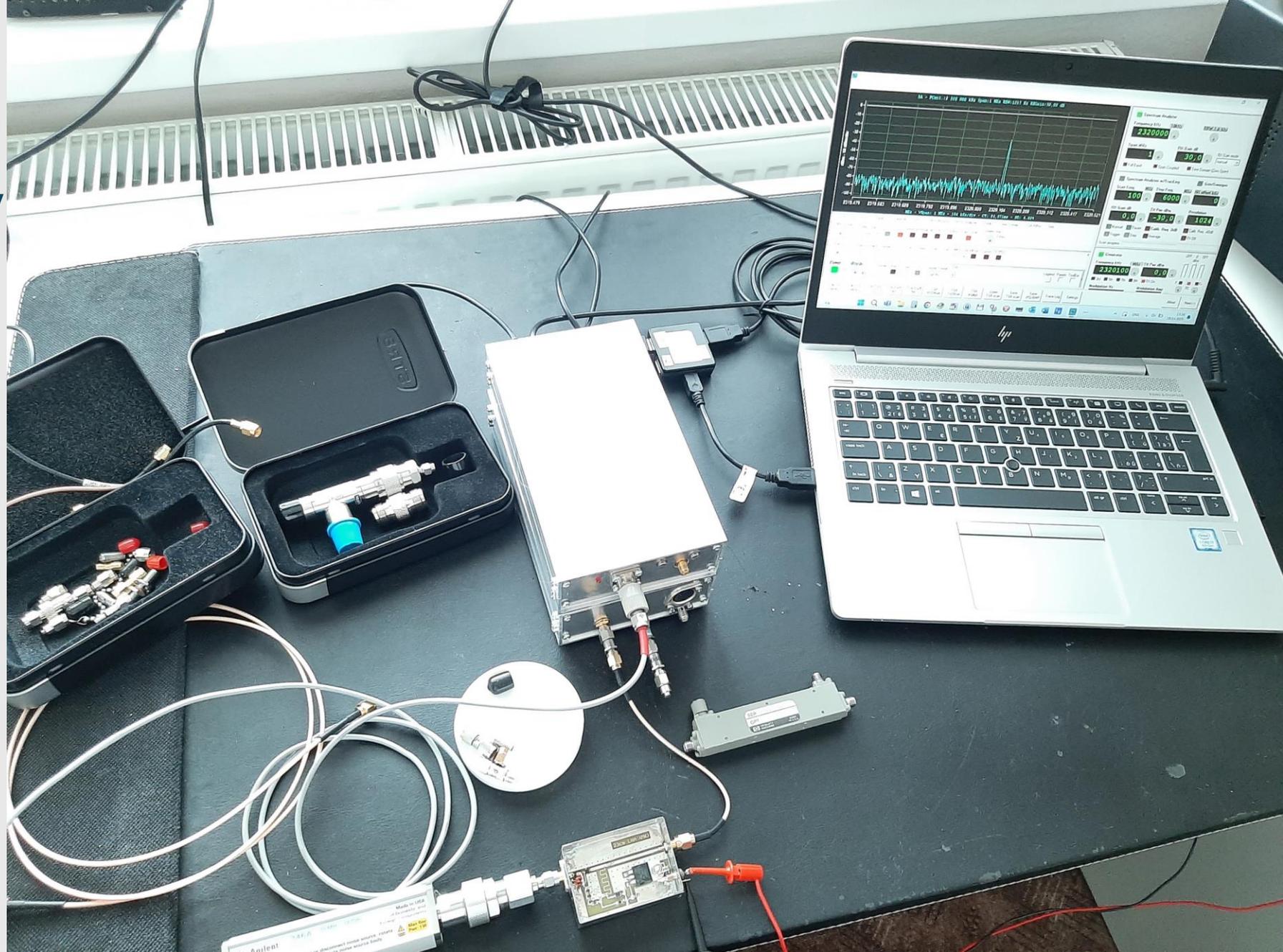


HOME Laboratory

Domáci Laboratoř

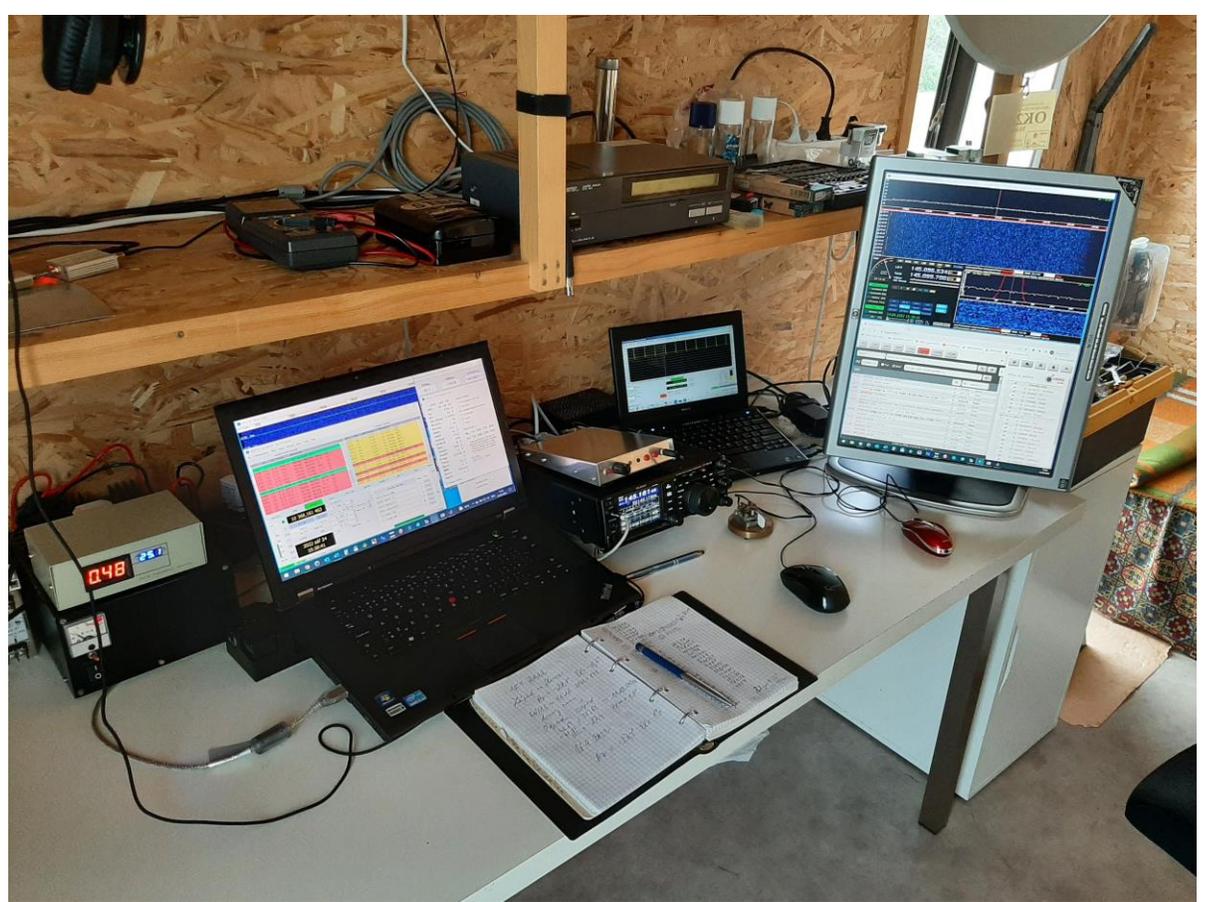
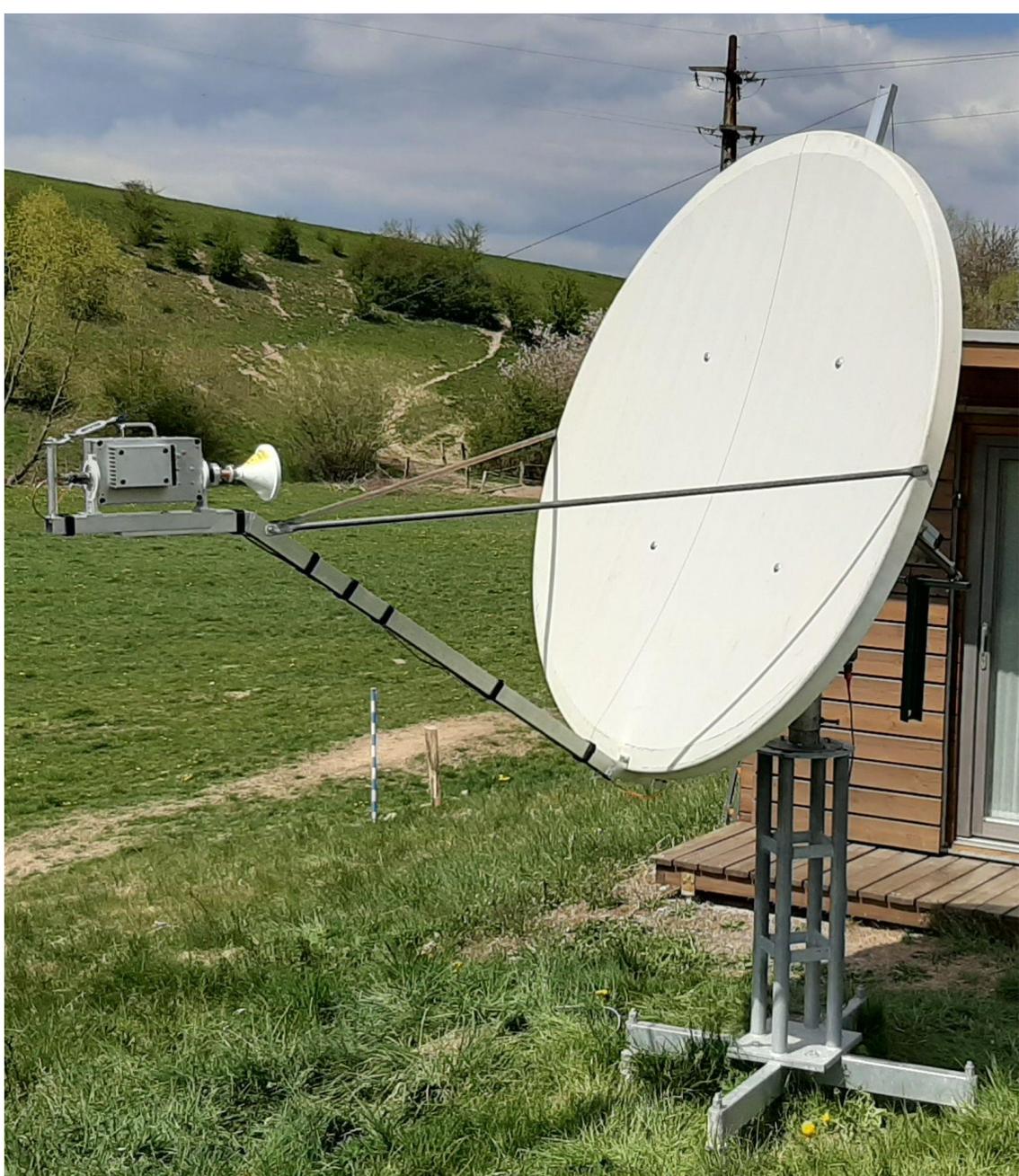
Mirek Kasal
OK2AQ



