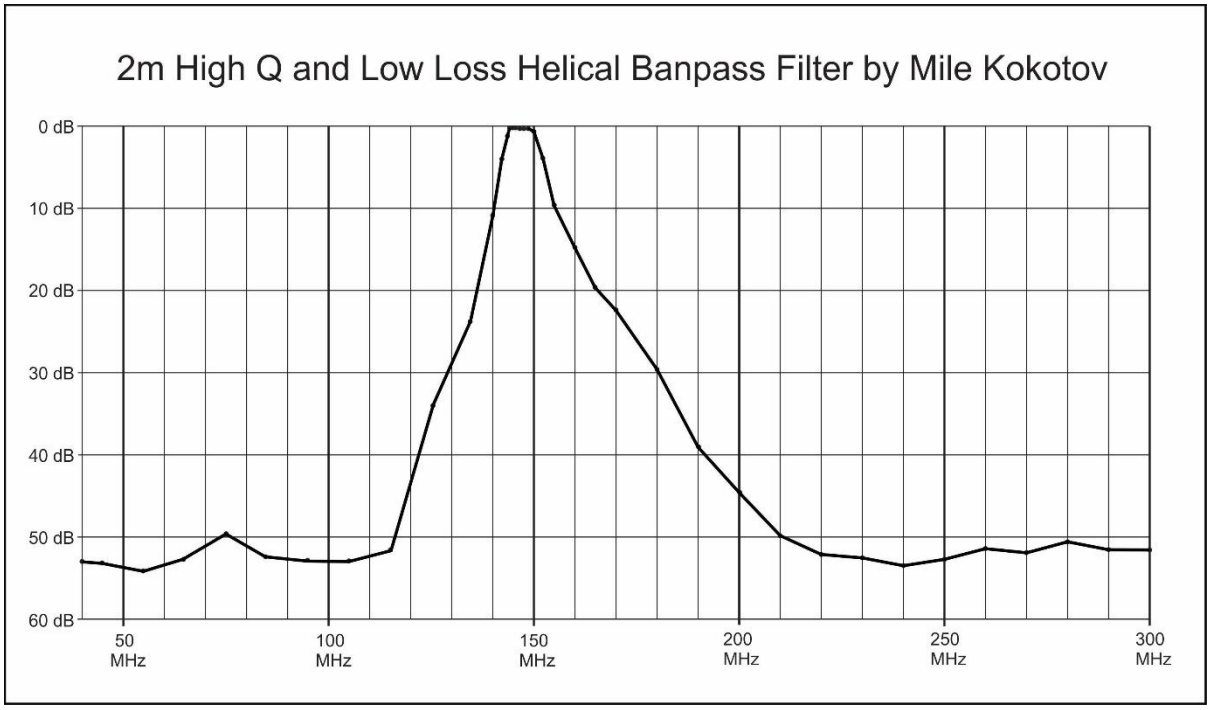
This Filter is excellent for improving the receiver front-end dynamic range by reject out-of-band unwanted strong signals which can make interference and block your receiver, making incapable to receive weak signal of interest.

Overloaded receiver front-end from very strong out of band unwanted signals means that it is not linear any more, and produces many signals by itself, increasing its noise level.
Very strong signals at the receiver front end makes Desensitization of the receiver, so it could not

receive weak signals any more.
We should not forget that the receiver front end "looks" all signals from the wide frequency range even if we want to receive only one signal at the time. The more wideband the receiver is, the higher dynamic range it has to be, for not been overloaded...

This filter can also be very useful for rejecting unwanted harmonics signals from your transmitter, making your neighbors happier…

When I connect this filter to my Baofeng UV-5R handheld transceiver, it has improve receiver ability for weak signals in 2 m band dramatically! Almost all wide frequency range transceivers suffers from low dynamic range in the receiver front-end. That is because it is almost impossible to made a good RF tracking filter in the front end of the receiver, for reasonable price. Using this band-pass filter for those transceivers/receivers make huge improvement for receiving weak signals, especially in urban area with many strong RF signals.

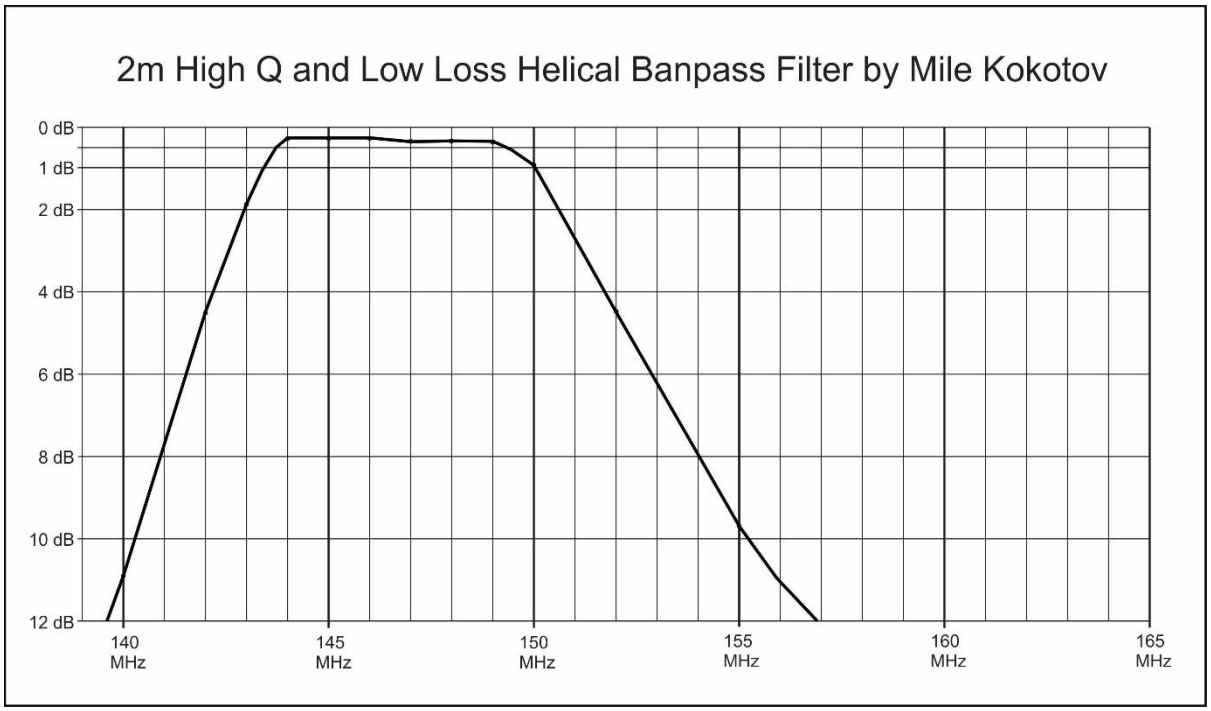


Basic design of the filter is from RSGB VHF-UHF Manual, but I made some modifications. Both inductors (coils) are made from 6 mm2 copper wire (the wire diameter is 2.6 mm)

Coils has 6 turns.
Coils diameter is 23 mm
Coils Length is 35 mm

The tuning capacitors are made from two copper round plates, about 31 to 32 mm in diameter each. (about 760 mm2)

One must be very careful using other variable capacitors instead of my suggestions here. There is very high RF voltage on this capacitors. When I was making experiments by using two pieces of RG-58 coaxial cable 16 mm each, as a capacitors (which is about 1.6 pf), and when I applied about 8 watts RF power on 145 MHz, the coaxial cable pieces burned immediately. You can imagine how high RF voltage is present here, because maximum voltage by producer specification for RG-58 coaxial cable is more then 1,4 kV RF Voltage. This Helical Band-pass filter has very low loss. About minus 0.3 dB for the 5 MHz bandwidth and minus 3 dB for 8 MHz bandwidth.



The signal loss is only 0.3 dB. In other words, when I tested this filter on 145 MHz, and applied 10W RF power from my transmitter through filter to dipole antenna, the signal loss was only 0.7 W. It means that 9.3 W goes to antenna. (7% signal loss). On the receiving mode I can not noticed any signal changes with or without this filter even with the very weak signals, almost buried in the noise.

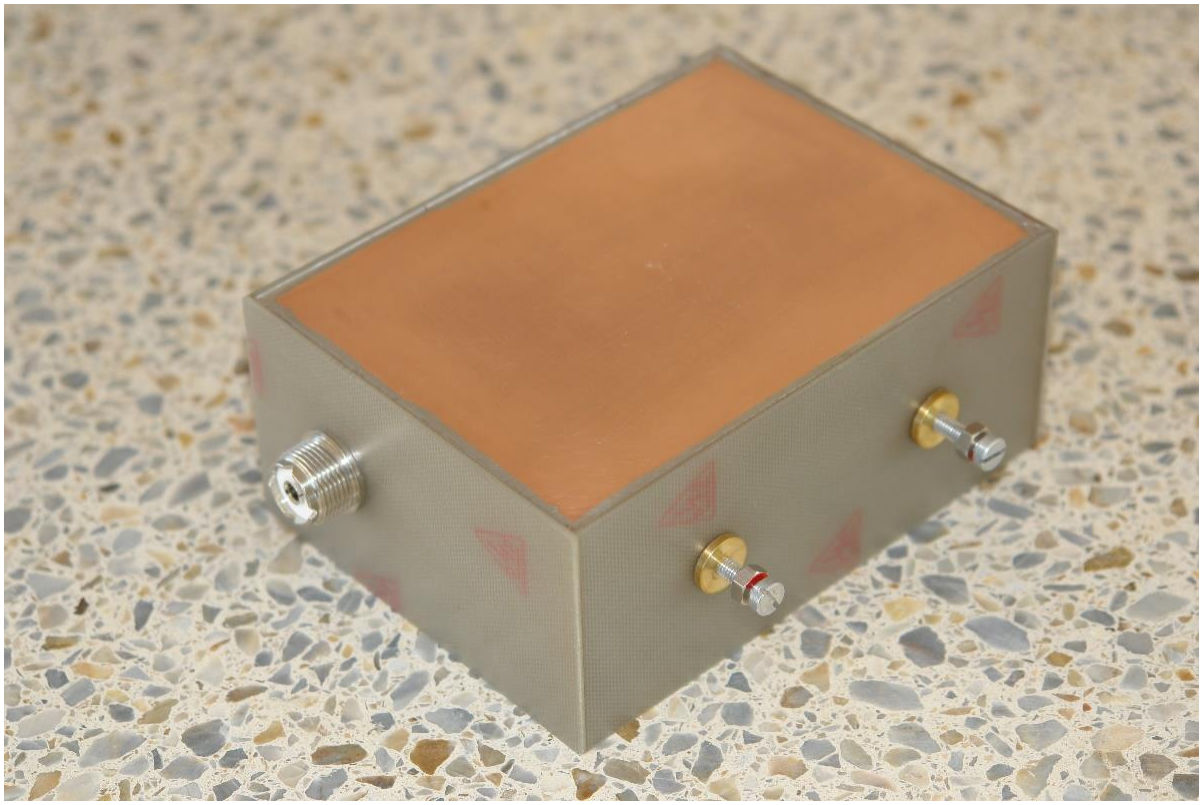
You can see my YouTube video about this excellent VHF Low Loss Band-pass Filter:

https://www.youtube.com/watch?v=jBNcTn9BEy0

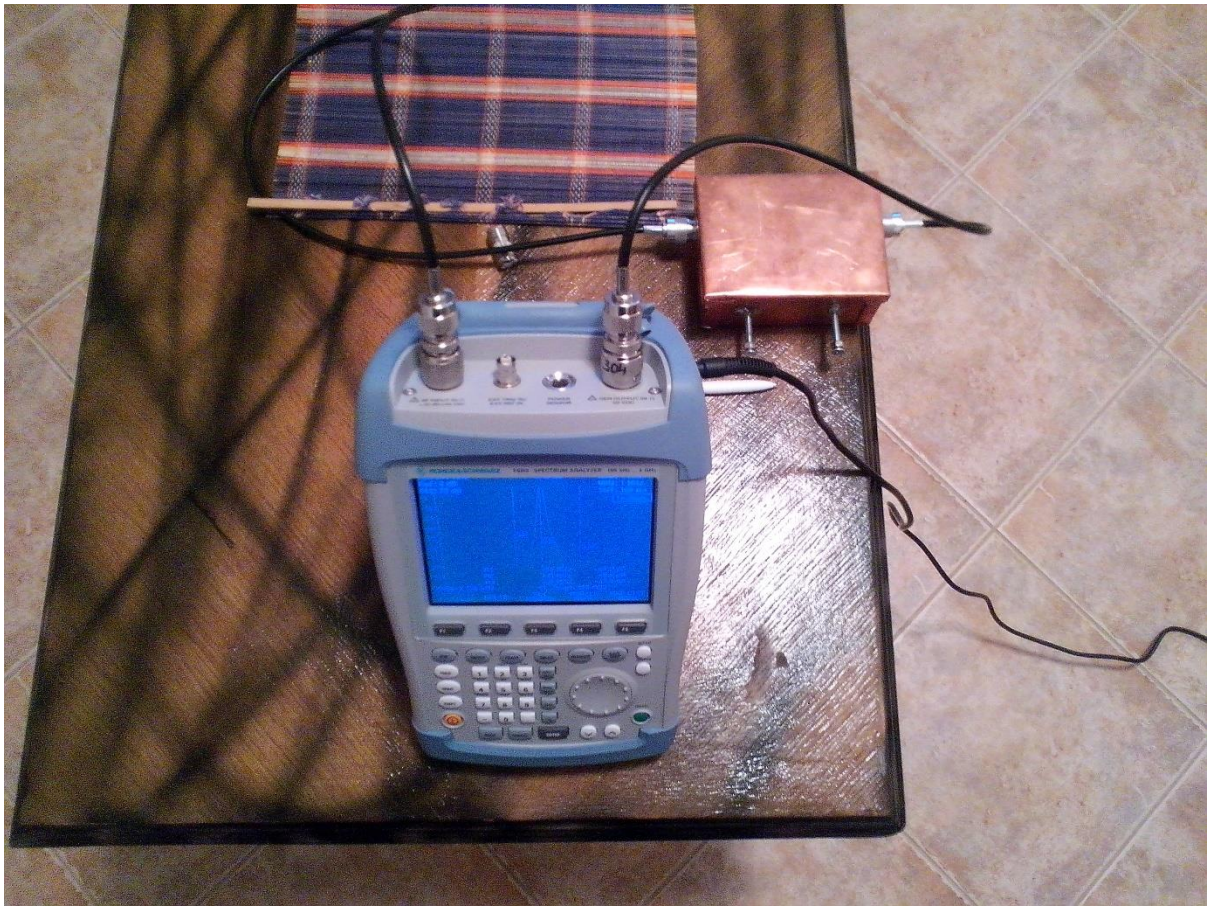
measuring and characterization of this filter on this link:
https://www.youtube.com/watch?v=vMG7OgDXOU8

