V3.08

DATV-Easy

User Manual

DATV-Easy V3

DATV-Easy

## DATV broadcast from a PC with a LimeSDR mini or Adalm Pluto
Thanks for their great help with the development to all the beta testers and ON1RC et F5OEO

Prerequisites :

➢ A LimeSDR mini SDR with the latest Firmware (note the PortsDown dvb seems incompatible)
  or an Adalm Pluto with the manufacturer's original firmware
  or an Adalm Pluto with the Evariste firmware tested on 2908 0201 0303 2022 2402 and DVB2
  >>>>>>>>>>> See specific chapter for firmware PlutoDVB2 F5OEO<<<<<<<<<<<<

➢ **New support for HackRF One via USB**

➢ An INTEL PC processor minimum Core I5, core I7 recommended or recent generation AMD.

➢ **Connection to USB 3 or USB 2 with Pluto SDR LimeSDR mini and HackRF One**

➢ **Ethernet port with Pluto SDR but experimental and limited by very high transfer rates.**

➢ If NVIDIA or AMD graphics card or INTEL CPU integrating GPU processor coding is much more efficient.

Fonctions :

➢ DATV-Easy allows transmission in DVB-S, DVB-S2 and DVB-T with a Limesdr mini or Adalm-Pluto and its original firmware with a Symbol Rate (SR) between 20 Ks/s and 4000 Ks

➢ Parameterization is facilitated for beginners by default preset values.

➢ You can choose your preferred frequencies of use "Easy Button" by editing the Frequency.csv file (Modify button) Windows Notepad in C:\F1EJP (Values separated by ;)

➢ For Oscar 100 users you can choose the predefined frequencies (OSCAR-100 button) and you can change the frequency and SR with a single click with the built-in Quick Tune software !

➢ DATV-Easy uses FFMPEG with GPU processors from NVIDIA cards or recent INTEL processors to compress in H262, H264 and H265 -> **Choose your encoder carefully**.

➢ It can also code directly in soft but in this case the use is limited by the power of the processor above 333Ks or it can be saturated especially in H265 or H266.

➢ The Video and Audio source can be OBS software or vMIX or an iP stream or **webcam Logitec C920 or C922**.

➢ For audio you have the choice between MP2, AC3, MP3, OPUS, AAC which allows lower bit rates.

➢ You can control the main parameters remotely thanks to an integrated udp server (see attached file)

➢ Choose SR (Symbol Rate) and FEC (error correction) and the software comes up with optimized defaults.
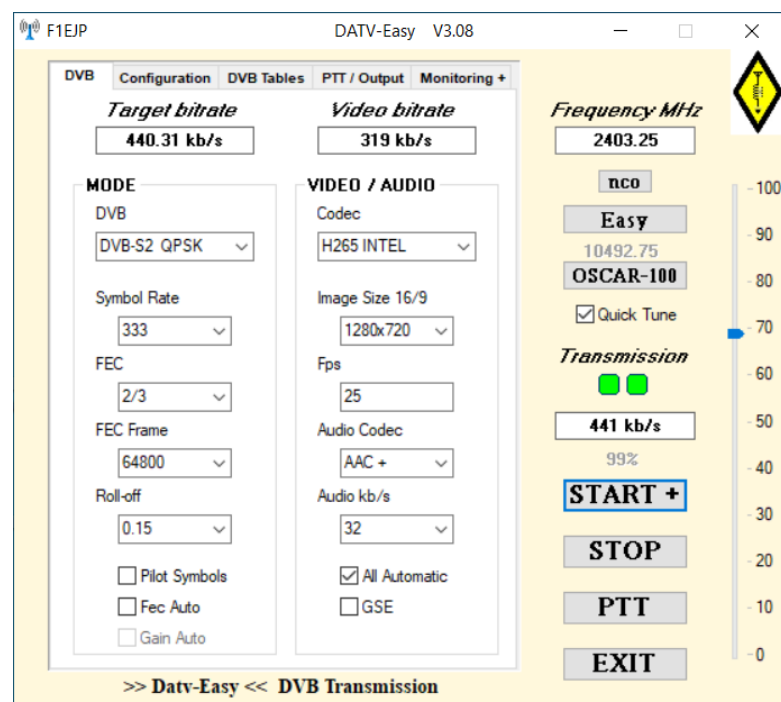
1/ If you haven't already, INSTALL OBS and the VirtualCam or vMIX plugin

