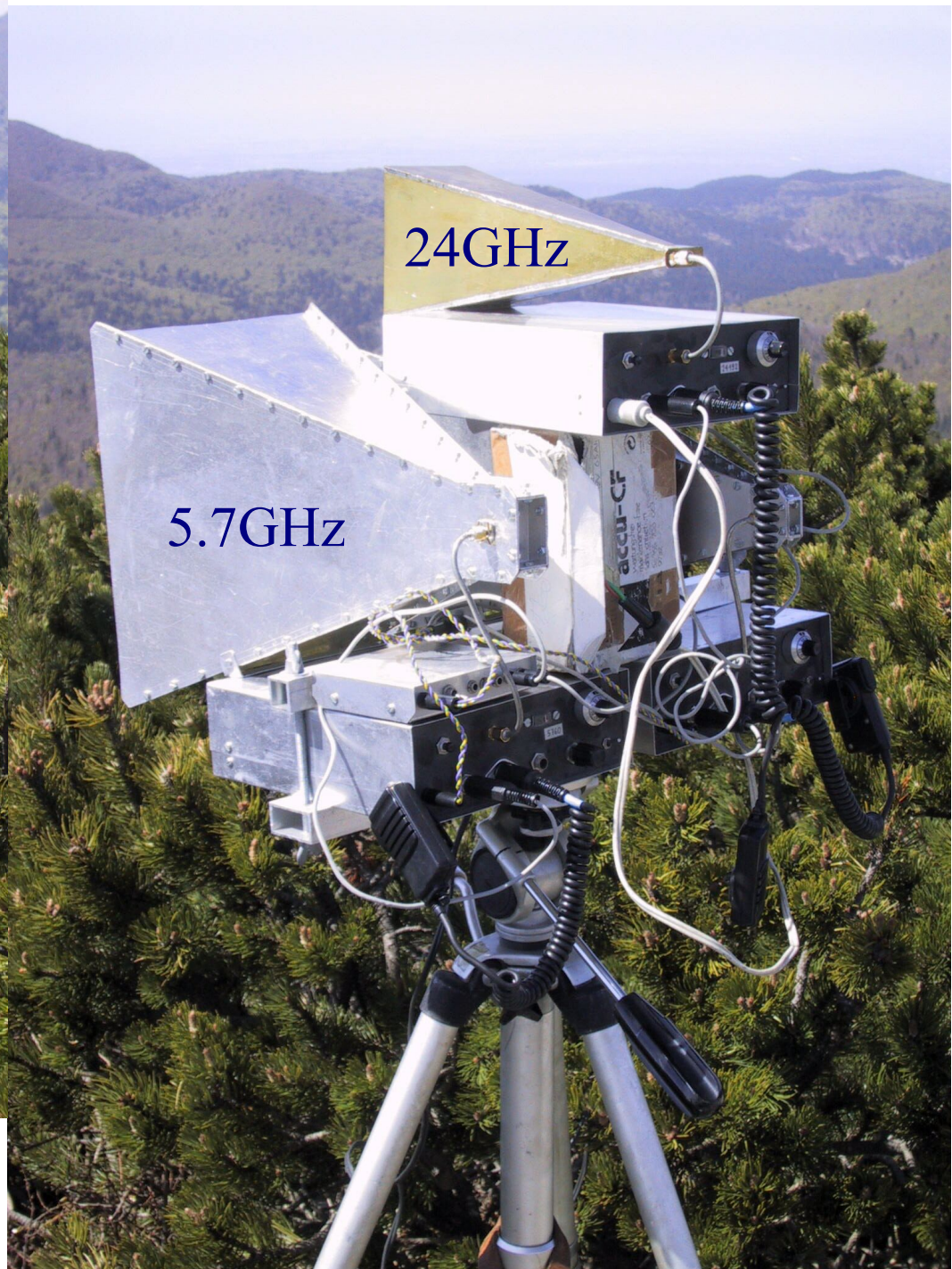
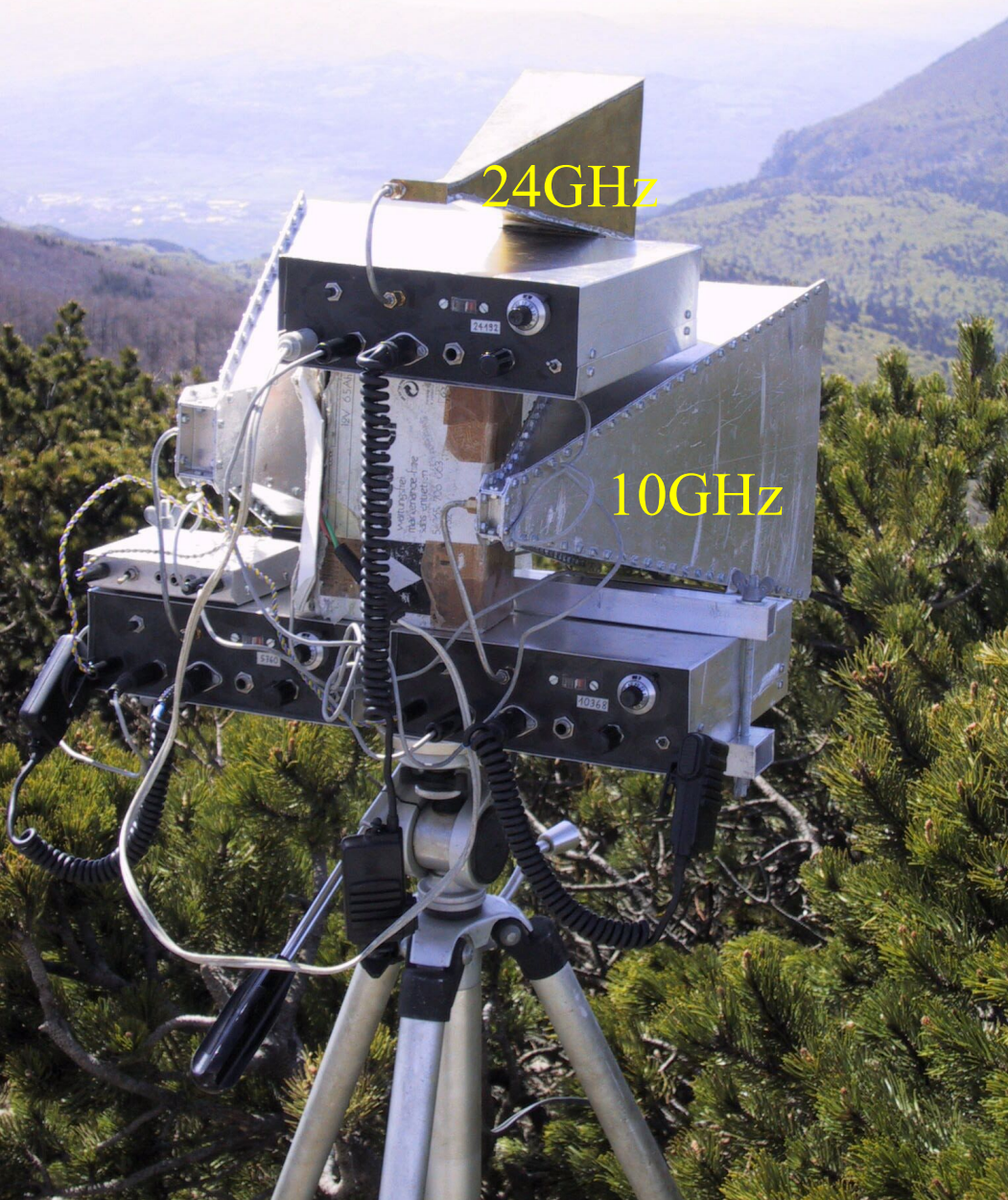


