HF Mini Whip Antenna (0 - 30 MHz)

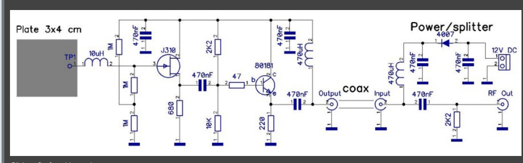
See the Mini Whip Slimline click here

First Mini Whip at UBA-SNW

Test of the (Basic) PA0RDT Mini Whip antenna for HF Freq. 0 to 30MHz

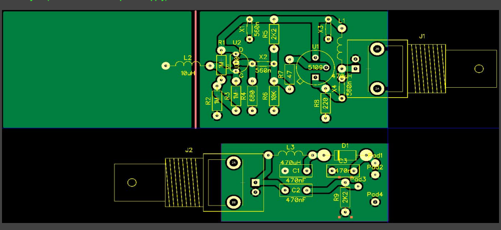
After a search on the Internet to find a simple antenna for HF SDR (0 - 30 MHz), I inevitably came this Mini Whip Antenna from PA0RDT against, which is found in many variations. Also, the Web-SDR of Twente NL boys make use of this antenna. Because it is an active antenna, I was quite skeptical because my previous experiences in this area were rather disappointing. A 20 years ago, there was once a print provided by Elektor, with which one could make an active (indoor) antenna with an slide antenna. That proved to be a success as well, and it quickly disappeared into the junkbox. I thought now (present tense) when it is copied from Elektor, so that will not work correctly. And I got initially equal. BUT. You must have seen the theory about the Mini Whip. Allow me to say: this Mini Whip antenna DOES ABSOLUTELY NOT WORKS INDOORS.
However I was thus still begun the construction of the antenna. And I thought, let's do it right away but good. So make i a design of the PCB in a PCB layout program, as a scheme to draw, and print out the results and produce the print.

Circuit :



Click on fig. for a bigger view
The schedule is as many as you can find on the Internet. There is almost no variation.
The actual antenna is a single copper-plane of approximately 3x4cm. This plane is coupled to a FET J310 with very high input resistance, and low noise figure. Behind it is just an RF transistor for amplification and some decoupling.
The 80181 is an old RF transistor from the rommelbox, which is used in cable-TV amplifiers. But any good HF transistor is fine.
The power supply can be done on site with a small 9V battery or through a power supply decoupled from the end of the connection cable. For this one so still need a nutrition print.
The impedance seen by the receiver, is about 100 ohms, but this is not verifyed !

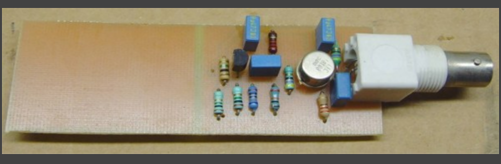
The board layout (HF circuit board and power supply) :



Click on photo for a bigger view

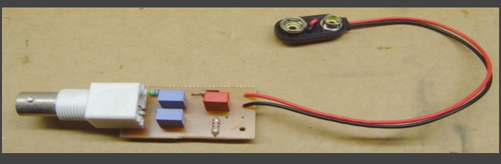
The total size of the RF section is only 3cm x 9cm !

HF board :



Please note that the coil of 10μH, you do not see, is placed on the copper side.

The finished power :