> ➤ it is the best solution to stream videos from any source, camera, chart, film, etc.

https://obsproject.com/   https://www.vmix.com/

With OBS here are just the settings to apply (will be grayed out with VirtualCam started)
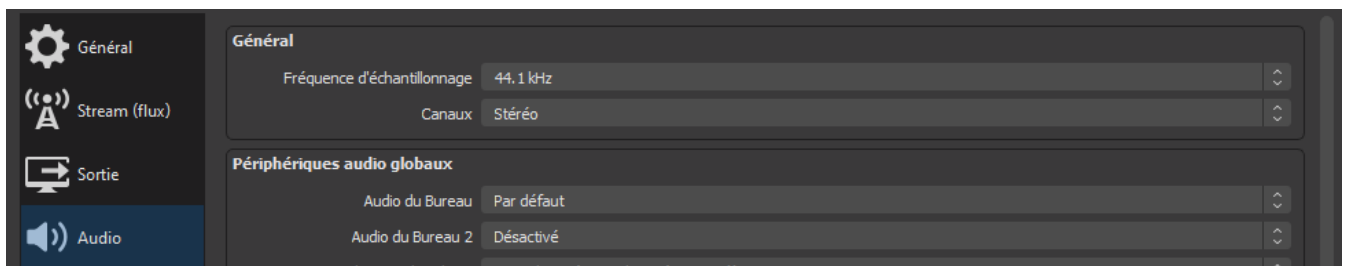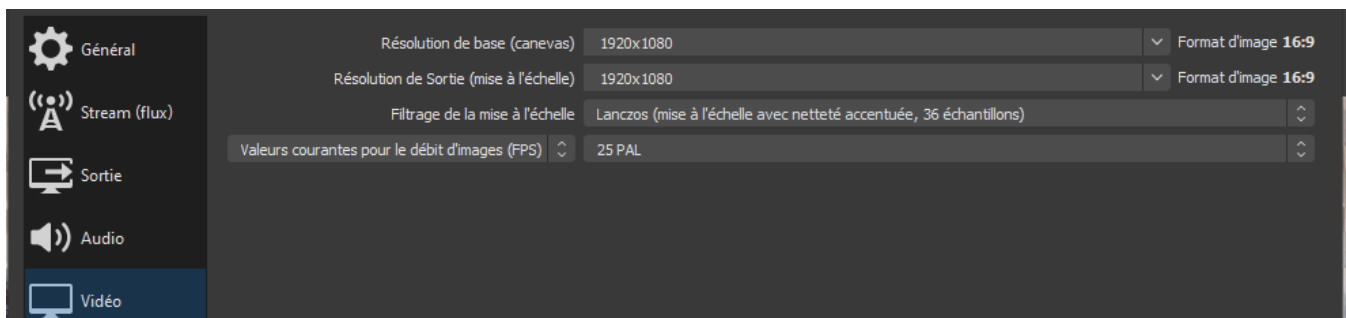
2/ For OBS Install :   VirtualCam for OBS version < 28

or DroidCam for OBS version > 28   or VB-Audio Virtual Cable

WARNING version 28 , you have to start the virtual camera integrated in OBS and only the sound is recovered by DroidCam or VB-Audio Virtual Cam.

https://obsproject.com/forum/resources/obs-virtualcam.949/

https://obsproject.com/forum/resources/droidcam-virtual-output.1580/
Install the 2 exe files

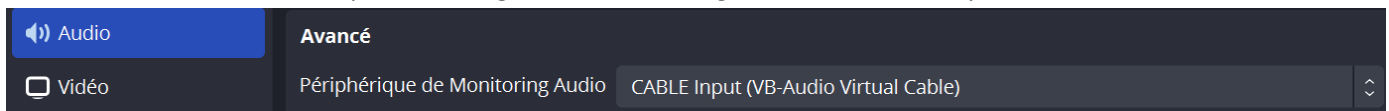⬡DroidCam.Drivers.New_0.1.0.exe

⬡DroidCam.OBSVirtualOut.Plugin.0.1.2.exe
On OBS, go to "Tools" then "Virtual Camera" or "DroidCam" and check "Start automatically"

https://vb-audio.com/Cable/index.htm
With VB-Audio Virtual Cable you have to go to OBS in settings > Audio and modify:

Then go to Edit > Advanced Audio Properties and in Audio Monitoring select Monitoring and output for all outputs
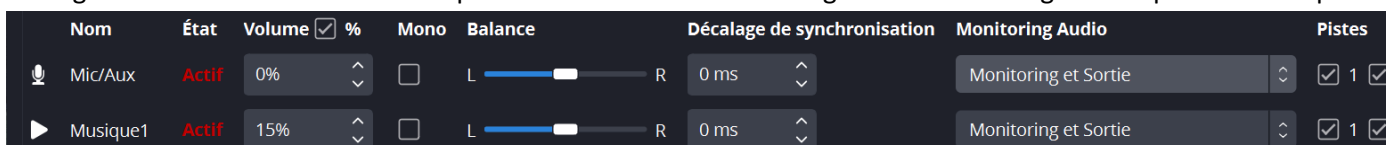
Google is my friend for the latest versions and installation explanations.

3/ Installation and Configuration DATV-Easy

➤ **Install drivers LIMESDR or PlutoSDR or HackRF One (see Driver folder provided)**

LimeSDR-Mini driver installation - Myriad-RF Wiki (myriadrf.org)

For the Pluto SDR you have the shortcuts to install everything by connecting with your browser on the Pluto connected by USB on 192.168.2.1 or https://wiki.analog.com/university/tools/pluto/drivers/windows

ATTENTION Adalm-Pluto can be used with the manufacturer's original firmware either via USB or with a USB 3 / Ethernet Gigabit converter. (experimental and less reliable)

Adalm-Pluto can be used with firmware from F5OEO 0201 or 0303 (addition of DVB-T) and higher

With this firmware you must install the libraries libiio-0.24.gc4498c2-Windows-setup.exe zip include.

SetupF1EJP-DATV-Easy-V3.xx.exe **<<< ALWAYS UNSTALL OLD VERSIONS BEFORE**

`Attention` >> During installation and on the first launch your antivirus can block several times, you will have to accept and put exclusions if necessary because it is not a virus .

Go to the "Configuration" tab»   Choice of SDR   Transmit Power and limitation

OBS autostart if selected in Enter

Default Frame rate at 15 25 or 30 frames / second

GOP setting

Audio / Video synchronization + / -

If using Arduino

Choose support for encoding
(NVIDIA or AMD card or processor or software)
and speed or quality for each encoder

Audio Sampling Rate

Fill in the IP for the Pluto the port and number
On F5OEO firmware on Exit switch to mode
passthrough and/or reboot

Choose the source: Webcam, OBS, vMIX software or coded IP stream (enter the input IP address and the port) or a Logitec C920 or C922 WebCam

4/ Connection Ethernet with Pluto and settings :

CAUTION THIS MODE IS EXPERIMENTAL AND DOES NOT WORK AT HIGH RATES
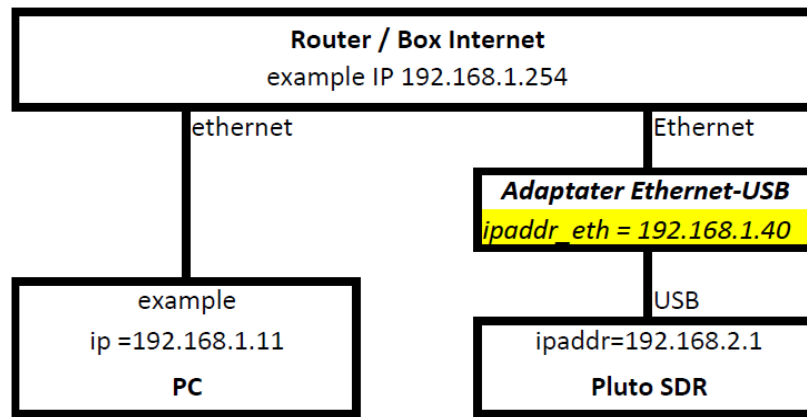
The PlutoSDR once connected as in the diagram, should automatically have an IP address given by your network router (router, internet box).

It is preferable to have a fixed IP address, which does not change.

