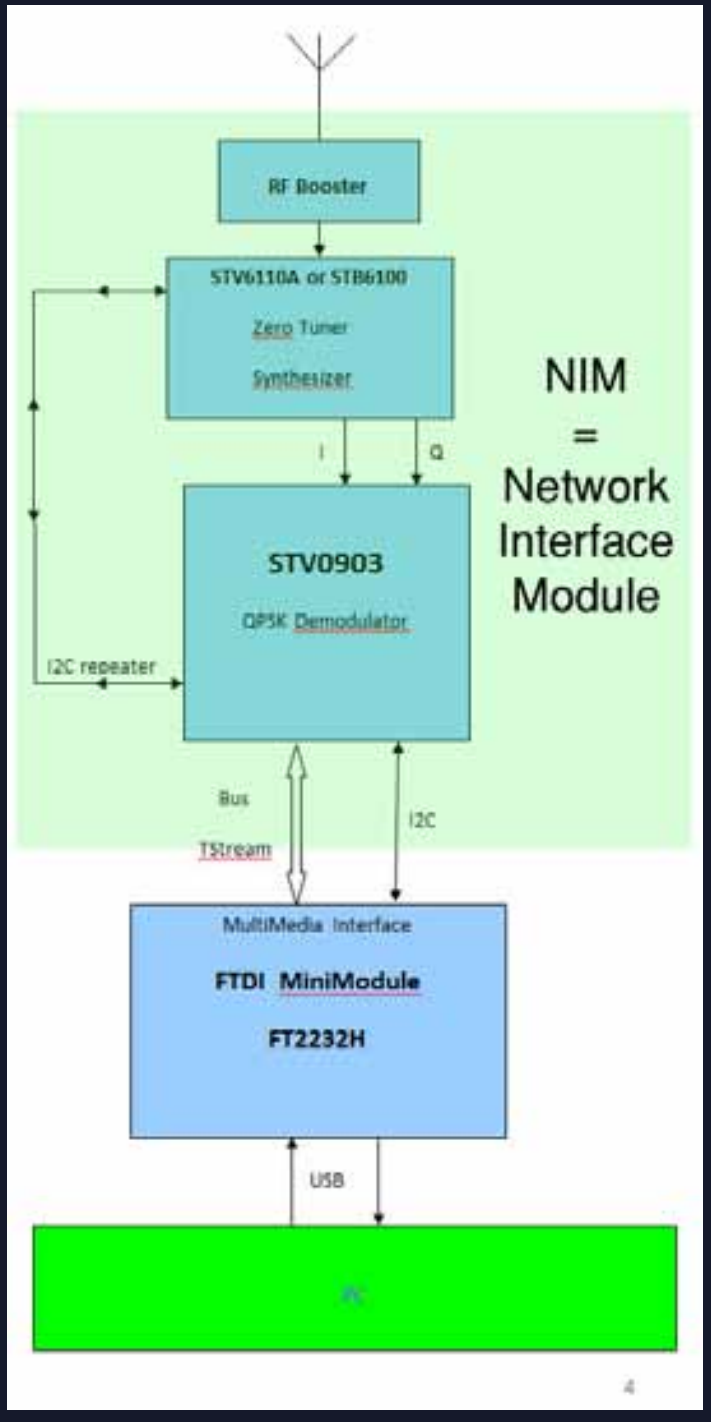
MiniTiouner & MiniTiounerPro

Create your own DVB-S/S2 USB receiver

CAT16 24/09/2015

Jean Pierre Courjaud F6DZP



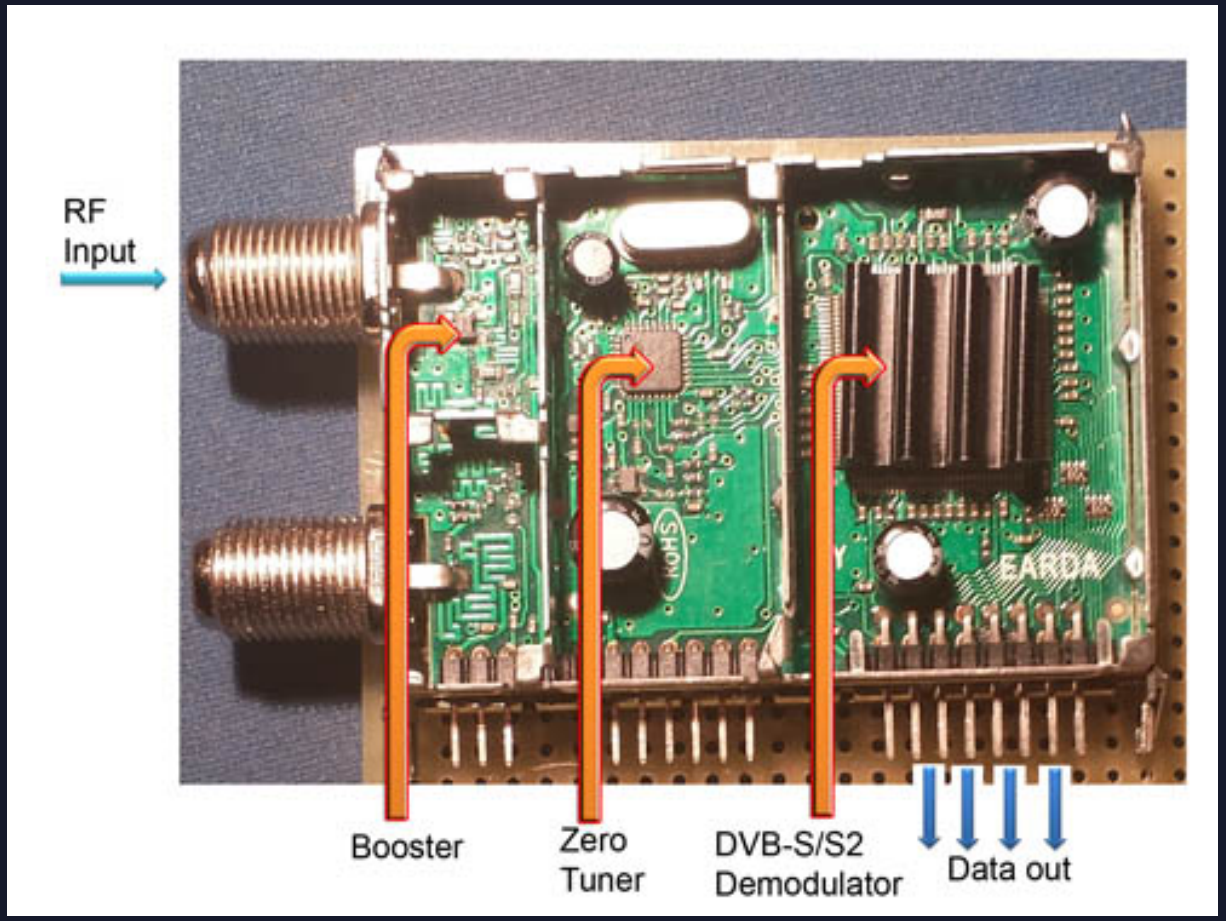
MiniTiouner Internals

- L-Band receiver
- Wide band or Narrow band, phase modulated signal
- STB6100 Or STV6110 processes RF signal
- Analogue differential I and Q signals
- QPSK demodulator, STV0903, Processes I and Q signals
- Transport Stream is transferred to the PC via the FTDI Mini-Module FT2232H, connected to the USB input of the PC.
- The software sends instructions to setup STV0903 via USB / I^2C. The instructions are sent to the STB6100 or STV6110 synthesizer via an I^2C repeater.

We use a NIM

Network Interface Module

Samsung



Eardatek

Which NIM must I use?

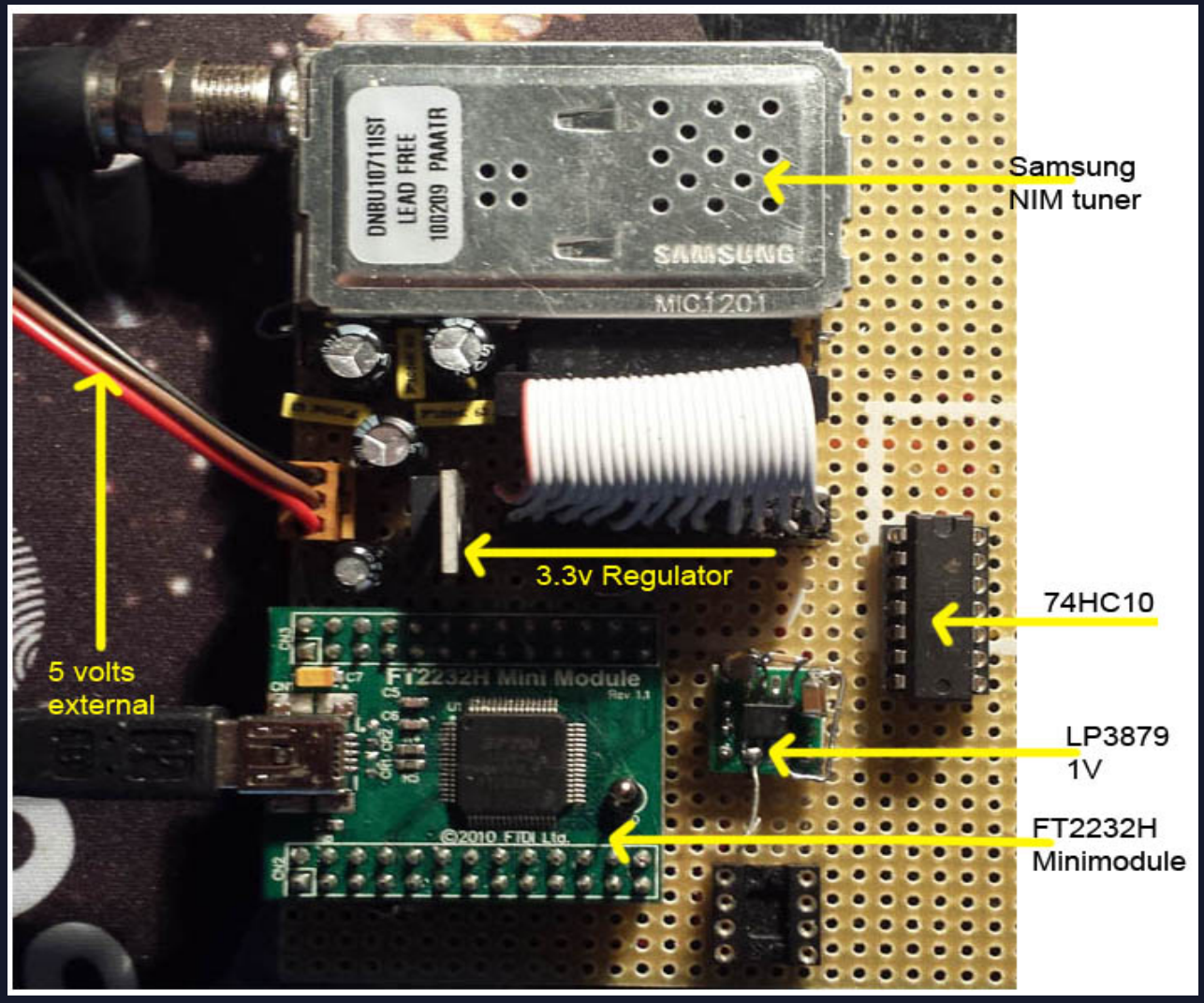
To be sure that it works well at low SR, we must chose a NIM using a STV0903 as the demodulator.

In 2015, I have selected 3 kinds of NIM.

