

DATV – Start here !

DATV Digital Amateur TV

HB9DUG Michel

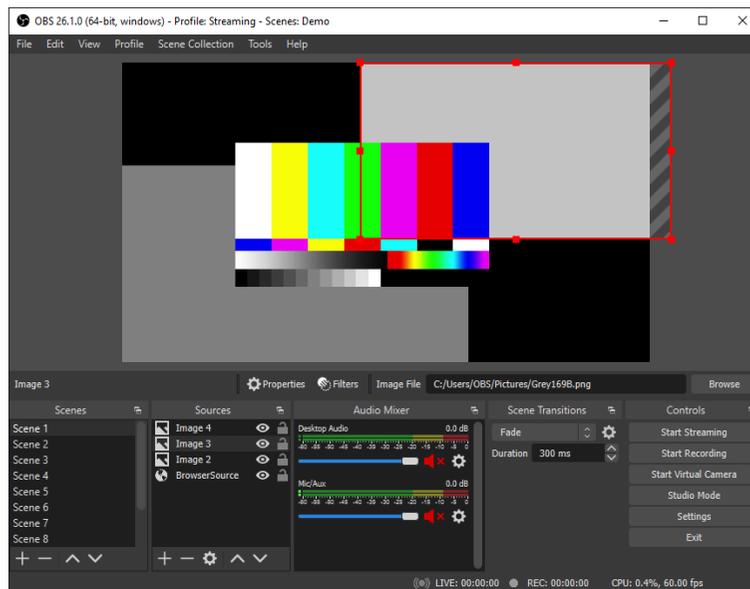
October 22, 2022

The key components a DATV station

- Video and Audio Source
- Hardware to run the DATV software
- Software Defined Radio hardware
- Optional output, PTT switching, PA control
- ~~Amplifier, transverter~~

Video and Audio Source

- Logitech C920
- EasyCap video capture device
- Raspberry Pi Camera
- OBS Studio



Before buying, check supported hardware, especially for Portsdown 4

Hardware to run DATV software

- PC or Laptop
 - Windows, linux and MacOS
 - processors: the bigger the better especially if video software coding
 - GPU, provides hardware accelerated H.264/H.265 encoding/decoding, a must
 - Raspberry PI 4 Model B
 - hardware accelerated H.264 encoding/decoding. H.265 decoding
- + Raspberry PI 7" Touchscreen



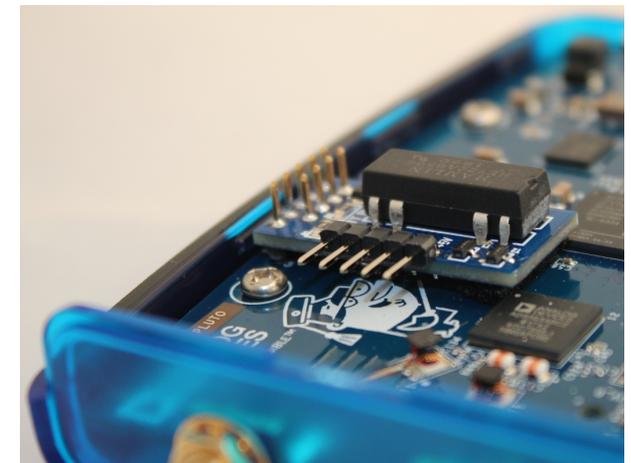
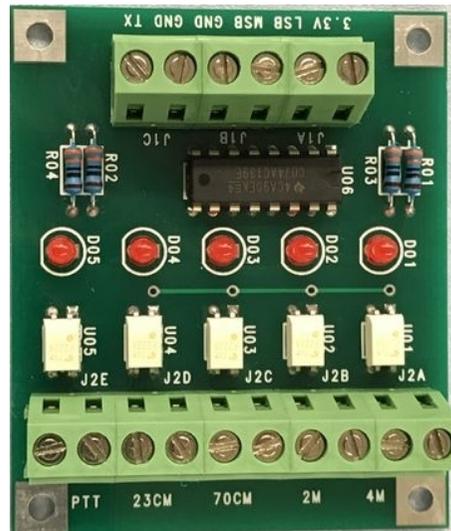
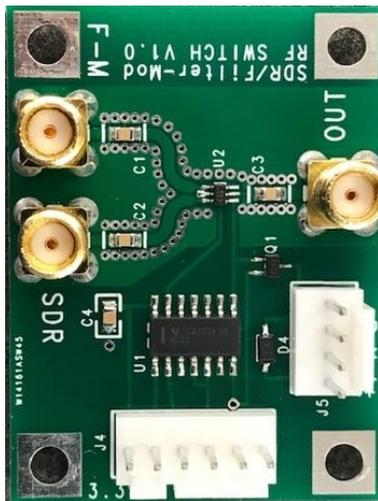
Software Defined Radio hardware

- LimeSDR Mini
 - 100 kHz – 3.8 GHz, 1 RX et 1 TX channel
- ADALM-PLUTO
 - 325 MHz - 3.8 GHz, (70 MHz - 6 GHz), 1 RX et 1 TX channel
- USB RTL-SDR and Airspy dongles
 - receive only
- MiniTioner
 - USB DVB S/S2 hardware tuner
 - different flavours supplied by REF, BATC and DATV-Express



Optional output, PTT switching, PA control

- BATC RF switch and PTT modules
- PTT modules for ADALM-PLUTO from F5UII and Minikits
- USB relays, ARDINO UNO + SHIELD Ethernet solution from F1EJP



DATV – Start here ...

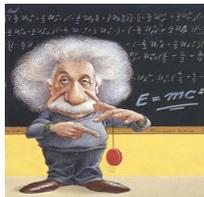
But it depends of your goal



I want to try DATV at the lowest price



I want a turnkey solution



I want to be at the front end of the technology



I want to try DATV at the lowest price



Receive only : DVB-S2 Demod GUI



The software developed by Marcel Kröner

- Windows OS + RTL-SDR (or Airspy, LimeSDR Mini, Adalm-Pluto)
- <https://forum.amsat-dl.org/index.php?thread/101-software-dvb-s-demodulator>



libairspy | AirSpy MINI v1.0.0-rc10-0-g946184a 2016-09-19 | SERIAL: 334503083363498507

Lo Freq: 11030 MHz
Hi Freq: 11880 MHz
1280,007 MHz

Baseband Processing
Standard: DVB-S1 DVB-S2
Bandwidth: 6000000
FFT Size: 2048
FFT Intens.: [Slider]
BB Gain: [Slider]
Spectrum: Inverted
RF Filter:

Timing Recovery
sym_rate: 500 ks
Gain (Kp): 1/64
Damping (Kj): 1/65536

Carrier Recovery
 Enabled
Loop Gain (Kp): 2
Loop Damping (Kj): 0.03125

Equalizer
Constant Modulus Algorithm
 Update Coeff. Show
Taps: 16
Gain μ : 0.000045

Recording / Network
MPEG-TS (188) File
127.0.0.1 8888 UDP

IQ Plot

Signal Info
Symbolrate: 504.574 ksym/s
Bandwidth: 681.175 KHz
Modcode: 8PSK 3/4
Pilot symbols: off
Frame type: long
Rolloff: 0.35

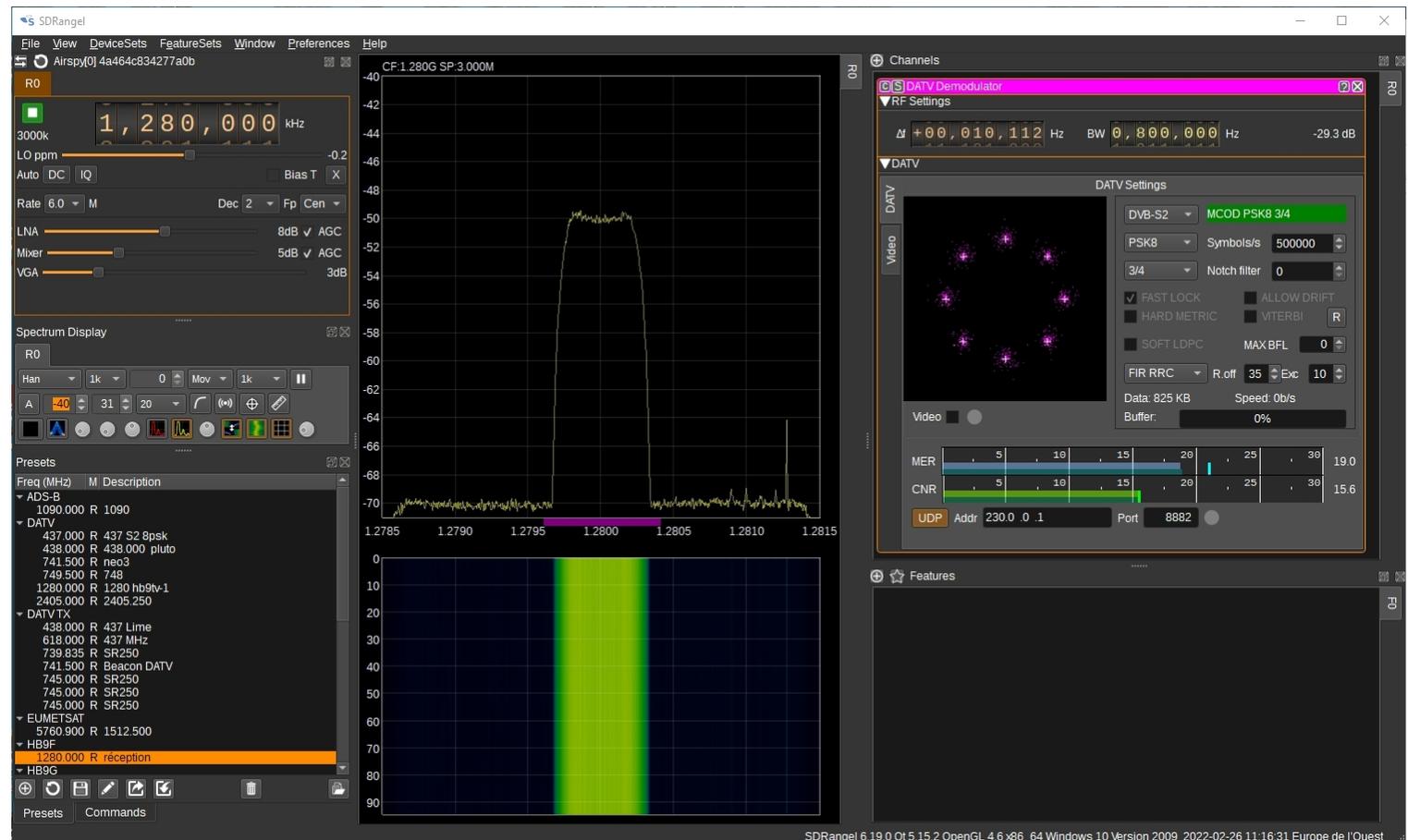
sync_confidence: 32
Buffers: 1 / 32768

Receive only : SDRangel



The software developed by Edouard F4EXB

- Windows OS / linux + RTL-SDR (or Airspy, LimeSDR Mini, Adalm-Pluto)
- <https://www.sdrangel.org>