So you have to modify the file which is in the root directory of the PlutoSDR player in the file *config.txt*

> ➢ Open the *config.txt*
> ➢ After the line *[USB_ETHERNET]*, modify the IP address by indicating a free IP address of your network. There are network analyzer software that allow you to list all the equipment connected to your network

The Pluto will have this fixed IP address on the next restart, in the example 192.168.1.40 to put in DATV-Easy > Pluto SDR IP

Do not modify the NETWORK section address but that of the USB_ETHERNET section.

```
[NETWORK]
hostname = pluto
ipaddr = 192.168.2.1
ipaddr_host = 192.168.2.10
netmask = 255.255.255.0

[WLAN]
ssid_wlan =
pwd_wlan =
ipaddr_wlan =

[USB_ETHERNET]
ipaddr_eth = 192.168.1.40
netmask_eth = 255.255.255.0
gateway_eth = 192.168.0.254
```

You will find on the Internet and other OM methods for installing new firmware
https://wiki.analog.com/university/tools/pluto/users/firmware

Use with PlutoDVB2 F5OEO firmware

After installing the latest Evariste F5OEO firmware here:
https://github.com/F5OEO/plutosdr-fw/releases

Be careful with certain USB/Ethernet converters that worked with old firmware, this does not always work (no communication, this happened to me) It is recommended to use those tested by Evariste:
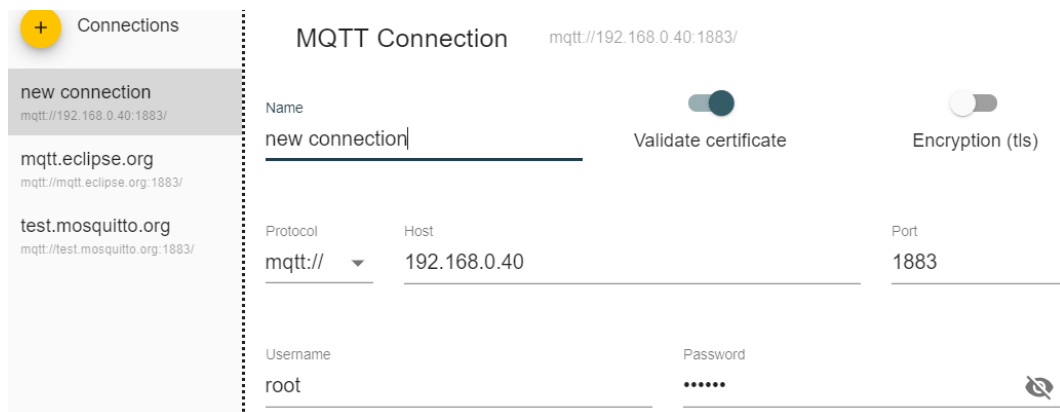https://www.amazon.fr/dp/B07K1PSVG5?psc=1&ref=ppx_yo2ov_dt_b_product_details
https://www.amazon.fr/dp/B0871ZHCKK?psc=1&ref=ppx_yo2ov_dt_b_product_details

To test communication Install: MQTT-Explorer-0.4.0-beta1.exe **IP Pluto username and password**
https://github.com/thomasnordquist/MQTT-Explorer/releases > Click on "Assets"
Choose the latest version MQTT-Explorer-xxx-.exe

When you get a call with Pluto : In DATV-Easy
      1. Select the right equipment in the "PlutoDVB2 F5OEO" configuration tab
      2. Enter your code on the "DVB Tables" tab AND validate with the "Enter" key
      3. You must have the Reboot >>>>>>> message
Your callsign should appear on mqtt Explorer:
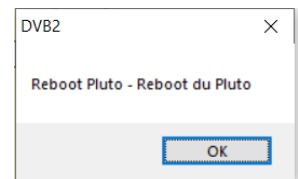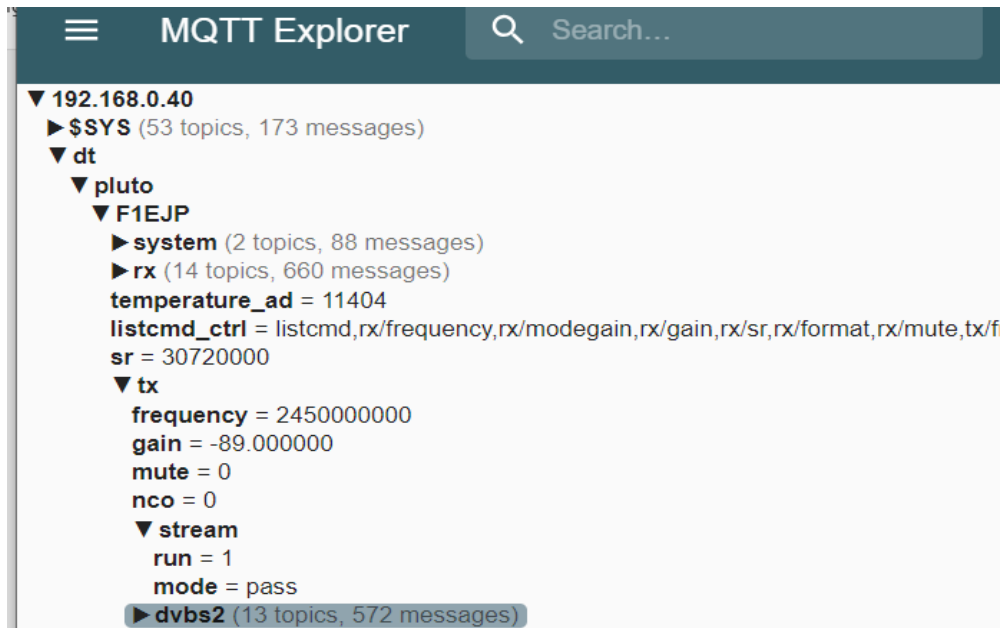
You are ready to use DATV-Easy!
In the event of a problem, manually reboot the Pluto.