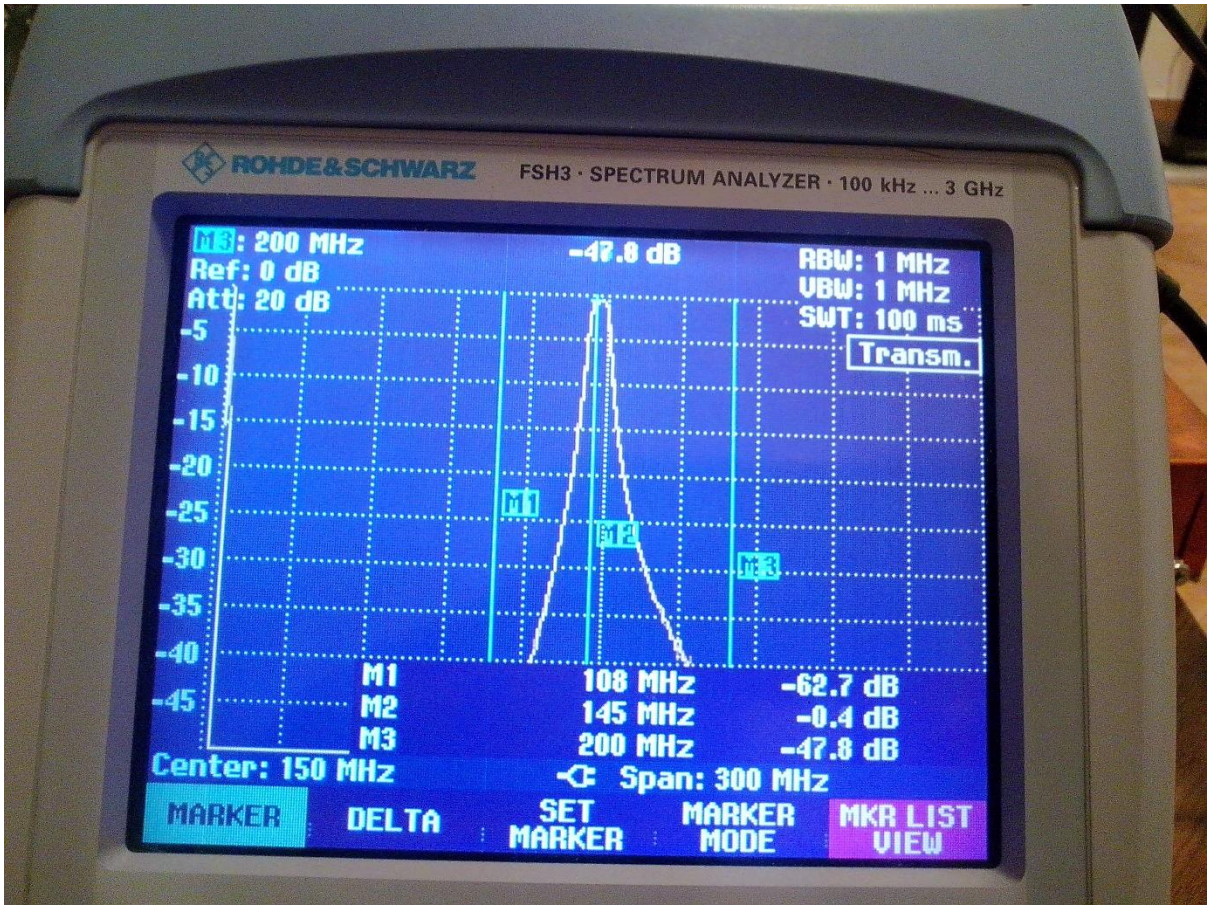
Check the effectivity of this filter achieved by others who built it:
https://www.youtube.com/watch?v=Yw8LOz8rumM

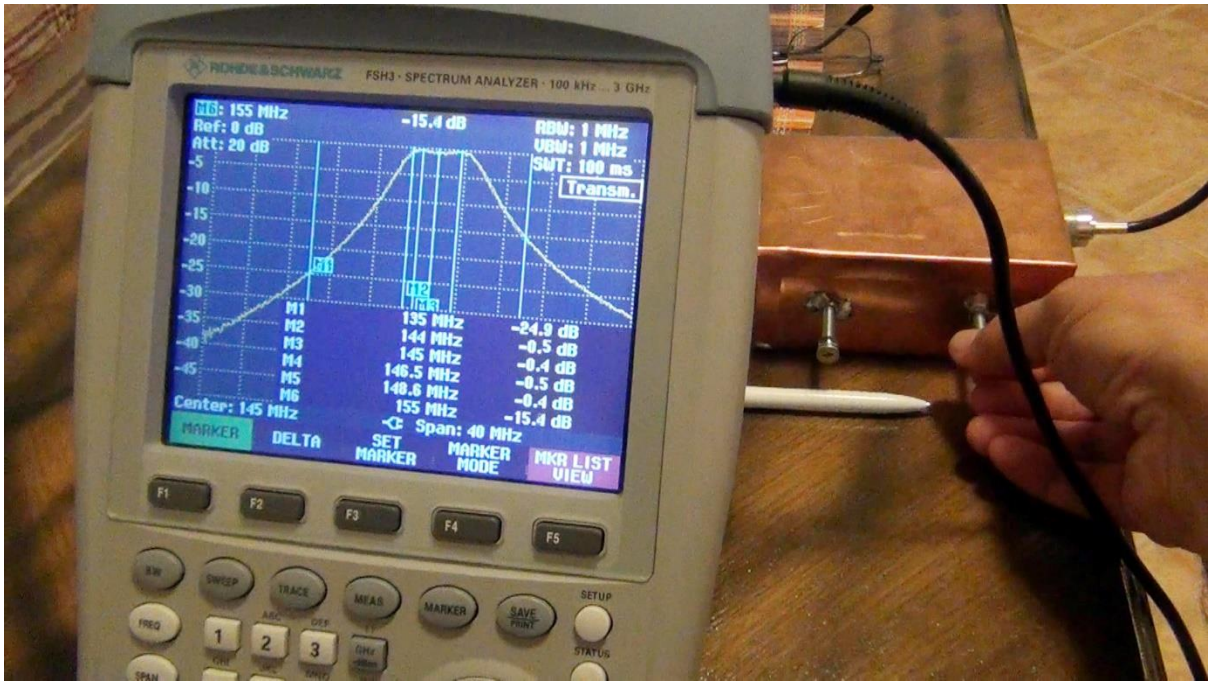
73,
Mile Kokotov, Z33T



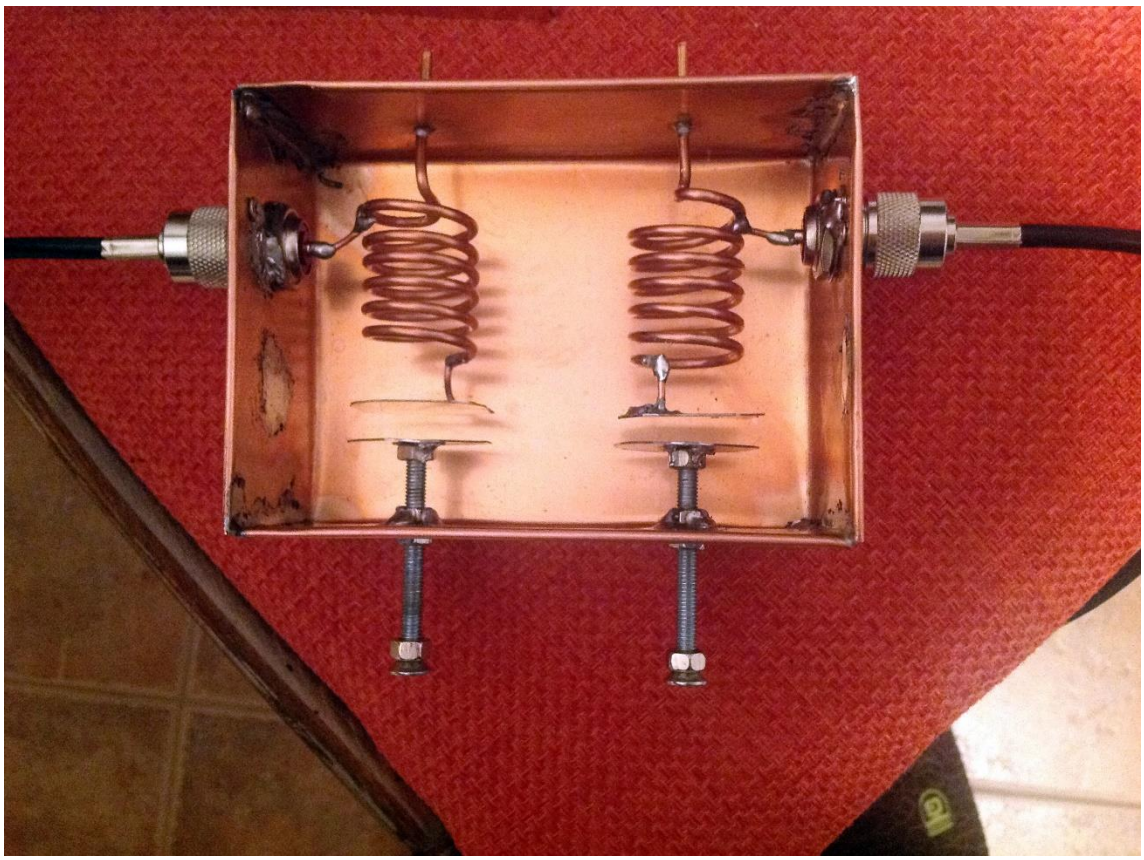
VHF Filter made by Done, Z32KF (the box is made from copper plated material for PCB)