Click on photo for a bigger view

The theory
Why this antenna will not work indoors?
To understand this we need to tighten some physical things. This antenna is based on the electrical signal-field in the air.
We must realize that in the city, and in our homes, we live between incredibly strong electro-magnetic radiation from our (DECT) phone, computer, baby monitors, power supplies, fluorescent lamps, WiFi, and various other devices indoors. So we live in a fairly strong electromagnetic field radiation, which prevents other weak RF signals from outside, can not be received by the strong radiation field. They are there, but are 'pushed' by the stronger radiation inside our house. An amplifier does not make sense for these weak signals, because the strong interior radiation strengthens it, and make matters worse.
In other words, the strong radiation field in a house has a high noise value, and the weak RF signals that we want to receive a lower noise value. In this low noise RF amplifier is NOT above the strong noise indoors, so we will not hear the weak RF signals in our receiver. The only way to solve this is to find a solution to reduce the strong noise, until our receiver also will be able to receive the weak RF signals enough. Of these, a number of physical measurements have been made, with surprising results.
Most of them do know that there exist two types of antennas: one type (most window antennas) received best at the electric field in the air, and the other kind of antennas (usually loop-antennas), received on the best magnetic field in the air. Now bring the measurements somewhat surprisingly to light. Magnetic (loop) antenna, interior posted receives LOTS of interference inside the house, but can still somewhat works, because this antenna must be sharply tuned in (a capacitor) to a narrow frequency band. But that is not really suitable for HF broadband reception. Window antennas, have not these capacitors, and received interior the full distorsion over the entire HF band. But now it comes. In various measurements of magnetic and electric fields inside and outside, it has been found that the magnetic fields remain mostly within our homes, through the walls and the like, and that the electric fields are less affected by that. This means that we outsite, on a certain distance from our house, much better RF signals can be received, and the interference radiation from the house though it will reduce a lot. This makes the application of a window-antennas outside of a lot better. A wire, as well as window-antenna behaves primarily as a capacity on the lower frequencies. .

Now this science is known, this is also applicable to a "whip" antenna, both active or not. And it will also receive the electric field from the air. Now it is known, is one to look for other types of antenna.
It appeared that a small whip antenna works mostly capacitive. That gives temptation to replace the rod by a "capacity" or simply a (copper) surface. And it works! And so was born the Mini Whip antenna,
Although there of the "whip" not much is left. But the name Mini "Whip" remained.
A disadvantage could be that now the active part of the antenna, the copper surface is very small, so abbreviated.
So the signals were coming up here very, very small. And that's actually true. However, we use a FET transistor which is very sensitive to small signals. And it works, as long as the interference radiation of the environment is small enough. Measurements have shown that the best best RF reception is approximately 100 meters from buildings. But that is absurd. Most of us will not get. However, it has already proved it is possible from a few meters of building HF reception ! How further the distance the better. Please note that the antenna should not be placed on the end of a metal tube.

Construction

In the construction set are no major problems. My first copy is made entirely of parts from the junkbox ! The antenna cable is 10 meters using 50 ohm (RG-58U) coaxial cable. Any other coax cable is fine.

Testing

The first test was done with a 9V battery with clip directly behind the HF printer connected.
Later, the splitter / power PCB are used in house at the end of the coaxial cable to the RF PCB. The exit of the power supply PCB is connected with approximately 1m cable to the input of the SDR stick or receiver.

Practice Photos :

Outsite at 4 meter

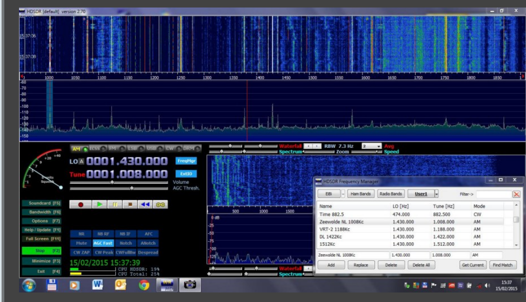
Detail of HF board + 9V battery

Not working test insite house

Click on photo for a bigger view
The receiver

The intention was to use this antenna for HF SDR reception, so we also tested.
We use a PC or laptop with the HAM HDSDR program, which we fine a number of observations / pseudo measurements can do.
To compare, we go the opposite way: we begin to try to obtain the best possible reception with a lineup outside, and go more inward to see what happens with the signal.

