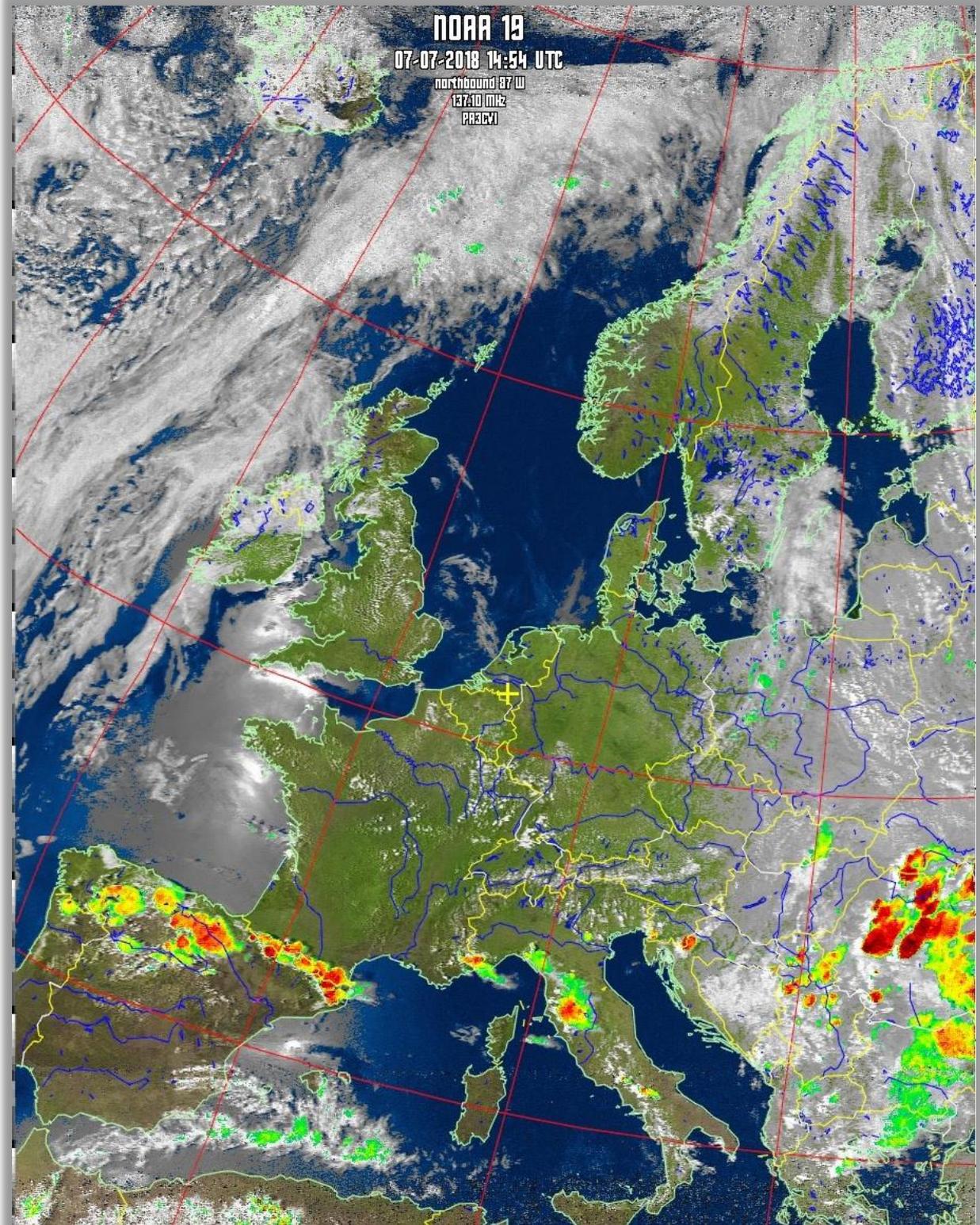


Reception from NOAA weather satellite images



1. Introduction.

There are more than 1700 satellites orbiting the earth, some 150,000 km away. They send photos and other data to Earth. Most satellites are American. (quote from National Geographic, February 2018).

This tutorial describes the reception of the NOAA satellites, which transmit an analog signal also called APT (Automatic Picture Transmission).

Currently, three US NOAA weather satellites are active, orbiting the earth at a sloppy 850-900 Km. They are so-called polar satellites that orbit the Earth via the North and South poles.

The NOAA satellites send analog signals to Earth in the 137 Mhz segment and are convertible for us amateurs into pictures of the weather that are fairly easy to receive given the "low" satellite altitude.

Currently there are three NOAA satellites active and receivable on:

- NOAA 15 - 137.6200 MHz launch date: May 13, 1998
- NOAA 18 - 137.9125 MHz launch date: May 20, 2005
- NOAA 19 - 137.1000 MHz launch date: February 5, 2009

At a mission duration of 2 years, the three satellites are still spinning. How long will their signals continue to be received, no one can say yet.

You need **three free downloadable** programs for that, namely: 'SDRSharp', 'WXin-tolmg' and for part 2: 'Orbitron'.

This article aims to help everyone receive weather satellite images with a Windows system as simply as possible with a cheap RTL-SDR (software defined radio) dongle (USB stick).

The NOAA satellite reception consists of 2 parts:

Part 1 describes the procedure to follow to receive the satellite images using 'SDRSharp', in combination with 'WXtolmg'. The disadvantage of this is that you have to be present at the moment that the images can be received to start both programs. It is best to follow this method first, because it is the most simple method to receive the satellite photos. You then only use the programs 'SDRSharp' and 'WXtolmg'. The quality of the photos, described in both parts, do not differ. I advise you to get some experience with the simple method, part 1 first.

Part 2 describes the possibility to have 'SDRSharp' started automatically by a third program called 'Orbitron'. This program also corrects for the doppler effect and is explained later in this manual..

PART 1

Hand-controlled reception.

To get the most out of RTL-SDR you need a decent antenna. Make sure to place it as high as possible against a metal surface for best results.

For weather satellite reception you should think of a QHF or Tun stile antenna, fig.1 and 2, in the range of 137Mhz. Googling on the internet provides sufficient information about this, also for self-build.

Try it first with a high placed antenna, if the signal is still too weak, then you will have to buy an expensive LNA, fig.3, and place it close to the antenna as possible.

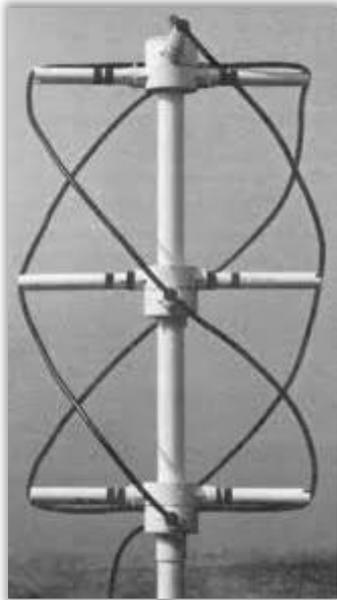


Figure 1, QHF antenna.



Figure 2, Turnstile antenna.



Figure 3, Low Noise Amplifier.

Whatever components you use, the installation will largely follow the guidelines below.

One of the most daunting aspects of setting up a receiving system for the NOAA weather satellites is the tedious setup and are:

- Installation of your RTLSDR dongle, fig.4.
- Installation 'SDRSharp'.
- Setup 'SDRSharp'.
- Installation 'WXtoImg'.
- Installation 'VB-Cable Virtual Audio Device'.

- Installation 'Orbitron', part 2.
- Adding the 'DDE Tracker' plugins in 'SDSRSharp', part 2.
- Set-up 'DDE Tracking' planning, part 2.
- Configure 'Orbitron' to automatically start 'SDRSharp', part 2.

The above topics are discussed one by one.

You must have sufficient skills to perform basic PC operations such as extracting files, installing software, moving and copying files, and the motivation to learn new software.

RTLSDR dongle. (Tested on Windows 10/8/7 32/64 Bit)

Please note that the RTL-SDR dongle is not a plug-and-play device. You must have sufficient skills to perform basic PC operations such as downloading and extracting files, installing software, moving and copying files and the motivation to learn how to use new software. This tutorial wants to offer support where possible

Currently the most common RTL-SDR dongle, the R820T/R820T2 is usually for sale for about 25 Euros. fig.4.



Figure 4, RTL-SDR dongle

In general, at least one PC with a dual-core processor is required to run most SDR software smoothly. To get the most out of RTL-SDR you need a decent antenna. Make sure to place it as high as possible against a metal surface for best results.

Before we start with the installation, put the RTL-SDR dongle aside for a while and you may not use the usually supplied CD.

NB ! Windows XP platform is not recommended.

You must have the skills to perform basic PC operations such as downloading and extracting files, installing software, moving and copying files, and have the motivation to learn new software. This tutorial aims to provide support where possible

Installation Microsoft.NET 4.6.

SDRSharp is the most commonly used SDR under Windows. This program is recommended because it fits seamlessly with the RTL-SDR. (RTL chip, Software Defined Radio).

*Do not insert the RTL-SDR dongle into the USB port yet.
Don't use the usually supplied CD!*

You must have 'Microsoft.NET 4.6' installed to use 'SDRSharp' later. Follow the link:

<https://www.microsoft.com/nl-NL/download/details.aspx?id=49981>

Download and install: 'Microsoft .NET Framework 4.6.1'

Most Windows 10 PCs already have these installed by default, but computers with older operating systems may need to install them as well. Note that '.NET 4.6' is not compatible with Windows XP. Also note that on some computers you may also need to install 'Visual C++ Runtime' if it isn't already installed.

Download SDRSharp, (Tested on Windows 10/8/7 32/64 Bit)

First create a new map, I chose 'NOAA-Satellites', but of course you can come up with another one. "(C:) NOAA Satellites". This main folder is the folder where all relevant files are located. The root folder may not be placed in 'Program Files' or 'Program Files (x86)', fig.5.



Figuur 5, Figure 5, do not use these folders.

Installation, SDRSharp and Orbitron.

An easy way to install "SDRSharp" and "Orbitron" is the "Meteor LRPT Suite.zip" file from Les Hamilton, [3]. This installs the entire "Orbitron" and "SDRSharp" configuration in the LRPT folder. This initial situation is a unique opportunity to create a well-functioning system with as few actions as possible. The download link can be found on the site of Les Hamilton.

<http://leshamilton.co.uk/MeteorLRPTSuite.htm>

In part 1 we leave the program "Orbitron" undisturbed, it will only be discussed in part 2.

Both "Orbitron" and "SDRSharp" are standalone programs. They can be run from any folder on any drive on your computer, as all their configuration files, data files and DLLs etc. reside in their own folders, not hidden in the depths of Windows. Extract the "Meteor-LRPT-Suite.1.8b.zip" file and put the extracted "LRPT" folder containing all files in the Meteor-Satellites folder. From there, delete the "LRPT Decoder" and "QPSK" folder, fig.6, as these are unnecessary for our purpose.

“Meteor-LRPT-Suite.1.8b.zip” is actually intended for the installation of another satellite, but because it considerably simplifies the installation, this method was chosen, after which a number of irrelevant folders are removed.

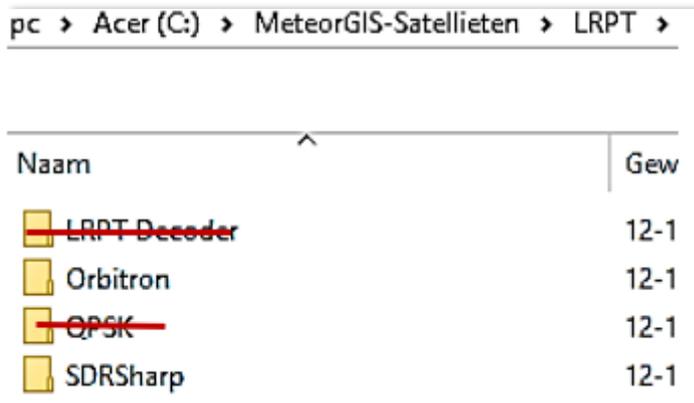


Figure 6, folder configuration

 Read the tutorial **carefully**, it seems like quite an undertaking, but it is not that bad. Once everything is working you can start the recording process in two or three clicks, do other things, the program will do the rest. Later in the day you can retrieve and edit the recording.

Installation of your RTL-SDR dongel, [4].

Connect your RTL-SDR USB dongle !

With recent Windows 10 (Home Edition) installations, a driver is automatically installed by Windows immediately when you insert the SDR dongle and therefore the installation will not work.

To install the RTL drivers for your dongle, you still need to start “Zadig”. (You can find the “Zadig” file in the “SDRSharp” folder.

In that case, run “Zedge” like this:

- Start “Zadig”, (run as administrator!).
- Click on “Options”.
- Click on “List All Devices”.
- Click again on “Options”, uncheck “Ignore Hubs or Composite Parents”, fig.7.
- Replace Driver
- Select RTL2838UHIDIR.
- Click on “Reinstall Driver”.

When you're done with that, check again under "Device Manager" in "USB Devices" to see if the driver is there.

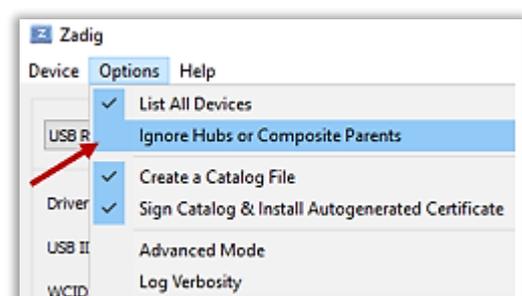


Figure7, “Ignore Hubs or Compostie” uncheck.

There you will find the Windows USB Receiver driver and the RTL238UHIDIR driver suitable for our purpose, fig.8.