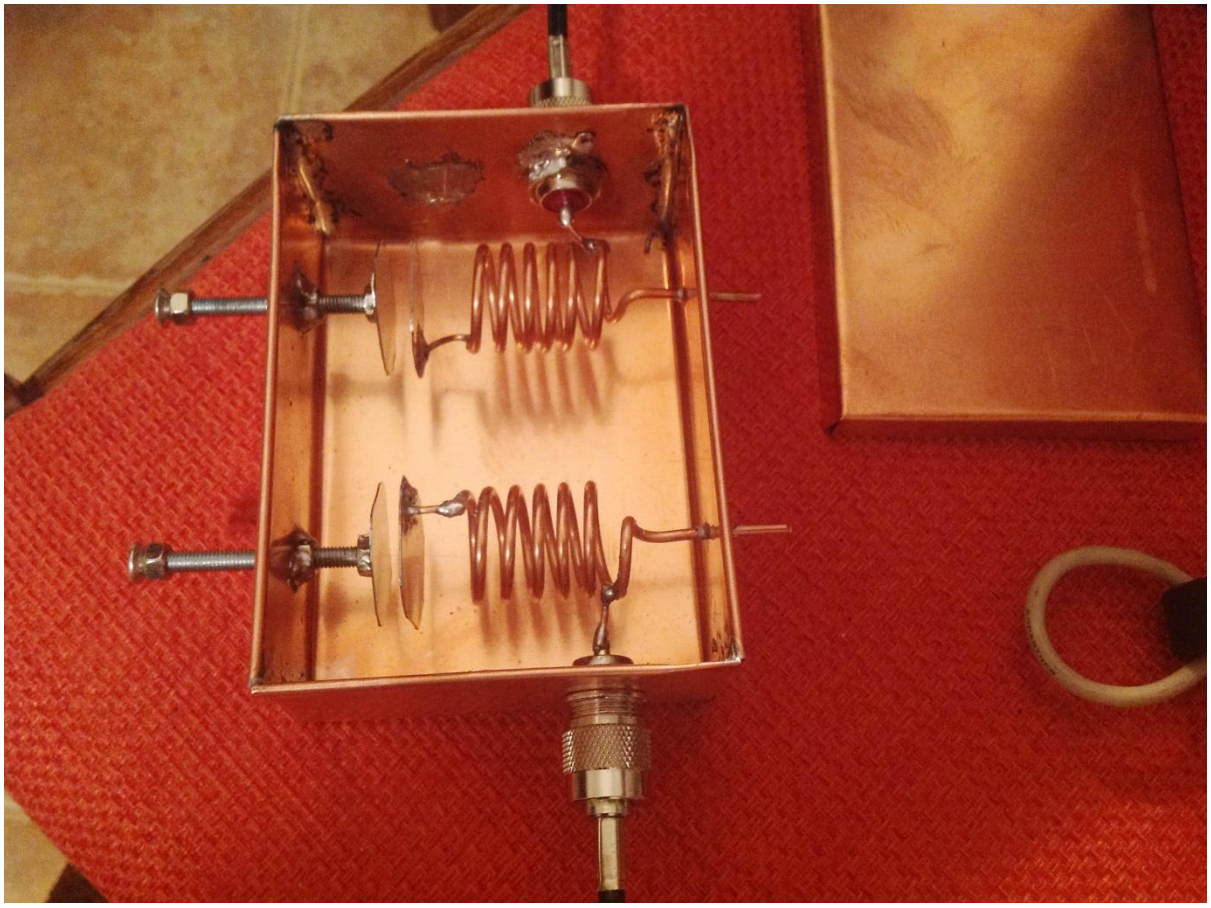


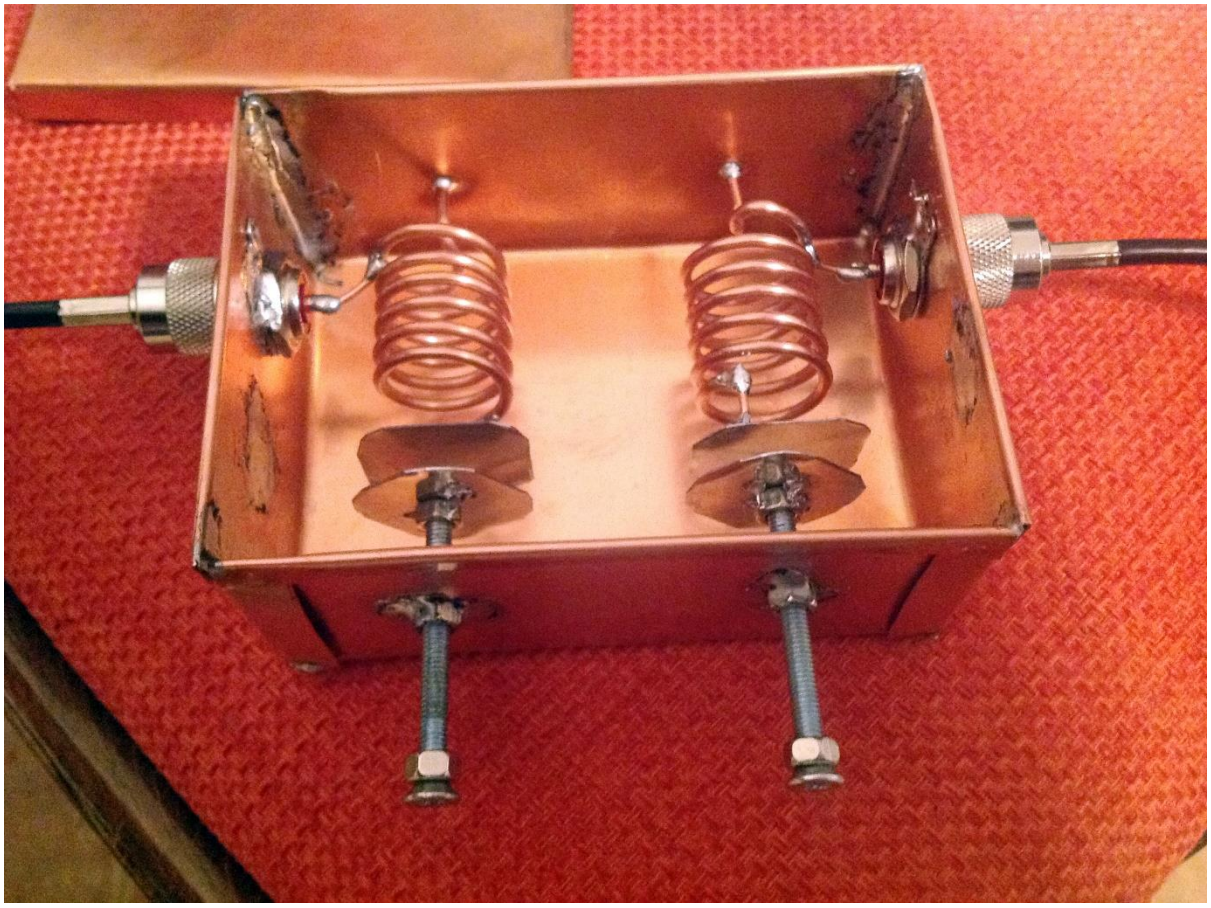


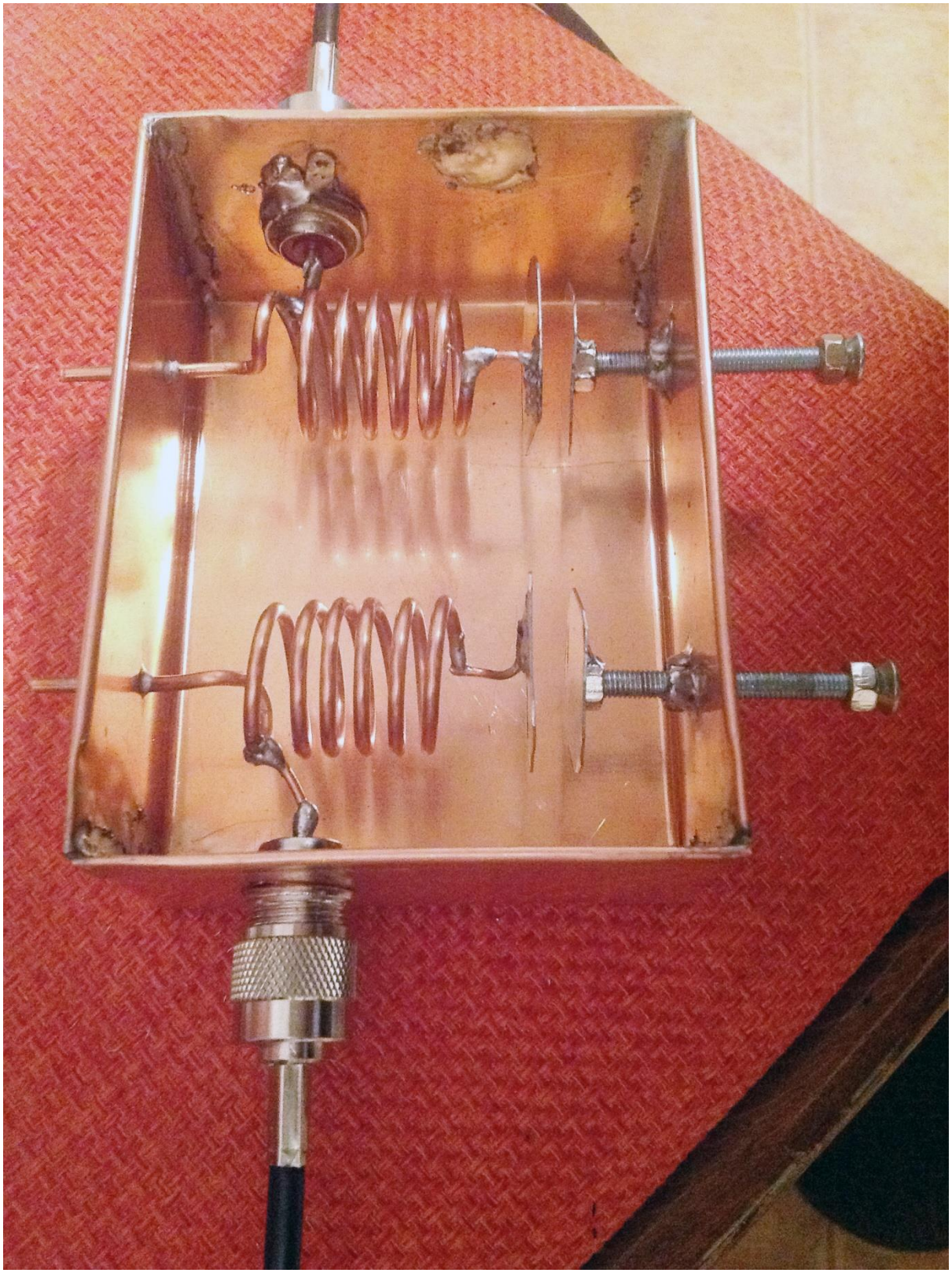


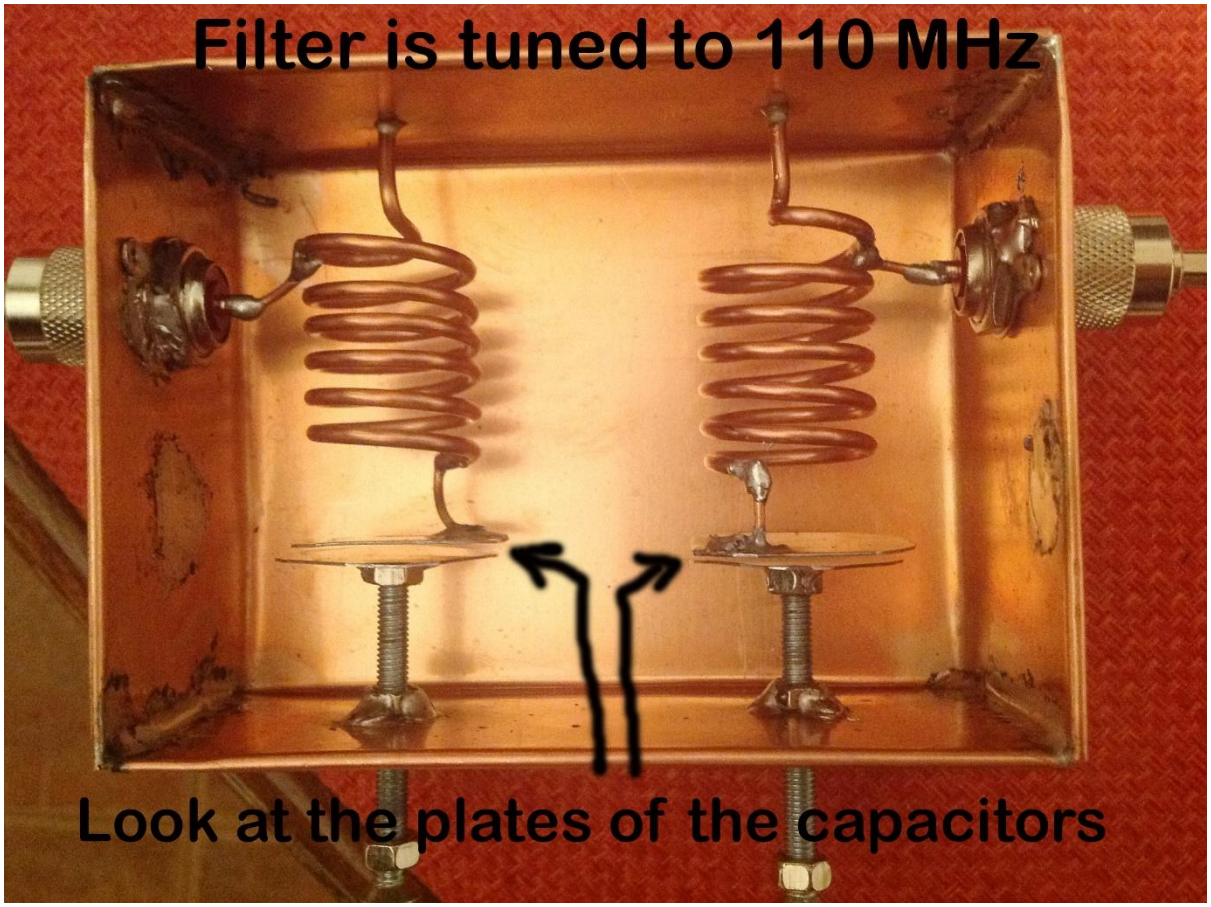
“One picture is worth a thousand words”, so here is several pictures which describes how the filter is made, for those who want to build it:

