# PORTABLE MW EME 9 - 6 - 3 cm

**XVII International EME Conference**
**Venice August 19th . 21st 2016**

ZDENEK SAMEK – OK1DFC

OK1KKD mini EME meeting & BBQ

SP6JLW mini EME meeting & BBQ

Microwave portable EME is on the limit of possibilities!

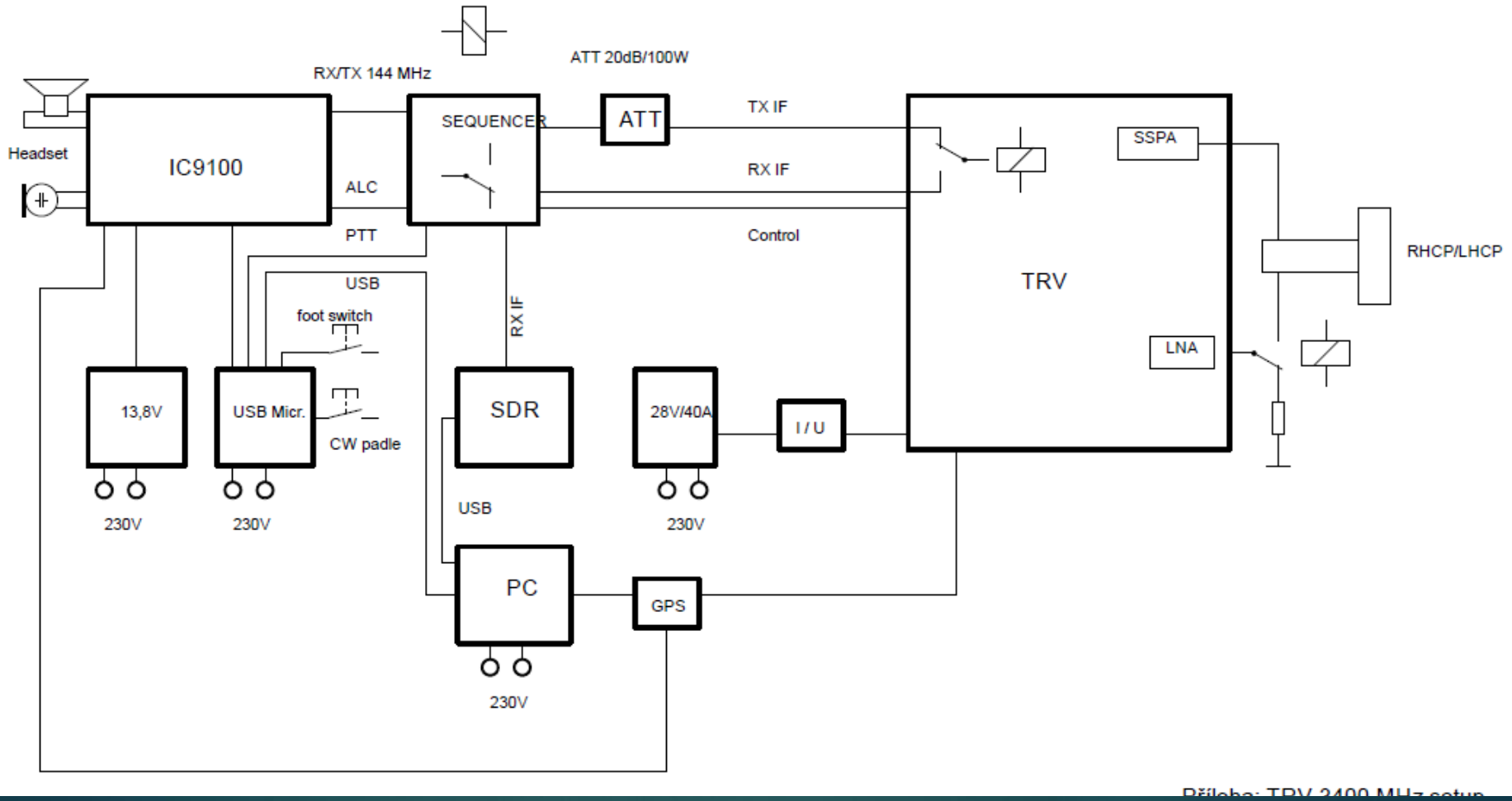
Mainly size, stability and quality of antenna is limited parameter of successful traffic

# So, what we need?

- First accept that problem does not exist, just only challenge
- We will need something where to install antenna and control it in AZ and EL.
- Control antenna in real time and position
- Choice right antenna
- TRV with PLL LO and IF TRX with PLL LO
- SW and accessories as GPS, SDR etc.

Make a QSO is just fun after that……

# Schematic Diagram

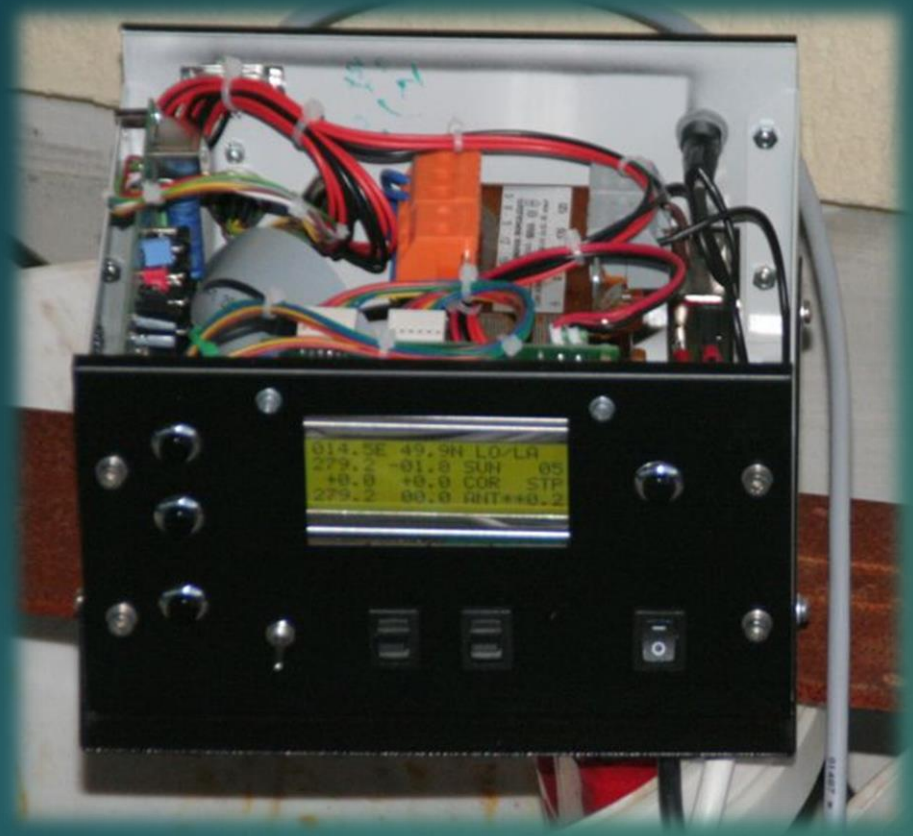



Příloha: TRV 2400 MHz setup

# Azimuth and Elevation

- Stability
- Easy to build
- Construction simple as possible
- Zero back slash in AZ and EL

# Control



- OE5JFL
- DF1SR
- F1EHN

**I have choice OE5JFL because options like this:**

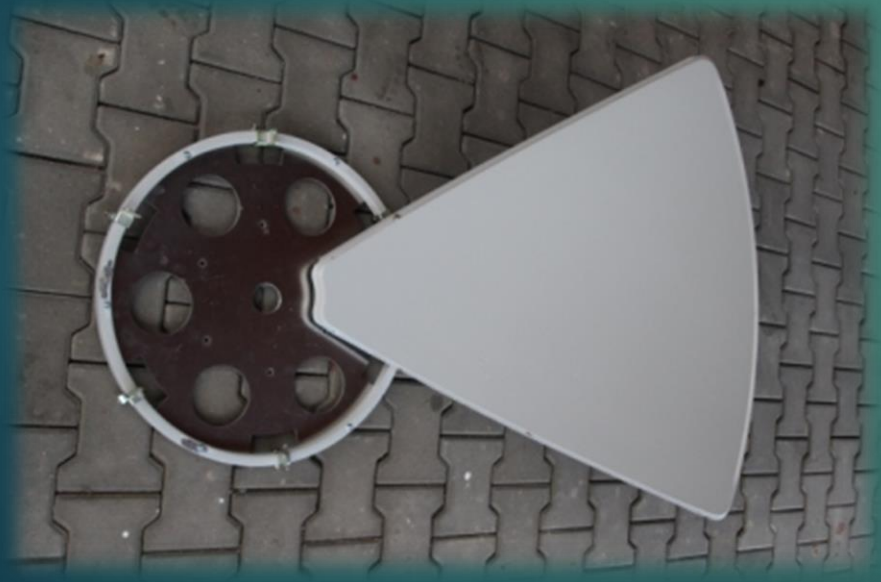
- No PC requested
- Automatic time and location due to GPS module developed by Alex HB9DRI
- Engine speed control for azimuth and elevation
- Automatic correction of antenna position trough one button

# Antenna - Mesh dish

3,2m is usable for 432, 1296, 2320 MHz.
3400 MHz has problem with surface accuracy and 1,8m solid dish giving almost same result

# Antenna - Solid Dish

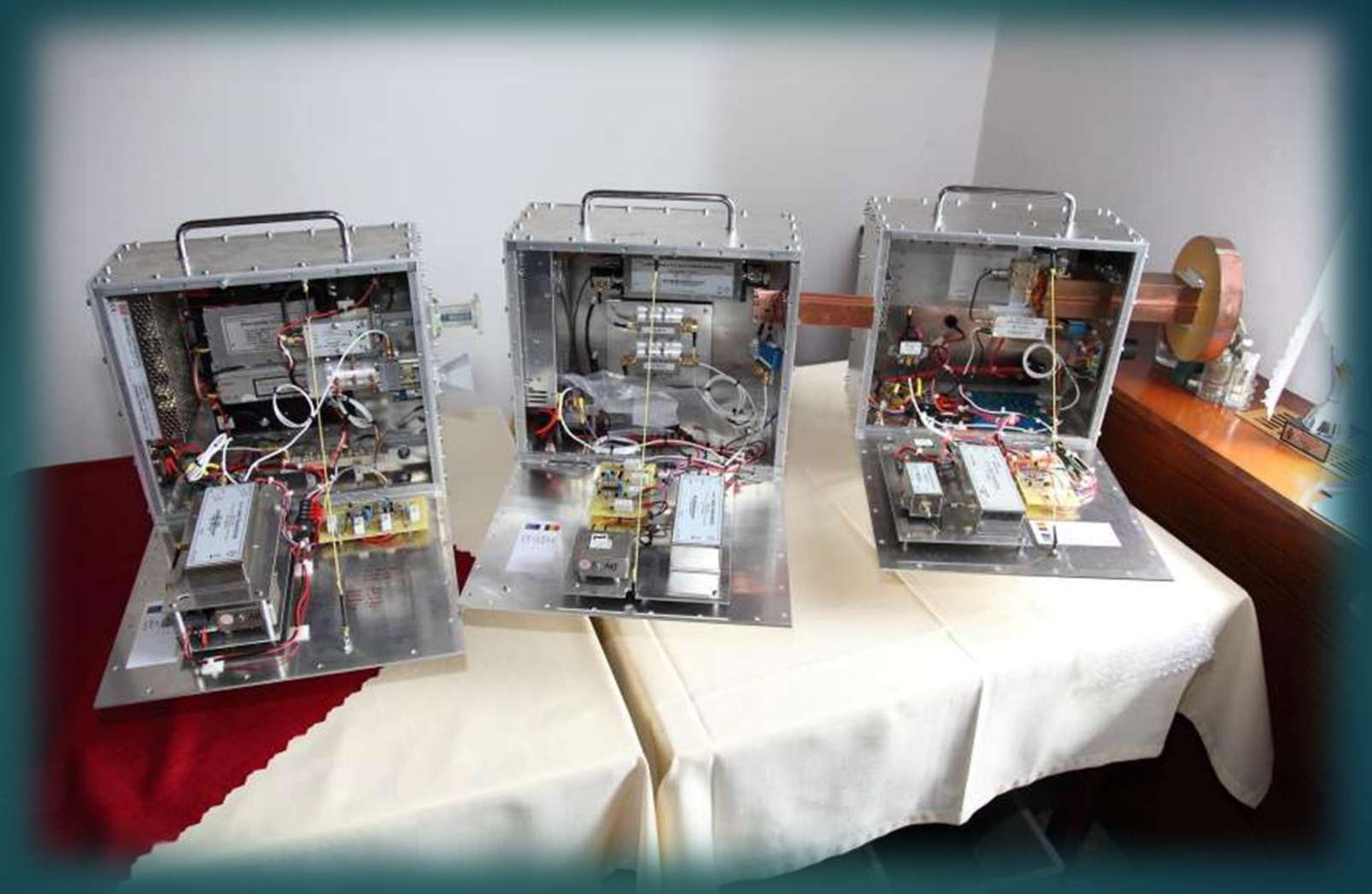
180cm dish for satellite reception
F/D 0,38
Very good usable for 9cm - 6cm and 3cm



