NOAA

Satellite

Tracking and Decoding

By: N7FNV and KJ6IX

Sam & Dale

Overview

The purpose of this guide is to completely install software and configure them to automatically receive incoming NOAA signals and process them into images. While there are many variations of hardware used for this application, we will focus on a simple setup to get you on the air!

Here is a list of Hardware required to receive and decode the signals from NOAA.

Personal Computer   Antenna   RTL-SDR USB Dongle

This is a basic installation with minimal settings. The software included offers a variety of different settings you are able to adjust to you own specs if you so wish to do so. This guide however will get you on the air and receiving images.

The first thing you will need to do is extract the NOAA Tracking and Decoding Guide.zip file. It may be easiest to unzip this file into a folder on your desktop for ease as we will be accessing multiple files during the setup process.

Depending on your system configuration, you may have to run the installers in Administrator Mode

Software Included:

- ➢ SDRSharp – By AirSpy
- ➢ VAC4.67 – By Digital Trends
- ➢ Orbitron – By Sebastian Stoff
- ➢ WxtoImg – By WXtoImgRestored
- ➢ Kepler's Updater – By Wraase Electronic
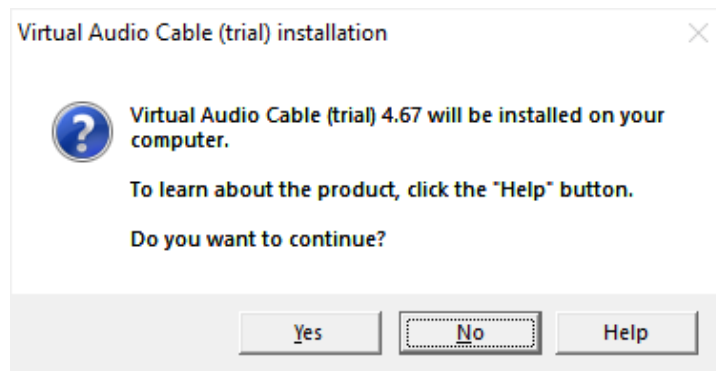
Table of Contents

Chapter 1 – Virtual Audio Cables

Virtual Audio Cable pipes the incoming audio signals from SDR# Sharp to WxtoImg so the audio can be decoded into an image.
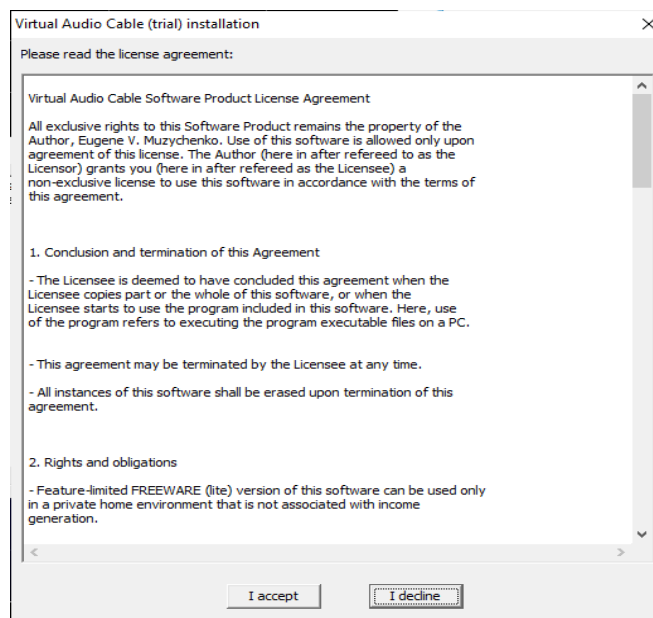
VAC 4.67

VAC 4.67 Installation

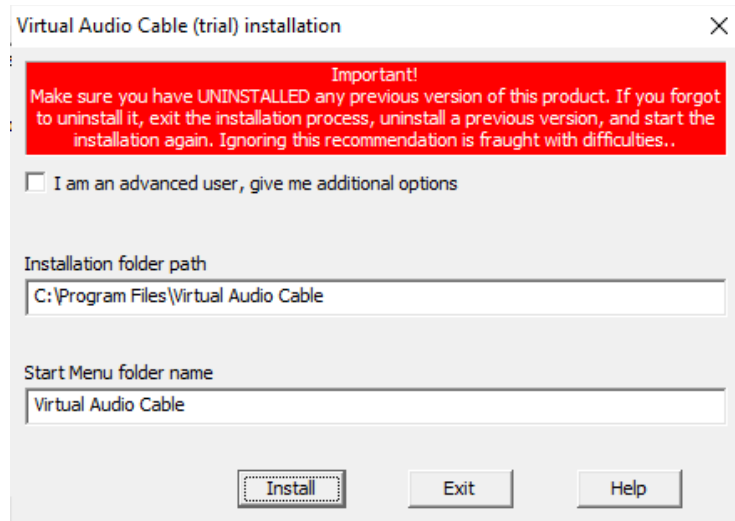➢ Open vac467.exe to Install the Virtual Audio Cable
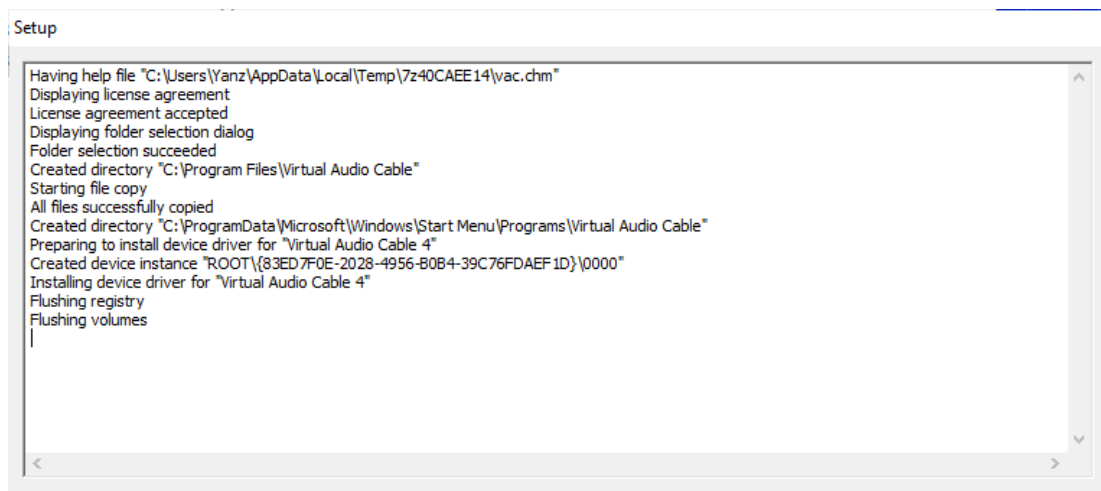

➢ Click **Yes** to continue

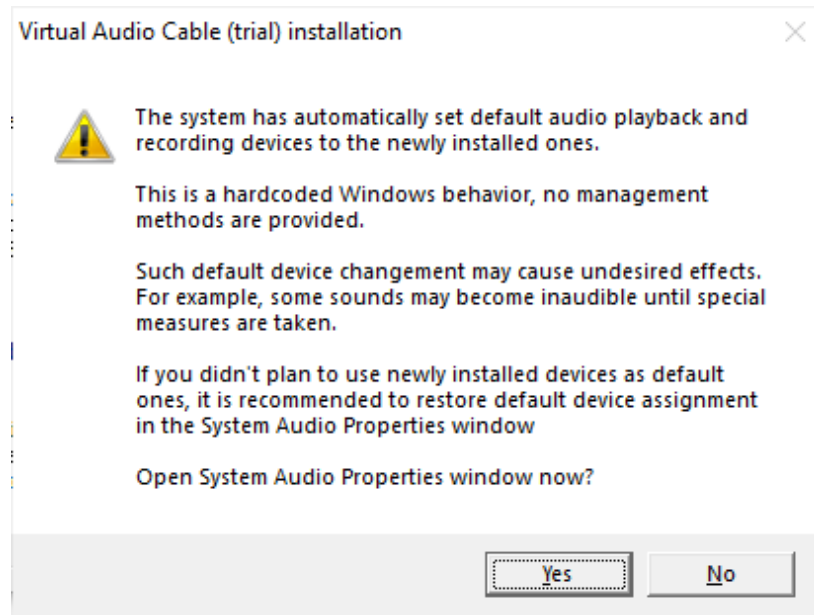

➢ Click **I Accept** to continue the installer now
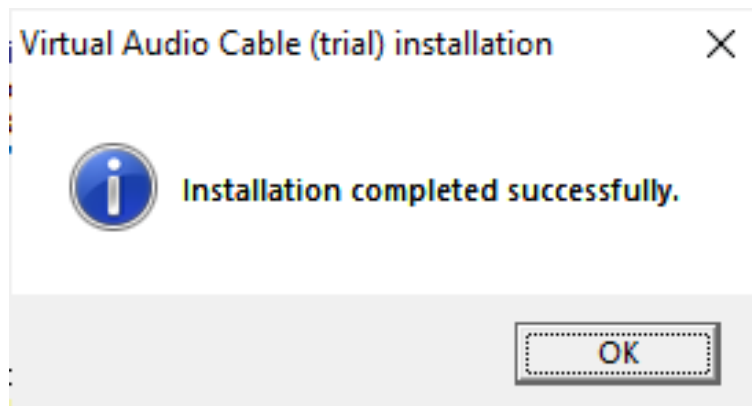
➢ Click **Yes** to Run the installer now

➢ Click **Install** to continue

➢ The installation will start and you should have some information scrolling in the window

➢ Click **No** in the following window that pops up

➢ Click **OK** once again to complete the Virtual Audio Cable Installation
➢ You may have to reboot your computer to complete the installation

Chapter 2 – Software Defined Radios

While there are many Software defined radio downloads available, we are going to focus on the most popular, SDR# (pronounced "SDR Sharp"). It is relatively simple to use compared to the other SDR software and has a very simple setup procedure. It is designed to be used with the AirSpy for $199 but works great with the RTL-SDR.
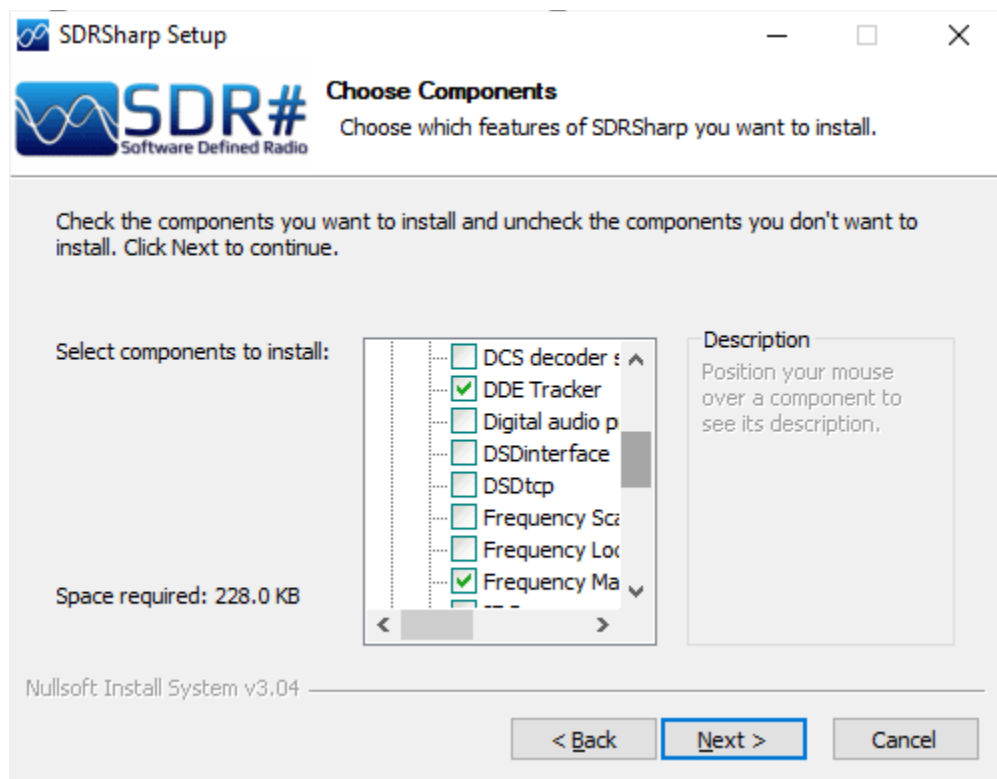
AirSpy SDR# Studio v1.0.0.1888