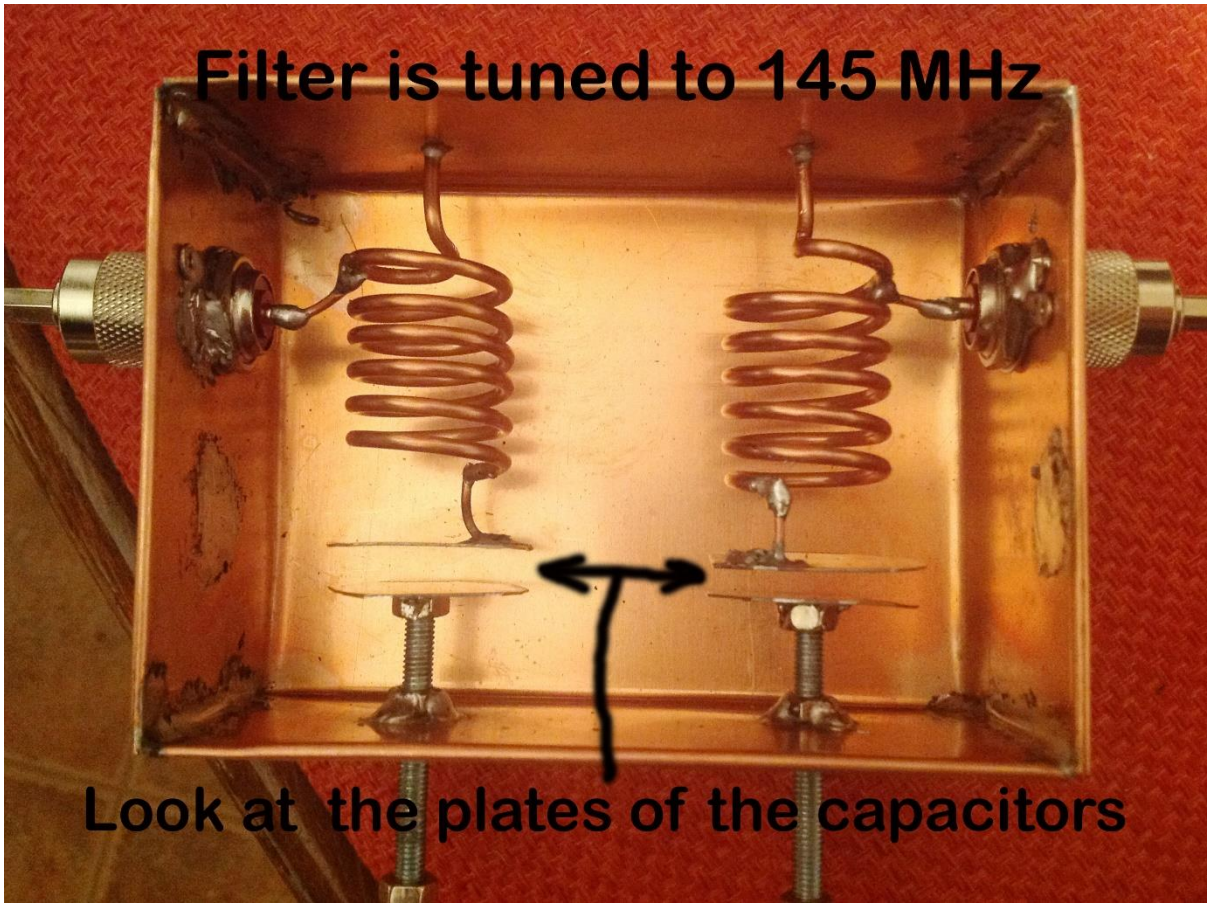


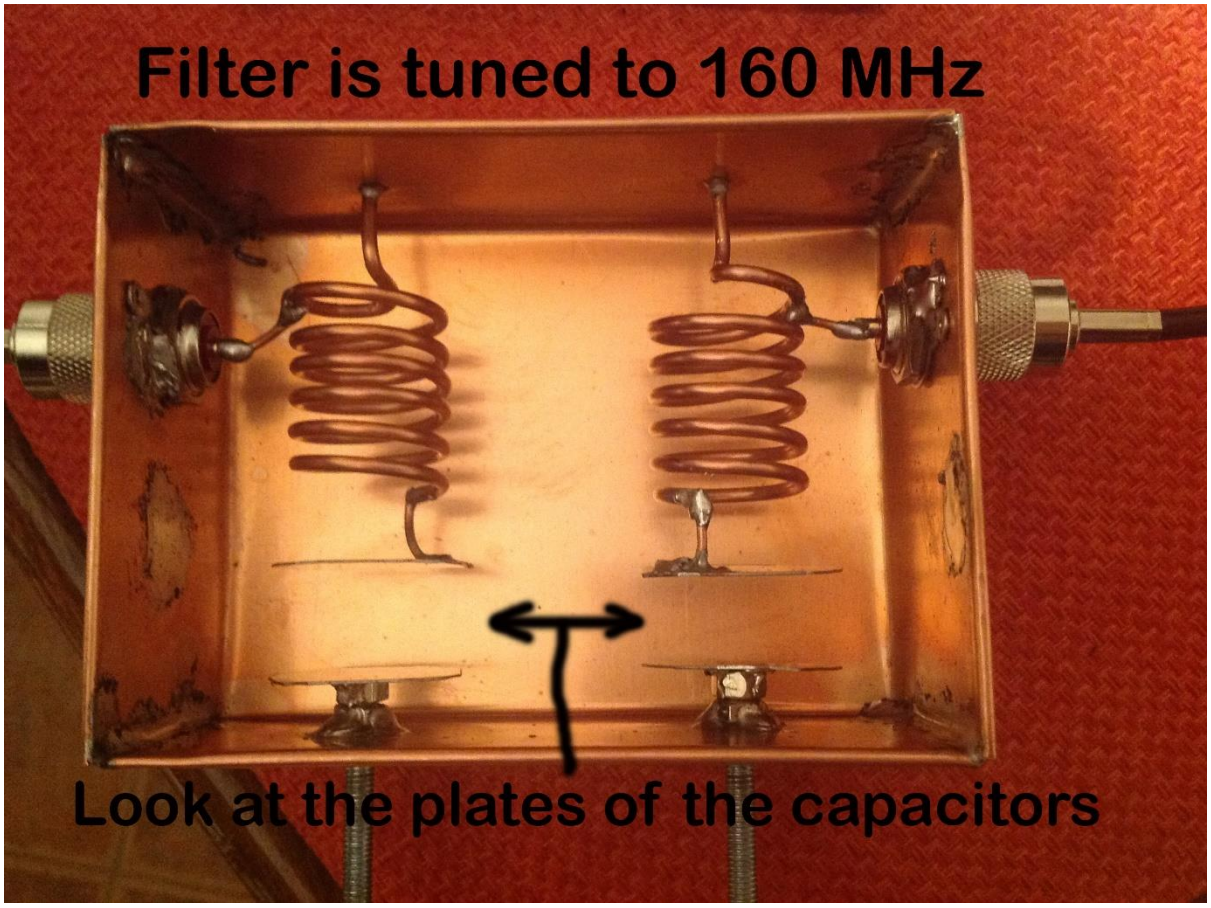




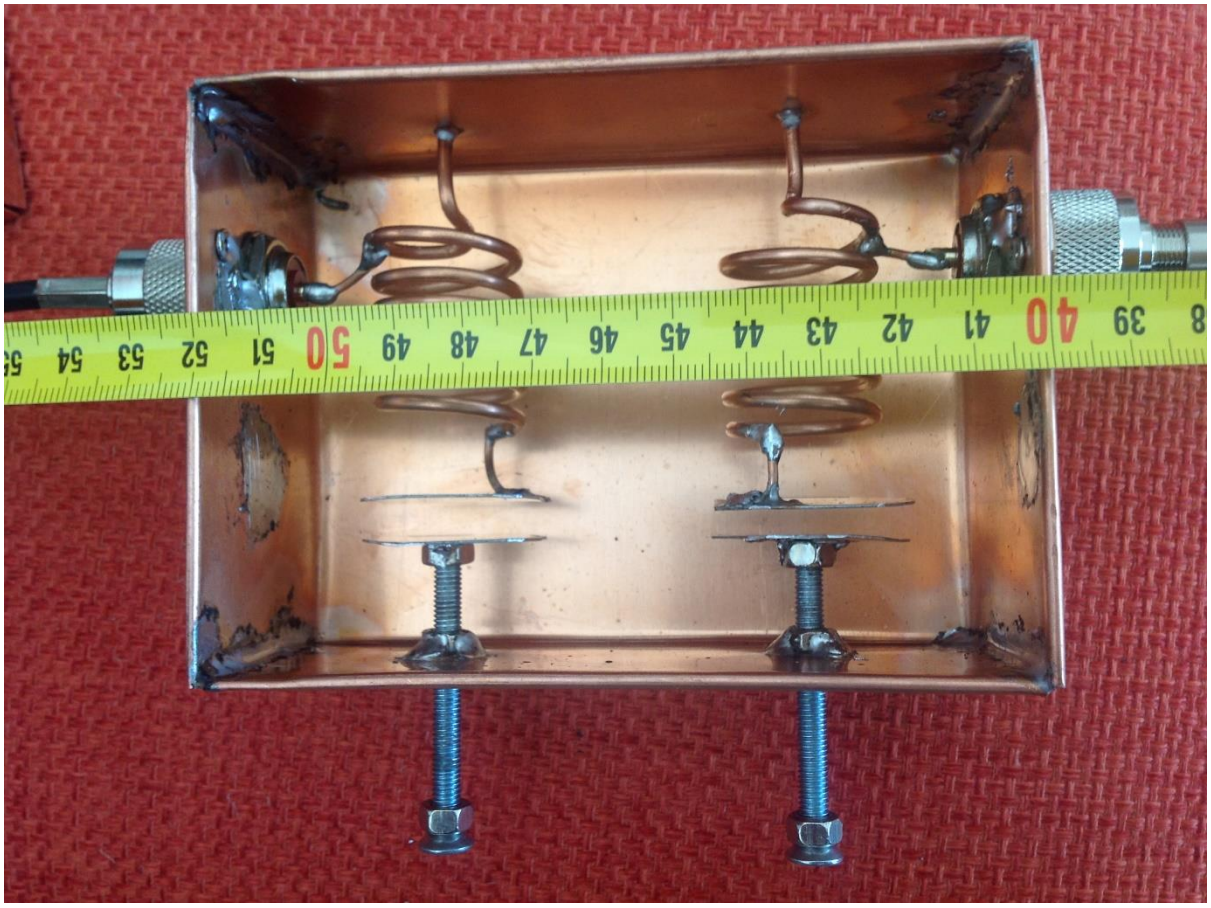


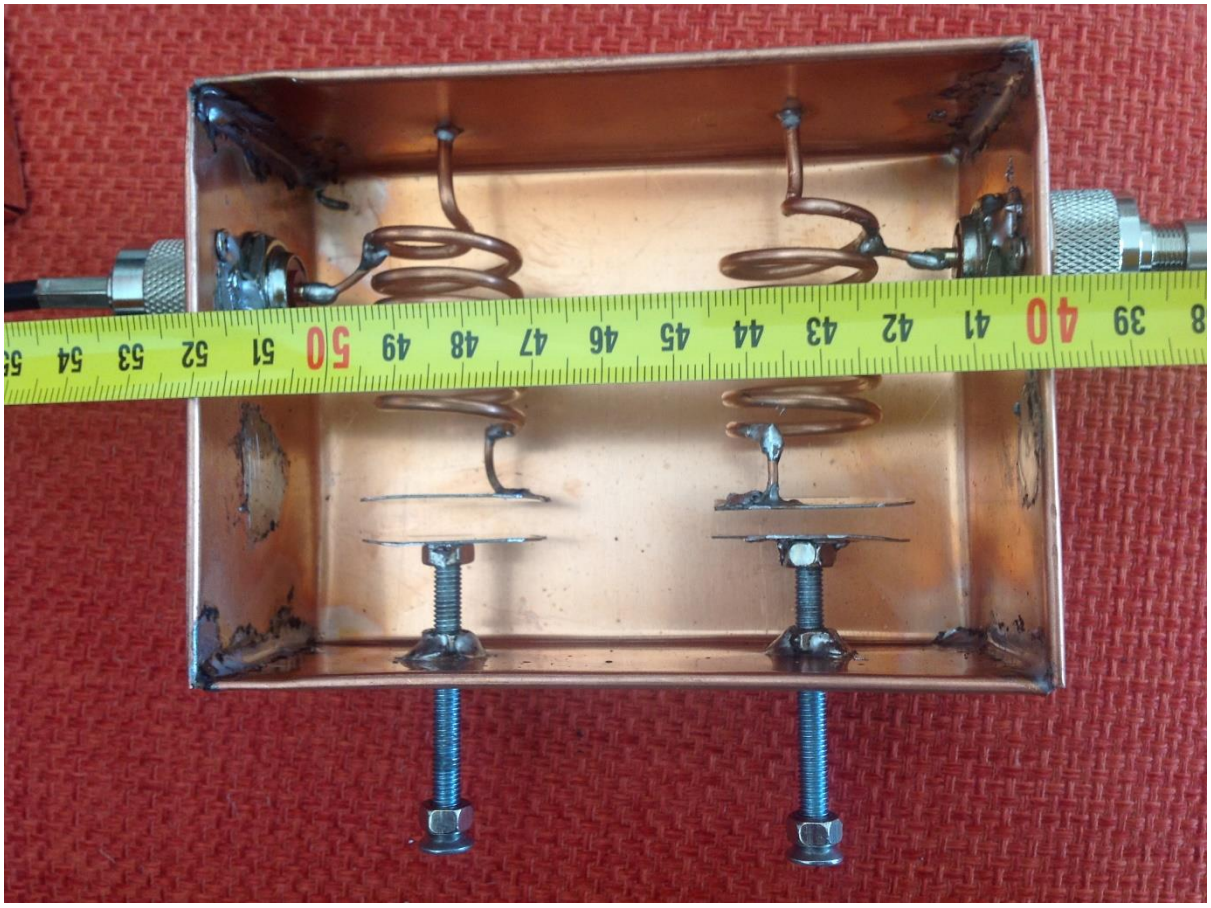

Filter is tuned to 110 MHz
Look at the plates of the capacitors

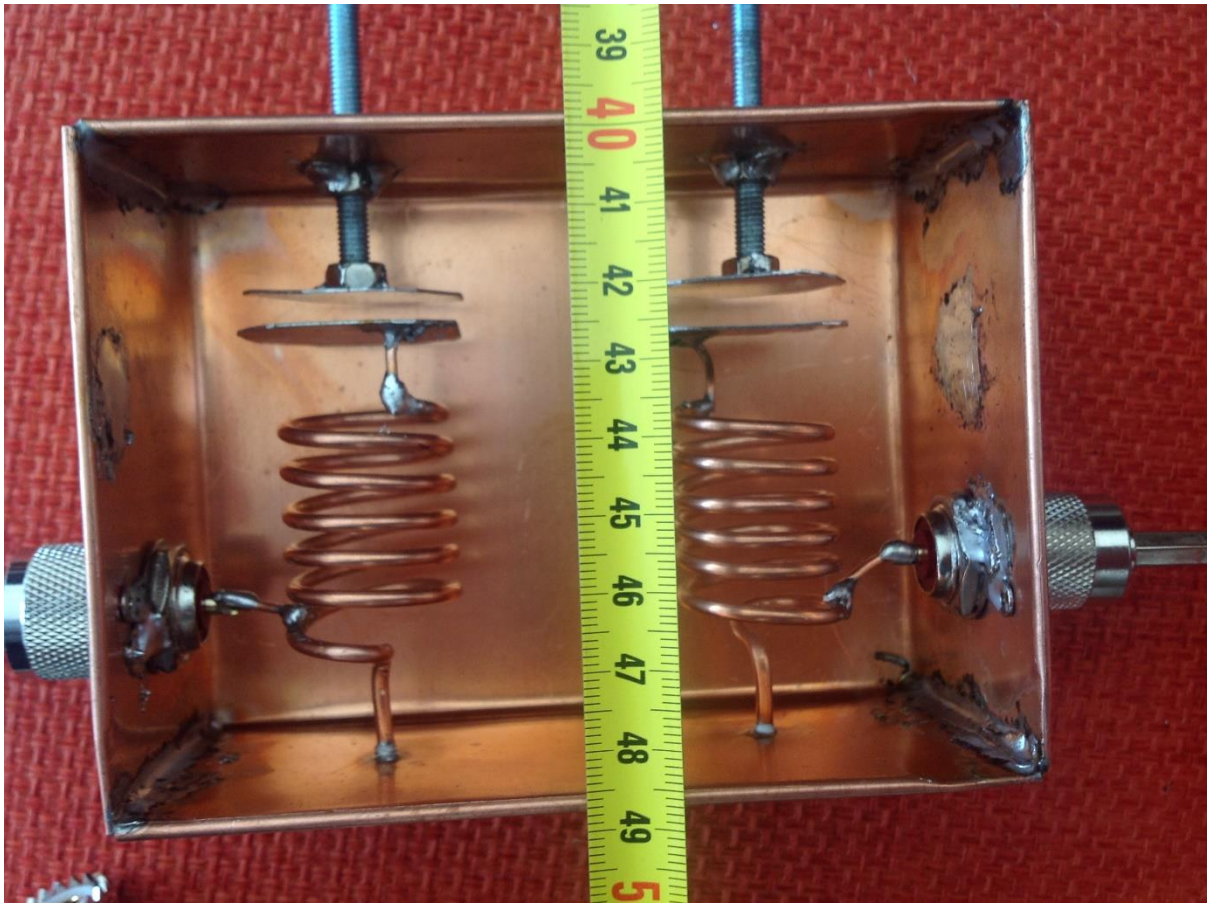

Filter is tuned to 145 MHz
Look at the plates of the capacitors


Filter is tuned to 160 MHz
Look at the plates of the capacitors

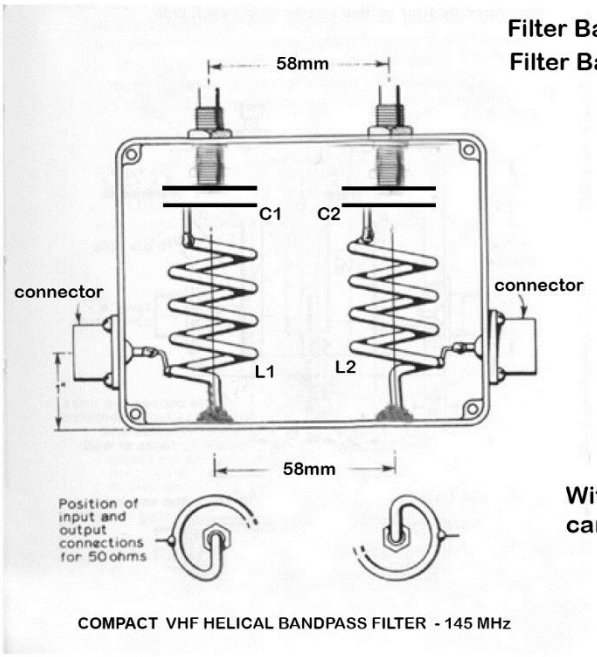

38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54








Minkom Rx Bandpass Filter
Frequency Band
VLF
LF
1.8
3.5
7
14
21
28
50
Bandpass Filter Select
Antenna 1
Antenna 2
Bias
Ground



Filter Bandwidth -0,3 dB: 5 MHz, 144 - 149 MHz
Filter Bandwidth -3 dB: 8.7 MHz, 142.5 - 151.2 MHz

Box = 120 x 90 x 50 mm made from copper plates
L1=L2 = 6 turns Cu wire 6mm2
Wire diameter = 2.6 mm
Coil Diameter = 23 mm

Coil Length = 36 mm
plus 15 mm to botom end and 10 mm to capacitor plate

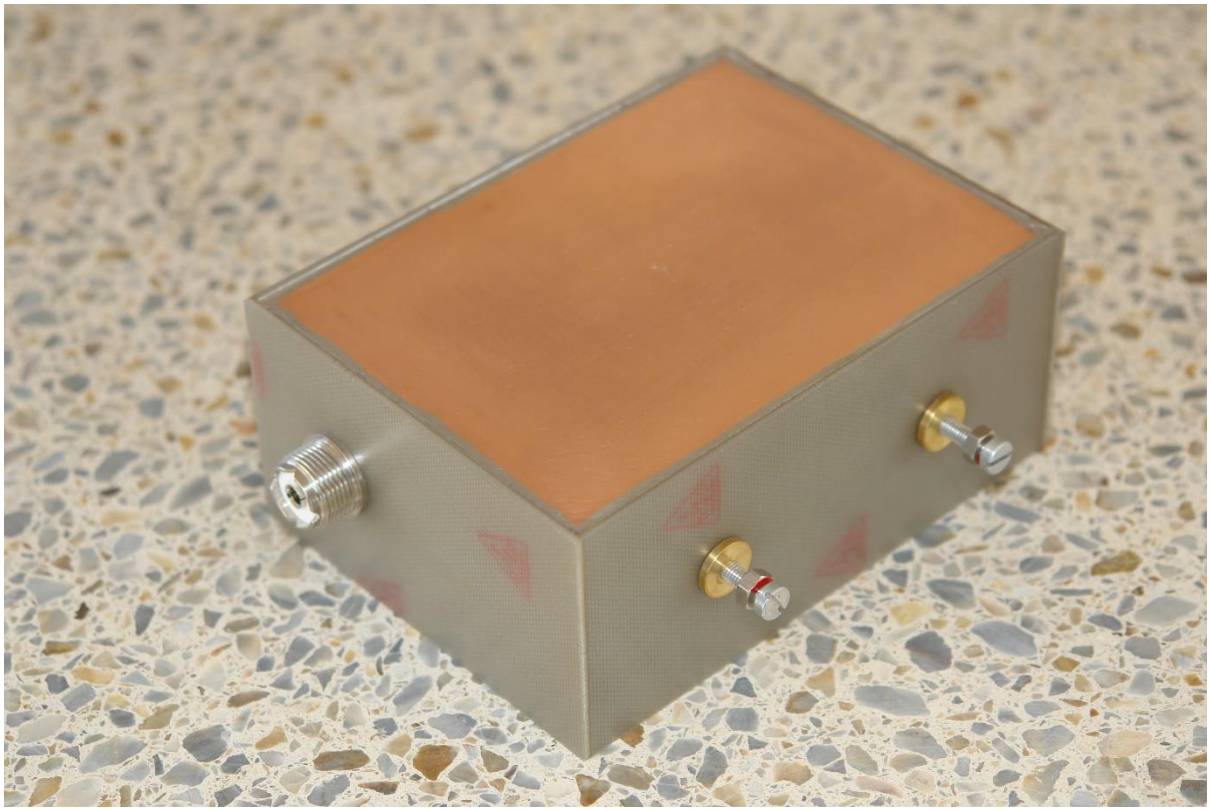
C1=C2 = about 0.5 - 5 pF
Capacitors are made from 2 copper round plates with 32 mm diameter each