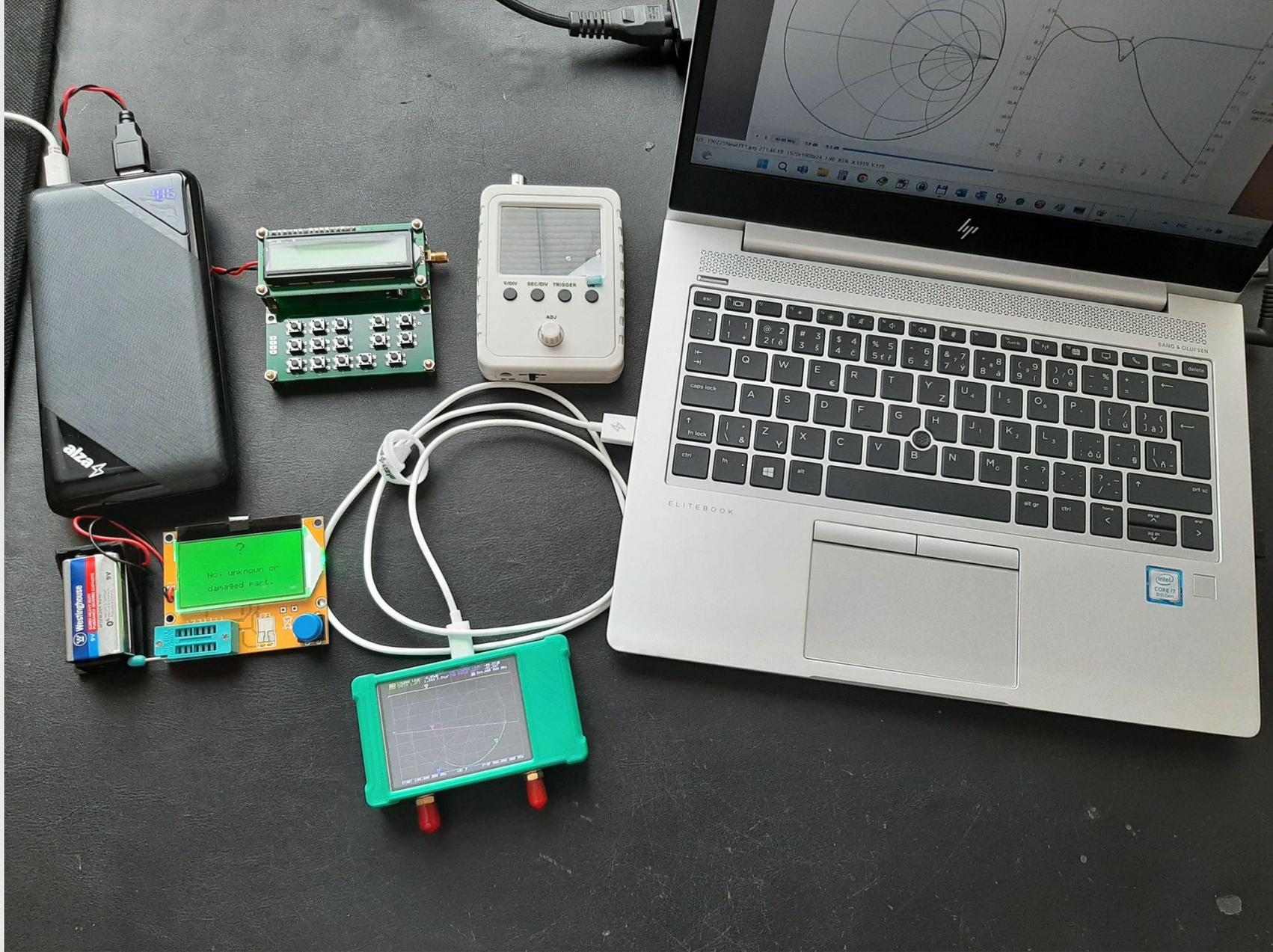
Up to 50 GHz

ESL DREL
FEEC BUT
Brno



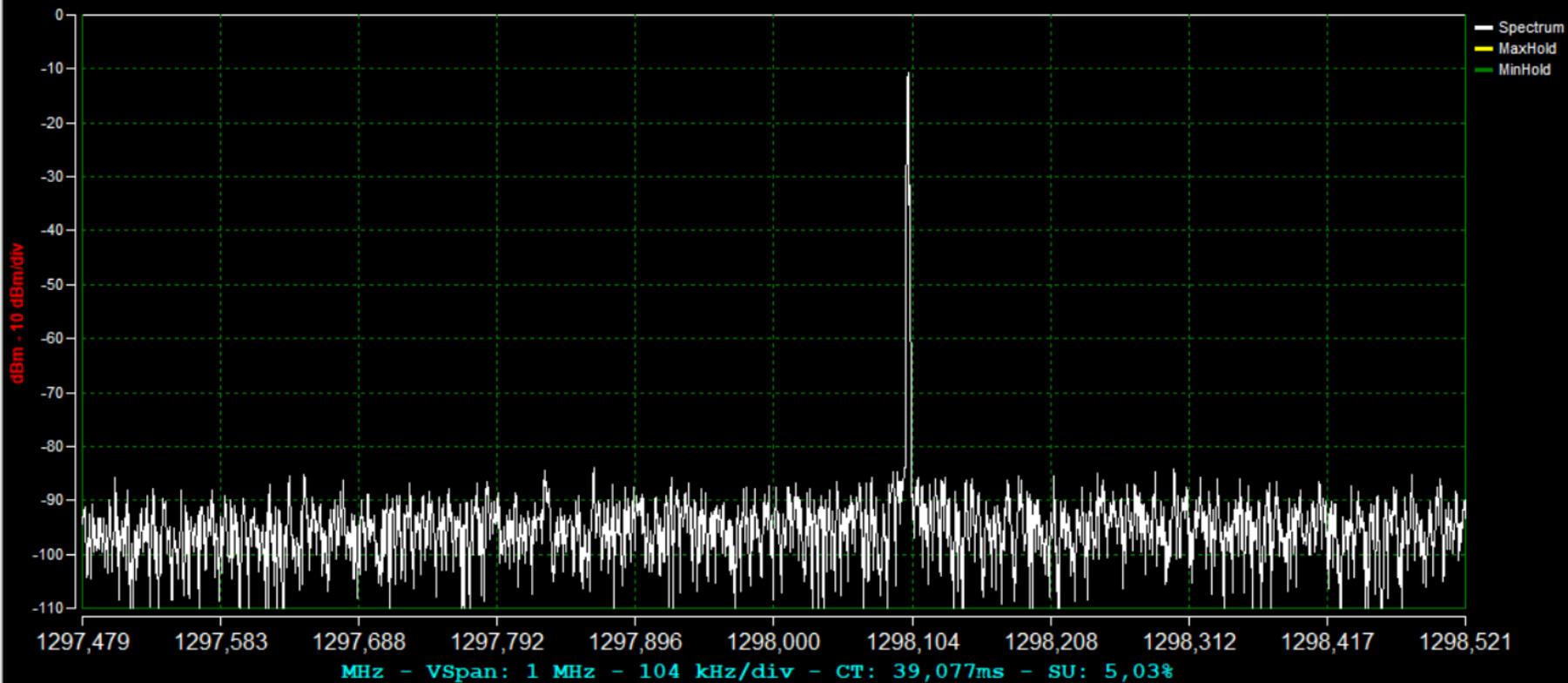


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SA - FCent.: 1 298 000 kHz Span: 1 MHz RBW: 508 Hz RXGain: 0,00 dB



SA Filters/trace types Triggers Waterfall DPD MKR Monitor NF/G Analyzer Radio Time Domain TSA RBW Grid

VFilter/cycle OFF VFilter Type PeakHold LO F E F MinHold MaxHold PM RWindow Fast-Cycle UpdateTime 100ms

PeakTH PeakA PeakH Tracker CF Prev Next Del Set MKR Unit All Info Cursors CP/PSD kHz

Power dBm/div 10 dBm TFinder Hold Copy L/C Display Format Logmag TSA Legend Panels ToolBar

Edit SA markers Edit TSA markers TSA/SWE 1st TSA/SWE 3rd TSA/SWE 5th TSA RXOffset TSA TXOffset TSA Multipl. Open TSA scan Save TSA scan Save JPG/BMP Trace Log Settings

Spectrum Analyzer

Frequency kHz 10kHz RBW: 508,0 Hz
1298000

Span MHz 1 RX Gain dB 0,0 RX Gain mode manual

Full Band Span Coupled Time Domain (Zero Span)

Spectrum Analyzer w/Tracking **Gen/Sweeper**

Start Freq. MHz 90 Stop Freq. MHz 2500 RX offset kHz 0

RX Gain dB 30,0 TX Pwr dBm -24,0 Resolution 512

Manual Pause Calib. Req. 0dB Calib. Req. -40dB
Trigger Step Average TX Off

Scan progress

Generator OFF -10 dBm OFF

Frequency kHz MHz TX Pwr dBm 1298100 -10,0

3rd 5th 7th 9th TX On F- F+ FC

Modulation Hz 1000,0 Modulation Amp 100 0,1 kHz 1,5

CW DC FMW FMN AM EXT ASK FSK NPR

About Next>>>

SATSAGEN (Alberto IU1KVL)

- Spektrální analyzátor (SA)
- SA s trackingem
s vhodnou směrovou vazbou - SNA
- SA s měřičem šumového čísla
- Generátor

ADALM Pluto

70 MHz – 6 GHz

v základním režimu

18 GHz

v harmonickém režimu

Kromě ADALM Pluto podporuje Pluto+, AntSDR, Libre SDR, Pluto CN, USRP B200mini, Airspy (R2 a mimi), RTL-SDR (V3 a V4), NESDR SMARt a celou řadu dalších.

Pokud má SDR dva kanály Rx a Tx (ADALM Pluto ver.C), může pracovat jako VNA

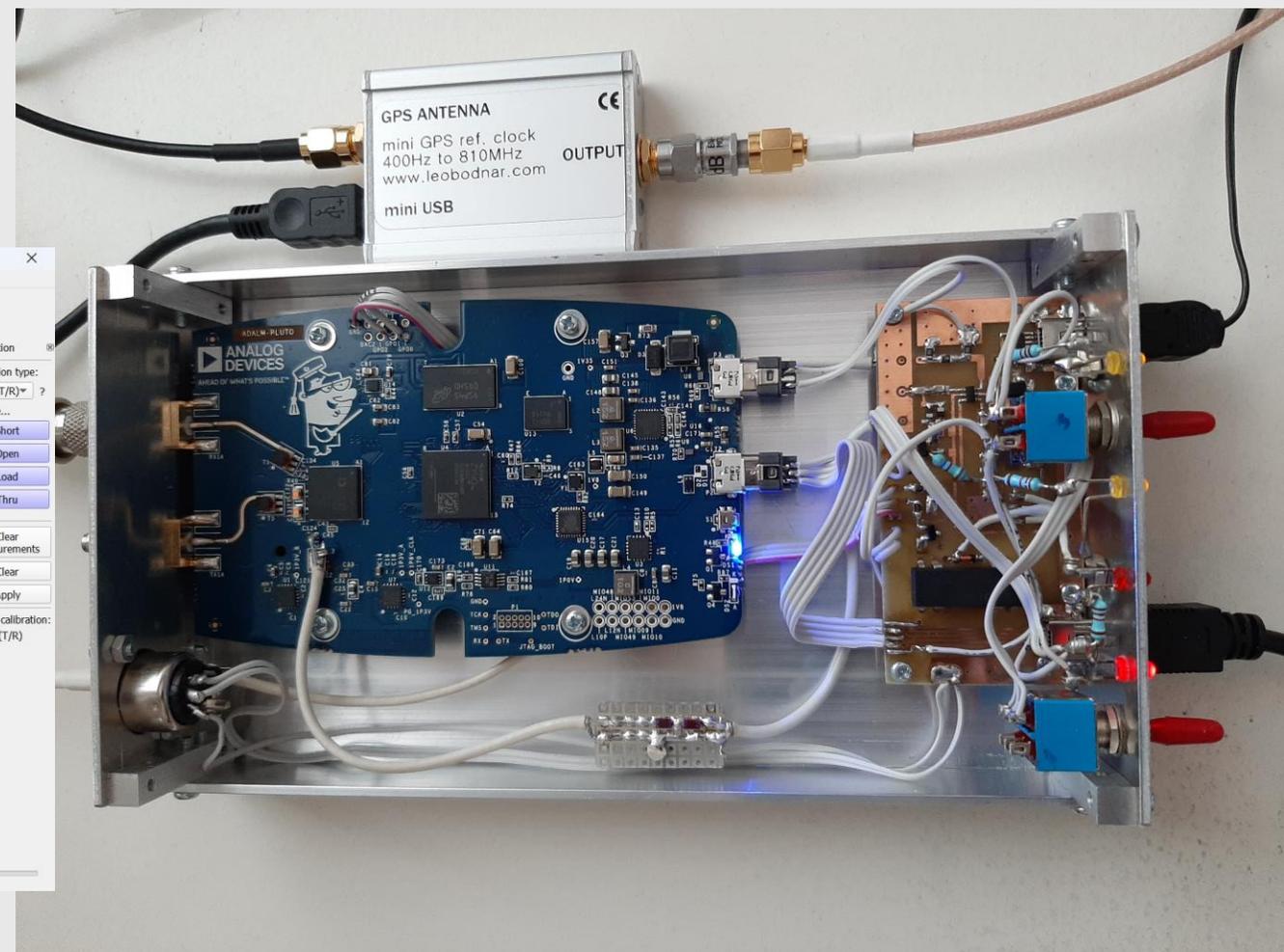
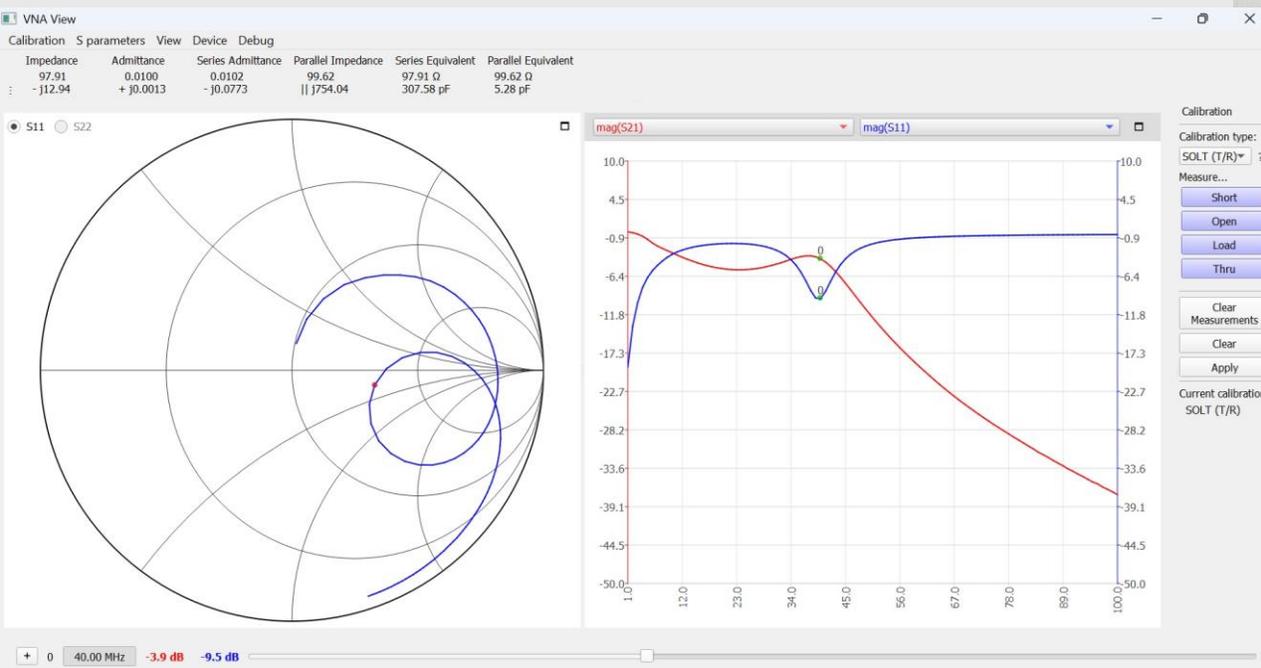
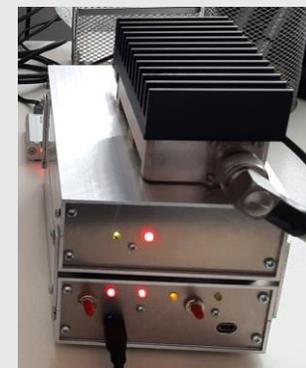
HARDWARE