5/ PTT commands

- If you have entered the correct Pluto SDR IP (default USB 192.168.2.1) you can order the double PTT switching board for Adalm Pluto SDR described by the very good article by F5UII :

  https://www.f5uii.net/actualites/dual-ptt-switching-board-for-adalm-pluto-sdr/
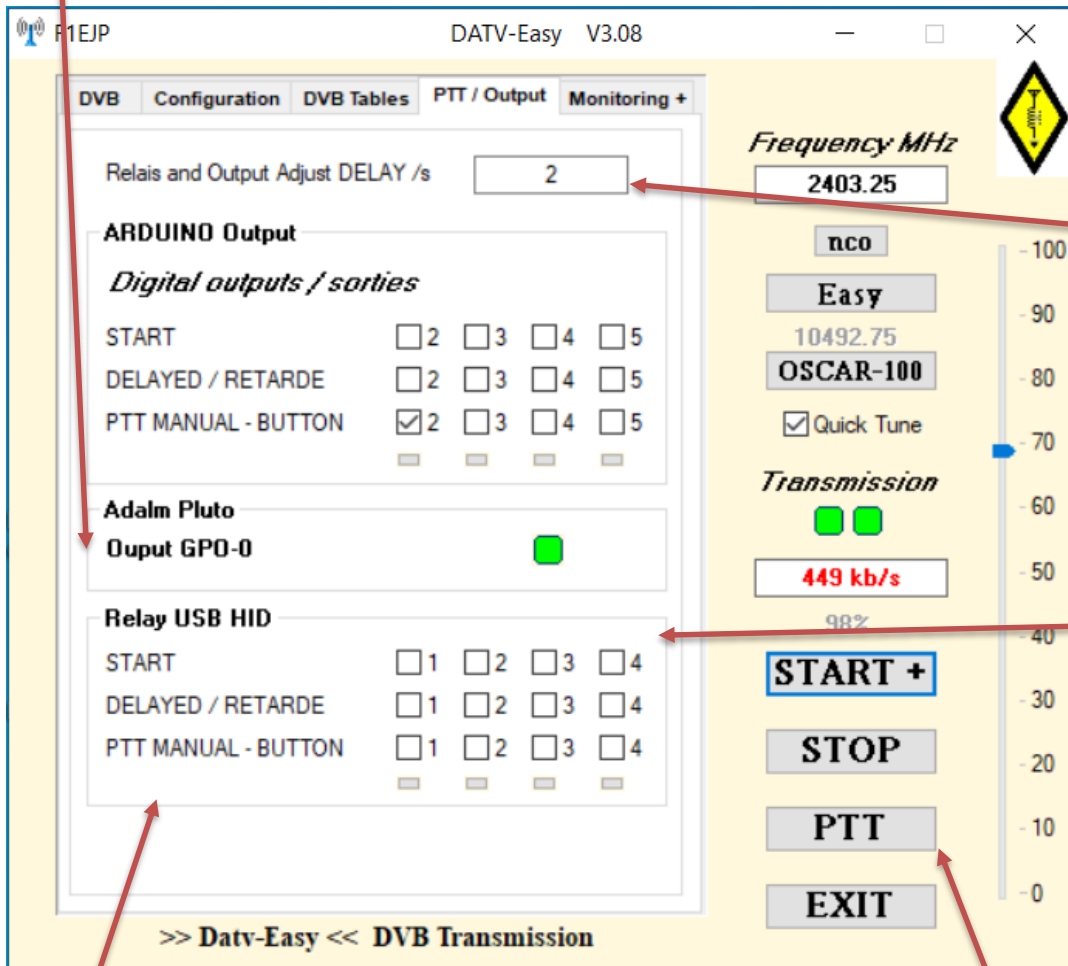
To control the power supplies of your amplifiers without or with delay or manually to avoid calibration peaks: You can change the delay to ADJUST DELAY