AirSpy Studio Installation

➢ Install SDRSharp-installer.exe from the file you extracted.
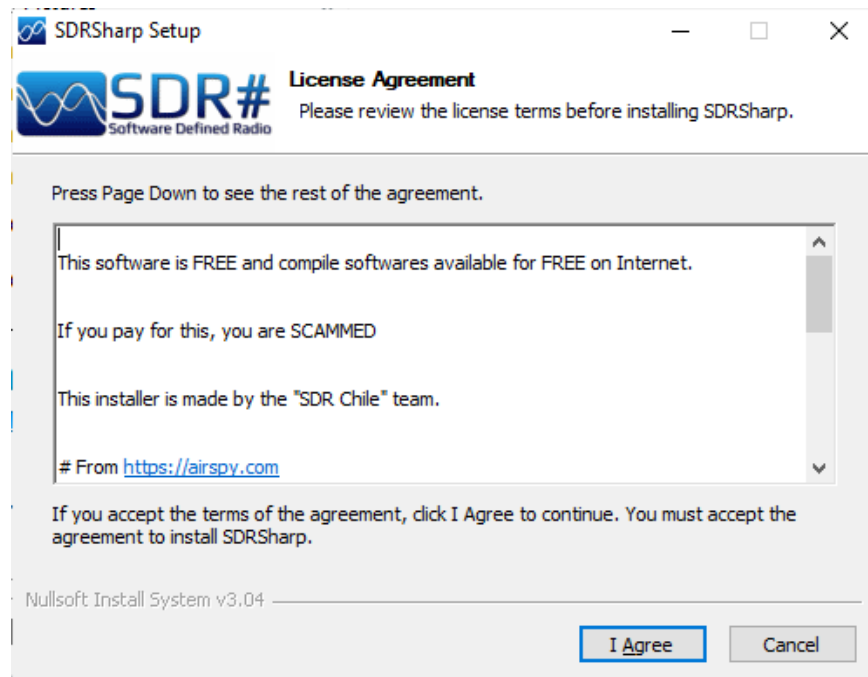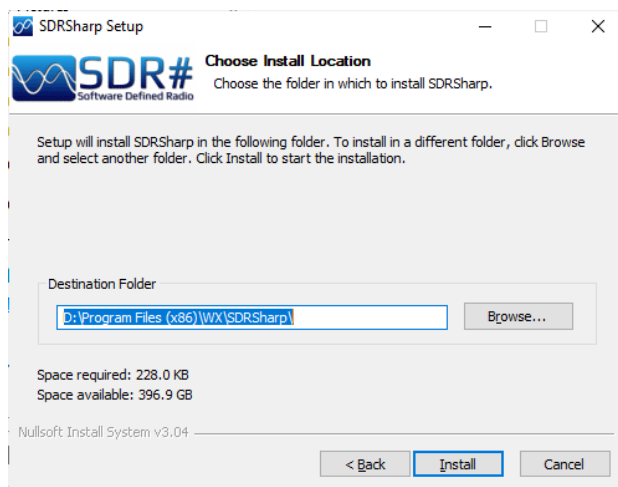

➢ Click Agree to begin the installation process

➢ Choose the components you wish to install, typically everything will be selected. You can install everything selected by default but we are only interested in two.
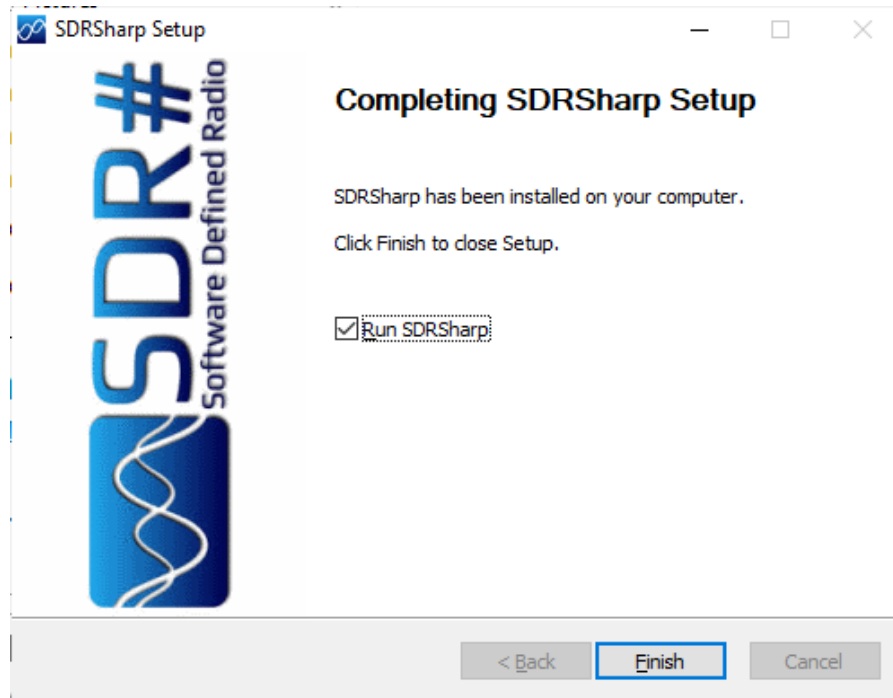

➢ Here are the plugins we need to have installed:
    From rtl-sdr.ru\DDE Tracker
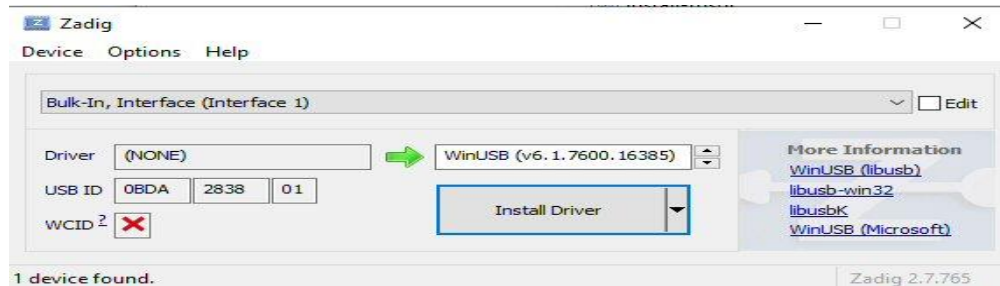   From rtl-sdr.ru\Frequency Manager

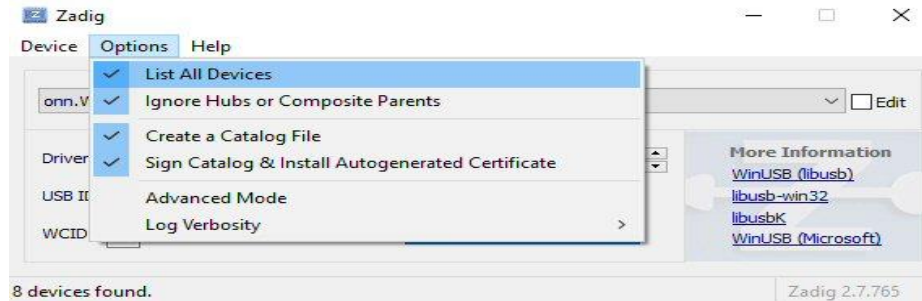➢ Choose a Directory and Folder for this installation and click Install

➢ When installation is completed, uncheck the Run SDRSharp box and click Finish

➢ Navigate to the **SDRSharp\bin** folder you just created where SDR Sharp was installed
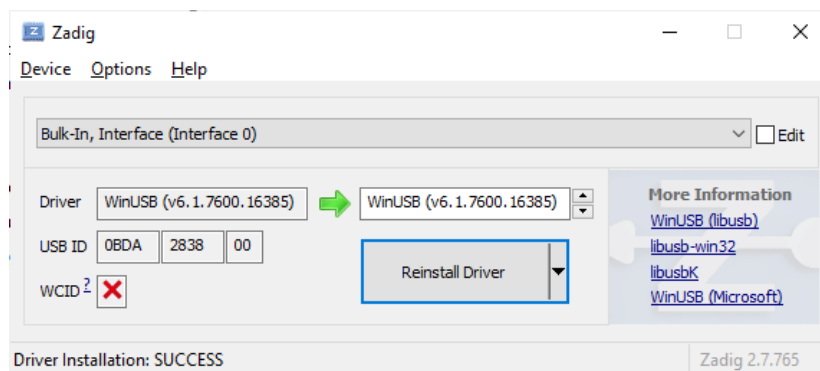
Zadig Setup

- ➢ Insert your Dongle into an available USB in your computer

- ➢ Run Zadig.exe which is located in the bin folder of SDR Sharp

- ➢ Click Options and then List all Devices

- ➢ Select **Bulk-In, Interface (Interface 0)** from the drop down box
  Make sure the USB ID shows **OBDA 2838 00** and click Install Driver

- ➢ You should see the WinUSB driver in both boxes as shown above
- ➢ Close Zadig.exe
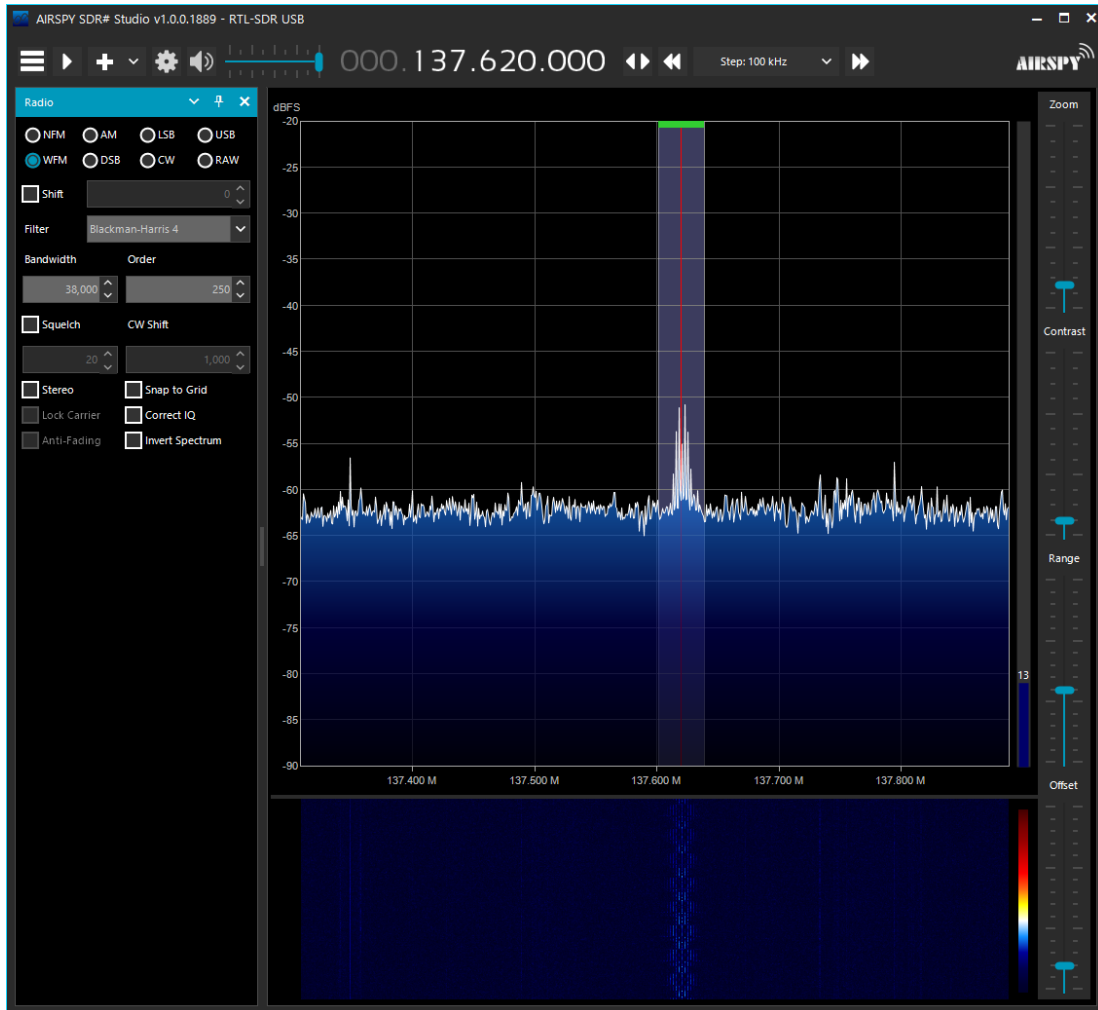
AirSpy Studio Settings

