H1 Observation with RTL-SDR & IF Average

Dan Kowell, AL7RS

Equipment

> 2.4 GHz parabolic WiFi grid dish

> NooElec 20 Mhz – 4 Ghz LNA

> NooElec DC Block

> 1 – N male to SMA male Adapter (to connect LNA to Cable on Antenna)

> RTL-SDR Dongle

> SDR# Software with IF Average Plugin

> 1 – USB Cable to supply power to the LNA

> 1 – USB Cable to connect the Dongle to the PC

Equipment (the least of my worries), used is the same setup as in the article found on the RTL-SDR website.....

https://www.rtl-sdr.com/cheap-and-easy-hydrogen-line-radio-astronomy-with-a-rtl-sdr-wifi-parabolic-grid-dish-lna-and-sdrsharp/

.... with the exception of the LNA. Currently i am using the NooElec LaNA 20 MHz - 4 GHz which has a Gain of about 19 dB at 1420 MHz and a NF of about 1.2 dB. I plan on getting the NooElec SAWbird H1 1420 MHz LNA which has a Gain of about 40 dB at 1420 MHz and a NF of about 0.8 dB, (all Data from NooElec Data Sheets).

Apparently the same equipment is found in the "Scope in a Box" although i dont know what software if any is provided in that package. The SDR# program with the IF Average Plugin is a fairly easy program to use. At first i could not get the Plugin to work in SDR#, but after obtaining a newer laptop and downloading and installing everything again into the newer laptop i was able to use the IF Average Plugin and get some clear results.

Software (my biggest headache)

First, how i set up the Software..... Download and install the following programs first, (if your PC doesnt already have them).

NOTE: You must have the Microsoft .NET 5.0 or newer redistributable installed to use SDRSharp.

Note that on some computers you may also need to install the Visual C++ Runtime if it is not already installed. Also for the IF Average Plugin, Download and install:

windows desktop-runtime-5.0.2-win-x86

microsoft-net-framework-5-0-3

Microsoft XNA Framework 4.0 Redistributable

If any of these programs are missing (in my case) the IF Average Plugin will never load or work in SDR#.

Once those are installed, then Download: sdrsharp x86

AVE (the IF Average zip file link below)

https://www.dropbox.com/sh/v3ul0a8x9ofagej/AADwDWqiuGUZexueFzfqEGGva?dl=0

..... when the page opens just click the Download button at the top right hand corner of the page....

Make a folder in C:/ (like C:/SDR#), extract the zipped files from sdrsharp to the new folder..... then extract the files from AVE into the same folder.

** before the next steps make sure you are connected to the internet as Drivers and some files get downloaded in the process.

Next, open the SDR# folder and look down the list for the Plugins XML Document File, Open it with notepad..... type in the magic sentence:

<add key="IF Averge" value="SDRSharp.Average.AveragePlugin,SDRSharp.Average" />

click save.....

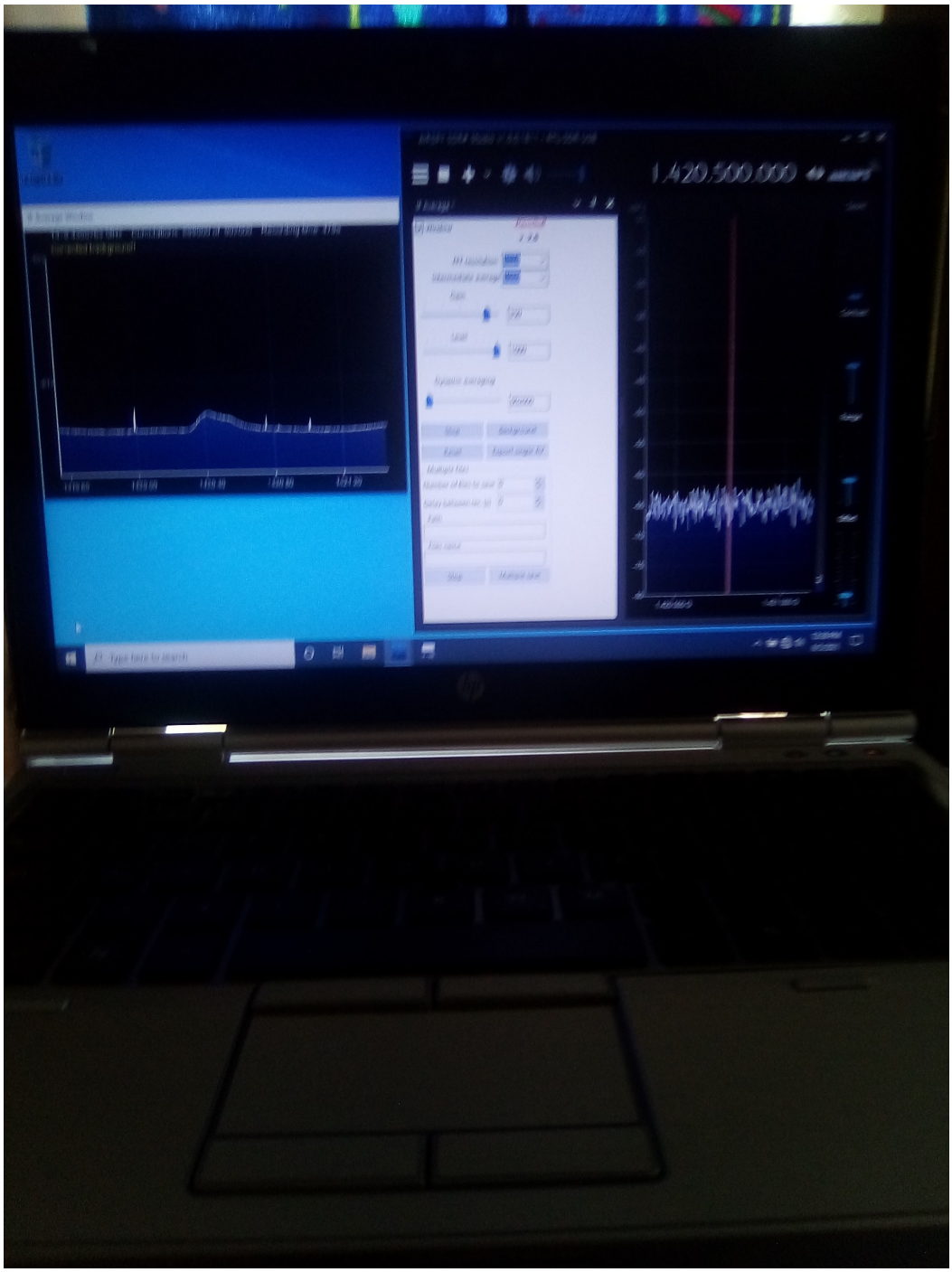
Now find the install-rtlsdr windows batch file just up from the Plugins XML File, right click.... run as administrator.....