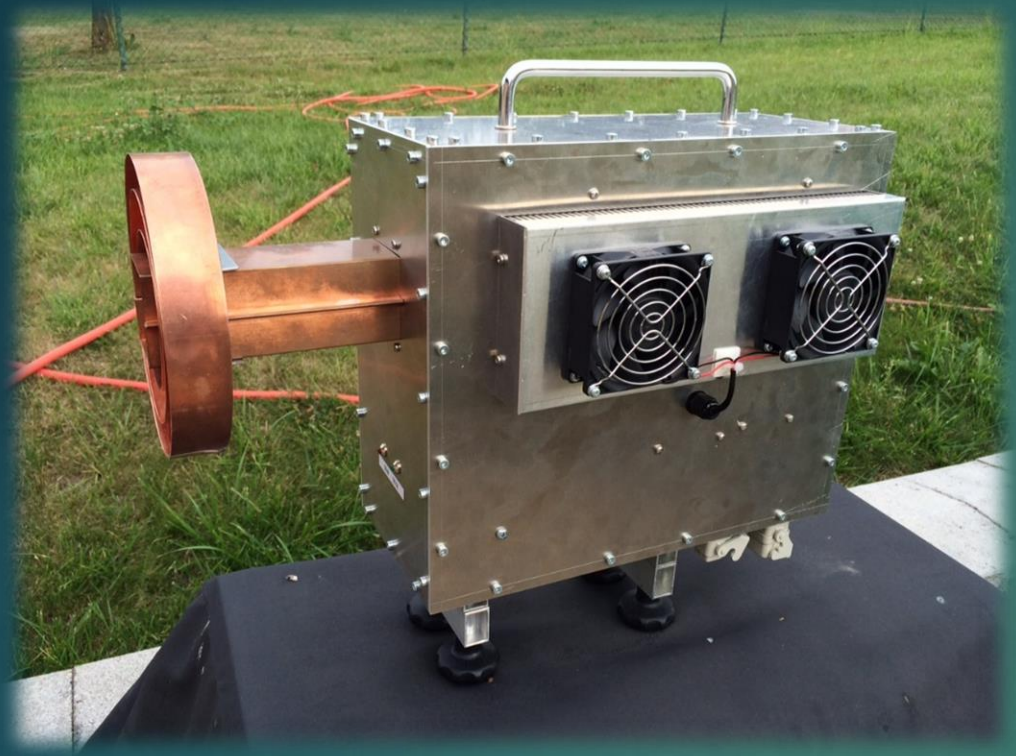
Mechanical parts important for axe stability of dish

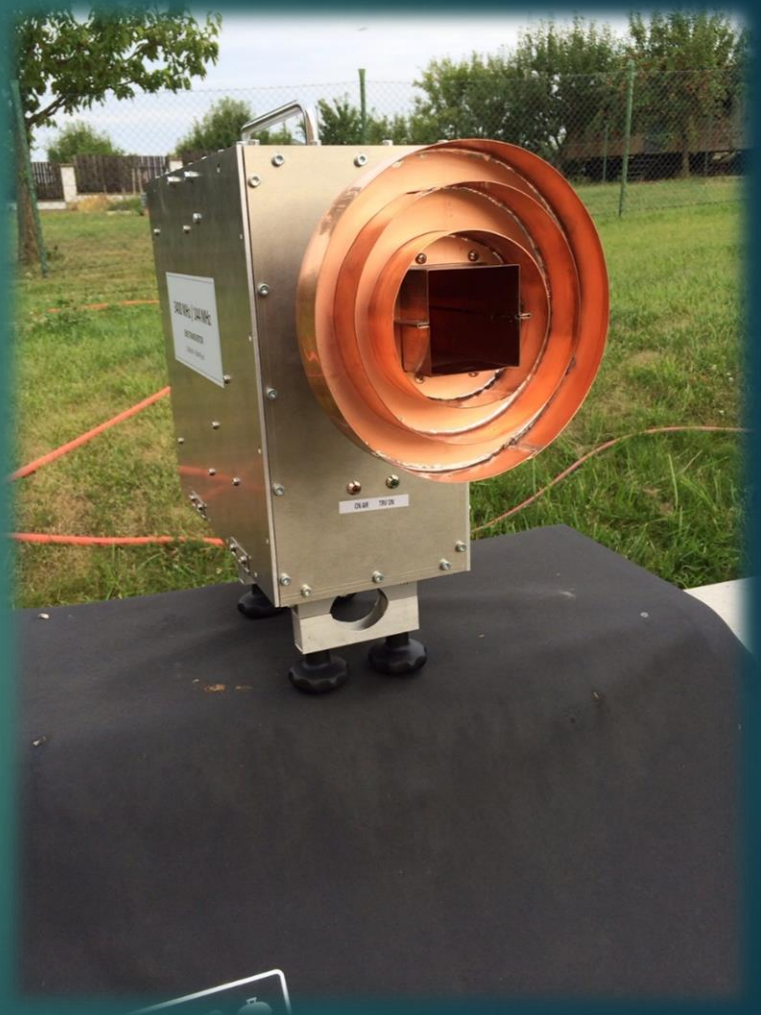
Test in 3cm band. Looking for maximum of Sun noise