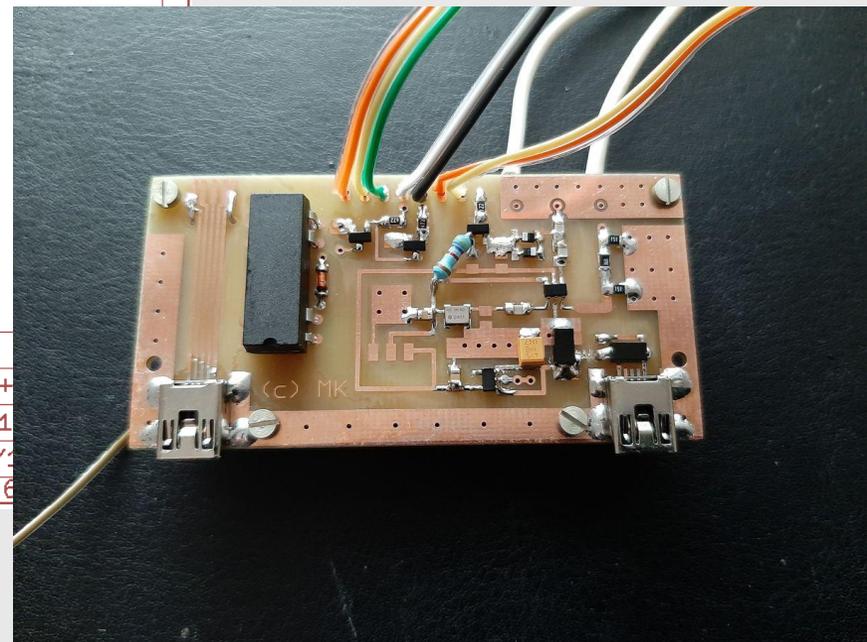
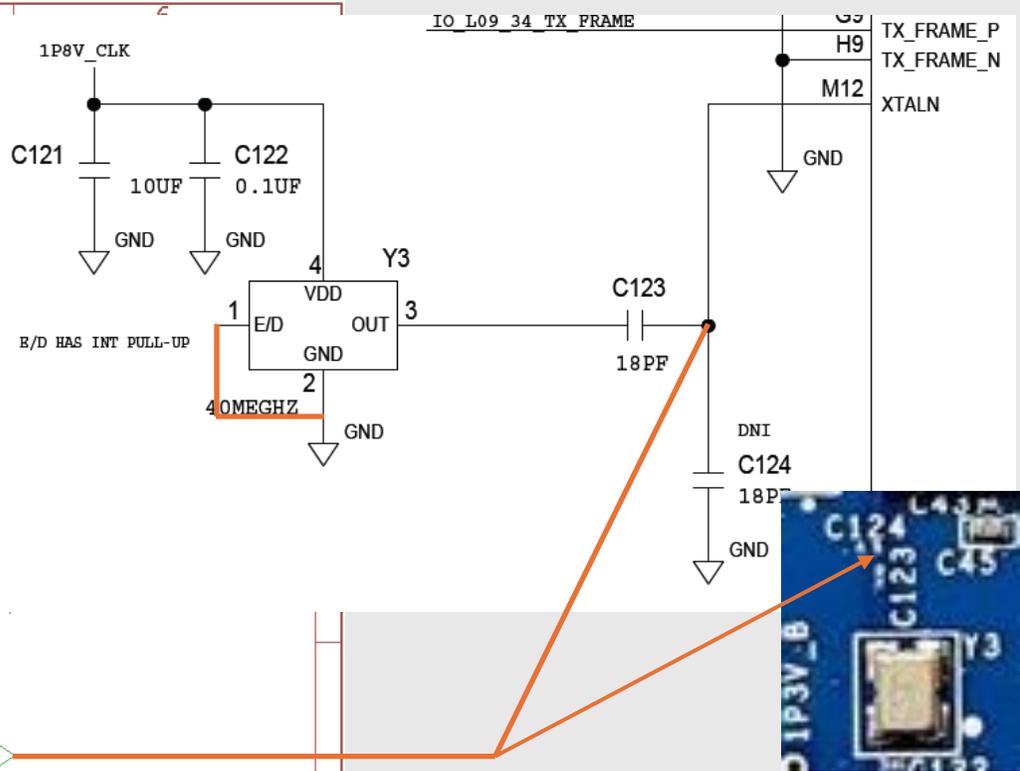
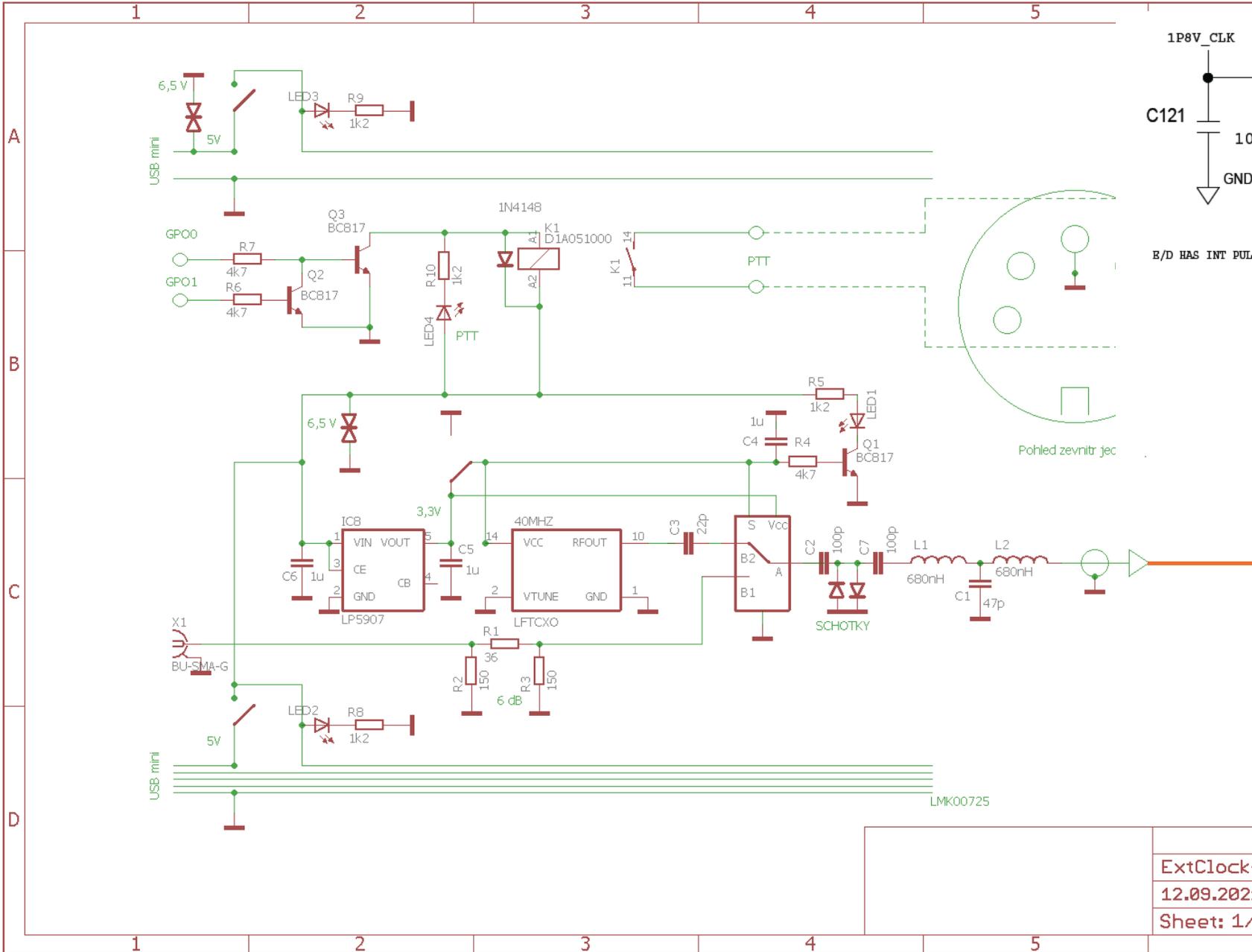
ADALM Pluto se stejnou úpravou jako pro EME

- externí TCXO MHz s možností přepnutí k GPSDO

LPF 40 MHz

Firmware F5OEO s PTT

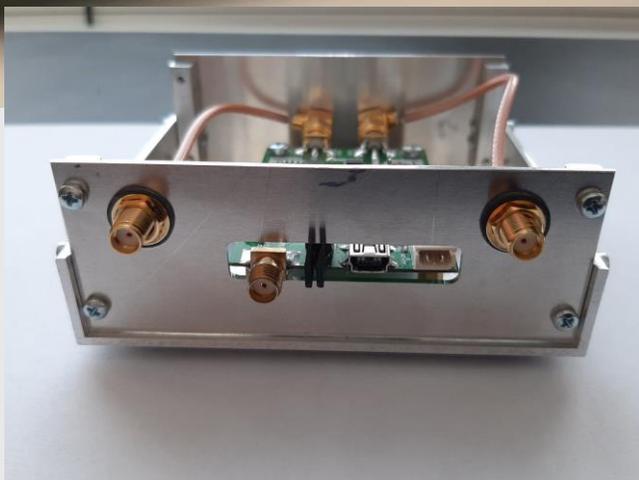
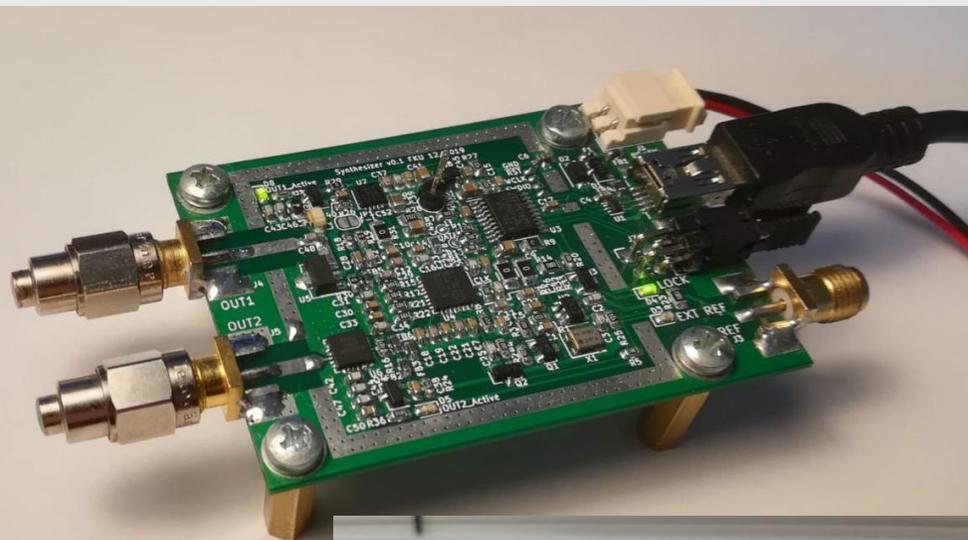




ExtClock+
12.09.2021
Sheet: 1/2

MW Syntezátor

- 30 MHz – 6 GHz
- 6 GHz – 12 GHz



Synthesizer Control Program by OK2FKU

Close Port COM3 PLO Init

Out 1 Off Out 2 On Ext Ref

Direct output frequency control

Output frequency: 50.000 000 MHz
Calculated freq.: 50.000 000 MHz
Delta frequency: 0 Hz

Synthesizer module info

Active Output 1: **ON** Active Output 2: **OFF**
Reference Signal: Internal
Frequency at Out 1: 50.000 000 MHz
Frequency at Out 2: 6400.0 MHz

```
800000c9' sent
16:07:14: command: 'plo set_register
80a00040' sent
16:07:14: plo isn't locked
16:07:14: plo locked
16:07:21: command: 'plo read_reg6 vco'
sent
16:07:21: register6_vco 70000038
16:07:21: plo locked
16:07:25: command: 'plo read_reg6 temp
20323' sent
16:07:25: register6_temp 702f8038
16:07:25: plo locked
16:07:28: command: 'plo read_reg6 temp
20323' sent
16:07:28: register6_temp 702f8038
16:07:28: plo locked
16:07:29: command: 'plo read_reg6 temp
20323' sent
16:07:29: register6_temp 702f8038
16:07:29: plo locked
16:07:30: command: 'plo read_reg6 temp
20323' sent
16:07:30: register6_temp 702f8038
16:07:30: plo locked
16:07:35: command: 'plo read_reg6 tune
20323' sent
16:07:35: register6_tune 703f8038
16:07:35: plo locked
16:07:36: command: 'plo read_reg6 temp
20323' sent
16:07:36: register6_temp 702f8038
16:07:36: plo locked
```

PLO MAX2871 Registers Settings

Direct control of registers Registers memory

Registers controls

Register 0:	80A00040	Write R0	Set As Def
Register 1:	800000C9	Write R1	Load Def
Register 2:	18007F42	Write R2	Save Into File
Register 3:	27FFB	Write R3	Load From File
Register 4:	60EC86BC	Write R4	
Register 5:	1400005	Write R5	Force Load All

Export currently set registers into Memory tab

Register 6 control

ADC Mode: Temperature

Get ADC Value: 41.42 °C

Get current VCO: 7

Reference frequency

Internal Ref. freq: 10.000 000 MHz x2 +2

R Divider: 1 fPFD 10.000 000 MHz

LD speed adjustment: fPFD <= 32 MHz

Output frequency control

IntN: 320 Mode: Integer

FracN: 8 A Divider: OUTA/64

MOD: 25 Phase P: 0

LD function: Int-N Lock-det.