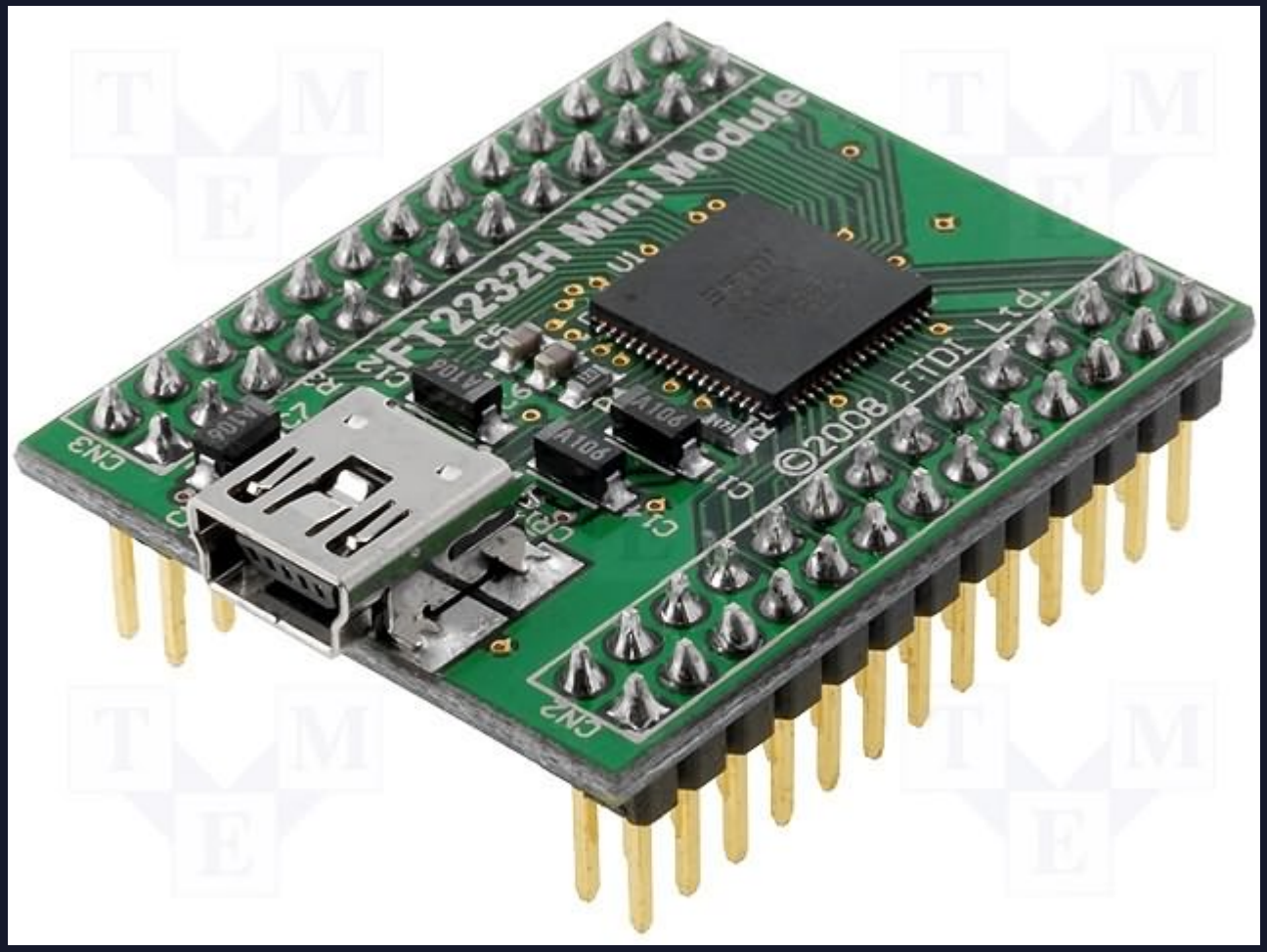
Samsung Sharp Eardatek

In 2016,I have added 2 new NIMs : LG and Serit with STV0913

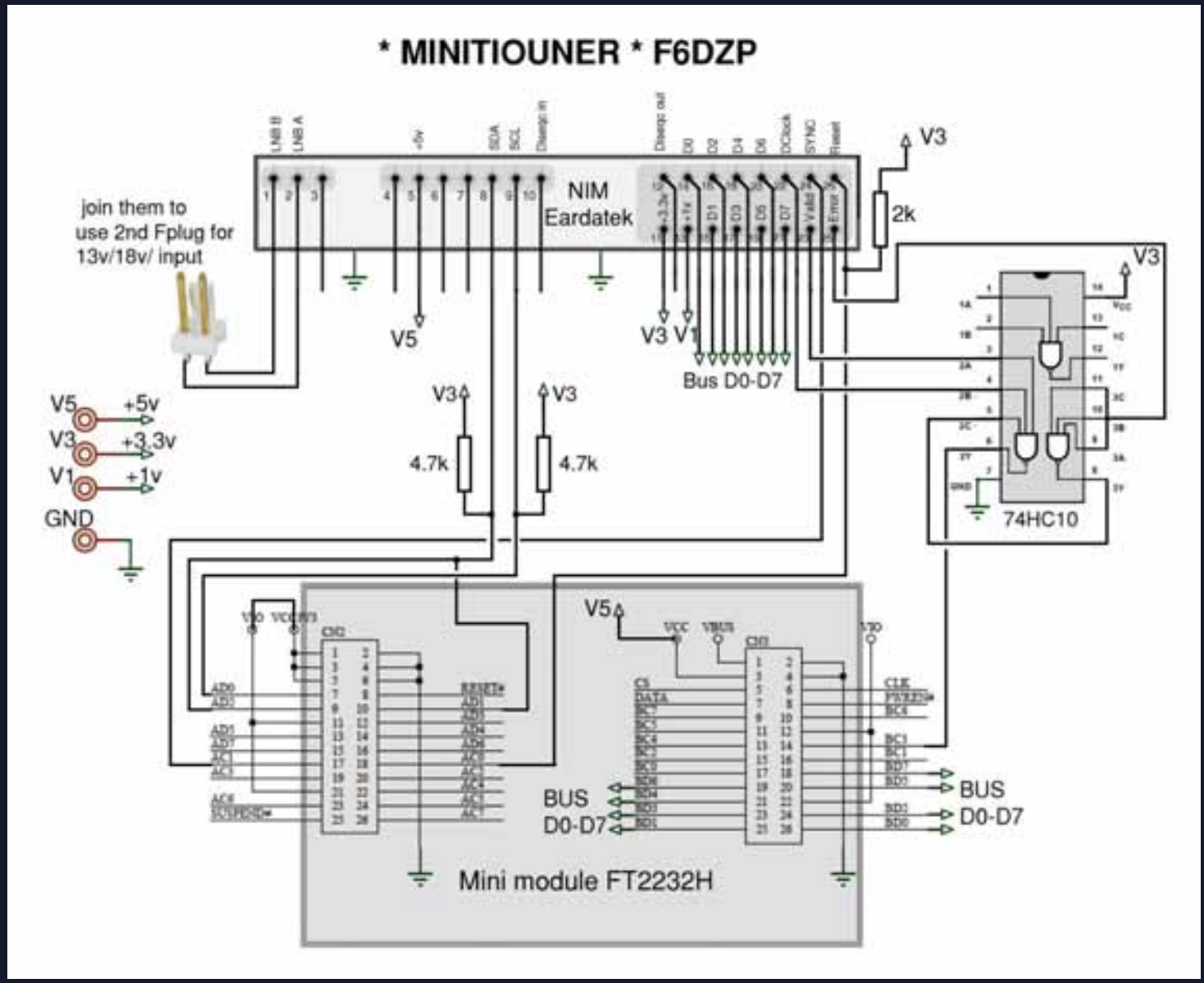
First prototype in March 2015



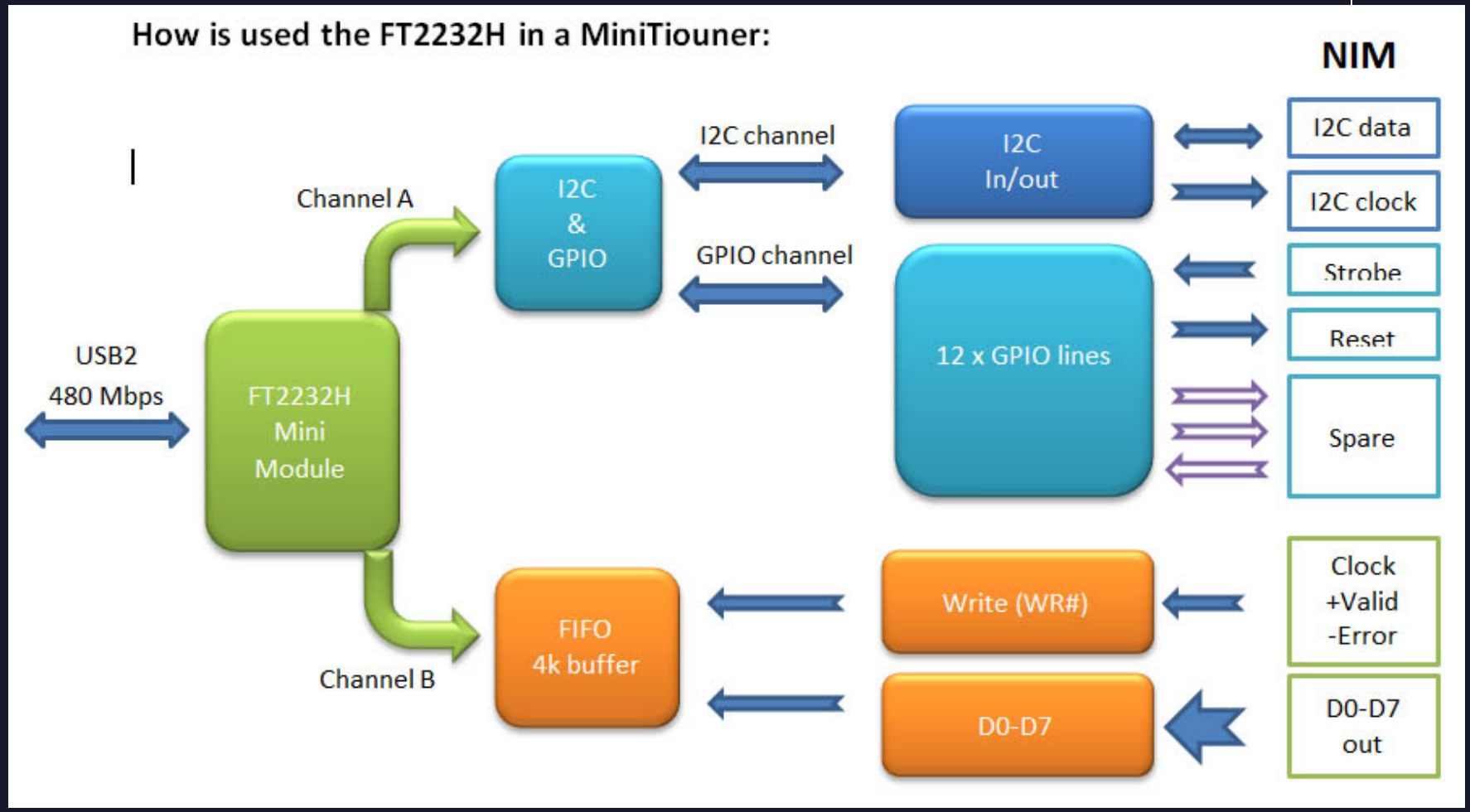
The USB mini module FT2232H



Minitiouner: basic Schematic



FT2232H configuration



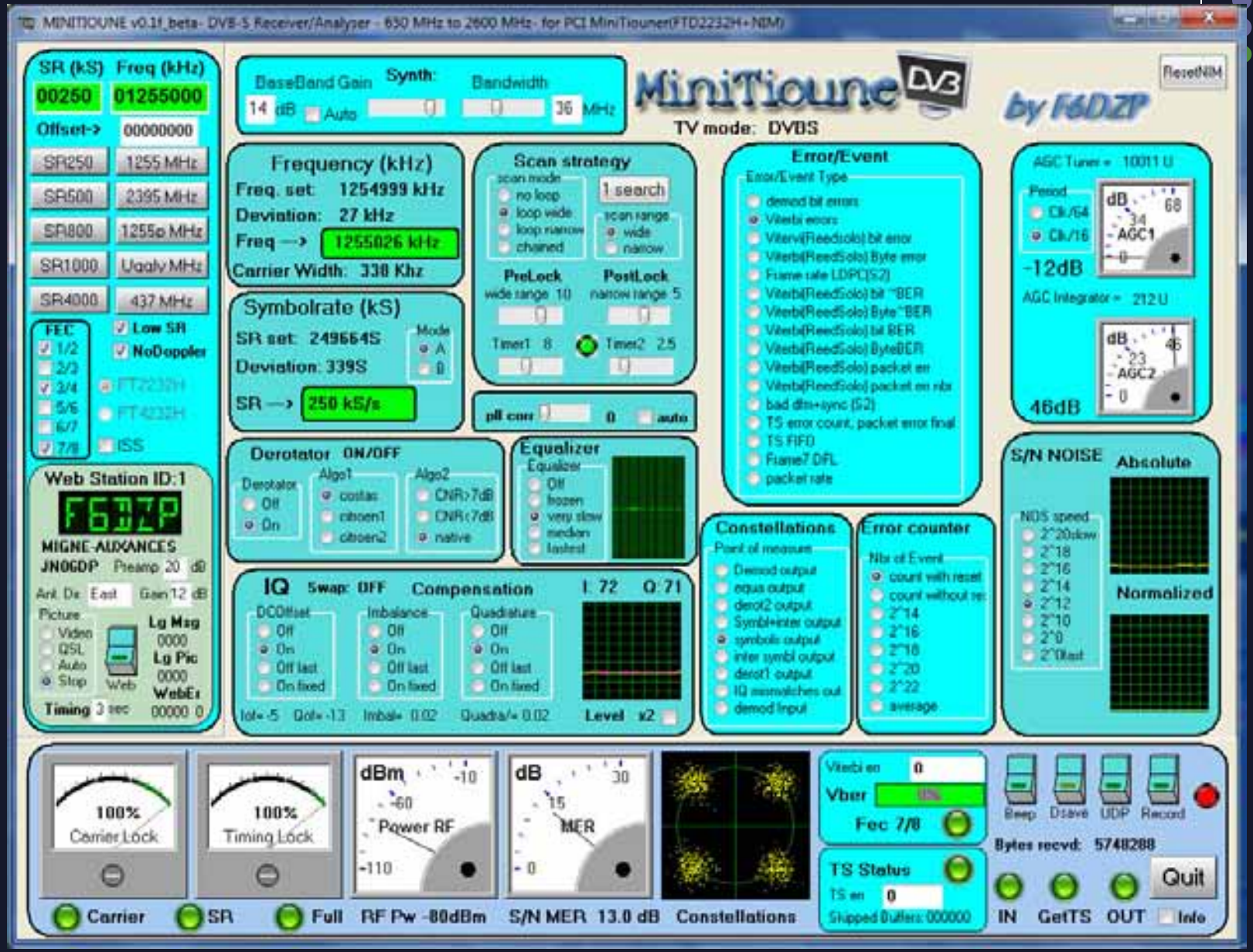
MiniTiouners…

Pipo can run MiniTioune

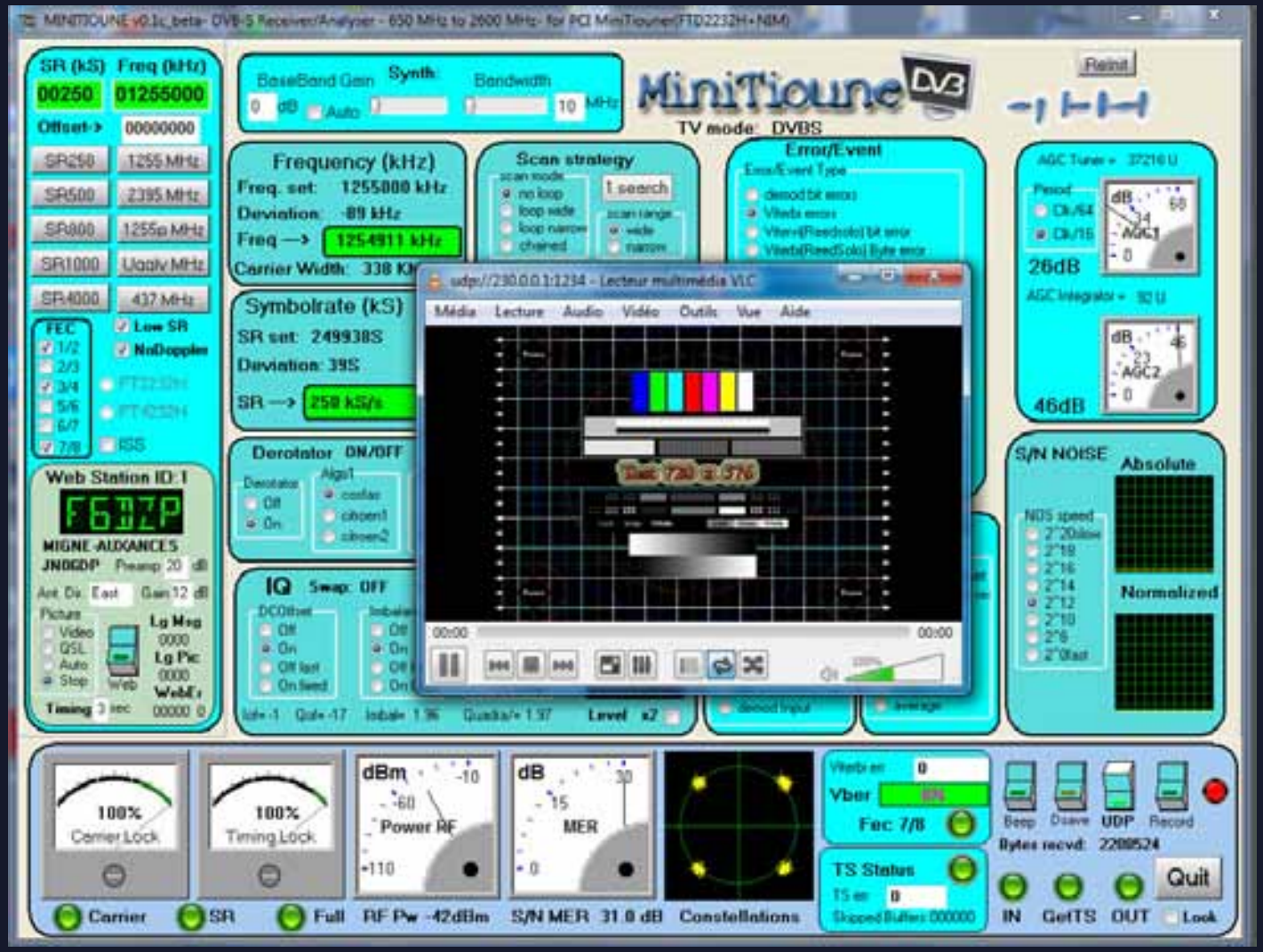
- A little PC running Win8.1
- Intel Atom Quad Core
- 4 USB + 1 micro USB
- HD touchscreen (1280x800)
- HDMI output
- Wi-Fi and Bluetooth
- 12v 480mA when receiving and rendering video
- Less than $110