- ➢ Navigate back to the SDRSharp\bin folder and run the install-rtlsdr.bat file
- ➢ Press any key to close the command window

- ➢ Launch the SDRSharp.exe file in the bin folder

➢ Make sure the Radio settings are as follows:

Modulation mode – **WFM**

Shift – **Off** **(Unchecked)**

Bandwith - **38000**

Filter – **Blackmand-Harris 4**

Squelch – **Off** **(Unchecked)**

Stereo – **Off** **(Unchecked)**

Snap to Grid – **Off** **(Unchecked)**

Correct IQ – **Off** **(Unchecked)**

Invert Spectrum – **Off** **(Unchecked)**
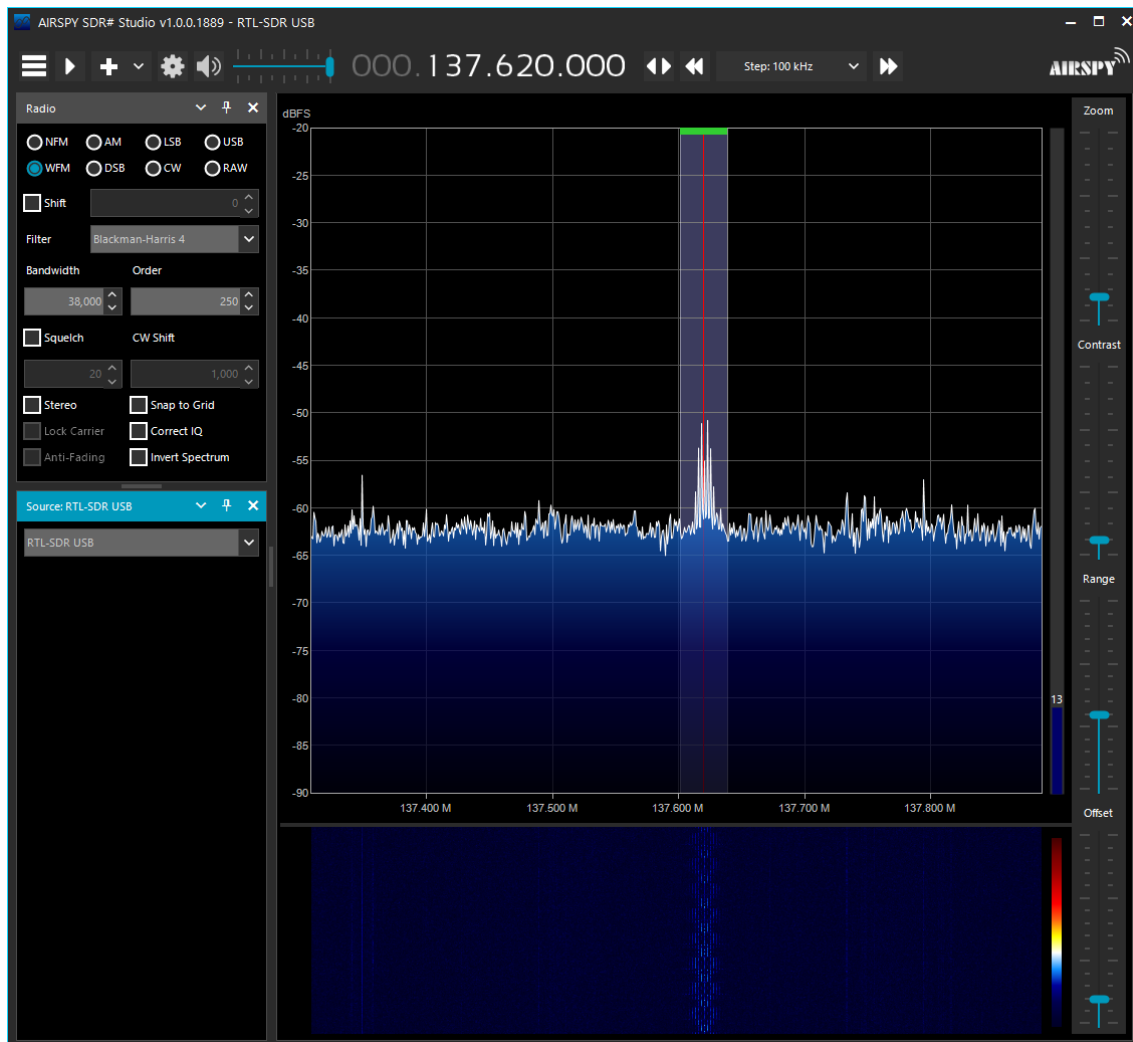
➢ Make sure the Source settings are as follows

➢ In the dropdown box, select your source
(This guide is based on the **RTL-SDR USB** Dongle)
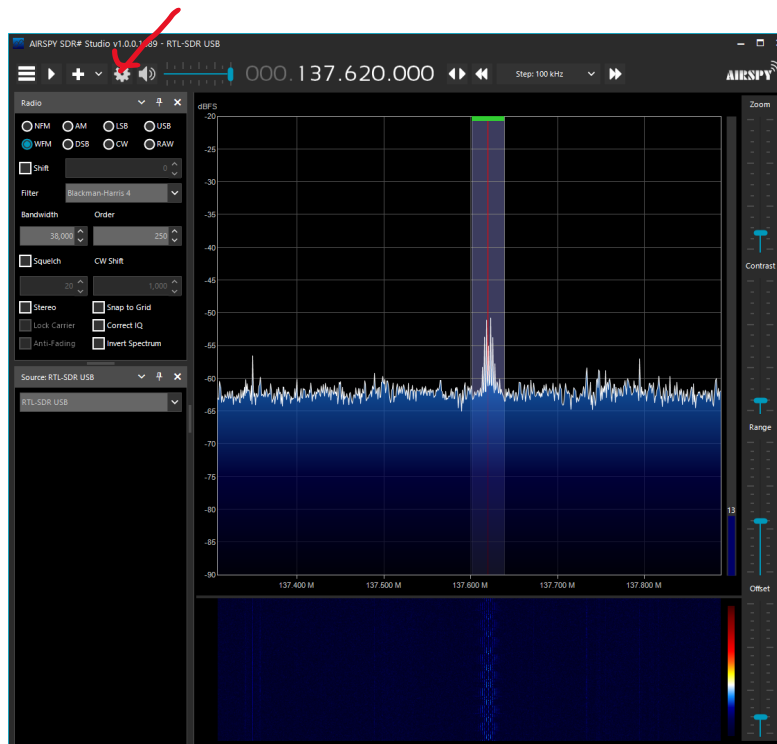
➢ Now click on the Cog in the upper left area
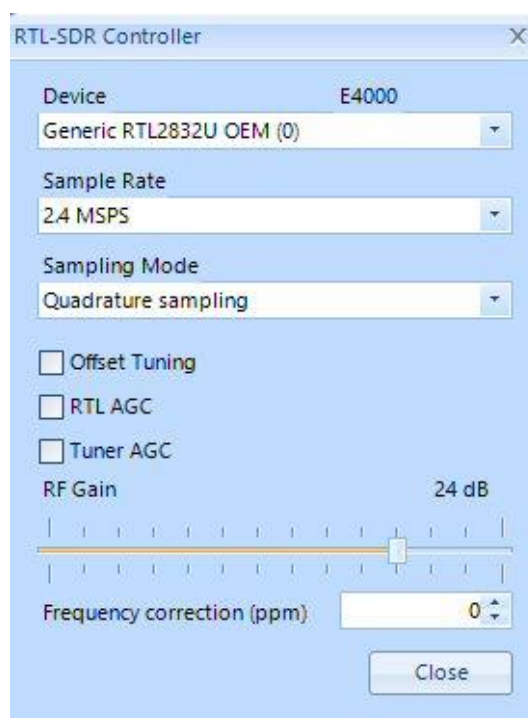
➢ If all went well thus far, you should have your dongle or source listed in the first drop down box
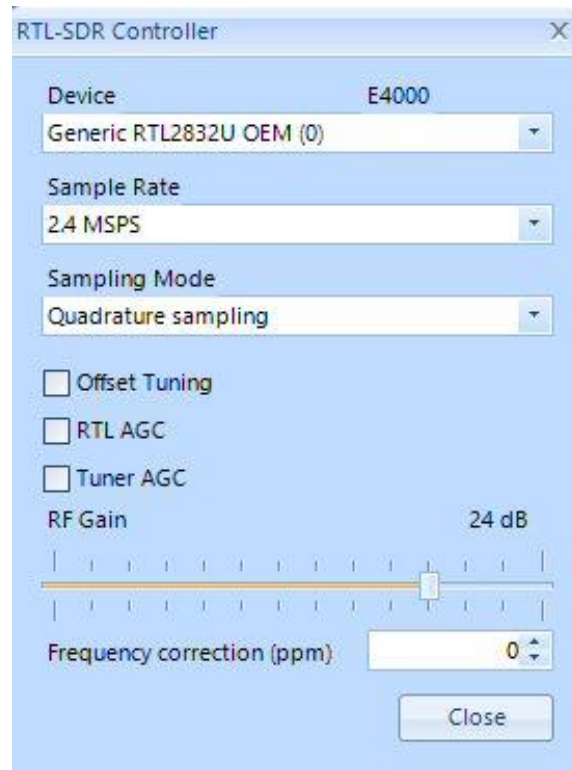
> ➢ Make sure the following settings are as follows

Sample Rate – **2.4 MSPS**
Sampling Mode – **Quadrature sampling**
Offset Tuning – **Off**
RTL AGC – **Off**
Tuner AGC – **Off**
RF Gain – **24 dB (**This can be increased if you are not seeing the signal**)**