RfOutB path: VCO fundamental

VCO to N FB: VCO fundamental

S-D noise mode: Low-noise Mode

Phase detector

LD precision: 10 ns PFD polarity: pos

Shutdown controls

PLO Power down VCO divider
 Reference input VCO LDO
 PLL VCO

Output frequency info

fVCO: 3200,000 000 MHz
fOUT A: 50,000 000 MHz
fOUT B: 3200,000 000 MHz

Output Controls

RfOutA Enable: 1. Enabled RfOutB Enable: 0. Disabled
RfOutA Power: +5 dBm RfOutB Power: +2 dBm

VCO settings

Automatic VCO selection
 VAS temperature compensation

Manual VCO select: 0

Band-Select clock div: 200

RFOUT Mute until Lock Detect Mode
 Delay LD to MTLD function to prevent flickering

Clock divider value: 4095 Delay: 10 ms

Calc CDIV to spec. delay: 20 ms

Charge pump

R set: 4700 Fast Lock:

Current: 5,549 mA Phase Adjust.:

Linearity: 0% extra Tristate Output:

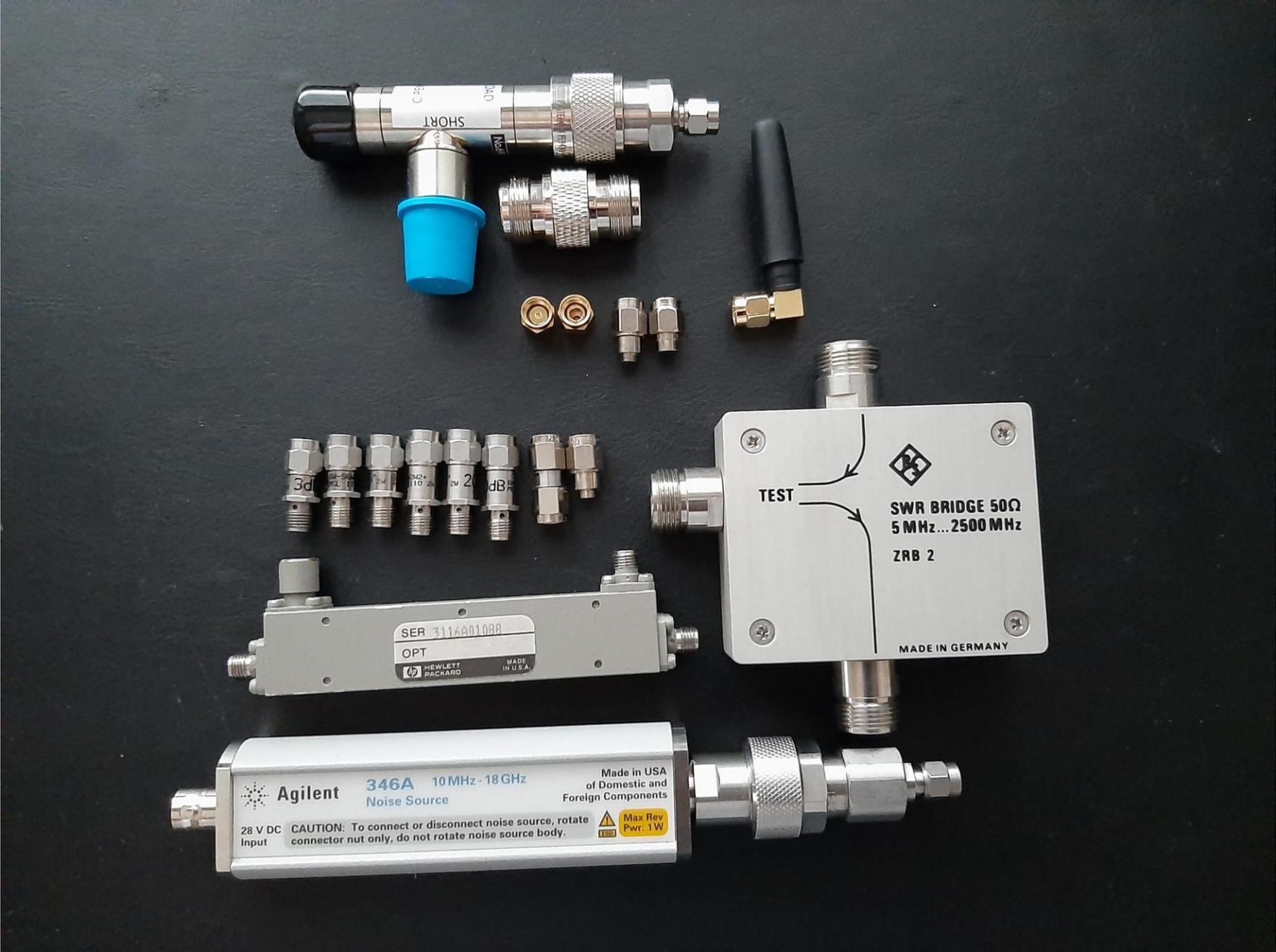
CP Test: Normal Cycle Slip Mode:

Generic controls

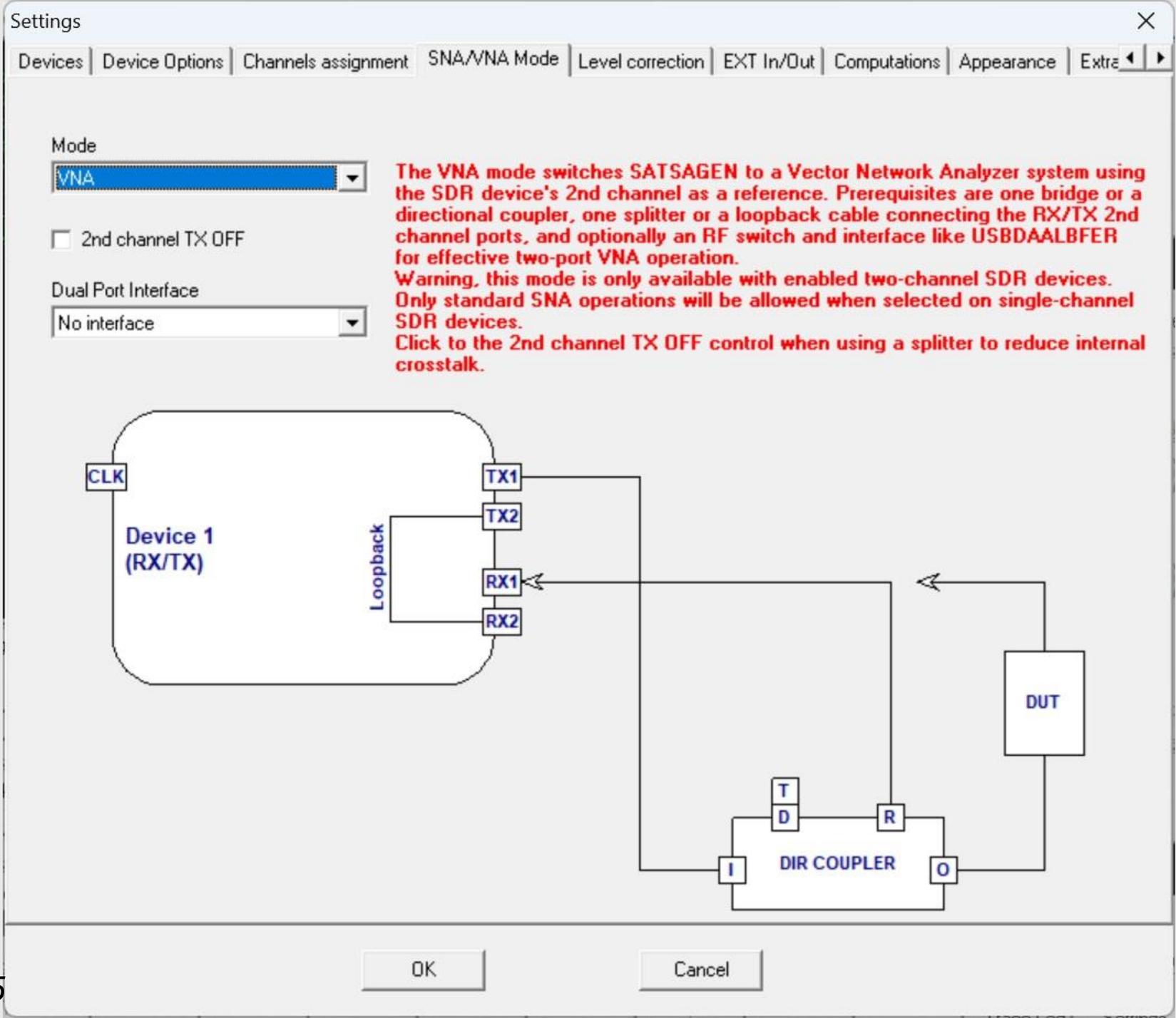
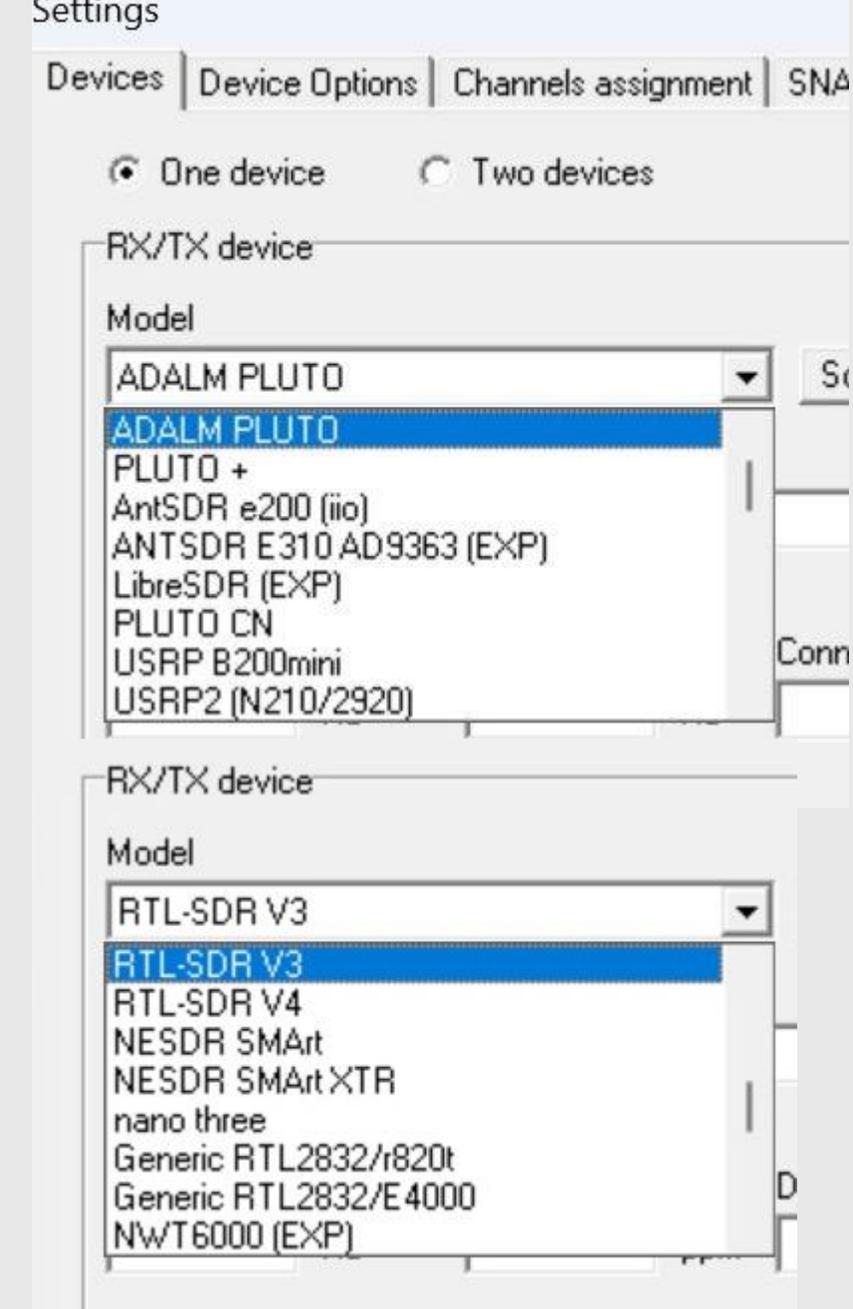
Mux Pin Mode: Digital lock detect

Register 4 double buffered with reg. 0
 Integer-N mode auto set, if FracN = 0
 R and N counters reset

plo is locked



33rd EME a MW seminar, Radešín 2025



Settings

Devices | **Device Options** | (

RX/TX device
ADALM PLUTO

- SA Harmonic mode
- Kernel buffers
- Auto TX calibration

Settings

Devices | Device Options | Channels assignment | SNA/VNA Mode | Level correction | EXT In/Out | Computations | Appearance | E

File INI TX correction
 ...