I want a turnkey solution



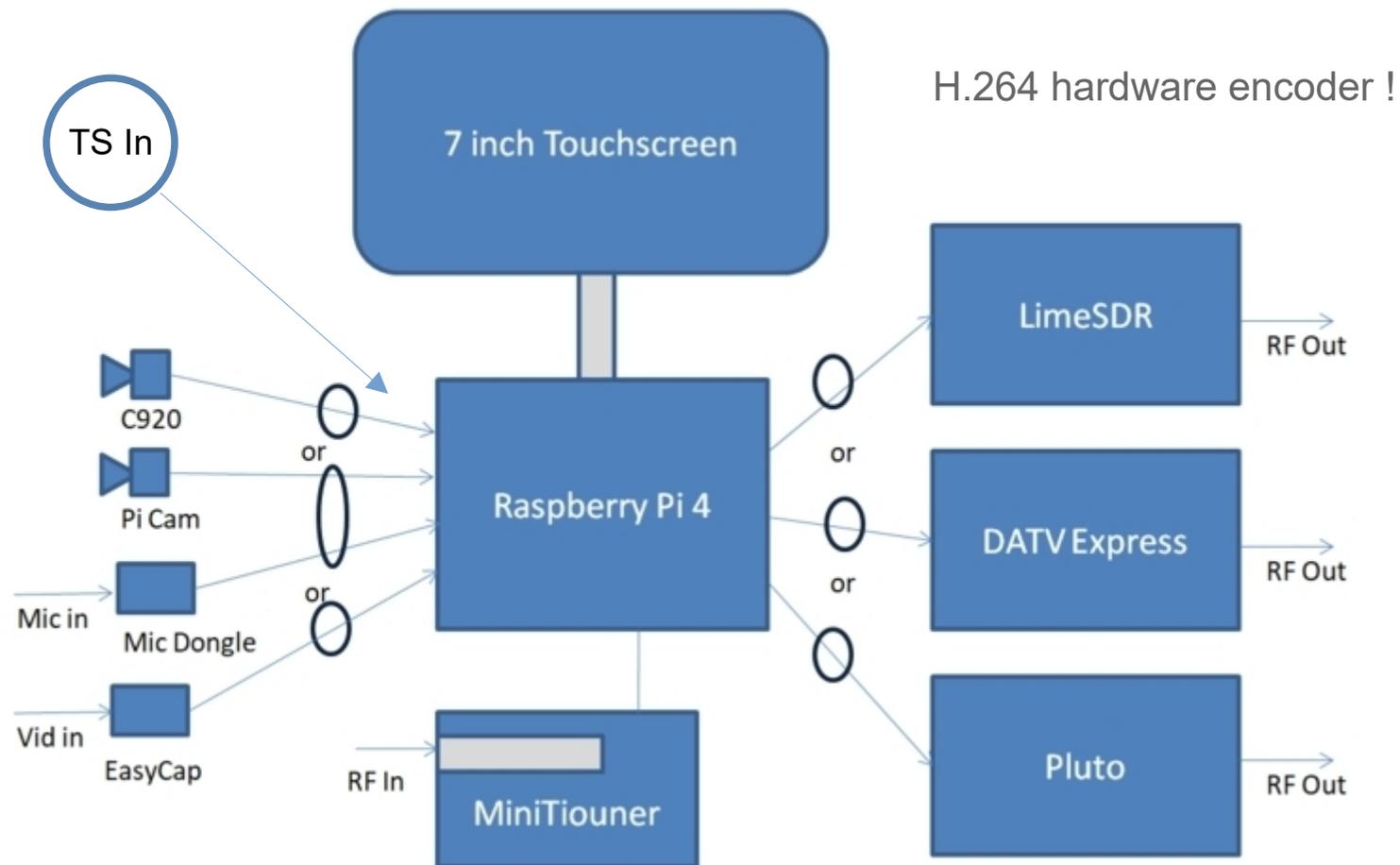
Portsdown 4 DATV transceiver



System developed by the BATC – Dave G8GKQ

based on prototypes from Jean-Pierre F6DZP and Evariste F5OEO

- https://wiki.batc.org.uk/Portsdown_4



Portsdown 4 DATV transceiver

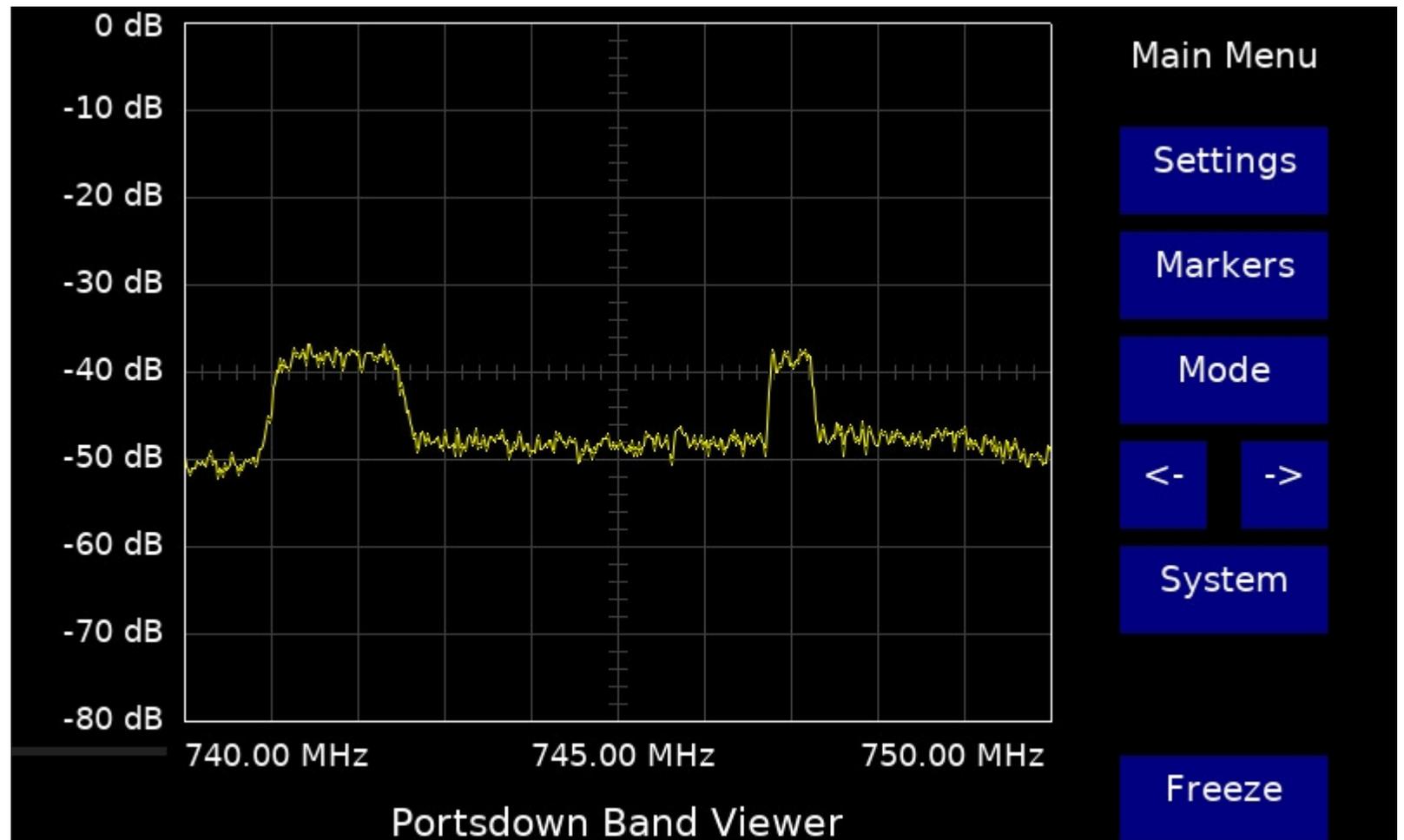


Portsdown 4 DATV transceiver



Band Viewer

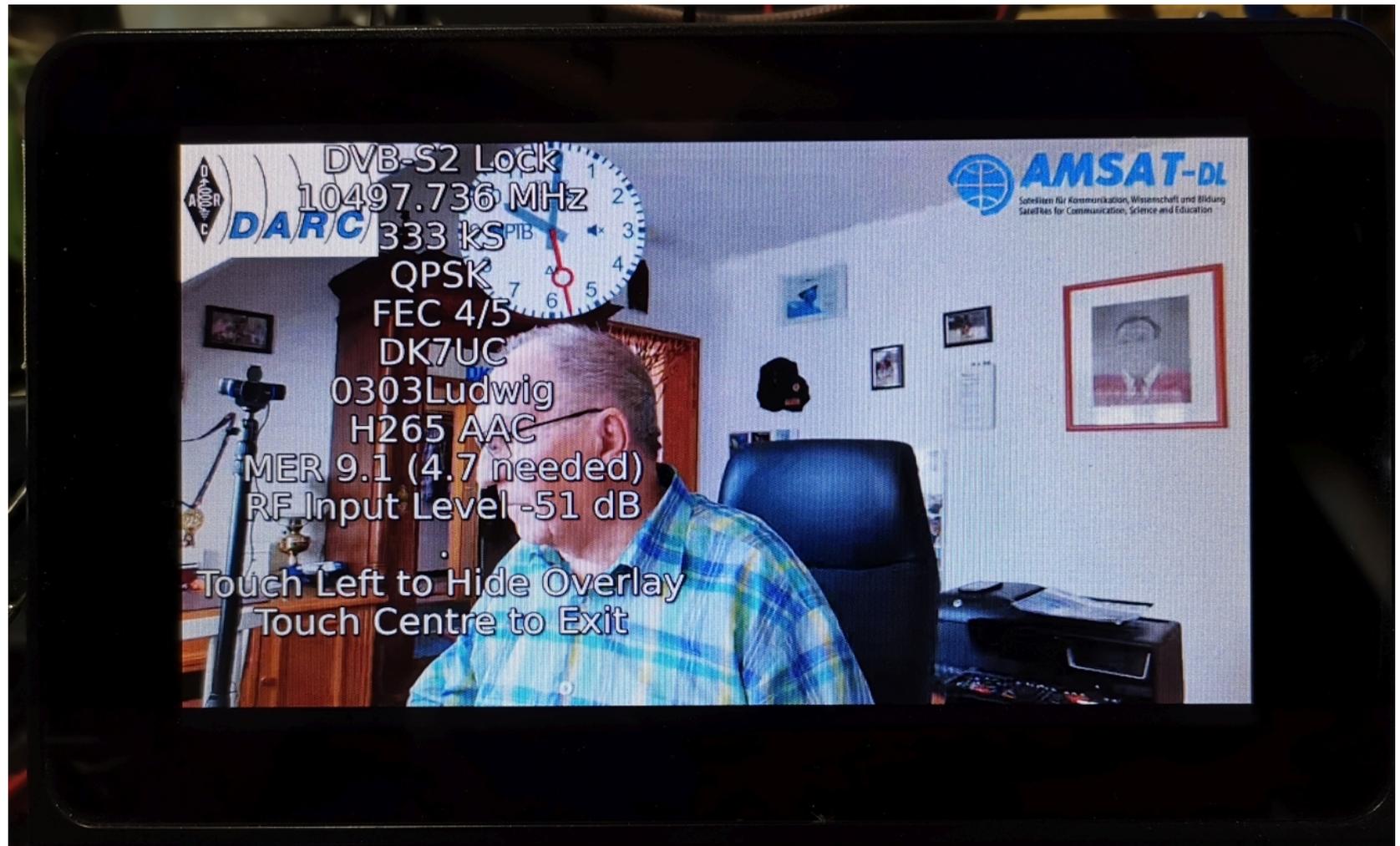
run using the receiving section of a LimeSDR Mini, Airspy R2 or RTL-SDR



Portsdown 4 DATV transceiver



DVB S/S2 Receiver
with a MiniTiouner hardware



PlutoDVB DATV transmitter

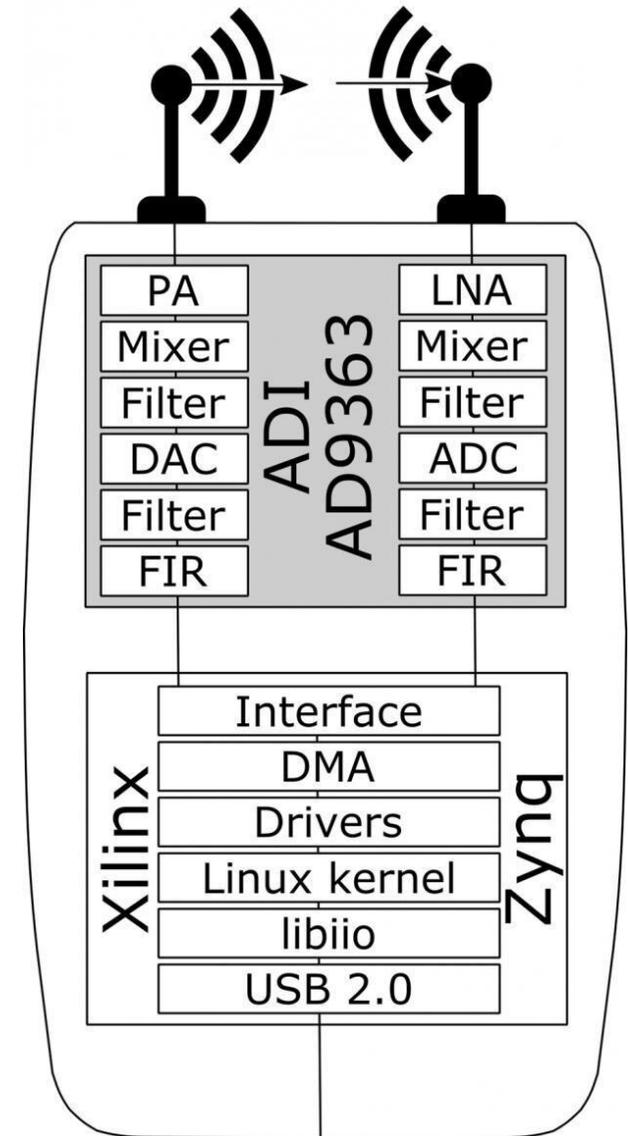


The software developed by Evariste F5OEO

- Run on an Adalm-Pluto SDR
- <https://www.f5uui.net/en/patch-plutodvb/?o=2110>

Video & audio input from :

- a RTMP stream on port 7272
- a Transport Stream on port 8282



PlutoDVB DATV transmitter



Web interface Controller

Analysis

Documentation

QO-100 WB Bandplan

Firmware version : 0201

F50EO:

ADALM-PLUTO DATV Controller

Thanks Rob M0DTS for help. Mods by G4EML for codec selection and sound enable