> ➢ Close the RTL-SDR Controller Window
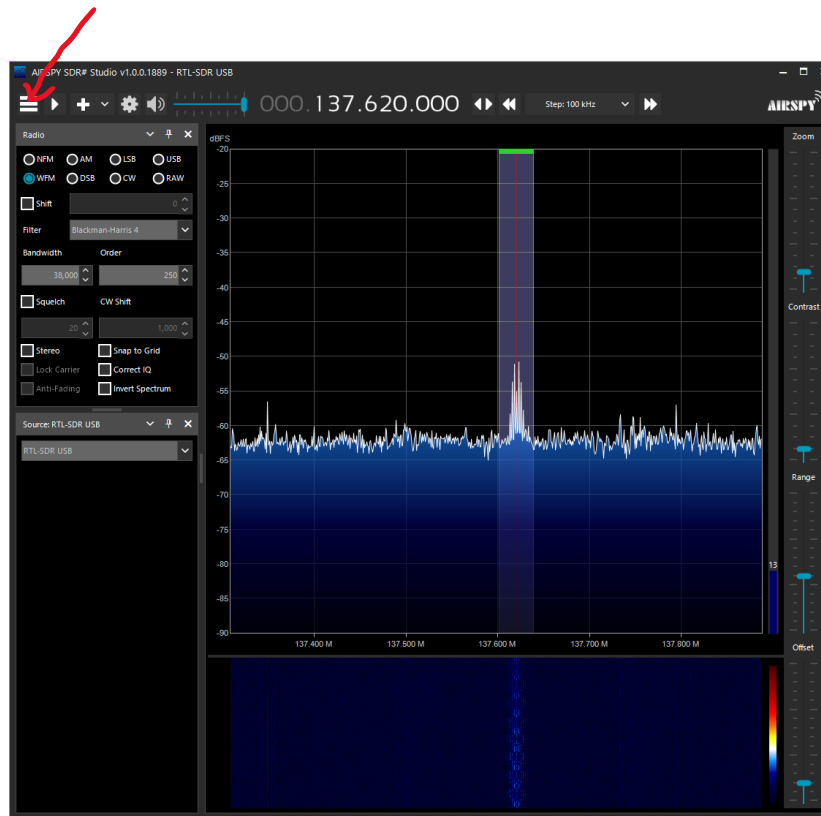
➢ In the upper left menu control, select Audio
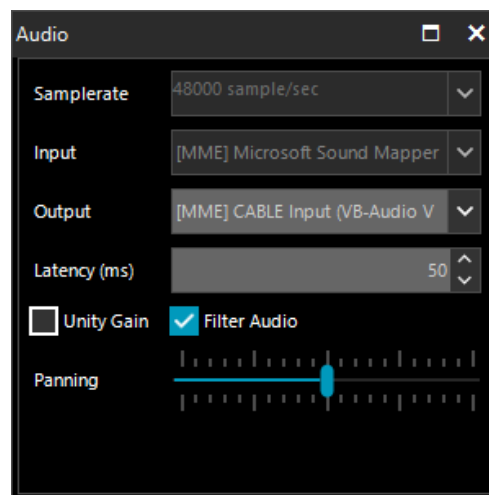
➢ Depending on which VAC you installed, Change the Output audio to:
  ○ **[MME] Line 1 (Virtual Audio Cable)**
➢ Remove checkmark from Filter Audio
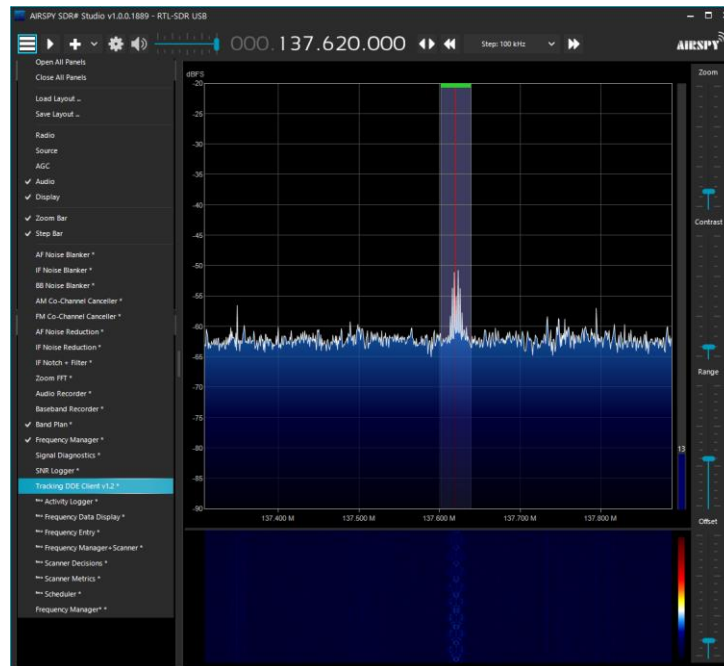
> ➢ In the upper left menu control, select Tracking DDE Client v1.2
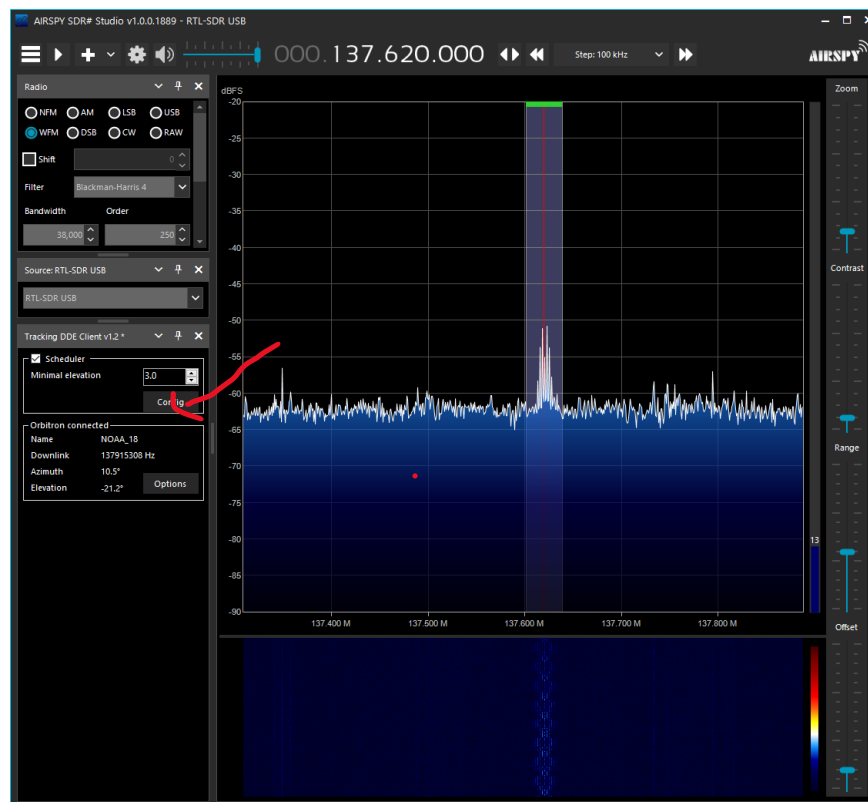
> ➢ Change the minimum elevation to 3.0 **This can be adjusted to what works best for you**
> ➢ Click Config
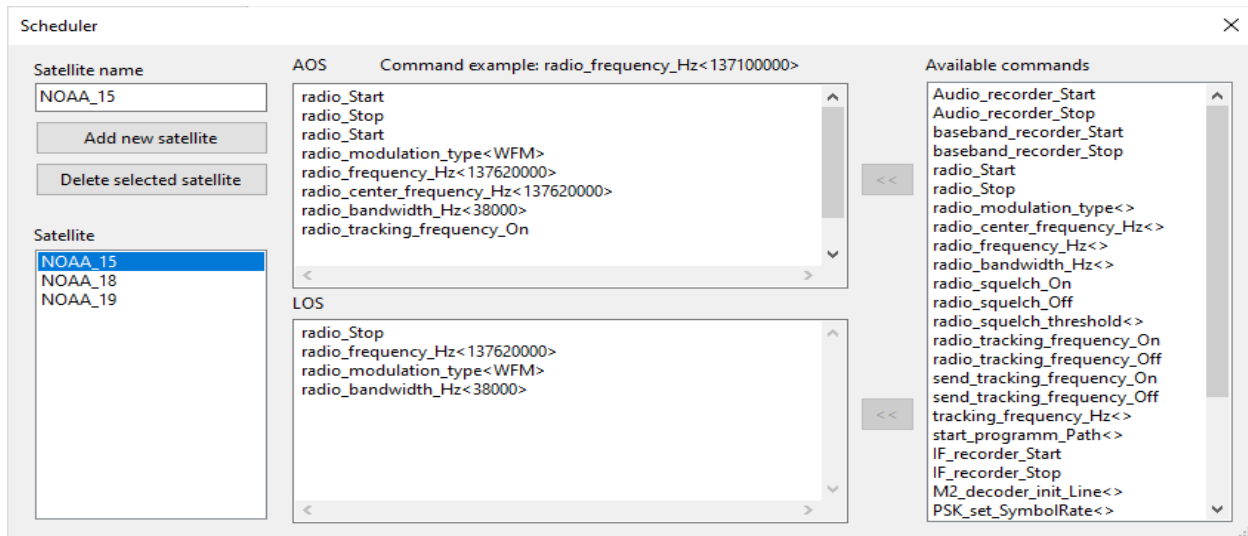
When you click New Satellite, make sure to select it in the Satellite box and then edit the name

- In the Scheduler window add the 3 satellites and make sure to label them as follows
  - NOAA_15
  - NOAA_18
  - NOAA_19

- Add the following to each AOS and LOS boxes like the above image, making sure to adjust the frequency of each satellite accordingly.

Below are the settings that can be copied and pasted into each Satellite in the Scheduler

NOAA_15

AOS	LOS
radio_Start radio_Stop radio_Start radio_modulation_type<WFM> radio_frequency_Hz<137620000> radio_center_frequency_Hz<137620000> radio_bandwidth_Hz<38000> radio_tracking_frequency_On	radio_Stop radio_frequency_Hz<137620000> radio_modulation_type<WFM> radio_bandwidth_Hz<38000> radio_tracking_frequency_Off

NOAA_18

AOS	LOS
radio_Start radio_Stop radio_Start radio_modulation_type<WFM> radio_frequency_Hz<137912500> radio_center_frequency_Hz<137912500> radio_bandwidth_Hz<38000> radio_tracking_frequency_On	radio_Stop radio_frequency_Hz<137912500> radio_modulation_type<WFM> radio_bandwidth_Hz<38000> radio_tracking_frequency_Off

NOAA_19

| AOS	LOS
radio_Start radio_Stop radio_Start radio_modulation_type<WFM> radio_frequency_Hz<137100000> radio_center_frequency_Hz<137100000> radio_bandwidth_Hz<38000> radio_tracking_frequency_On	radio_Stop radio_frequency_Hz<137100000> radio_modulation_type<WFM> radio_bandwidth_Hz<38000> radio_tracking_frequency_Off

➢ Close the scheduler window and put a check mark in Scheduler in the SDR# Sharp window/ Tracking DDE Client Box to enable

➢ This will allow SDRSharp to receive from Orbitron and automatically adjust to the frequency of the satellite and also adjust for the doppler effect while it passes.

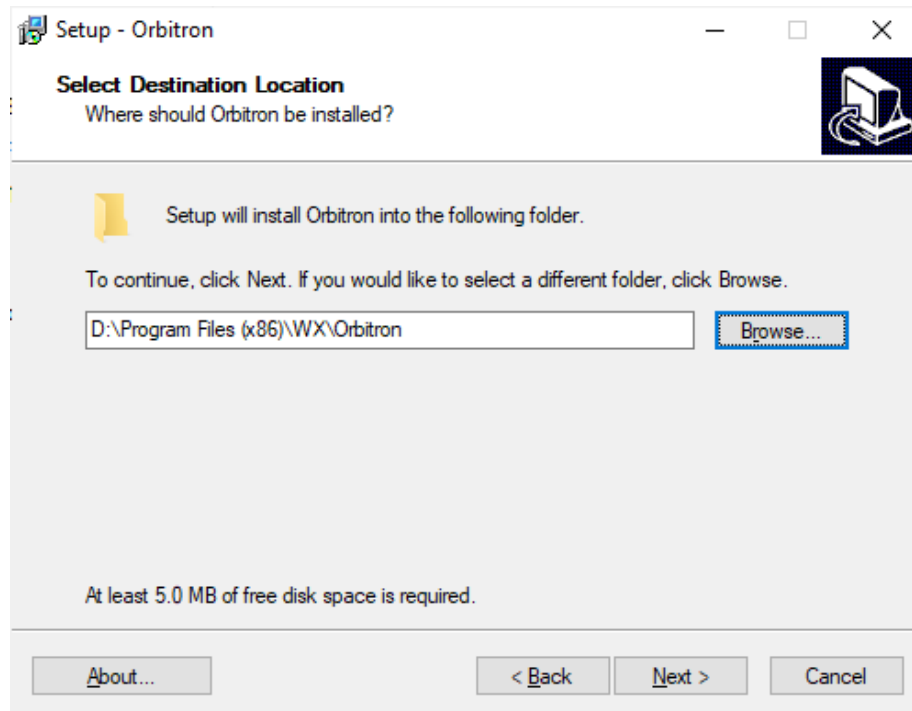# Chapter 3 – Satellite Tracking Software
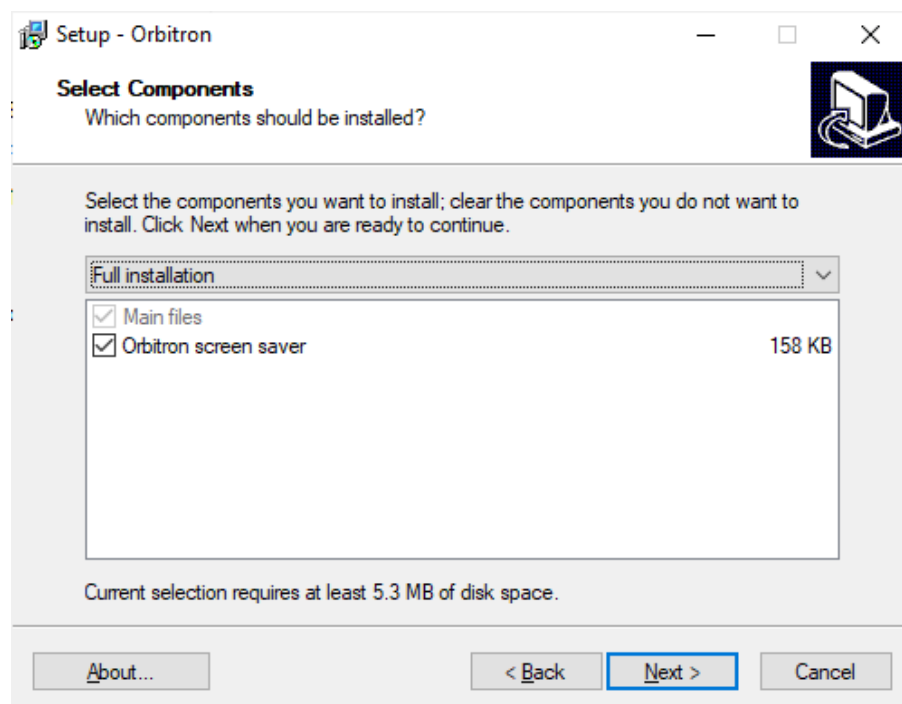
Orbitron 3.71