Using a Pipo X8

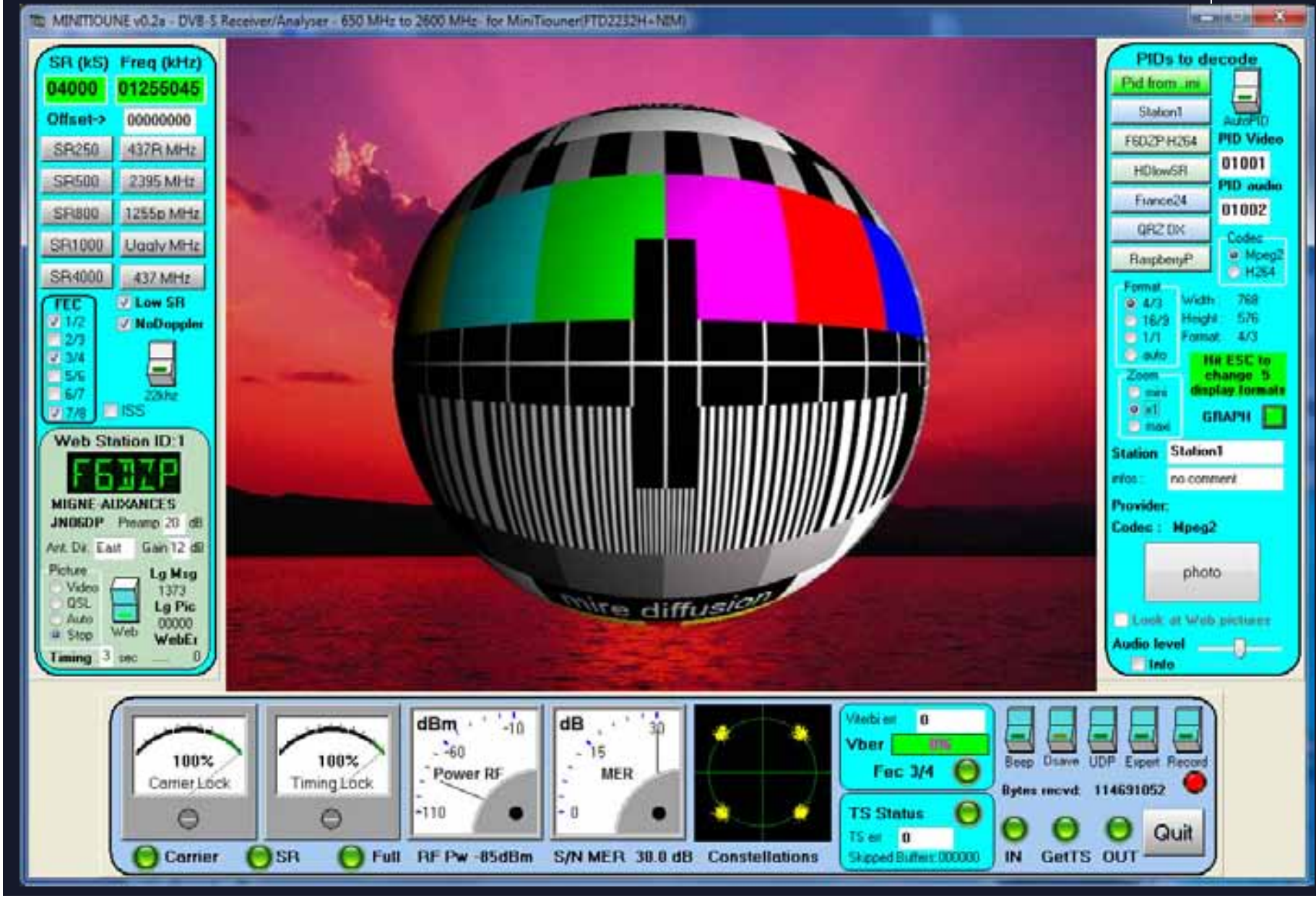
Software : Minitioune v0.1 April 2015



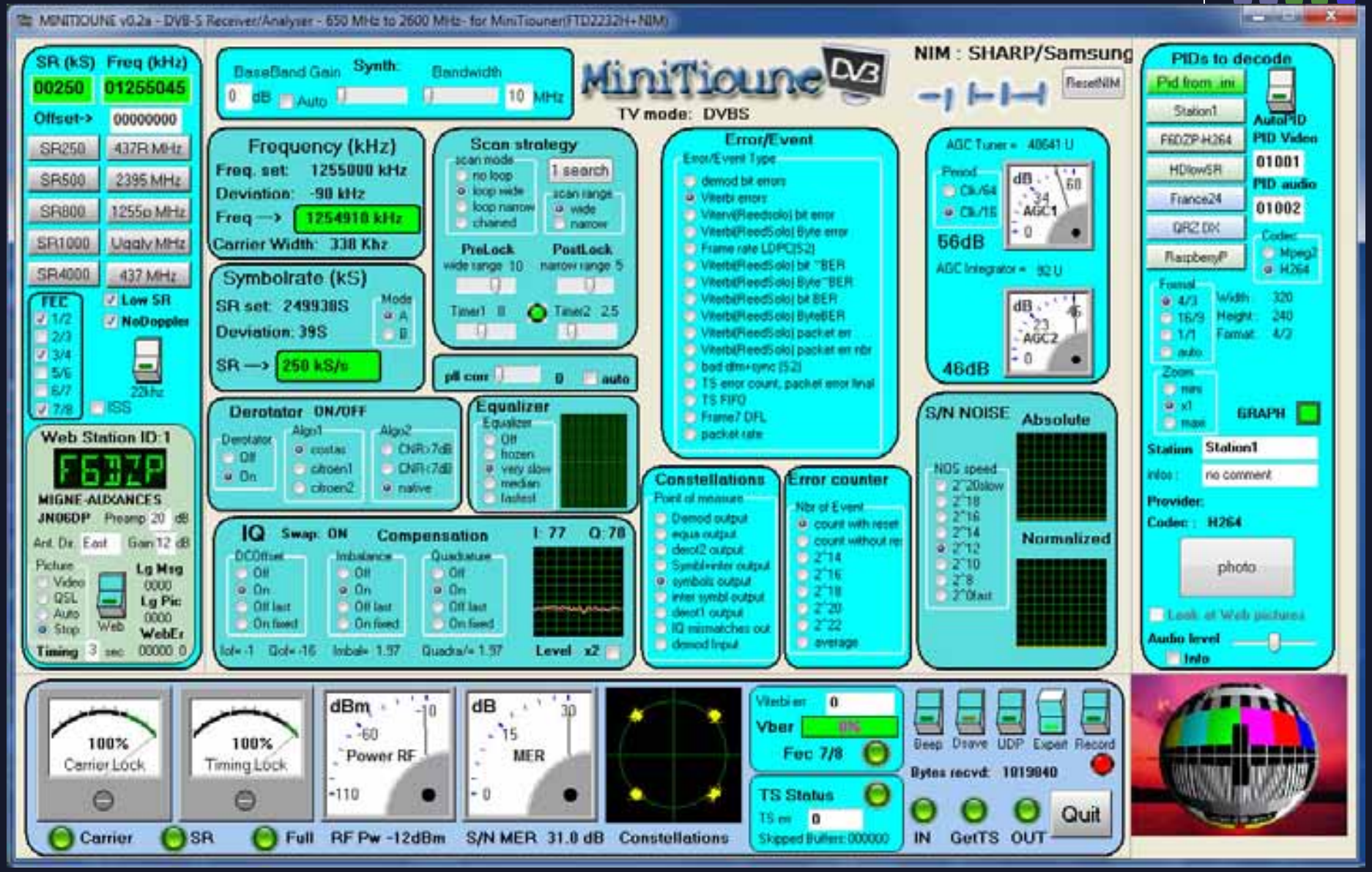
We use VLC to see the video



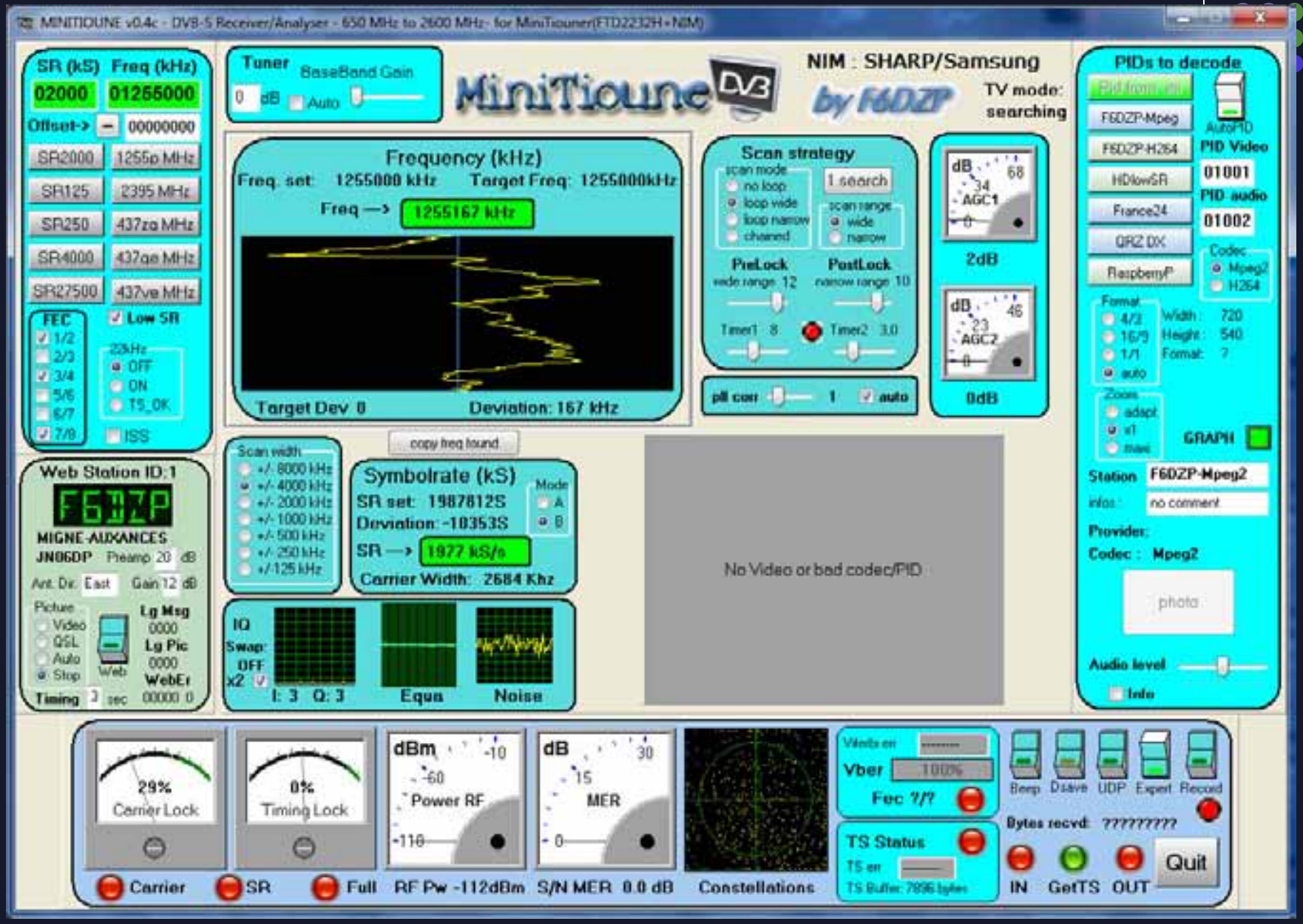
MiniTioune V0.2a Sept 2015



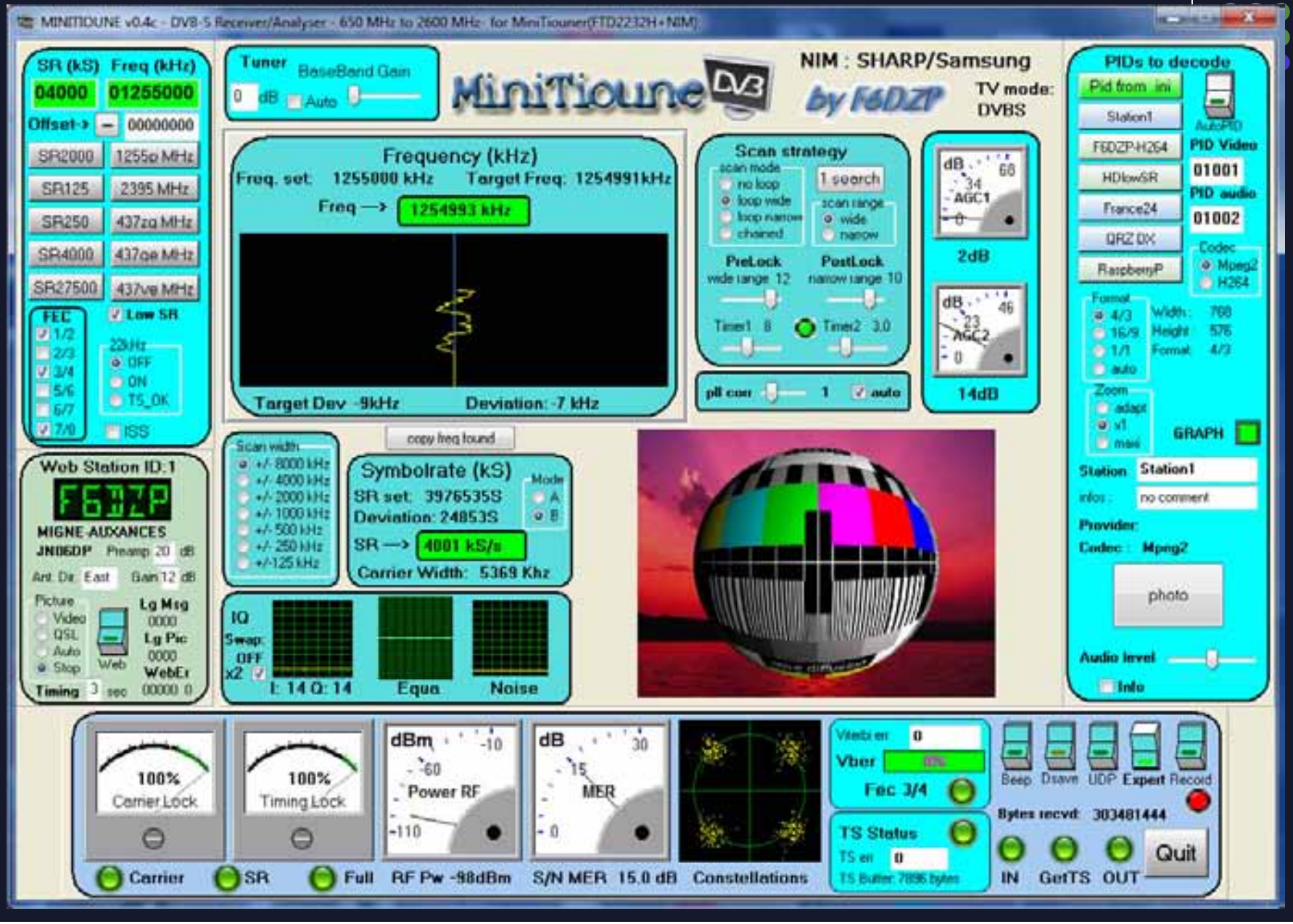
Minitioune v0.2 Expert mode



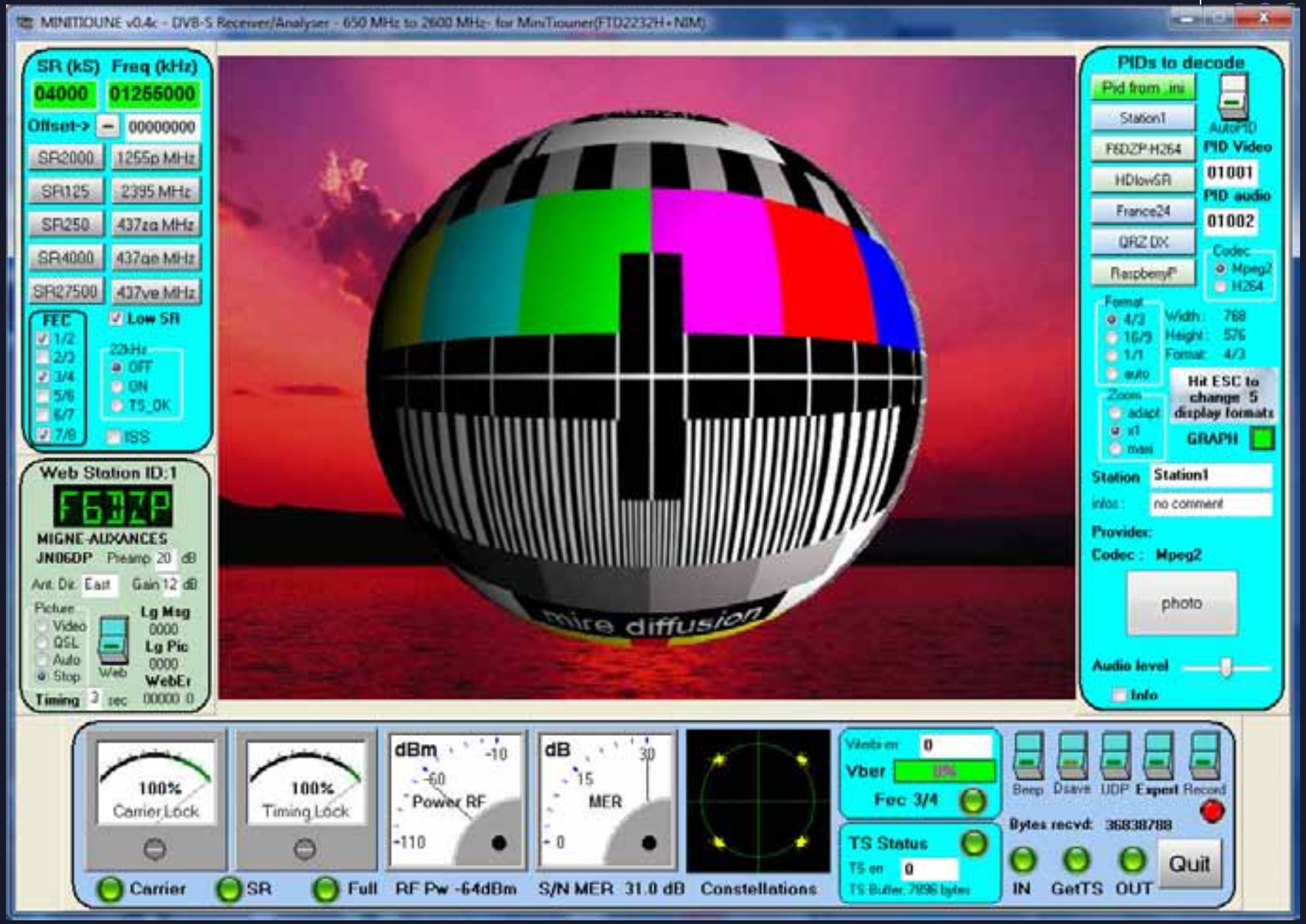
Minitioune v0.4c Expert mode



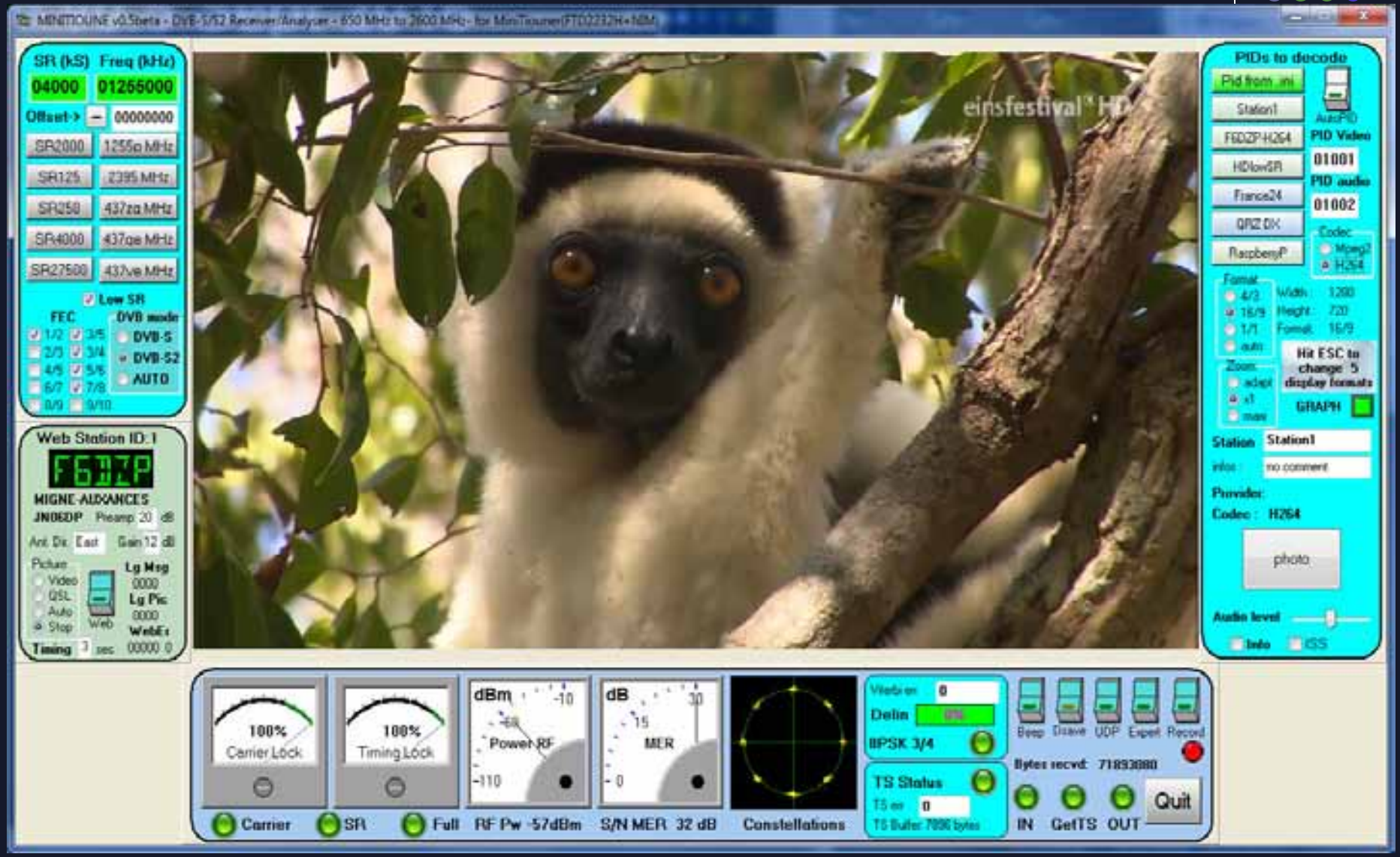
Minitioune v0.4c Expert mode



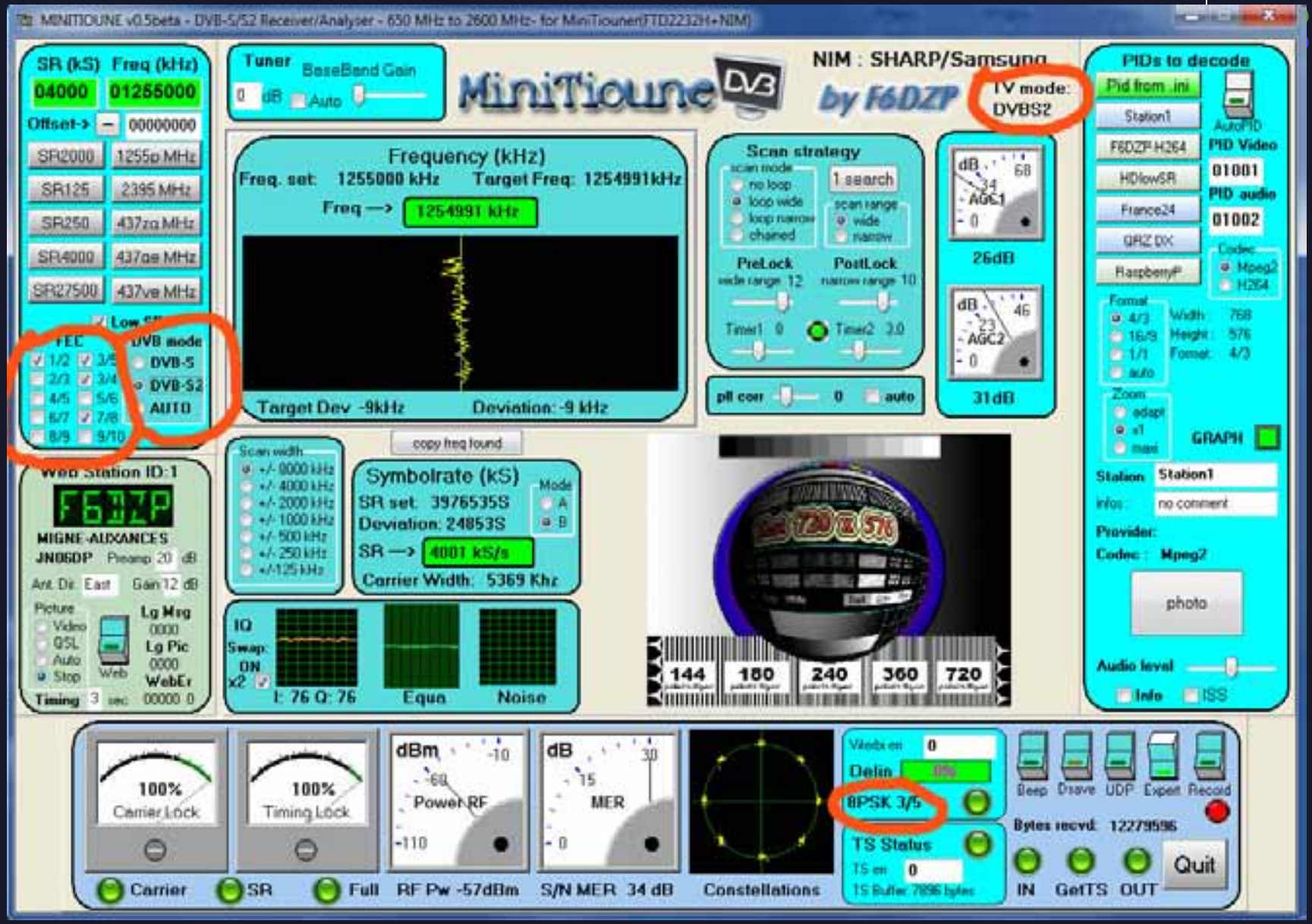
Minitioune v0.4c June 2016



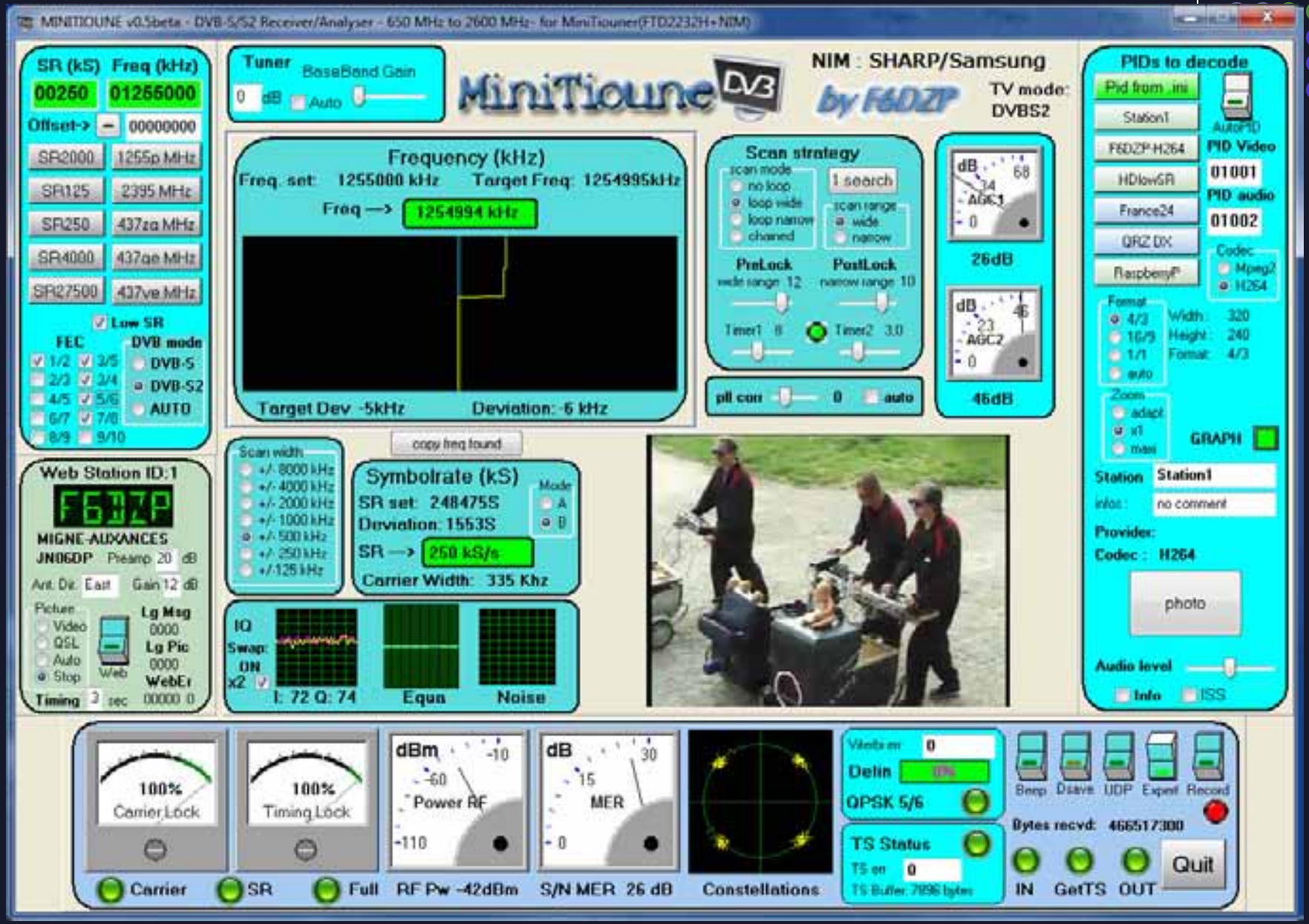
Minitioune v0.5 Sept 2016



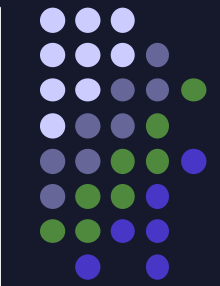
Minitioune v0.5 =DVB-S and S2



Minitioune v0.5 DVBS2-low SR



What new features does DVB-S2 offer?

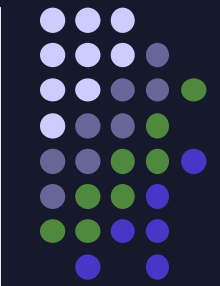


Four modulation modes:

•QPSK and 8PSK are proposed for broadcast applications, and can be used in non-linear transponders driven near to saturation.