You can use **USB HID relays without the need to install any driver**. Found on Ebay or Amazon for 7 to 17 €

6/ Monitoring

Checking this box allows you to view the ffmpeg executable window to see if there is a coding problem

Device used.
On Firmware PlutoDVB2 displays the model, version, temperature of the Analog Device chip and the video buffer.

Additional window displayed when the option is checked
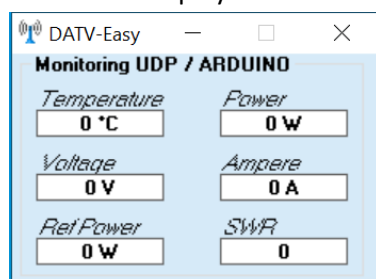
> If like many OM you have an ARDUINO UNO with a SHIELD Ethernet card and a relay card:
> - o You can monitor several values of your amplifiers with the analog inputs.
> - o You can control Digital outputs 2 to 5 with a relay card for your amplifiers.

Many tutorials are on the Internet to use the ARDUINO UNO but once the ADUINO program is installed you just have to inject the provided program UDP_DATV_Easy.ino

By default the IP of the ARDUINO is in the VLAN 192.168.0.x address 192.168.0.230 if your network is different you must change the IP address in the program of the ARDUINO and in the file C:\F1EJP\ param.ini
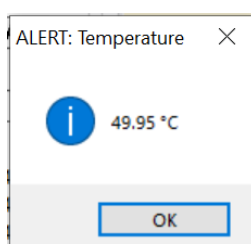

For analog inputs A0 to A4 the measured value goes from 0 V to 5 V you can adjust their end of scale (gain) and the offset in the C:\F1EJP\param.ini file :
- Input A0 corresponds to the temperature ((Offset_Temp and Range_Temp)
- Input A1 corresponds to measured watts > **squared measured voltage** ((Offset_Temp and Range_Temp)
- Input A2 corresponds to the voltage of the Amplifier ((Offset_Volt and Range_Volt)
- Input A3 corresponds to the intensity ((Offset_Amp and Range_Amp)
- Input A4 is reflected watts > **squared measured voltage** ((Offset_RWatt and Range_RWatt)

Many OM articles describe power and reflected power measurement solutions.

http://www.vivadatv.org/viewtopic.php?f=87&t=698&hilit=arduino
http://f6kcz.free.fr/Technique/Telemesures/Telemesures.htm

You can remove the squaring of the 2 power measurements in the C:\F1EJP\param.ini file : - SquaredValue=1 by = 0

You can also set a safety threshold on the temperature which will switch off all the relays in the file param.ini : - TempMax=45

7/ Optional

Go to the "DVB Table" tab   Fill in your callsign and provider

>> Datv-Easy << DVB Transmission

Optional:

If necessary, enter the Identifications (PID, SID) of the different DVB streams, otherwise leave as default Audio, Video stream etc.

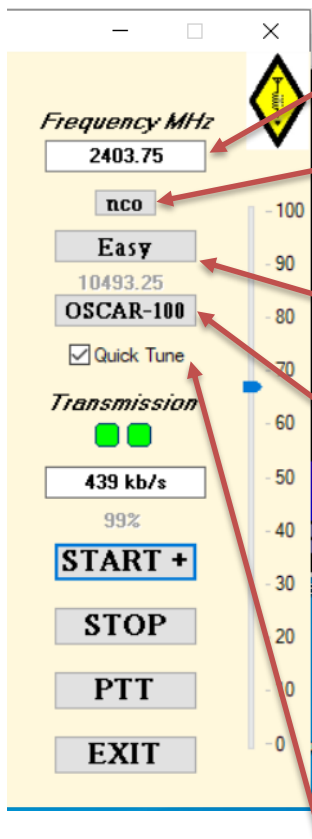Please note the PCR PID takes the value of the video PID

Avoid modifying these values without specific need and without knowing the usefulness.