Orbitron 3.71 Installation
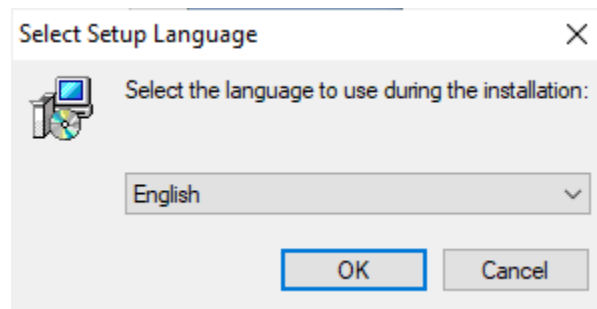
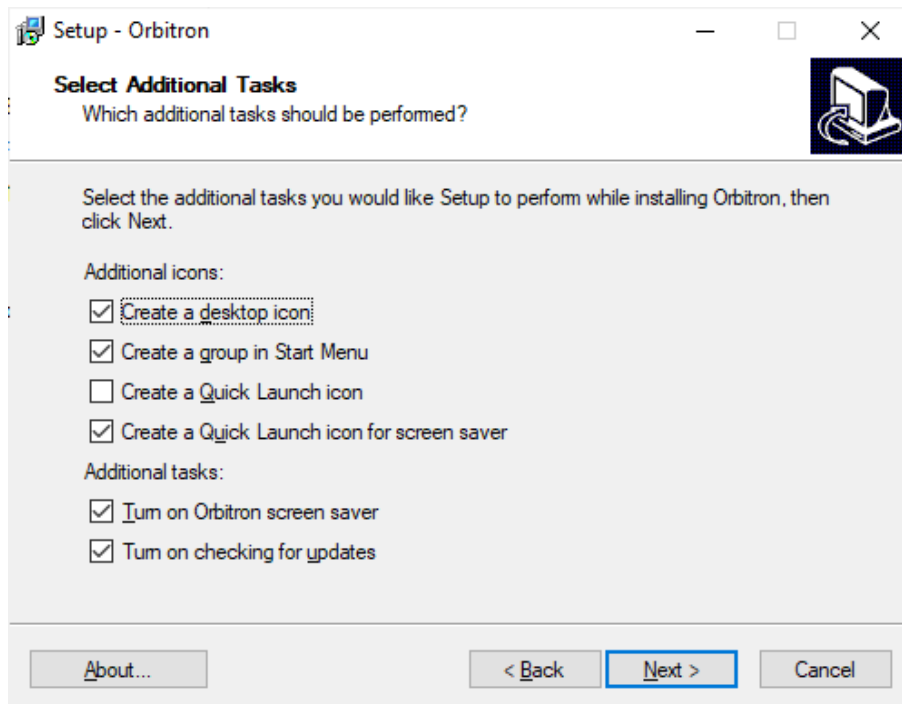➢ Install Orbitron.exe and select your desired language. Click OK.

➢ Click next to continue the installation process.

➢ Choose a Directory and Folder for this installation and click Next
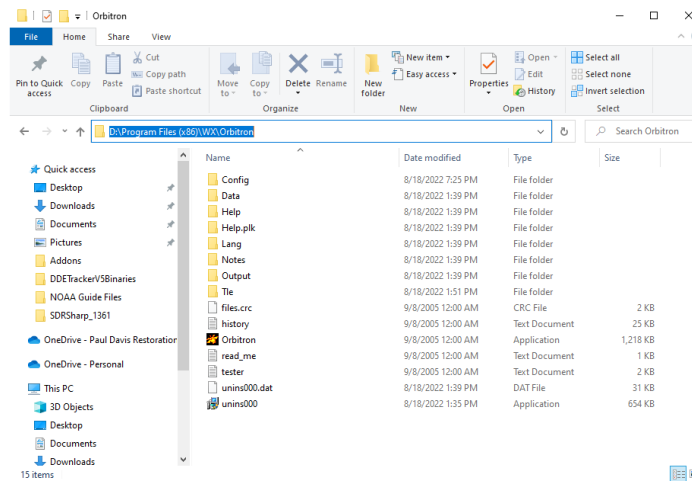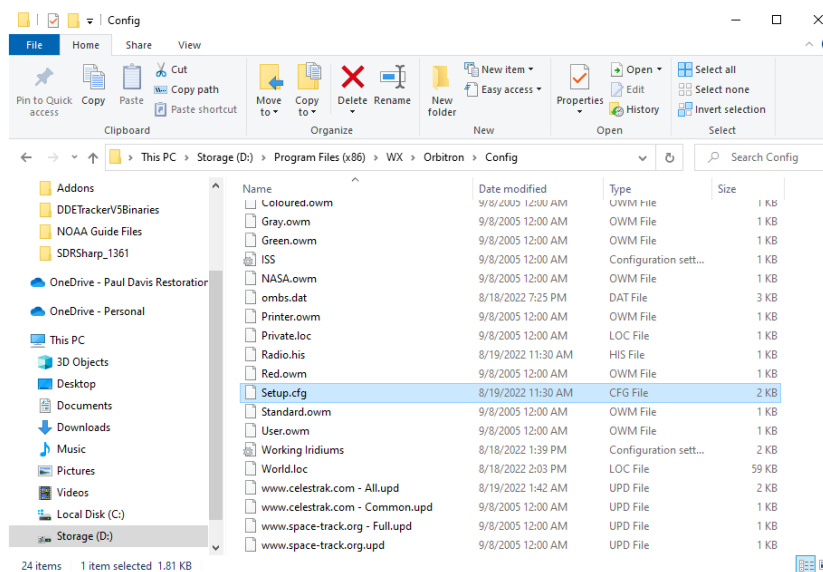

➢ Click Next

➢ Click Next
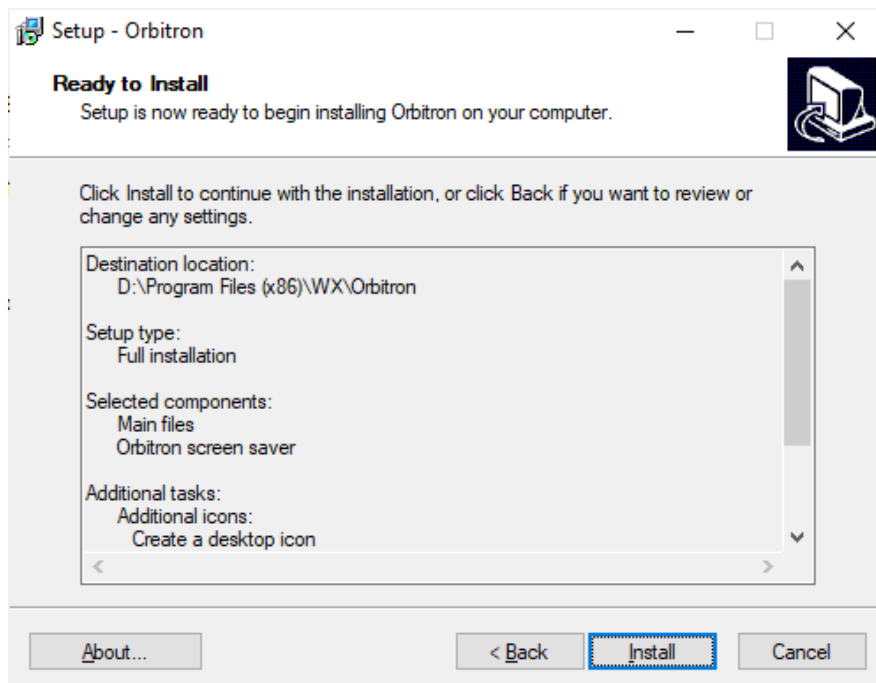
➢ Click Install to Continue
➢ When installation completed, uncheck the Launch Orbitron box and click Finish
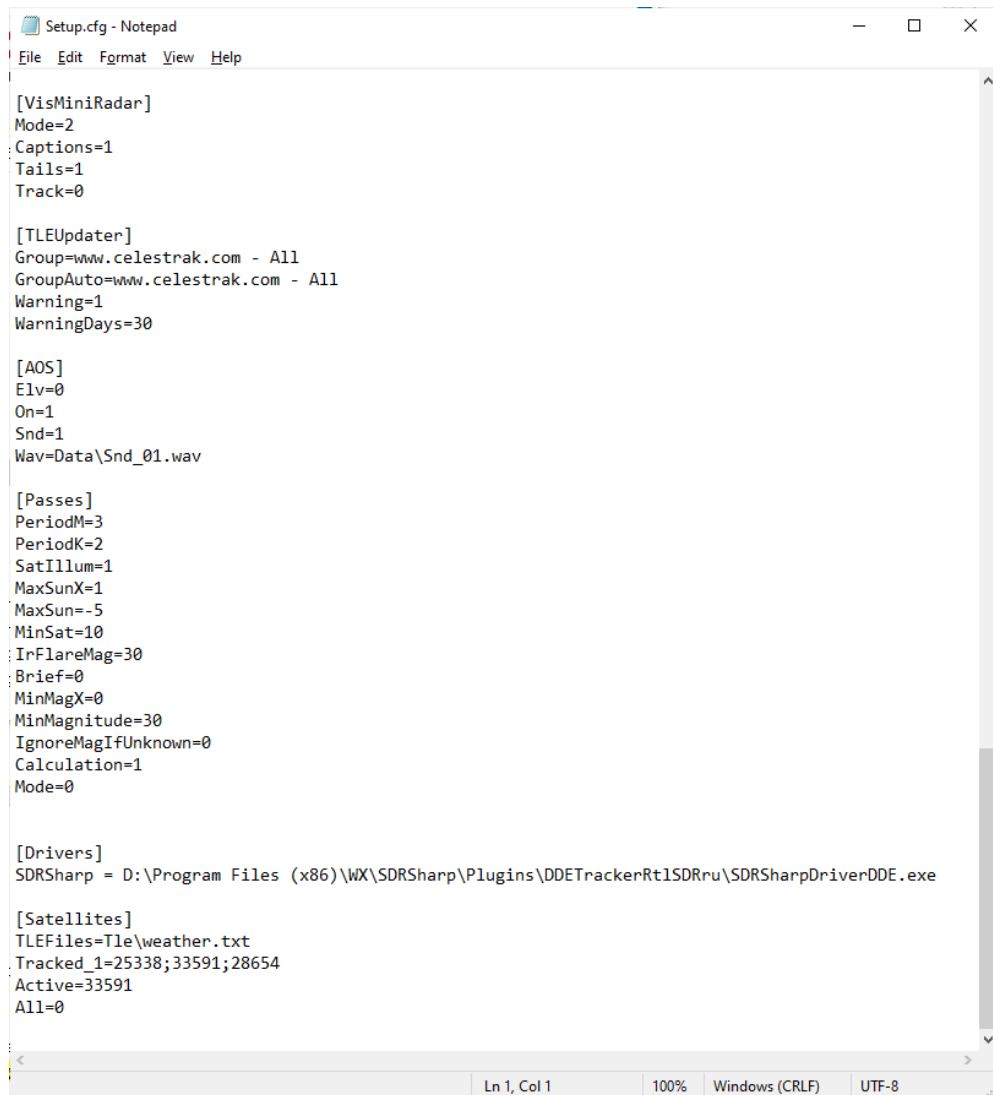
SDRSharpDDE Plugin Installation

- ➢ Navigate to the Orbitron folder you just created where Orbitron was installed
  - o NOTE: My directory will be different than yours