# TRVs

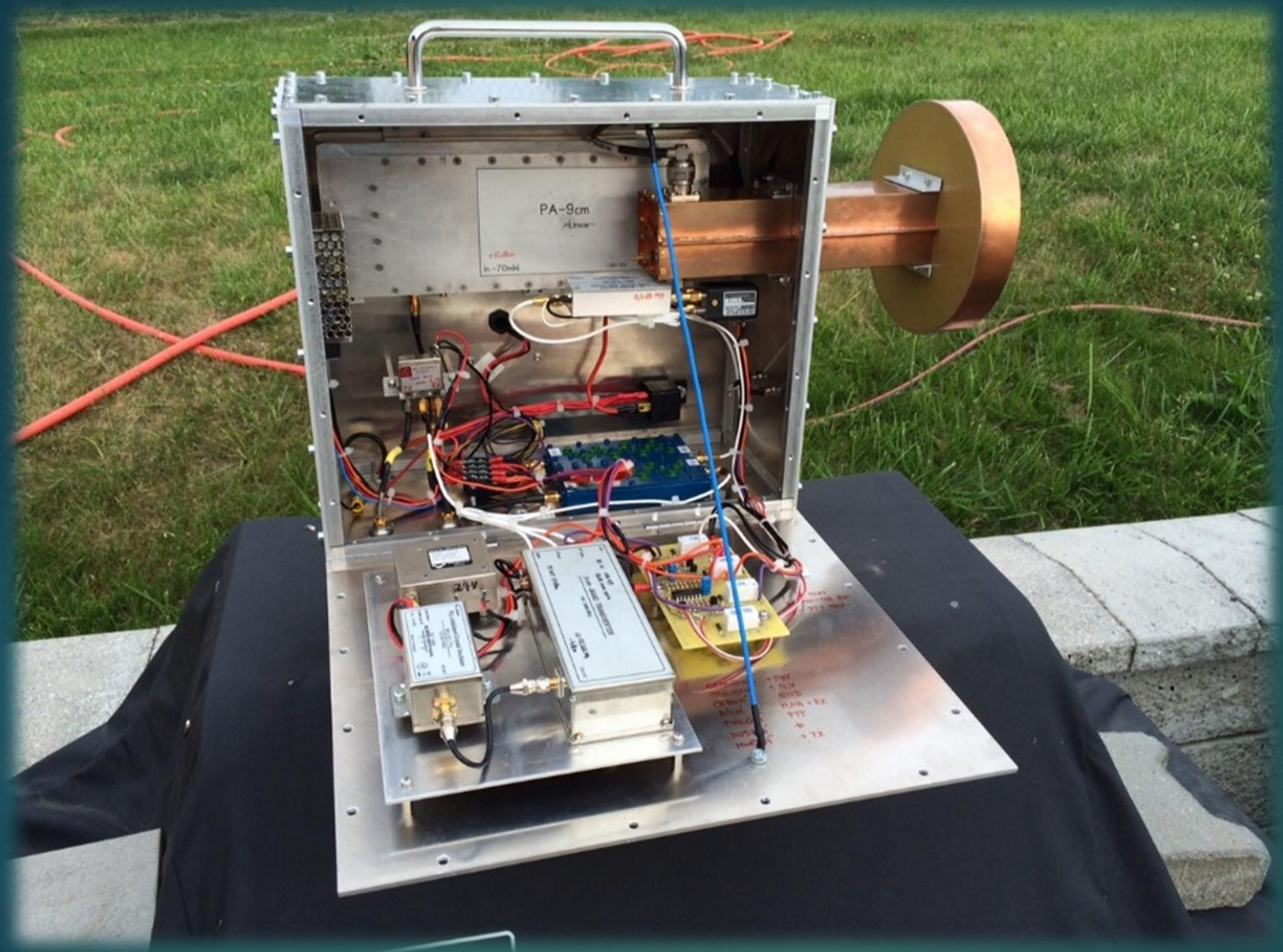


# 3400 MHz





- 100W RF
- 0,7dB N/F DB6NT
- Septum feed OK1DFC and Chaparral ring



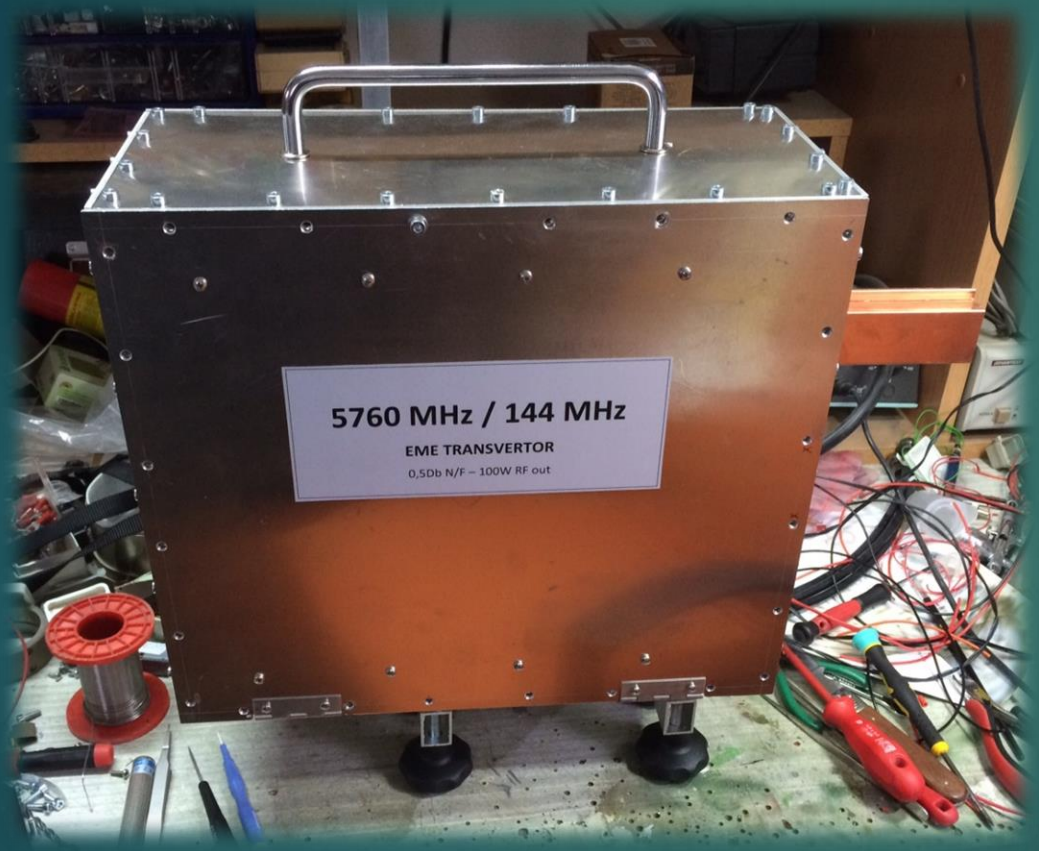

Opened TRV

HB9Q EME 3400 MHz

PA3DZL EME 3400 MHz

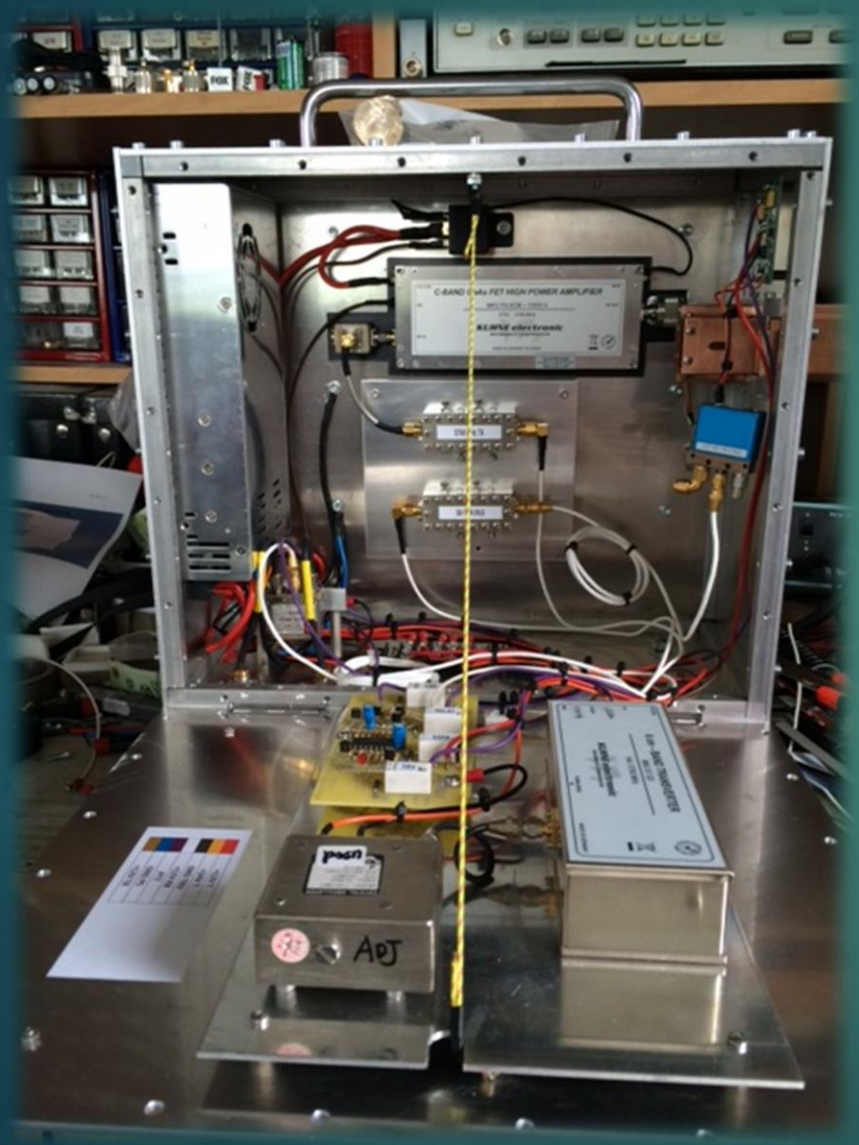
OK1KIR RS 3400 MHz

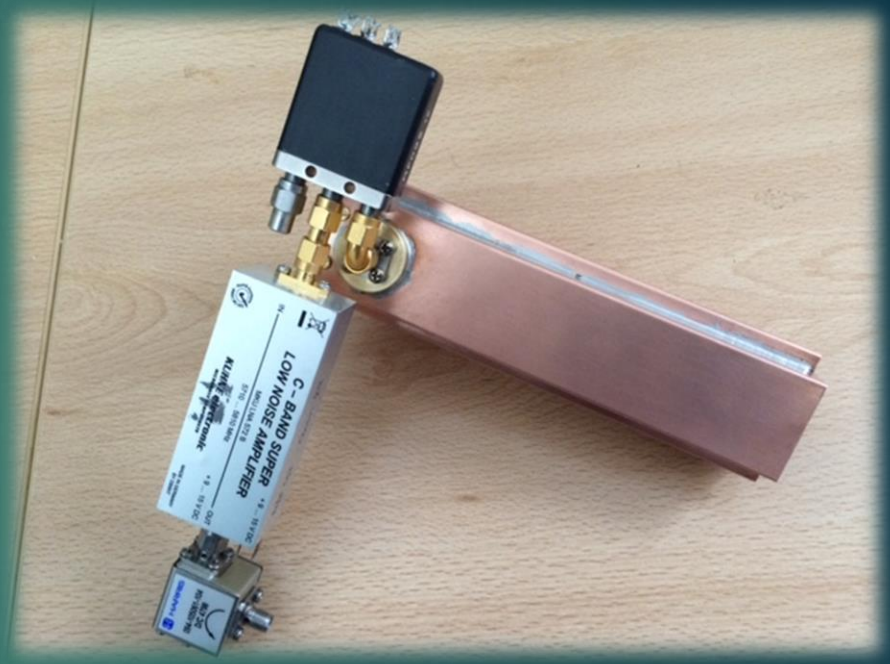
# 5760 MHz




- 100W RF DB6NT
- 0,9dB N/F DB6NT
- Septum feed OK1DFC

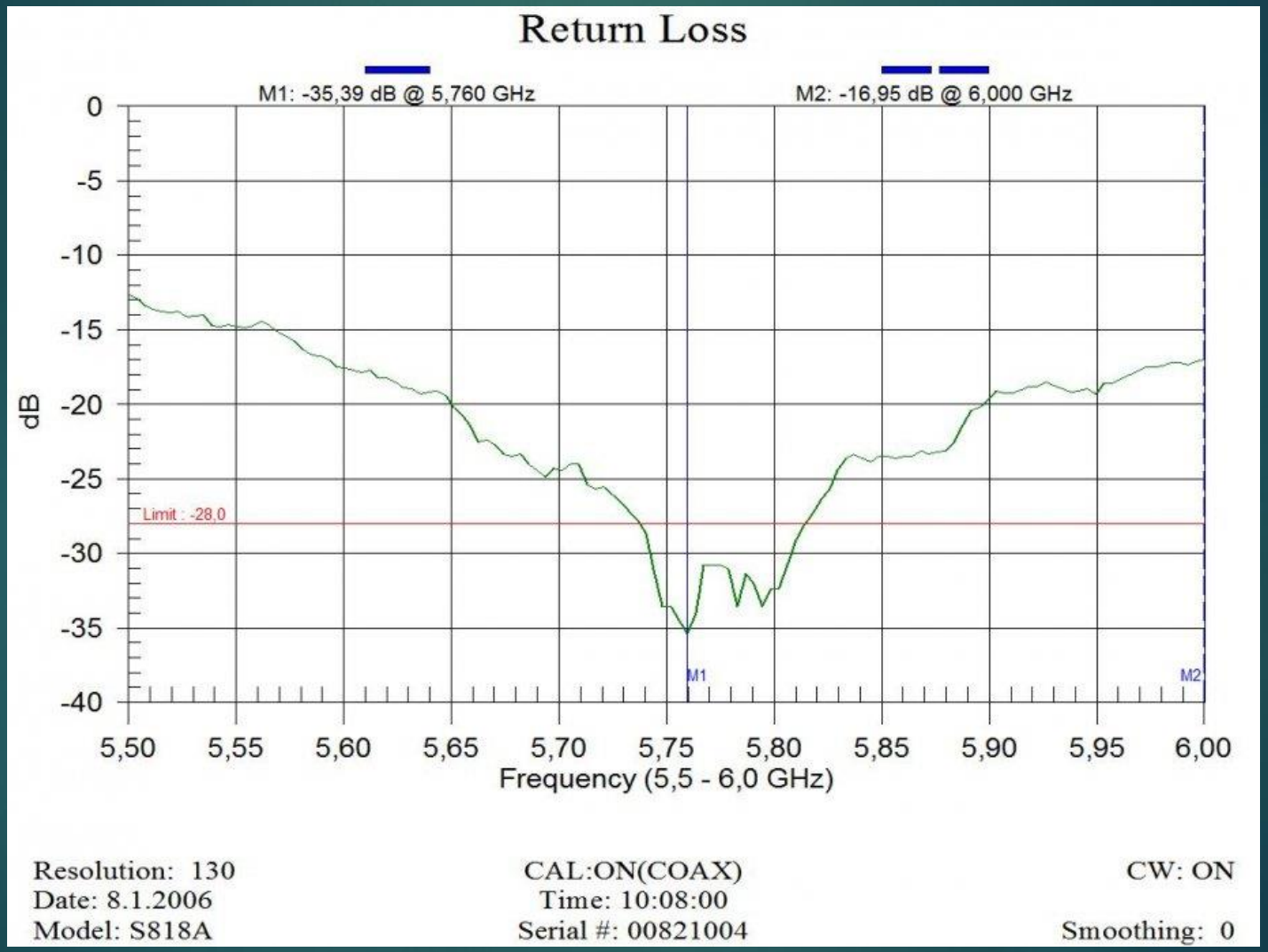
# 5760 MHz



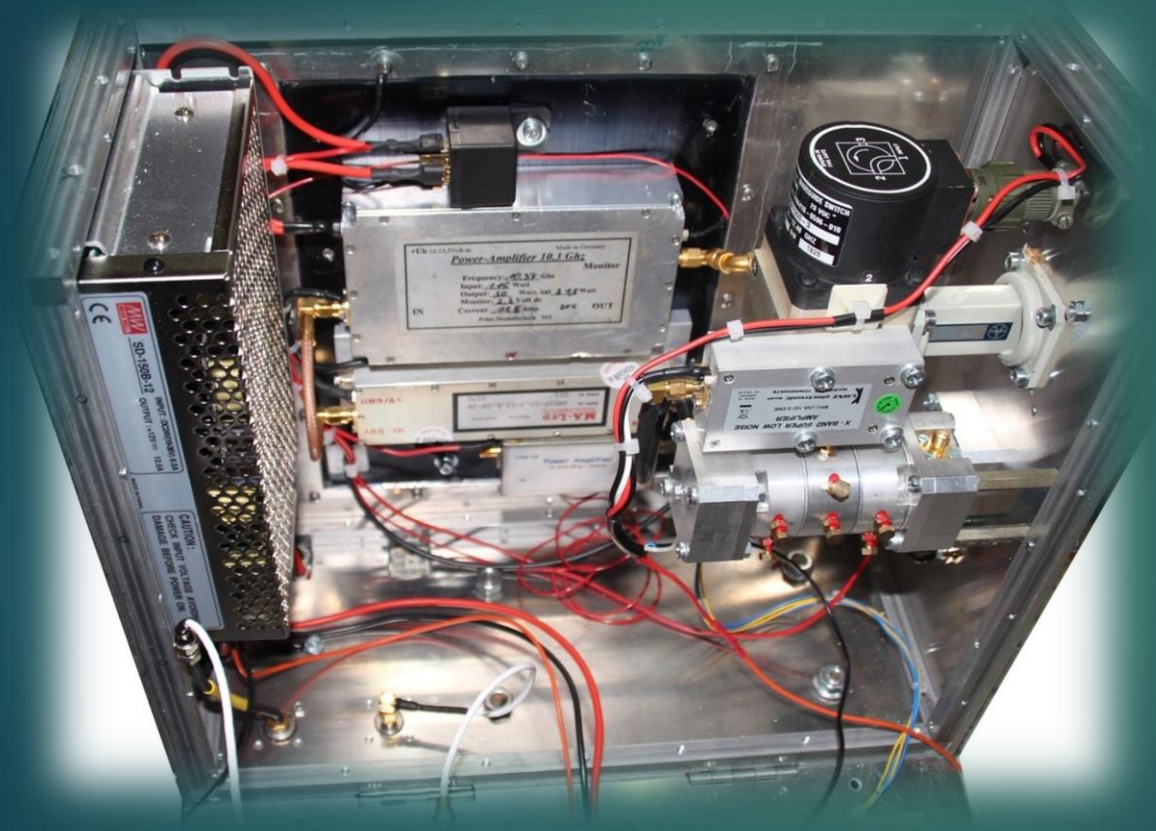




- Feed and VLNA detail
- Internal construction

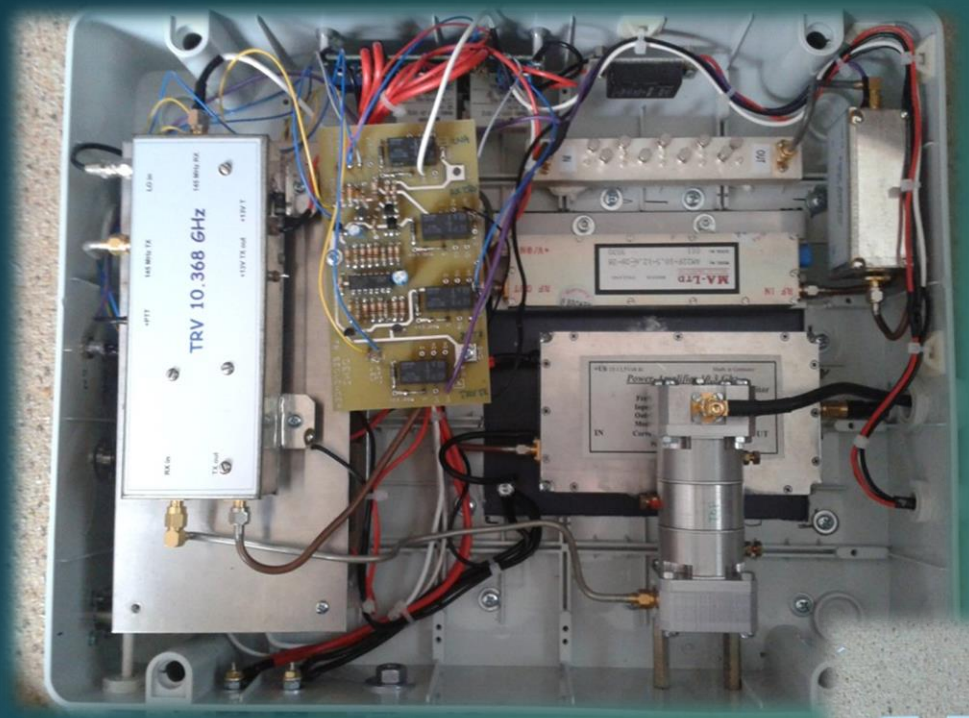
# 6cm FEED SWR measuring



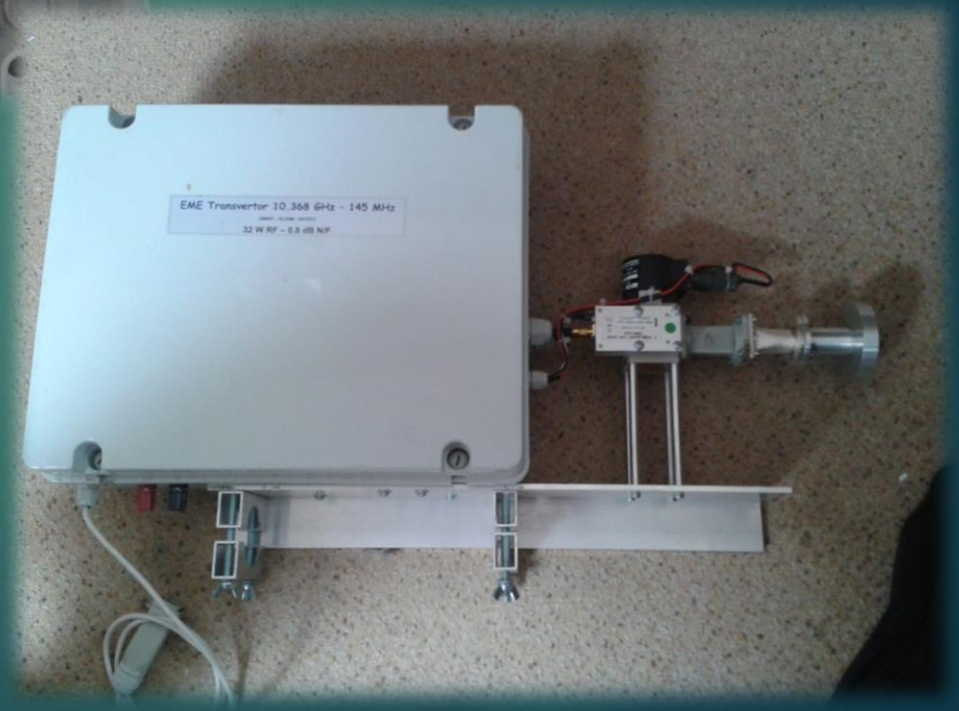
# 10368 MHz




- 31W RF – SSPA DL2AM - 50W in progress
- 0,8dB N/F LNA DB6NT
- Linear feed



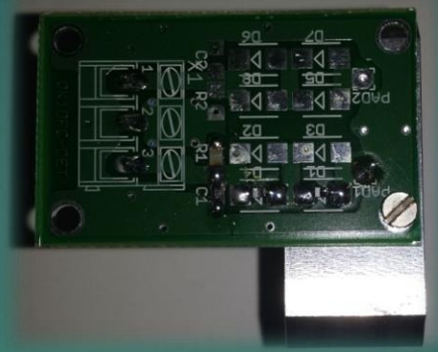

Previous construction in PVC box, problems with RF ingress.