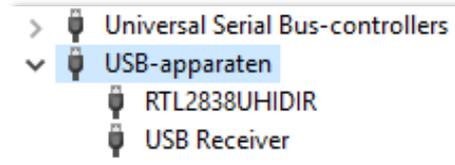
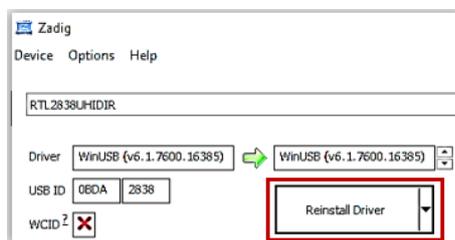


Figure 8, RTL2838, UHIDIR present..

If your dongle has not been pre-provisioned with a driver by Windows10, follow the exact order above, except that you do not uncheck “Ignore Hubs or Compo-site Parents”. Click on “Reinstall Driver”, fig.9.



Figuur 9, Reinstall Driver.

Note that if you plug the dongle into a different USB port, you may need to run “zadig.exe” again. So, the installation of “SDRSharp” is now complete. Finally, we're going to do a few more settings.

- From “NOAA-Satellites” folder, copy the “SDRSharp” startup file, fig.10, and put it on your desktop, fig.11, then run SDRSharp.exe.

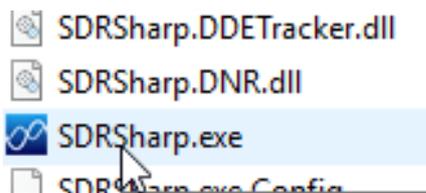


Figure 10, SDRSharp.



Figure 11, SDRSharp on your desktop.

SDRSharp settings.

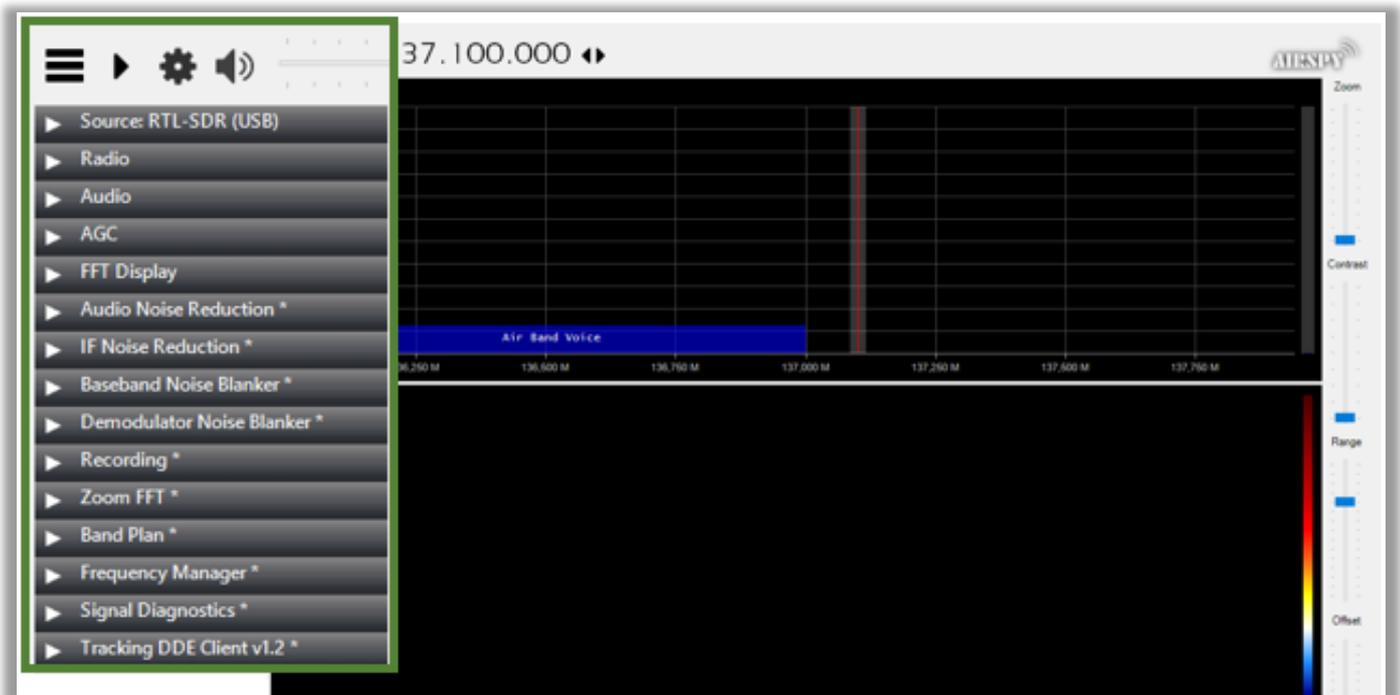


Figure 12, SDRSharp window with detail settings window

- Your RTL-SDR software radio must be set up before you can receive signals. Now first select your (USB) dongle in the “SDRSharp” window, fig.12.

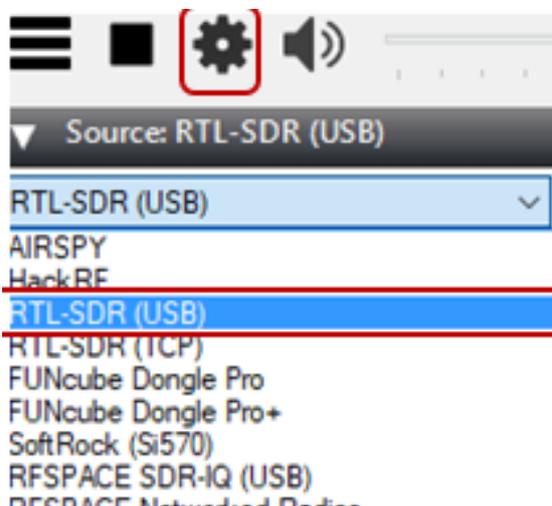


Figure 13, select your dongle.

Important! don't forget to also adjust the RF Gain settings by clicking the Configure Source button. , fig.13. By default, the RF-Gain is set to zero.

With a gain of zero, you probably won't receive anything. Therefore, increase the RF Gain to receive the NOAA signals, fig.14. Later when receiving NOAA satellites, do not set the RF Gain too high because of inter-modulation of any nearby signals.

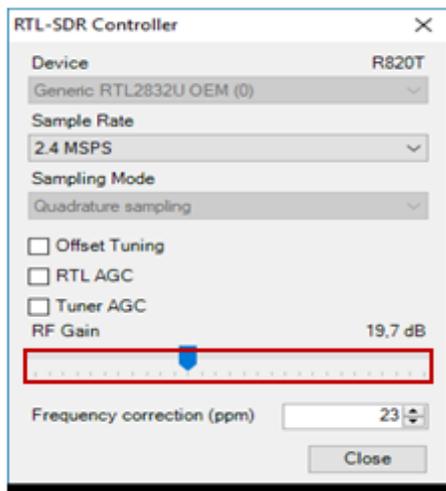


Figure 14, RF Gain setting.

- In the Radio tab settings set the reception mode to: WFM: Wide FM, uncheck Swap I&Q, fig15. And it can also be useful to check Snap to Grid.
- The Doppler effect ensures that the signal does not stay at the correct frequency. In order to receive the entire passage recording properly, you can set the filter bandwidth to 36 kHz, provided there are no nearby interfering signals in the immediate vicinity.

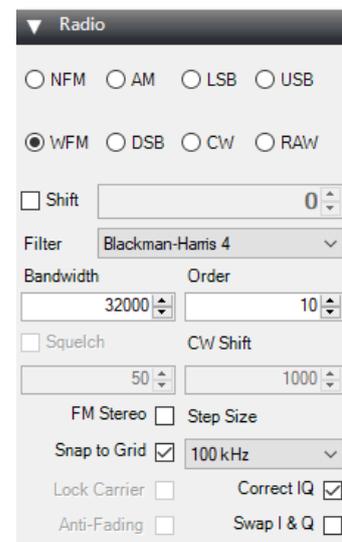


Figure 15, Radio settings.

The **Frequency Manager tab** allows you to pre-program reception frequencies of various satellites to later select the desired satellite with a simple click. Run 'SDRSharp' and click on Frequency Manager.

As you can see in fig.16, you have three options to use. Select New, give Group a name and fill in the required data from the first NOAA, also fig.16. (BW is the desired bandwidth).

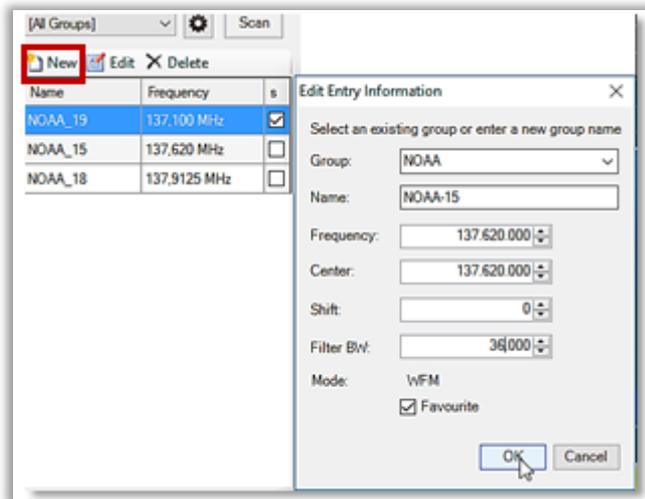


Figure 16, NOAA preset frequencies.

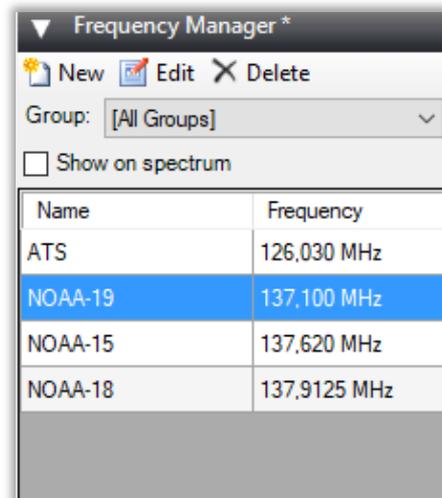


Figure 17, Frequency Manager

Click OK, and repeat these actions for the next NOAA. If you have completed everything to your satisfaction you will find the three satellites under Group: NOAA, fig.17. Clicking on one of them will automatically set the VFO to the correct frequency and bandwidth in the graphical window. Another point to pay attention to is the RTL-SDR dongle frequency deviation. These dongles are relatively cheap because they are mass-produced, with the result that each dongle has a different frequency deviation. An ATIS frequency (*Automatic Terminal Information Service*) is useful for accurately calibrating your RTL-SDR Dongle using the Tuner Correction option of the RTL Controller. You can now make the correction, as shown in figures 18 through 20.

I live near Eindhoven Airport and find an ATIS signal at 126,030 Hz to which I can fine-tune.

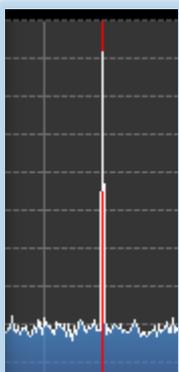


Figure 18, Atis signal.

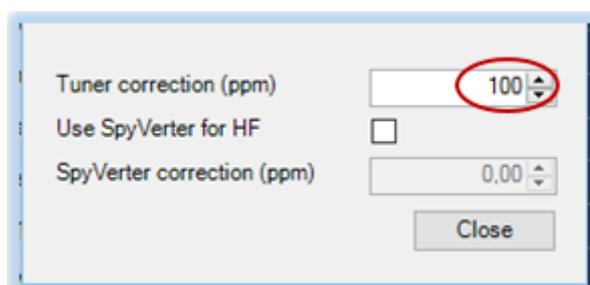


Figure 19, Tuner correction dongel.

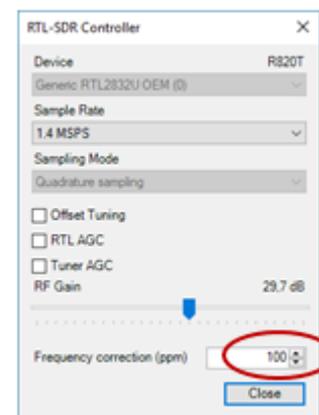


Figure 20, Frequency correction.

You can create another Group for the ATIS setting and specify the correct settings in it. If you want to see them all, select All Groups, fig.17. These settings remain in effect, so you do not need to save them.

Download and install VB-Cable Virtual Audio Device.