- ➢ Navigate to the config folder

- ➢ Open Setup.cfg using notepad

```
Setup.cfg - Notepad                                              —  □  ×
File  Edit  Format  View  Help

[VisMiniRadar]
Mode=2
Captions=1
Tails=1
Track=0

[TLEUpdater]
Group=www.celestrak.com - All
GroupAuto=www.celestrak.com - All
Warning=1
WarningDays=30

[AOS]
Elv=0
On=1
Snd=1
Wav=Data\Snd_01.wav

[Passes]
PeriodM=3
PeriodK=2
SatIllum=1
MaxSunX=1
MaxSun=-5
MinSat=10
IrFlareMag=30
Brief=0
MinMagX=0
MinMagnitude=30
IgnoreMagIfUnknown=0
Calculation=1
Mode=0


[Drivers]
SDRSharp = D:\Program Files (x86)\WX\SDRSharp\Plugins\DDETrackerRtlSDRru\SDRSharpDriverDDE.exe

[Satellites]
TLEFiles=Tle\weather.txt
Tracked_1=25338;33591;28654
Active=33591
All=0


                              Ln 1, Col 1        100%   Windows (CRLF)   UTF-8
```

➢ Scroll to the bottom of the file and insert the following lines as is

> **[Drivers]**
> **SDRSharp = SDRSharpDriverDDE.exe**

➢ Change the location of SDRSharpDriverDDE.exe to the location of yours.
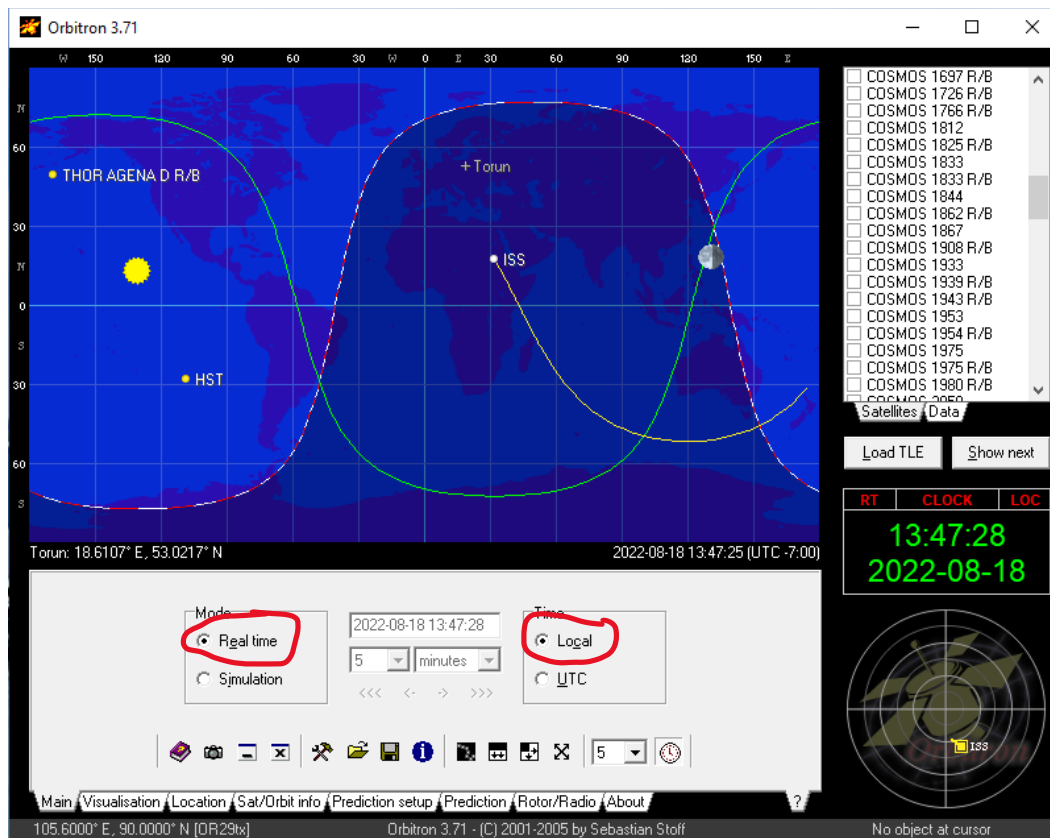
> It will be located in the **SDRSharp\Plugins\DDETrackerRtlSDRu** folder
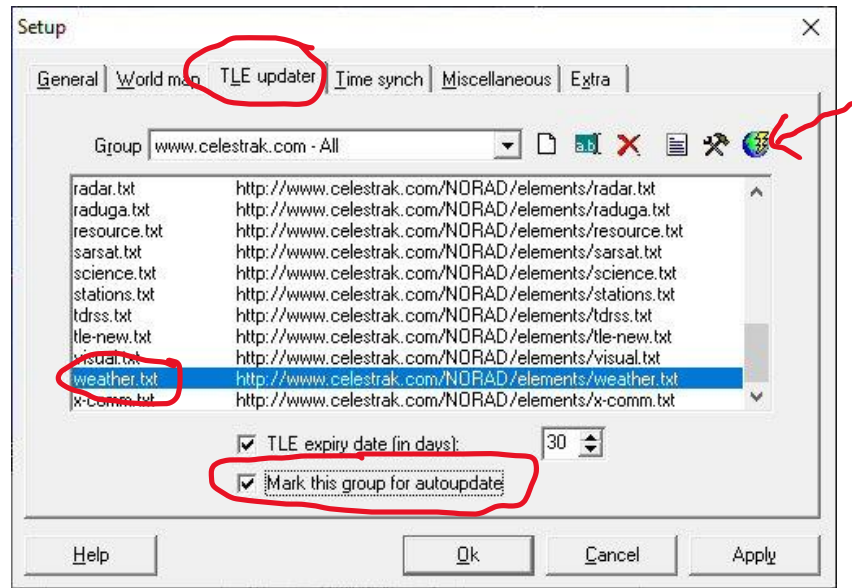
Mine will be the following for example:

[Drivers]

SDRSharp = D:\Program Files (x86)\WX\SDRSharp\Plugins\DDETrackerRtlSDRru\SDRSharpDriverDDE.exe

Orbitron Settings and Config

- ➤ Launch Orbitron 3.71

- ➤ Select the Main tab in the Orbitron Window

- ➤ Make sure Real time and Local is selected

- ➢ press (ALT-F5) to open the settings window
- ➢ Select the TLE Updater tab
- ➢ Scroll down to weather.txt and select the Mark this group for autoupdate and click apply
- ➢ Click on the Lightning Globe in upper right to update the TLE files as shown above
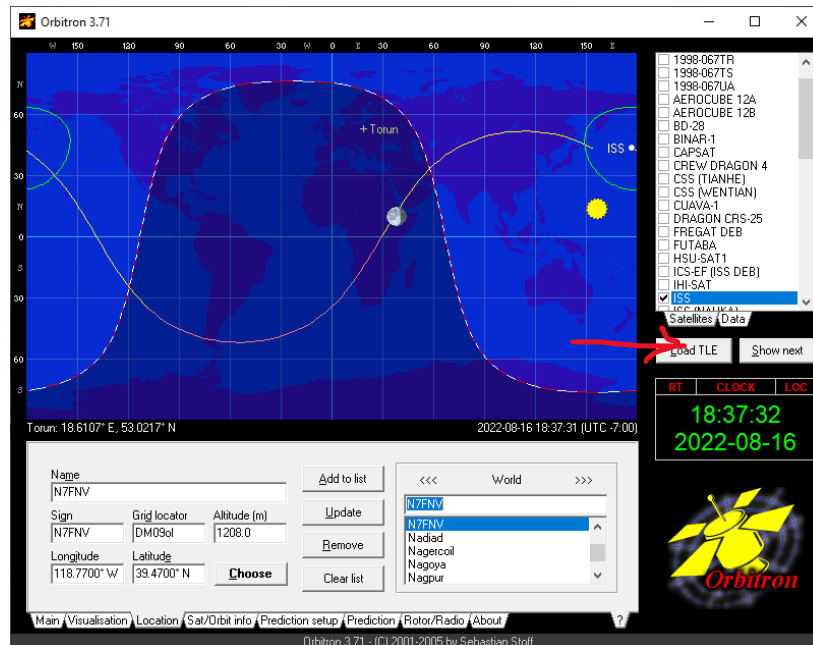- ➢ Click OK
- ➢ Click on Apply and then OK
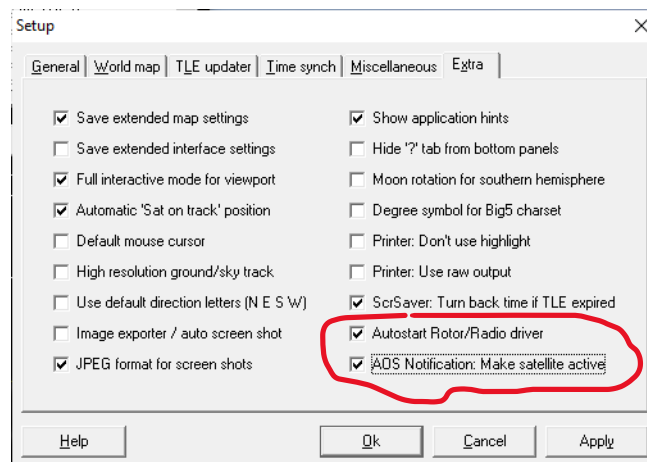
- ➢ Switch to the Extra tab and make sure the Autostart driver and AOS Notification is checked and click Apply

This will allow Orbitron to automatically make the next pass active and start the driver for piping the audio to WxtoImg
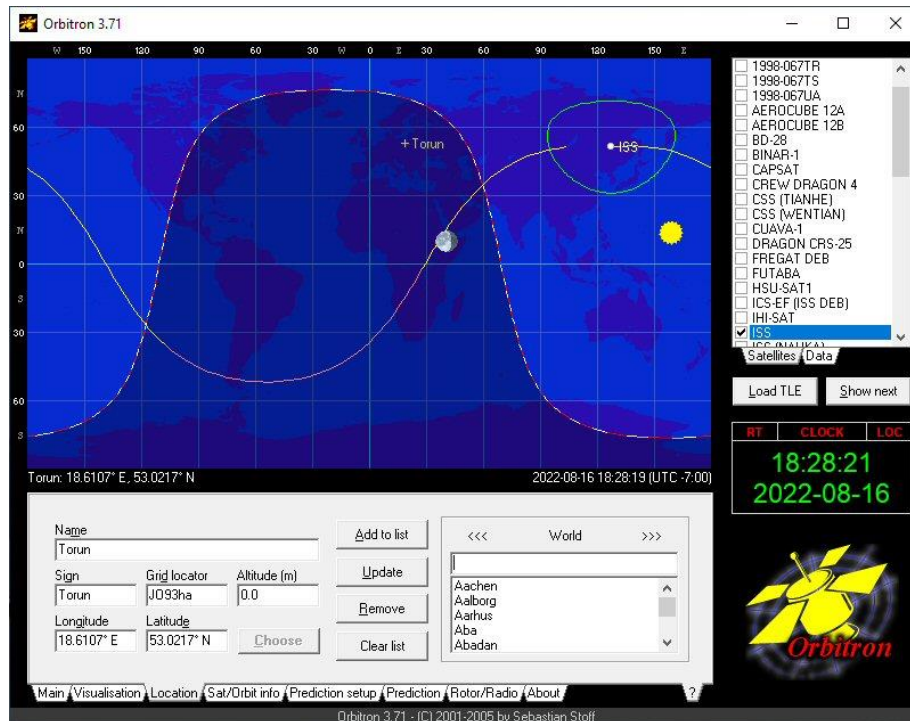
➢ Switch to the Location tab in the Orbitron window

➢ Edit the following information:
  o Name – Whatever you want to call your station
  o Sign – What you want to appear on the global map
  o If you know your Grid Locator you can enter it or skip if you know the Lat/Long
    ▪ Latitude and Longitude Finder on Map Get Coordinates (latlong.net)
    ▪ Amateur Radio Ham Radio Maidenhead Grid Square Locator Map (levinecentral.com)
  o Altitude – Enter your altitude in meters
   ▪ Feet to Meters - ft to m conversion (metric-conversions.org)