• 16APSK and 32APSK are used mainly for professional, semi-linear applications, but can also be used for broadcasting though they require a higher level of available C/N and an adoption of advanced pre-distortion methods in the uplink station in order to minimize the effect of transponder linearity. (not offered with standard NIM)

What new features does DVB-S2 offer?



Improved coding

a modern large LDPC code is concatenated with an outer BCH code to achieve quasi-error free (QEF) reception conditions on an AWGN channel. The outer code is introduced to avoid error floors at low bit-error rates.

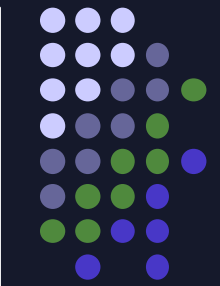
A single FEC frame may have either 64800 bits (normal) or 16200 bits (short) not offered with standard NIM.

Several code rates for flexible configuration

1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, and 9/10.

Code rates 1/4, 1/3, and 2/5 have been introduced for exceptionally poor reception conditions in combination with QPSK modulation. (not offered with standard NIM)

What new features does DVB-S2 offer?



Improved rolloff:

0.20 and 0.25 in addition to the roll-off of DVB-S 0.35.

ACM/VCM : adaptive / variable coding modulation.

- **Variable coding and modulation (VCM)** to optimize bandwidth utilization based on the priority of the input data, e.g., SDTV could be delivered using a more robust setting than the corresponding HDTV service.
- **Adaptive coding and modulation (ACM)** to allow flexibly adapting transmission parameters to the reception conditions of terminals, e.g., switching to a lower code rate during fading. (not offered with standard NIM)

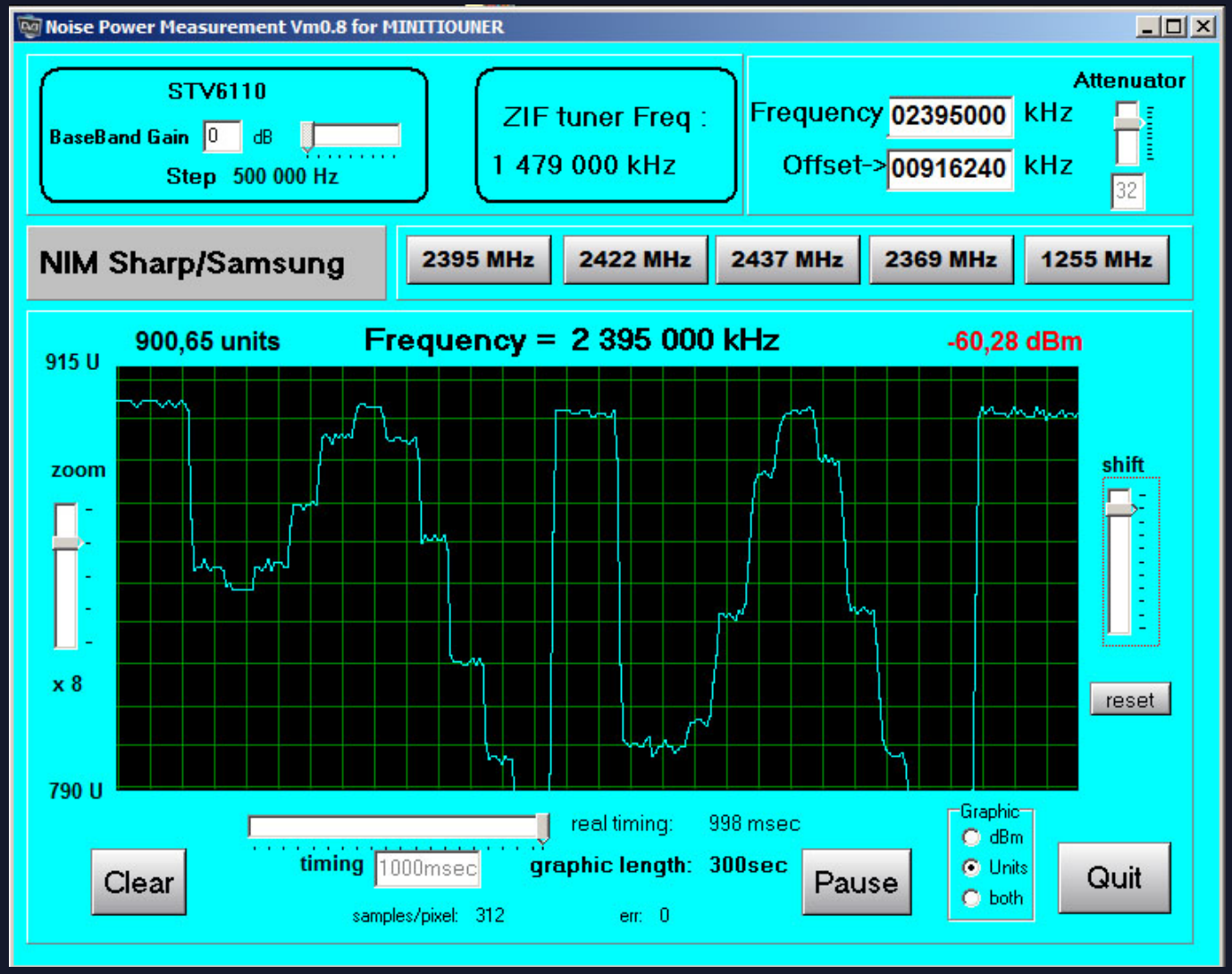
Should we use DVB-S2?

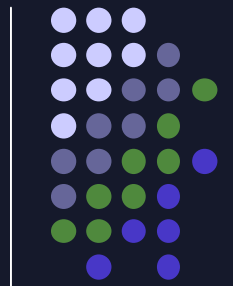
- At standard Symbol rate QPSK:
  Better lock for lowest signal.
  We could expect a gain of 2dB ???

- At low Symbol Rate QPSK:
  Using a standard NIM, my first tests give me a better result with DVBS
  To be confirmed….
  Using a NIM “pro” ….I have not tested yet, but I suppose a better result.

Noise Power Measurement

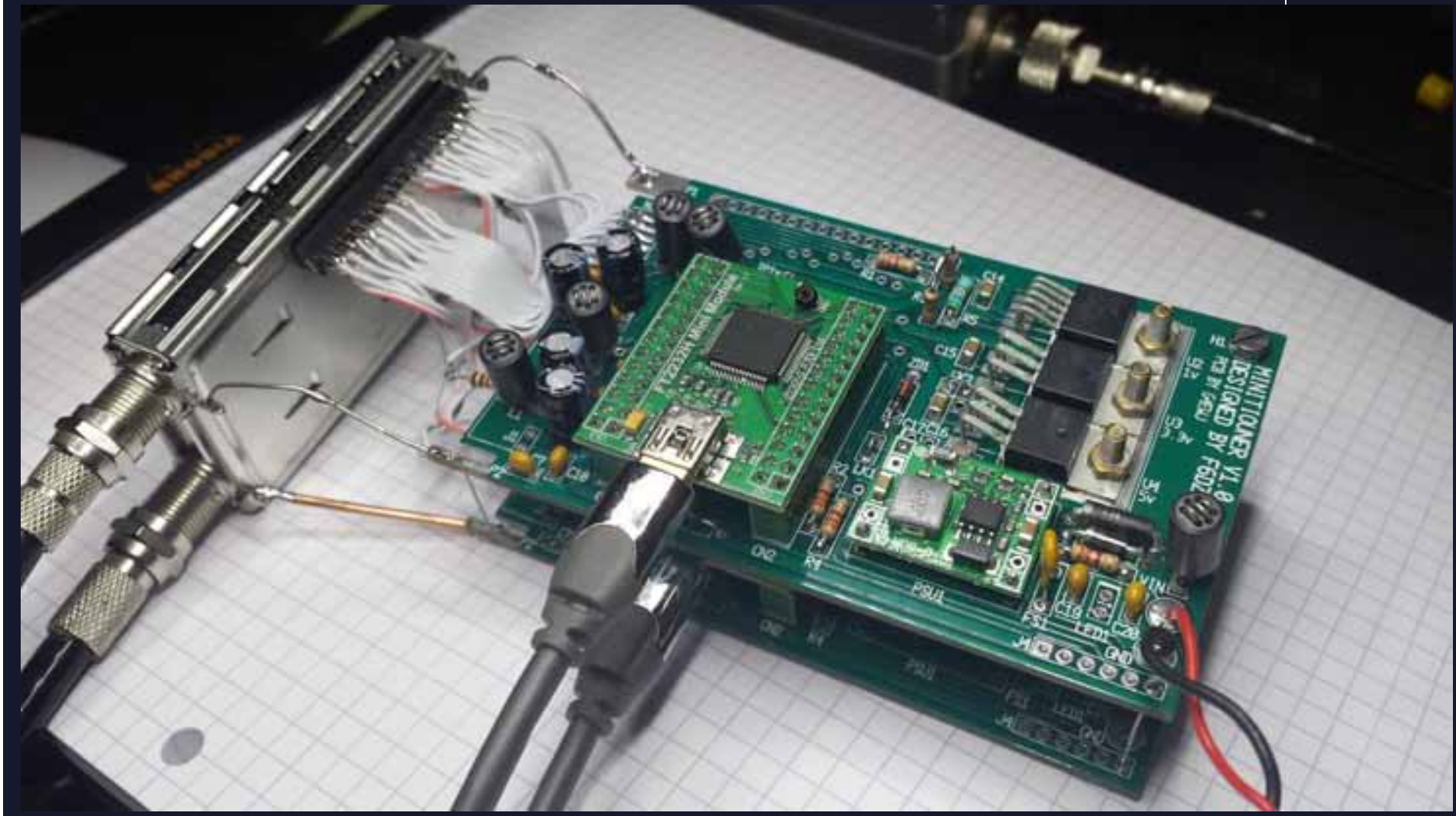
That helps for setting our tracking system, measuring the sun noise, using your MiniTiouner