This software is necessary to enable a virtual audio connection between “SDRSharp” and the “WXtolmg” program, fig.21. Download and install this program from the site:

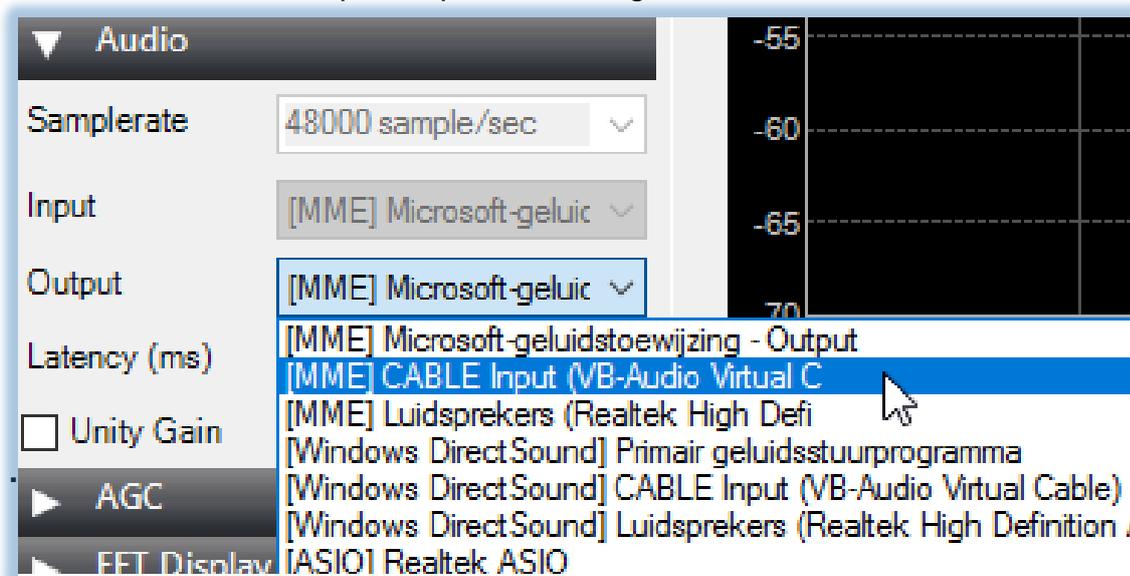
<https://www.vb-audio.com/Cable>



The screenshot shows the VB-Audio Software website. The main heading is "VB-AUDIO Software" with the tagline "Audio Mechanic & Sound Breeder". The navigation menu includes Home, News, Audio Apps, Audio Pro, Support, Developers, and WebShop. Below the navigation, there are tabs for Virtual Audio Cable, Voicemeeter, Banana, VBAN, and Spectralissime. The "Virtual Audio Cable" tab is selected, showing a "Playback" section with a dropdown menu for "CABLE Input" (VB-Audio Virtual Cable) and a "Recording" section with a dropdown menu for "CABLE Output" (VB-Audio Virtual Cable). A blue arrow points from the "CABLE Input" dropdown to the "CABLE Output" dropdown. To the right, there is a section titled "VB-CABLE Virtual Audio Device." with a description: "VB-CABLE is a virtual audio device working as virtual audio cable. All signals coming in the CABLE input is going to the CABLE output. Then It becomes simple to make computer audio recording or to connect a player application to a recorder one." Below this is a section for "Install VB-CABLE Driver (Donationware)" with a "Download" button and a link to "VBCABLE_Driver_Pack43.zip (1.09 MB - OCT 2015)". An "INSTALLATION:" note at the bottom states: "Extract all files from the ZIP and run Setup Program in Administrator Mode (Reboot after installation or de-installation)."

Figure 21, Download VB-Audio.

After installing VB-Audio Cable, open 'SDRSharp' and select the virtual audio line option from the Audio Output drop-down list, fig.22.



The screenshot shows the Audio settings window in SDRSharp. The "Audio" section is expanded, showing the following settings: Samplerate (48000 sample/sec), Input ([MME] Microsoft-geluid), and Output ([MME] Microsoft-geluid). The Output dropdown menu is open, showing a list of audio devices. The device "[MME] CABLE Input (VB-Audio Virtual C" is highlighted in blue. Other devices in the list include "[MME] Microsoft-geluidstoewijzing - Output", "[MME] Luidsprekers (Realtek High Defi", "[Windows DirectSound] Primair geluidsstuurprogramma", "[Windows DirectSound] CABLE Input (VB-Audio Virtual Cable)", "[Windows DirectSound] Luidsprekers (Realtek High Definition A", and "[ASIO] Realtek ASIO".

Figure 22, installation VB-Audiokable.

Download: Wxtoimg and intallation.

In short: 'WXtoimg' is, in collaboration with 'SDRSharp', a program that converts the received NOAA signals into images and can also predict the times and frequencies of the NOAA satellite transitions.

There is also a paid version of 'WXtoimg' which offers more features, but it is not required for use with RTL-SDR dongle. Unfortunately the original website is down. Fortunately, the Windows version can still be downloaded from the ar-chive.org site:

<https://web.archive.org/web/20171209052450/http://www.wxtoimg.com:80/downloads/>

An extensive (English) manual of 'WXtoimg', in which all options are explained, can be found under:

<https://www.wraase.de/download/wxtoimg/wxgui.pdf>

Install WXtoimg.

- Click on profit21011.exe
- Allow Windows to download this program: “yes”.
- Welcome to WXtoimg: “next”.
- License agreement: tick I agree and click on “Next”.
- Destination folder: Brows: C:\NOAA-Satellites\WXtoimg and “Next”.
- WXtoimg successfully installed !: “finished” .

Settings WXtoimg.

To let 'WXtoimg' and 'SDRSharp' communicate with each other, you need to make the following settings:

Open “WXtoimg” and go to “Options Ground Station Location”, fig.23. Enter your city and country there, fig.24, or if your city is not listed, enter the exact latitude and longitude.

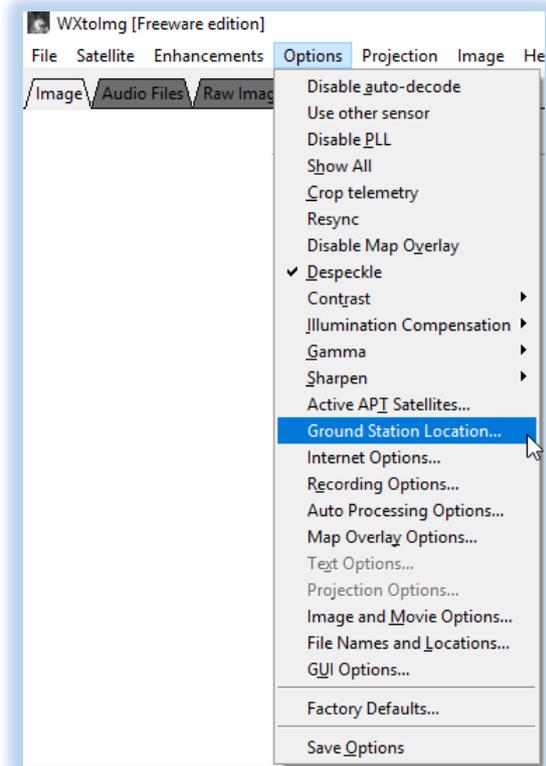


Figure 23, location of your station tab

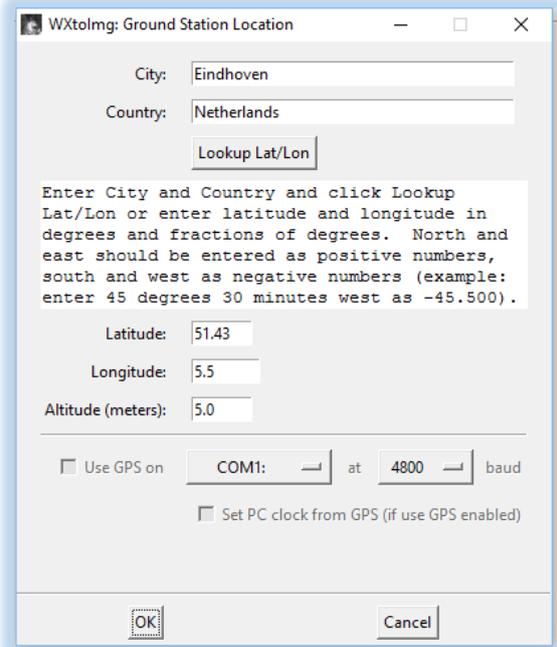


Figure 24, entering your location.

Recording.

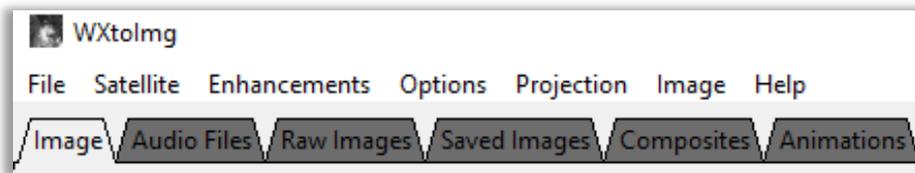


Figure 24, main menu

In 'WXtolmg' choose the installed VB-Audio Virtual. To do this go to Options (fig.24) > > Recording Options, making sure the correct device is selected from the sound card option. Here you can also check Record only when active APT satellites are overhead. You can reduce the default values if you have an antenna with a wide view or if you find that 'WXtolmg' stops recording too early or doesn't start fast enough. In the beginning, keep the default values 20 and 8, fig. 24a.

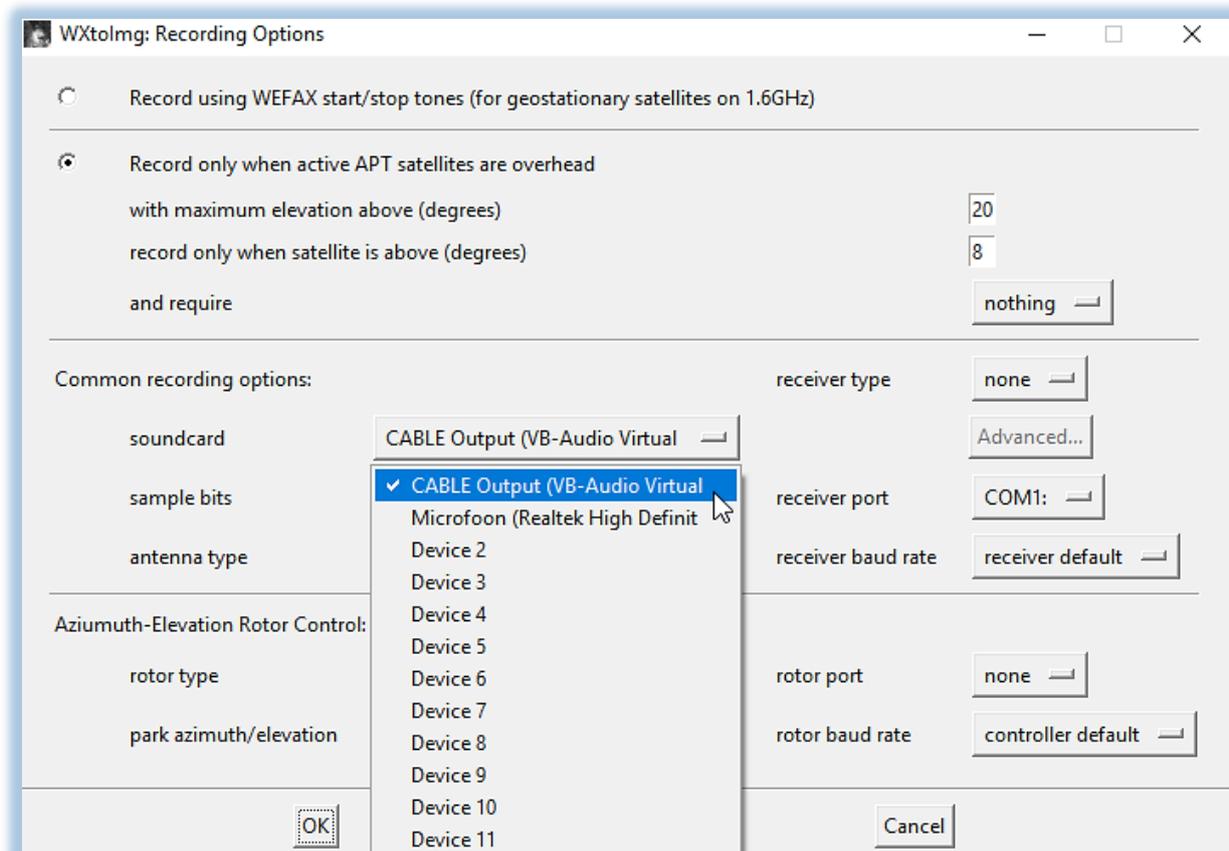


Figure 24a, selectionCable Output.

Update Kepler, (TLE) files.

Beforehand: what does TLE mean and what is the purpose of TLE?

Very briefly:

TLE is a standard mathematical model for describing the orbit of a satellite. TLE is short for: Two Line Elements and are processed in a computer program, which provides predictions for the viewing time and position of the satellite. The program determines the location of selected satellites above the horizon from a chosen observation location.

Now you will also want to update the Kepler files called. These files contain information about satellite locations and pass times. They need to be updated regularly because satellites drift in time of their orbit.

Go to File Update Keplers. Make sure you have an internet connection for the update.

Satellite pass times.

Go to File > Satellite Pass List, to find a time when a satellite passes overhead. Also note the frequency, fig.25.

WXtolmg: Satellite Pass List

Look ahead 1 week

Satellite passes for Eindhoven, Netherlands (51°25'N 5°30'E)
while above 8.0 degrees with a maximum elevation (MEL) over 20.0 degrees
from 2017-03-24 19:48:57 West-Europa (standaarttijd) (2017-03-24 18:48:57 UTC).

2017-03-25 UTC

Satellite	Dir	MEL	Long	Local Time	UTC Time	Duration	Freq
NOAA 19	S	50E	14E	03-25 03:50:24	02:50:24	11:27	137.1000
NOAA 19	S	33W	9W	03-25 05:31:25	04:31:25	10:29	137.1000
NOAA 15	S	40E	16E	03-25 06:39:08	05:39:08	10:44	137.6200
NOAA 18	S	47E	15E	03-25 07:25:25	06:25:25	11:33	137.9125
NOAA 15	S	37W	7W	03-25 08:19:03	07:19:03	10:25	137.6200
NOAA 18	S	35W	8W	03-25 09:06:20	08:06:20	10:49	137.9125
NOAA 19	N	29E	21E	03-25 13:42:45	12:42:45	10:17	137.1000
NOAA 19	N	57W	1W	03-25 15:22:28	14:22:28	11:41	137.1000
NOAA 15	N	21E	25E	03-25 16:26:35	15:26:35	8:43	137.6200
NOAA 18	N	29E	22E	03-25 17:17:47	16:17:47	10:13	137.9125
NOAA 15	N	79W	4E	03-25 18:04:32	17:04:32	11:19	137.6200
NOAA 18	N	60W	1W	03-25 18:57:23	17:57:23	11:44	137.9125

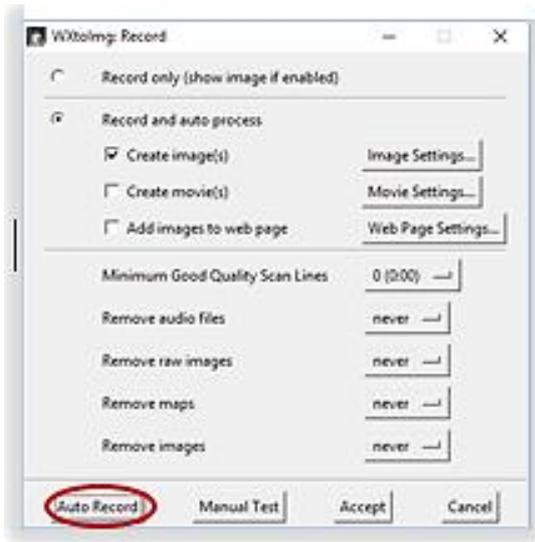
2017-03-26 UTC

Satellite	Dir	MEL	Long	Local Time	UTC Time	Duration	Freq
NOAA 19	S	41E	17E	03-26 04:39:02	02:39:02	11:08	137.1000
NOAA 19	S	39W	6W	03-26 06:19:50	04:19:50	10:53	137.1000
NOAA 15	S	26E	23E	03-26 07:14:30	05:14:30	9:41	137.6200
NOAA 18	S	39E	18E	03-26 08:13:52	06:13:52	11:15	137.9125

Print Close

Figure 25, start and end time of the next satellite.