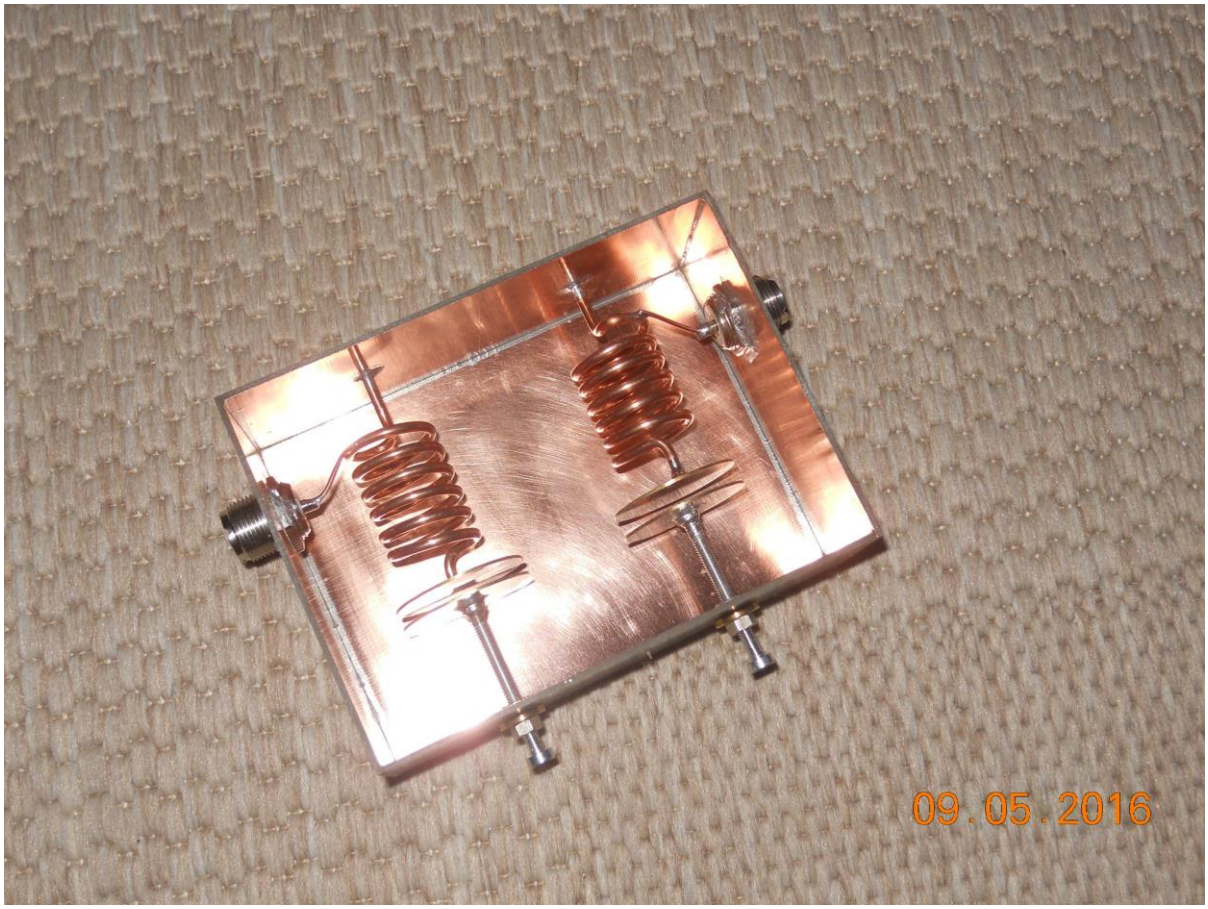
With this capacitors, bandpass filter can be tuned from 110 MHz to 160 MHz

By Mile Kokotov, Z33T

There are many people who have made this filter.

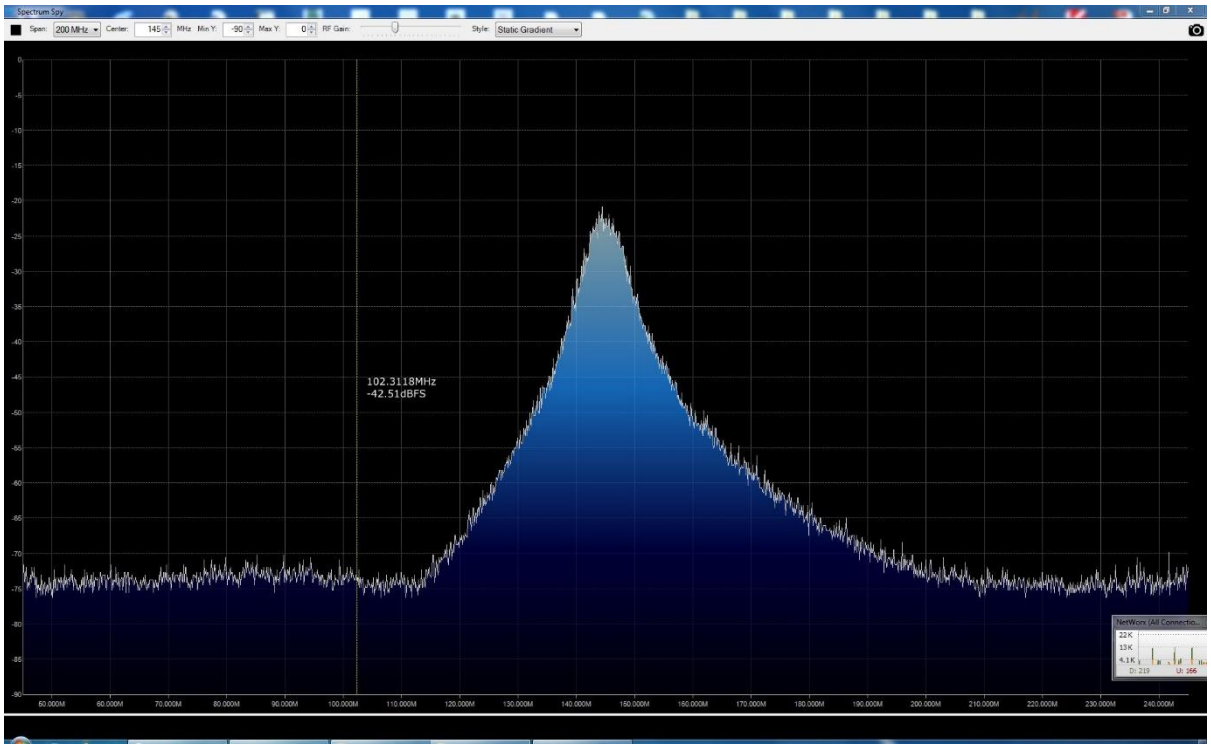
Here are some additional photos from the filter made by Done, Z332KF:



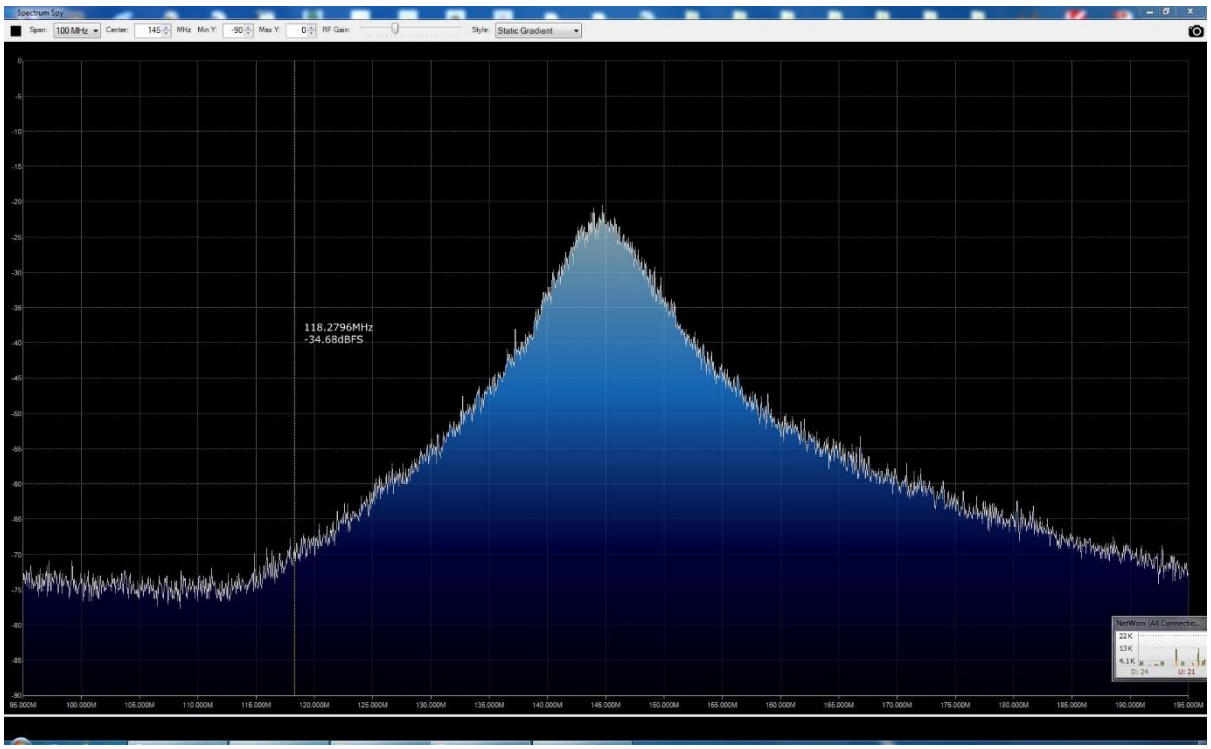

09.05.2016


09.04.2016

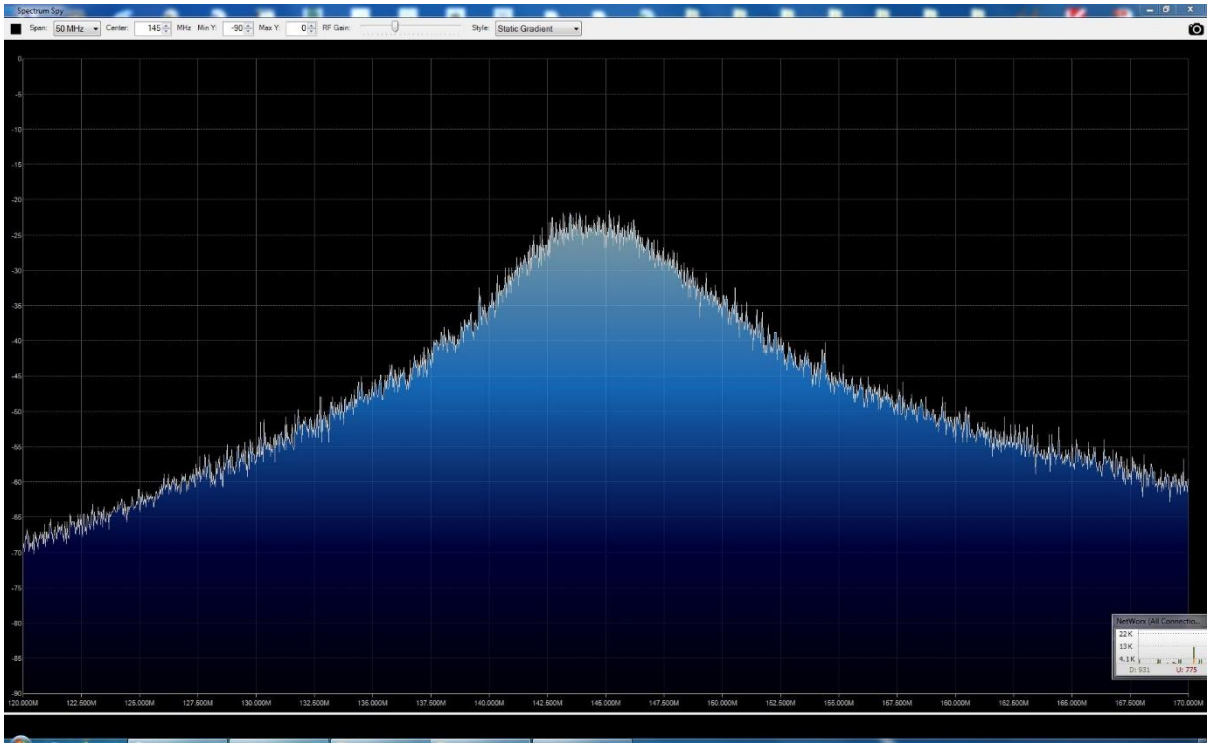
The Filter characterization (200 MHz span):



The Filter characterization (100 MHz span):



The Filter characterization (50 MHz span):



If you have made this filter, send me some photos, so I can put them on my web page.

73,

Mile Kokotov, Z33T

Here are some e-mails I received from those who build this excellent Low-Loss Filter:

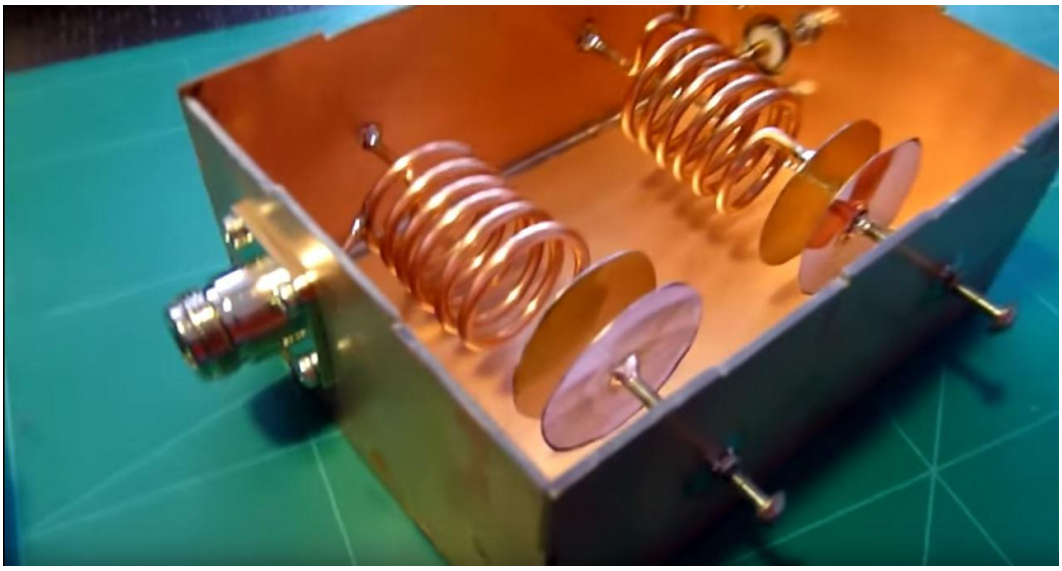
Hi Mile, I am Florin - YO3IVT. I have build your filter and I am very satisfied. Here is my video:

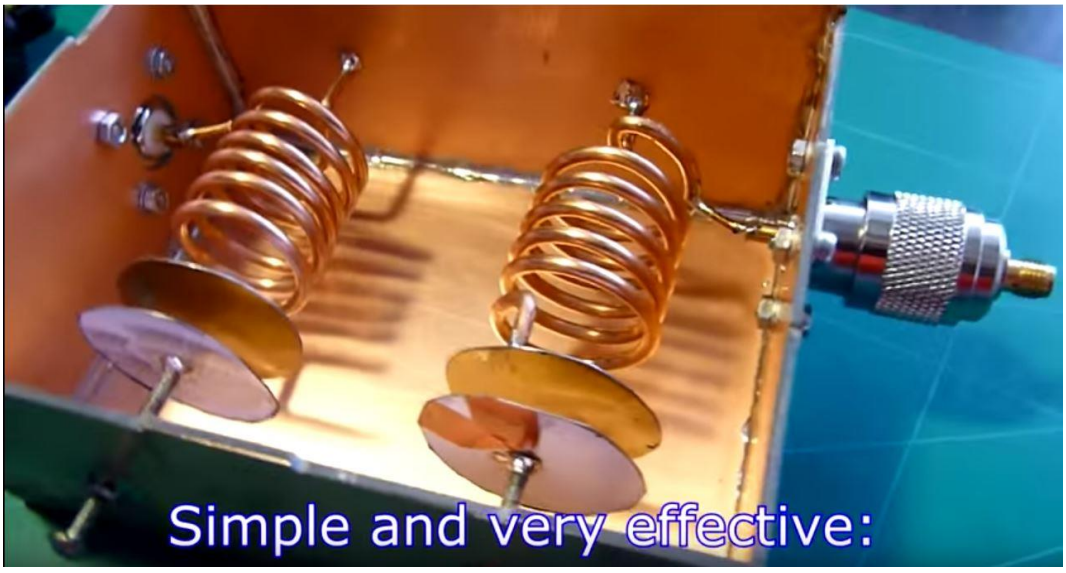
https://www.youtube.com/watch?v=jBNcT...