Mods by Chris [F5UII.net](#) version *UII2.4*: [Details](#)

Mods by Roberto IS0GRB (Save SpectrumView button state, Show how much patch.zip inserted (August 29th, 2020))

QO-100 Spectrum Setup Help

To display the QO-100 spectrum, enable the display on the Setup tab.

PTT (F10)
Apply mod. settings (F9)

Switch ON

STANDBY
43:21:59

18.4°C - 15.9°C

Modulator

+ Add modulator

Main

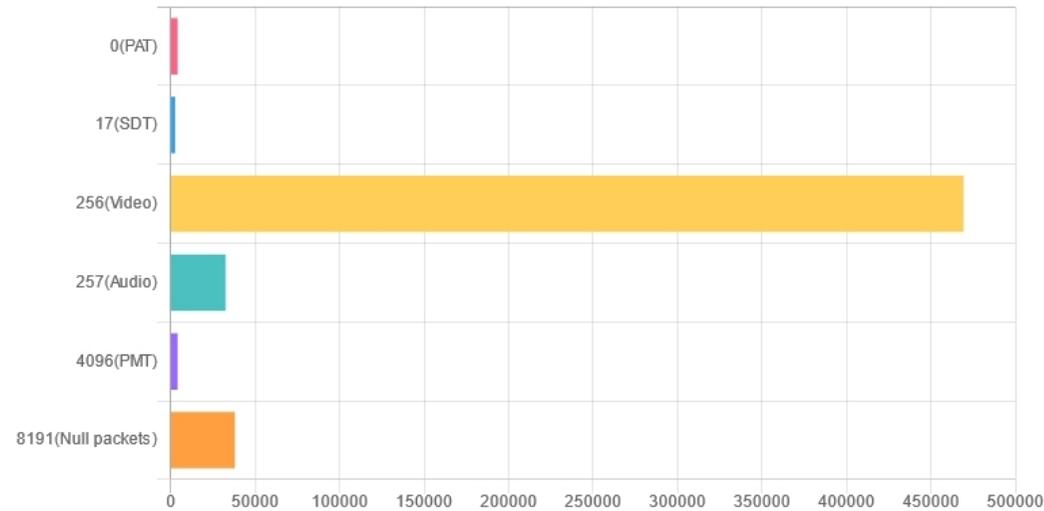
| | | | |
|------------------------------|--------------------------------------|---|---|
| Power (0.1 dB steps) | <input type="range" value="-6.8dB"/> | | |
| Callsign(DVB Program Name) | <input type="text" value="HB9DUG"/> | DVB Provider Name <small>(output: FwVer_ProvName)</small> | <input type="text" value="_HB9DUG"/> (max 15 chrs) |
| PCR/PTS | <input type="range" value="1000ms"/> | PAT period | <input type="range" value="500ms"/> |
| Freq-Manual (70 MHz - 6 GHz) | <input type="text" value="441.75"/> | Freq-Channel <small>(SR channel Uplink / Downlink)</small> | <input type="text" value="333KS14 (2409.75 / 10499.25)"/> |