AutoRecording.



Go to File > Record and click on Auto Record, fig.26. The recording, decoding and imaging will start when the satellite appears on your horizon, and stop when it is out of sight according to the times stated in the satellite Satellite Pass List. After activating Auto Record, also in the bottom line of the “Wxtolmg” screen appears the message with the start and end time with the date of the next satellite pass recording, fig.26.

Figure 26, Automatic recording.

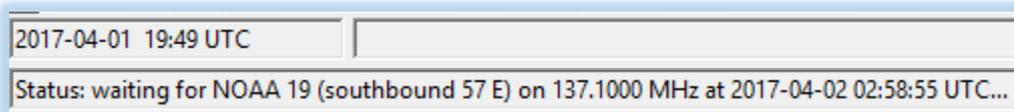


Figure 27, waiting for the recording start time.

Start up NOAA recording.

Just before the satellite passage will take place, open 'SDRSharp' and and click Start. ▶

When receiving the signal, adjust the Gain so that the horizontal volume bar in the lower right corner of 'WXtolmg' turns green, fig.28. The photo is built up line by line.

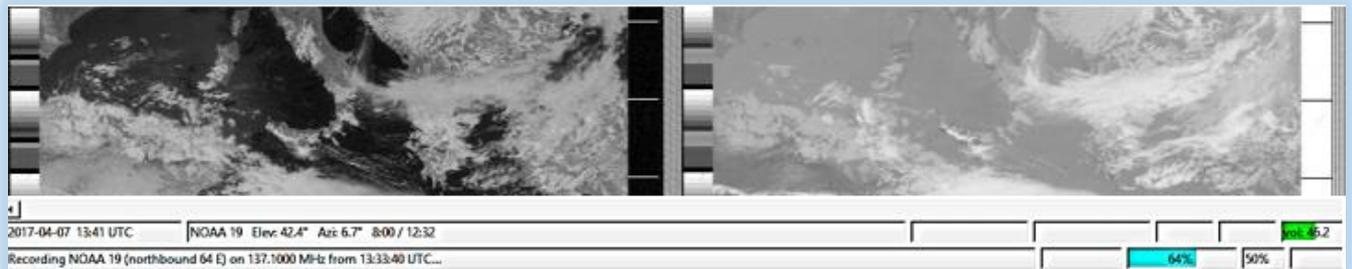


Figure 28, WXtolmg in receive mode.

In fig.29 you can see what such a NOAA analog signal looks like. You can clearly put the NOAA signal on the speaker via your sound card. Experiment yourself with the setting options, including those of your sound card.

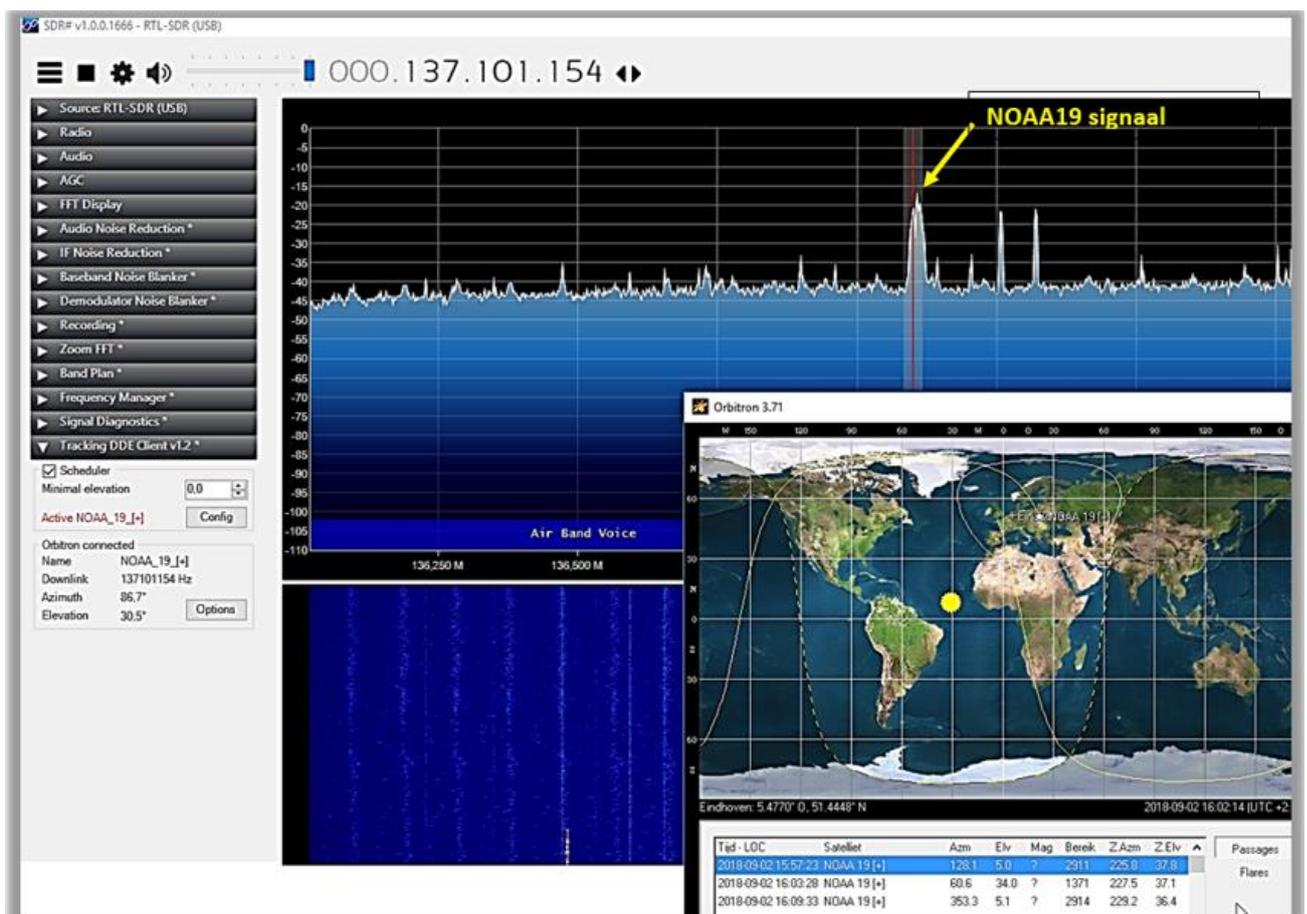


Figure 29, SDRSharp in receive mode.

If you have selected Options/Auto Processing Options > Record and autoprocess in 'WXtoImg', you will get a picture as shown in fig.30. The recording stops when the so-called "duration" time in the stated end time of the Satellite pass list has expired. With File/Save Image as you can save both the raw and edited image in a folder of your choice.

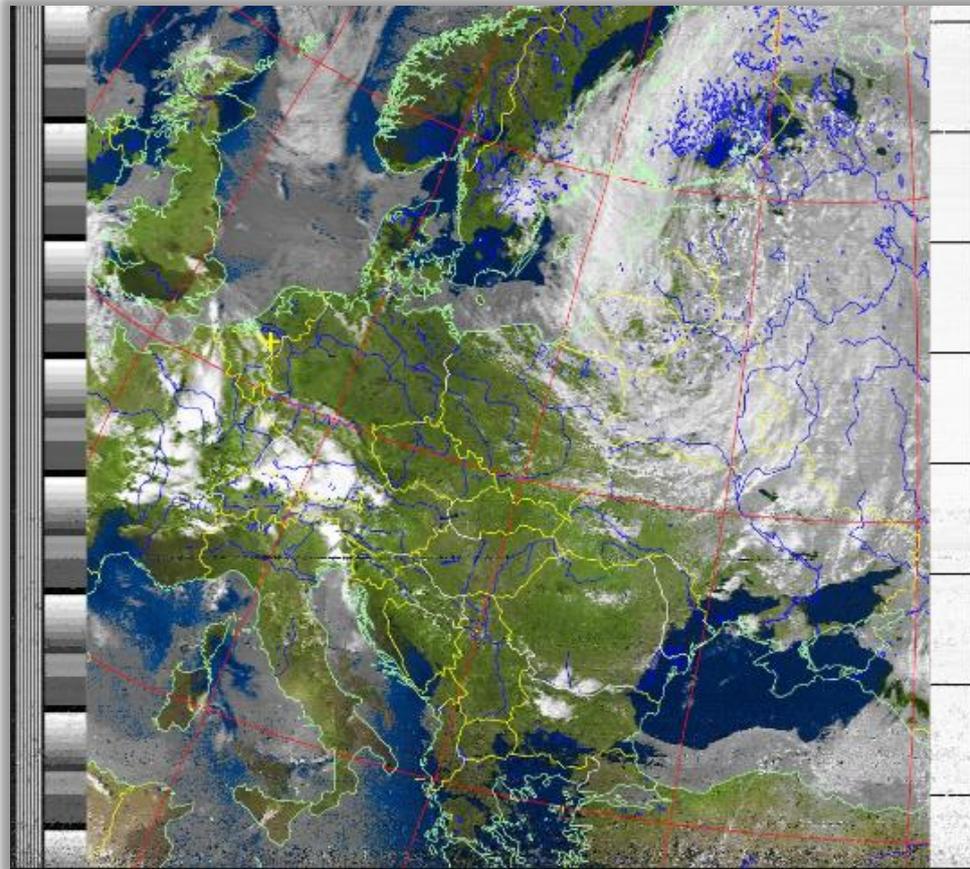


Figure 30, MSA multispectral analysis (NOAA-# 2-4/1-4, met syncpuls colom.

So much for part 1.

PART 2

Orbitron

There is also an option to make 'SDRSharp' start up automatically using a third program called 'Orbitron'. In this way you do not have to be present at the start of the images reception.

Why the title (semi)-automatic: 'Orbitron' is not able to control 'WXtoImg' as well. You will therefore have to activate it yourself well in advance with Autorecord.

First a word about SDRSharp's options. When opening 'SDRsharp' the following basic setting options are available, see fig. 31.

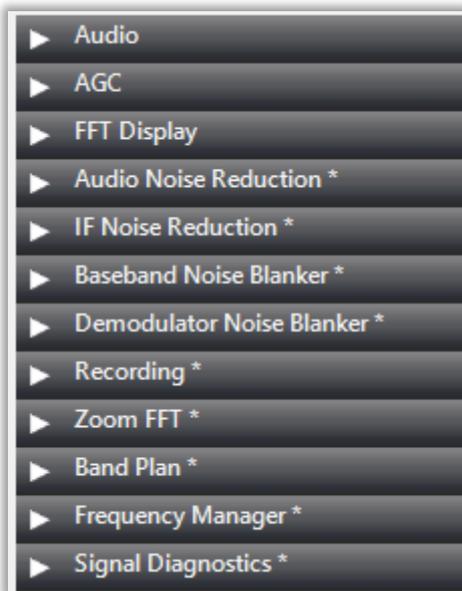


Figure 31, basis options.

To enable 'Orbitron' to start 'SDRSharp' at the correct time, the Tracking DDE Client v1.2 option must be added, fig. 32.

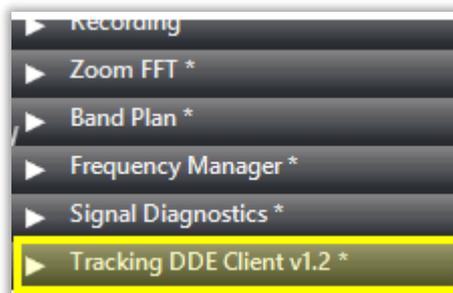
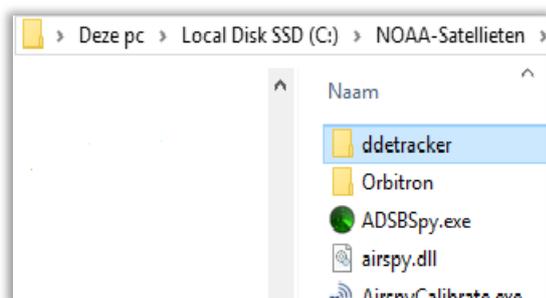


Figure 32, Add Tracking Option.

Download the plugin, DDE tracking + Scheduler plugins from the site below:

<http://www.rtl-sdr.ru/page/vse-dostupnye-na-etom-sajte-plaginy-s-kratkim-opisaniem>

Place the folder DDE Tracker under the NOAA-Satellites folder, fig.33 and open this folder, fig.34.



Figuur 33, ddetracker.

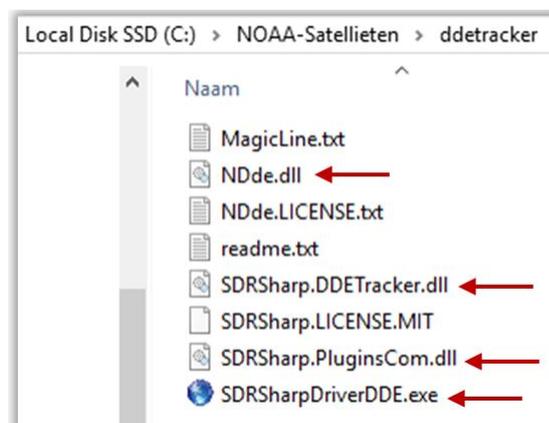


Figure 34, contents of SDRSharp folder.