Setting the maximum PCR / PTS multiplexing delay (buffering)
A delay that is too short causes dropouts and too long increases coding latency.

The periodic table values are automatic based on the parameters chosen on the first tab or can be modified manually

8/ Utilisation DATV-Easy

Tap or choose your frequency with the buttons.

nco: fine tuning (in real time on Pluto with PlutoDVB2 firmware)

Easy :
Modify frequencies with the modify button
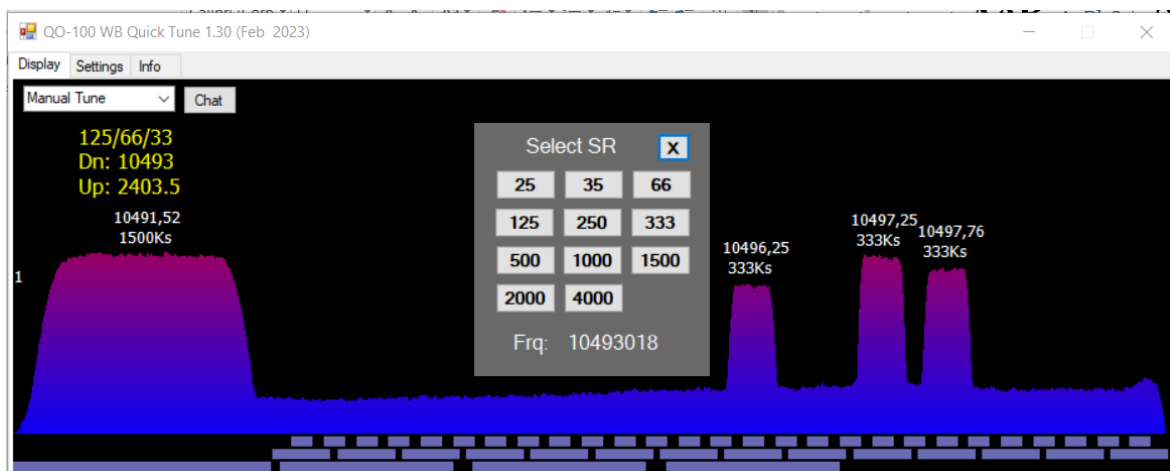
OSCAR100
Frequency choice compared to SR

By checking the Quick Tune software opens: A right click above or on a small slot selects the frequency and opens the SR selection window. (Do not click on a large slot because of error message)