MiniTiouner Pro

MiniTiouner Pro - prototype



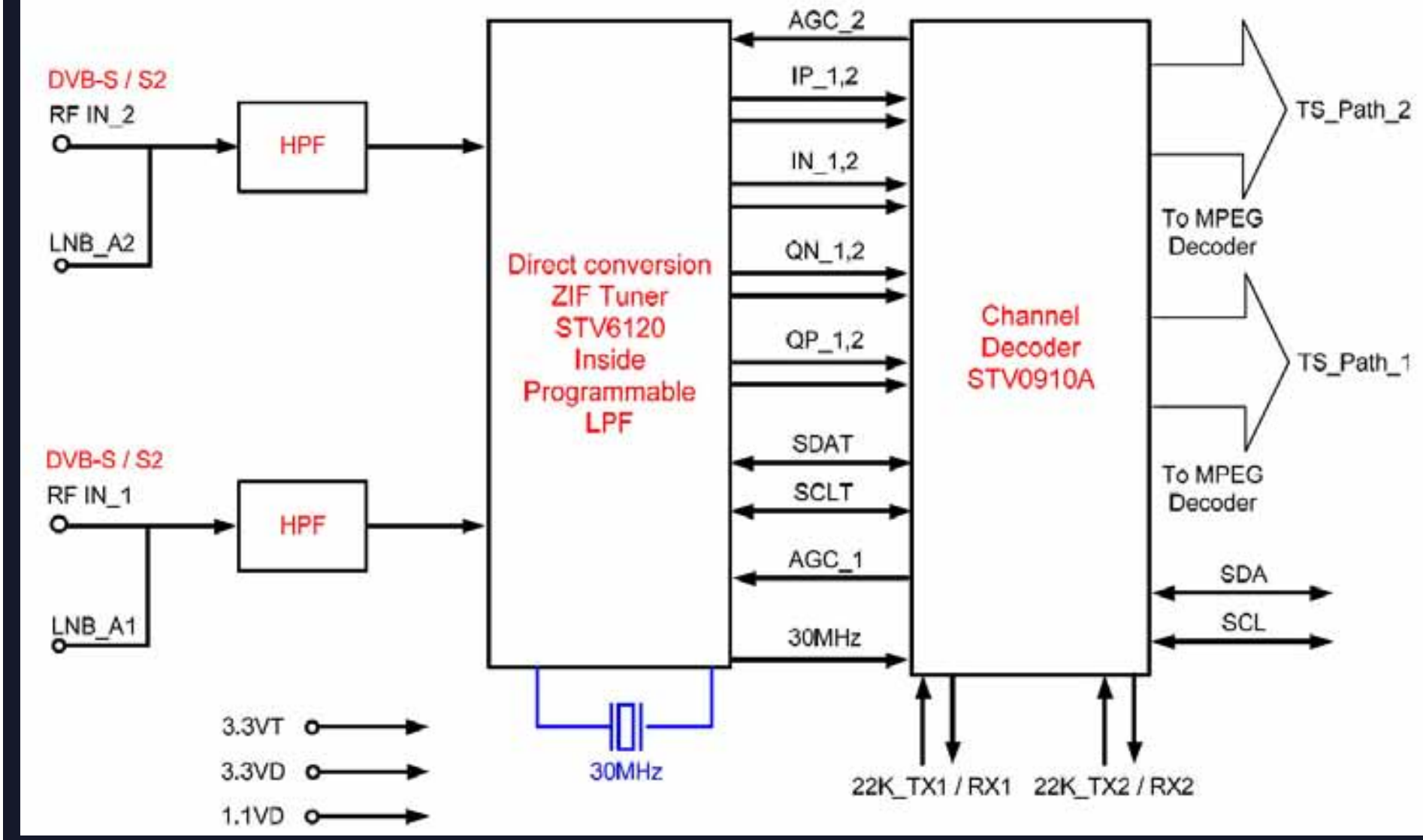
MiniTiouner Pro

Using a NIM Pro : Serit FTS-4335

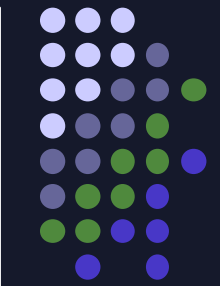
- 2 x RF inputs
- 2 x ZIF tuners wide bandwidth
- 2 x DVB-S/S2 demodulators Advanced
- 2 x TS parallel outputs

NIM FTS-4335

From Serit documentation



Why I call it « Pro » ?

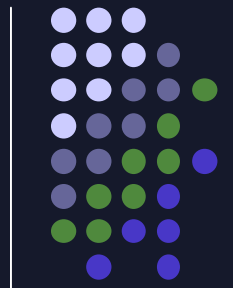


Because there is an « A »!

The DVB S/S2 demodulator is the STV0910A
The « A » means « Advanced »
So we will have advanced features:

- Code rates 1/4, 1/3, and 2/5
- 16 APSK and 32 APSK
- Short frames
- ACM Adaptive coding and modulation
- Low Symbol Rate optimisation
- Data mode, Measuring mode …

Dual tuner STV6120



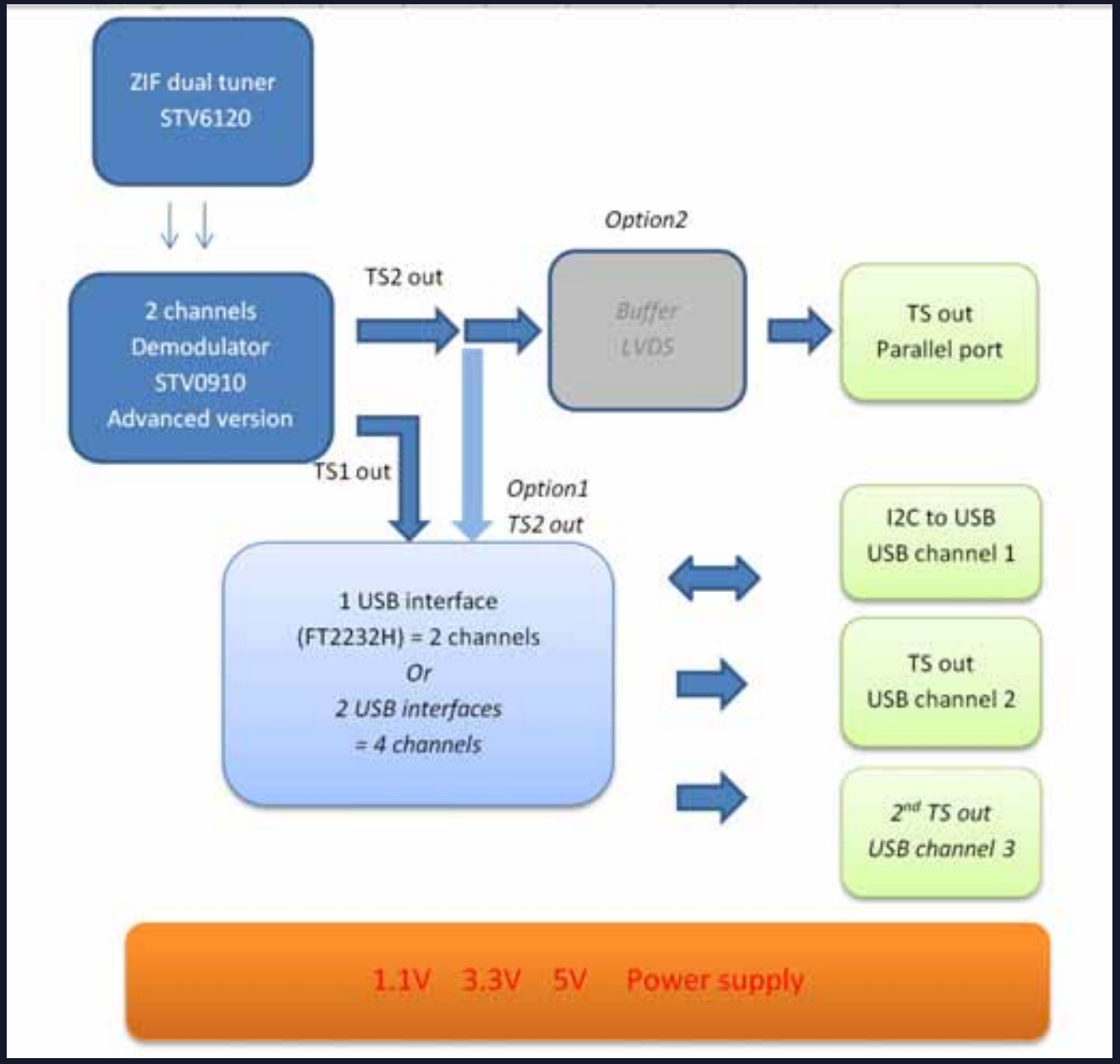
Four VLNA inputs + On-chip 4:2 matrix

Input frequency range 250 MHz to 2150 MHz
➔tested working from 144MHz to 2450 MHz

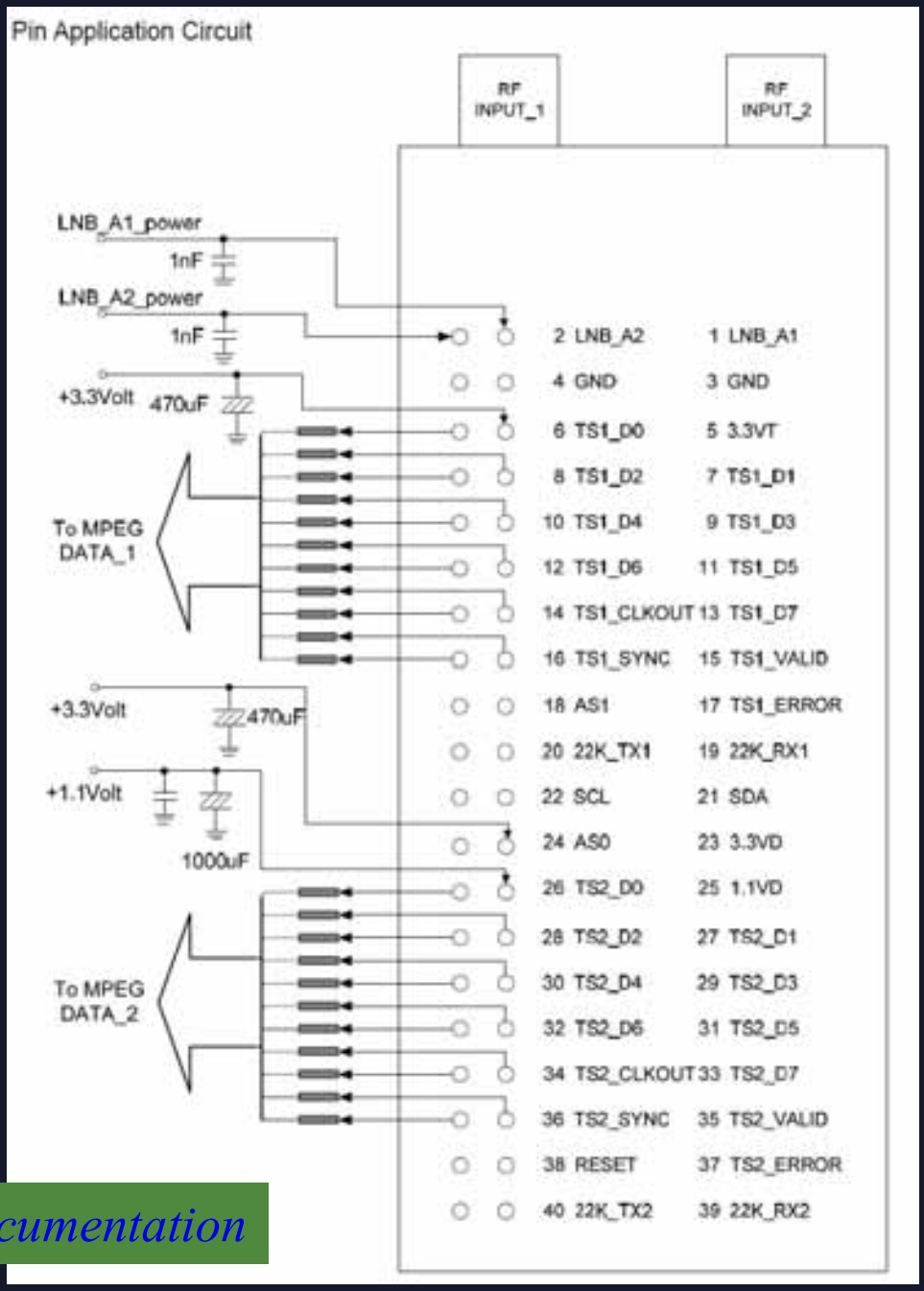
Two independently programmable tuners
RF to baseband direct conversion