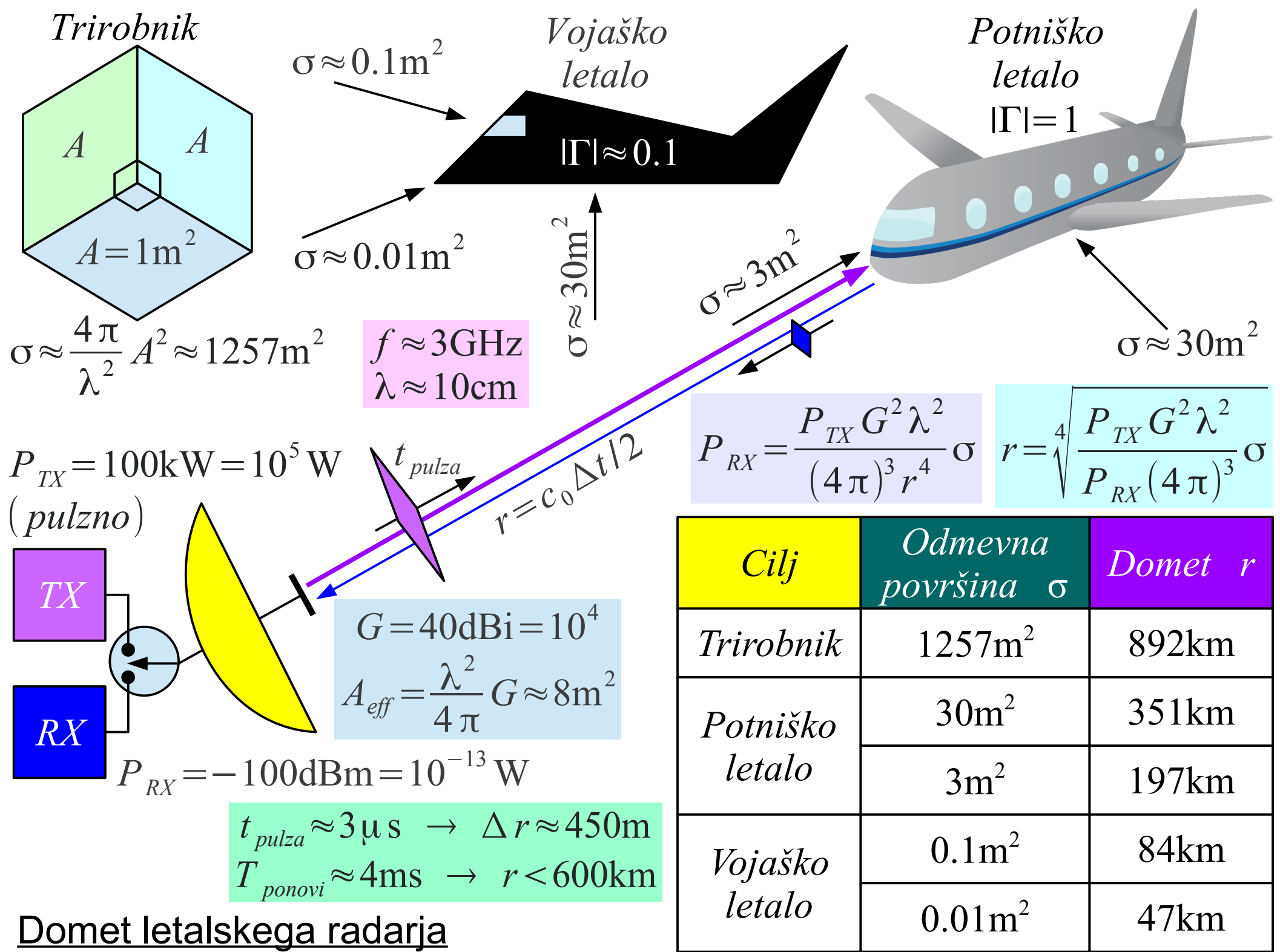
Vremenski radar

Mali Golak maj 2003



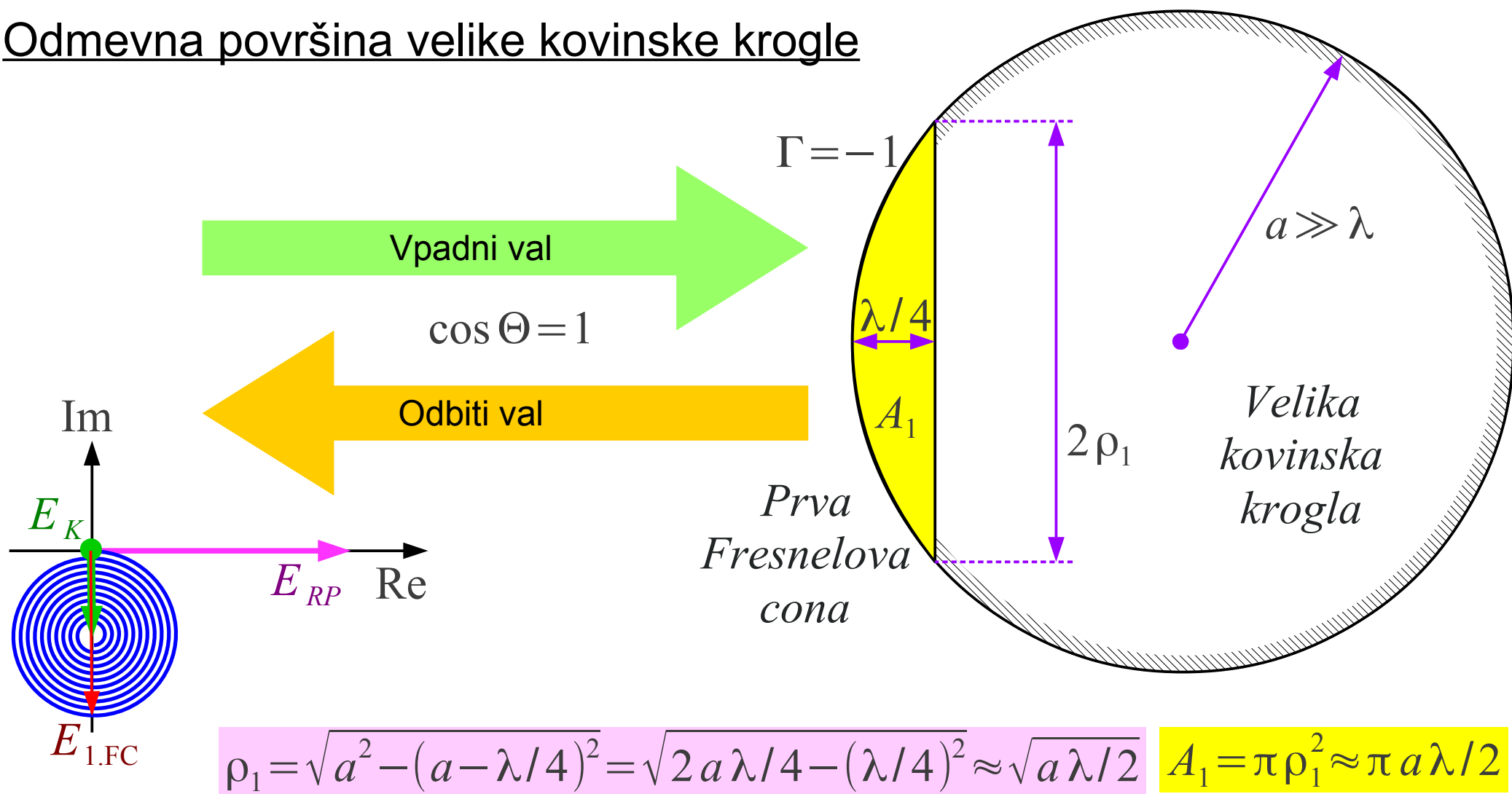


Mali Golak maj 2003



Domet letalskega radarja

Odmevna površina velike kovinske krogle

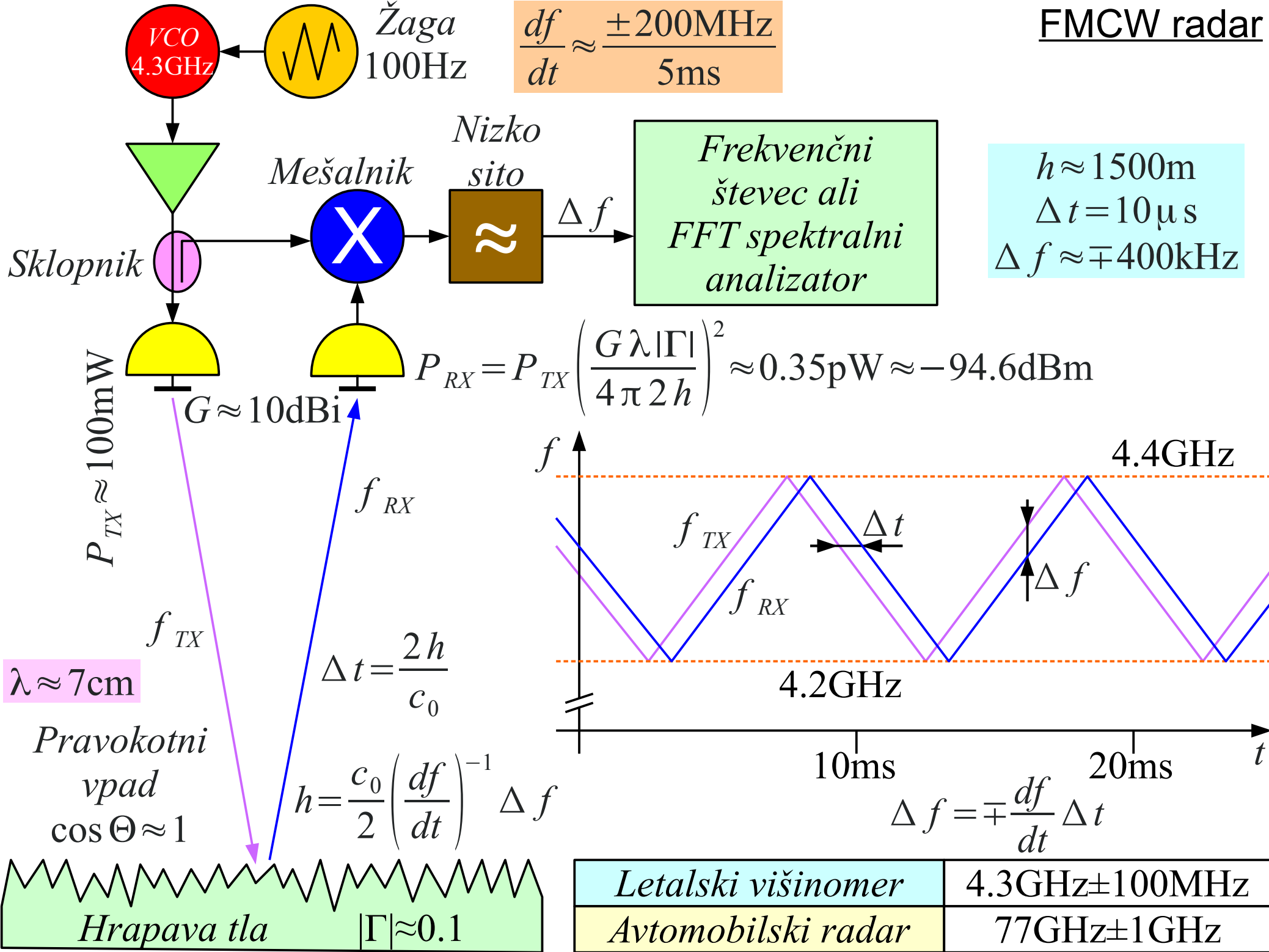


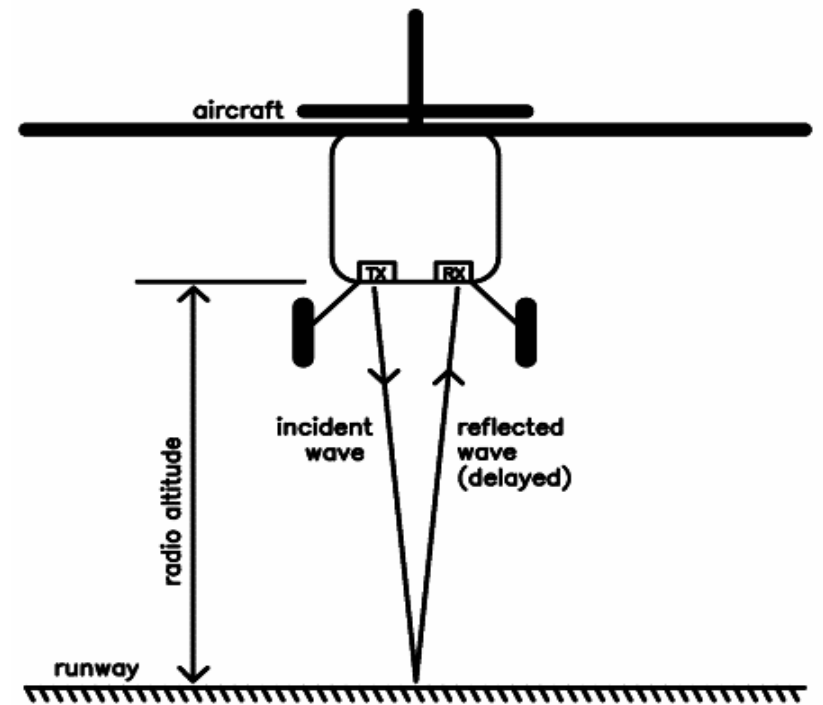
Ravna plošča $A_1 \rightarrow \sigma_{RP} = \frac{4\pi}{\lambda^2} A_1^2 \approx \frac{4\pi}{\lambda^2} (\pi a\lambda/2)^2 = \pi^3 a^2$

Prva Fresnelova cona $A_1 \rightarrow E_{1.FC} = -j \left(\frac{2}{\pi} \right) E_{RP} \rightarrow \sigma_{1.FC} = \left(\frac{2}{\pi} \right)^2 \sigma_{RP} \approx 4\pi a^2$

Velika kovinska krogla $\rightarrow E_K = \frac{1}{2} E_{1.FC} \rightarrow \sigma_K = \frac{1}{4} \sigma_{1.FC} \approx \pi a^2$

FMCW radar



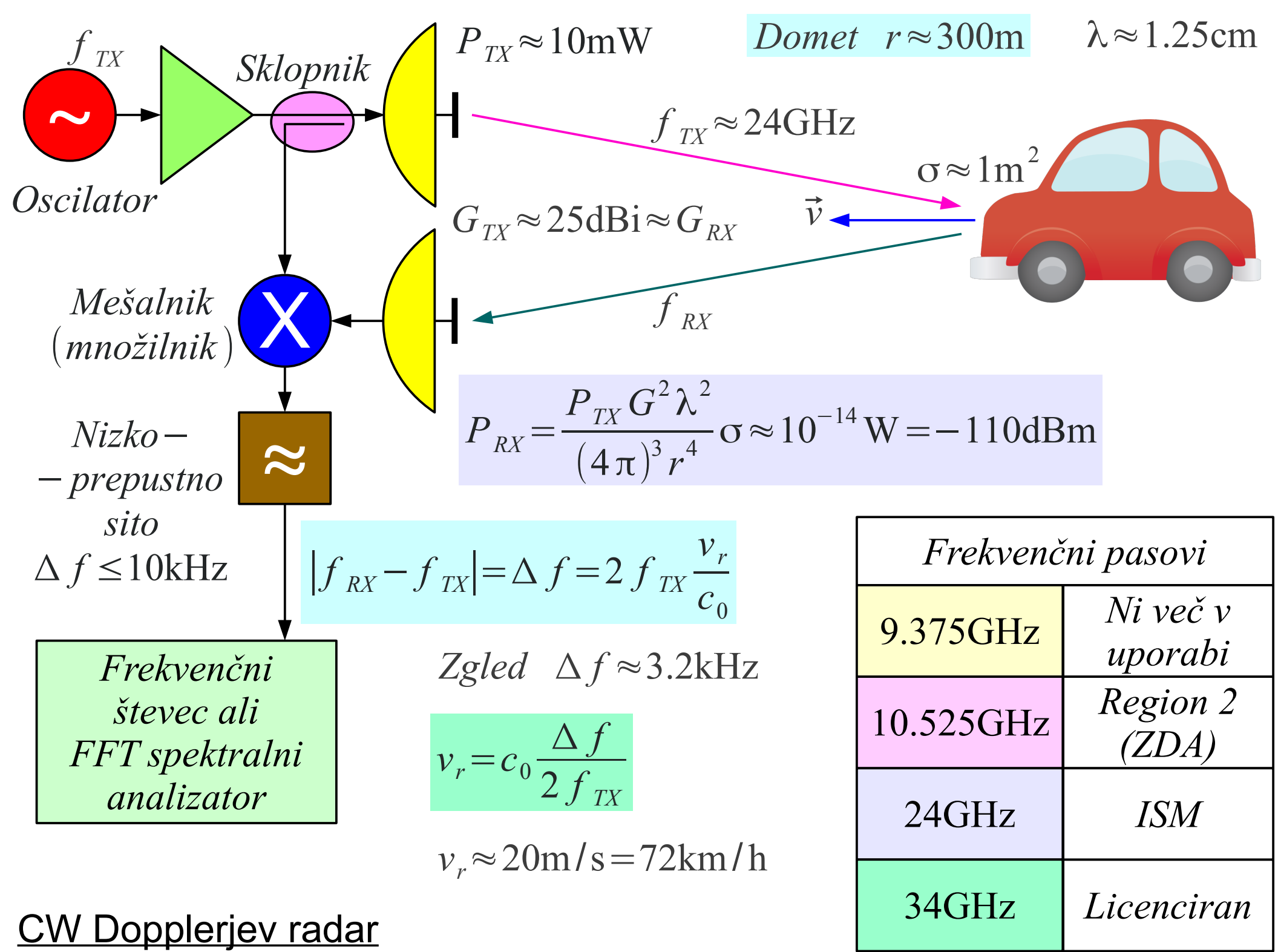


380kV
Sredipolja – Divača



Avgust 2007

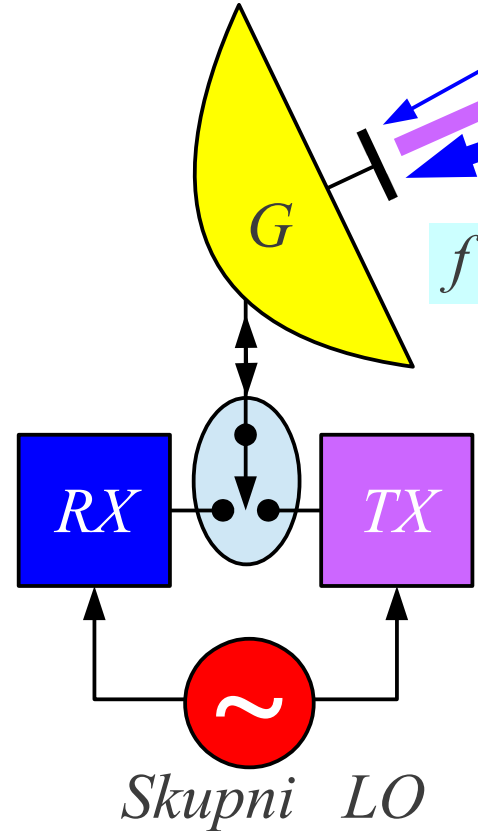
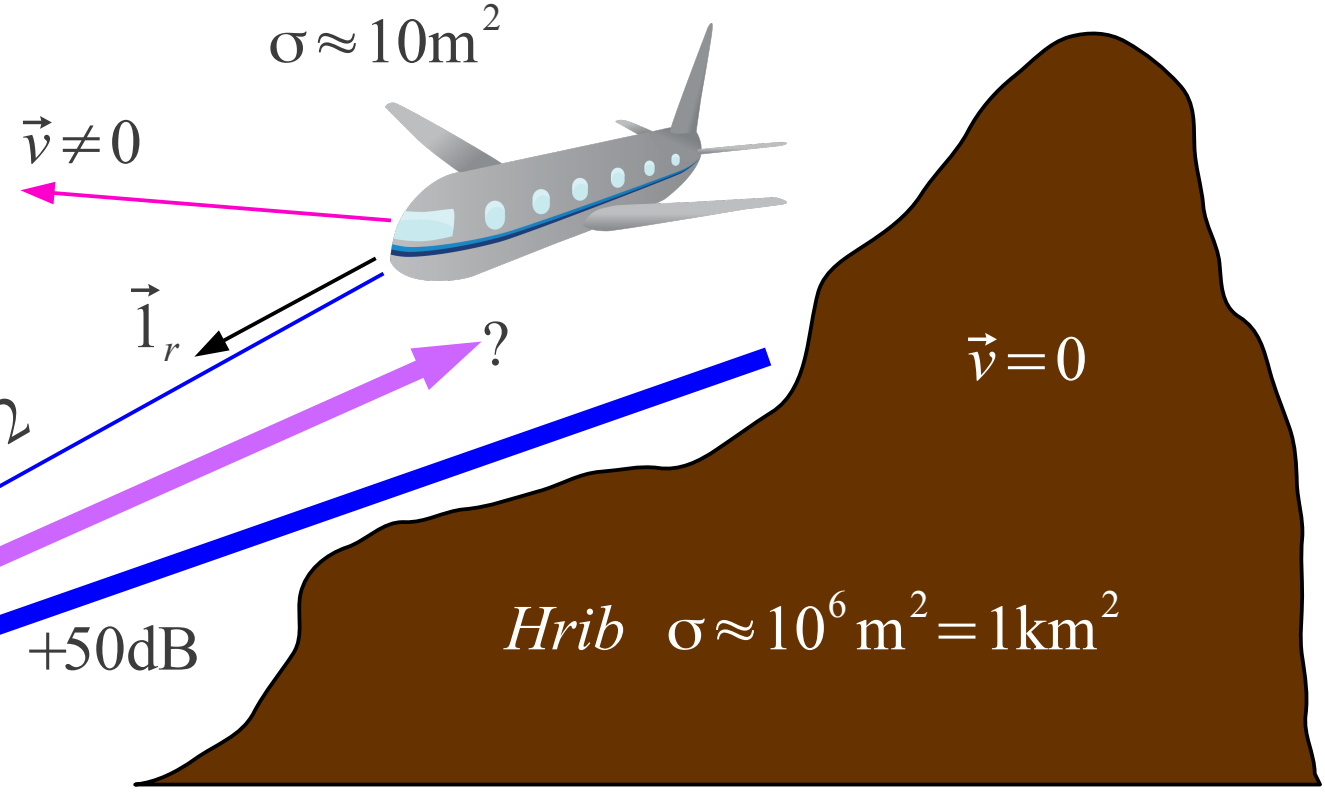
Višinomer in daljinovod