Copy the three **.DLL** files and the **.EXE** file from the **ddetracker** folder and paste them into the 'NOAA-Satellites' folder.

Now open **MagicLine.txt** and copy the 2 lines below, fig.35.

```
<add key="DDE Tracking Client"
value="SDRSharp.DDETracker.DdeTrackingPlugin,SDRSharp.DDETracker" />
```

Figure 35, contents of **MagicLine.txt**

With Word or another text editor open **Plugins.xml** from the 'NOAA-Satellites' folder and paste these 2 lines somewhere at the bottom between the lines:

<frontendPlugins> and **</frontendPlugins>**, fig.36.

```
<add key="Frequency Manager"
value="SDRSharp.FrequencyManager.FrequencyManagerPlugin, SDRSharp.
FrequencyManager" />
  <add key="Signal Diagnostics"
value="SDRSharp.Diagnostics.DiagnosticsPlugin, SDRSharp.Diagnostic
s" />
<add key="DDE Tracking Client"
value="SDRSharp.DDETracker.DdeTrackingPlugin, SDRSharp.DDETracker"
/>
</sharpPlugins>
```

Figure 36, added rules.

3.2. scheduler.

The Scheduler is a script that controls and configures SDRSharp.

Start SDRSharp, select the newly created tab: Tracking DDE Client v1.2* and click on Config, fig.37.

Make sure you check the Scheduler option in the DDE Tracker plugin. In fact, if you open 'SDRSharp' from its own folder, and check this option, then close the program again, it will automatically remain checked.

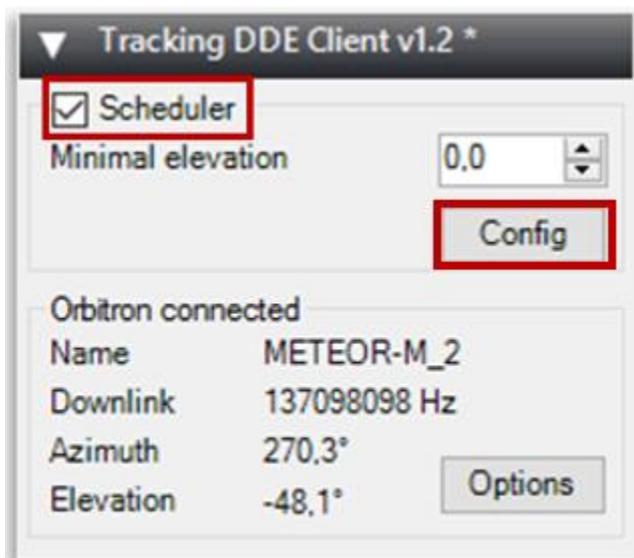


Figure 37, Check Scheduler and click Config.

In the window now displayed, fig.36, the DDE Tracker must be programmed to perform the tasks correctly when a NOAA signal is first detected, (AOS: Acquisition of Signal) and at the end of the passage (LOS: loss of signal). AOS contains the transmit frequency, modulation type and bandwidth, plus the commands to pass the corrected frequency (calculated by 'Orbitron') to 'SDRSharp'.

3.2.1. Entering the Satellite Name.

Any 'space' character must be replaced by an 'underscore' character. So for example 'NOAA_19' instead of 'NOAA-19'. Even changing the uppercase to lowercase will cause errors.

3.2.2. Preparation AOS for the Satellite.

Any of the options shown on the right panel can be moved to the center panel using the arrow keys. The top panel, labeled AOS, relates to the processing of the satellite signal, fig.38.

The stop commands appear in the LOS window.

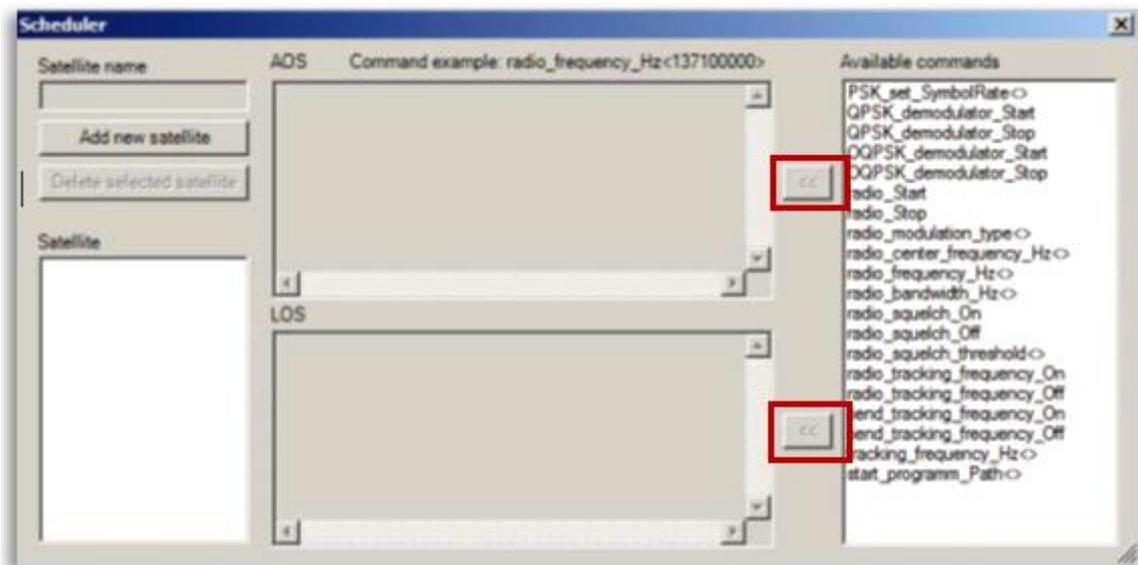


Figure 38, the empty AOS DDE Tracker field.

Add the following commands to the AOS and LOS window as shown in fig.39.

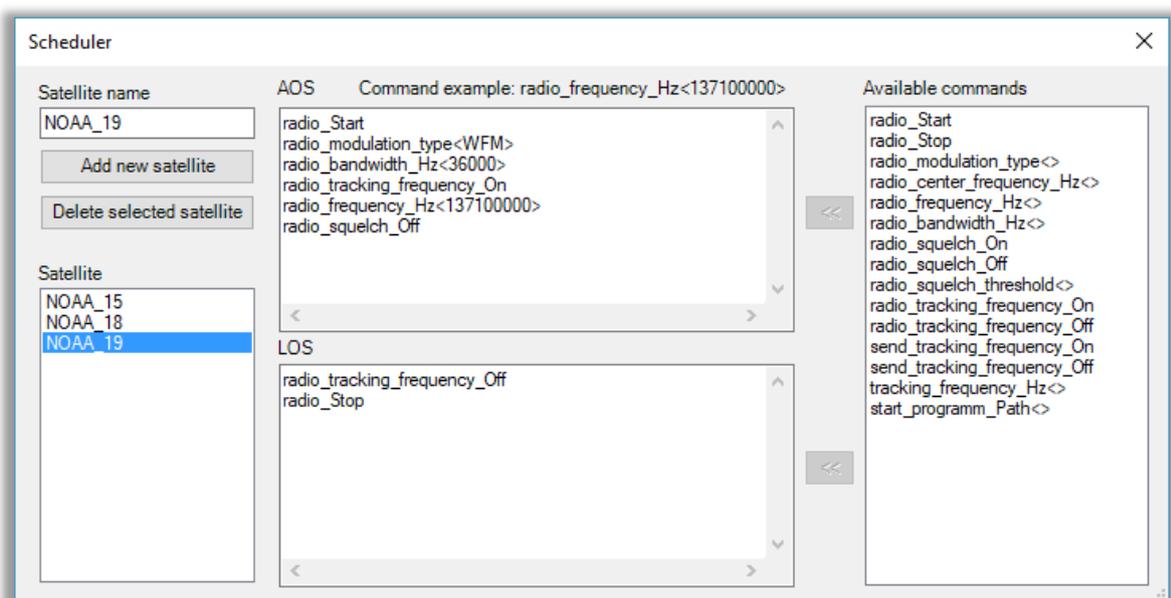


Figure 39, the DDE scheme configured for the NOAA reception.

Note that there is no Save button. All listings and changes are automatically saved to a file called DDESchedule.xml, which can be found in the 'NOAA-Satellites folder. You can now close 'SDRSharp'.

3.3. Orbitron explanation.

Manually acquired NOAA recordings, as described in part 1, can yield very satisfactory results, but improvements are possible. As the satellite approaches your receiving station and then moves away from you, the frequency will change due to the Doppler effect. The received frequency will increase as it approaches and decrease as it moves away from you, sometimes as high as 5000Hz. to be

If a means can be found to continuously adjust the Doppler effect during a satellite pass, the software locking of the signal will rather allow for longer images and be less susceptible to the effects of local RF interference. The solution is to use a satellite tracking program such as Sebastian Stoff's Orbitron to drive SDRSharp and feed it with an updated Doppler corrected frequency throughout the satellite pass. 'Orbitron' can be downloaded from:

<http://www.stoff.pl/downloads.php>

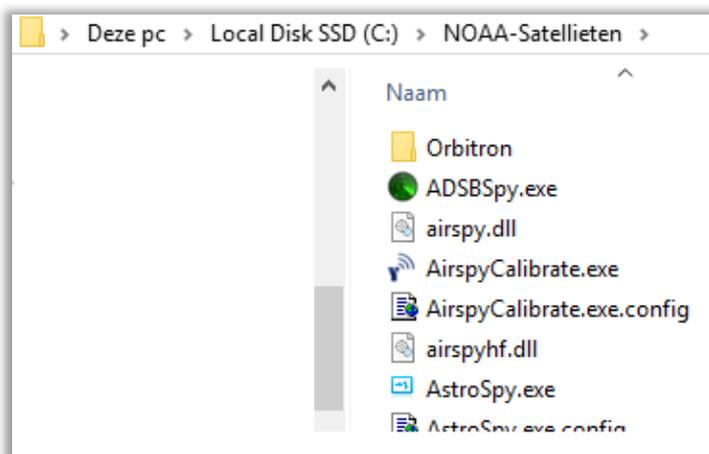


Figure 40, the location of Orbitron map.

After installation, the NOAA Satellites folder should look like shown in fig.40.

3.4. Download Orbitron 3.71.

Click on 'Orbitron 3.71' Installer, size : 2 MB and then click on [orbitron.exe](#), fig.41.

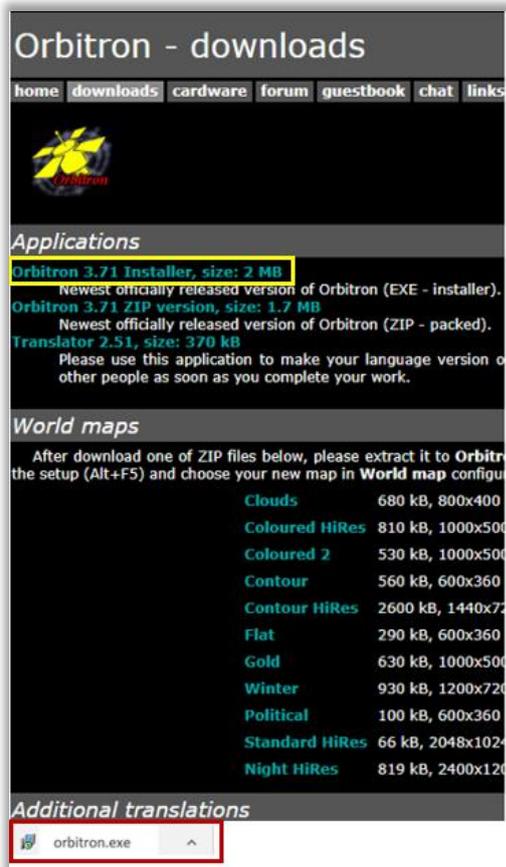


Figure 41, Sebastian Stoff's URL.

3.5. Setup Orbitron v3.71.

Fill in the following windows to appear as follows:

- Allow save changes: "Yes".
- Language selection for Setup: your language.
- In the welcome window: "Next".
- Choose destination folder: C:\NOAA-Satellites\Orbitron.
- Which components to check: Orbitron screen saver.
- Select additional tasks: Make a desktop icon tick.
- Preparing installation ready: "Install".
- Setup installation Orbitron ready: "Finish", 'Start Orbitron' on finches.

After the last setting, 'Orbitron' will start automatically and the following TLE windows will appear, fig. 42

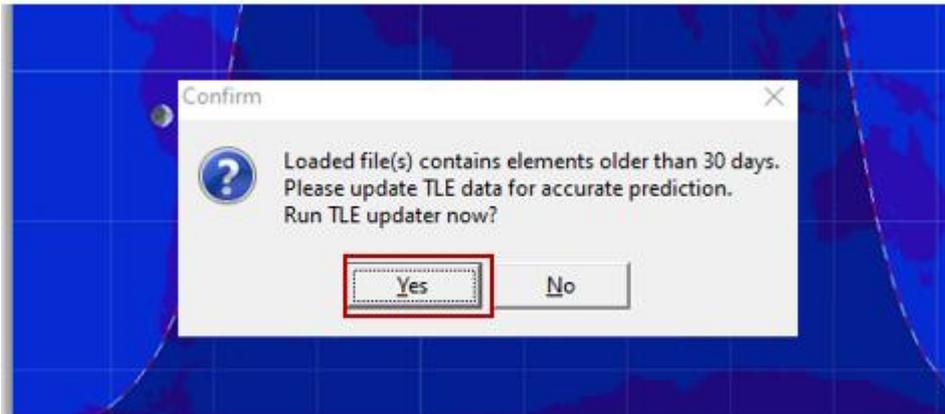


Figure 42, Update TLE, click Yes.

Select Group www.celestrak.com, and check TLE Expiration Date and Mark AutoUpdate, fig.43.