Once you get to this point just follow the Instructions that come with SDR# and you should be ready to set Settings and run the Programs.

My Equipment (photos)

The Antenna, NooElec 20 MHZ to 4 GHz LNA, NooElec DC Block, RTL-SDR Dongle, USB Cables

close up of the electronics



screen shot of SDR# and IF Average Window running and showing the second arm of H1 crossing over the Antenna. (photo taken 05 Jun 2021 at 16:54 z)

Before running IF Average I changed some Settings. First in the Configuration Panel (click the Cog in upper left corner of SDR#), i set the Sample Rate to 1.92 MSPS which on the Display Windows show a frequency range of 1419.750 - 1421.250.

Next I turn off the Waterfall which " I think " will be less work for the CPU.

Next I set the IF Average Settings as follows: FFT Resolution - 1024

Intermediate Average - 1000

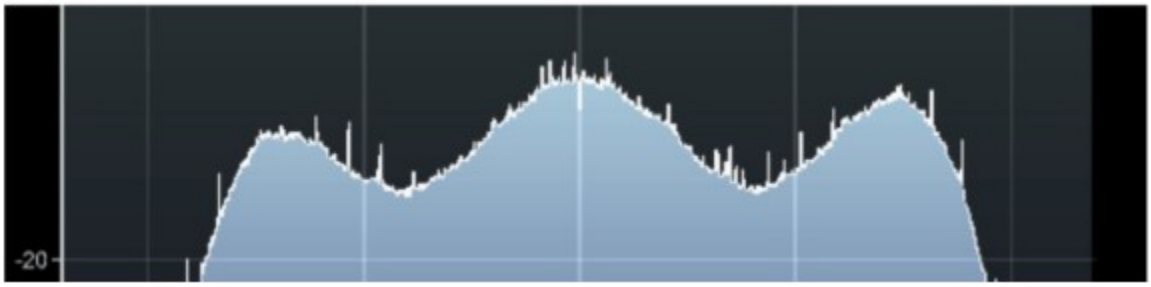
Gain - 350

Level - adjust as needed to bring the Trace into view, usually after running the Calibration. Normally i find my setting to be around 1000.

Dynamic Averaging - 902000

Calibration

First, I point the antenna toward the ground then open SDR#, then IF Average Control Panel and the IF Average Window. I start SDR# and then IF Average and immediately click the "Background" button to start the calibration. (not running the calibration will give a wavy trace).



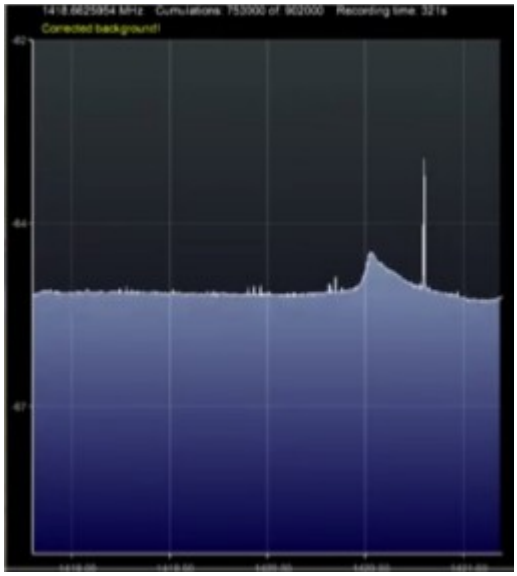
wavy Trace (this is how the Trace looks on first start up before Calibration).

Once the Scan is complete the upper left corner of the IF Average Window should display a yellow message saying:

" Corrected Background"

I then usually need to adjust the Level setting slider to bring the Trace into view.

After Calibration you should see a nice flat Trace as in photo below: (without the H1 Peak), that will come later.



Corrected Background

The IF Average does have File Saving though i have not been able to find Instructions for the Plugin on how to use the program or the functions. At the moment i just use the Windows Snipping Tool to capture a screen shot of the IF Average Window. At some point i will explore a little deeper into the File Saving Funtions.

There is also a Program (Chronolapse) which is an executable program (thank God !), which saves screen shots and then later can be edited to make a movie which can show in fast motion many hours of data collection. I will be persuing this option as well.

So, i hope the above information will helpful / useful to others who like me are not computer programmers, software engineers, computer geeks, hackers, etc . . .