PlutoDVB DATV transmitter



Web interface Analysis



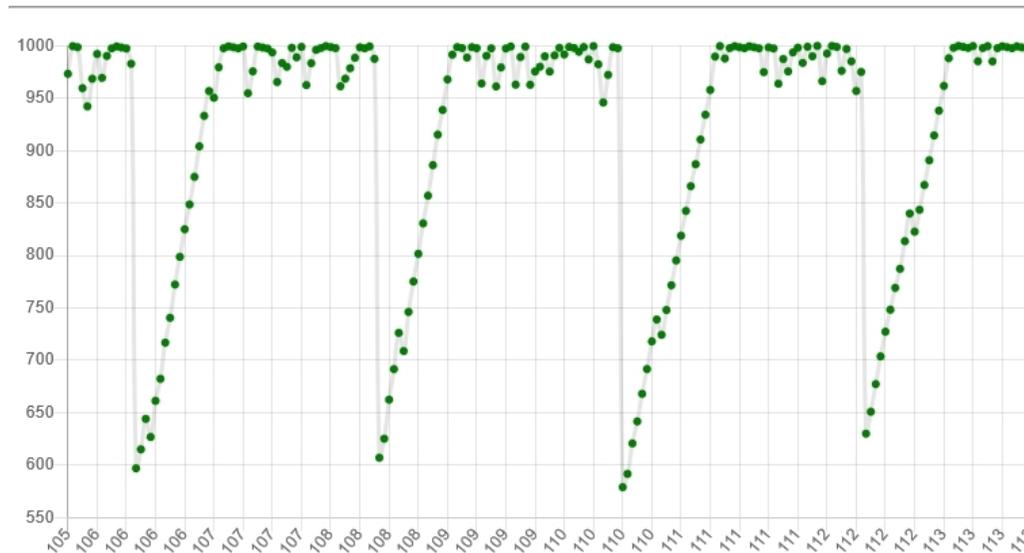
Null packets among 550 998
kbits/s of total data

- Instantaneous : 6.6 %
- average over 5s : 12.9 %
- average over 1 min : 10.8 %

Distribution



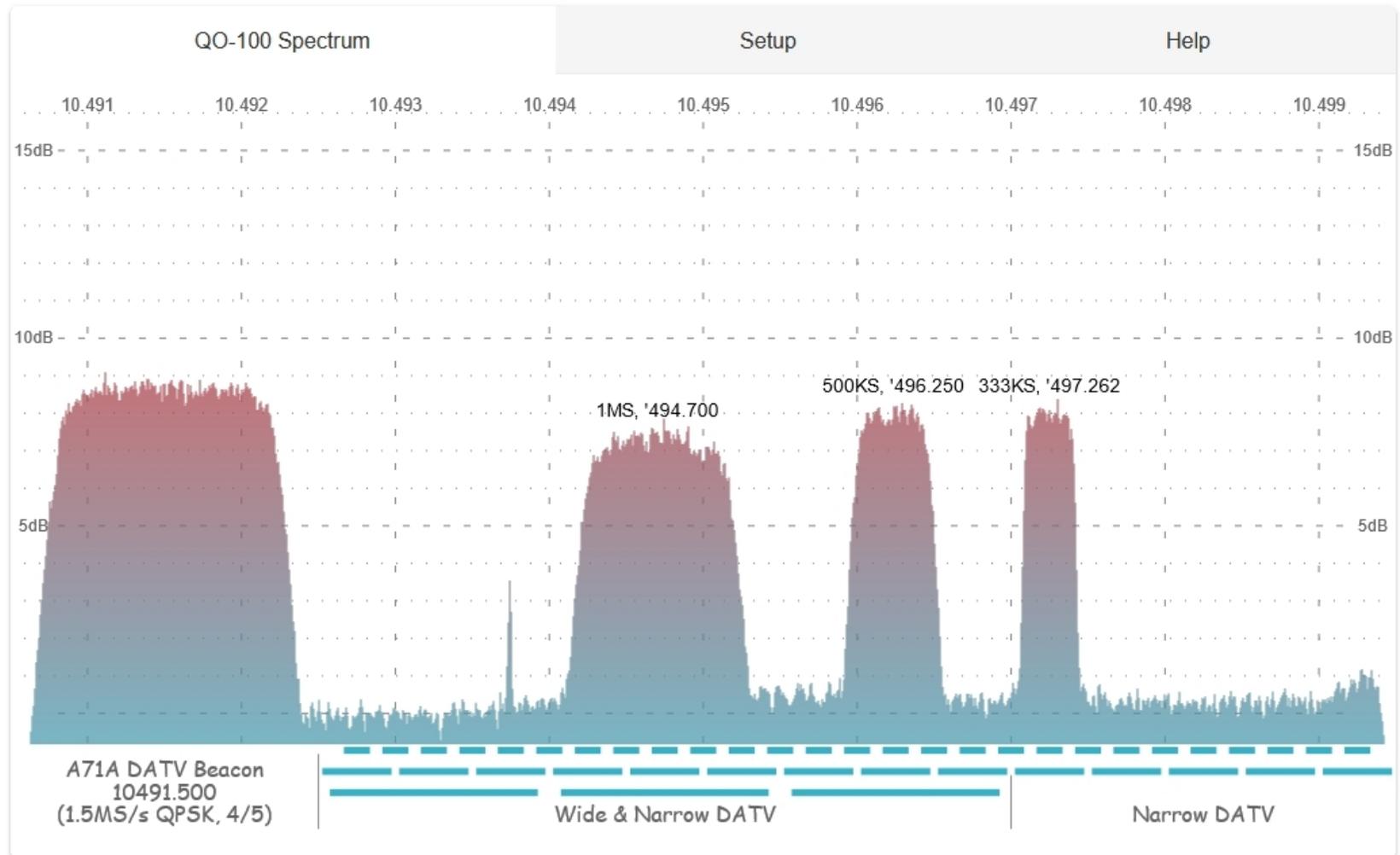
Video buffer analysis



PlutoDVB DATV transmitter



Spectrum
dedicated to QO-100



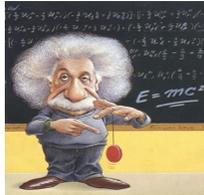
Reception – MiniTioune + MiniTiouner hardware

Windows software developed by Jean Pierre F6DZP for the Minitiouner

- <http://vivadatv.org>

The screenshot displays the MiniTioune v1.0.1.1c software interface, which is a receiver/analyser for DVB-S/S2 signals. The interface is divided into several functional areas:

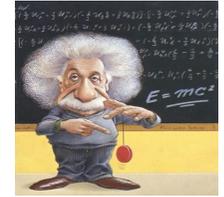
- Top Left:** Control panel for SR (Symbol Rate) and Freq (Frequency). SR is set to 00500 kS and Freq to 01280000 kHz. It includes an Offset control and a list of SR options (SR1500 to SR8000).
- Top Center:** MiniTiounerPro V1 status, NIM: Serit FTS-4334L, ppm calibr 41.07 (e), and a digital display showing 18 19 38.
- Top Right:** PID configuration section with buttons for 'Pid from .ini', 'Auto PID', and 'RaspberryP'. It shows video and audio PIDs (00256, 00257) and AAC.
- Middle Left:** DEROTATOR section with Symbolrate mode (fixed/scan), SR set (500061S), Deviation (-28S), and SR (500 kS/s). It includes a Derotator Search button and Carrier Width (675 Khz) information.
- Middle Center:** Frequency section showing 'Freq asked: 1280000kHz' and 'Freq -> 1279995 kHz'. It features a spectrum plot and a 'Copy Freq found' button.
- Middle Right:** TS (Transport Stream) analysis section with a large plot showing '1 112,963kb/s' and '1 114,062kb/s'. It includes a 'reset TS' button.
- Bottom Left:** A video window showing a live feed of a man in a radio shack.
- Bottom Center:** Payload Diagram for HB9DUG, a pie chart showing: Video 73.1%, Null Packet 22.7%, Audio 3.1%, and Overhead 1.1%.
- Bottom Right:** Program information for HB9DUG, including TS IP (230.0.0.10:10000), dimensions, and decoder settings.
- Bottom:** A row of gauges for LNA gain (13.0dB), Carrier Lock, SR Lock, RF Power (-71dBm), C/N MER (27.0dB), and Constellations. It also includes BCH errors (0), LDPC (0%), FEC 8PSK 3/4_L35, C/N needed (8.6 dB), and TS statistics (Null Packets: 22.7%, Video: 814kb/s 73.1%, Audio: 35kb/s 3.1%, data rcvd: 1 107.1kb/s_v, TSbitrate: 1 114.003kb/s).