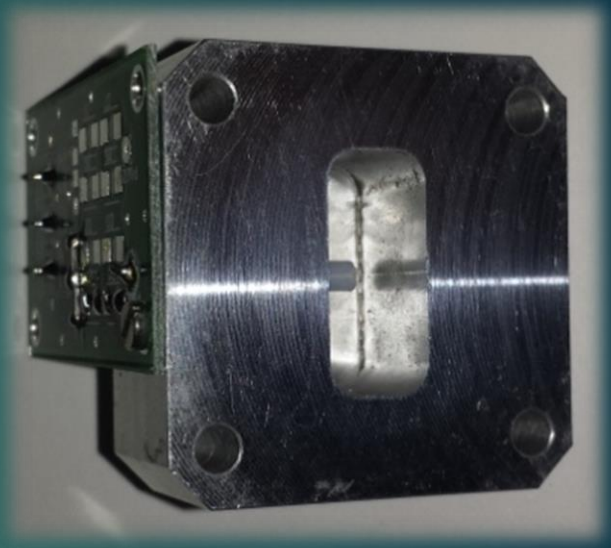


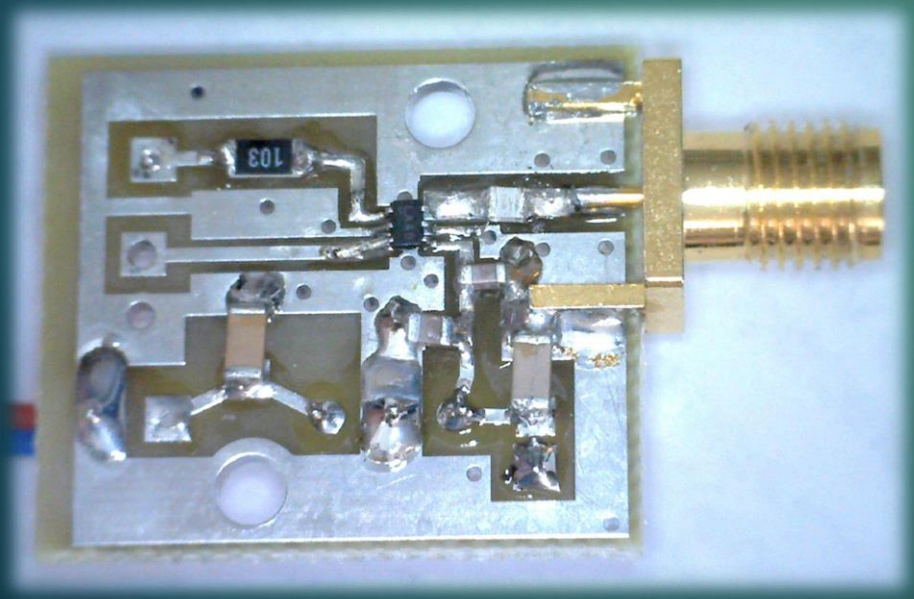
New TRV in Alu box and RF detection

# RF detection

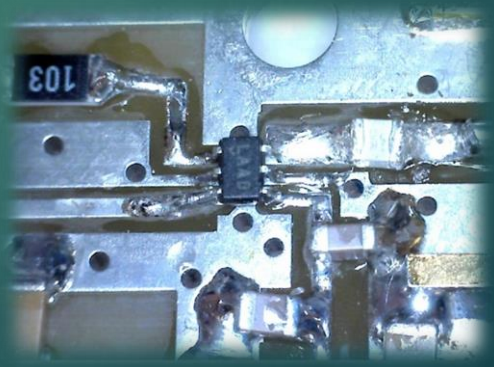
Previous solution with diodes BAT15







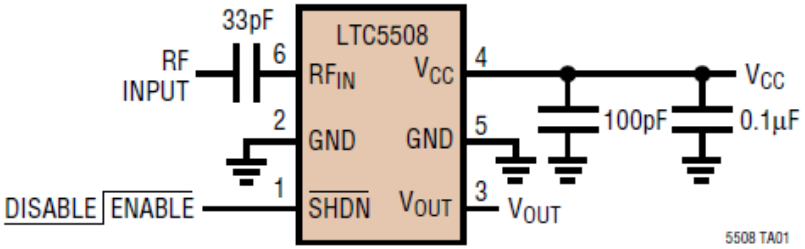

New detection with W1GHZ design



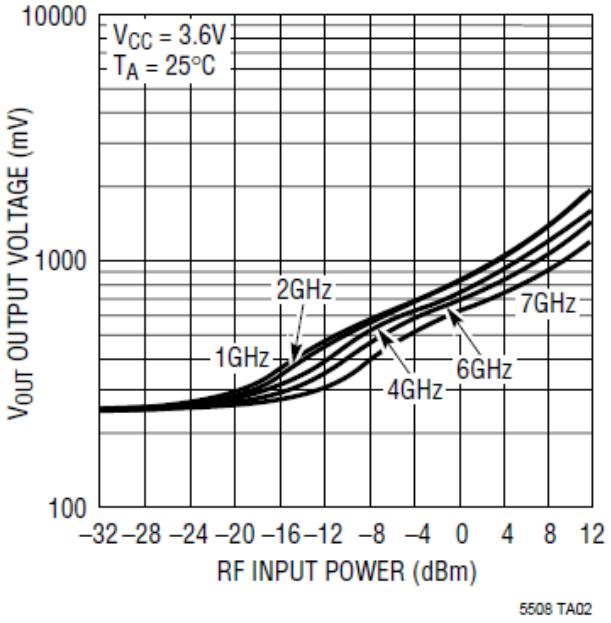
# RF detection LTC5508

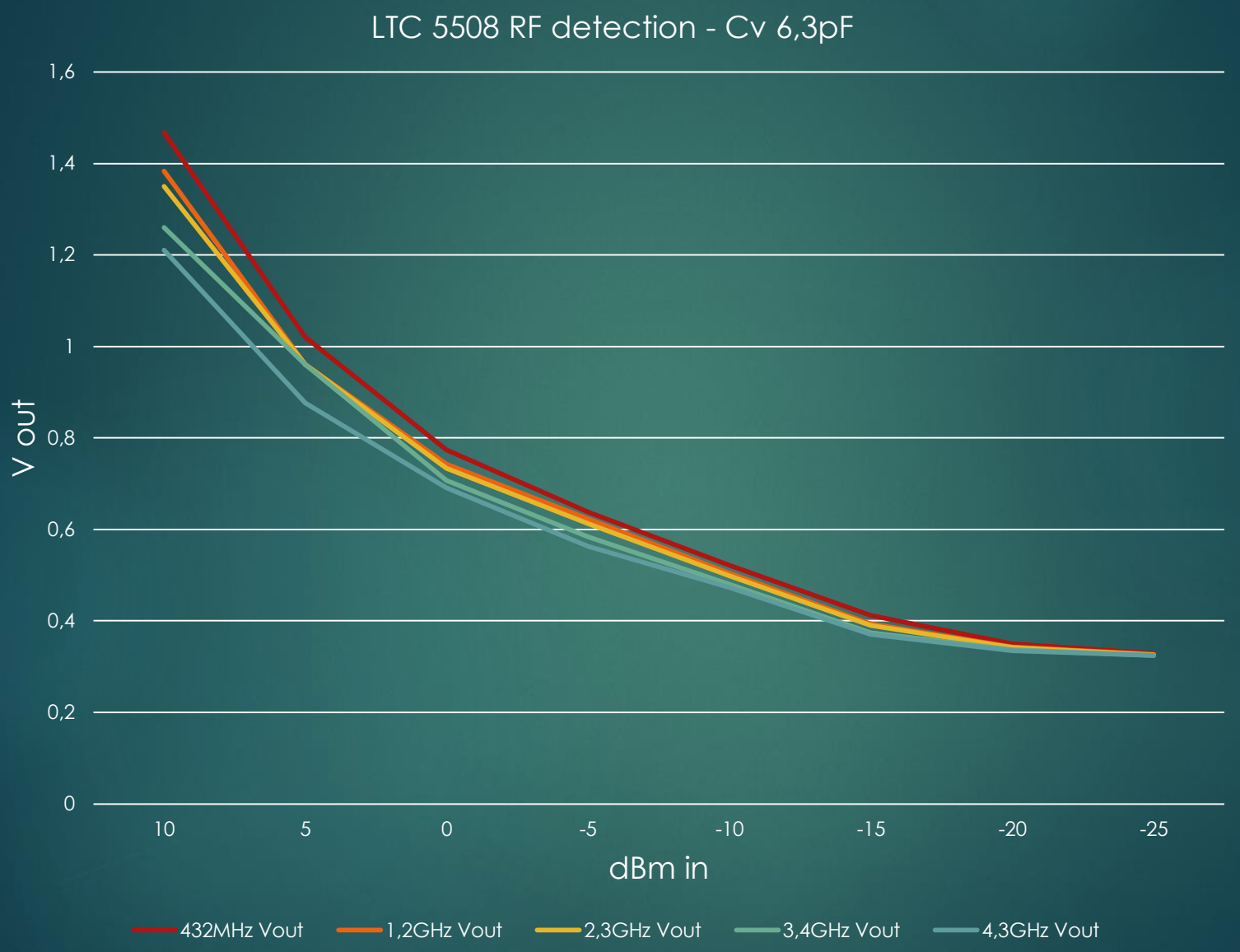
## TYPICAL APPLICATION

**300MHz to 7GHz RF Power Detector**




**Output Voltage vs RF Input Power**




LTC 5508 RF detection - Cv 6,3pF
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
V out
10
5
0
-5
-10
-15
-20
-25
dBm in
432MHz Vout
1,2GHz Vout
2,3GHz Vout
3,4GHz Vout
4,3GHz Vout

# IC9100 and Sequencer

# IF unit

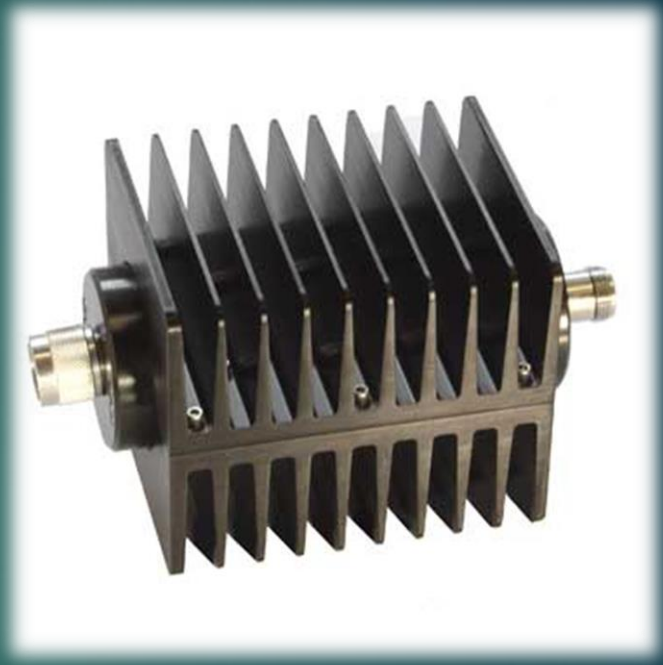
**Previous - IC756 PROII - 28MHz**

- Necessary to have other small 2m TRV
- Not so good SDR part

**Now - IC9100 - 144 - 432 - 1296 MHz direct**
**MW are goes trough TRVs**

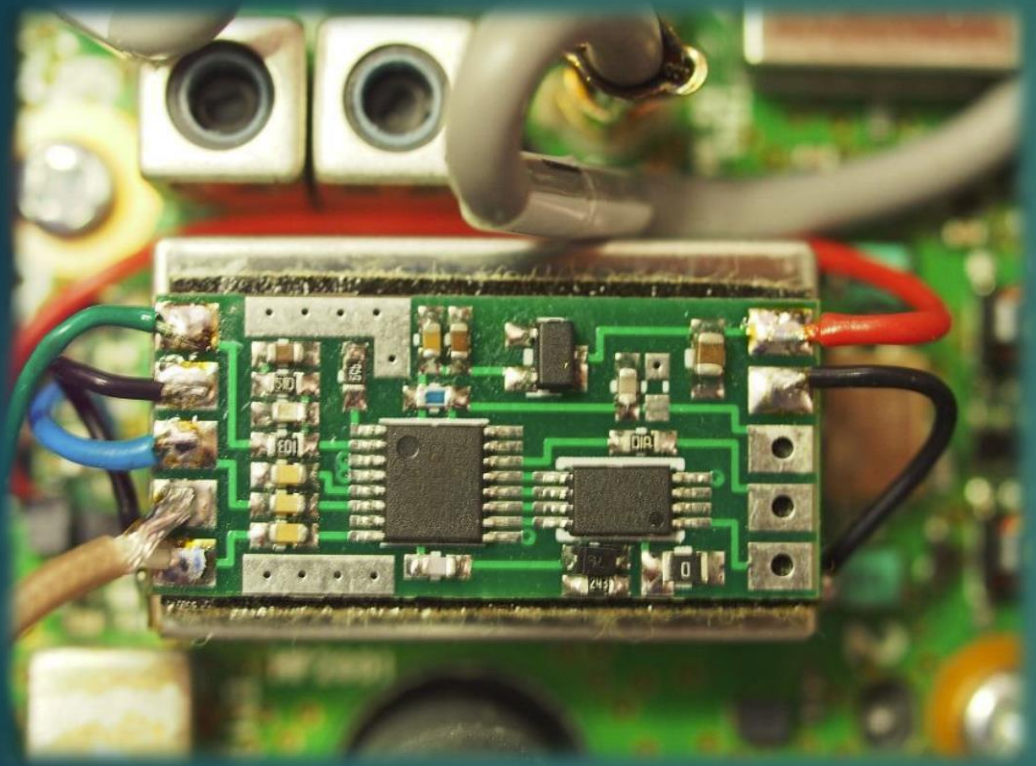
- Internal TCXO 3ppm
- Possible to lock with 10 MHz GPS normal
- 20dB ATT because maximum RF power