- ➢ Click add to list and Click Choose to set your location on the map for Sat passes
- ➢ Click the Load TLE button on the right below the current satellite list
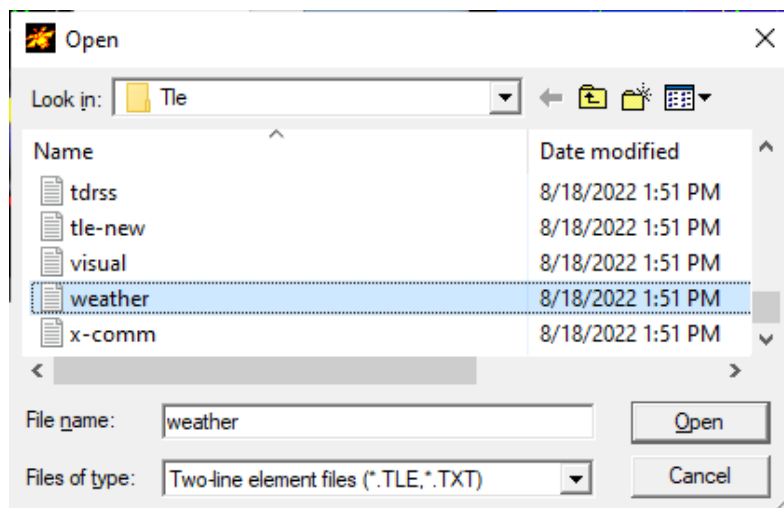
- ➢ Scroll down in the list and select weather.txt in the list and click open
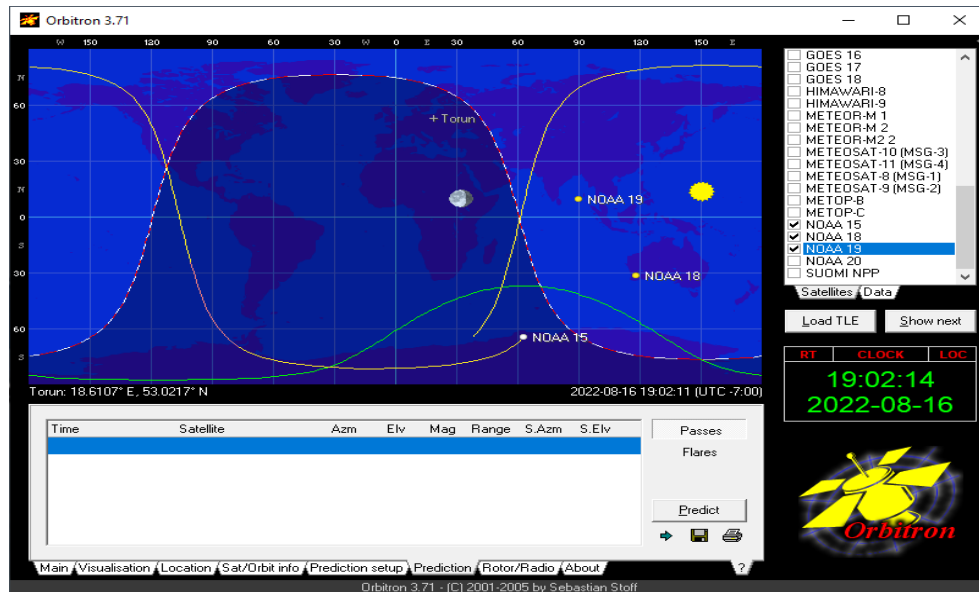
- ➢ Scroll down in the Satellites list and check the box next to each of the following
    - ○ NOAA 15
    - ○ NOAA 18
    - ○ NOAA 19

- ➢ You should see the three satellite being tracked on the map now
- ➢ Click on the Prediction tab in Orbitron
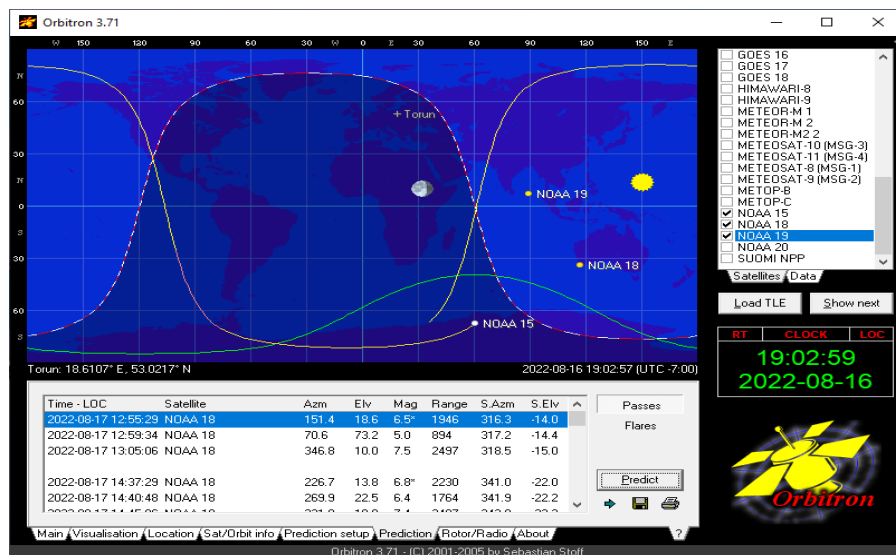
- ➢ Click on Predict
- ➢ It will populate the NOAA Satellite Pass list in Orbitron
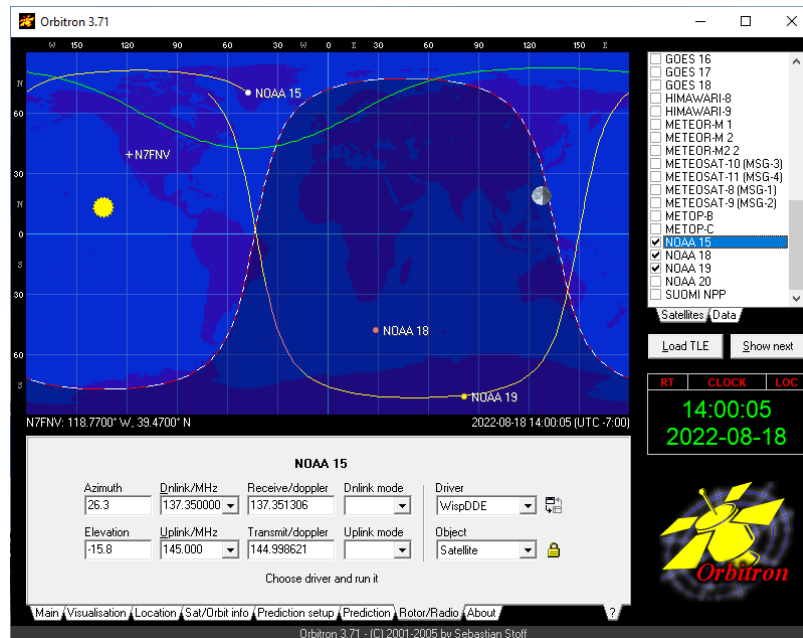
- ➢ Click on the Rotor/Radio tab in Orbitron
- ➢ Double click on NOAA 15 in the right hand satellite list to populate. Do this for each of the following Satellites.

Make the following changes to each of the three satellite:

NOAA 15

Change the DnLink/MHz to **137.620000**

Change the DnLink mode to **FM-W**

Change the Driver to **SDRSharp**

NOAA 18

Change the DnLink/MHz to **137.912500**

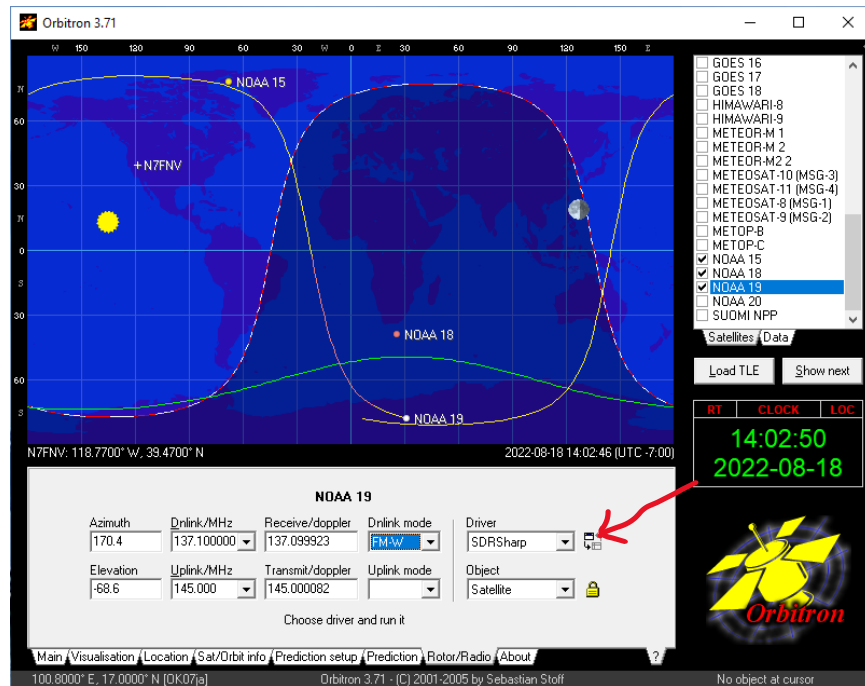Change the DnLink mode to **FM-W**

Change the Driver to **SDRSharp**

NOAA 19

Change the DnLink/MHz to **137.100000**

Change the DnLink mode to **FM-W**

Change the Driver to **SDRSharp**

➢ To send data to SDR# Sharp, click on the enable button like the image above

NOTE:: You will not have to enable this as we have Orbitron set to enable this when a satellite is within range of your location.
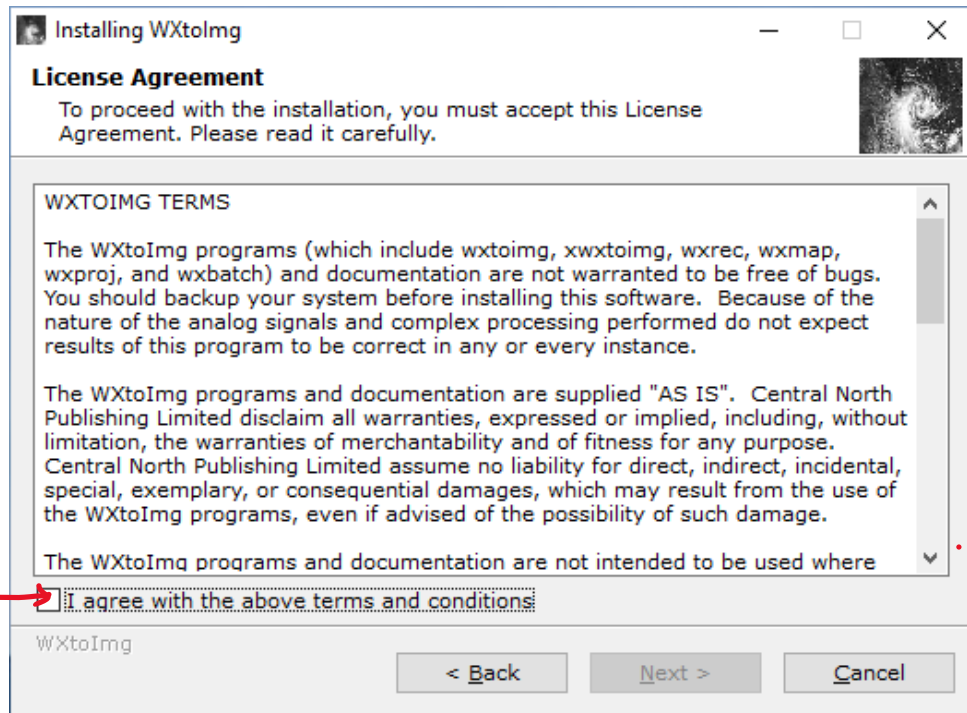
Chapter 4 – Audio Decoding Software
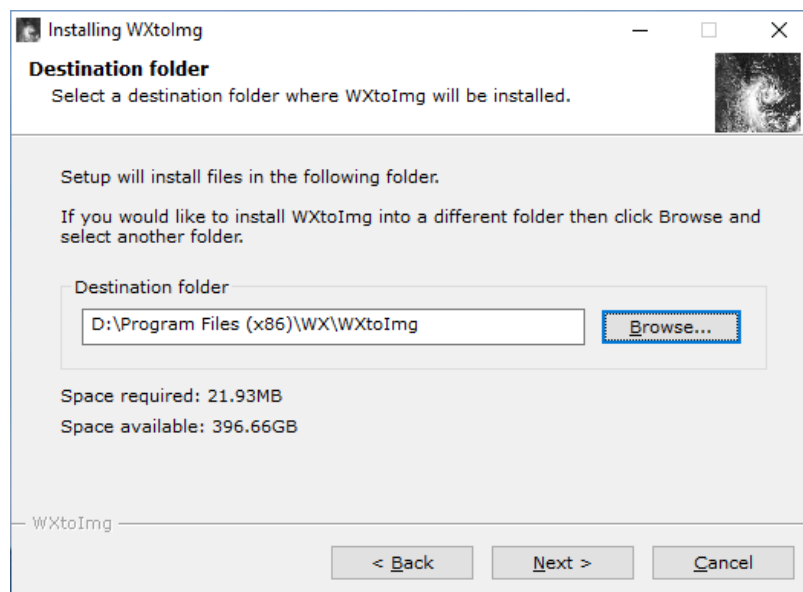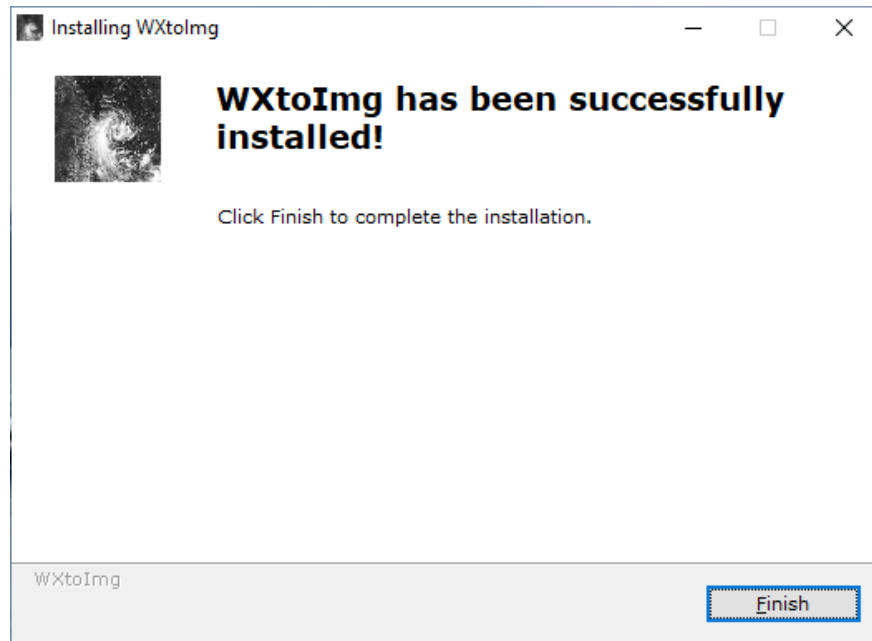
WxtoImg v2.11.2 Beta