In the Settings tab click on "Add Receiver" and configure on the "WinterHill" tab an IP at 127.0.0.1 and port 9920 (you can choose other parameters under [Commands_UDP] in the file C:\F1EJP\param.ini)
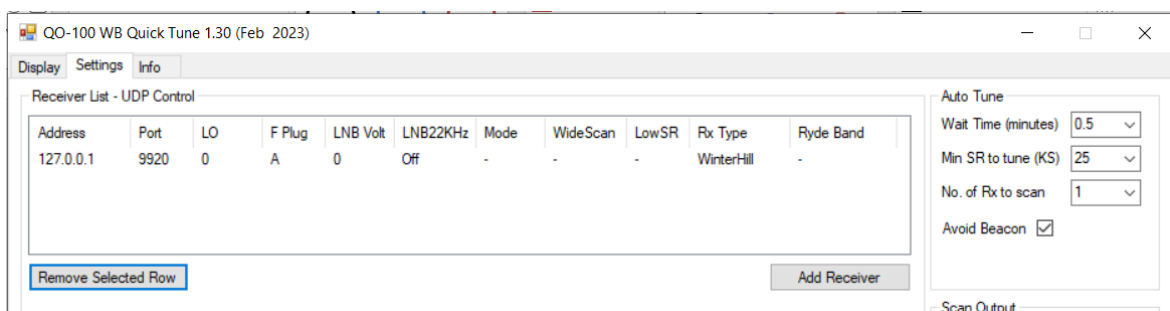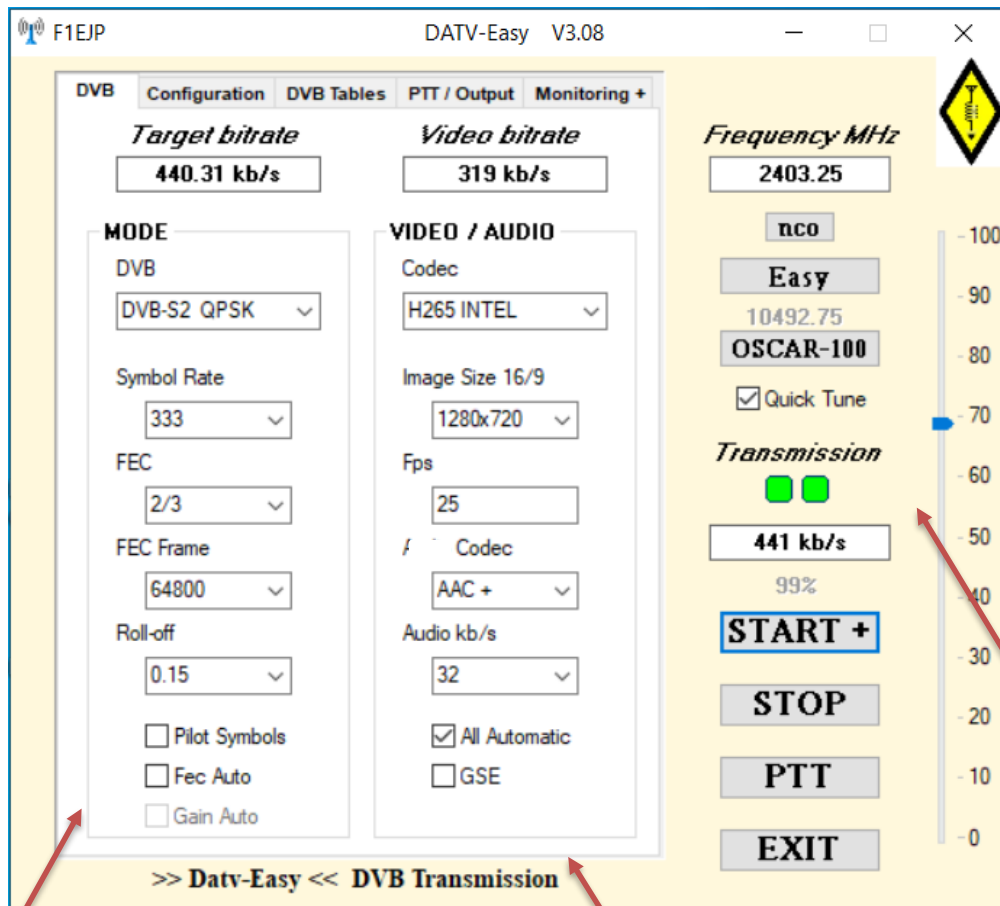
First choose the type of DVB modulation
Choose Symbol Rate or Bandwidth and FEC
Error Correction and or Guardfactor.

In DVBS2 the calculated bit rate also takes
into account the parameters chosen in
transmission for the FEC Frame and Pilots
Symbol
In DVBT the calculated bit rate takes into
account the bandwidth of the FEC and the
GuardFactor

PlutoDVB2 firmware allows you to
experience variable FEC and GSE MODE
with an MPEGTS or AVI stream
In the file C:\F1EJP\plutodvb2.ini you can
modify the Fec Minimum of DVB-S2 and
the Fec Range in Fec Auto mode.

Choose Video encoding:
 H264 or H265 or H262(mpeg2) or
 H266 in experimental software.
 AV1 to test in GSE mode
(AV1 hard coding not tested)
Choose Audio coding:
MP2, AC3, MP3, OPUS, AAC..

The image resolution, audio bitrate
and frame rate are offered by default
depending on the DVB settings and
the type of encoder used.
  ➤ You can change them but if
     the settings are too high
     ffmpeg may no longer get the
     right bitrate and crash.

The left LED displays the
correct operation of the SDR
and its driver
The light on the right is that
of ffmpeg.

The display shows you the
actual bitrate output from the
encoder. It turns red if too
high and 0 if there is a coding
problem.
The % is the encoding speed
and must be > 99

The slider allows you to
adjust the power during
transmission.

  ➤ Launch OBS or vMIX or the IP stream then click on **START+** to start the broadcast (delay 12 seconds)
  ➤ After modifying the parameters, pressing **START+** again applies the new parameters
  ➤ **STOP** to stop, **EXIT** to quit the software
  ➤ **PTT** allows to manually control a relay for an amplifier or a power supply

Thank you for all your suggestions and test feedback. 😜👍 73 Dominique F1EJP