Receiving 4 meter in open air :



LO A 0001.430.000
Tune 0001.008.000
15/02/2015 15:37:39
CPU HDSDR: 19%
CPU Total: 25%

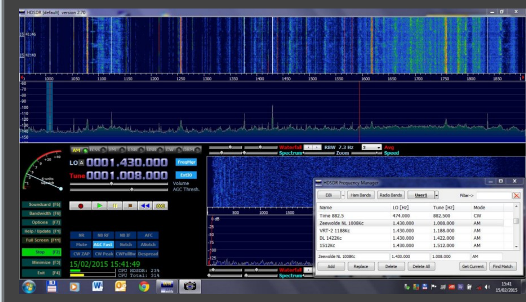
Name	LO [Hz]	Tune [Hz]	Mode
Time 882.5	474.000	882.500	CW
Zeewolde NL 1008Kc	1.430.000	1.008.000	AM
VRT-2 1188Kc	1.430.000	1.188.000	AM
DL 1422Kc	1.430.000	1.422.000	AM
1512Kc	1.430.000	1.512.000	AM

Zeewolde NL 1008Kc 1.430.000 1.008.000 AM

Click on photo for a bigger view

A good test are the few remaining NL medium wave station, which are sometimes by day to receive all difficult. Here we see on receipt Radio5 1.800KHz which received very good.

Receiving 2 meter under glass roof :



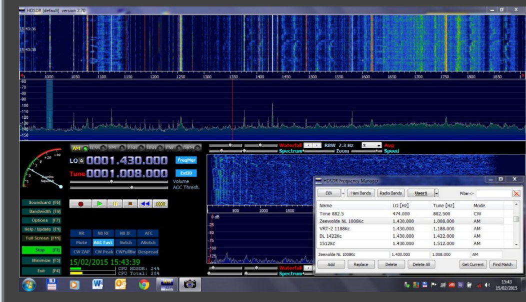
LO A 0001.430.000
Tune 0001.008.000
15/02/2015 15:41:49
CPU HDSDR: 23%
CPU Total: 31%

Name	LO [Hz]	Tune [Hz]	Mode
Time 882.5	474.000	882.500	CW
Zeewolde NL 1008Kc	1.430.000	1.008.000	AM
VRT-2 1188Kc	1.430.000	1.188.000	AM
DL 1422Kc	1.430.000	1.422.000	AM
1512Kc	1.430.000	1.512.000	AM

Zeewolde NL 1008Kc 1.430.000 1.008.000 AM

Click on photo for a bigger view
Here we see that the reception on 1.800kHz has been greatly reduced. French channels which are very strong , are to be received well.

Receiving 1 meter under glass roof :



LO A 0001.430.000
Tune 0001.008.000
15/02/2015 15:43:39
CPU HDSDR: 24%
CPU Total: 28%

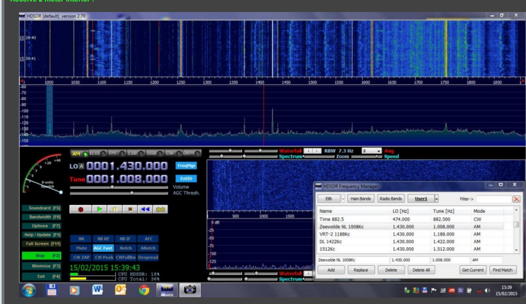
Name	LO [Hz]	Tune [Hz]	Mode
Time 882.5	474.000	882.500	CW
Zeewolde NL 1008Kc	1.430.000	1.008.000	AM
VRT-2 1188Kc	1.430.000	1.188.000	AM
DL 1422Kc	1.430.000	1.422.000	AM
1512Kc	1.430.000	1.512.000	AM

Zeewolde NL 1008Kc 1.430.000 1.008.000 AM

Click on photo for a bigger view

At 1 m from the housewall the NL signal is already almost entirely disappeared. Other strong French channels can be received even reasonable.