Extremely low phase noise
Continuously variable gain: 0 to 65 dB
Additional and programmable gain on baseband amplifier: 0 to 16 dB
Programmable 5- to 36-MHz cut-off frequency (Butterworth 5th-order baseband filters)

MiniTiounerPro synoptic



FTS-4335



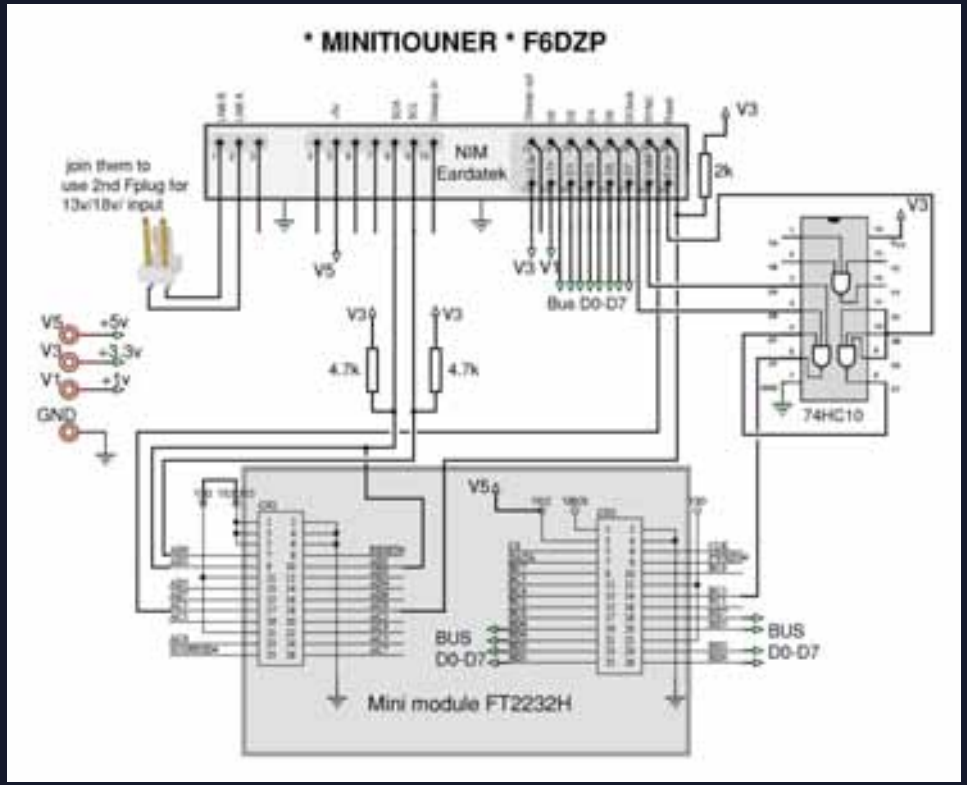
From Serit documentation

MiniTiounerPro schematic

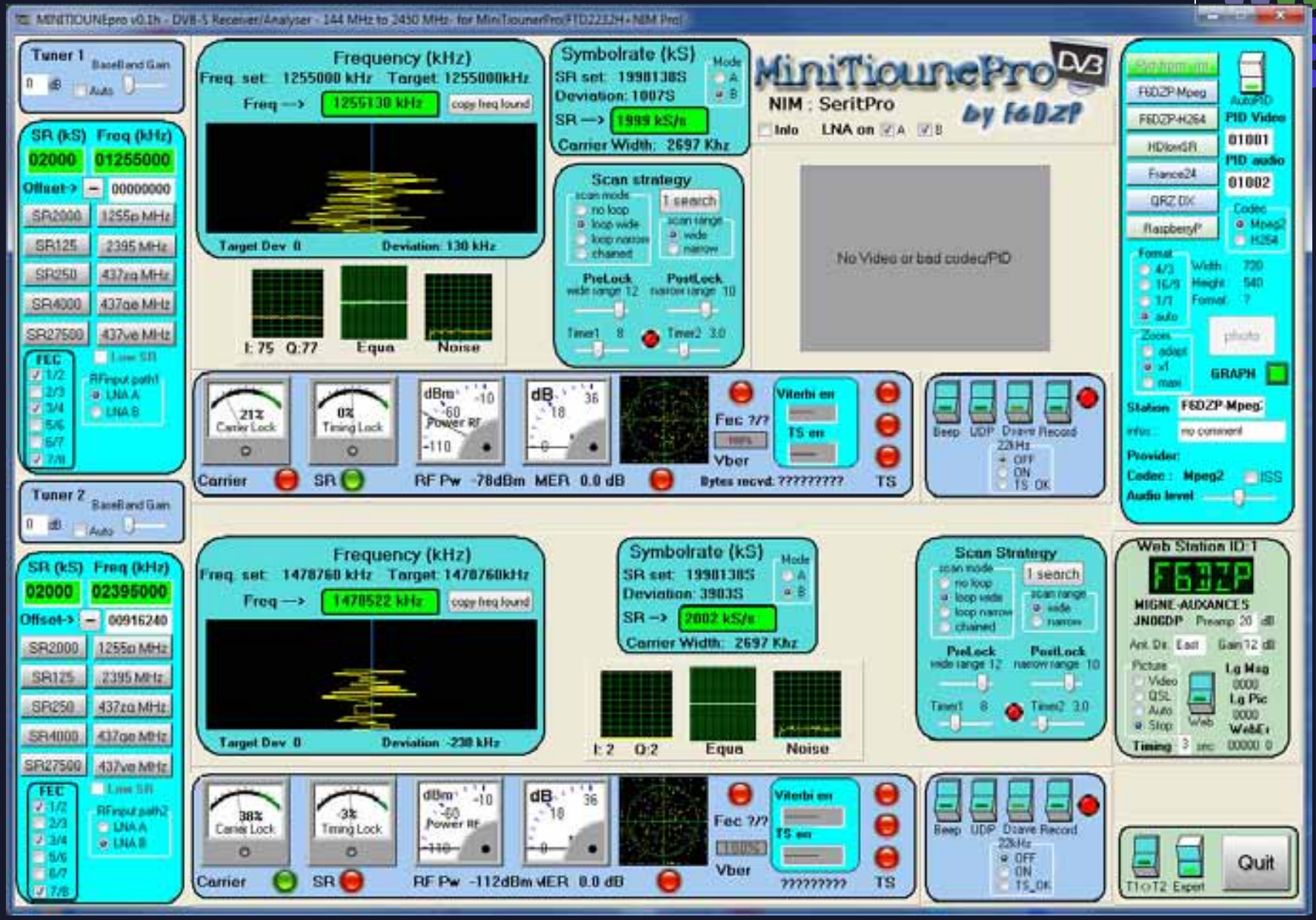
We can use the same schematic as we have used for the MiniTiouner.

We just need another FT2232H if we want to output the 2nd TS via USB

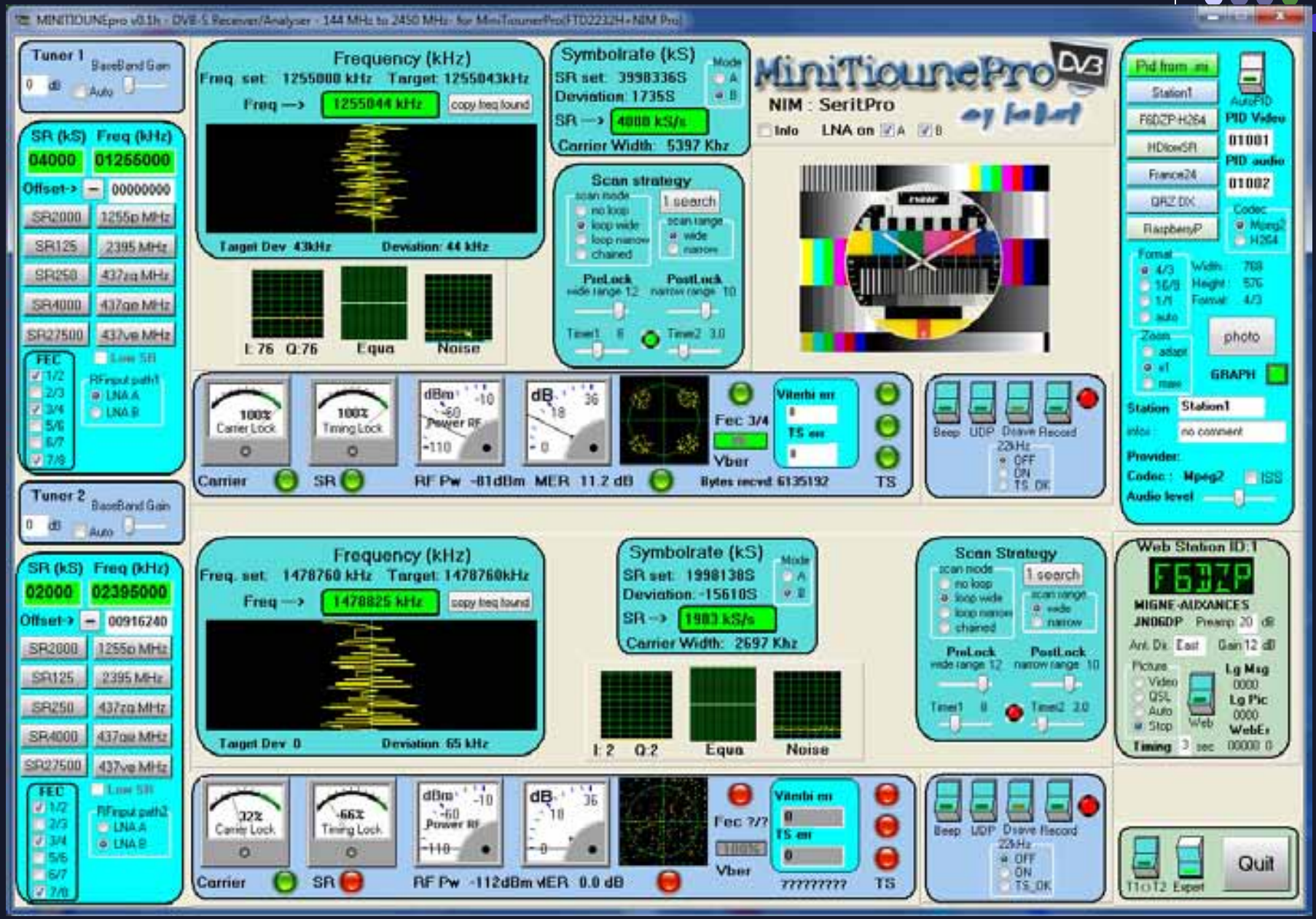
Another option is to output the second TS to a DVB parallel port