I want to be at the front end of the technology

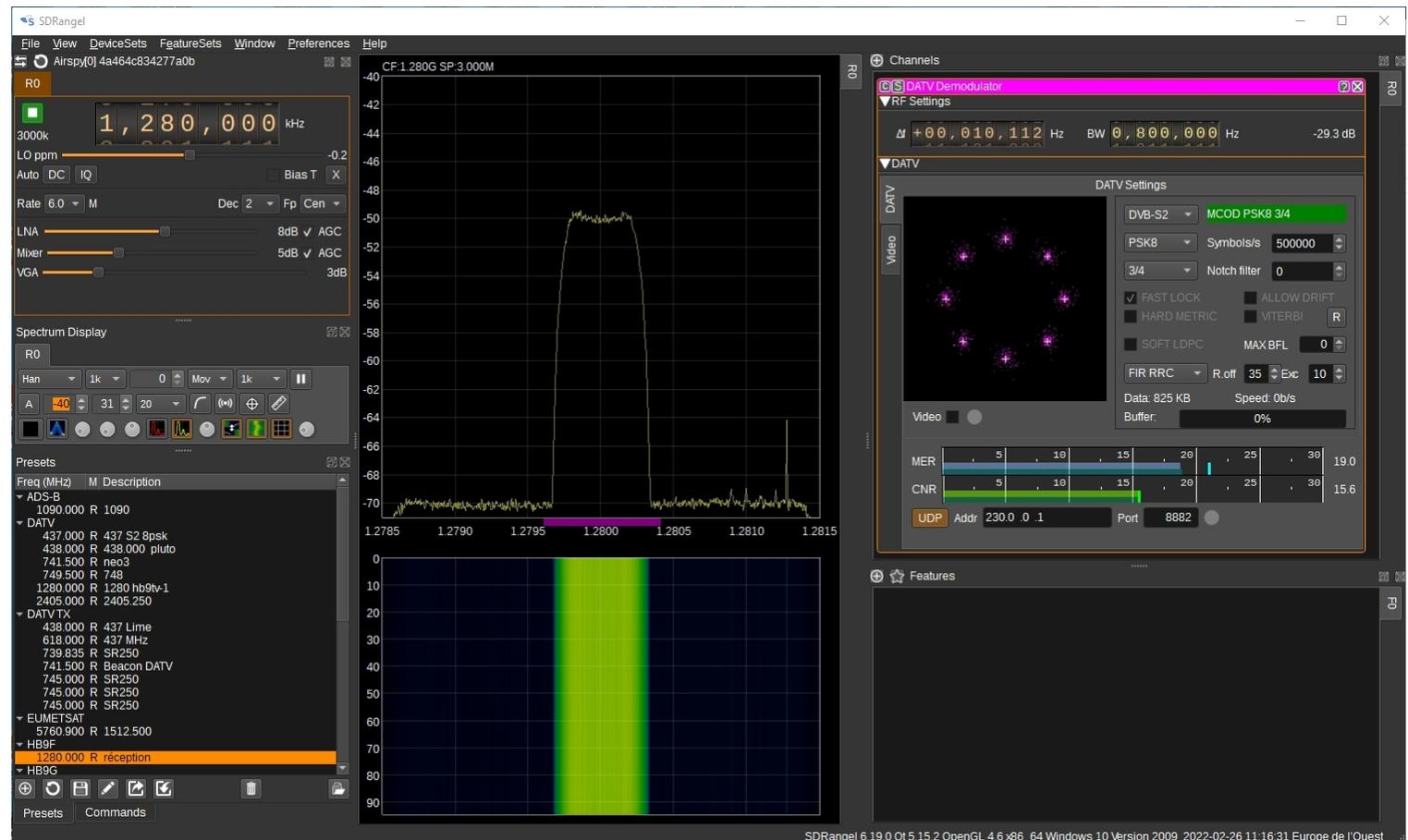


SDRangel

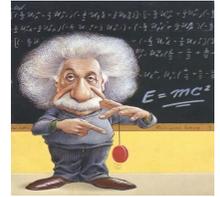


The software developed by Edouard F4EXB

- Full duplex rx/tx with linux OS, Windows and MacOS + LimeSDR Mini, Ettus B200
- <https://www.sdrangel.org>

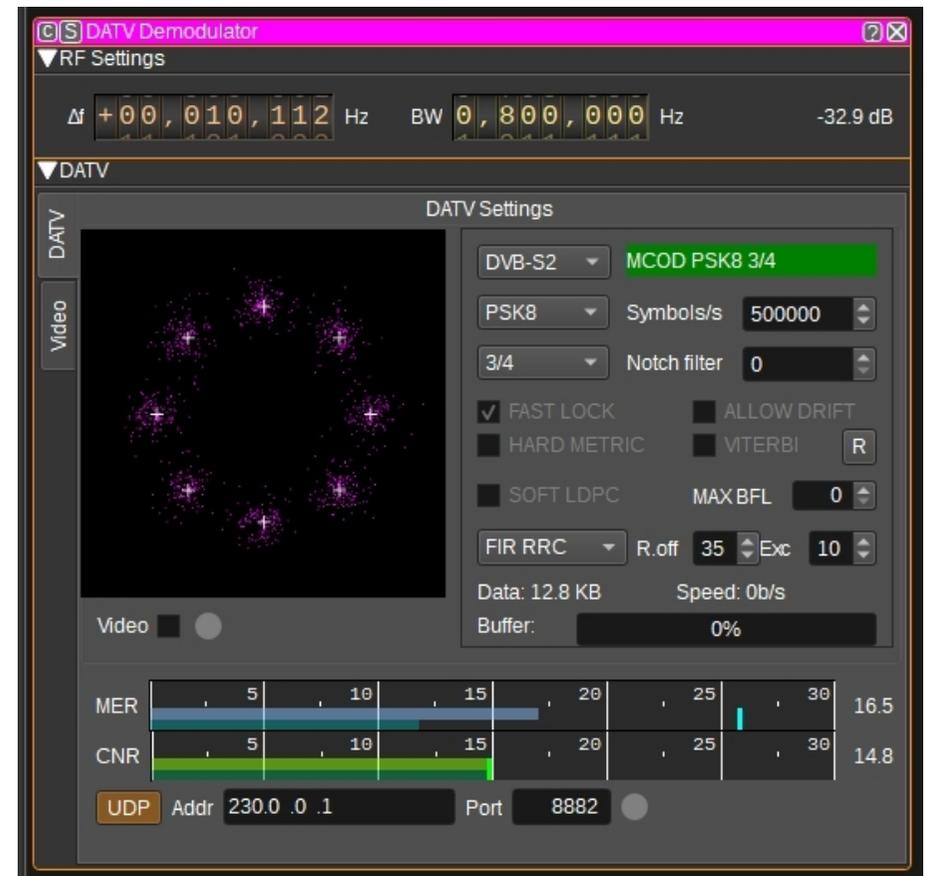
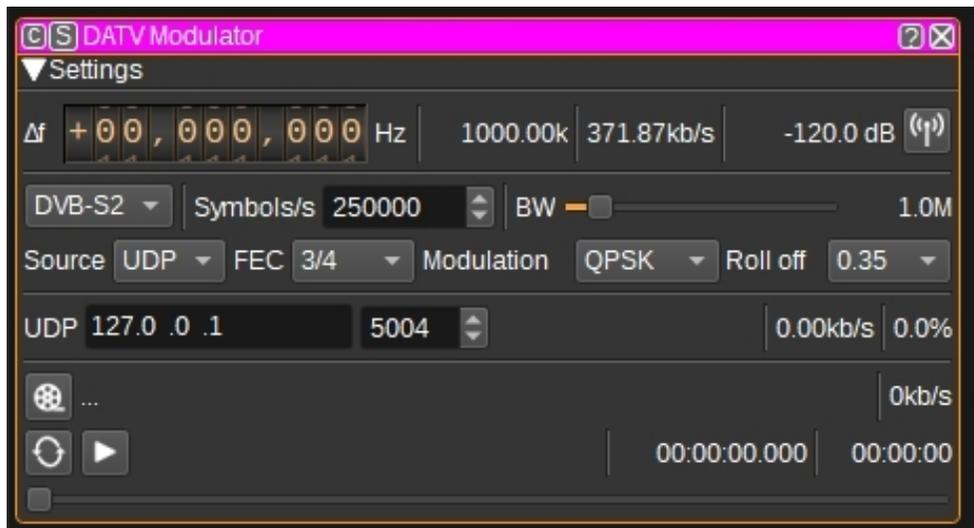


SDRangel

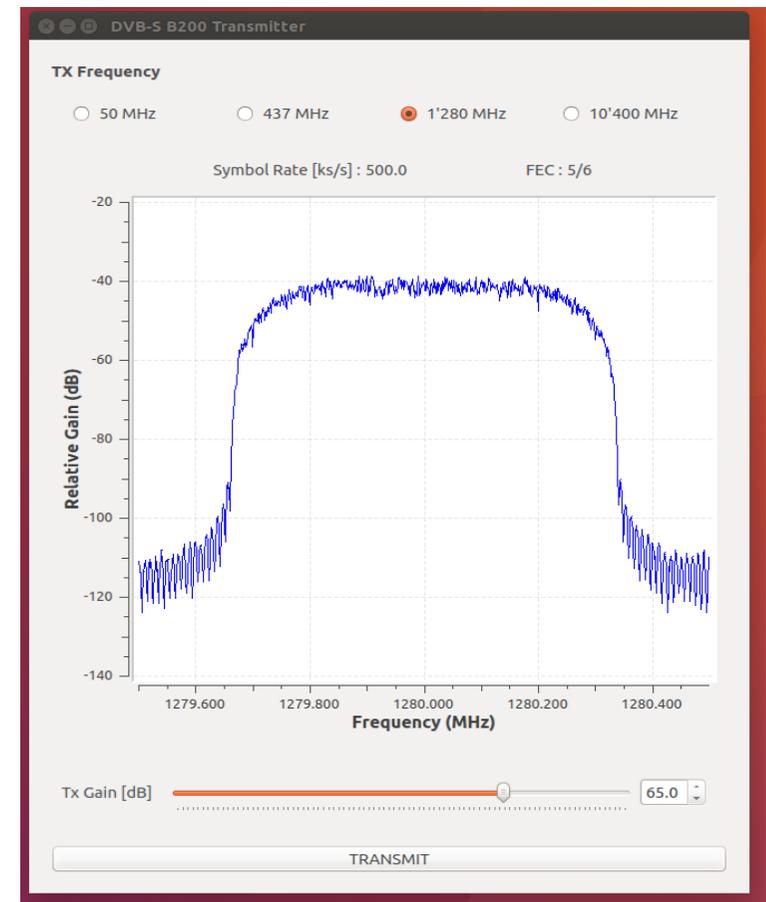
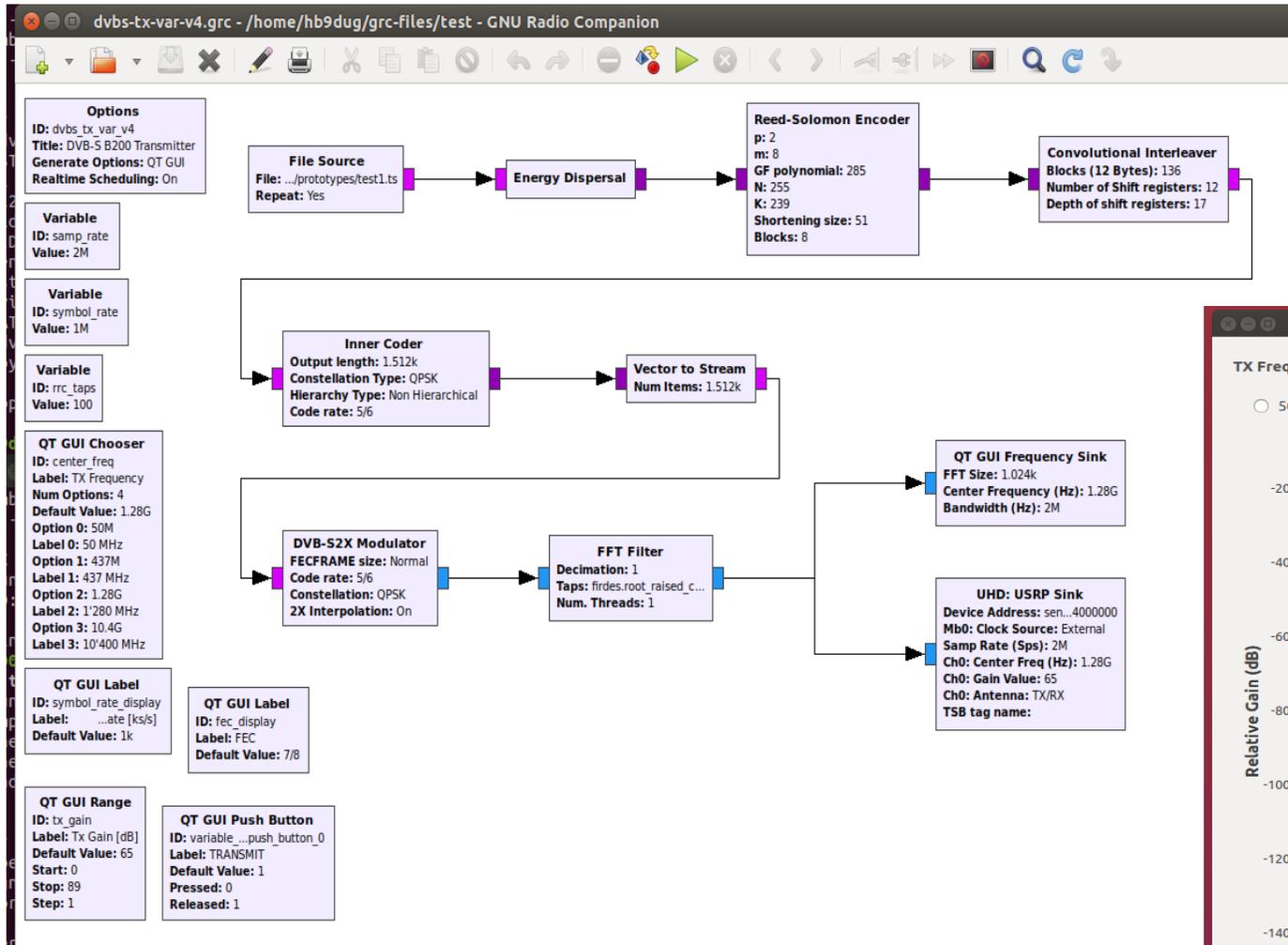
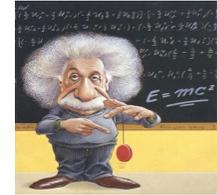