CW Dopplerjev radar

$t_{pulza} \approx 3 \mu s \rightarrow \Delta r \approx 450 m$
 $T_{ponovi} \approx 4 ms \rightarrow r < 600 km$

Zahtevna primerjava faze zaporednih odmevov
 $\Delta f \ll 1/t_p$



$f_{RX} = f_{TX} + \Delta f$

$f \approx 3 GHz$
 $\lambda \approx 10 cm$

Razločevanje premičnih ciljev MTI

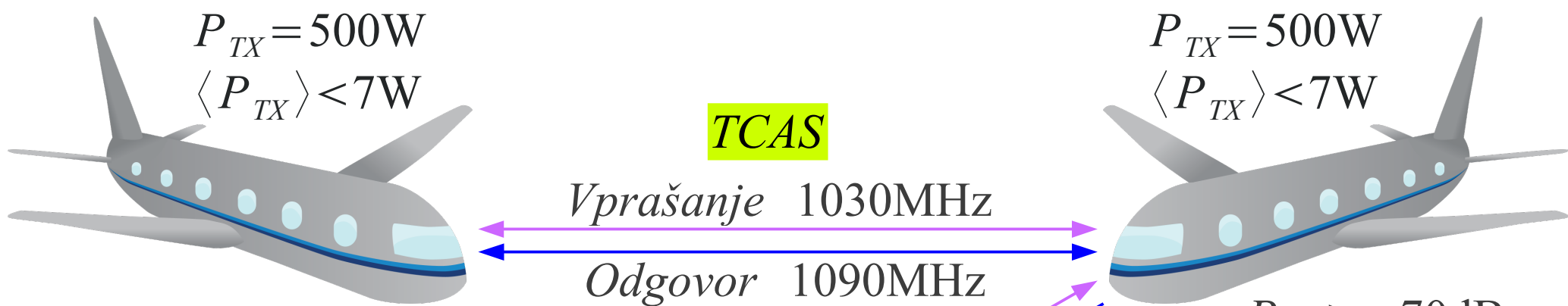
Letalo $v \approx 250 m/s = 900 km/h$
 $\rightarrow \Delta f \leq 5 kHz$

Hrib $v \approx 0 \rightarrow \Delta f \approx 0$

$$\Delta f = 2 \frac{f_{TX}}{c_0} (\vec{v} \cdot \vec{1}_r) \equiv \text{Dopplerjev pomik}$$

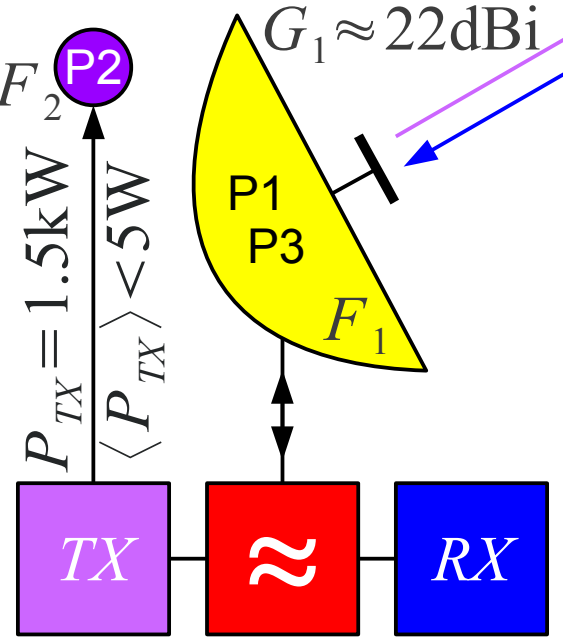
Pulzno-Dopplerjev radar ne vidi:
 (1) Počasnih ciljev: baloni, jadralci...
 (2) Tangencialnih ciljev: $\vec{v} \perp \vec{1}_r$

Pulzno-Dopplerjev radar



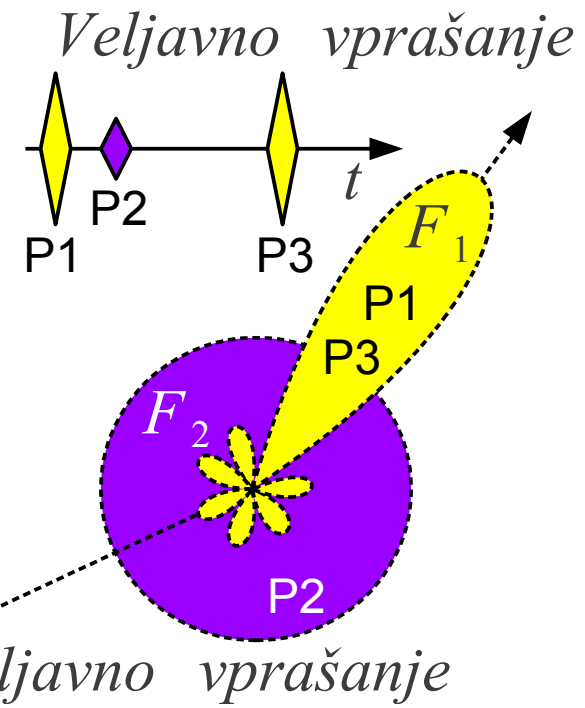
Vprašanja 1030MHz:
 Mode „A“ $t_3 - t_1 = 8\mu s$
 Mode „C“ $t_3 - t_1 = 21\mu s$
 Mode „S“ 56bit/112bit
 4Mbps BPSK

TCAS \equiv Traffic-alert Collision Avoidance System
 TCAS-1: Traffic Advisory C/S
 TCAS-2: Resolution Advisory S

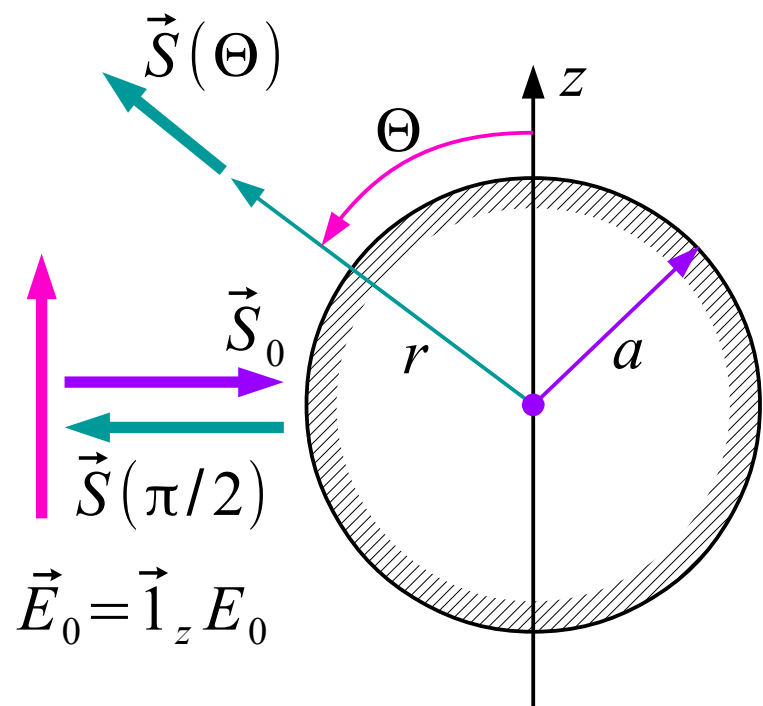


Odgovori 1090MHz:
 Mode „A“ koda letala 15bit
 Mode „C“ višina letala 13bit
 Mode „S“ 56bit/112bit
 1Mbps Manchester/ASK

$t_2 - t_1 = 2\mu s$



Sekundarni radar (IFF)

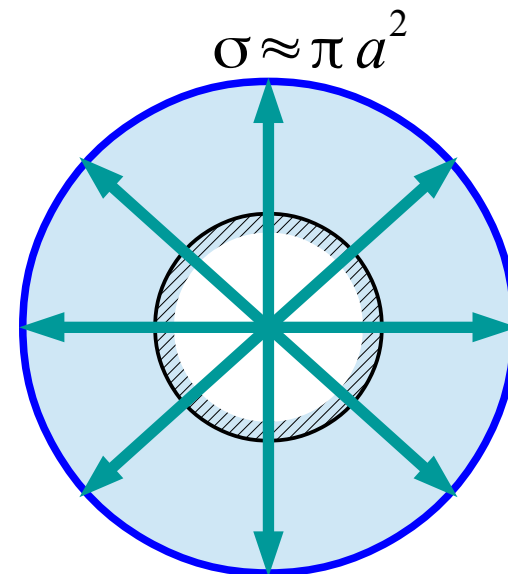


*Kovinska
kroglica*

$a \gg \lambda$
*neodvisno od
frekvence ter
polarizacije
(bel oblak)*

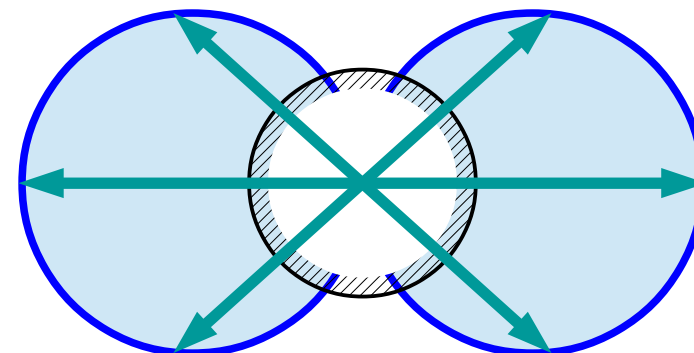
*Rezonance (Mie)
 $a \approx \lambda$*

*Rayleigh
 $a \ll \lambda$
polarizacijsko
ter frekvenčno
odvisno
(modro nebo)*



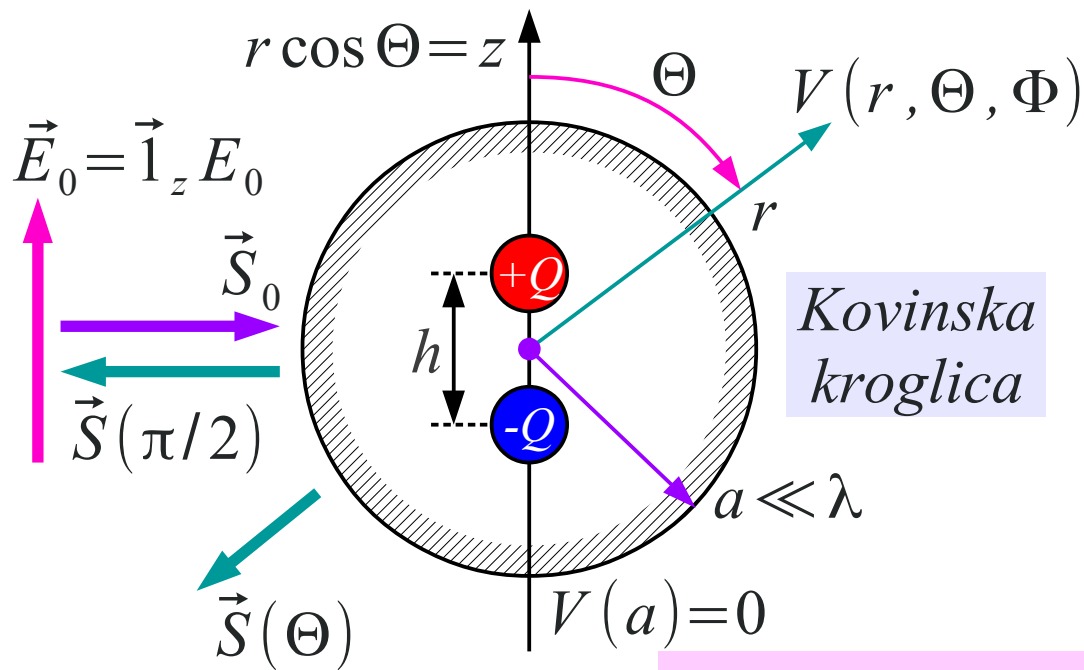
$$F(\Theta, \Phi) = 1$$

$$F(\Theta, \Phi) = \sin \Theta$$



$$\sigma \approx 4 \pi k^4 a^6 \ll \pi a^2$$

Odboj od prevodne kroglice



Prazen prostor $\Delta V + k^2 V = 0$

$a \ll \lambda \rightarrow$ Statika $\Delta V \approx 0$

Pogoja $V(a) = 0$ in $V(\infty) = -E_0 z$

$$V(r, \Theta, \Phi) = E_0 \left(-r + \frac{a^3}{r^2} \right) \cos \Theta$$

$$\text{Statika } V_{\text{dipol}}(r, \Theta, \Phi) = \frac{Qh}{4\pi\epsilon_0} \frac{\cos \Theta}{r^2}$$