TX level correction

TX Level Offset
 dB Loss Gain

2nd Channel -TX Level Offset
 dB Loss Gain

File INI RX correction
 ...

RX level correction TSA

RX level correction SA

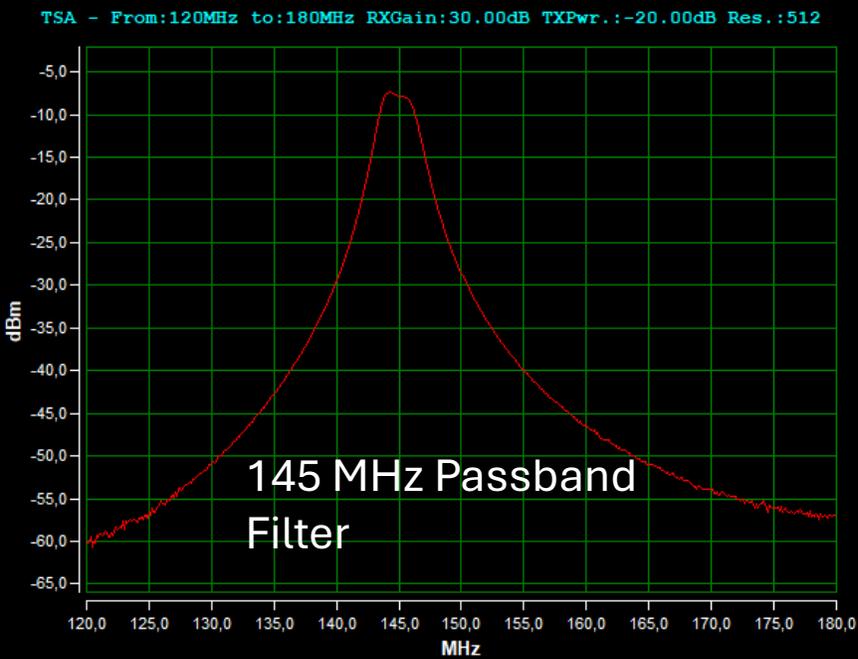
TSA Sub. RX Gain

SA Sub. RX Gain

Harmonic level correction

RX level offset
 dB Loss Gain

2nd Channel - RX level offset
 dB Loss Gain



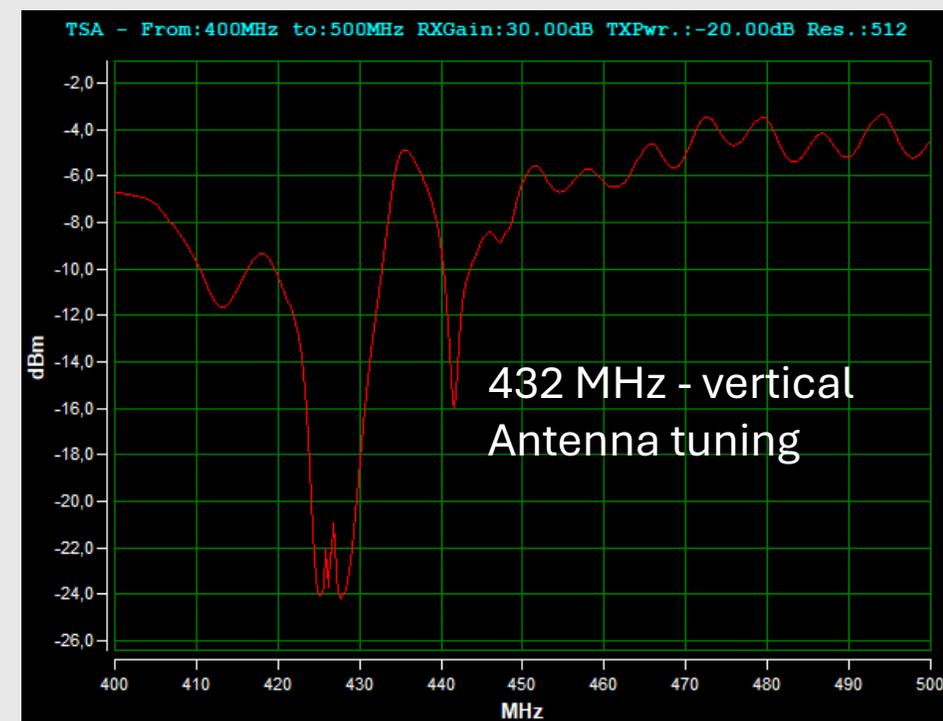
Spectrum analyzer
+ Tracking Oscillator

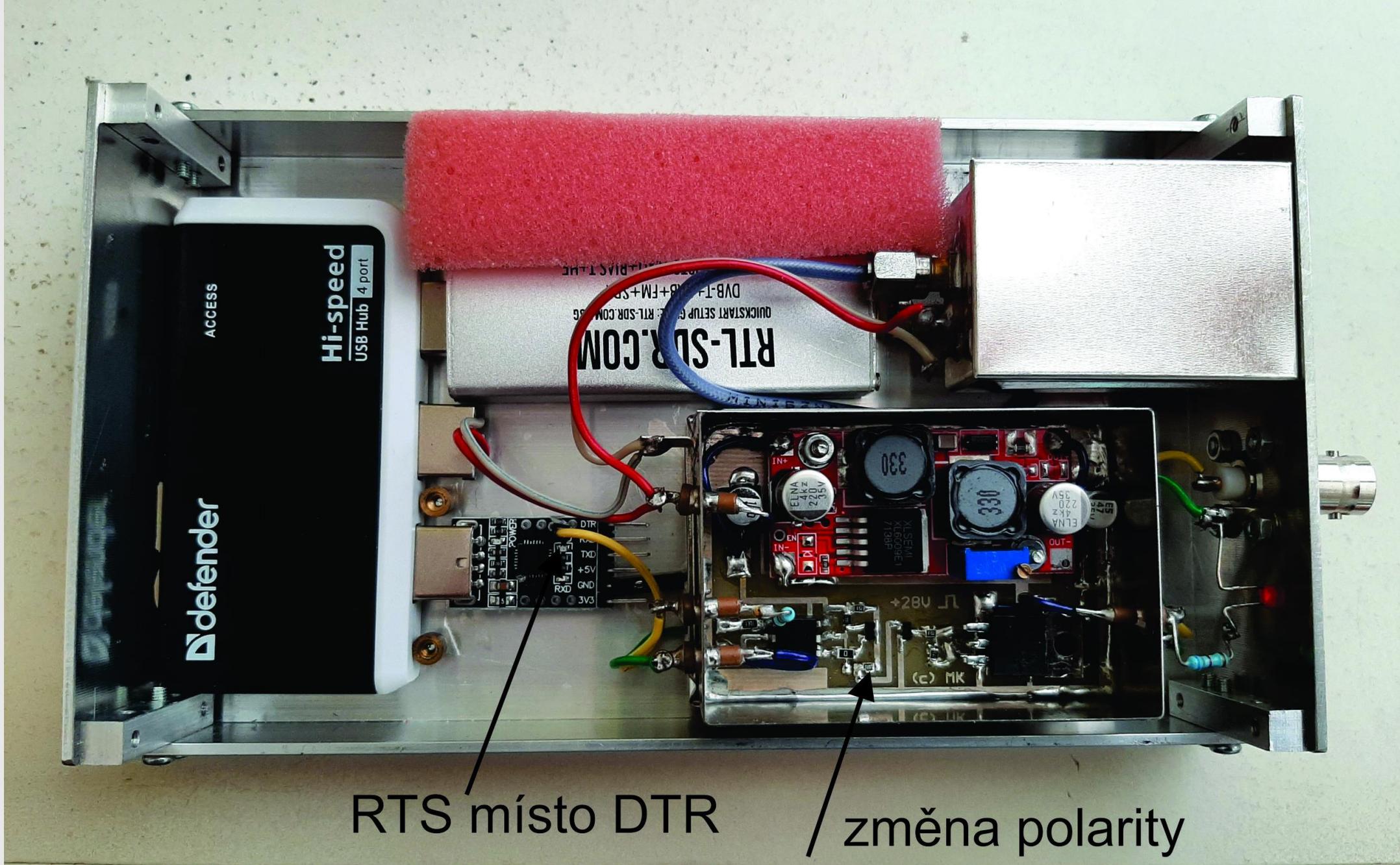


+



Directional Coupler





RTS místo DTR

změna polarity

Level correction | EXT In/Out | Computations | Appearance | Extra

Noise-Gain Analyzer

File ENR INI

Manual/Calibration
 Samples

Auto
 Samples

NS ON/OFF time delay
 ms

RX Gain attenuation
 dB

Ambient temperature (Tcold compensation)
 °C

Loss 1 dB  Loss 2 dB

Adaptive on three gain settings

Settings

Devices | Device Options | Channels assignment | SNA/VNA Mode | Level correction | EXT In/Out | Computations | Appearance | Extra

Sync Out/Sweep Out/Trigger In device

COM Port
 USBDAALBFER COM Port autodiscovery

Sync Out (via serial RTS line, 50ms negative pulse)

Mode Delay after sync start ms

NF/G Analyzer

Noise source power interface

- No interface
- USB D/A albfer.com
- Serial RTS line**
- Generator as a Noise Source

Edit Noise Source ENR INI

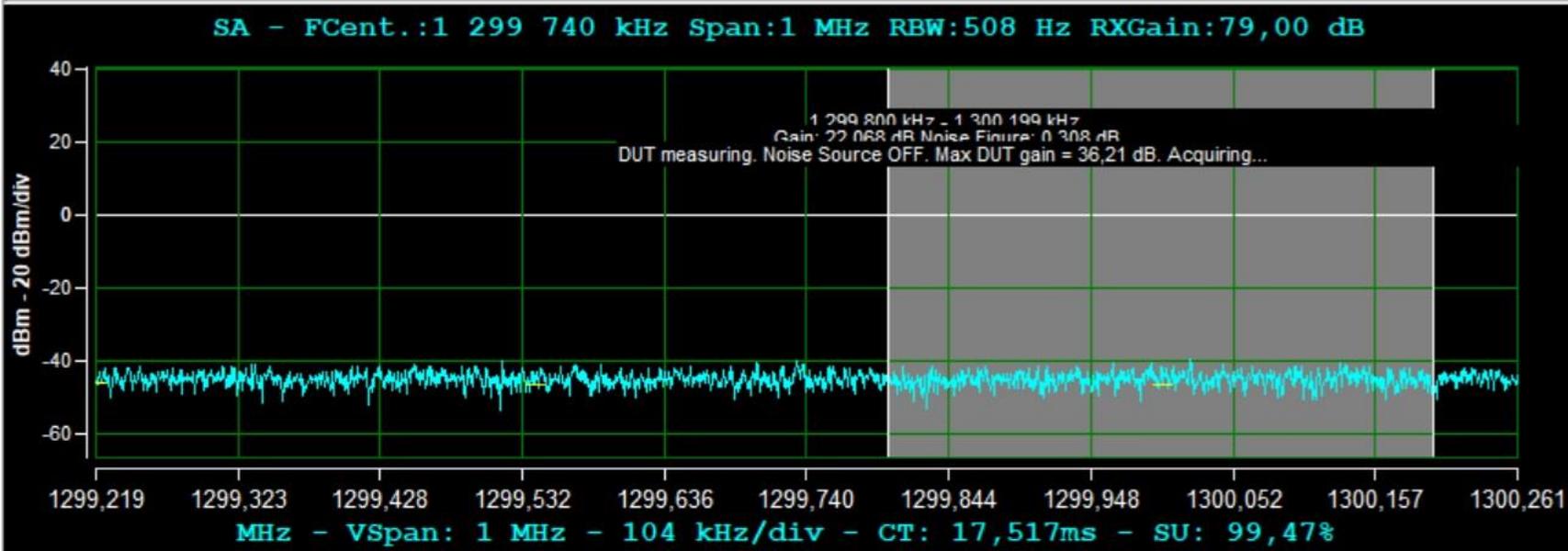
freq	ENR
3000000000	5,41
4000000000	5,42
5000000000	5,39
6000000000	5,4
7000000000	5,41
8000000000	5,49
9000000000	5,51
10000000000	5,53
11000000000	5,54
12000000000	5,49
13000000000	5,5
14000000000	5,52
15000000000	5,63
16000000000	5,75
17000000000	5,78
18000000000	5,58



Edit SA markers table

ID	Trace	ReqFrequency	LockFrequency	IFFrequency	Span	CalcMode	NAvg	NAvgI	NPeak	Label	Bandwidth	Value	ValueI	IValue	Peak	PeakH	Log	GPSCoord
1	Spectrum	8500086331			0	0 CP	0	0	0		718950	-1 000,000	0,000	-1 000,000	0,000	0,000	False	False
2	Spectrum	13000000000			0	400000 NF/G	0	0	0		400000	NAN	NAN	NAN	NAN	NAN	False	False
3	Spectrum	4320000000			0	400000 NF/G	0	0	0		0	-1 000,000	-1 000,000	-1 000,000	0,000	0,000	False	False
4	Spectrum	23200000000			0	400000 NF/G	0	0	0		0	-1 000,000	0,000	-1 000,000	0,000	0,000	False	False
5	Spectrum	5087675839			0	0 CP	0	0	0		718950	-1 000,000	0,000	-1 000,000	0,000	0,000	False	False