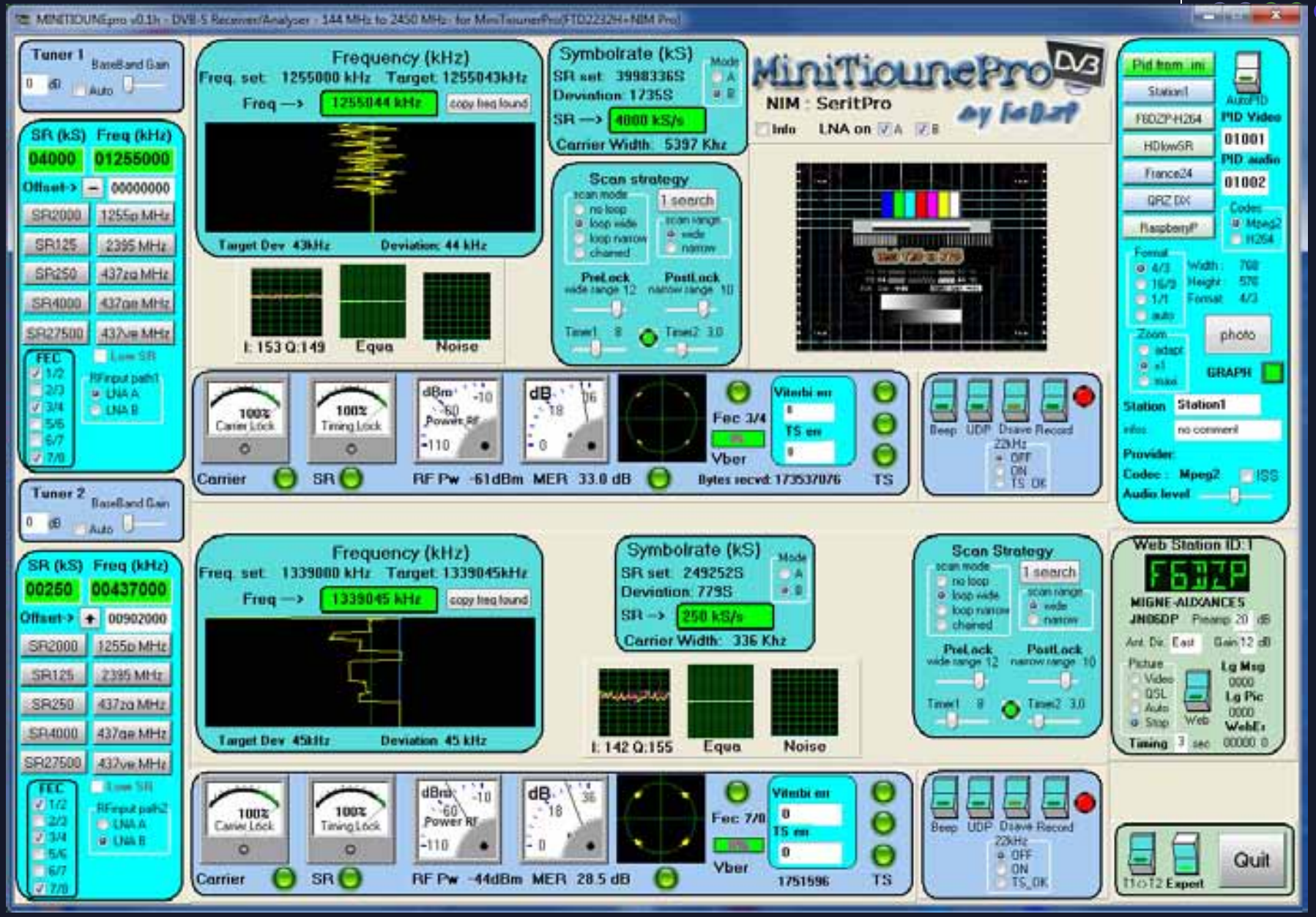
New software: Minitioune Pro



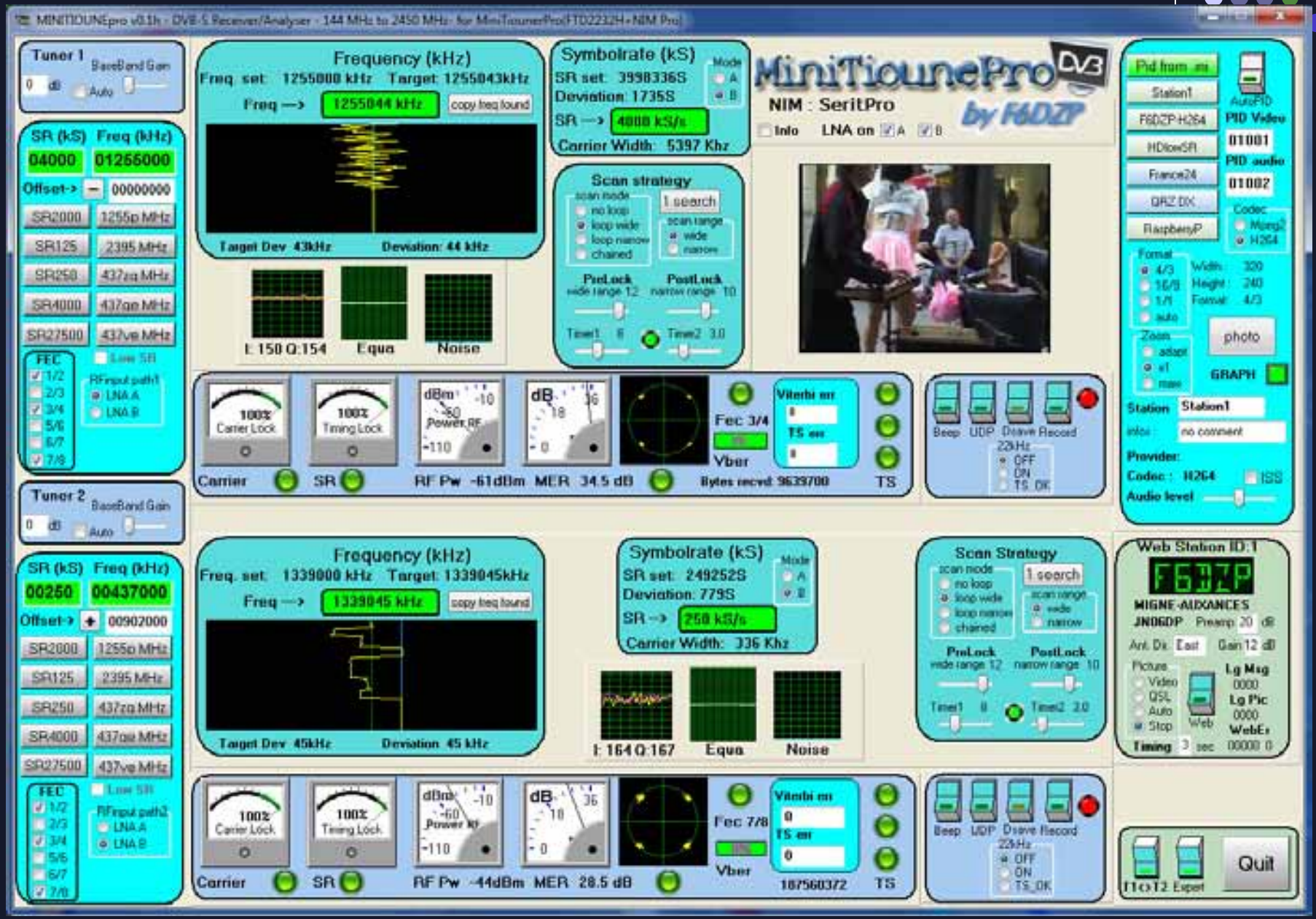
Minitioune Pro – 1 freq locked



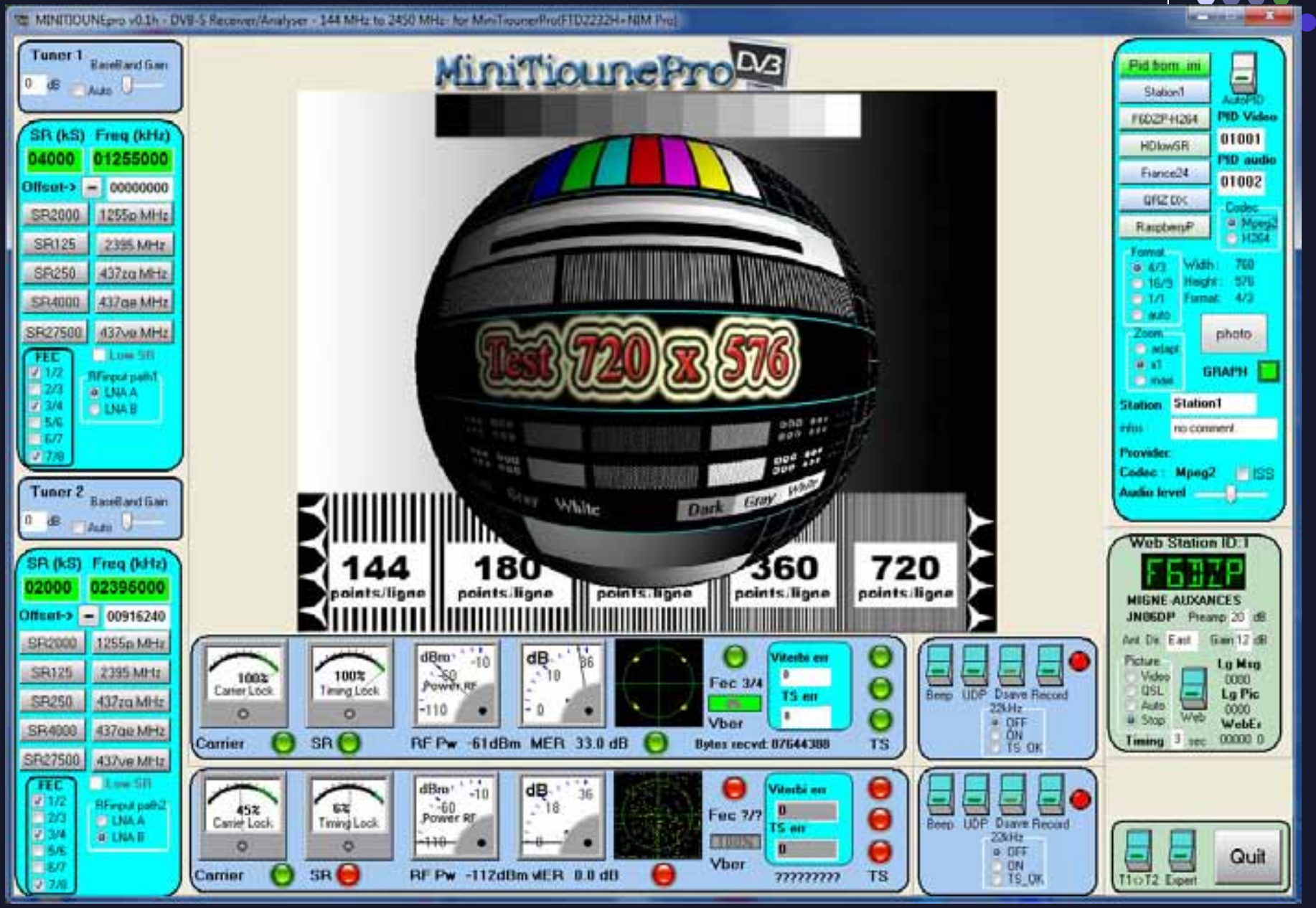
Minitioune Pro – 2 freq locked



Minitioune Pro – 2 freq locked

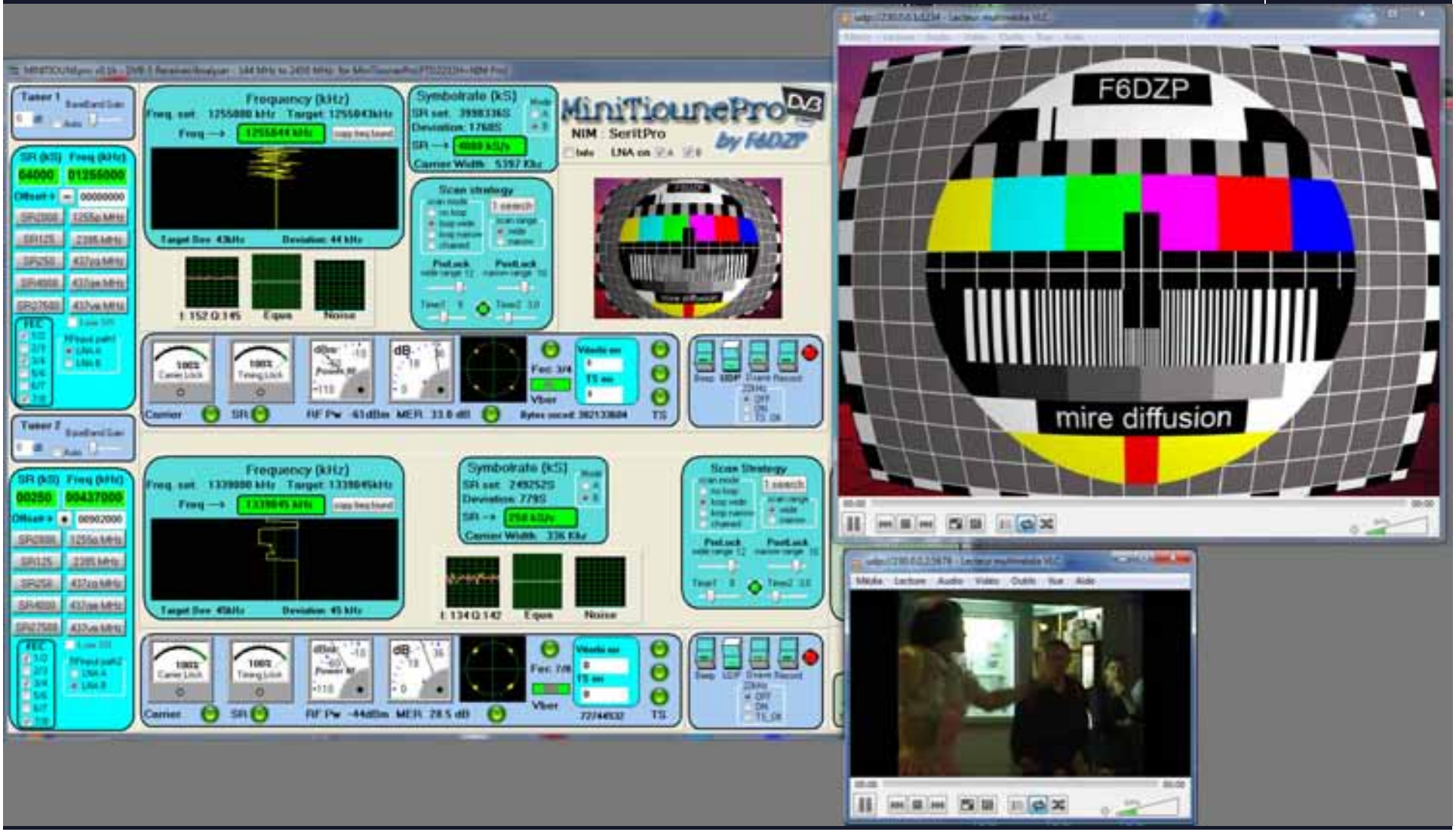


Minitioune Pro - TS1 display

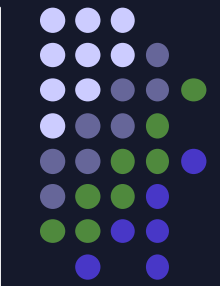


Minitioune Pro –TS2 display

Minitioune Pro
Using 2 VLC



MiniTiouner Pro / Minitioune next steps

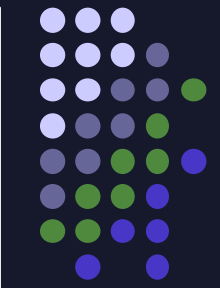


NIM FTS-4335 is easy to buy in lots of 100 units.
Before we create a PCB, we have now to decide which option to choose:

1.Same as MiniTiouner, same schematic : 1 x FT2232H ➔1 TS output (demod1 or demod2).
2. Double USB TS output using 2 x FT2232H
3.1 x USB TS output and 1 x TS parallel output
(remember that we have 2 multiplexers that allow us to do many things : receiving and showing a TS and sending the same to the parallel output …or different TS at different output or …)

In case we choose solution 3, it is easy to create a little external parallel to USB converter using a 2nd FT2232H

MiniTiouner-Pro - availability



MiniTiouner-Pro seems to be a good solution for the future
It can be used for many applications:

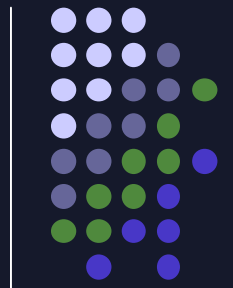
- DATV DVB-S
- Narrow band DATV
- DATV DVB-S2
- Receiving HamTV
- Receiving broadcast satellite DVB-S or DVB-S2

For a first solution, a kit or PCB could be offered.
A second solution could be a MiniTiouner-Pro fully assembled and tested, as proposed by Art Towslee WA8RMC.

Conclusion

- The Minitiouner /MiniTiouner-Pro project offer us to build our own USB DVB-S/S2 tuner that can receive from SR 120 kS/s up to 45000 kS/s.
- NIM, pcb and others components are available at the BATC shop
- Pipo X8/X9 + Minitiouner = a mobile solution
- Narrow Bandwidth DATV is now possible for DX
- Useful also for receiving HamTV.

All information on www.vivadatv.org Forum
You can also look at the BATC forum :
http://www.batc.org.uk/forum/



Thank you for your attention