Zveznost $I = j\omega Q$

Sevanje točkastega dipola $\vec{E} \approx \vec{1}_\Theta \frac{jkZ_0}{4\pi} I h \frac{e^{-jkr}}{r} \sin \Theta$

$$Qh = 4\pi\epsilon_0 a^3 E_0 \rightarrow Ih = 4\pi\epsilon_0 j\omega a^3 E_0 \rightarrow \vec{E} \approx -\vec{1}_\Theta k^2 a^3 E_0 \frac{e^{-jkr}}{r} \sin \Theta$$

Gostota sevane moči $\vec{S}(\Theta) = \vec{1}_r \frac{|\vec{E}|^2}{2Z_0} = \vec{1}_r k^4 a^6 \frac{|E_0|^2}{2Z_0} \frac{\sin^2 \Theta}{r^2} = \vec{1}_r k^4 a^6 |\vec{S}_0| \frac{\sin^2 \Theta}{r^2}$

$$\vec{S}(\Theta) = \vec{1}_r \frac{|\vec{S}_0| \sigma}{4\pi r^2} \quad \& \quad \sin \Theta = 1 \rightarrow \sigma = 4\pi r^2 \frac{|\vec{S}(\pi/2)|}{|\vec{S}_0|} = 4\pi k^4 a^6 = 64\pi^5 \frac{a^6}{\lambda^4}$$

Dielektrična kroglica $\sigma = 64\pi^5 \frac{a^6}{\lambda^4} \left| \frac{\epsilon_r - 1}{\epsilon_r + 2} \right|^2$

Odmevna površina majhne krogle

Dežna kapljica $\sigma = \frac{\pi^5}{\lambda^4} \left| \frac{\epsilon_r - 1}{\epsilon_r + 2} \right|^2 (2a)^6$

$\left| \frac{\epsilon_r - 1}{\epsilon_r + 2} \right|^2 = |K|^2 \equiv \text{dielektrični faktor}$

$\left| \frac{\epsilon_r - 1}{\epsilon_r + 2} \right|^2 \approx \begin{cases} 0.93 & (\text{voda } \epsilon_r \approx 80) \\ 0.21 & (\text{led } \epsilon_r \approx 3.5) \\ 1 & (\text{kovina } \epsilon_r \rightarrow \infty) \end{cases}$

Naključna faza $\rightarrow \sigma = \sum_i \sigma_i$

$Z = \frac{1}{\Delta V} \sum_i (2a_i)^6 \equiv \text{faktor odboja}$

$\eta = \frac{d\sigma}{dV} = \frac{\pi^5}{\lambda^4} \left| \frac{\epsilon_r - 1}{\epsilon_r + 2} \right|^2 Z \leftarrow Z [\text{m}^3]$

Dež $\sigma = V \eta = V \frac{\pi^5}{\lambda^4} \left| \frac{\epsilon_r - 1}{\epsilon_r + 2} \right|^2 Z$

Odmevna površina padavin

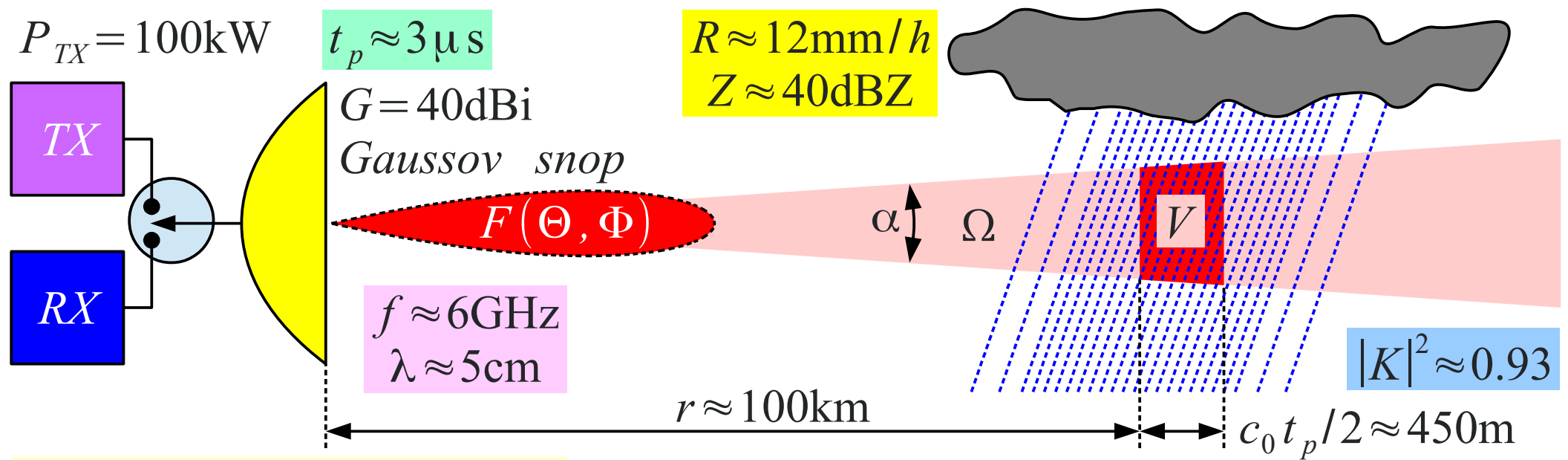
J. S. Marshall & W. M. Palmer 1948

$R \left[\frac{\text{mm}}{\text{h}} \right] \equiv \text{jakost padavin}$

$Z \left[\frac{\text{mm}^6}{\text{m}^3} \right] = 200 R^{1.6} \quad R = \left(\frac{Z}{200} \right)^{0.625}$

$Z_{\text{dBZ}} = 10 \log_{10} \frac{Z}{Z_0} \quad Z_0 = \frac{1 \text{mm}^6}{1 \text{m}^3} = 10^{-18} \text{m}^3$

<i>Padavine</i>	<i>R[mm/h]</i>	<i>Z[dBZ]</i>	<i>Z[m³]</i>	<i>Barva</i>
<i>Toča</i>	205mm/h	60dBZ	10 ⁻¹² m ³	
	100mm/h	55dBZ	3·10 ⁻¹³ m ³	
<i>Naliv</i>	49mm/h	50dBZ	10 ⁻¹³ m ³	
	24mm/h	45dBZ	3·10 ⁻¹⁴ m ³	
<i>Dež</i>	12mm/h	40dBZ	10 ⁻¹⁴ m ³	
	5.6mm/h	35dBZ	3·10 ⁻¹⁵ m ³	
	2.7mm/h	30dBZ	10 ⁻¹⁵ m ³	
<i>Rosenje</i>	1.3mm/h	25dBZ	3·10 ⁻¹⁶ m ³	
	0.6mm/h	20dBZ	10 ⁻¹⁶ m ³	



$$\vec{S}_0 = \vec{1}_r \frac{P_{TX} G}{4\pi r^2} \frac{|F(\Theta, \Phi)|^2}{|F(\Theta_{MAX}=0)|^2}$$

$$dV = \frac{c_0 t_p}{2} r^2 d\Omega$$

$$\eta = \frac{d\sigma}{dV} = \frac{\pi^5}{\lambda^4} |K|^2 Z$$

$$40 \text{ dBZ} = 10^{-14} \text{ m}^3$$

$$dP_{RX} = \frac{G \lambda^2}{4\pi} \frac{|F(\Theta, \Phi)|^2}{|F(\Theta_{MAX}=0)|^2} |d\vec{S}|$$

$$d\vec{S} = \frac{-\vec{S}_0}{4\pi r^2} \eta dV$$

Stožčast snop

$$F(\Theta) = \begin{cases} 1 & (\Theta < \alpha/2) \\ 0 & (\Theta > \alpha/2) \end{cases}$$

$$I = \Omega \approx \frac{4\pi}{G}$$

$$P_{RX} = \frac{P_{TX} G^2 \lambda^2}{(4\pi)^3 r^2} \eta \frac{c_0 t_p}{2} I \quad I = \oint_{4\pi} \left(\frac{|F(\Theta, \Phi)|^2}{|F(\Theta_{MAX}=0)|^2} \right)^2 d\Omega$$

$$P_{RX} \approx \frac{P_{TX} G \lambda^2}{64 \pi^2 r^2} \eta c_0 t_p = \frac{P_{TX} G \pi^3 c_0 t_p |K|^2}{64 r^2 \lambda^2} Z \approx 1.62 \cdot 10^{-10} \text{ W}$$

Gaussov snop

$$|F(\Theta)|^2 = e^{-(\Theta/\Theta_{-3\text{dB}})^2 \ln 2}$$

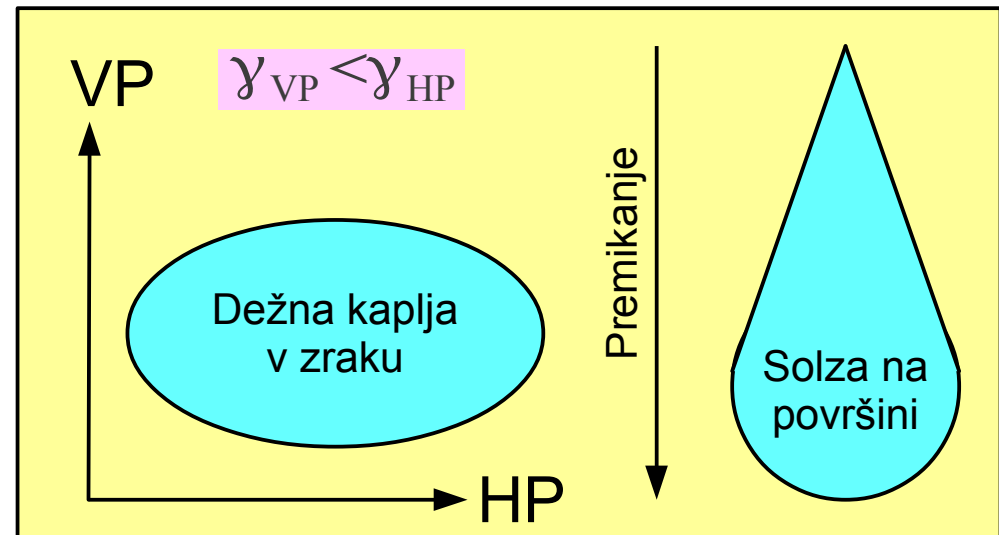
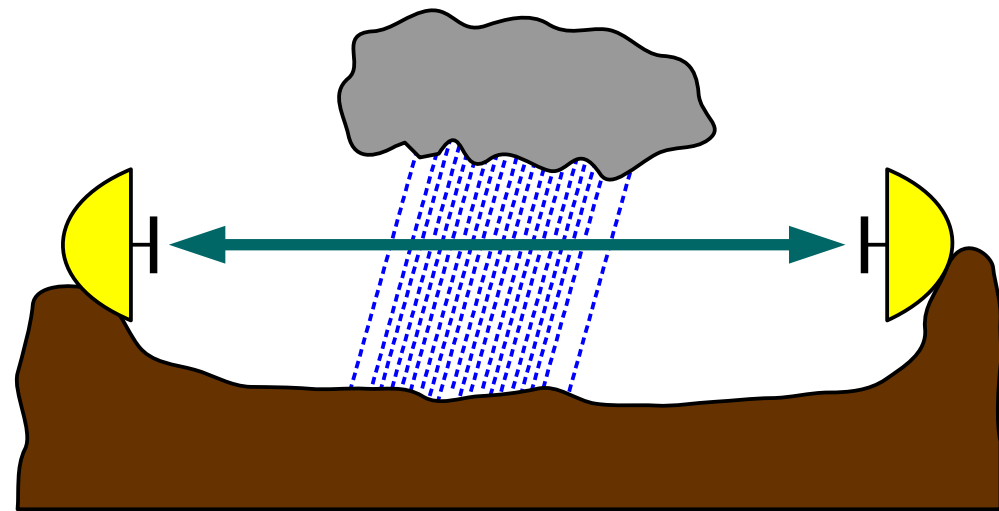
$$I \approx \frac{\pi \Theta_{-3\text{dB}}^2}{2 \ln 2} \approx \frac{2\pi}{G}$$

Vremenski radar

$$P_{RX} \approx 162 \text{ pW} \approx -67.9 \text{ dBm}$$

Dielektrične lastnosti vode

f	$\epsilon_r = \epsilon_r' - j\epsilon_r''$	$n = \sqrt{\epsilon_r}$
300GHz	5.81-j4.85	2.59-j0.94
150GHz	6.75-j9.57	3.04-j1.57
100GHz	8.26-j14.07	3.50-j2.01
60GHz	12.69-j22.00	4.36-j2.52
30GHz	26.40-j34.22	5.90-j2.90
18.5GHz	42.54-j35.62	7.00-j2.54
16GHz	50.00-j37.50	7.50-j2.50
11GHz	61.16-j32.12	8.07-j1.99
6GHz	73.72-j20.84	8.67-j1.20
4GHz	76.08-j16.05	8.77-j0.92
3GHz	78.30-j11.14	8.87-j0.63
2GHz	79.32-j7.53	8.92-j0.42
1.43GHz	80.92-j4.95	9.00-j0.28