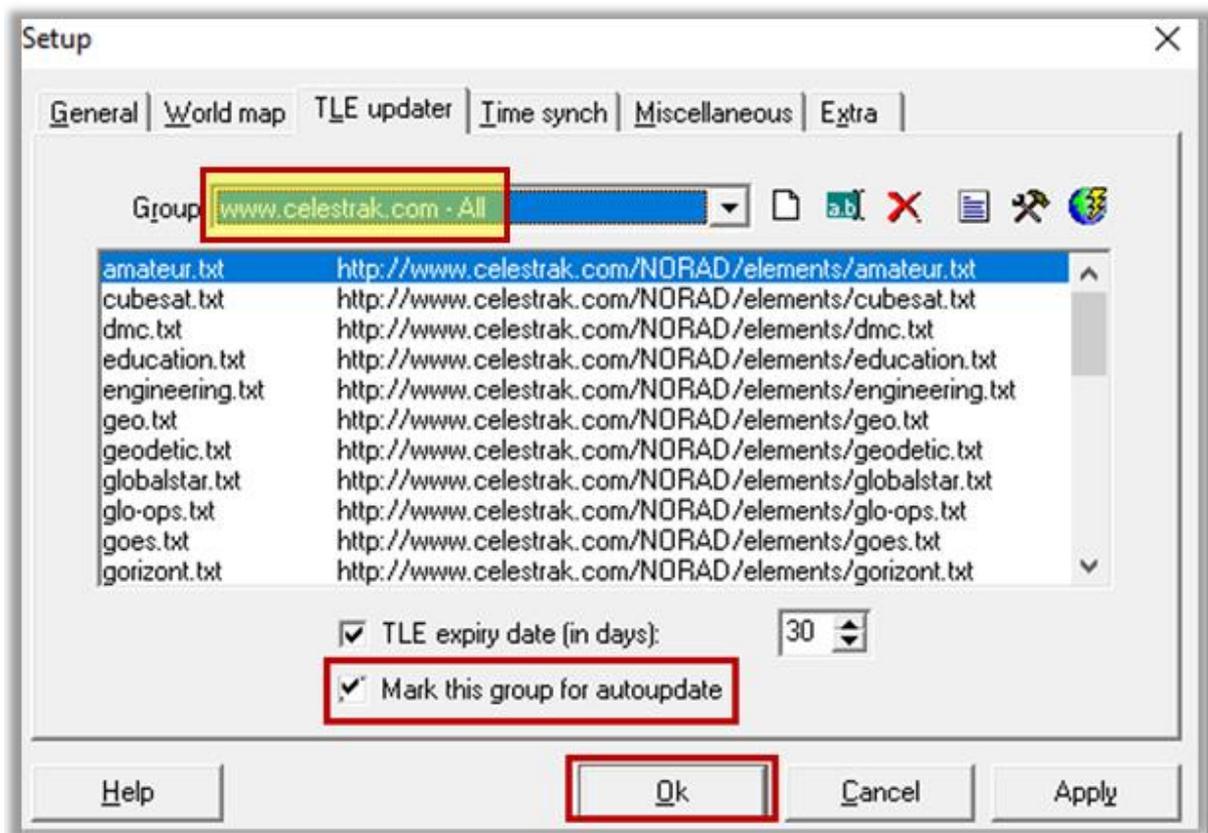


Figure 43, don't forget to check Mark AutoUpdate!

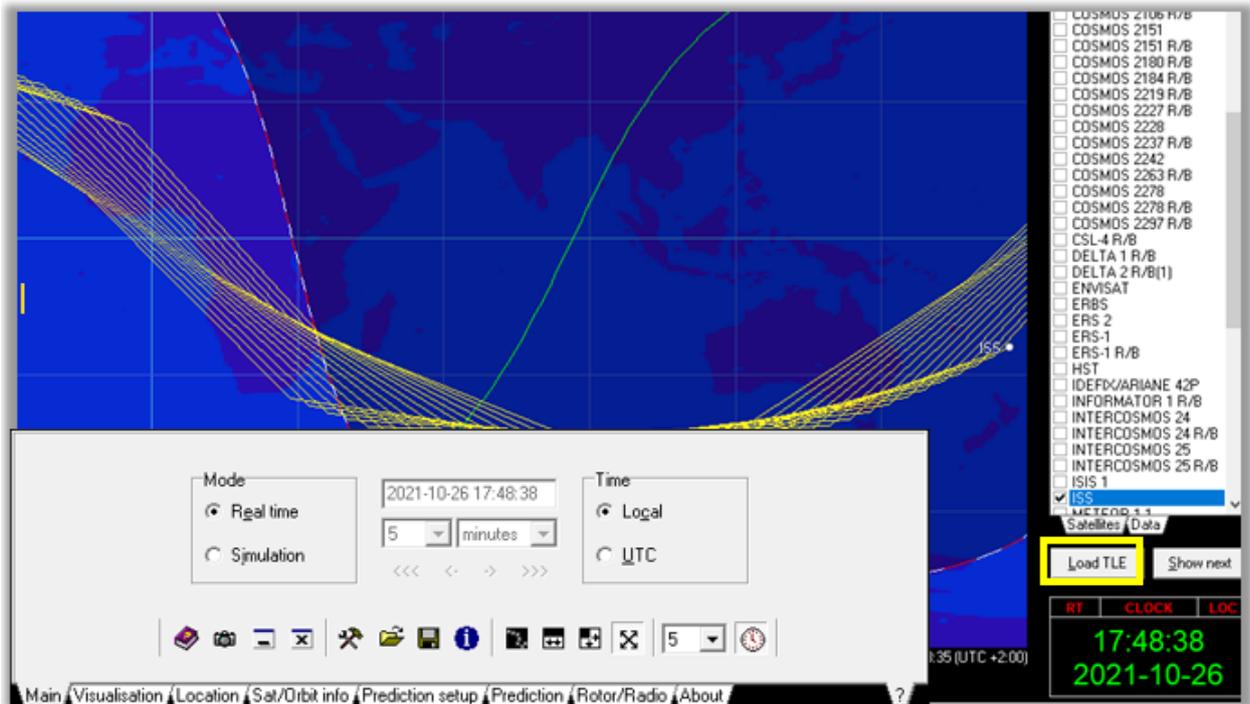


Figure 44, Click Load TLE.

Select and Open noaa.txt, fig.45.

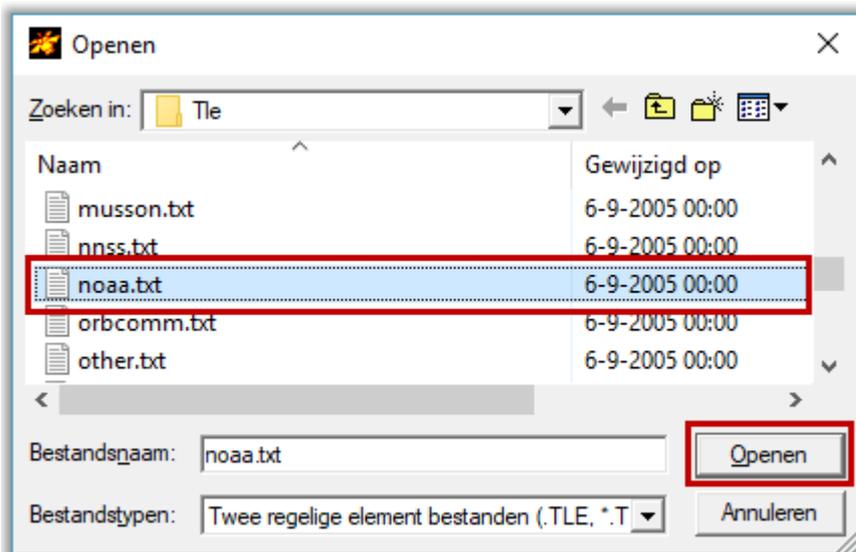


Figure 45, Select and Open noaa.txt.

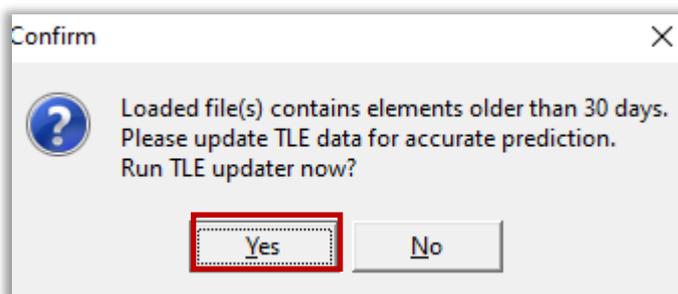


Figure 46, Update TLE data.

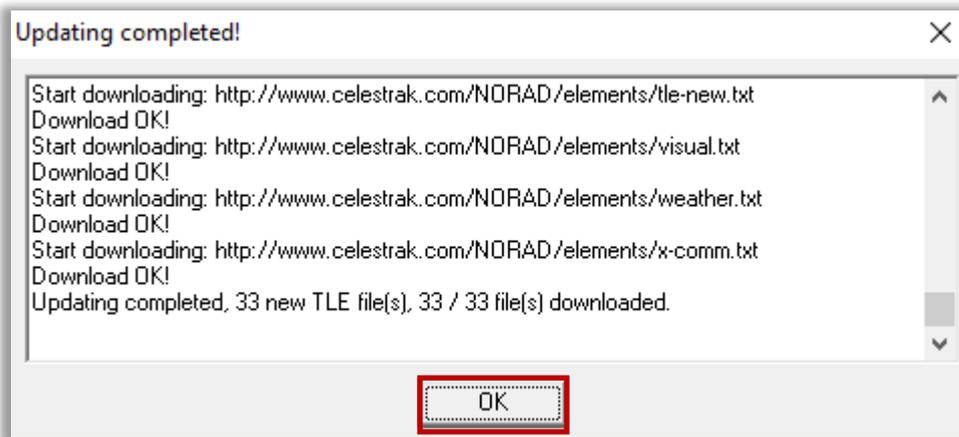


Figure 47, update ready.

If it fills the entire screen, press **[Alt + Enter]** to shrink it, fig. 48.

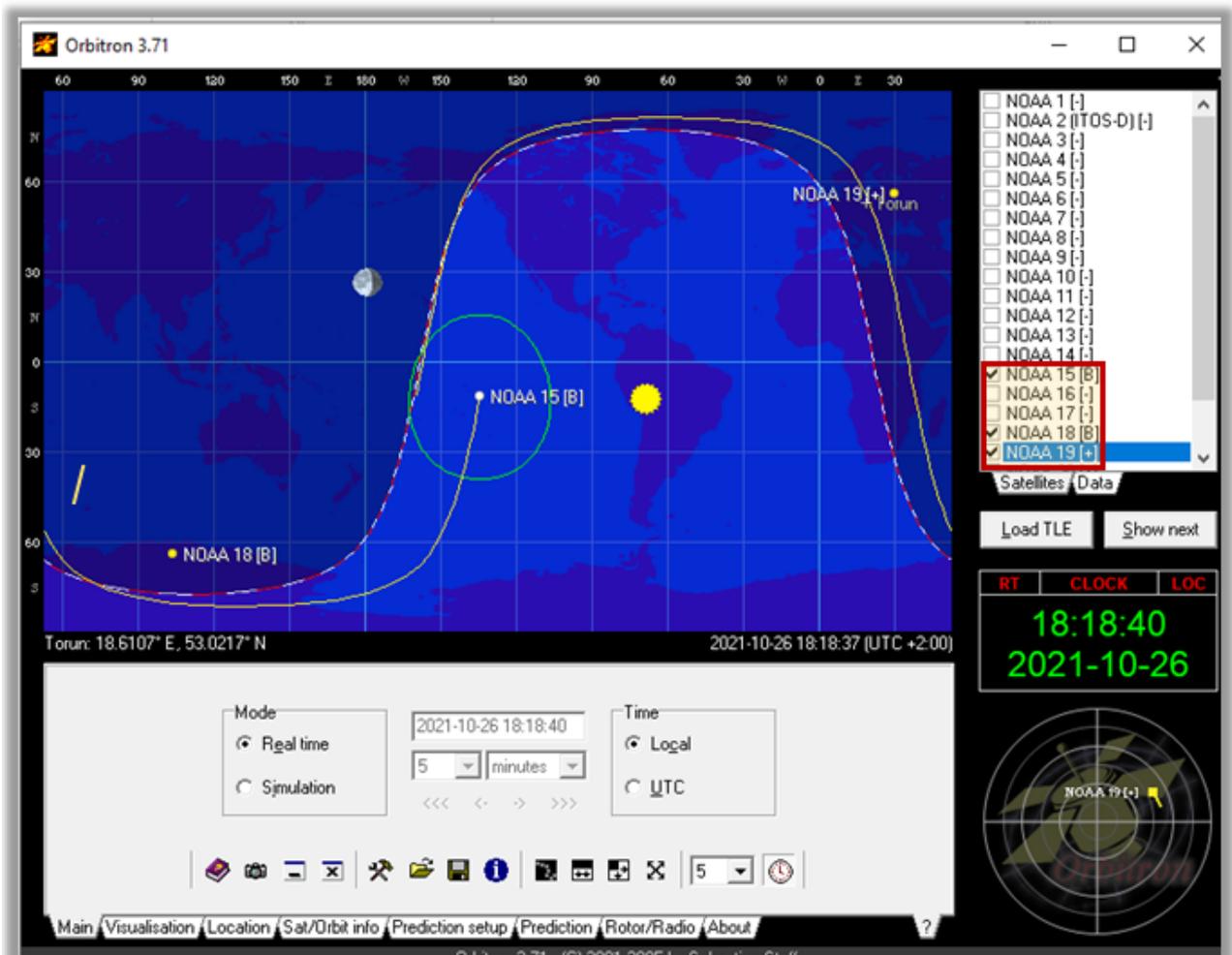


Figure 48, normal size window and check the three NOAAs.

3.7 Configureren van de DDE Tracker Plugin in Orbitron.

Now close 'Orbitron' and then open the file 'Setup.cfg' in the config folder of 'Orbitron' with a text editor, fig.49.