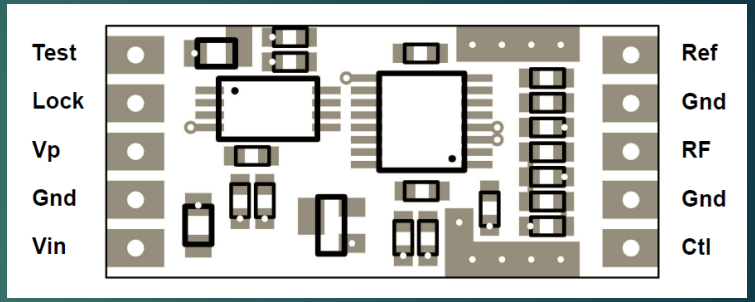
for accidently connected TRV or RF peeks with full RF is only **1W maximum !!!**



# IC9100 a PLL LO GPS

Solution by David VK3HZ



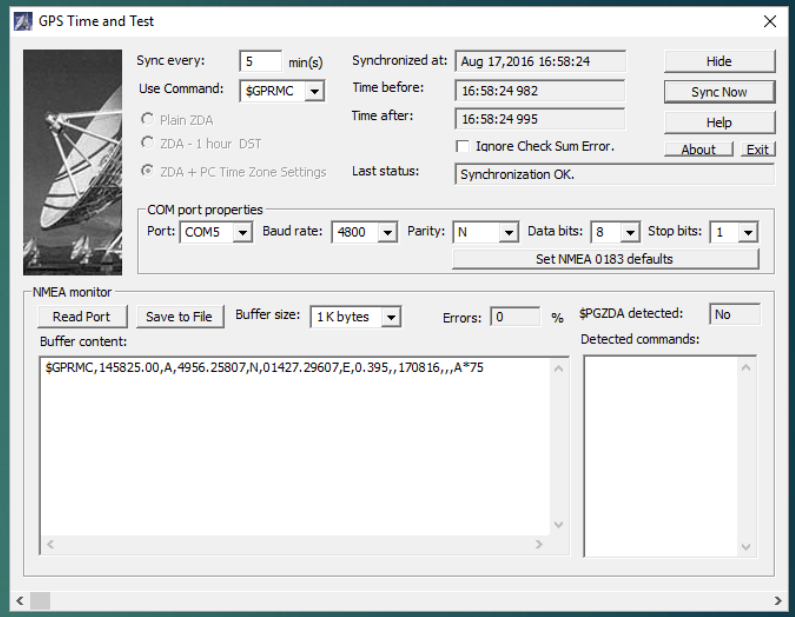



Thanks to this PLL system I was in the sked with Charlie G3WDG only **-12Hz** from sked QRG on 10368 MHz !!!

# PLL GPS 10MHz

GPS Disciplined Clock
BG7TBL 2014-12-09
GPS
RS232
1PPS
10MHz
DC11.7–12.9V
MAX 15W
WARN
GPS LOCK
RUN
PIN2–TXD
PIN3–RXD
PIN8–1PPS
10MHz OCXO FREQUENCY STA
10MHz DISTRIBUTION AMPLIFIER
BG7TBL 2015-01-06
10MHz OUT
OUT1
OUT2
OUT3
OUT4
PWR
F.ADJ

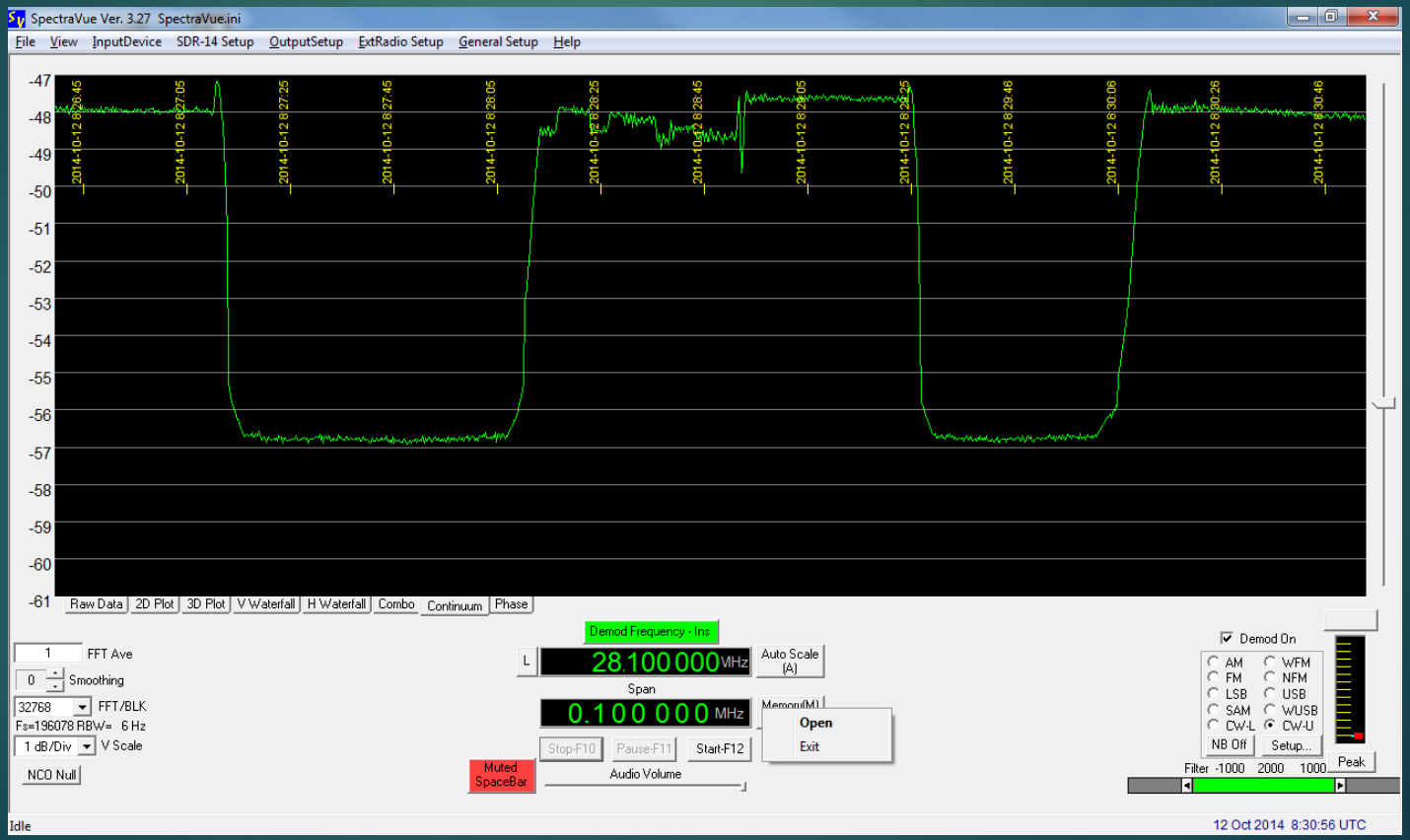
# SW and accessories




- SDR – 14
- Signalhound
- PC – with good RAM
- GPS for PC clock control
- GPS – 10 MHz for PLL LOs
- JT SW – JT65C - JT4F 10 GHz etc.
- WSJT-X - automatic Doppler correction
- SDR HD
- MicroHam USB interface

# SDR

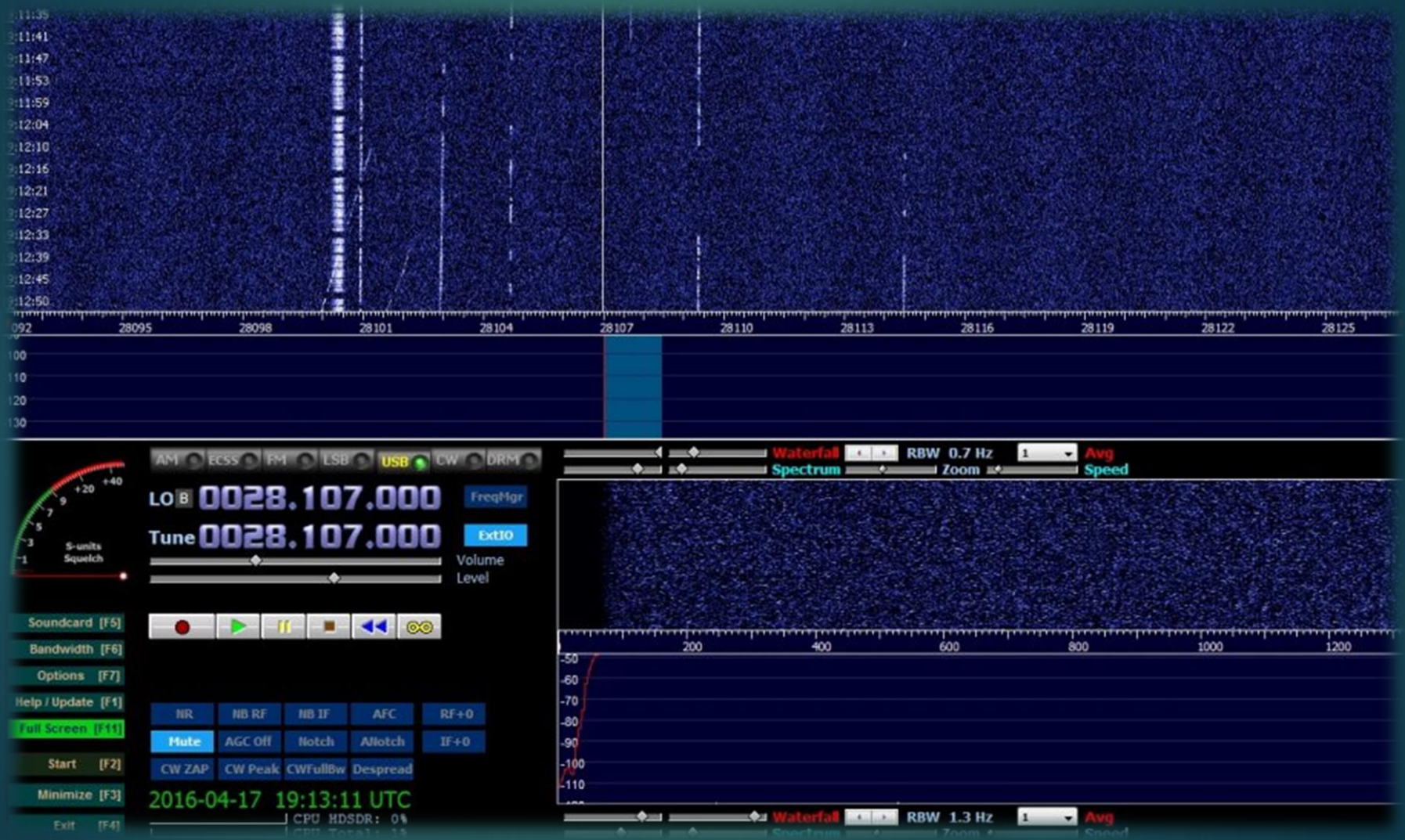
SDR-14
RFspace
DIRECT INPUT
UR


SpectraVue Ver. 3.27 SpectraVue.ini
File View InputDevice SDR-14 Setup OutputSetup ExtRadio Setup General Setup Help
-47
-48
-49
-50
-51
-52
-53
-54
-55
-56
-57
-58
-59
-60
-61
Raw Data 2D Plot 3D Plot V Waterfall H Waterfall Combo Continuum Phase
Demod Frequency - Ins
28.100 000 MHz
Auto Scale (A)
Span
0.100 000 MHz
Open
Exit
Stop-F10 Pause-F11 Start-F12
Muted SpaceBar
Audio Volume
1 FFT Ave
0 Smoothing
32768 FFT/BLK
Fs=196078 RBW= 6 Hz
1 dB/Div V Scale
NCO Null
Demod On
AM WFM
FM NFM
LSB USB
SAM WUSB
CW-L CW-U
NB Off Setup...
Filter -1000 2000 1000
Peak
Idle
12 Oct 2014 8:30:56 UTC