Priporočilo ITU-R P.838-3

$$\gamma [\text{dB/km}] \approx k(f) (R [\text{mm/h}])^{\alpha(f)}$$

Enačbe/tabele za $k(f)$ & $\alpha(f)$
posebej za HP oziroma za VP

Slabljenje padavin

$$\gamma = -a_{\text{dB}}/l$$

FIGURE 1

k coefficient for horizontal polarization

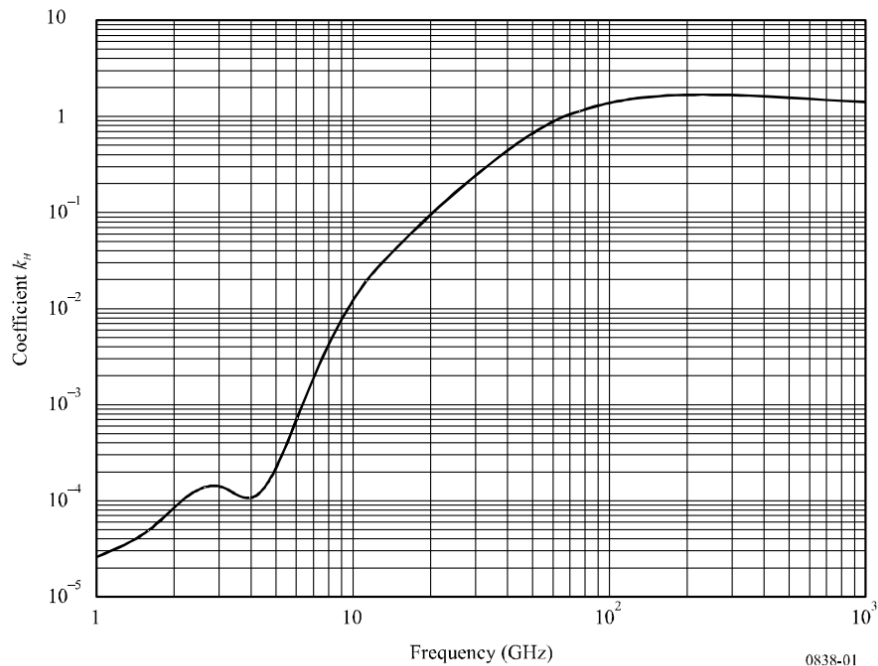


FIGURE 2

α coefficient for horizontal polarization

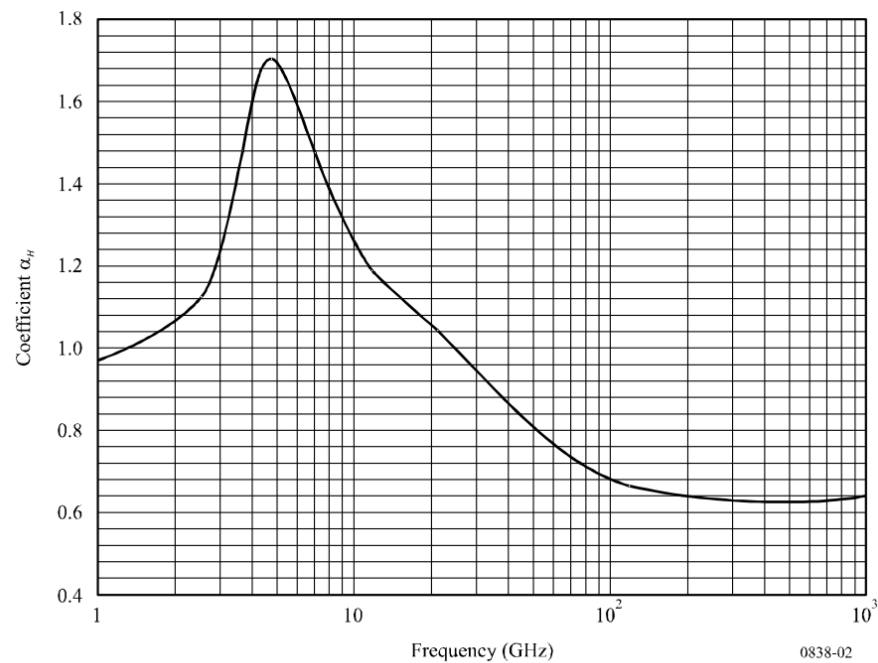


FIGURE 3

k coefficient for vertical polarization

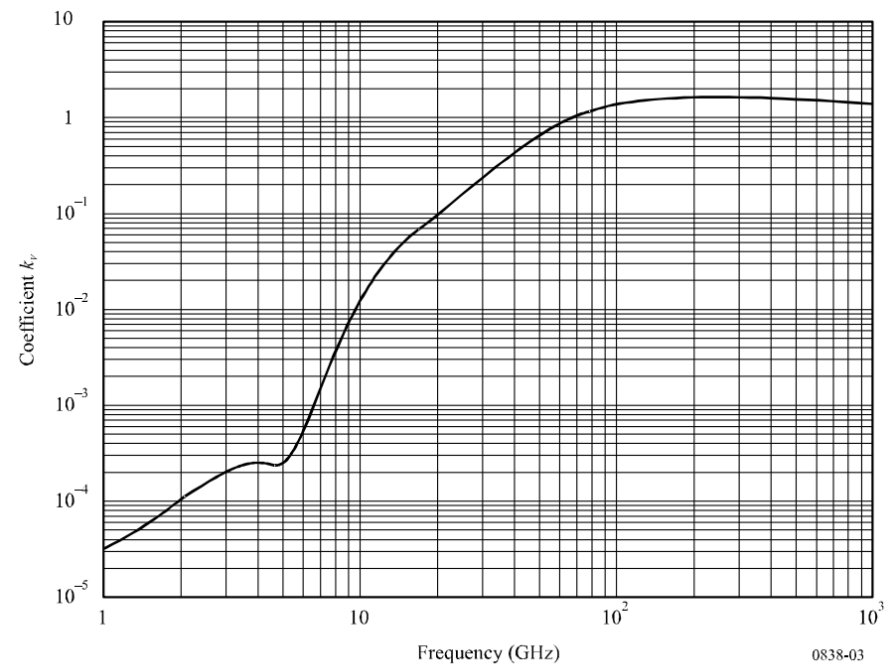
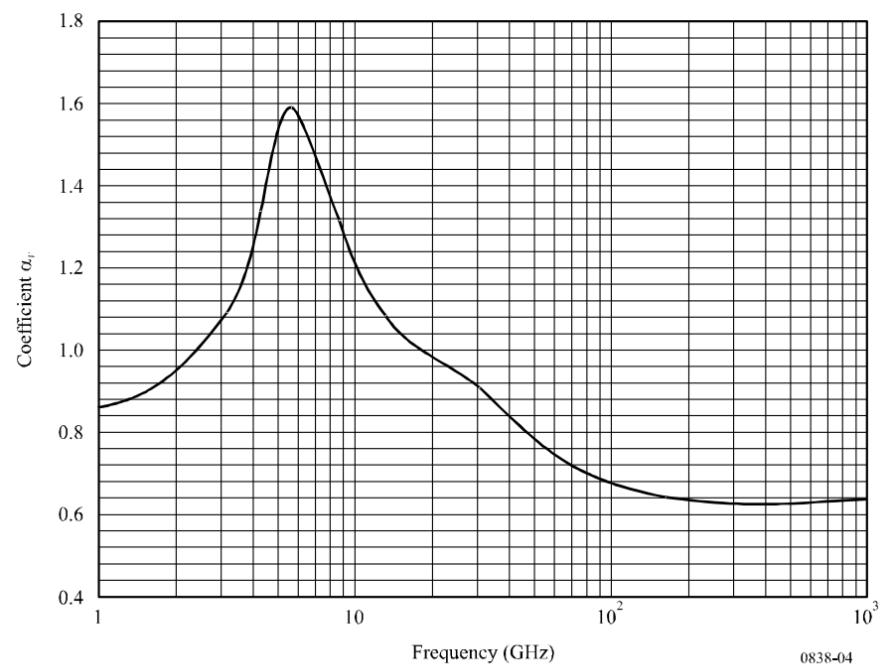