All the credits to Mile Kokotov for his building tutorial.
Since half an year, I have been experiencing some jamming on the local ham radio frequency, the further stations simply just disappeared during receiving. With a spectrum analyzer I could identify the source of all the troubles: a cab driver dispatch radio which is near me and it may have some RF leaks (or/and my Wouxun is not very well filtered on the first RF stages).
The bandpass filter eliminated all the problems caused by harmonics or intermodulation cleaning the signal I was interested in. The bandpass filter is very useful for using before a cheap Realtek SDR dongle.

73,
Florin - YO3IVT

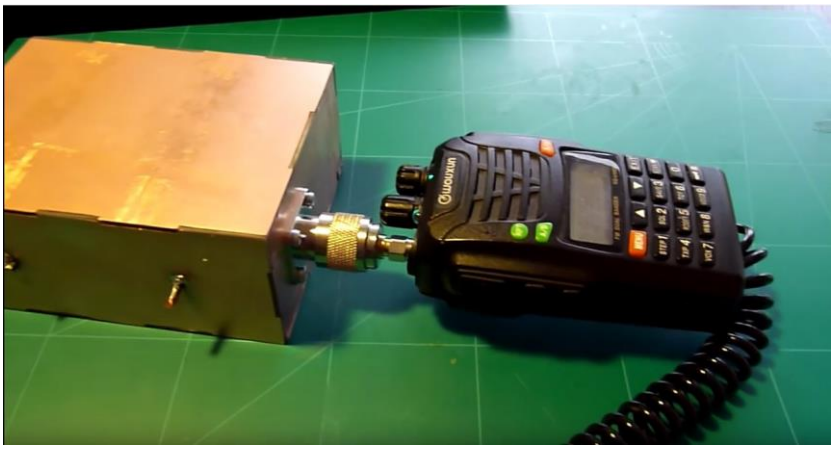
Here are screenshots from YO3IVT video:



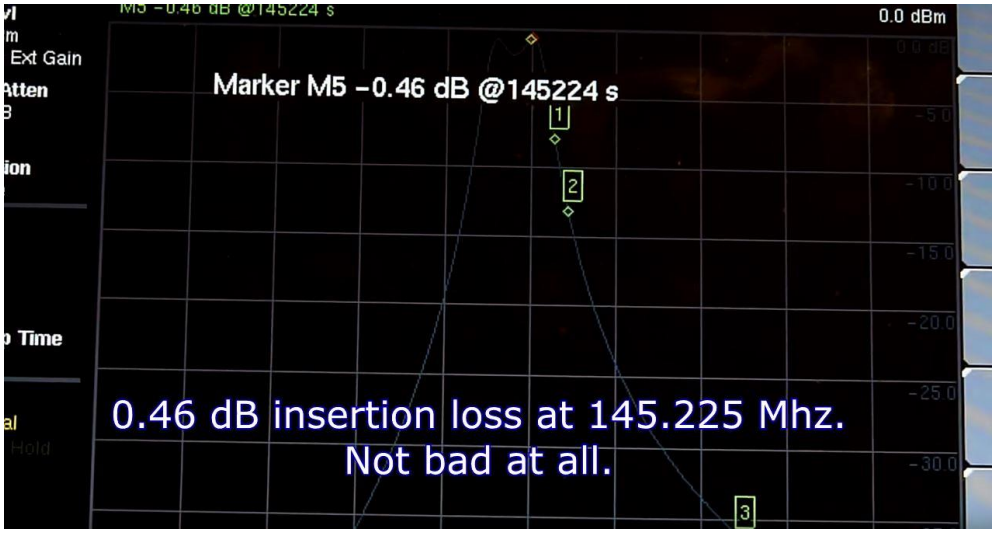


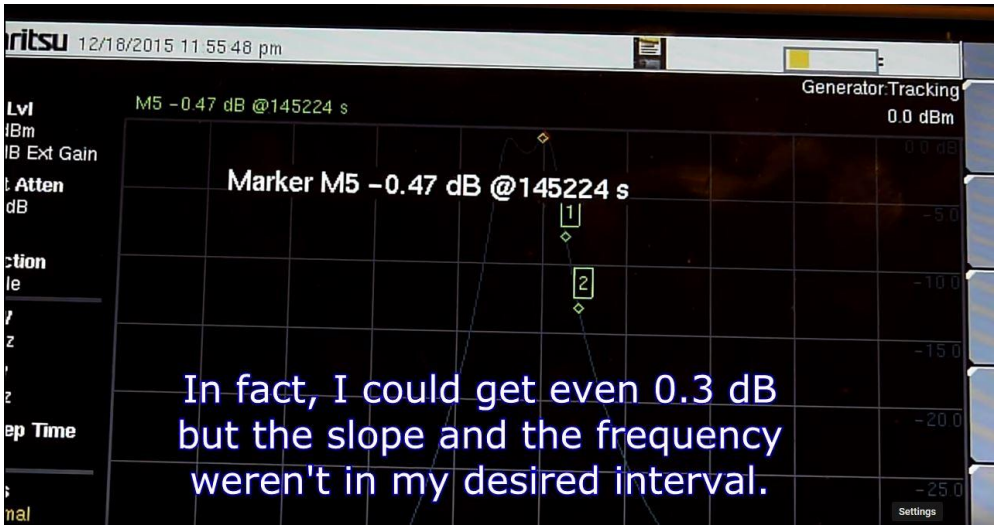

Simple and very effective:


The mighty bandpass filter :)




Anritsu MS2715E
SpectrumMaster
Now some measurements



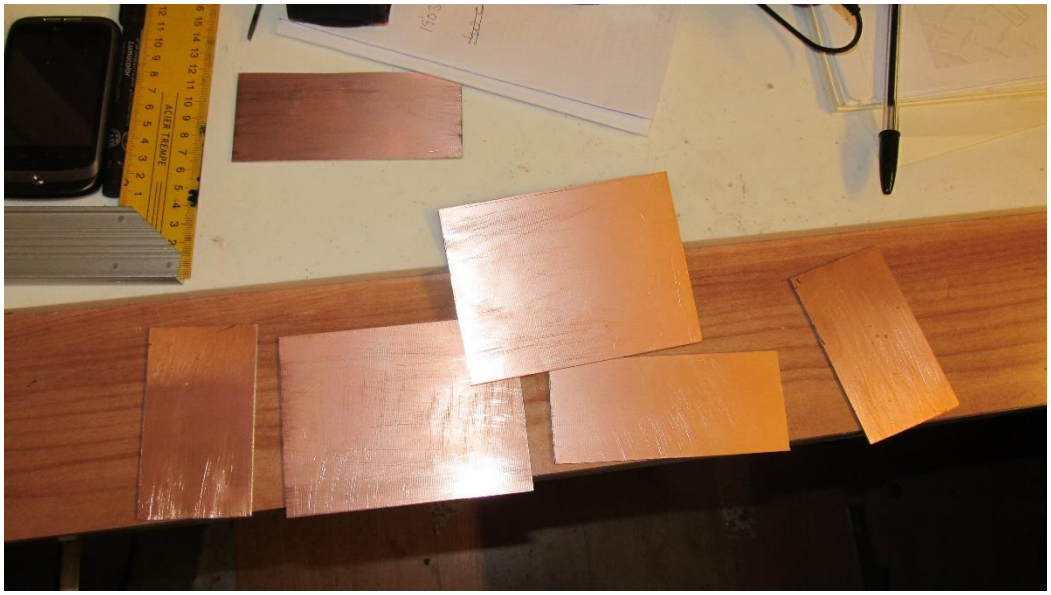


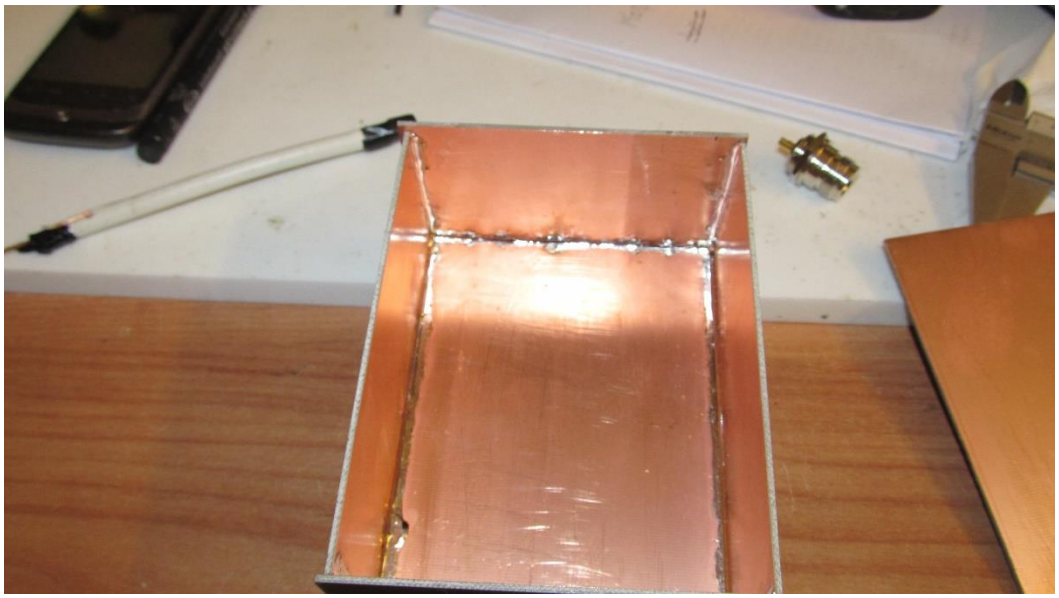
Hi Mile,
I am Carlos, EA1HXW. I am very satisfied with this filter, the main modifications was decrease diameter of wire to 2,1 mm , and I increase diameter of capacitor plates 2mm or 3 mm to get more space between plates and to use more power ..

The rest of filter was build like instructions
the cover have a film copper tape around the edges to do solder , and the inner solder is thin , better than photos . (Sn,Pb,Cu).

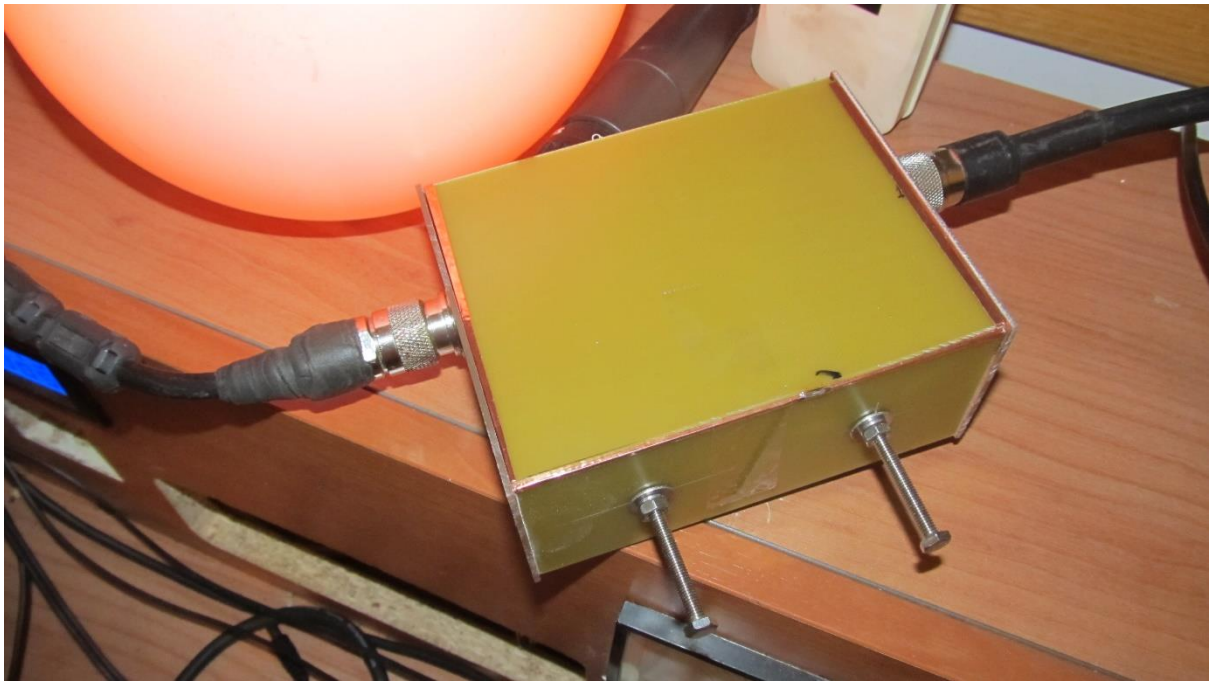
In this moment still I have inappropriate screw , I must change to brass but I have any now .
I use it in 2 metter band and no swr at 50w ft897 .
To me is perfect because I live with a lot qrm from fm broadcast.