Channels (plugins)

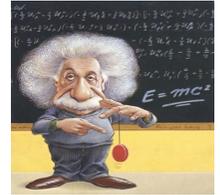
- DATV Modulator
- DATV Demodulator



GNURadio environment

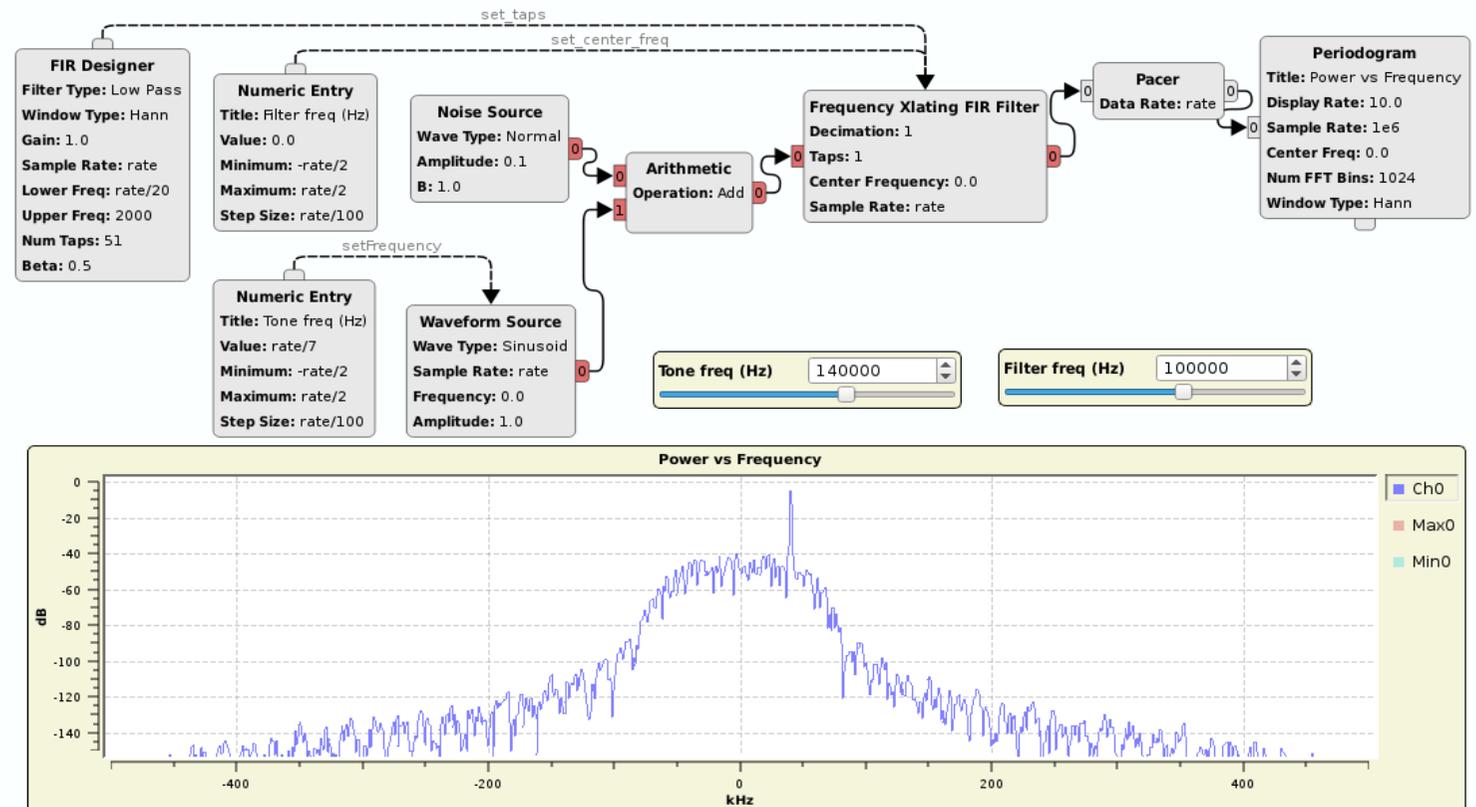


Pothos environment



Pothos is developed par Josh Blum

- Run on Windows, linux and OSX
- ATSC, DVB-T, DVB-T2, DVB-C and DVB-S2 modulation



Pothos

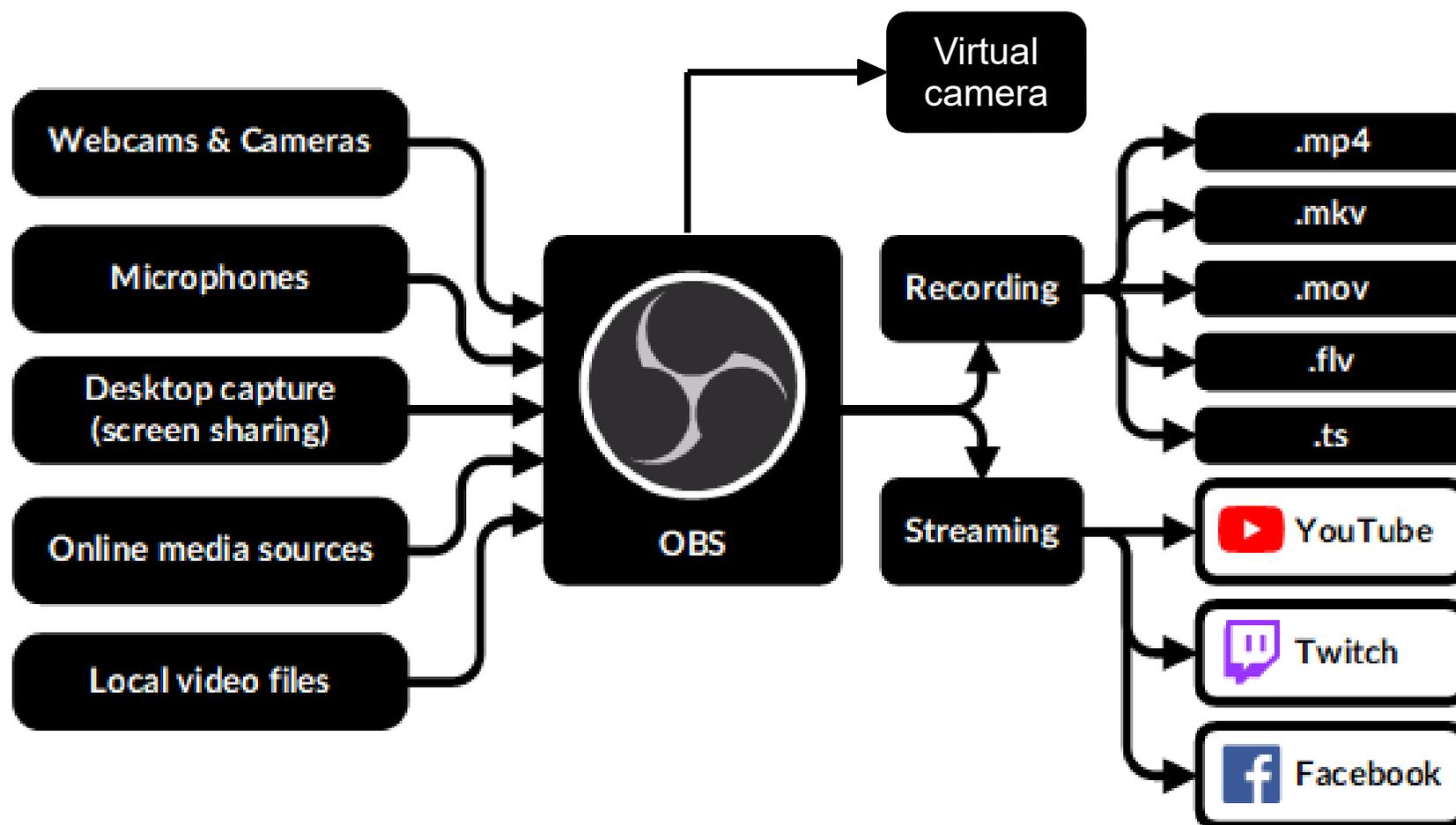
What is missing ?