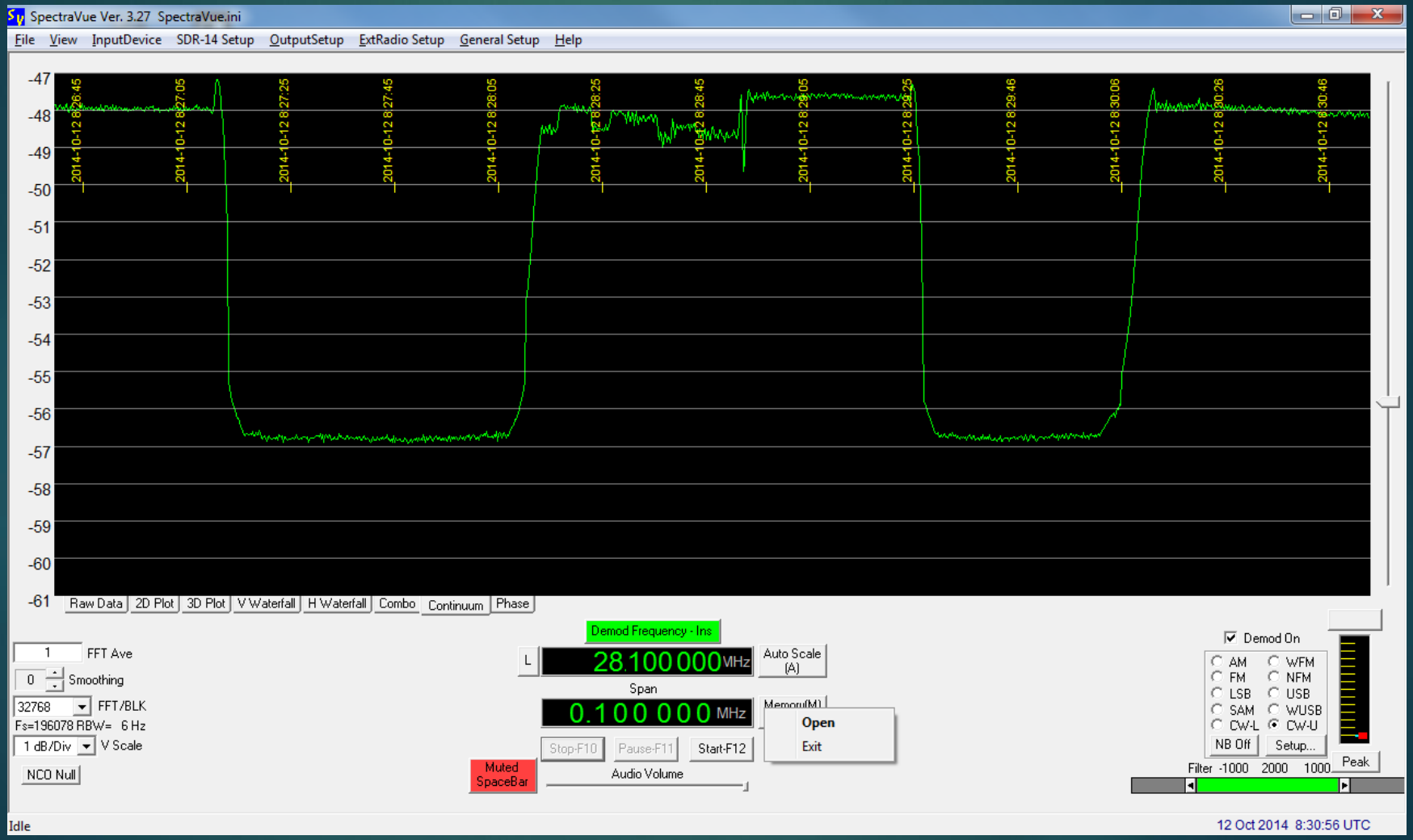
# Signalhound 10Hz-4,4GHz

Spectrum analyzer and tracking generator

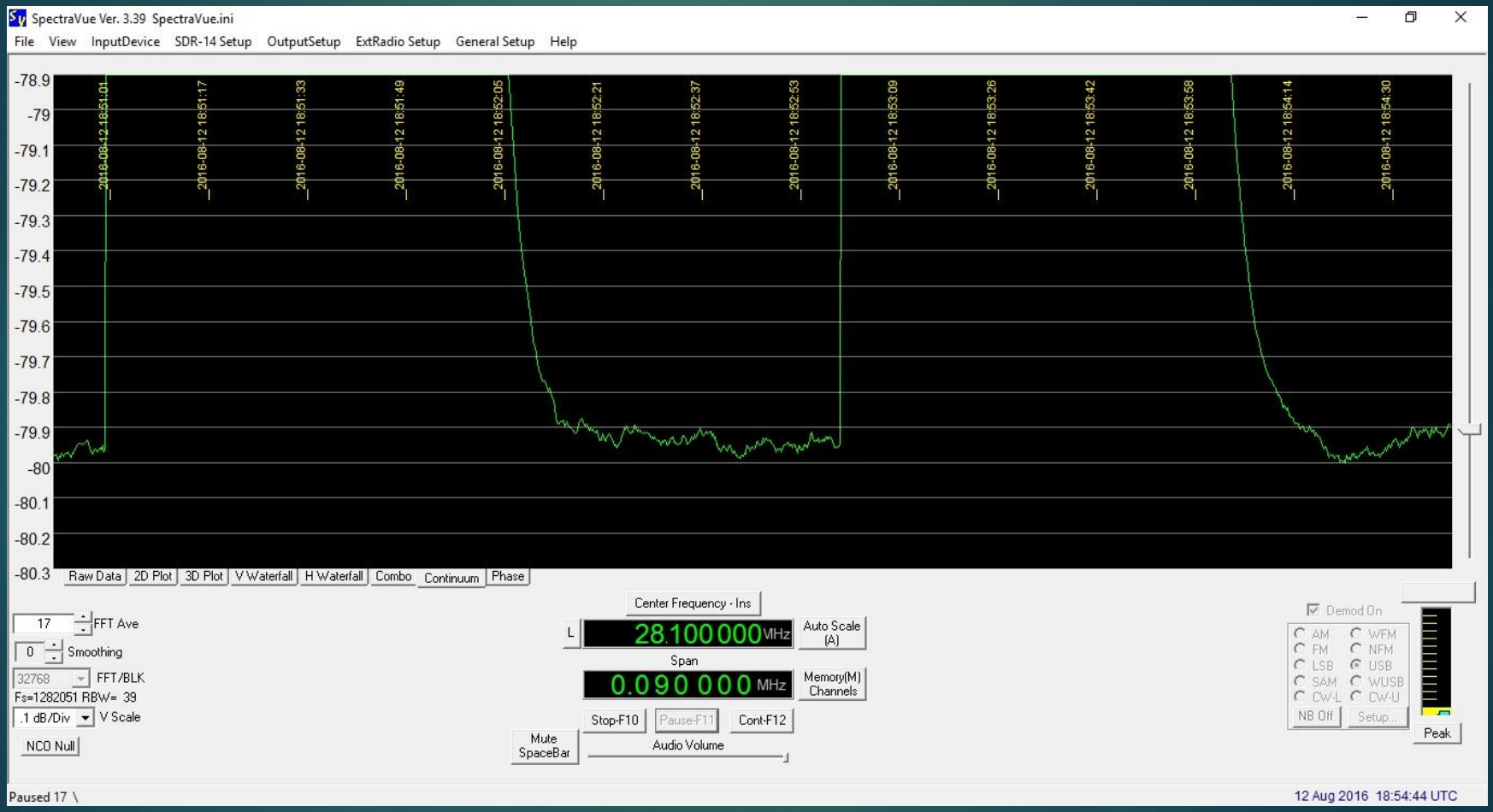
- Possible to lock with GPS 10 MHz
- Tracking works also as a CW generator
- Possible to use as a SDR RX up to 9cm


28095
28098
28101
28104
28107
28110
28113
28116
28119
28122
28125
AM
ECSS
FM
LSB
USB
CW
DRM
LO B 0028.107.000
Tune 0028.107.000
FreqMgr
Ext10
Volume
Level
S-units
Squelch
Soundcard [F5]
Bandwidth [F6]
Options [F7]
Help / Update [F1]
Full Screen [F11]
Start [F2]
Minimize [F3]
Exit [F4]
NR
NB RF
NB IF
AFC
RF+0
Mute
AGC Off
Notch
Allotch
IF+0
CW ZAP
CW Peak
CWFullBw
Despread
2016-04-17 19:13:11 UTC
CPU HDSDR: 0%
Waterfall
RBW 0.7 Hz
Avg
Spectrum
Zoom
Speed
200
400
600
800
1000
1200
-50
-60
-70
-80
-90
-100
-110
Waterfall
RBW 1.3 Hz
Avg