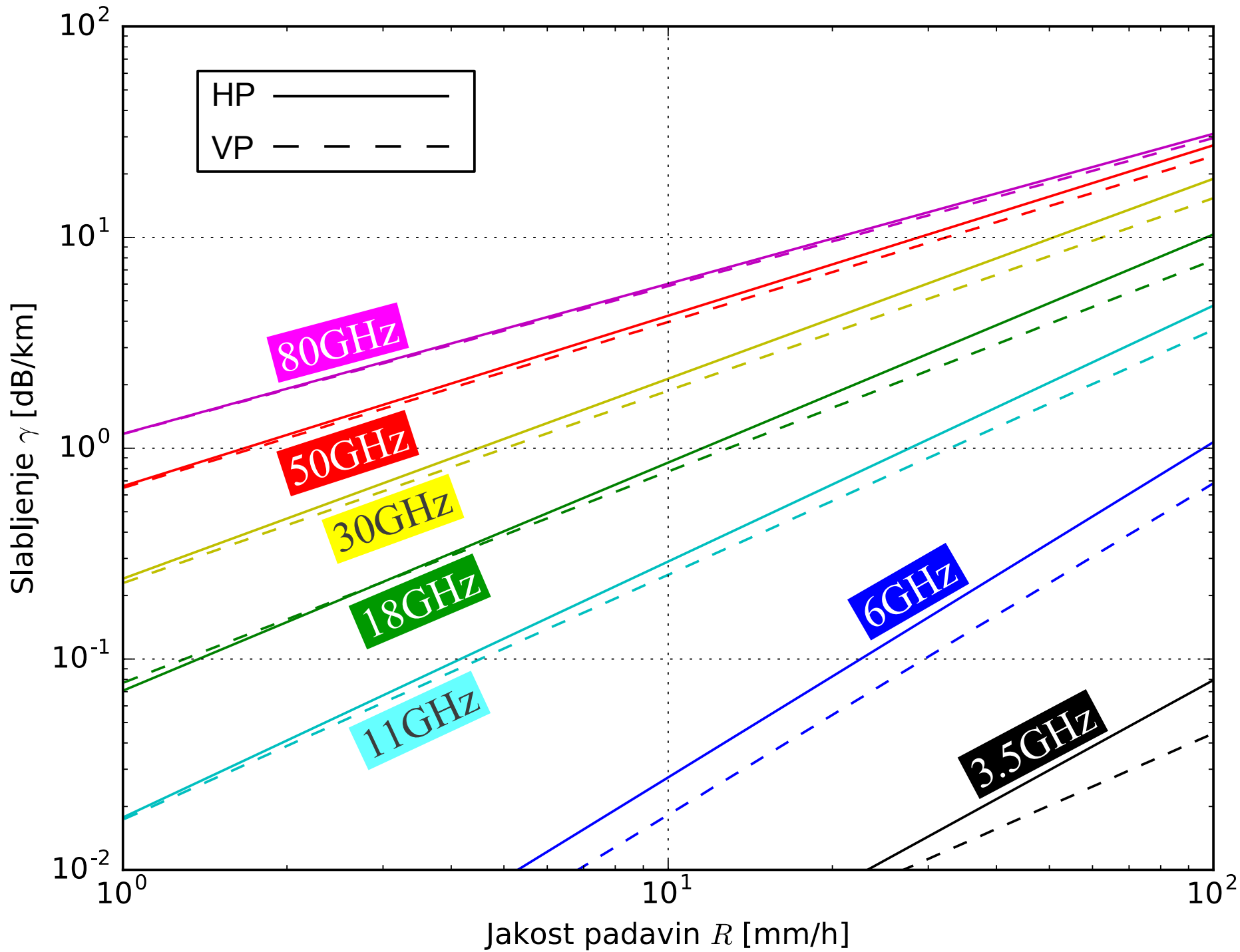
FIGURE 4

α coefficient for vertical polarization

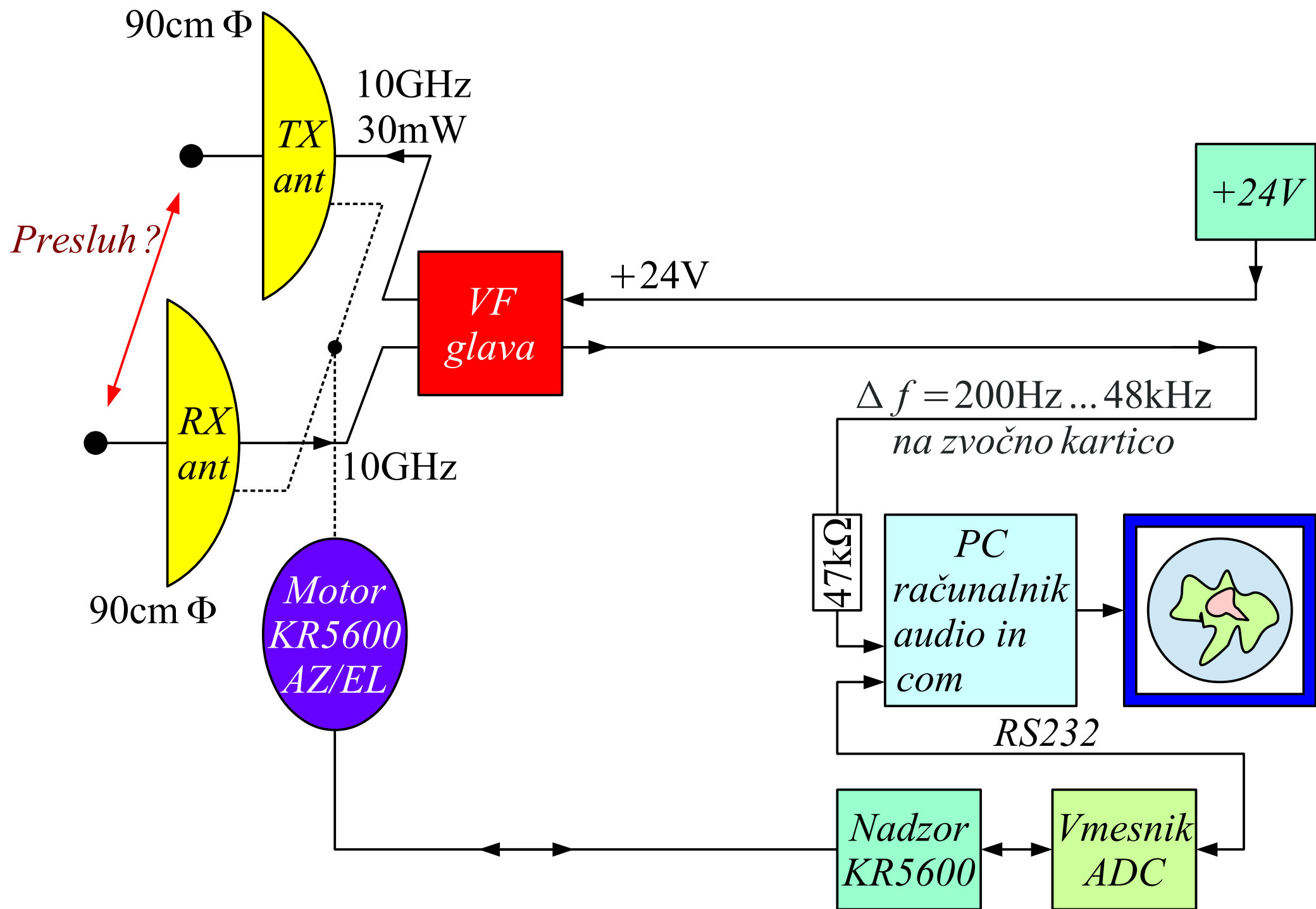


Koeficienti priporočila ITU-R P.838-3

Slabljenje padavin pri $f=3.5,6,11,18,30,50,80\text{GHz}$ po ITU-R 838-3

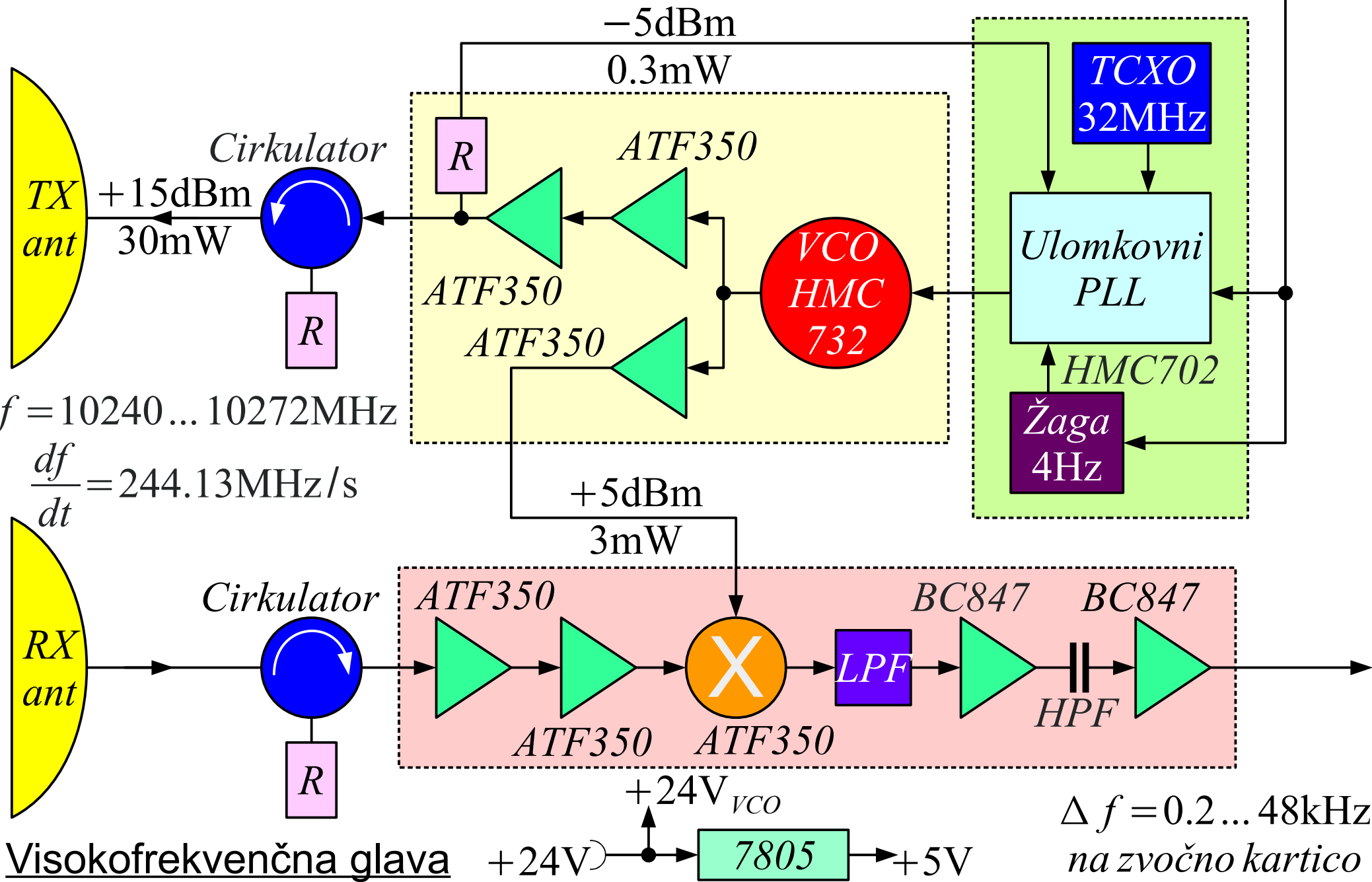
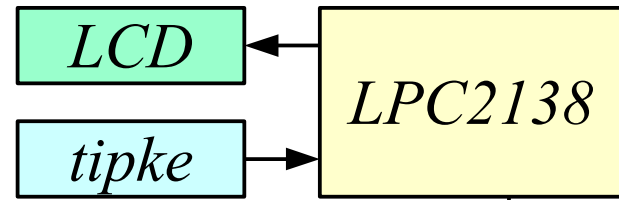


VF glava



Zasnova FMCW vremenskega radarja

$$r = \frac{c_0}{2} \left(\frac{df}{dt} \right)^{-1} \quad \Delta f = 0.12 \dots 29.5 \text{ km}$$