C:\NOAA-Satellieten\Orbitron\Config

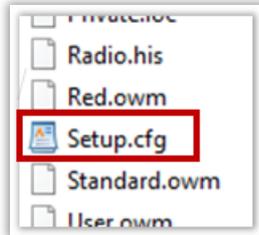


Figure 49, Customizing Setup.cfg.

Add to that the next two lines, fig.50 and 51.

```
[Drivers]
SDRSharp =C:\NOAA-Satellieten\SDRSharp.exe
```

Figure 50, add in Setup.cfg

```
IgnoreMagIUnknown=0
Calculation=1
Mode=0

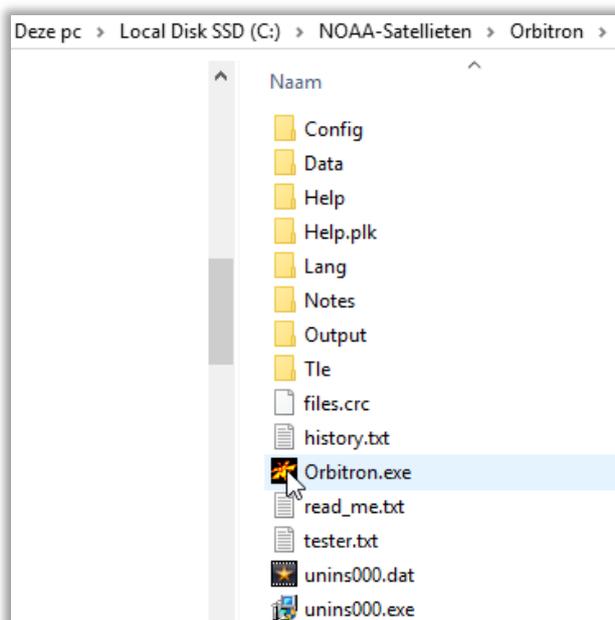
[Drivers]
SDRSharp =C:\NOAA-Satellieten\SDRSharp.exe

[Satellites]
TLEFiles=Tle\nooa.txt
Tracked_1=33591;25338
Active=33591
All=0
```

Figure 51, Orbitron now references SDRSharp.

Save setup.cfg. From 'Orbitron' you will soon be able to start 'SDRShar'p, fig.52.

Copy Orbitron.exe to your desktop, fig.53.



Figuur 52, Orbitron .exe.

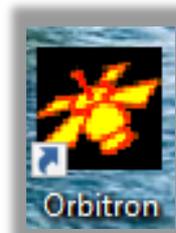


Figure 53, Orbitron on your desktop.

3.8. Set-up Orbitron.

From 'General, ' settings'  can be made via various tabs, fig.54 and next.

Algemeen.

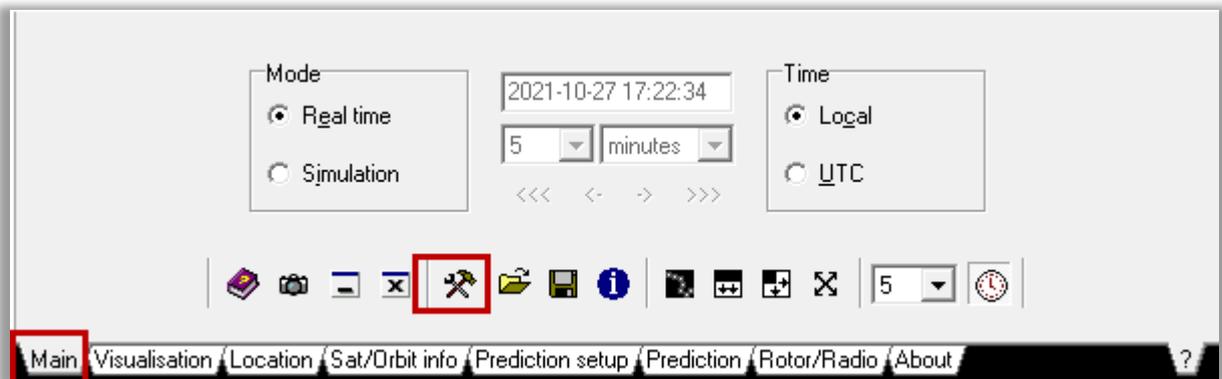


Figure 54, General Window.

- Set your time zone, fig.55.

First, make sure your computer clock is correct for your time zone. Absolute accuracy is not crucial, but should indicate true time within seconds. It's a good idea to check that regularly, or use software to maintain accuracy.

If your PC clock is not set to the local time, open the General tab and insert a correction for the local time.

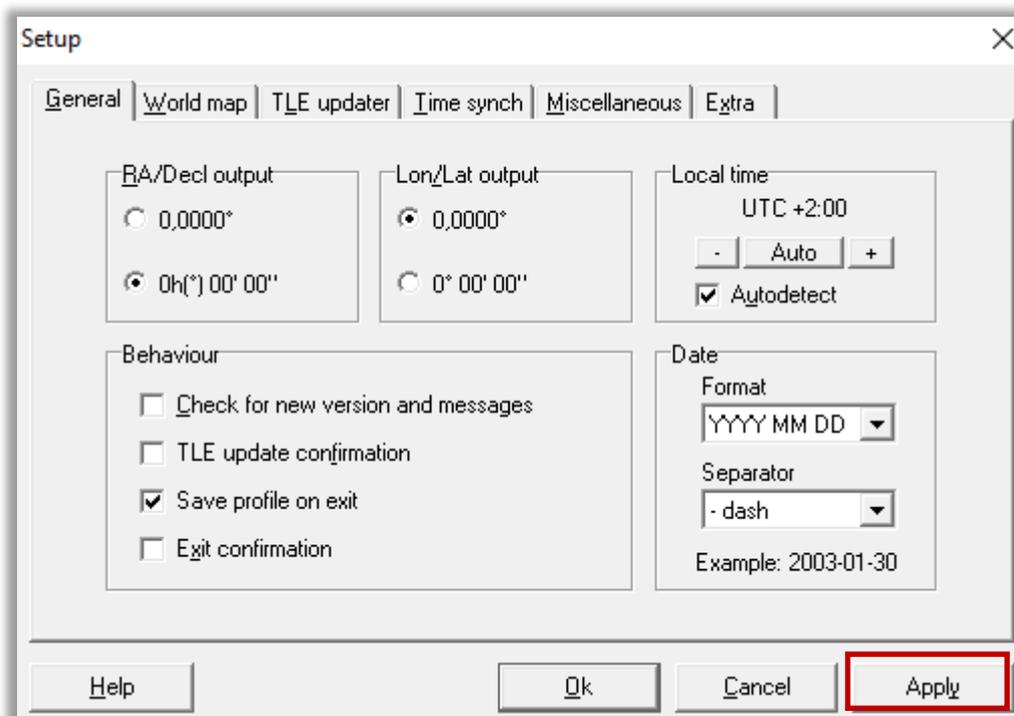
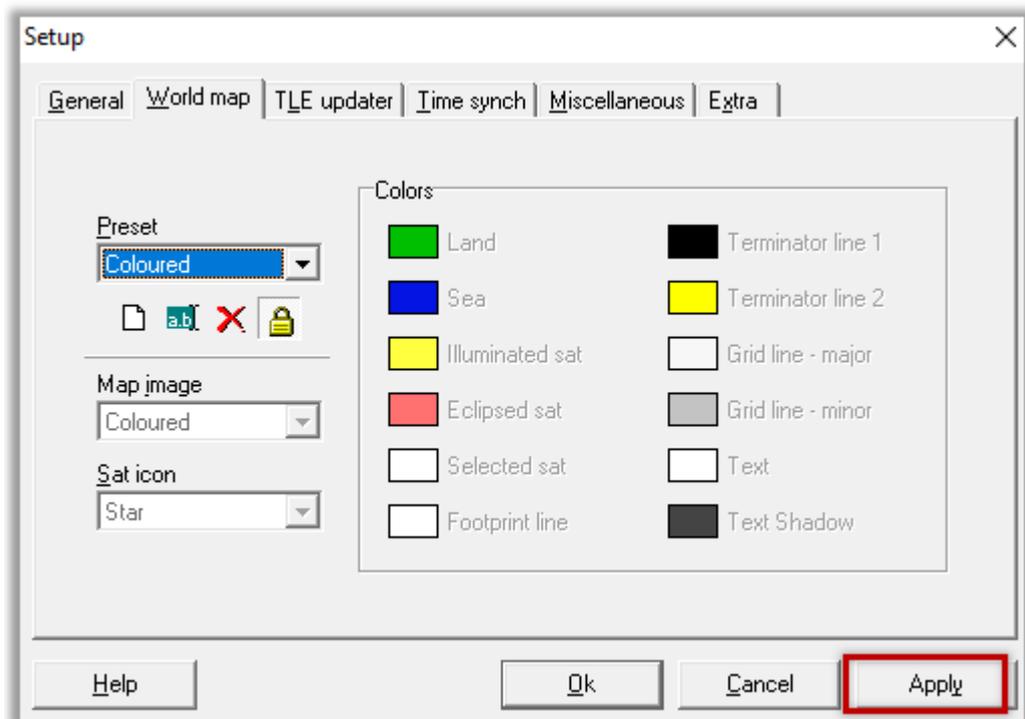


Figure 55, setting your local time.

- World map, fig.56.

You can choose from different cards. The Colored option is a good option.



- Time synchronization, choose your NTP server fig.57.

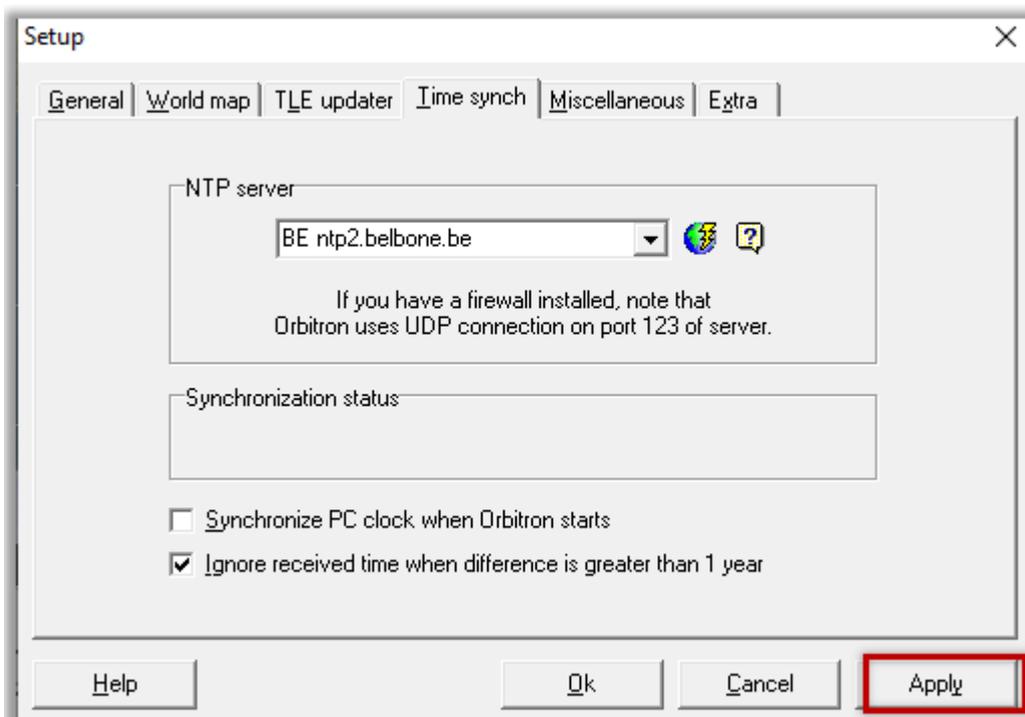


Figure 57, Settings Window > Synchronization Time.

- Miscellaneous.

If “Play sound” is checked, an alarm will sound as soon as the satellite rises above your horizon, fig.58.

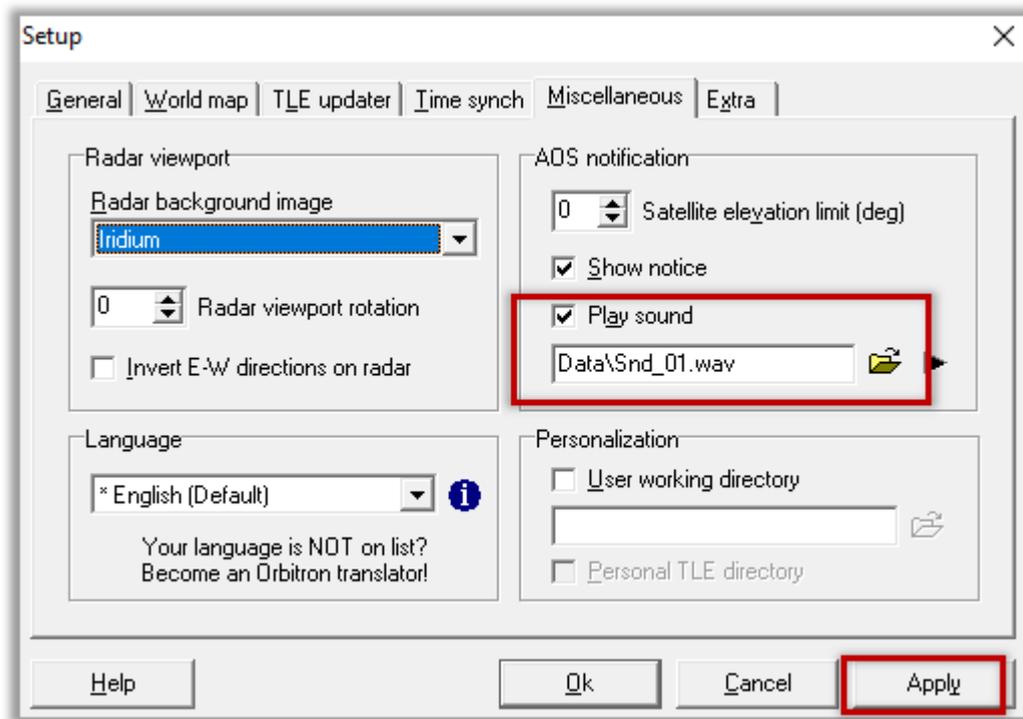


Figure 58, Settings Window Miscellaneous.