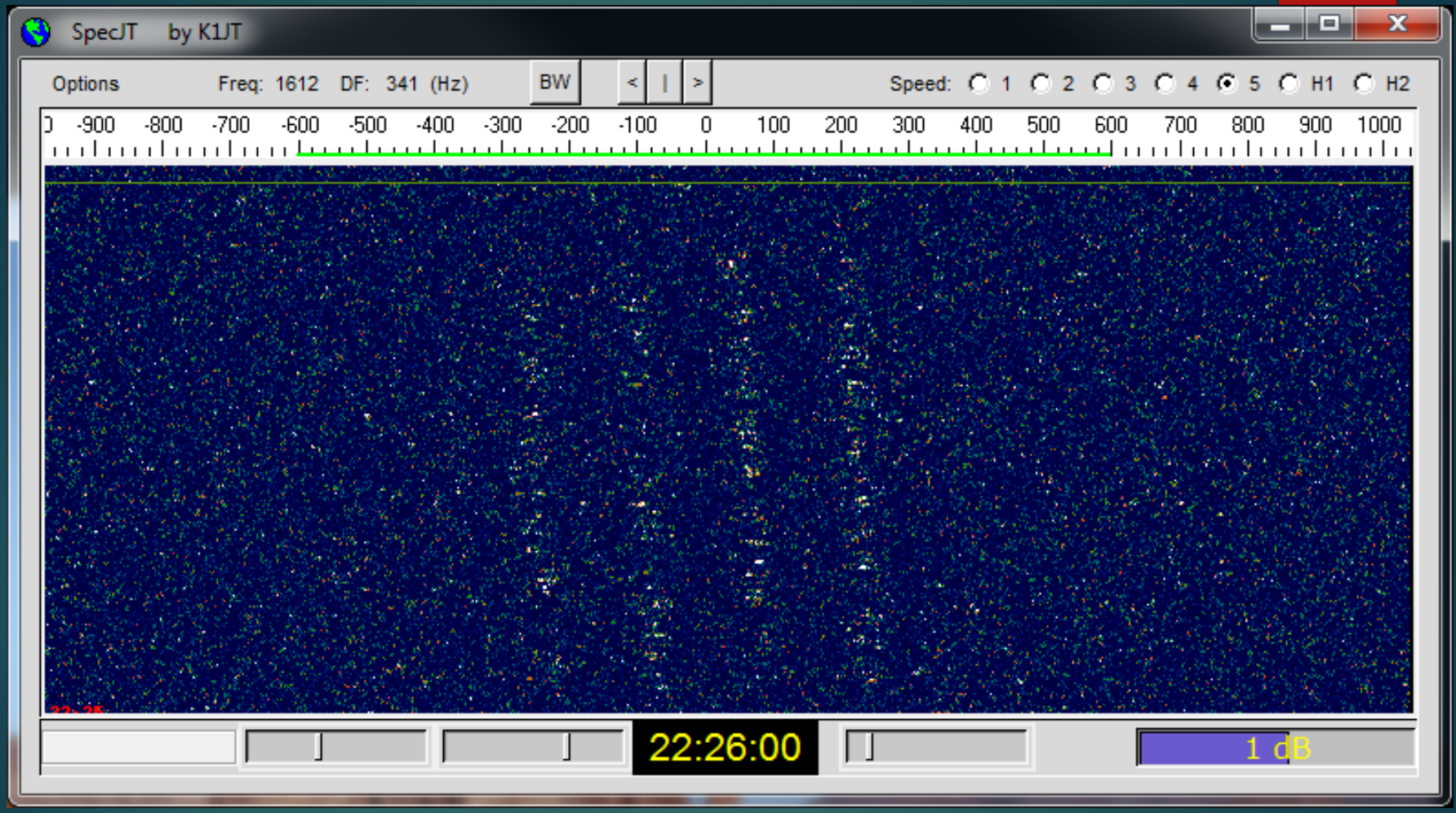
# Sun noise 10 GHz



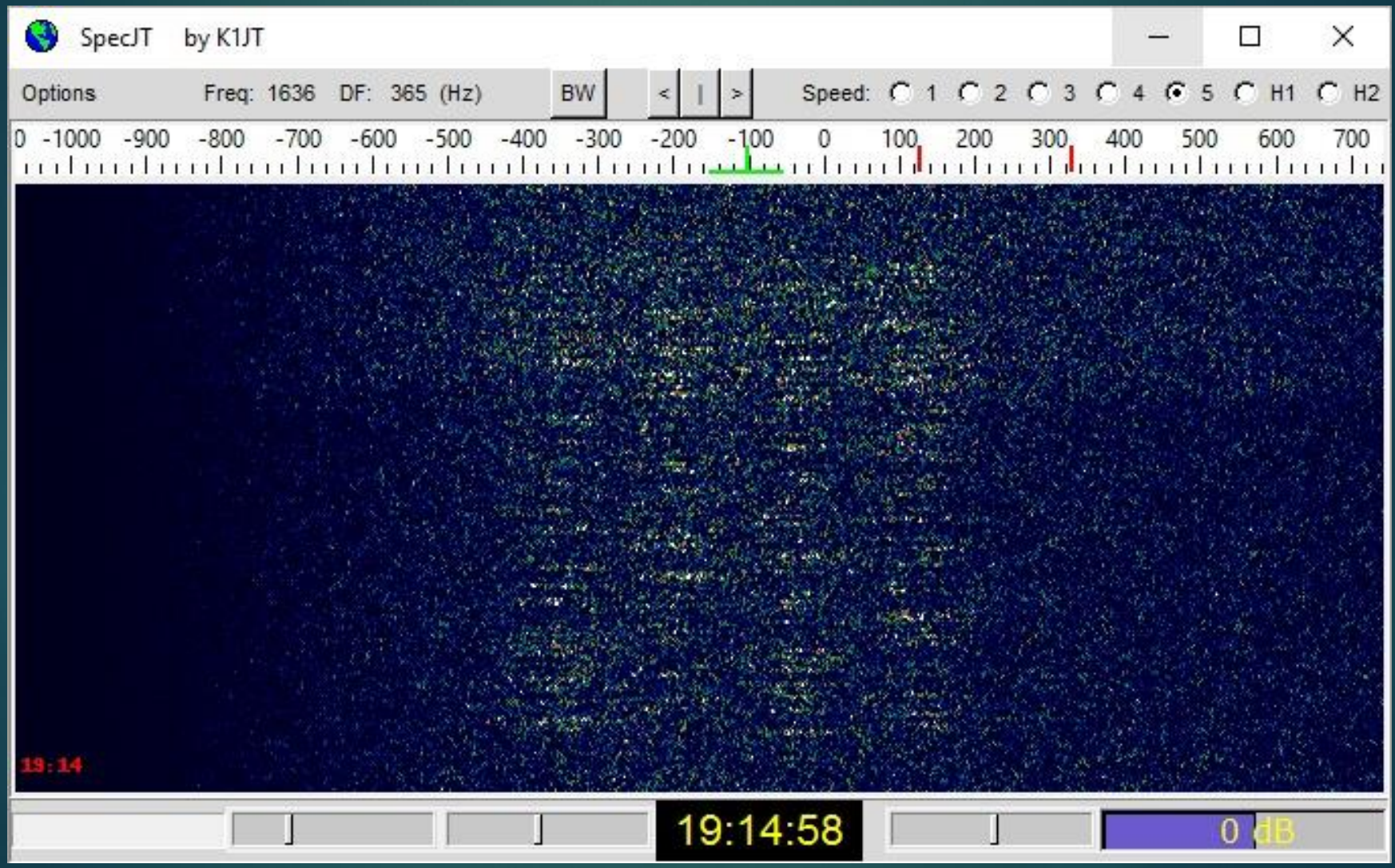
# Moon noise between RX/TX on 10 GHz



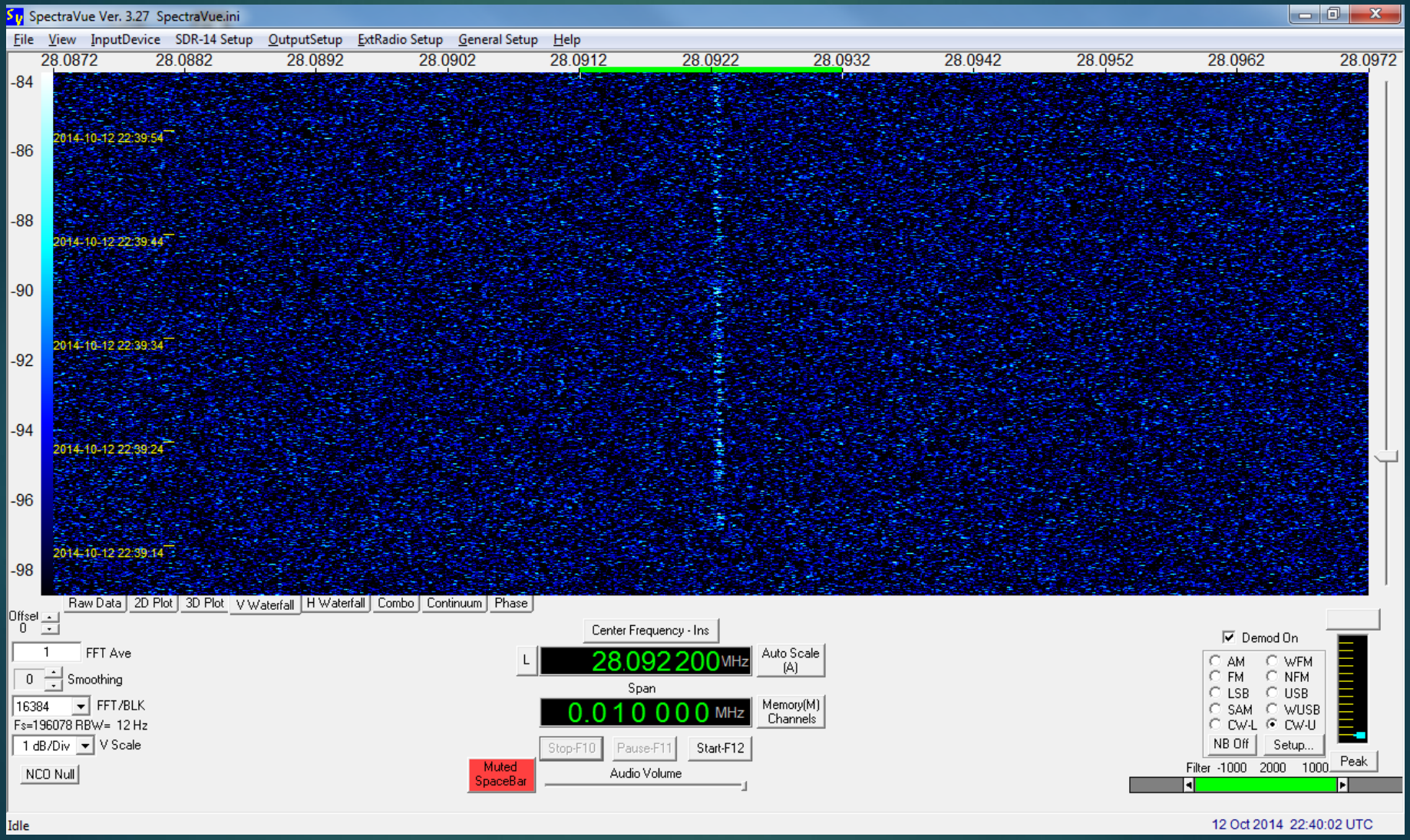
# No Doppler correction WSJT 10



# With Doppler correction WSJT - X



# CW 10 GHz


SpectraVue Ver. 3.27 SpectraVue.ini
File View InputDevice SDR-14 Setup OutputSetup ExtRadio Setup General Setup Help
28.0872 28.0882 28.0892 28.0902 28.0912 28.0922 28.0932 28.0942 28.0952 28.0962 28.0972
-84 -86 -88 -90 -92 -94 -96 -98
2014-10-12 22:39:54
2014-10-12 22:39:44
2014-10-12 22:39:34
2014-10-12 22:39:24
2014-10-12 22:39:14
Raw Data 2D Plot 3D Plot V Waterfall H Waterfall Combo Continuum Phase
Offset 0
1 FFT Ave
0 Smoothing
16384 FFT/BLK
Fs=196078 RBW= 12 Hz
1 dB/Div V Scale
NCO Null
Center Frequency - Ins
L 28.092 200 MHz
Auto Scale (A)
Span
0.010 000 MHz
Memory(M) Channels
Stop-F10 Pause-F11 Start-F12
Muted SpaceBar
Audio Volume
Demod On
AM WFM
FM NFM
LSB USB
SAM WUSB
CW-L CW-U
NB Off Setup...
Filter -1000 2000 1000
Peak
Idle
12 Oct 2014 22:40:02 UTC