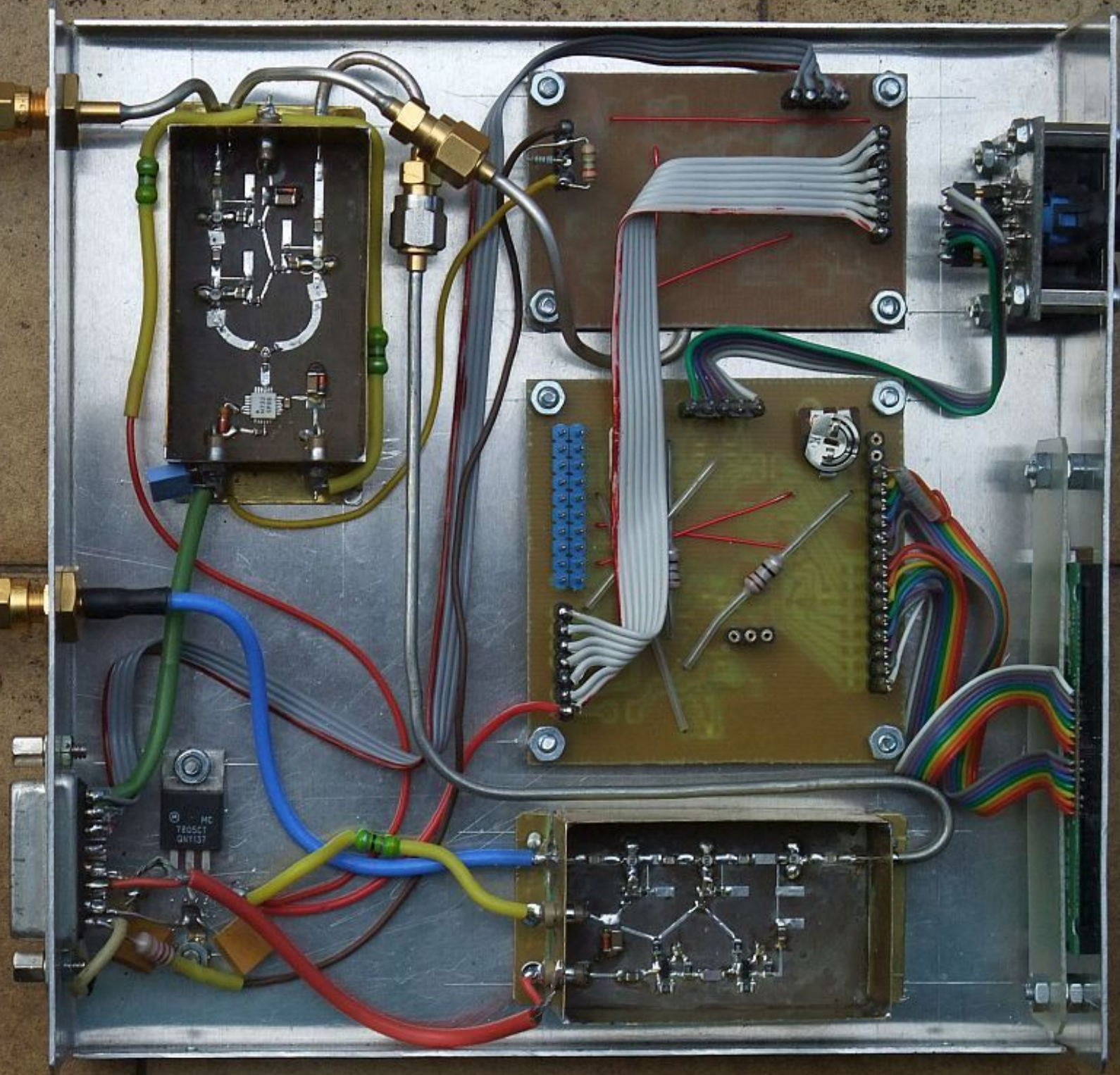


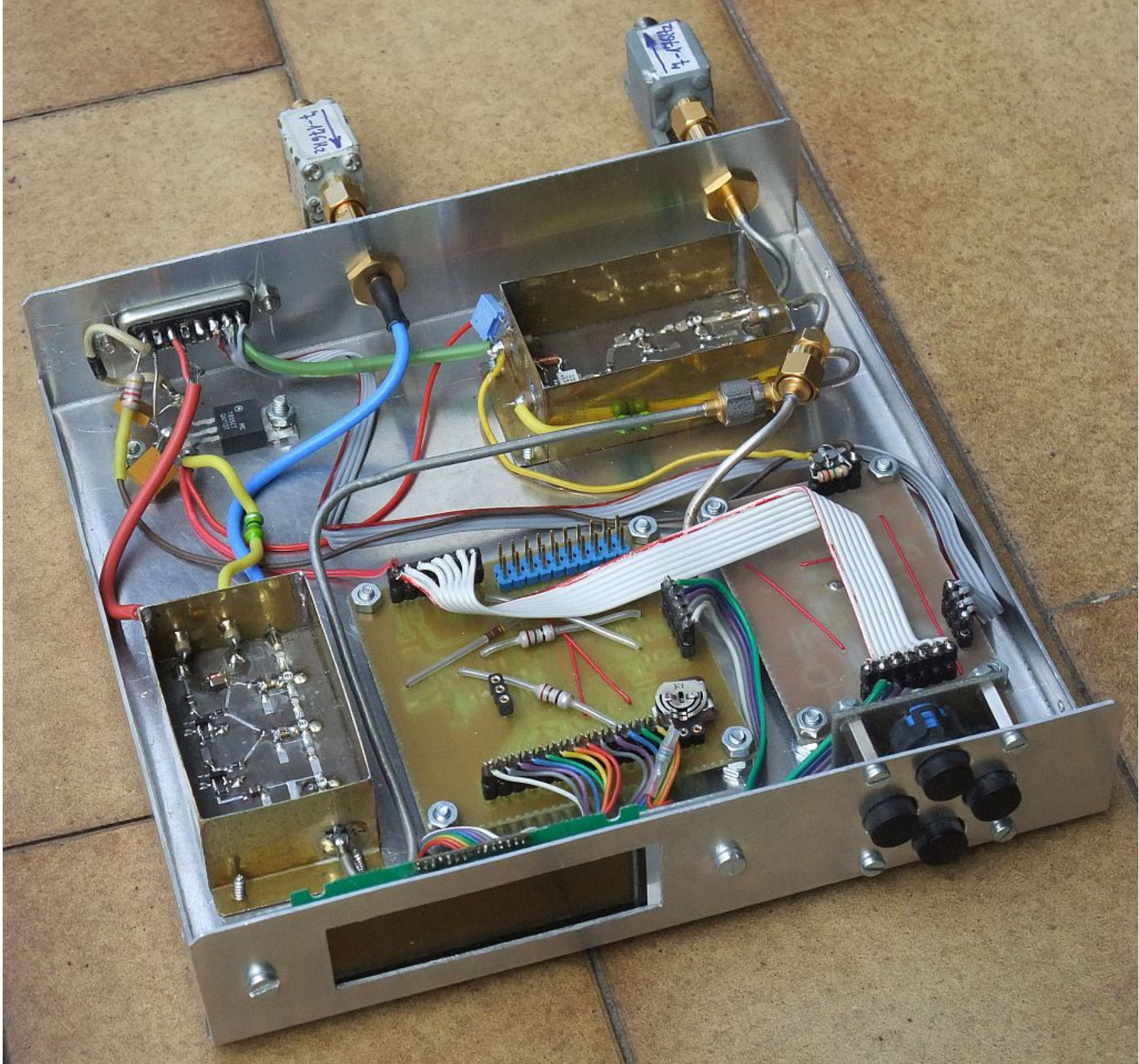
4-176Kz

7-176Kz

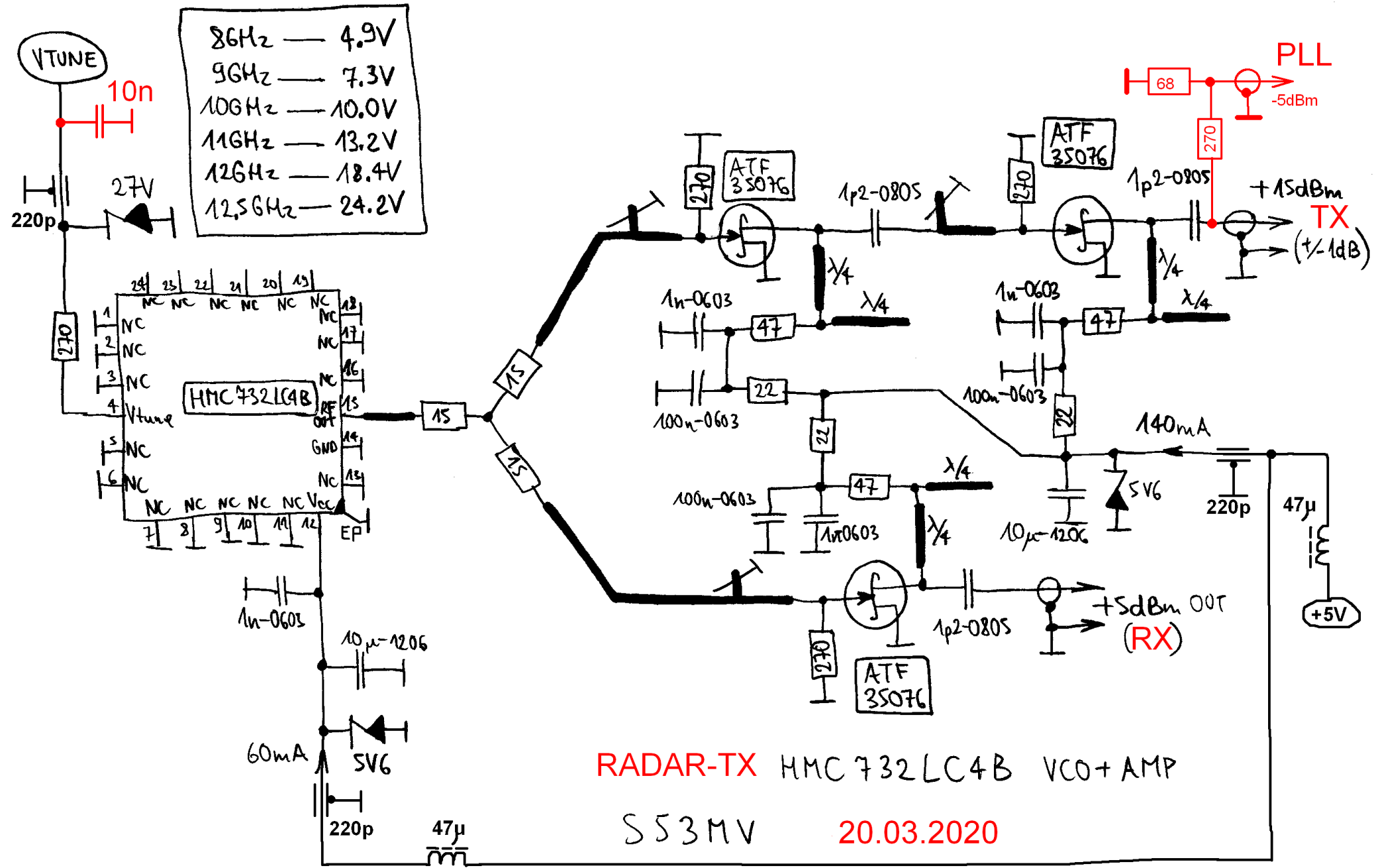
MC
7805
GN137

VF glava





Spredaj

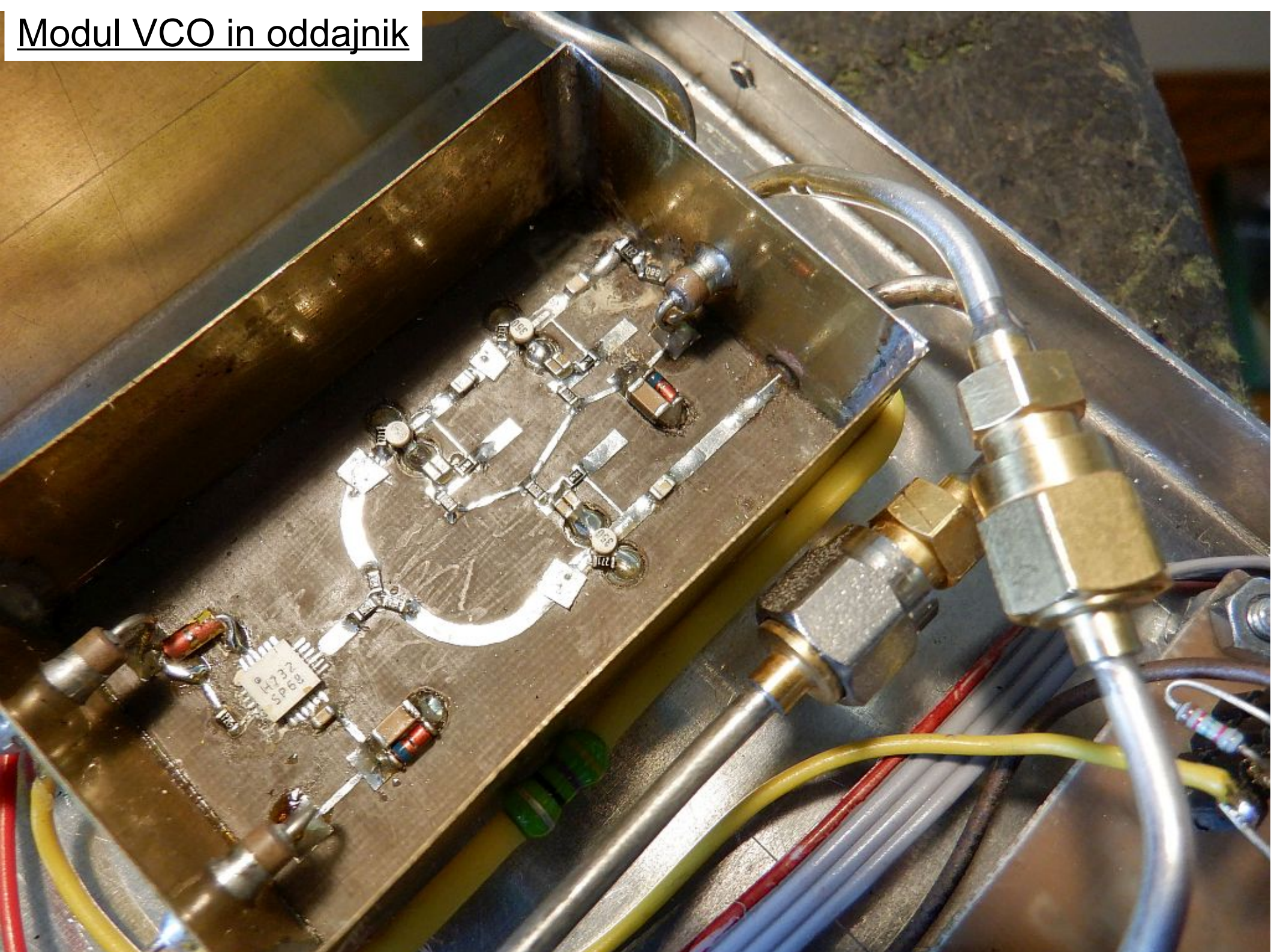


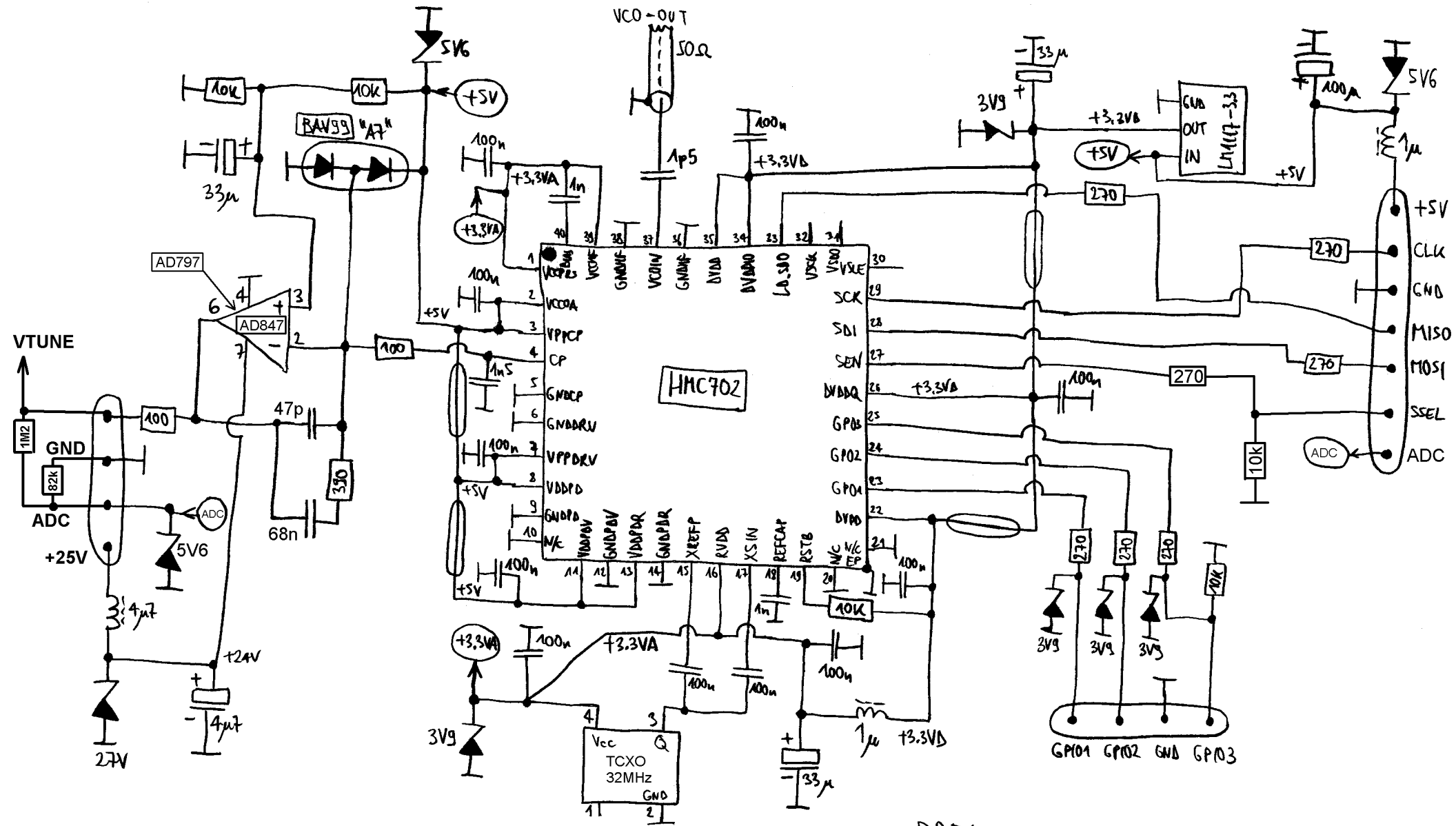
RADAR-TX HMC 732 LC4B VCO+AMP

S53MV 20.03.2020

VCO in oddajnik

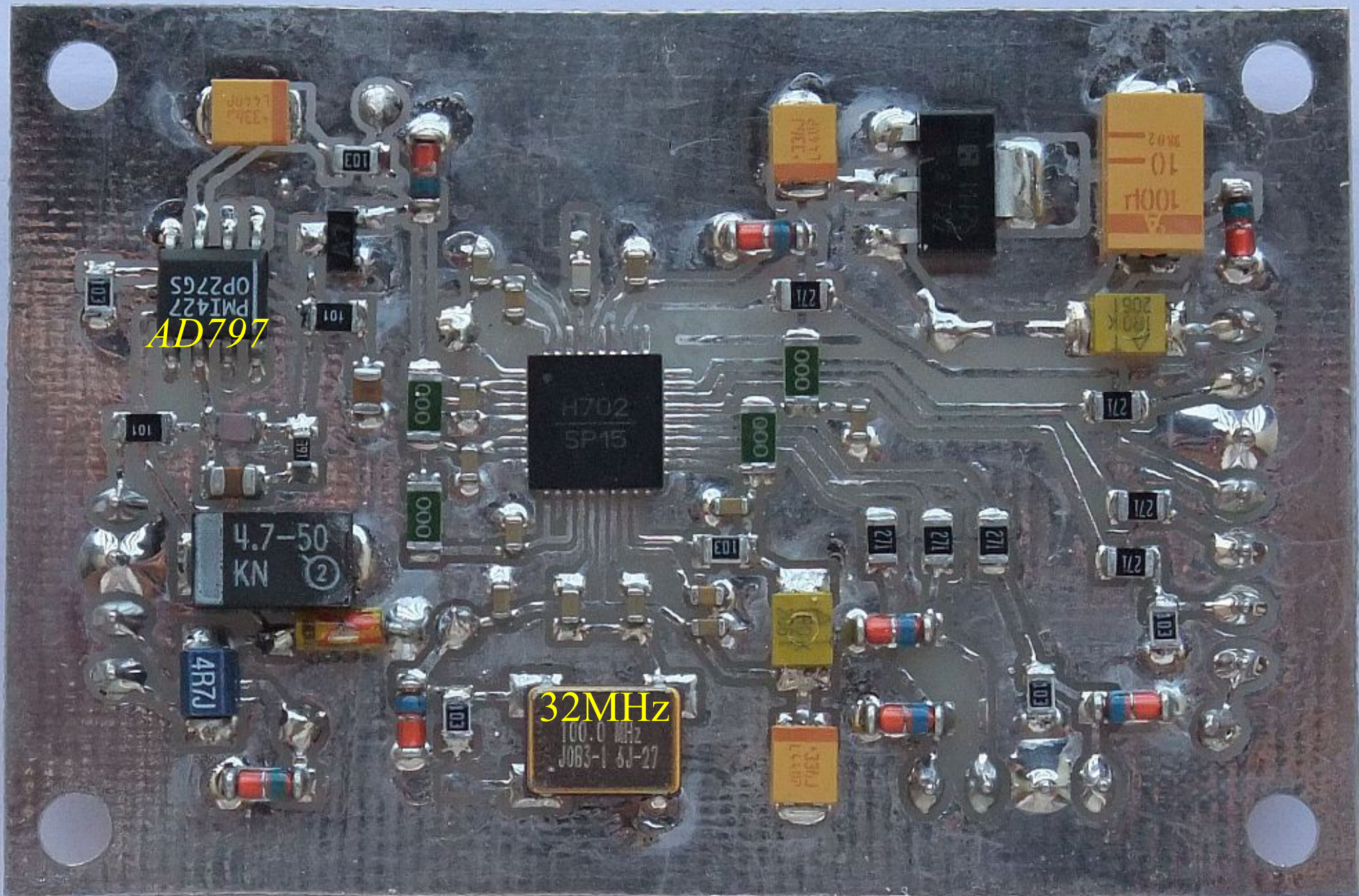