- Extra.

Check the last option AOS message: make this satellite active, fig.59.

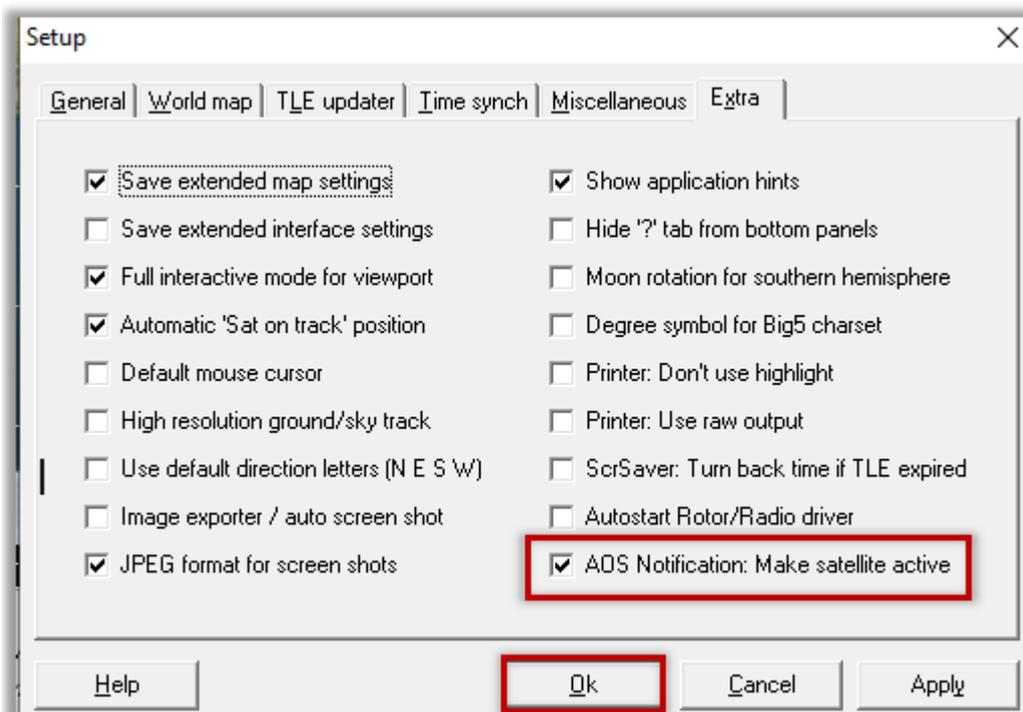


Figure 59, Window> Extra.

- Location.

In the 'Orbitron' main screen, open Location and select your city name. If it is not listed in the menu, you will need to enter these latitude and longitude coordinates manually, fig.60. Don't forget to click Choose.

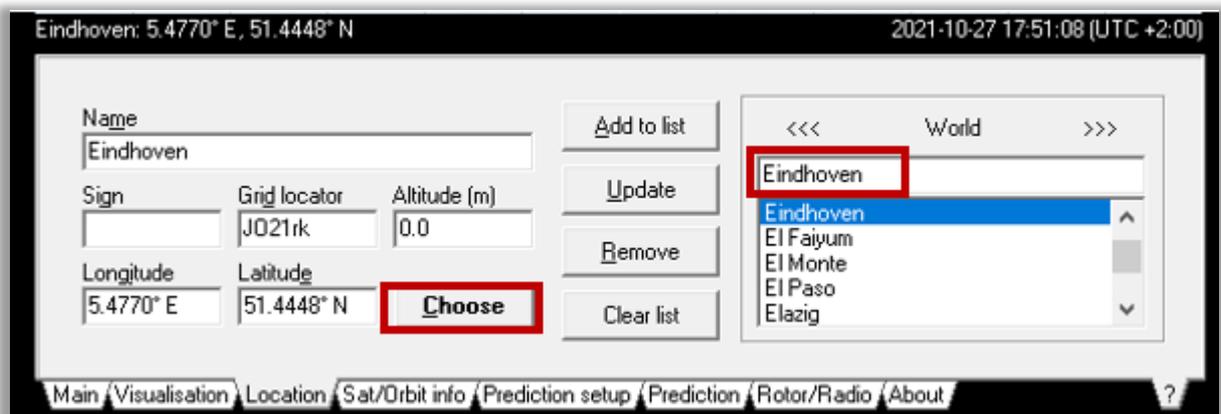


Figure 60, your location.

- Rotor/Radio.

In the Dnlink/MHz field, select FM-W, fig.61.

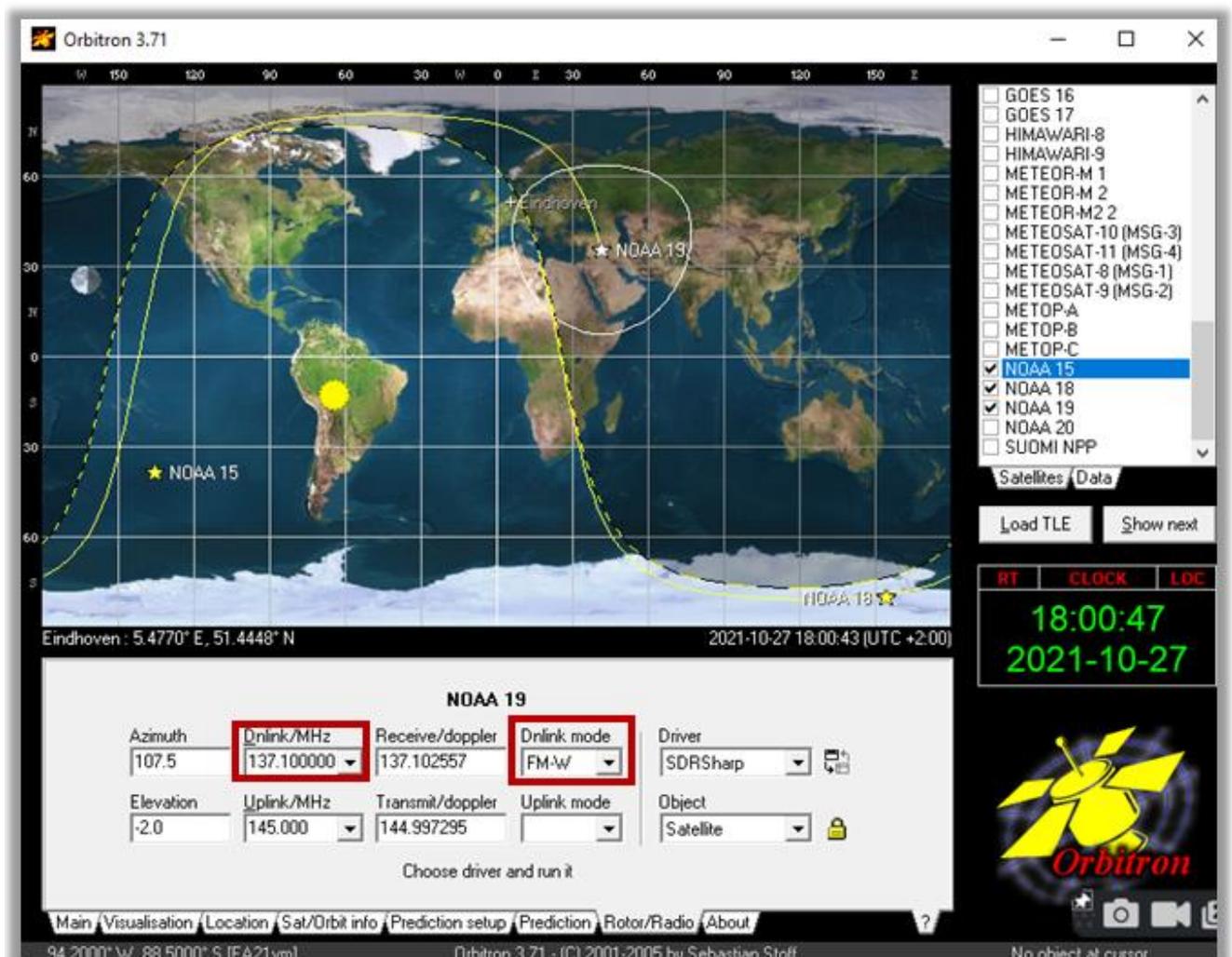


Figure 61, Setting DnLink Mode.

In the satellites column, on the right, by double clicking on each of the selected satellites you indicate the corresponding Downlink frequency in the Dlinl/MHz window. These values are automatically saved and adjusted slightly depending on the Doppler effect.

NOAA 15-137,6200 MHz
NOAA 18- 137,9125 MHz
NOAA 19-137,1000 MHz

Finally, select the SDRSharp driver from the drop-down list, fig.60. You should find an entry to SDRSharp there (added by you, during a previous 'Orbitron' setup.cfg file modification).

Note: If you find that the 'SDRSharp' driver is not added to the drop-down list, the most common cause of the problem is installing "Orbitron" in the Program Files folder (x86), or you have a made a mistake in the Orbitron / Config folder, with the addition in setup.cfg.

4. Start-up procedure.

4.1 Automatic NOAA satellite recording.

All settings you have made before will remain active. Everything is now ready to display the NOAA satellite images, fully automatic and Doppler frequency corrected, with 'WXtoIMG' in 2 steps.

Step 1. Orbitron.

Now fire up 'Orbitron' and select the Rotor/Radio tab. Click the icon next to Driver: 'SDRSharp', fig.62 and wait a few seconds until 'SDRSharp' appears on the screen.



Figure 62, Driver SDRSharp.

Predict the NOAA satellite transitions.

Click on the Prediction tab and then on Predict. After the download is complete, confirm with OK, fig.63.

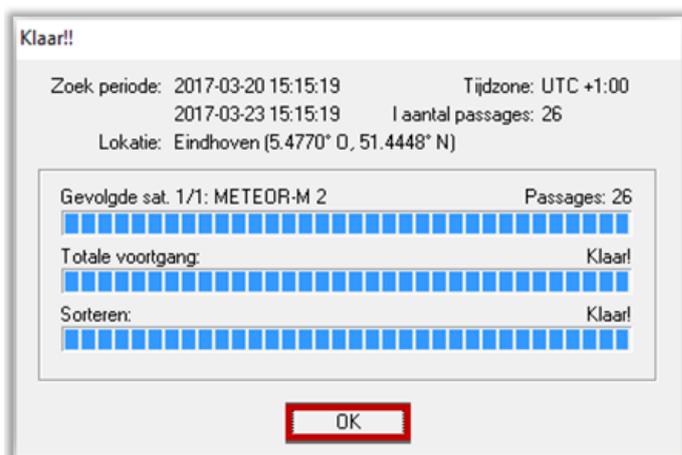


Figure 63, Satellite passages being loaded.

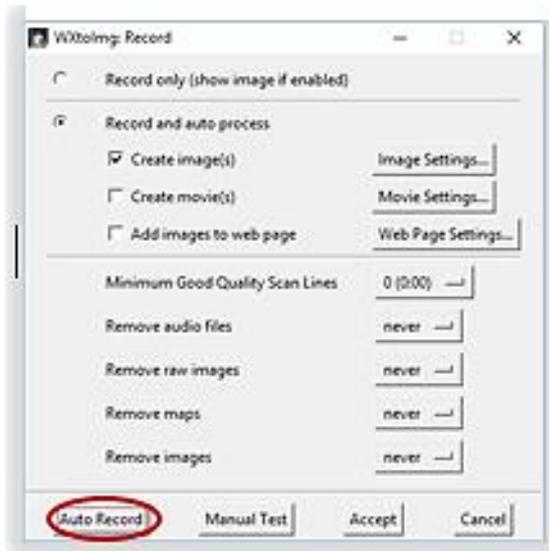
The new window shows all the required orbital information from the NOAAs, fig.64.

Time - LOC	Satellite	Azm	Elv	Mag	Range	S.Azm	S.Elv	Passes
2021-10-27 18:44:50	NOAA 18	35.9	0.0	7.8	3511	254.7	-4.5	
2021-10-27 18:47:09	NOAA 18	18.6	1.0	7.8	3382	255.1	-4.8	
2021-10-27 18:49:28	NOAA 18	1.4	0.0	8.0	3514	255.6	-5.2	
2021-10-27 18:49:29	NOAA 15	121.6	0.0	7.3	3387	255.6	-5.2	
2021-10-27 18:56:30	NOAA 15	56.7	23.5	5.8	1654	256.9	-6.3	
2021-10-27 18:58:33	NOAA 15	252.1	0.0	7.5	3488	256.9	-7.2	

According to the timetable, fig.63, 'Orbitron' will automatically start up 'SDRSharp' at 5:41 PM and 7 seconds at the previously set frequency of the NOAA15.

Step 2. WXtoIMG

Run 'WXtoimg'.



The 'WXtoimg settings are already described in part 1. Finally: Select AutoRecord, fig.65.

Figuur 65, WXtoimg in Auto Record.

After the above steps you can do other things. At a later time you can then save the photo, visible in the WXtoimg window.

Finally, close 'Orbitron', SDRSharp will be closed automatically.



Some points to keep in mind with this method:

- If you do not save the photo on 'WXtoImg' in time, the next recording will be started automatically, which unfortunately overwrites the first photo and you will lose it. In this case, fig.70, the NOAA15 picture will be overwritten by the NOAA19 satellite.
- Make sure your computer does not shut down prematurely, below you can see what you can do about it.
- Don't forget to start 'WXtoImg' after 'Orbitron' in Autorecord mode.
- 'WXtoImg' does not start automatically.

Again: It can be useful to have your screen turn off a little later. It would be a shame if the recording is in progress, your PC will be shut down.

Start / Configuration / Energy management > Set sleep time, (Windows10)