Here are few pictures from the filter I build:






15-16
13-14
11-12
9-10



73 from EA1HXW Carlos

TNX

- -

Here is another Band-Pass Filter made by Clement according to my project:

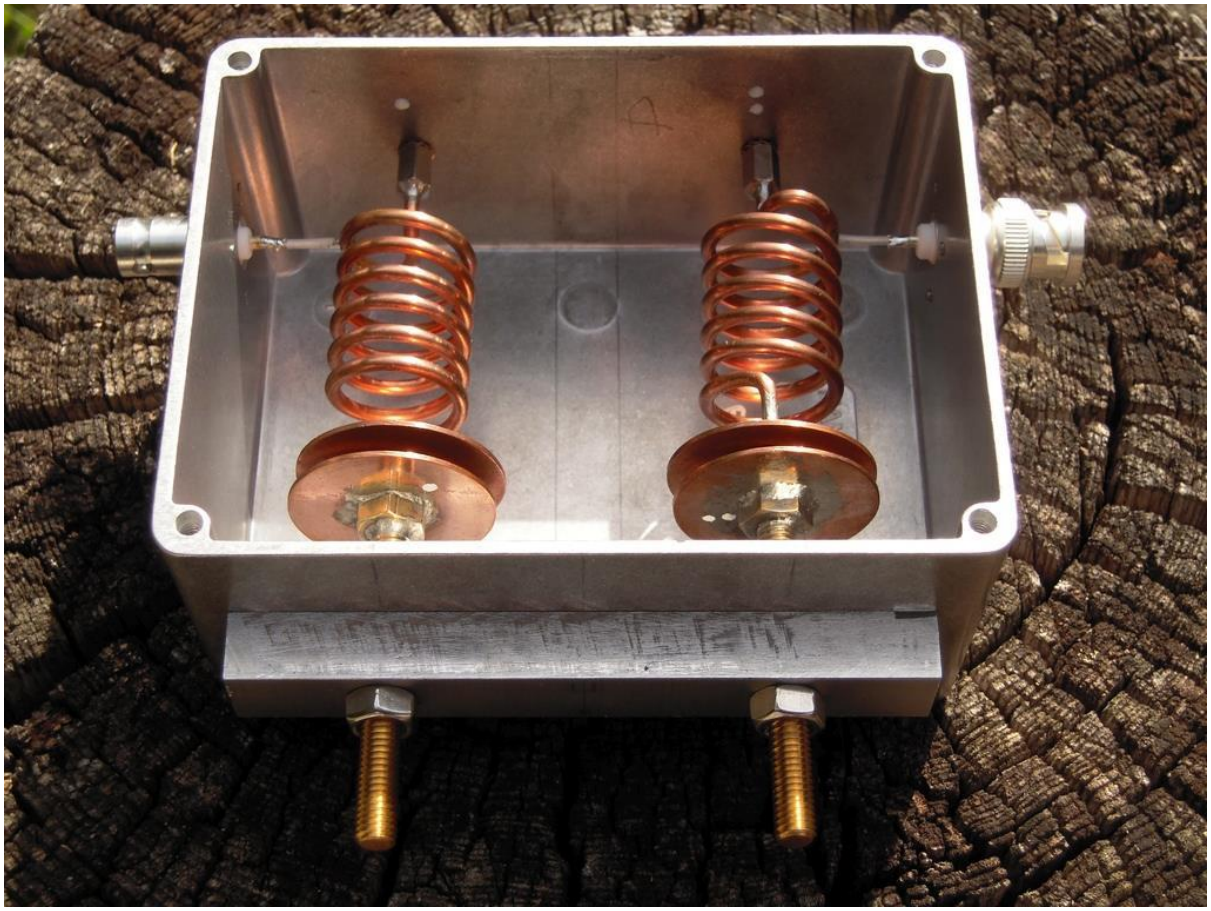
Clement ED Zerovingtsix added 4 new photos.

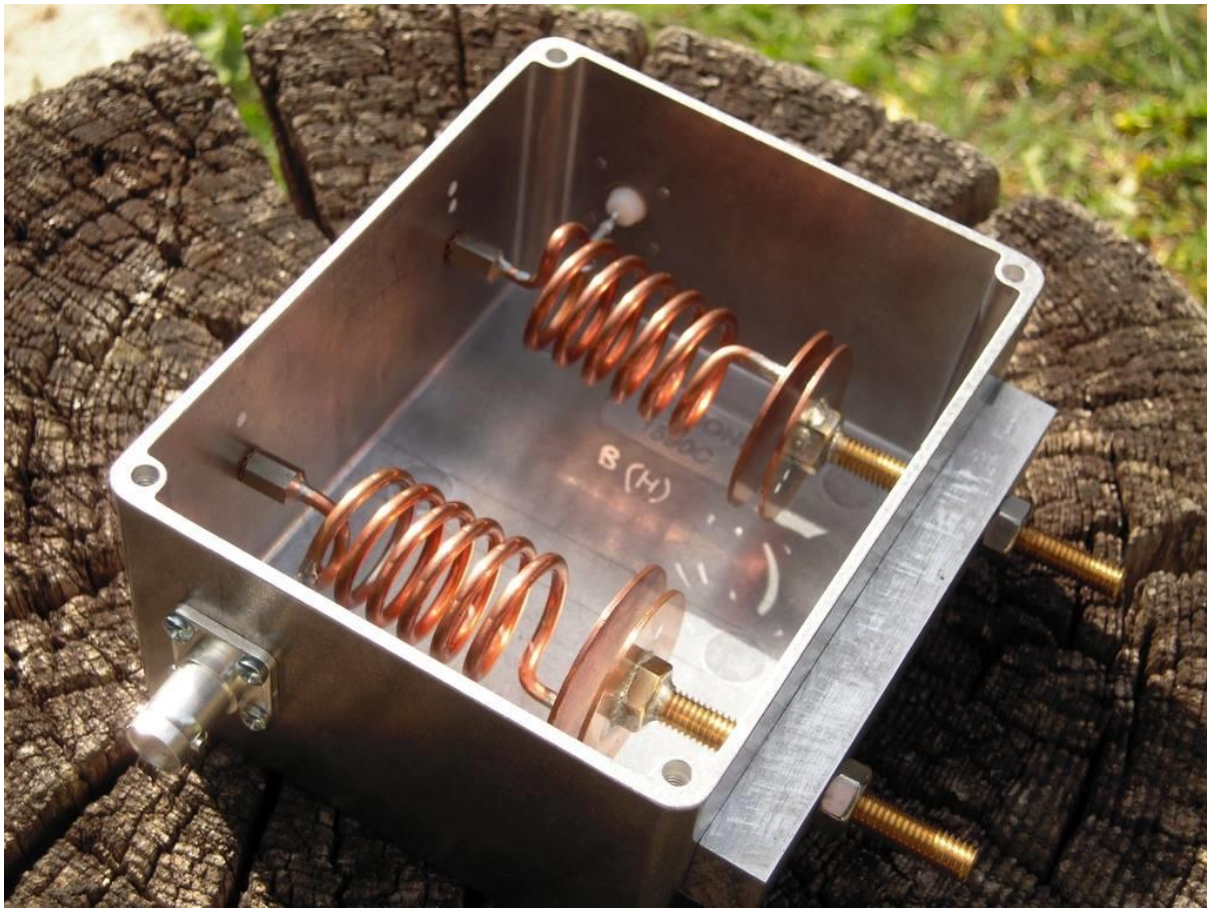
September 4 at 9:51pm ·

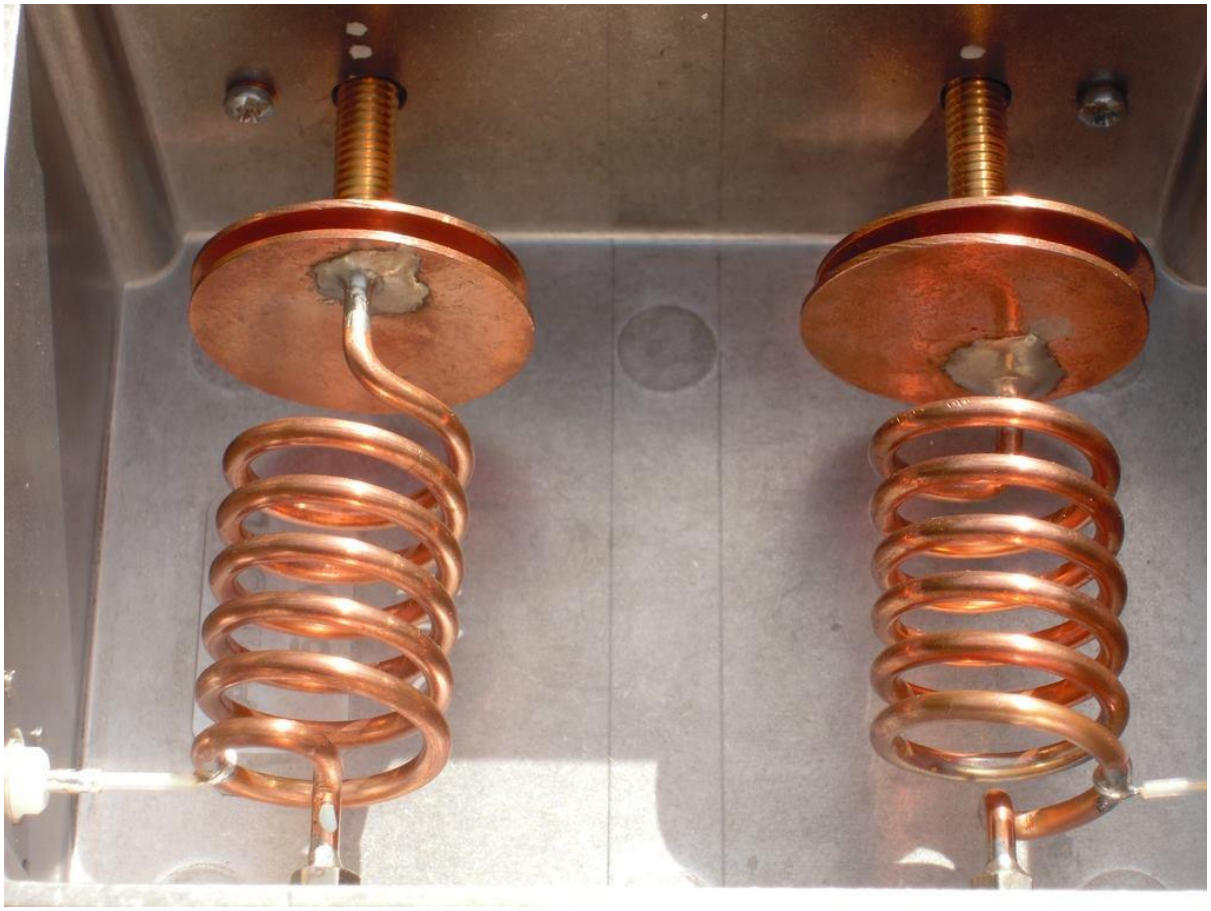
Filtre Hélicoïdal fait maison, filtre Pass Band VHF 110-160Mhz faible perte pour SDR/etc.
Testé sur le contest du weekend IARU R1 VHF , fonctionne tres bien, facile a régler.
!
Test sur analyseur de spectre bientôt.

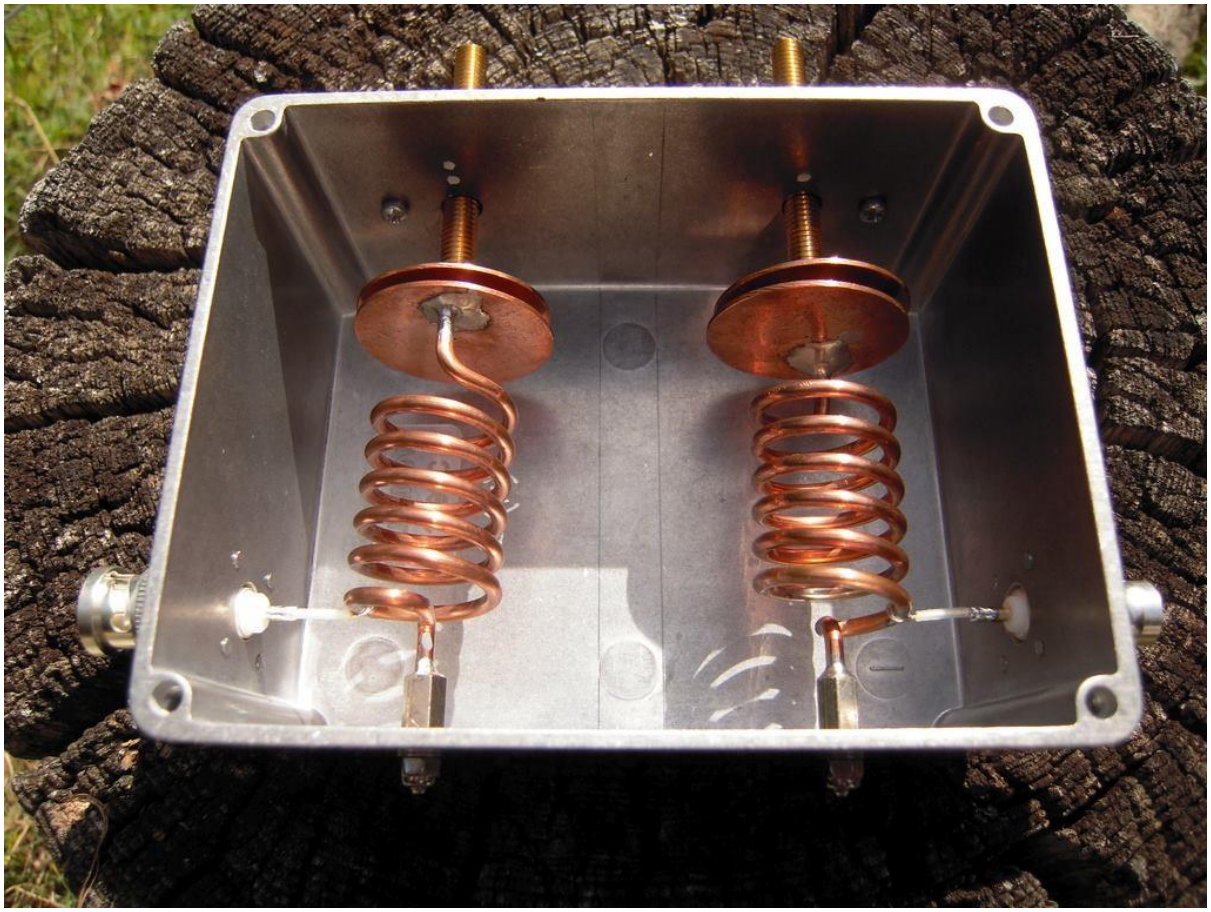
English Translation:

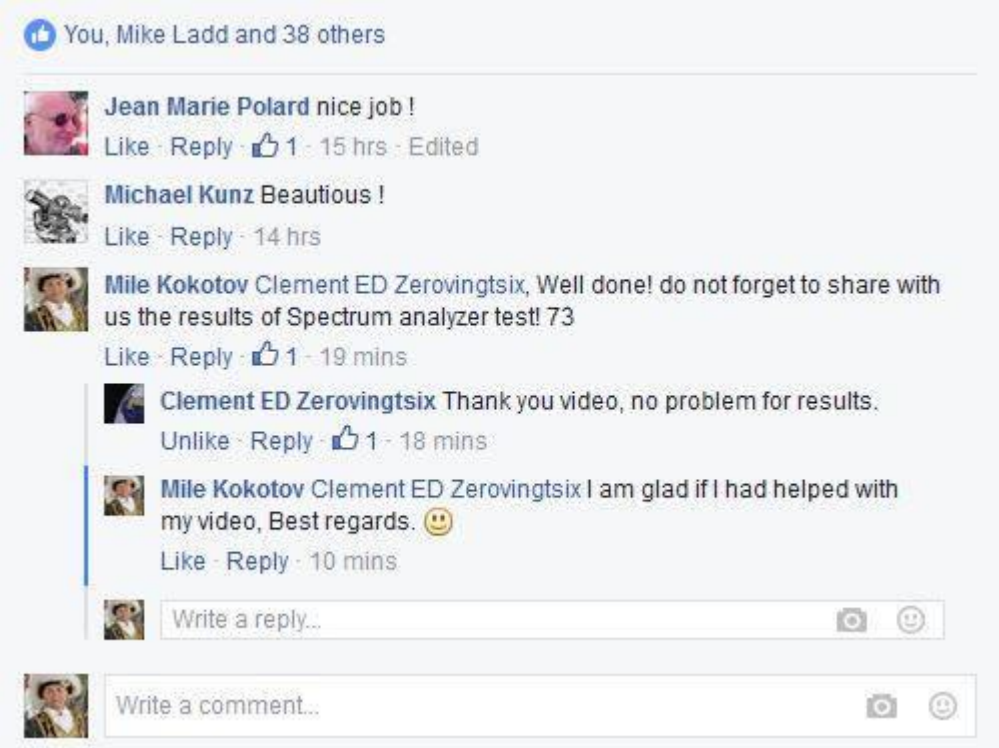
Helical Filter homemade VHF Band Pass filter 110-160Mhz small loss for SDR / etc.
Tested on the contest of the IARU R1 VHF weekend, works very well, easy to adjust.
!
Test Spectrum Analyzer soon.