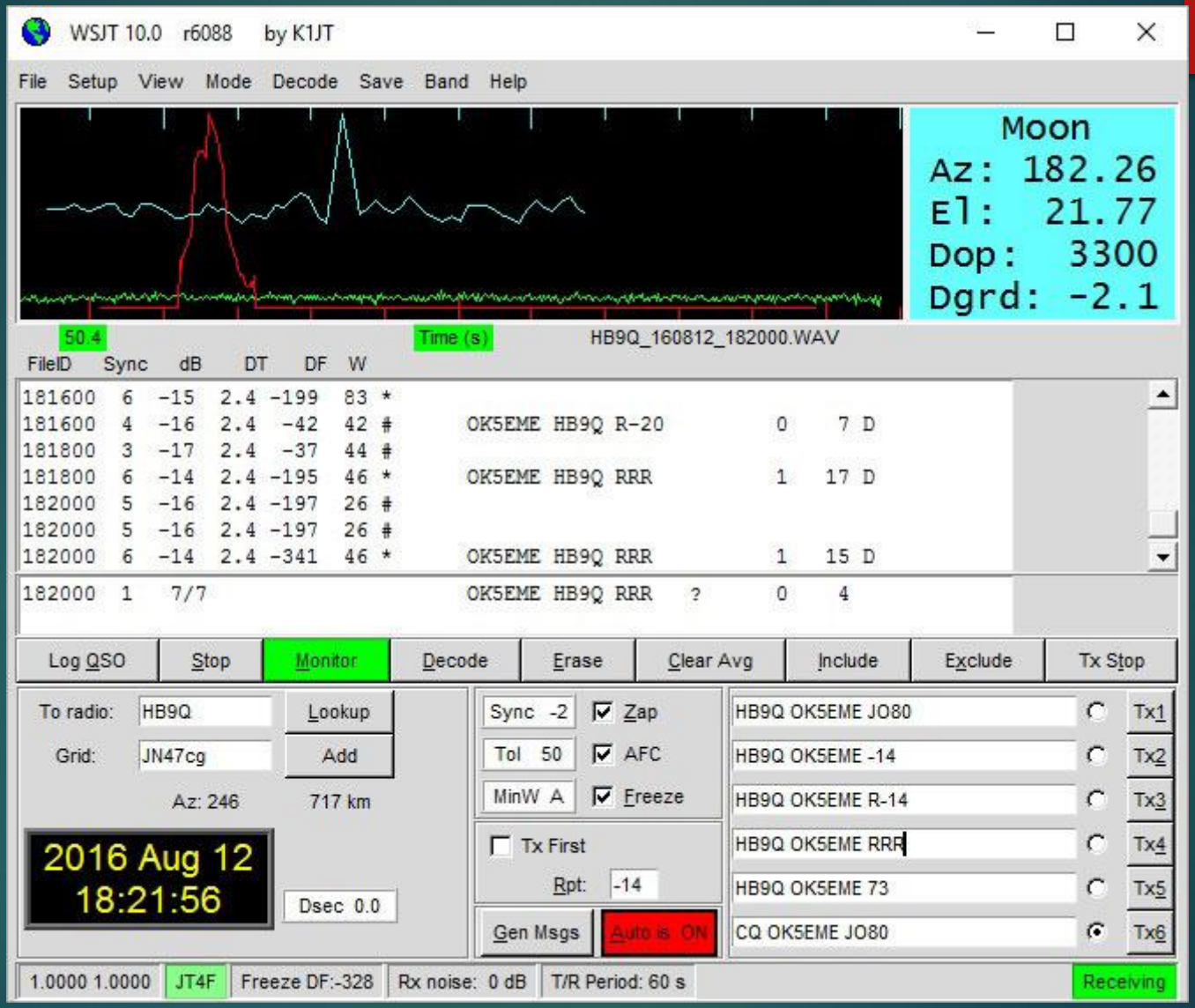
# SP/OK5EME 12th – 13th August

# SP/OK5EME 12th – 13th August

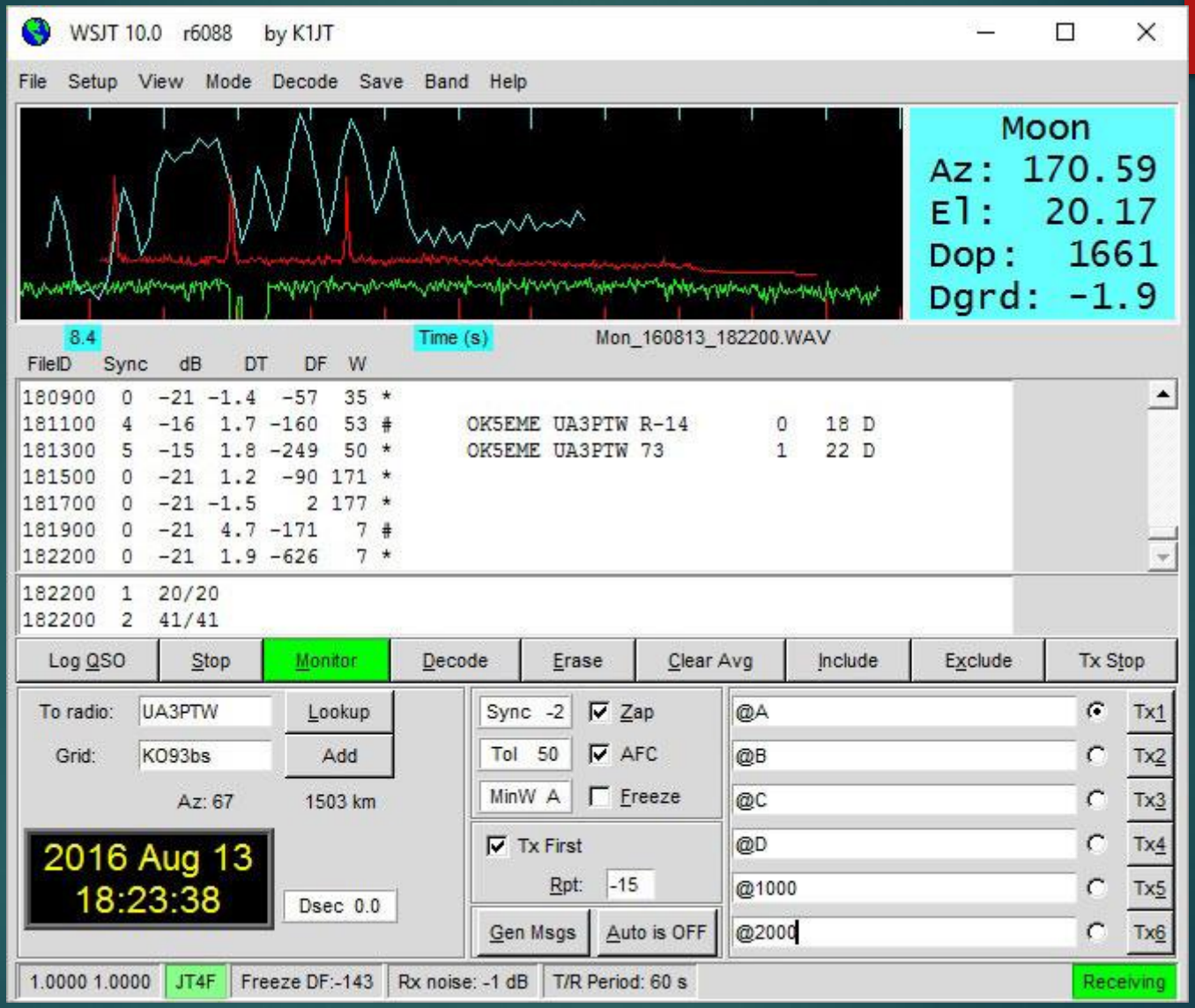
# SP/OK5EME 12th – 13th August

# SP/OK5EME 12th – 13th August

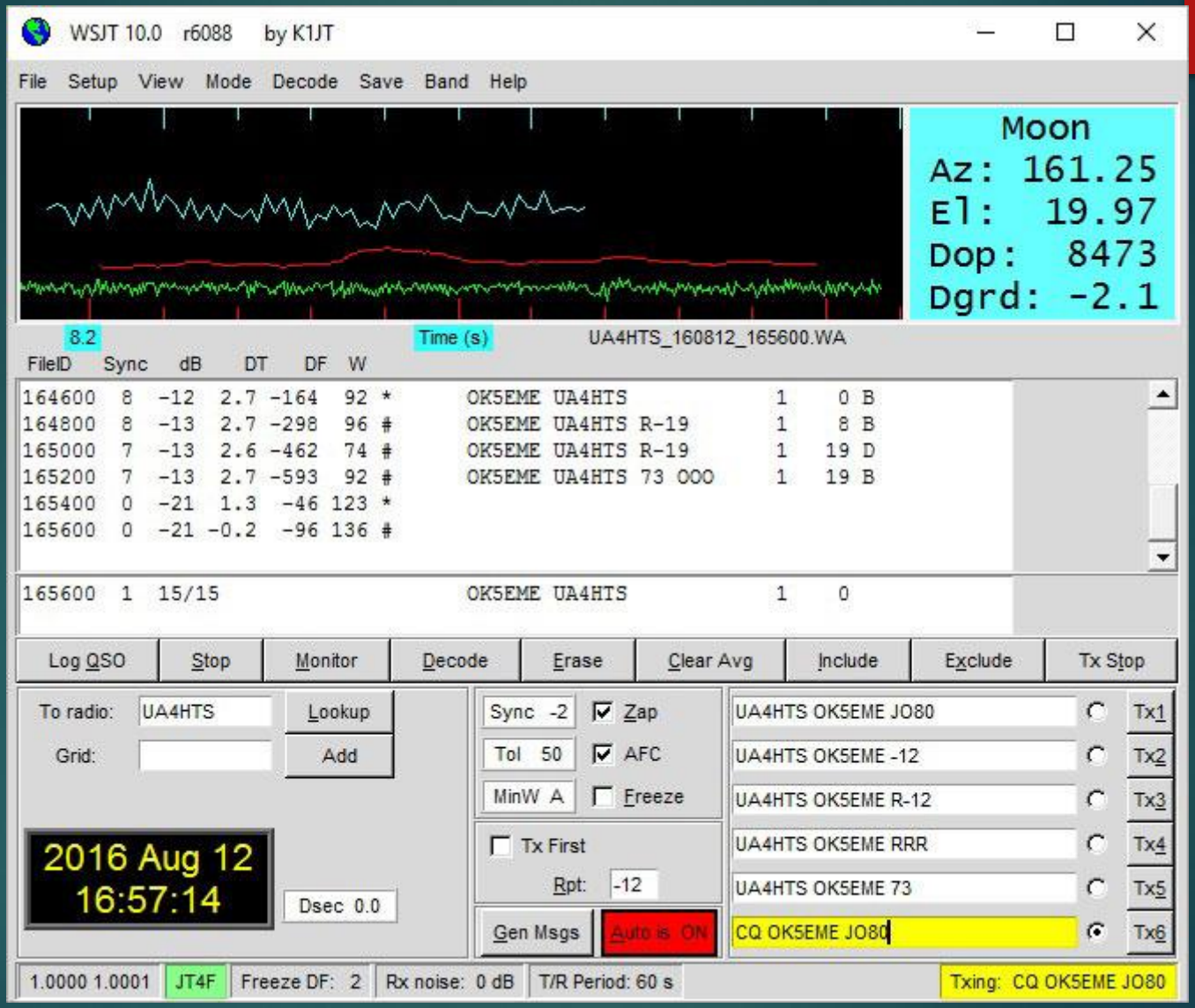
# My first EME 6cm QSO with HB9Q



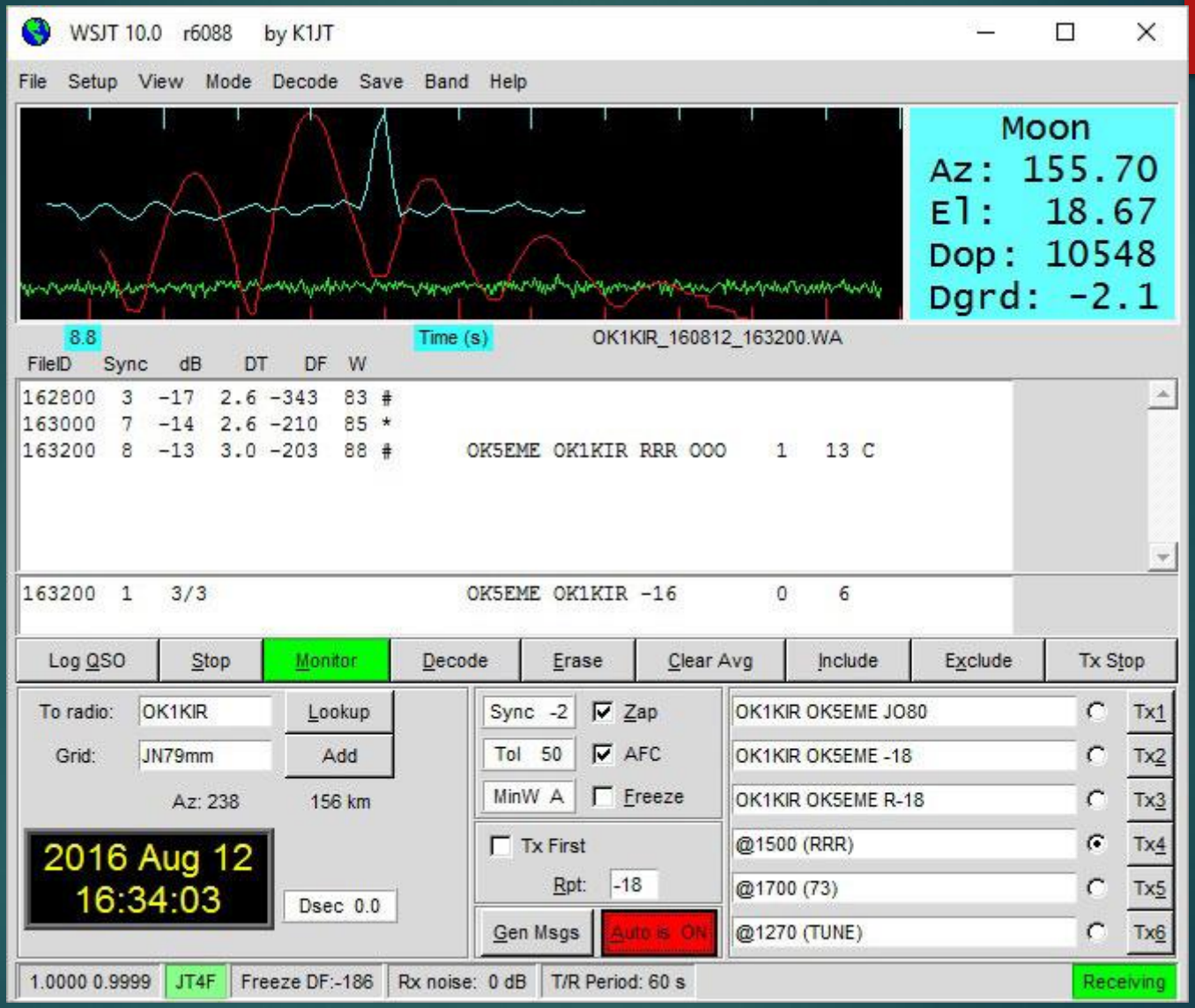
# Other EME 6cm QSO with UA3PTW



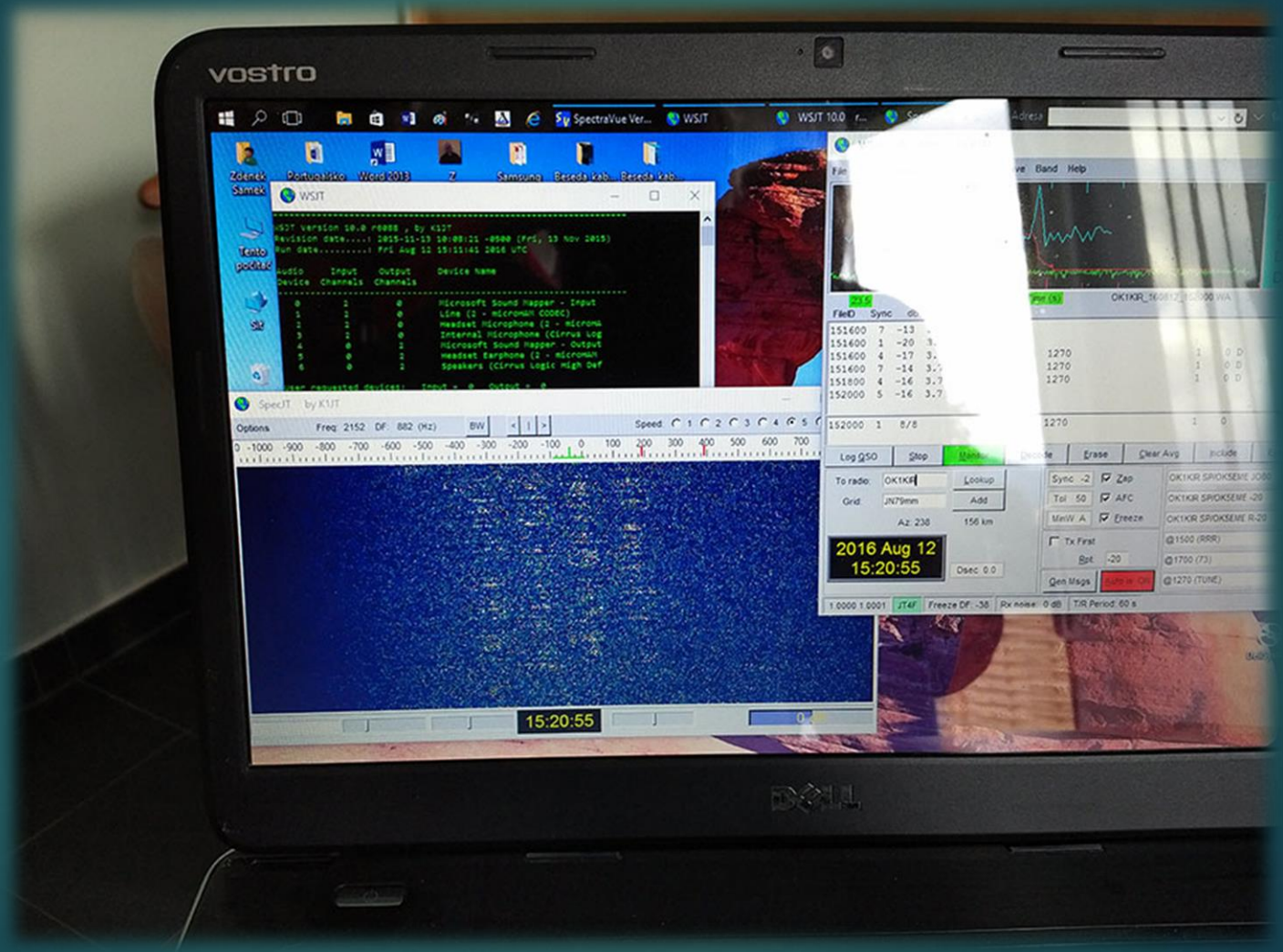
# EME 3cm QSO with UA4HTS



# EME 3cm QSO with OK1KIR



# EME 3cm QSO with OK1KIR



Thank you for your attention and see you via Moon during next DX pedition to ……..