Frequency MHz **Gain dB** **Noise Figure dB** Smoothing
 1300 22,07 0,31 0,10



SA Filters/trace types Triggers Waterfall DPD MKR Monitor NF/G Analyzer Radio Time Domain TSA RBW Grid

ON Manual SYS CAL NS OFF SYS CAL NS ON DUT NS OFF DUT NS ON Auto SYS CAL

PeakTH PeakA PeakH Tracker CF Prev Next Del Set MKR Unit All Info Cursors CP/PSD

kHz

Power °C kHz/div TFinder Hold Copy L/C Display Format TSA Legend Panels ToolBar

104 kHz Logmag

Edit SA markers Edit TSA markers TSA/SWE 1st TSA/SWE 3rd TSA/SWE 5th TSA RXOffset TSA TXOffset TSA Multipl. Open TSA scan Save TSA scan Save JPG/BMP Trace Log Settings

Spectrum Analyzer

Frequency kHz 10kHz **RBW: 508,0 Hz**
 1299740

Span MHz 1 **RX Gain dB** 79,0 **RX Gain mode** manual

Full Band Span Coupled Time Domain (Zero Span)

Spectrum Analyzer w/Tracking **Gen/Sweeper**

Start Freq. MHz 100 **Stop Freq. MHz** 6000 **RX offset kHz** 0

RX Gain dB 0,0 **TX Pwr dBm** -30,0 **Resolution** 1024

Manual Pause Calib. Req. 0dB Calib. Req. -40dB
 Trigger Step Average TX Off

Scan progress

Generator

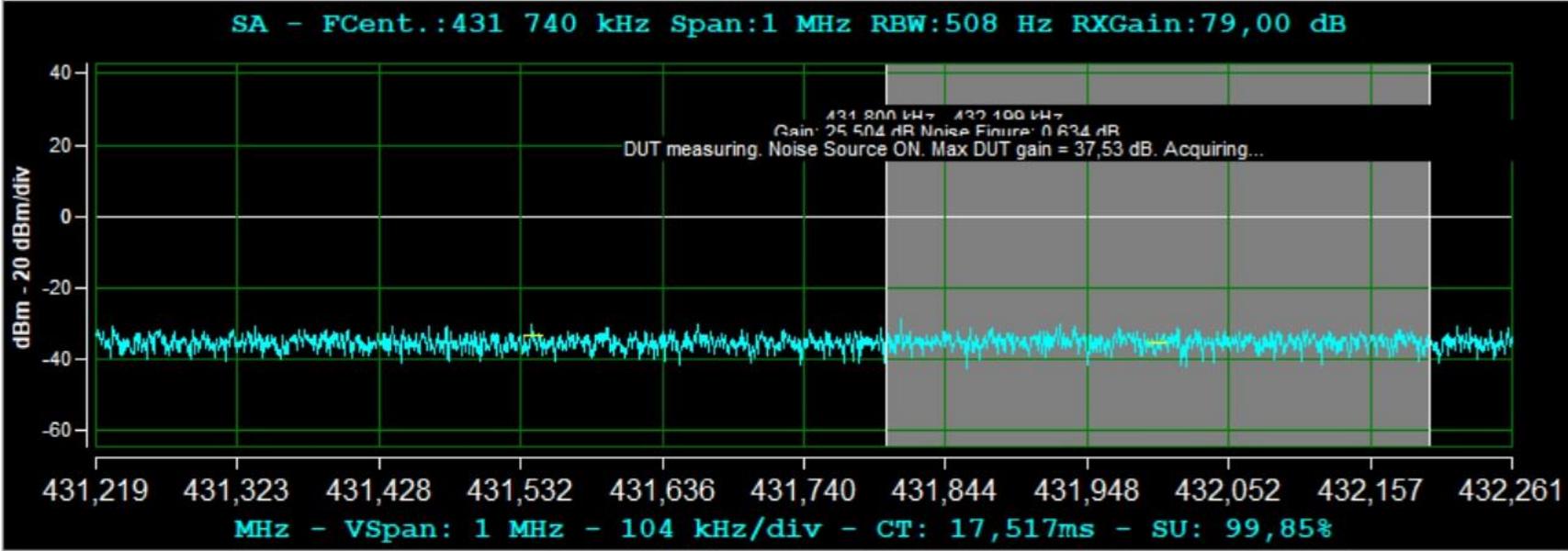
Frequency kHz MHz **TX Pwr dBm** -30,0

3rd 5th 7th 9th TX On F- F+ FC

Modulation Hz **Modulation Amp**

About Next>>>

Frequency MHz: **432** Gain dB: **25,50** Noise Figure dB: **0,63** Smoothing: 0,10



SA Filters/trace types Triggers Waterfall DPD MKR Monitor NF/G Analyzer Radio Time Domain TSA RBW Grid

ON Manual SYS CAL NS OFF SYS CAL NS ON DUT NS OFF DUT NS ON Auto SYS CAL

PeakTH PeakA PeakH Tracker CF Prev Next Del Set MKR Unit All Info Cursors CP/PSD

kHz

Power kHz/div TFinder Hold Copy L/C Display Format TSA Legend Panels ToolBar

104 kHz Logmag

Edit SA markers Edit TSA markers TSA/SWE 1st TSA/SWE 3rd TSA/SWE 5th TSA RXOffset TSA TXOffset TSA Multipl. Open TSA scan Save TSA scan Save JPG/BMP Trace Log Settings

Spectrum Analyzer

Frequency kHz: **431740** RBW: 508,0 Hz

Span MHz: **1** RX Gain dB: **79,0** RX Gain mode: manual

Full Band Span Coupled Time Domain (Zero Span)

Spectrum Analyzer w/Tracking Gen/Sweeper

Start Freq. MHz: **100** Stop Freq. MHz: **6000** RX offset kHz: **0**

RX Gain dB: **0,0** TX Pwr dBm: **-30,0** Resolution: **1024**

Manual Pause Calib. Req. 0dB Calib. Req. -40dB
Trigger Step Average TX Off

Scan progress

Generator

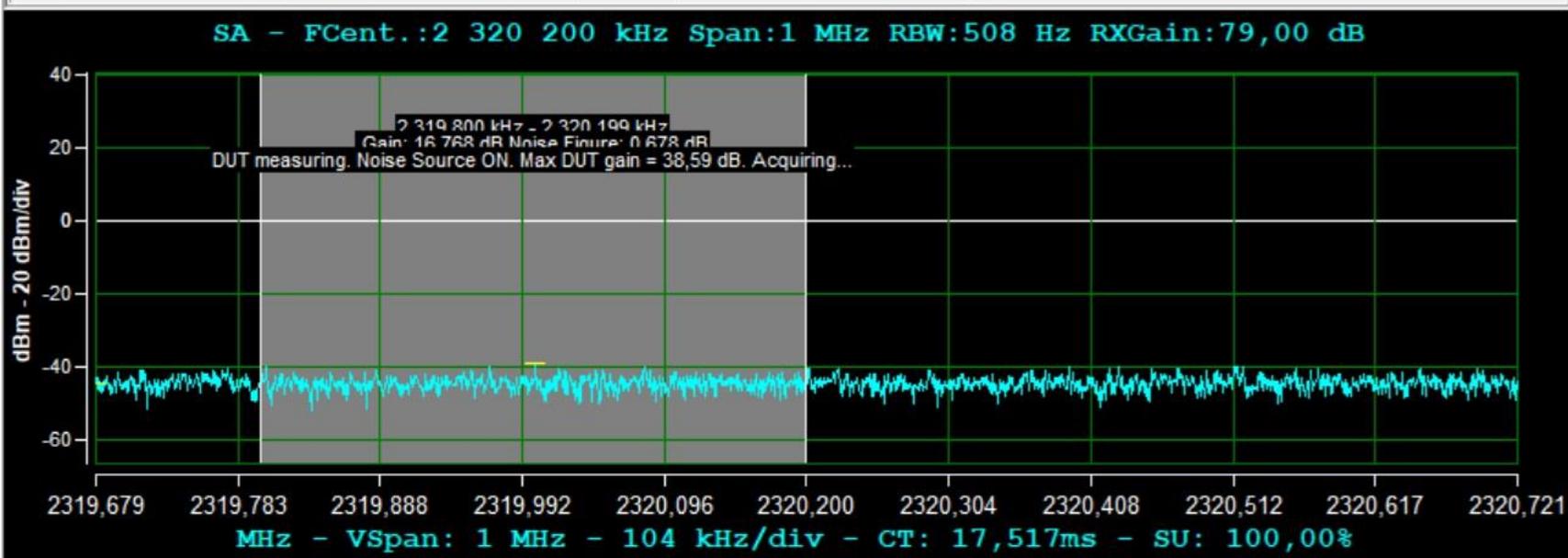
Frequency kHz: **8500100** TX Pwr dBm: **-30,0**

3rd 5th 7th 9th TX On F- FC F+

Modulation Hz Modulation Amp

About Next>>

Frequency MHz: **2320** Gain dB: **16,77** Noise Figure dB: **0,68** Smoothing: 0,10



SA Filters/trace types: ON Manual SYS CAL NS OFF SYS CAL NS ON DUT NS OFF DUT NS ON Auto SYS CAL

PeakTH: PeakA: PeakH Tracker: CF: Prev: Next: Del: Set: MKR Unit: kHz All Info: Cursors CP/PSD:

Power: °C: kHz/div: 104 kHz TFinder: Hold: Copy: L/C: Display Format: Logmag TSA: Legend: Panels: ToolBar:

Edit SA markers Edit TSA markers TSA/SWE 1st TSA/SWE 3rd TSA/SWE 5th TSA RXOffset TSA TXOffset TSA Multipl. Open TSA scan Save TSA scan Save JPG/BMP Trace Log Settings

Spectrum Analyzer

Frequency kHz: **2320200** 10kHz RBW: 508,0 Hz

Span MHz: **1** RX Gain dB: **79,0** RX Gain mode: manual

Full Band Span Coupled Time Domain (Zero Span)

Spectrum Analyzer w/Tracking **Gen/Sweeper**

Start Freq. MHz: **100** Stop Freq. MHz: **6000** RX offset kHz: **0**

RX Gain dB: **0,0** TX Pwr dBm: **-30,0** Resolution: **1024**

Manual Pause Calib. Req. 0dB Calib. Req. -40dB

Trigger Step Average TX Off

Scan progress:

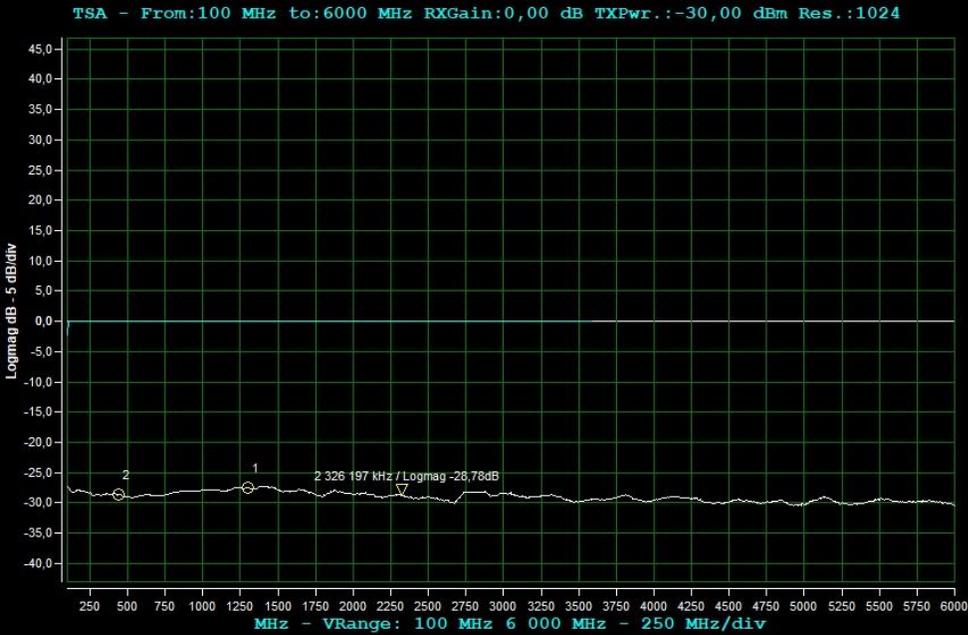
Generator

Frequency kHz: **8500100** MHz TX Pwr dBm: **-30,0** OFF -30 OFF dBm

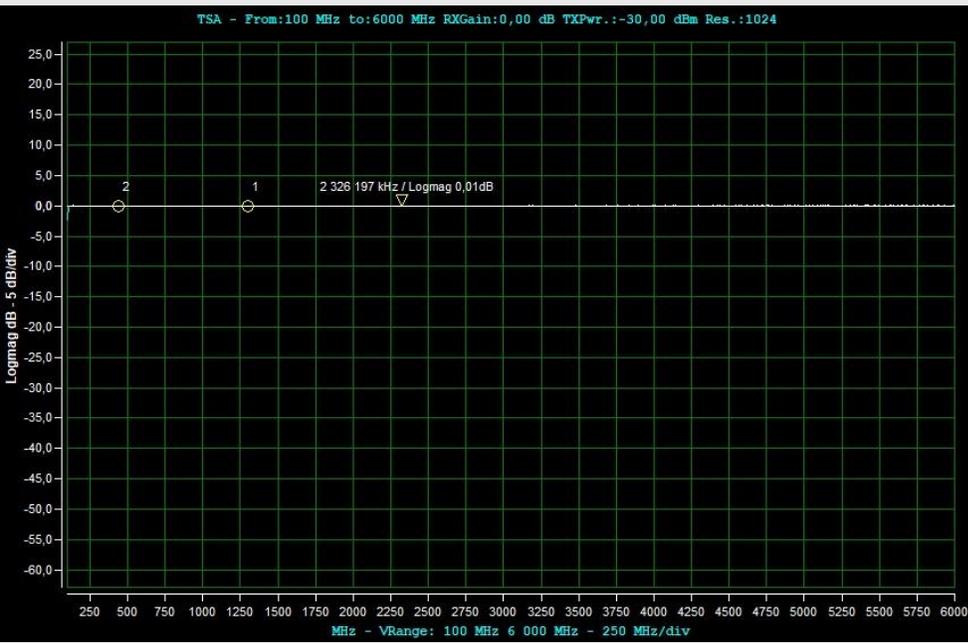
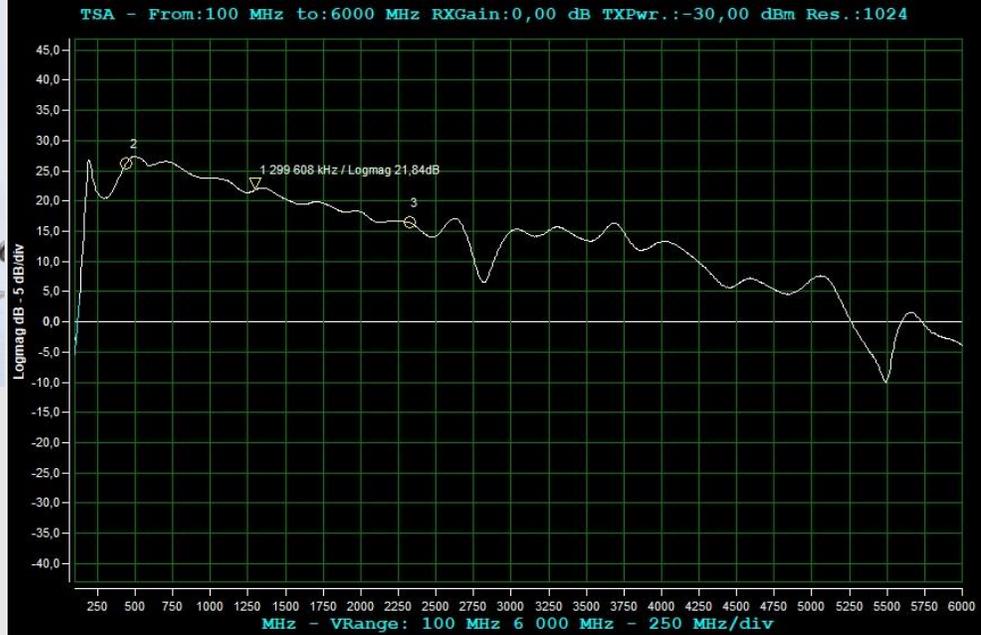
3rd 5th 7th 9th TX On F- FC F+

Modulation Hz: Modulation Amp:

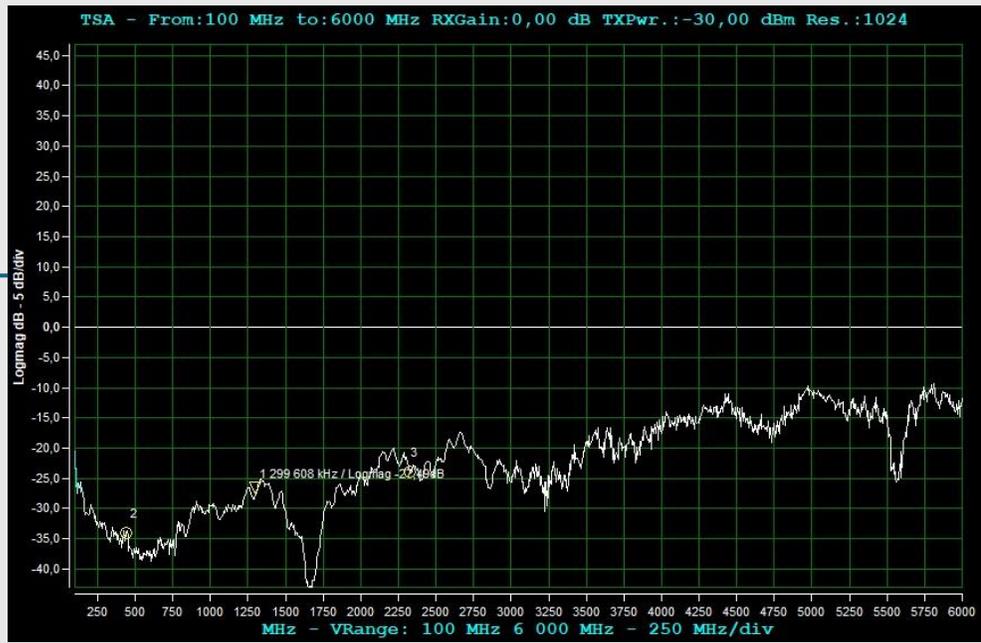
About Next>>>



LNA SKY67151



	432	1298	2320 MHz	
G	26	22	16	dB
S ₁₁	-35	-25	-23	dB
F	0.63	0.31	0.68	dB



Frequency MHz: 1300
 ENR dB: 5,38
 Noise Figure dB: —
 Smoothing: 0,10

SA - FCent.:1 299 740 kHz Span:1 MHz RBW:508 Hz RXGain:79,00 dB

SATSAGEN (Non-commercial use only) - v.0.9.2.1

File Edit View Run Settings Tools Scan Computation ?

Frequency MHz: 10368
 ENR dB: 5,50
 Noise Figure dB: —
 Smoothing: 0,10

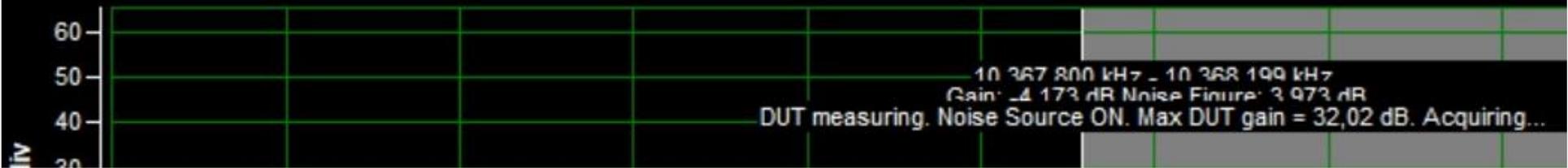
SA - FCent.:10 367 740 kHz Span:1 MHz RBW:508 Hz RXGain:79,00 dB

Frequency MHz: 8500
 Gain dB: -4,13
 Noise Figure dB: 4,02
 Smoothing: 0,10

SA - FCent.:8 499 740 kHz Span:1 MHz RBW:508 Hz RXGain:79,00 dB

Frequency MHz: 10368
 Gain dB: -4,17
 Noise Figure dB: 3,97
 Smoothing: 0,10

SA - FCent.:10 367 740 kHz Span:1 MHz RBW:508 Hz RXGain:79,00 dB



MEŘENÍ

ENR

MEŘENÍ

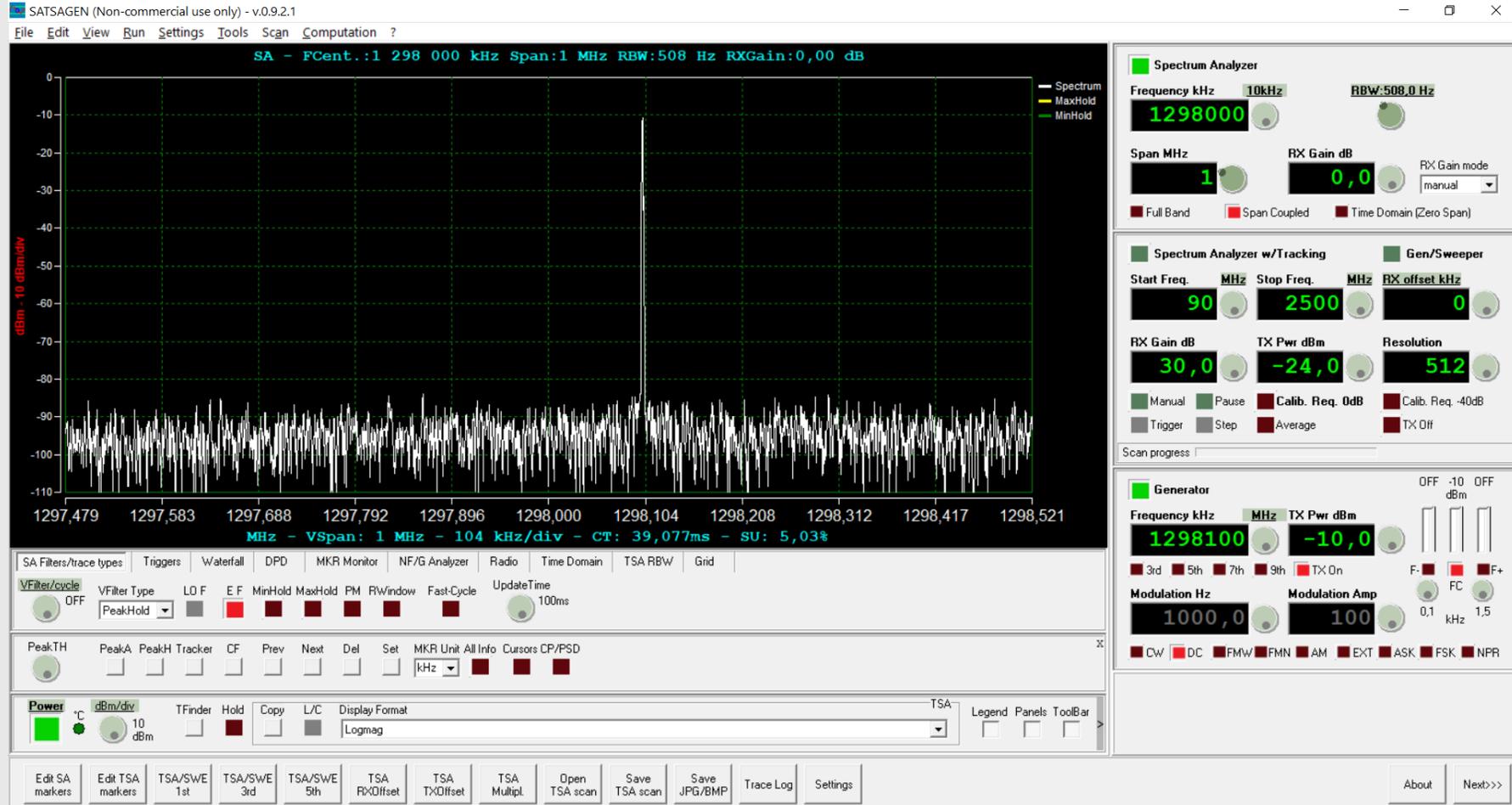
N.F.
 ATT 4 dB

SATSAGEN

- SA, TSA, GEN, Radio, NF/G
- Měření mod. parametrů
- Phosphor display, Waterfall
- Time domain, Triggers
- GEN – různé modulace

Doplňky s Arduino Nano

- Syntezátory s ADF4351
LMX2595, Si5351
- Log detektor s AD831x
- D/A a PWM D/A
- Napájení šumové hlavy
- (VNA RF přepínač)



Pro všechny tyto aplikace je k dispozici kód pro Arduino.