Receive 2 meter interior :



LO A 0001.430.000
Tune 0001.008.000
15/02/2015 15:39:43
CPU HDSDR: 18%
CPU Total: 36%

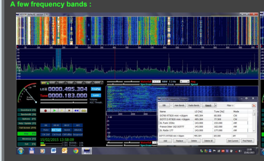
Name	LO [Hz]	Tune [Hz]	Mode
Time 882.5	474.000	882.500	CW
Zeewolde NL 1008Kc	1.430.000	1.008.000	AM
VRT-2 1188Kc	1.430.000	1.188.000	AM
DL 1422Kc	1.430.000	1.422.000	AM
1512Kc	1.430.000	1.512.000	AM

Zeewolde NL 1008Kc 1.430.000 1.008.000 AM

Click on photo for a bigger view

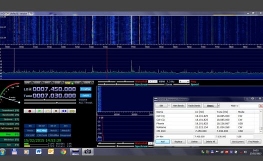
Inside the house it is very bad, and already difficult search for a station that still comes through. The French stations are not receiving practical.

A few frequency bands :



LO A 0000.495.304
Tune 0000.183.000
15/02/2015 13:58:09

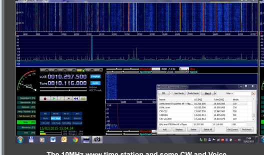
Beginning of the HF spectrum with French stations



LO A 0007.450.000
Tune 0007.030.000
15/02/2015 14:53:39

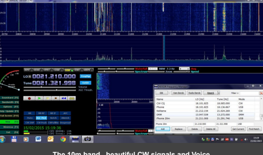
Spectrum on the 40m band (better in the evening)

Time Channels DCF77 and even 60kHz are well received in the daytime. The 40m band could be better, but there is sure to receive all CW and phonie in daytime.



LO A 0010.297.500
Tune 0010.116.000
15/02/2015 15:04:34

The 10MHz www time station and some CW and Voice



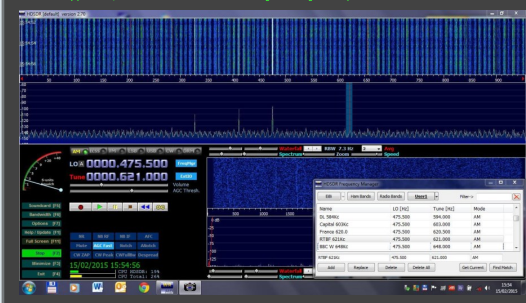
LO A 0021.210.000
Tune 0021.321.998
15/02/2015 15:19:36

The 10m band , beautiful CW signals and Voice

Click on photo for a bigger view

The time transmitter at 10MHz was not well received (better in the evening) , but there are to hear other CW and Voice broadcasts.
The 21MHz -10m band , with beautifully signals in CW and Voice.
This proves that the antenna still works well to at least 21MHz.

Here is the MiniWip power OFF, this look like this. What a difference ! Nothing but false signals and spikes.



LO A 0000.475.500
Tune 0000.621.000
15/02/2015 15:54:56
CPU HDSDR: 19%
CPU Total: 26%

Name	LO [Hz]	Tune [Hz]	Mode
DL 584Kc	475.500	594.000	AM
Capital 603Kc	475.500	603.000	AM
France 620.0	475.500	620.500	AM
RTBF 621Kc	475.500	621.000	AM
BBC W 648Kc	475.500	648.000	AM

RTBF 621Kc 475.500 621.000 AM

Links and Downloads : http://pi4utr.nl/wp-content/uploads/download/pa0rdt_whip.pdf

http://www.hamnieuws.nl/pa0rdt-mini-whip-bij-wimo/

http://www.pa4nic.nl/Mini-Whip/MiniWhip-pagina.html

http://dl1dbc.net/SAQ/Mwhip/Article_pa0rdt-Mini-Whip_English.pdf

http://home.scarlet.be/on1bes/index.html

This antenna is great for use with my SDR HF UP-convertor :
http://home.scarlet.be/on1bes/Homebrew_Challenge_2014_EN.html

mailto: on1bes Scarlet.be

Last updated on 21/3/2018 om 18:17:1902-08-2017 at 23: 40