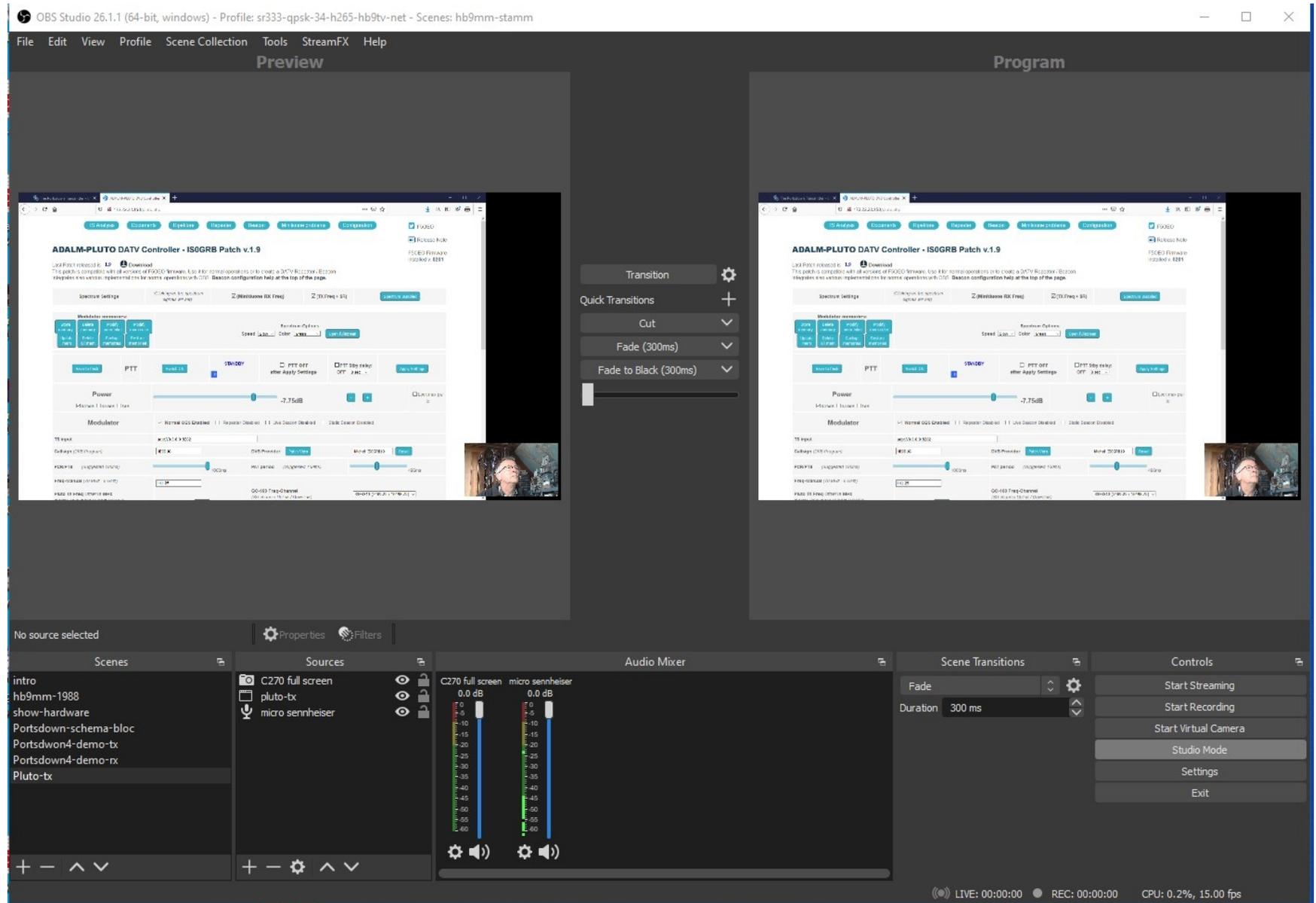
OBS Studio

The open source software for video recording and streaming

- <https://obsproject.com>



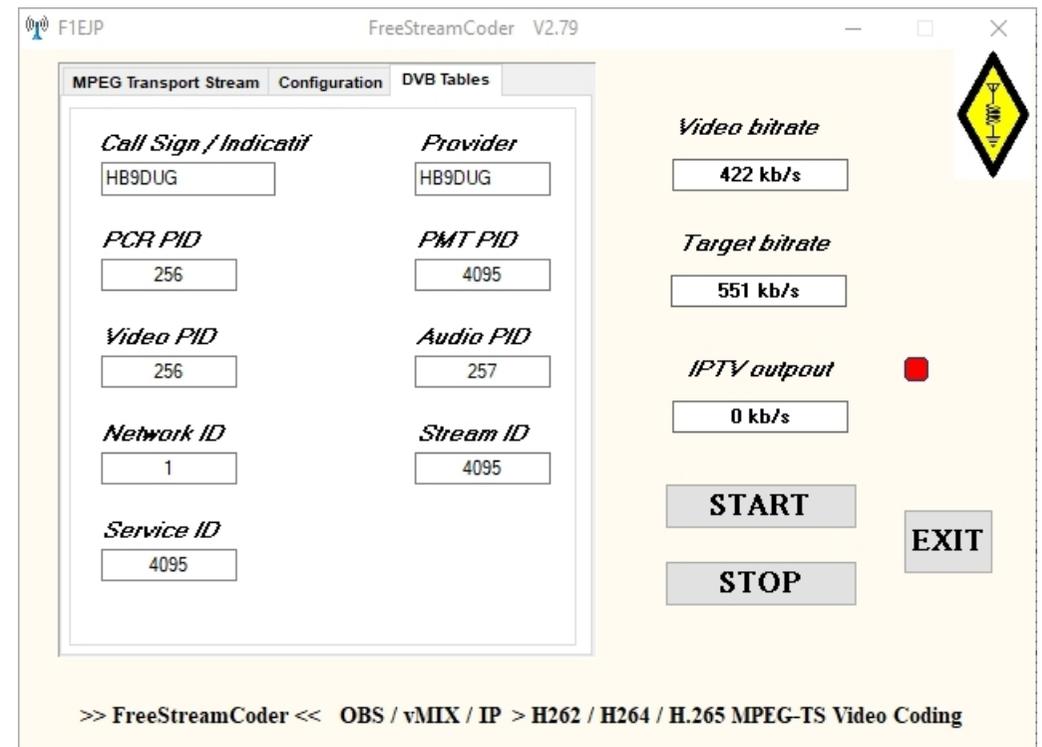
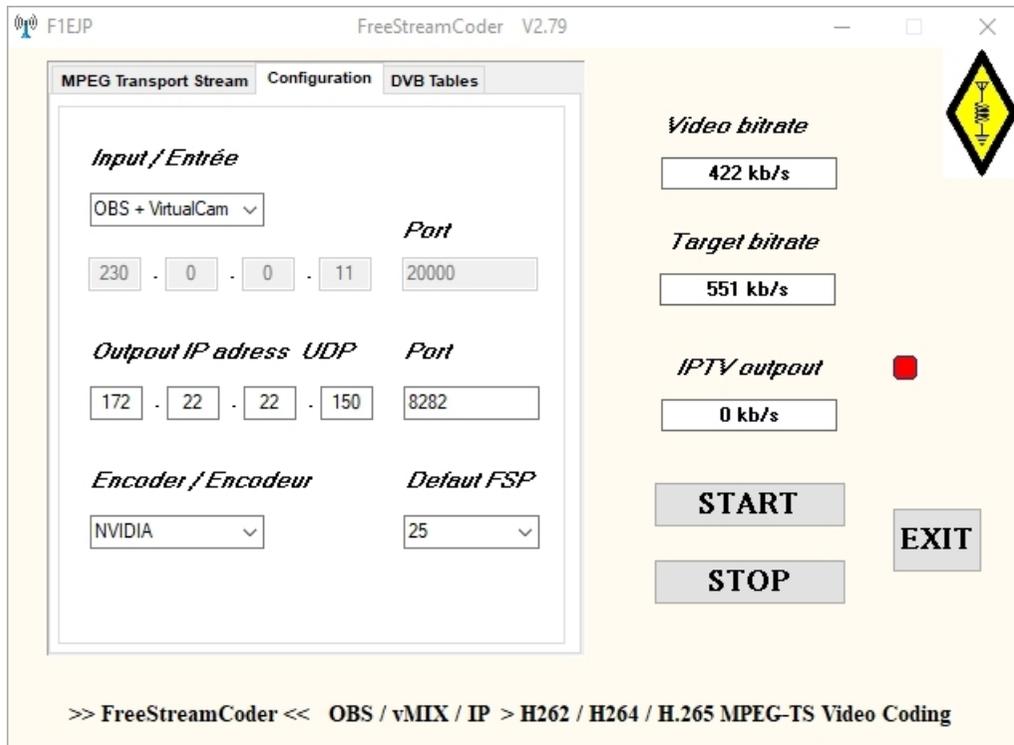
OBS Studio