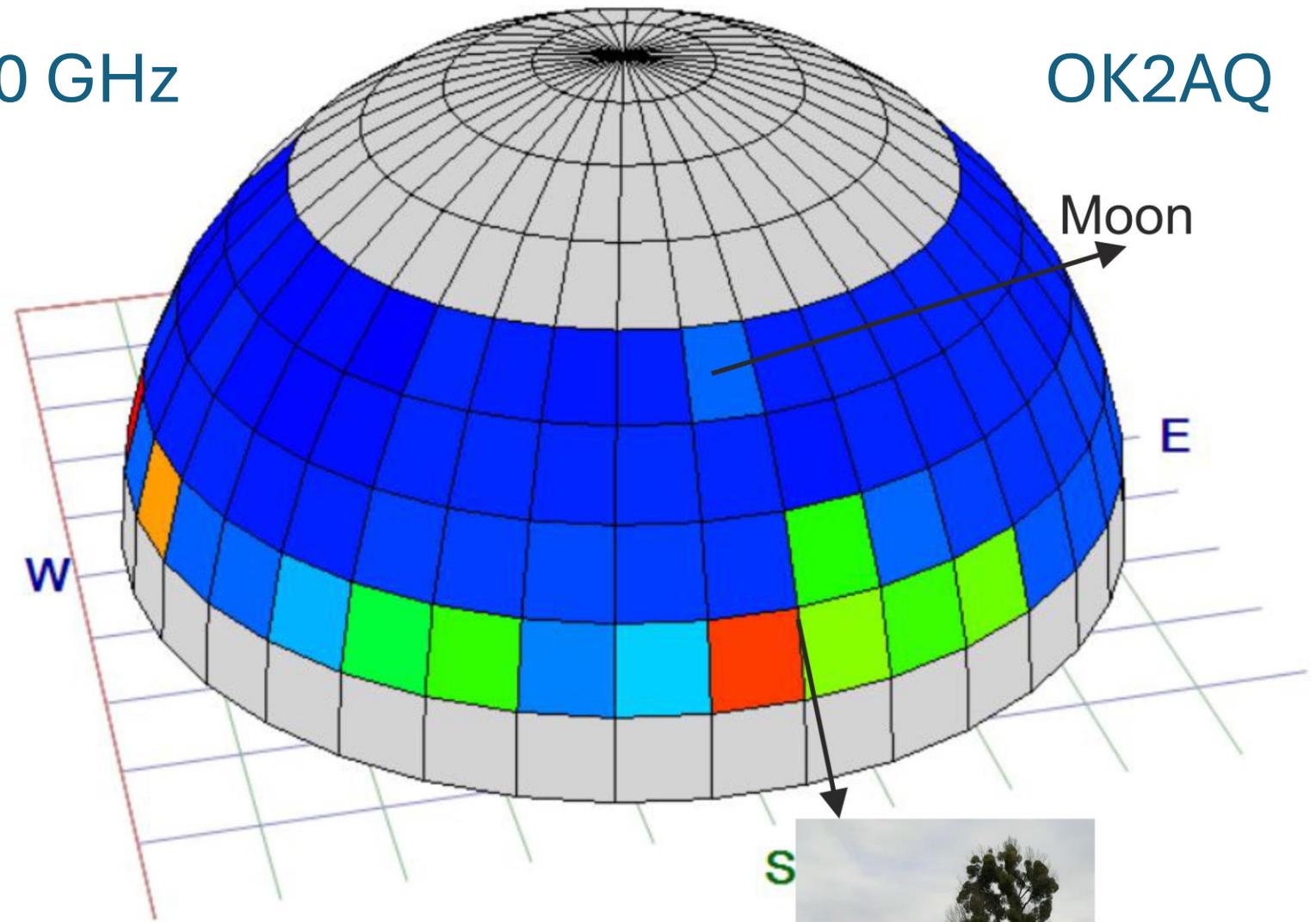
ŠUMOVÁ MAPA OBLOHY

Program SkyScanner

OZ9AAR

10 GHz

OK2AQ



<https://moonbounce.dk/hamradio/skyscanner.html>



Sound input

Line 1 (Virtual Audio Cable)

Refresh L O R

Noise: -30.95dB

Az: 295.0°

EI: 80.0°

Moon: 60.8° / 8.6°

Sun: 204.3° / 15.5°

Database

Open DB Create DB

Resolution (deg): 10

Frequency (MHz): 432.050

Zones measured: 234

Scanner

Dwell time (sec): 5

- Simulate measurements/rotor
- Park when measurement done
- Follow antenna

Zones left: 0

Time: 00:16:55

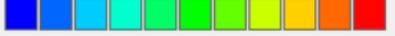
Start Stop

Track-A-Target

Sagg Leo Sun Moon

Stop track

-35.7 dB -23.2 dB



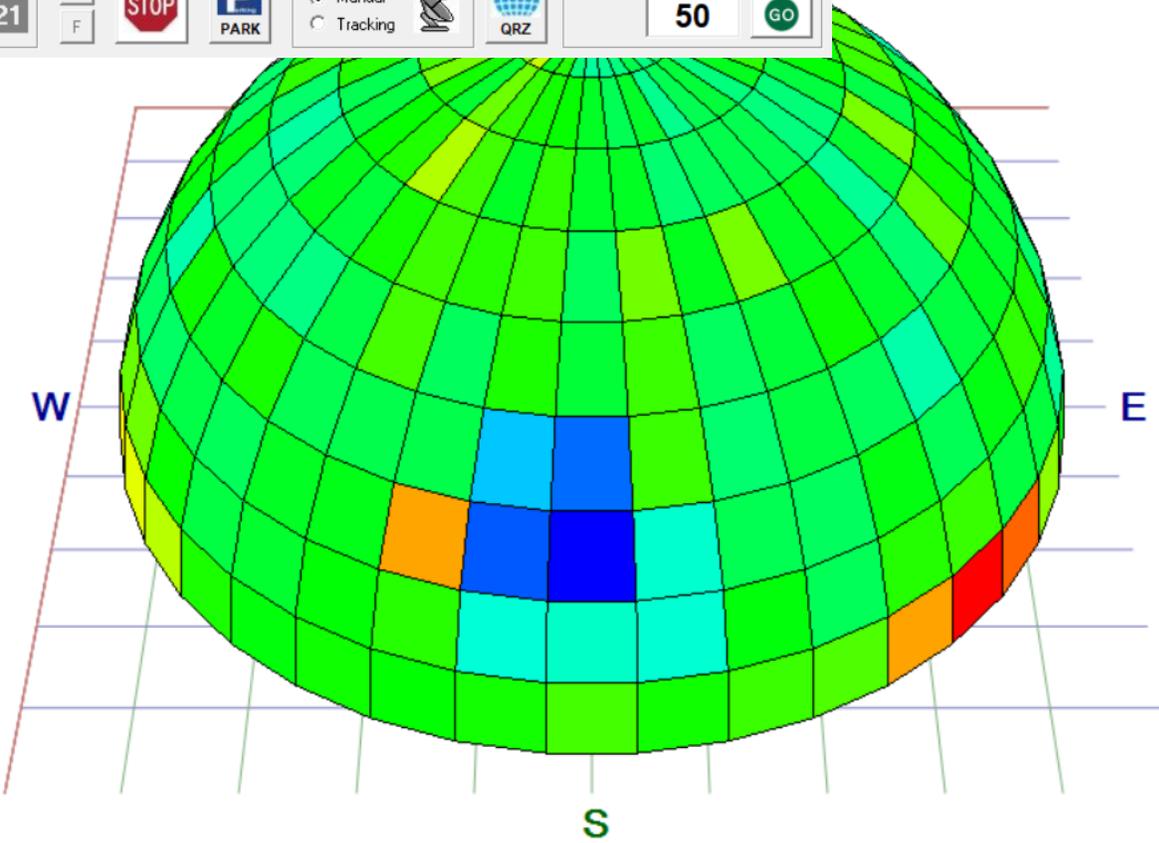
Last selected zone has been measured, all done

PstRotator - Registered to OK2AQ v17.67

Communication Setup Tracker RA/DEC GeoSats Maps My Maps Google Maps APRS EME DSN View Show Preset Help

The PstRotator interface includes several panels: a circular plot on the left showing a path of red dots; a 'QRB' panel with 'km' and 'QTH Locator' fields; a 'Presets' grid with buttons 1-12; a 'DXCC' panel with a list of countries and a 'GO to DXCC' button; a 'Mode' section with 'Manual' and 'Tracking' options; and a 'QRB' panel with 'AZ' (224) and 'EL' (50) fields and 'GO' buttons. A 'UTC' panel shows '16:24:21'. There are also 'STOP' and 'PARK' icons.

Yaesu GS-32 A/B OE5JFL controller



Left: El, Right: Az, Left+CTRL+ALT: Moveto zone, Left+SHIFT: Move, Left+CTRL/wheel: Zoom, Left+ALT: Select zone, Left+SHIFT+ALT: Delete measurement

Settings

General | Rotor

Observer

Latitude (- South/+ North)

Longitude (- West/+ East)

Grid locator

Height above MSL (meter)

Skip measurement if sun closer than (deg):

Width of signalgraph (seconds):

Show sun

Show moon

Select zones

Azimuth start:

Azimuth end:

Elevation start:

Elevation end:

Sequence

Finish elevation

Finish azimuth

Animation

Sun Sweep

Azimuth

Span (deg):

Step (deg):

Elevation

Span (deg):

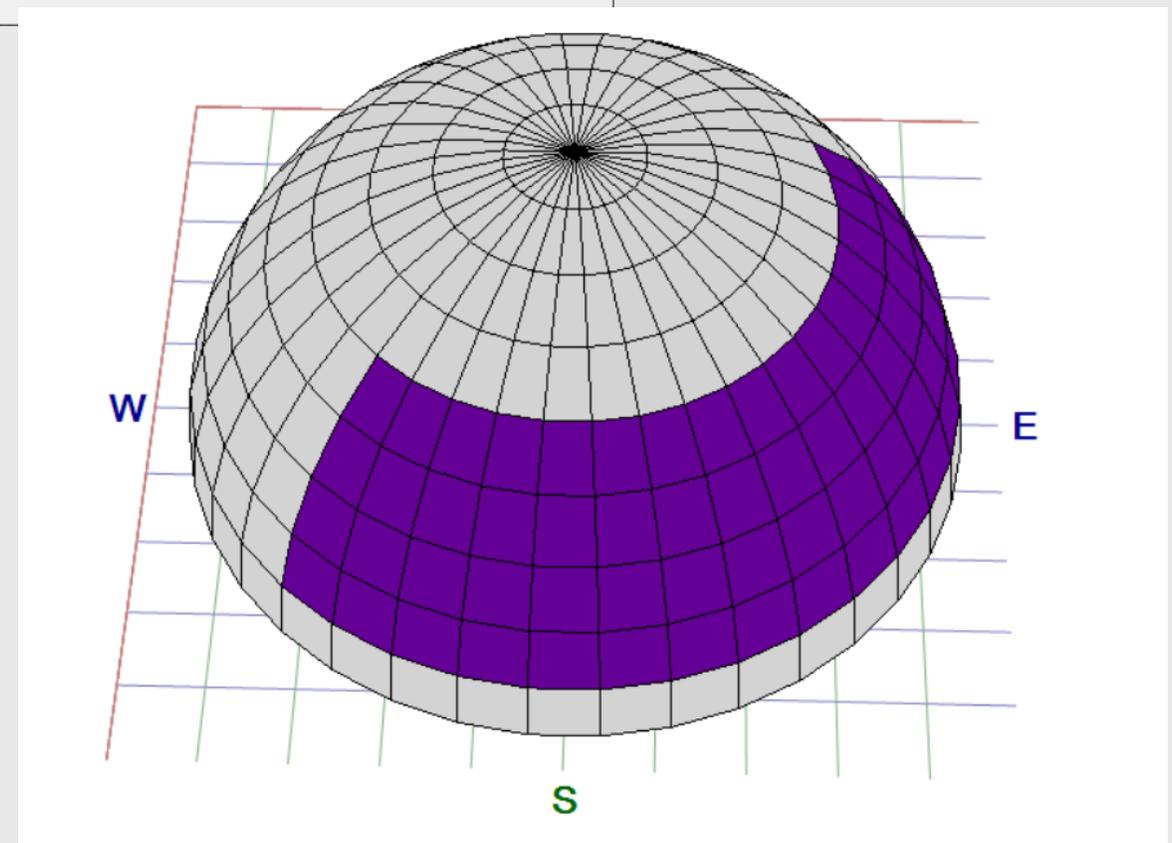
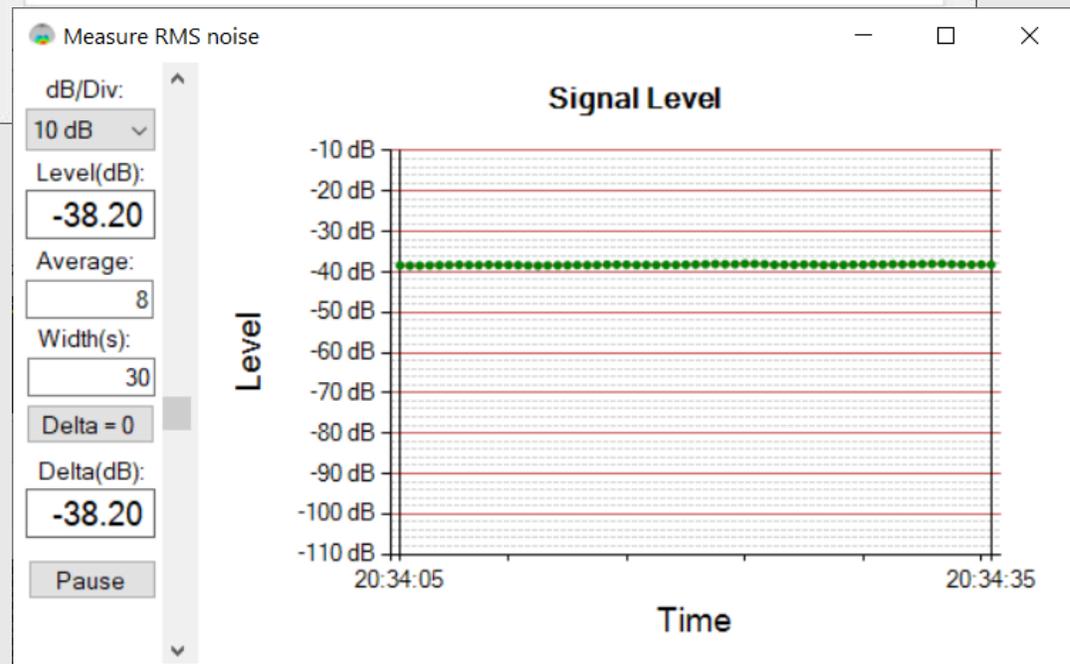
Step (deg):

Misc. settings

Dwell time (sec):

Frequency:

Comments:



Azimuth 50 – 220 deg

Elevation 3 – 45 deg

Step 3 deg

4,5 Hours