WxtoImg Installation

➢ Install **wxinst21102-beta.exe**
➢ Click Next

> Click the "I agree" button and click next

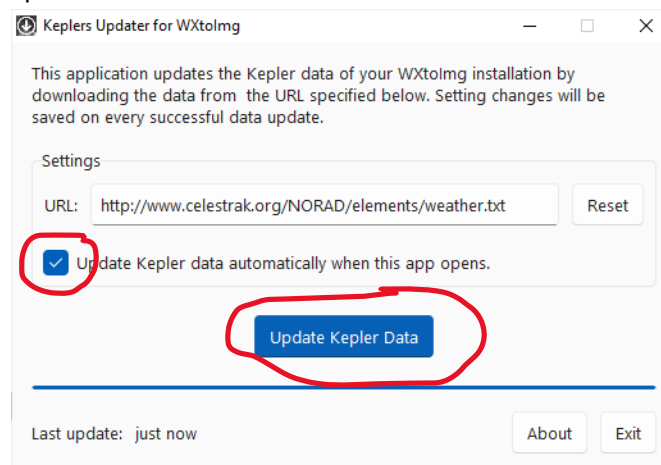> Choose the install folder and click next

➢ Click Finish to close the installer
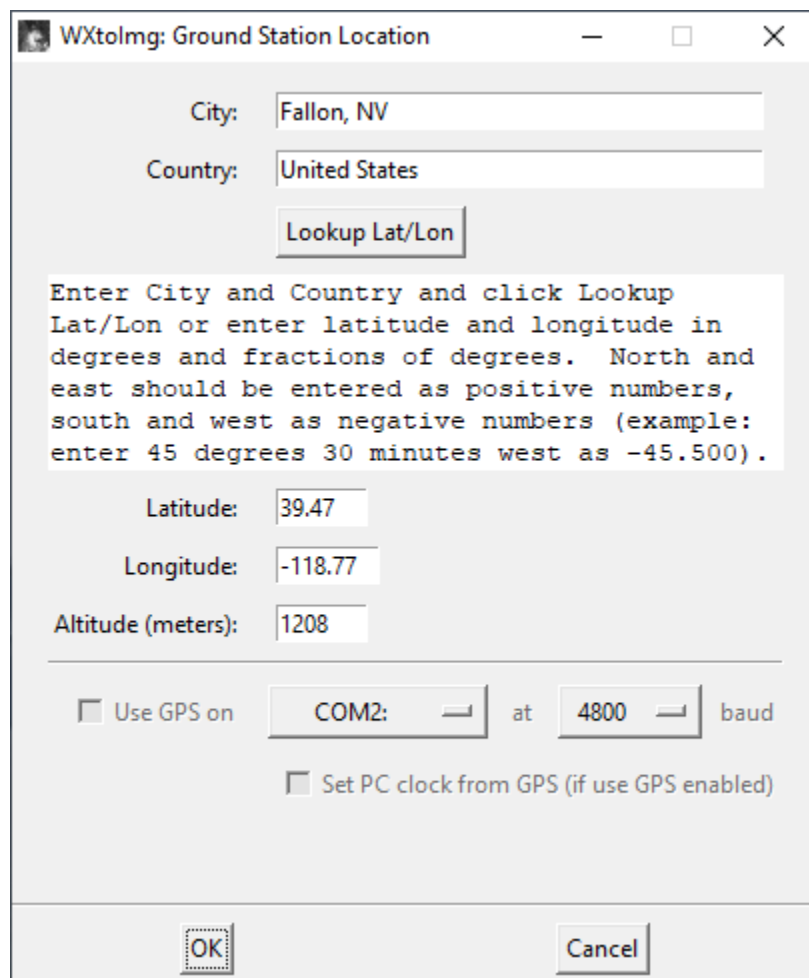
Keplers-Updater

Keplers-Updater Installation

➢ Copy Keplers-Updater.exe into your WXtoImg installation folder
➢ Launch Keplers-Updater

➢ Put the check mark in Update Kepler data automatically and click Update Kepler Data
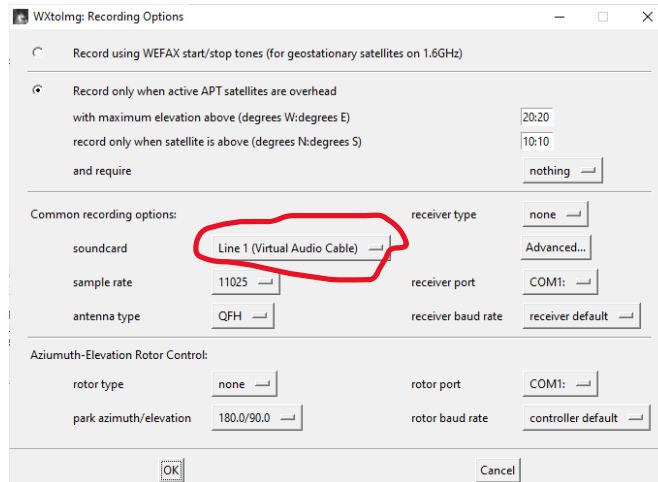➢ Click Exit to Close Keplers-Updater
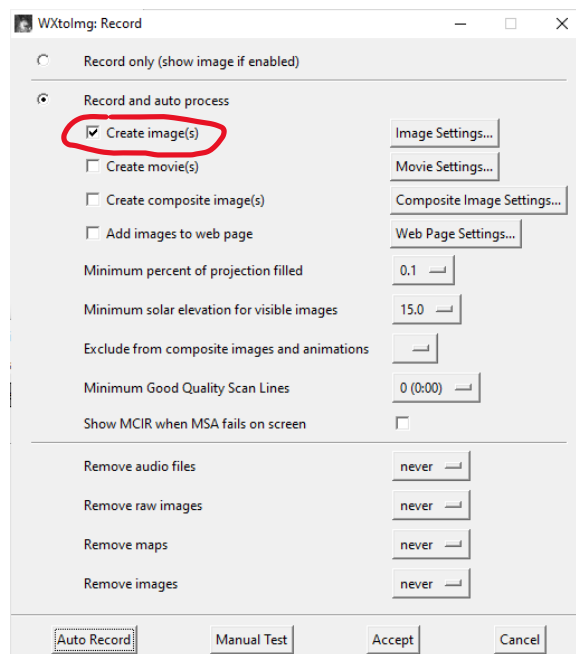
WXtoImg Setup and Config

➢ Launch WxtoImg

➢ Edit the Station Location settings to your location and Lat/Long
➢ Input your Altitude (in meters)
➢ Click OK
➢ Close the Calibration Window

- ➢ Click Options\Recording Options
- ➢ Verify that your soundcard is the same as what you have set in SDRSharp
- ➢ Close the recording options window

- ➢ Click File\Record
- ➢ Put a check mark in Create Image(s)
- ➢ Click Accept to close window

We have successfully installed and configured your system to receive and decode images from the NOAA Satellites. At this point, just make sure that the following are running at the same time:

Orbitron
SDR Sharp
WxtoImg

They can be started in any order. Now you can make some coffee and sit back and let the software do all the work.

There are many adjustments that you can play with that suits you best. Since we all have a variety of obstacles between us and the satellites for example, trees, buildings, hills, mountains, etc., I am unable to tell you what is going to work best.

The following was the latest pass I received while writing this guide with the same installation instruction I have laid out for you.
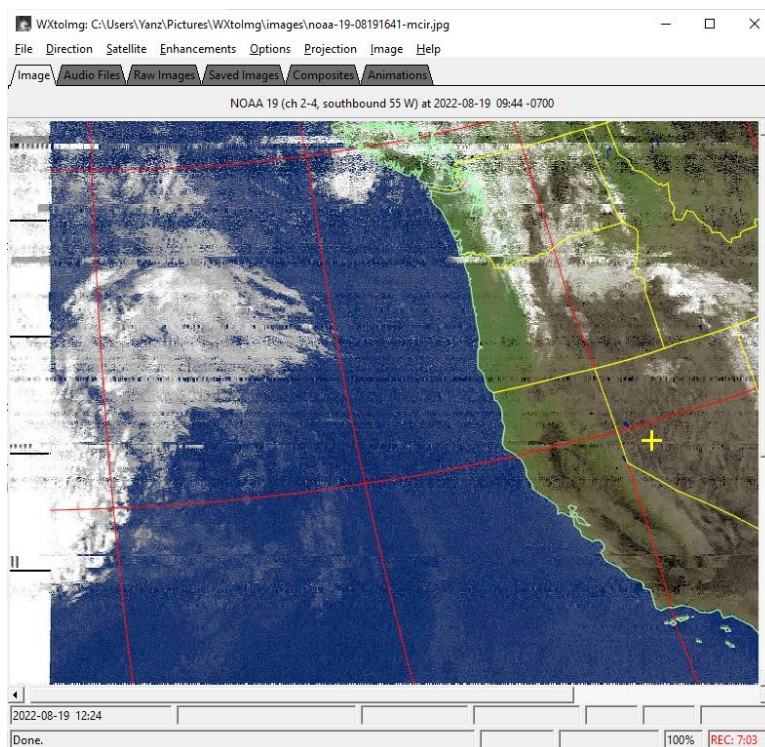
Chapter 5 – Additional Information

WxtoImg Upgrade Key Info

2018 Professional Edition Upgrade Key

Full Name: Kevin Schuchmann

Email Address: Enter your email address

Upgrade Key: CGHZ-PP9G-EAJZ-AWKK-NDNX

Chapter 6 – Additional/Optional Software

GPredict

Another Satellite Tracking Program

Gpredict - Browse /Gpredict at SourceForge.net

Virtual Audio Cable Driver Pack 43

Another Virtual Audio Cable

https://download.vb-audio.com/Download_CABLE/VBCABLE_Driver_Pack43.zip

SDRSharp Supported Plugins

A variety of supported plugins to use with SDRSharp

List of SDRSharp Plugins (rtl-sdr.com)

Chapter 7 – Frequently Asked Questions

Additional Adjustments

Adjusting Gain