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Here is a letter and several photos from one radio-engineer from Indonesia (JZ33BMY). He goes step further making experiments with several band-pass filters inspired by my filter design. Then he merged few filters and made duplexer!

A **duplexer** is an electronic device that allows bi-directional (duplex) communication over a single antenna. In radio communications repeater systems, it isolates the receiver from the transmitter while permitting them to share a common antenna.

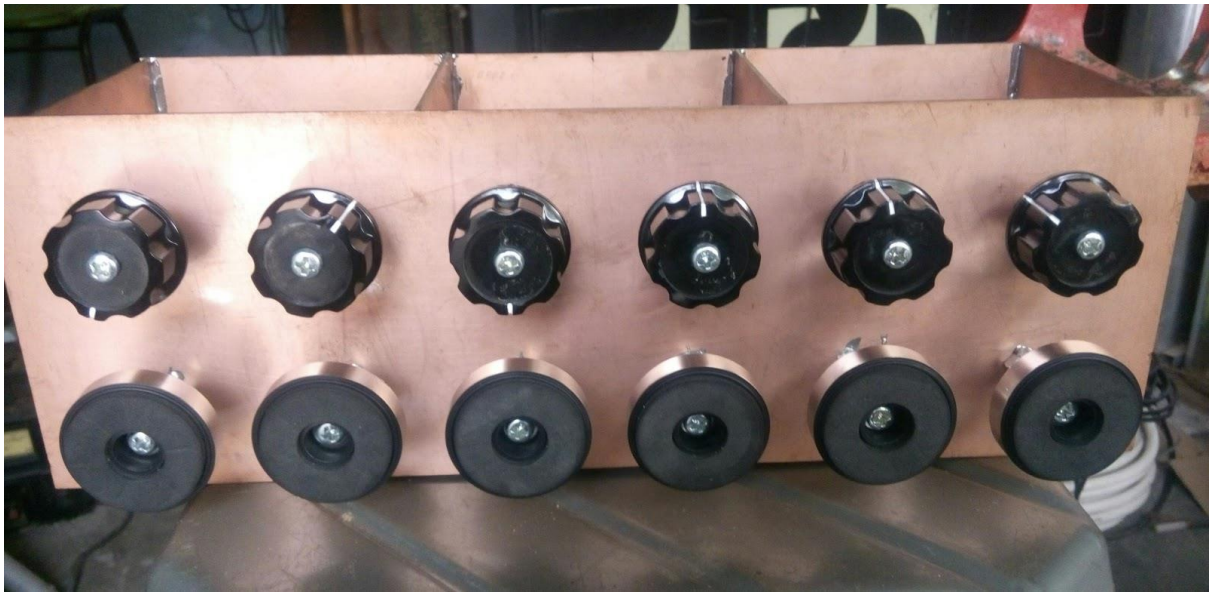
He wrote me several e-mails. Here is one of them:

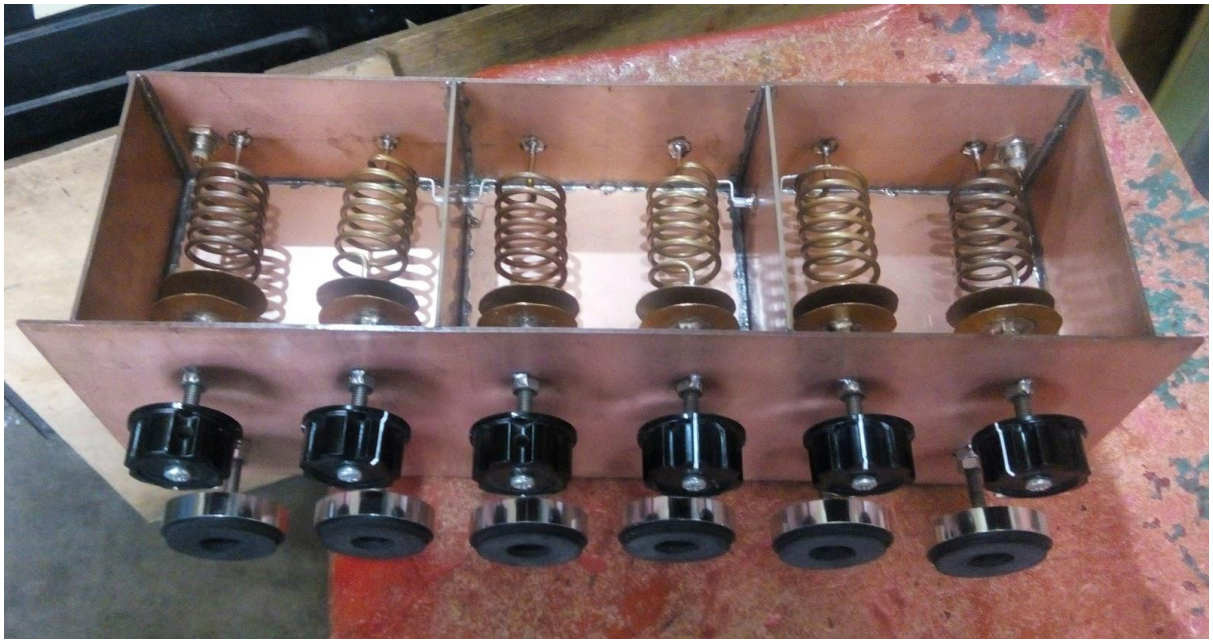
Sugeng Heriyadi 2:43 PM

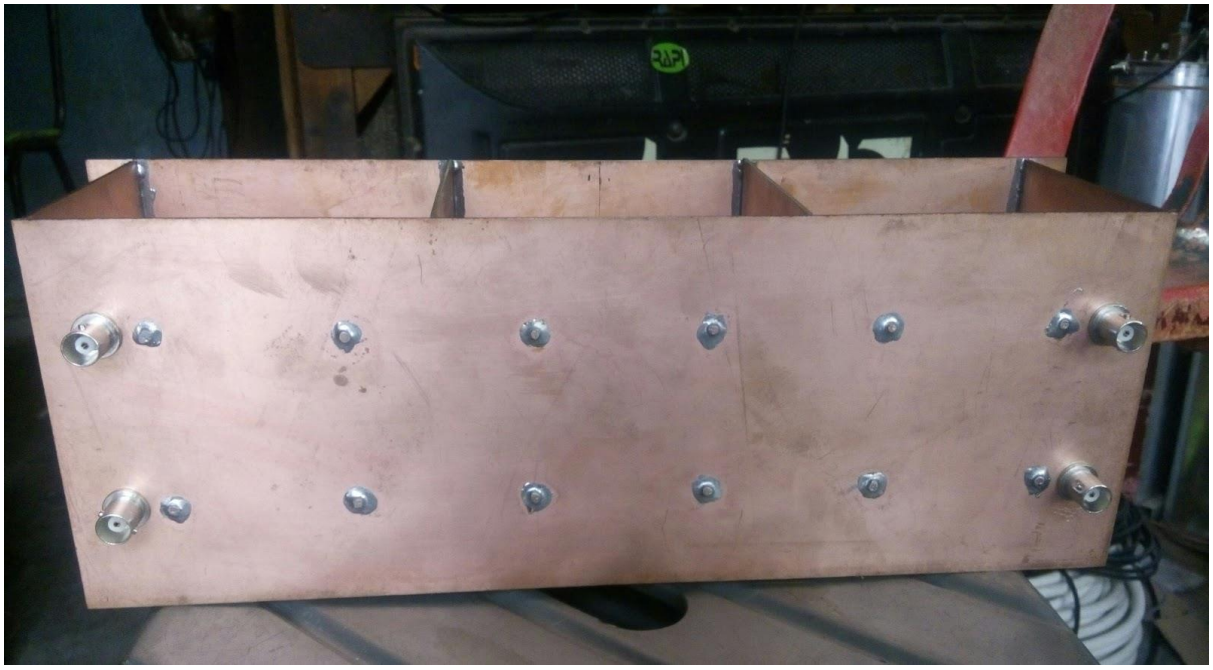
Many thanks mr kokotov.. Your idea ...inspiration for me ....to continue learning...
best regard...

Photos included:


RADIO
ANTENA
BAGOES COMMUNICATION
RADIO SERVICE
PRODUK RAKITAN/HOMEBROW
cavity filter / bandpass filter / interface
149.850 MHz
www.jz33bmy.blogspot.com
RADIO
ANTENA
BAGOES COMMUNICATION
RADIO SERVICE
PRODUK RAKITAN/HOMEBROW
cavity filter / bandpass filter / interface
F : 139.140 MHz
www.jz33bmy.blogspot.com







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Here is an email from Anders (from Denmark):

Anders Jørgen Ørts anders@oerts.dk (2017/03/18)

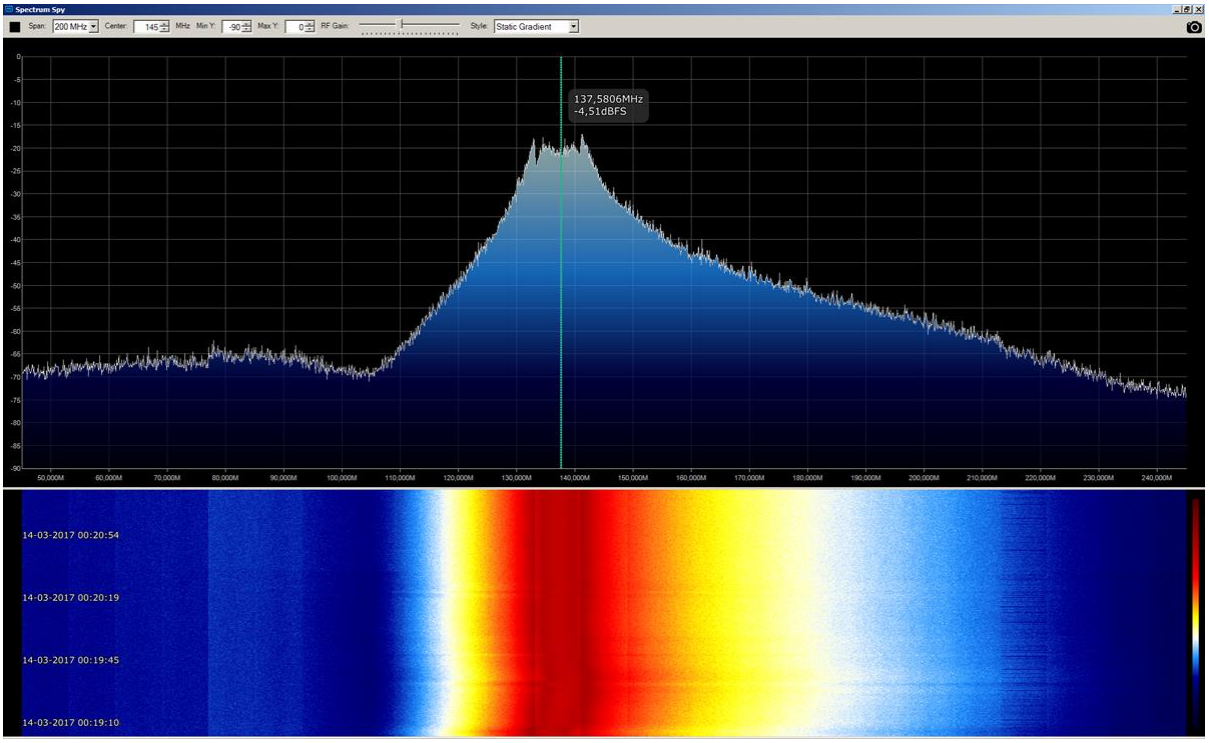
Hello Mile
I am Anders Ørts from Denmark. I don't know if you're still interested, but I have just finished building the VHF helical filter, designed by you. And it seems to work very well for my purpose. I was having strong QRM from a local FM transmitter (I assume) only 5 km away and it is now much attenuated. I may have to build a FM notch filter as well to get rid of it completely.

I am working on receiving flawless images from the Russian weather satellite Meteor MN2 (LRPT on 137.9 MHz). It seems to be difficult to get images without transmission errors (stripes) and QRM certainly don't make it easier...

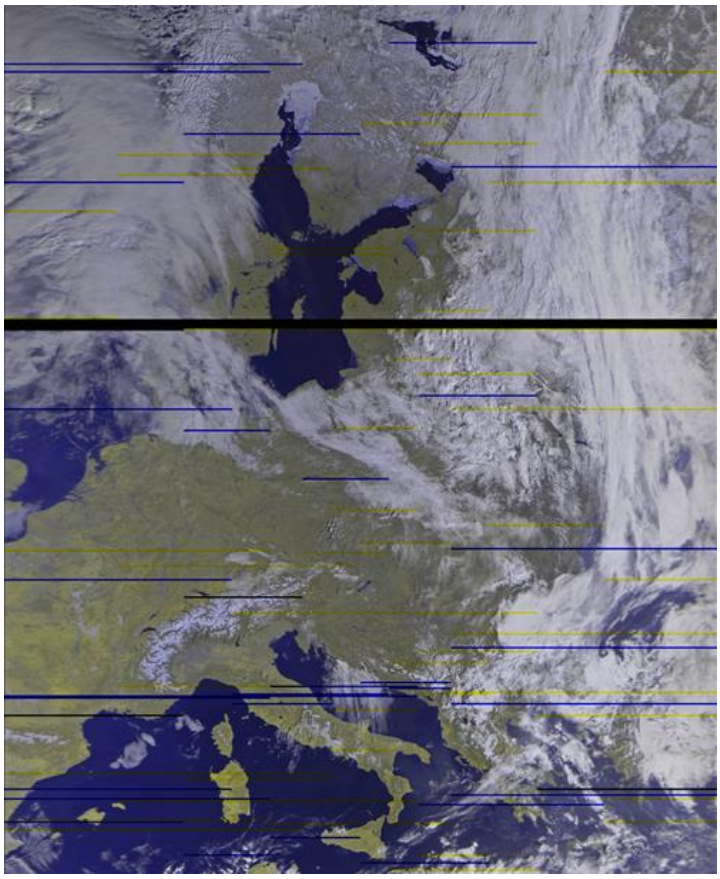
I have read/seen most of your splendid tutorials, and I have learned really much from you. Thank you very much, it is a pleasure!

Here's a couple of photos:

It is almost art :-)



The characterization of the actual filter after adjustments



A Meteor MN2 image from yesterday (the black bar is an error that comes from the satellite every 6½ minutes approx. - so nothing one can do about that)

All the best and kind regards
Anders Ørts
Randers, Denmark

Mile Kokotov kokotov@gmail.com (2017/03/18)
Hi Anders,
I am very pleased to see that you have build the band-pass filter with the instructions that I published and you are satisfied with the results!
Great job and excellent pictures. I will put them in my article about BPF on my web-page.
Thanks,

Mile Kokotov

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