FreeStreamCoder

Software developed by Dominique F1EJP

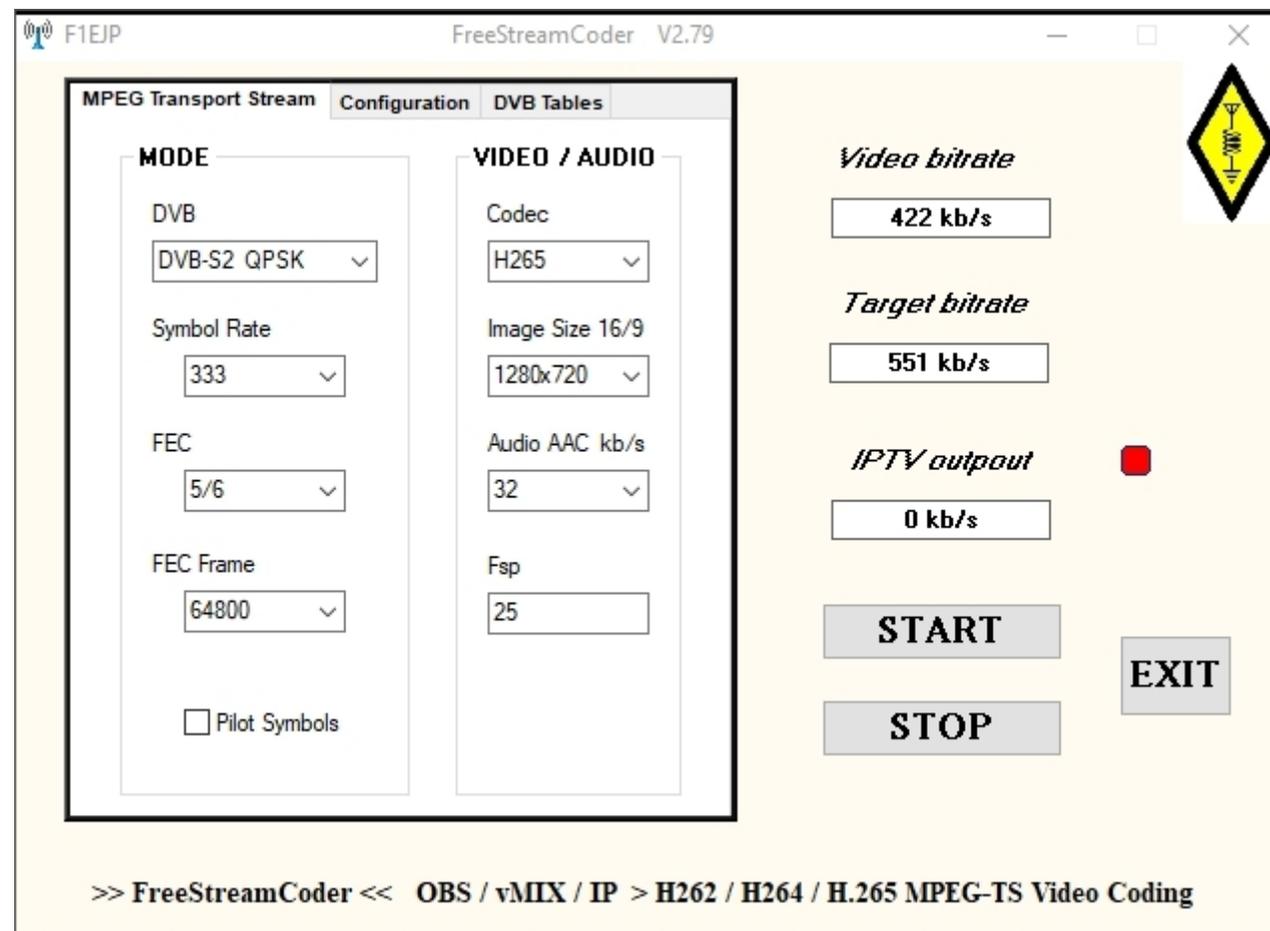
- Generates a TS-MPEG transport stream in H264 or H265 for the different DVB-S/S2/T modulation types



FreeStreamCoder

Software developed by Dominique F1EJP

- <http://vivadatv.org>



DATV-Easy

Software developed by Dominique F1EJP

- DATV-Easy allows transmission in DVB-S, DVB-S2 and DVB-T with a Limesdr mini or Adalm-Pluto with a Symbol Rate (SR) between 20 Ks/s and 2 Ms/s
- For the details, see the presentation de Dominique F1EJP
- <http://vivadatv.org/>

DVB / MPEG-TS Configuration DVB Tables PTT / Monitoring

Target bitrate
241.46 kb/s

Video bitrate
148 kb/s

Frequency MHz
441.250

MODE
DVB
DVB-S2 QPSK

VIDEO / AUDIO
Codec
H265

Symbol Rate
250

Image Size 16/9
640x360

FEC
1/2

Fps
25

FEC Frame
64800

Audio Codec
AAC

Roll-off
0.20

Audio kb/s
24

Pilot Symbols

Transmission 0 kb/s

Easy
OSCAR-100

START
STOP
EXIT

>>> Datv-Easy <<< OBS / vMIX / IP > H262 / H264 / H.265 DVB Transmission

Longmynd Client

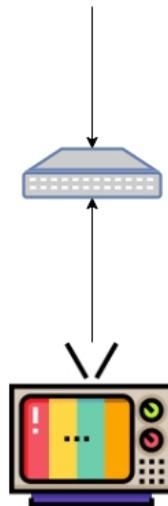
Software developed by Tom ZR6TG

- Longmynd Client allows to remotely control Longmynd, an Open Source Linux DATV receiver working with a Minitiouner hardware.
- <https://www.zr6tg.co.za>

Raspberry PI + Longmynd Software



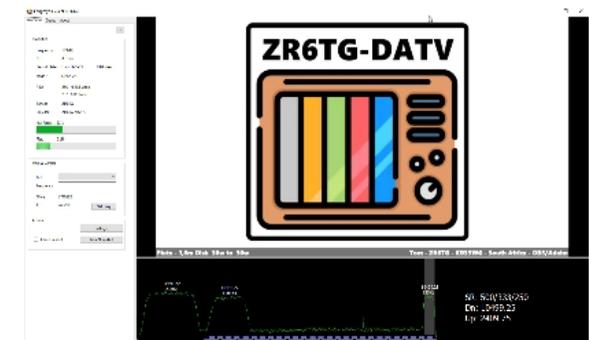
Minitiouner Hardware



Network

Longmynd Client

Remote access to minitiouner with Longmynd client v1

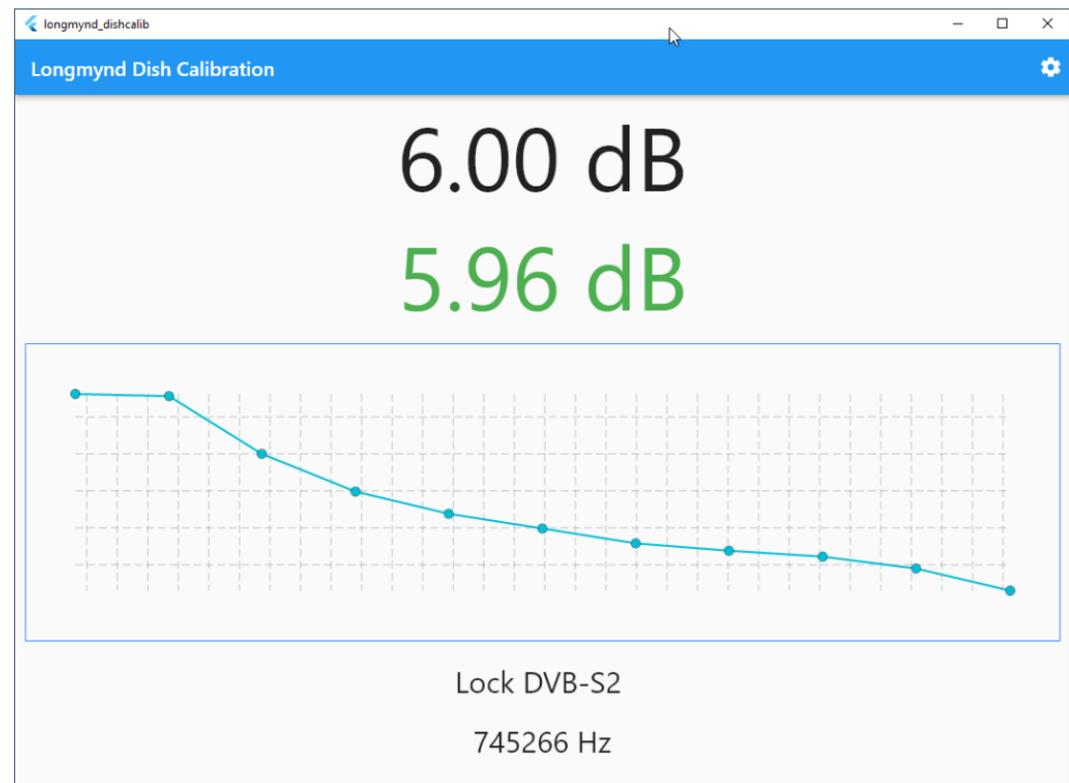


<https://www.zr6tg.co.za/longmynd-client/>

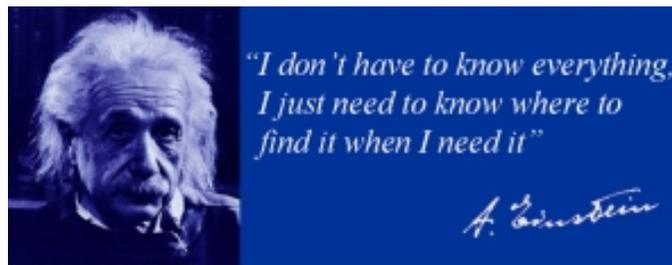
QO-100 Dish Calibration Using Longmynd

Software developed by Tom ZR6TG

- This application display the live MER and keep a running average of the last 200 points. Works on Windows and Android. (you can run it on a smartphone next to the dish through your local wifi.)
- <https://www.zr6tg.co.za>



Thank you for your attention !



This presentation will be available on the **swissATV** web site