Modul VCO in oddajnik





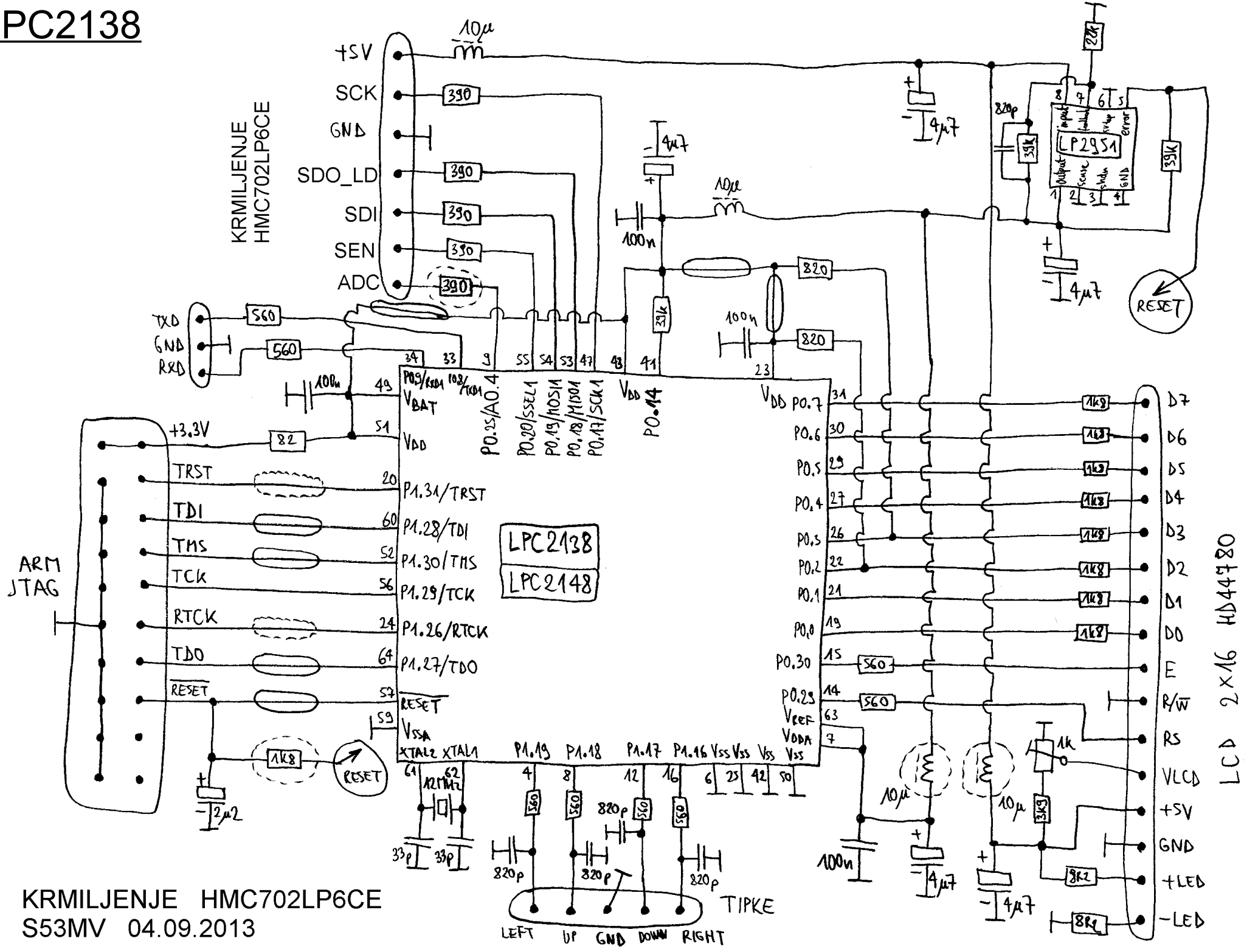
PREIZKUS SINTETIZATORJA HMC702
 SS3 MV 29.02.2020

Ulomkovni PLL



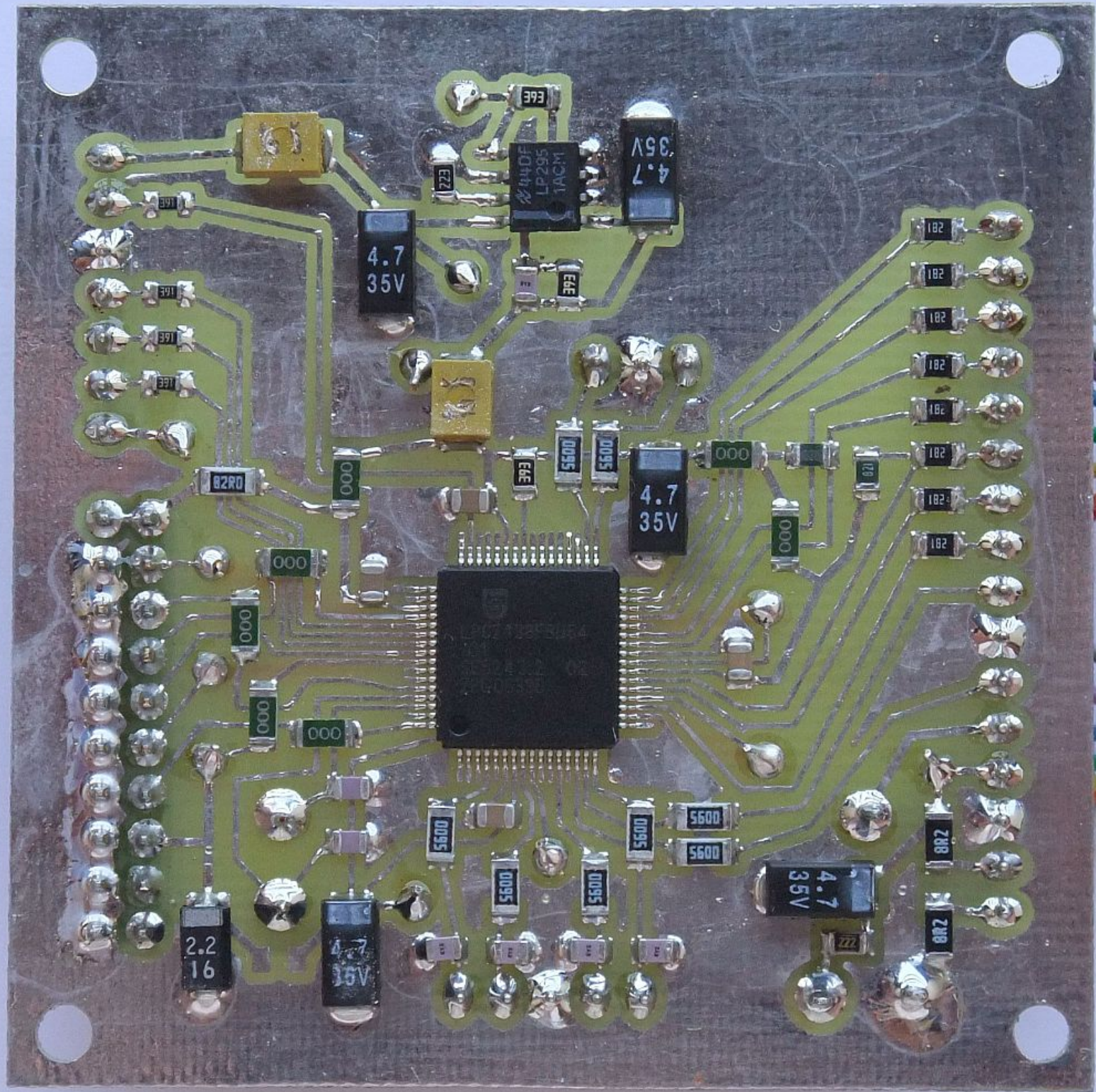
Modul ulomkovni PLL (prvotna izvedba)

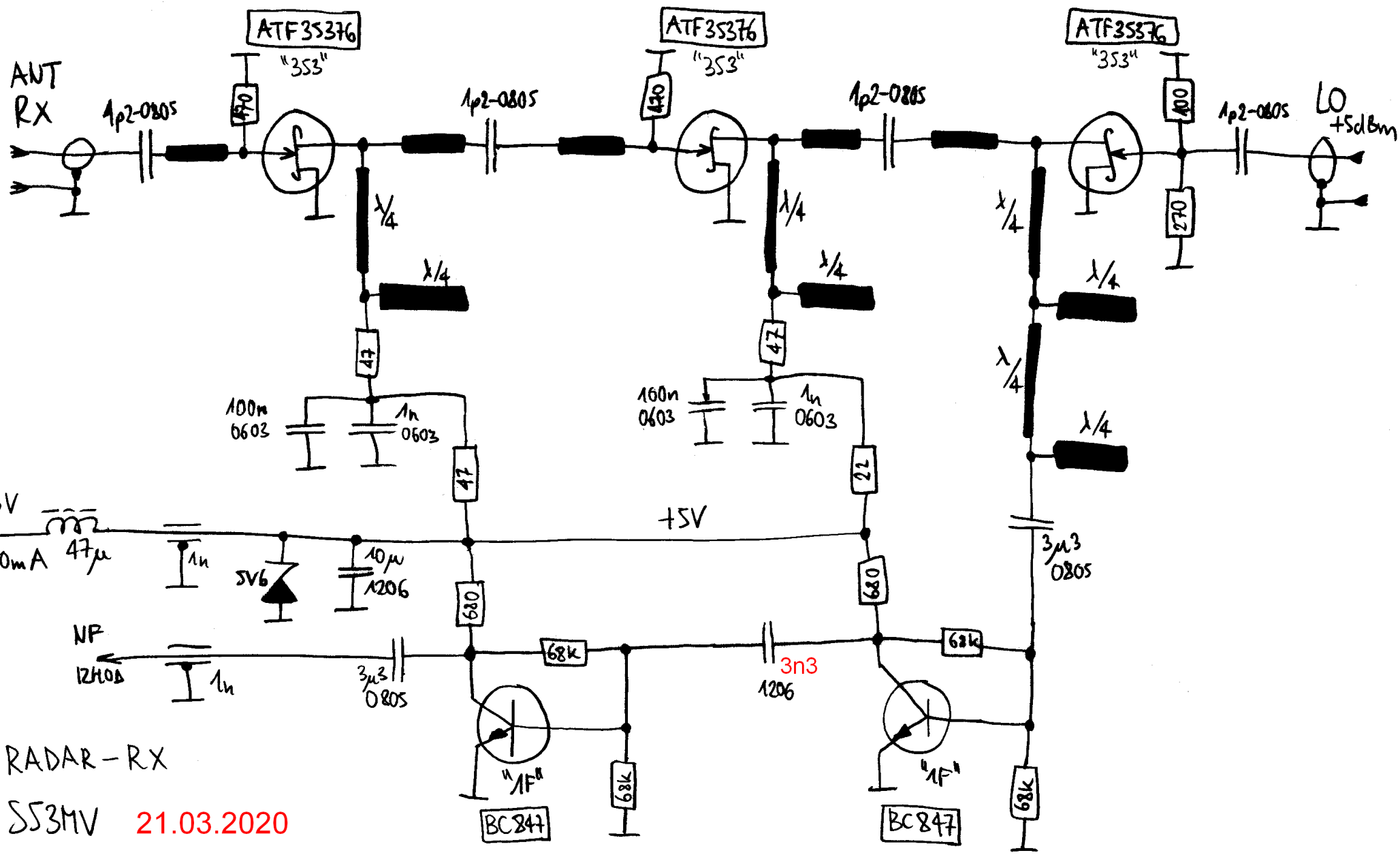
LPC2138



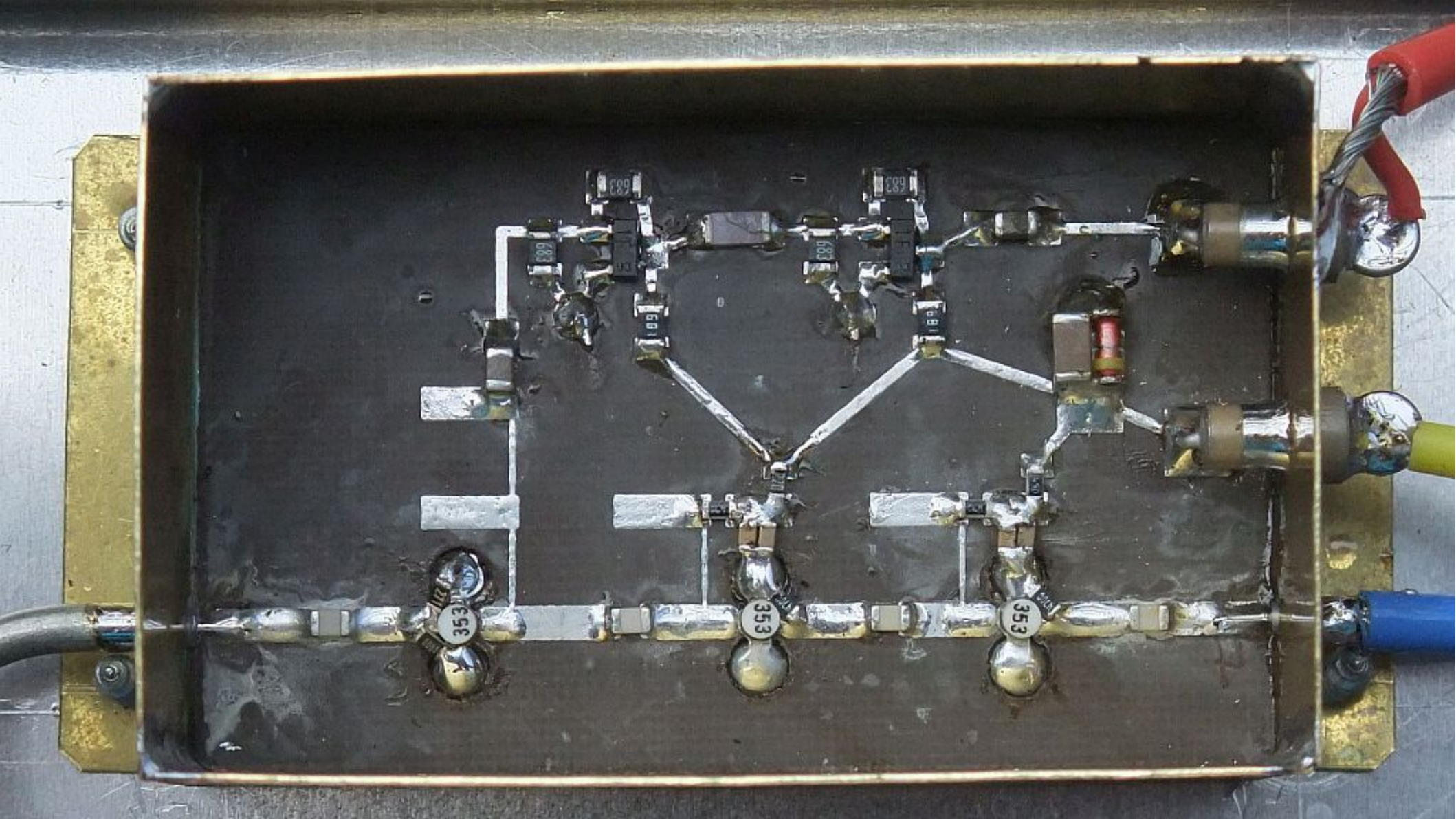
KRMILJENJE HMC702LP6CE
S53MV 04.09.2013

Modul LPC2138

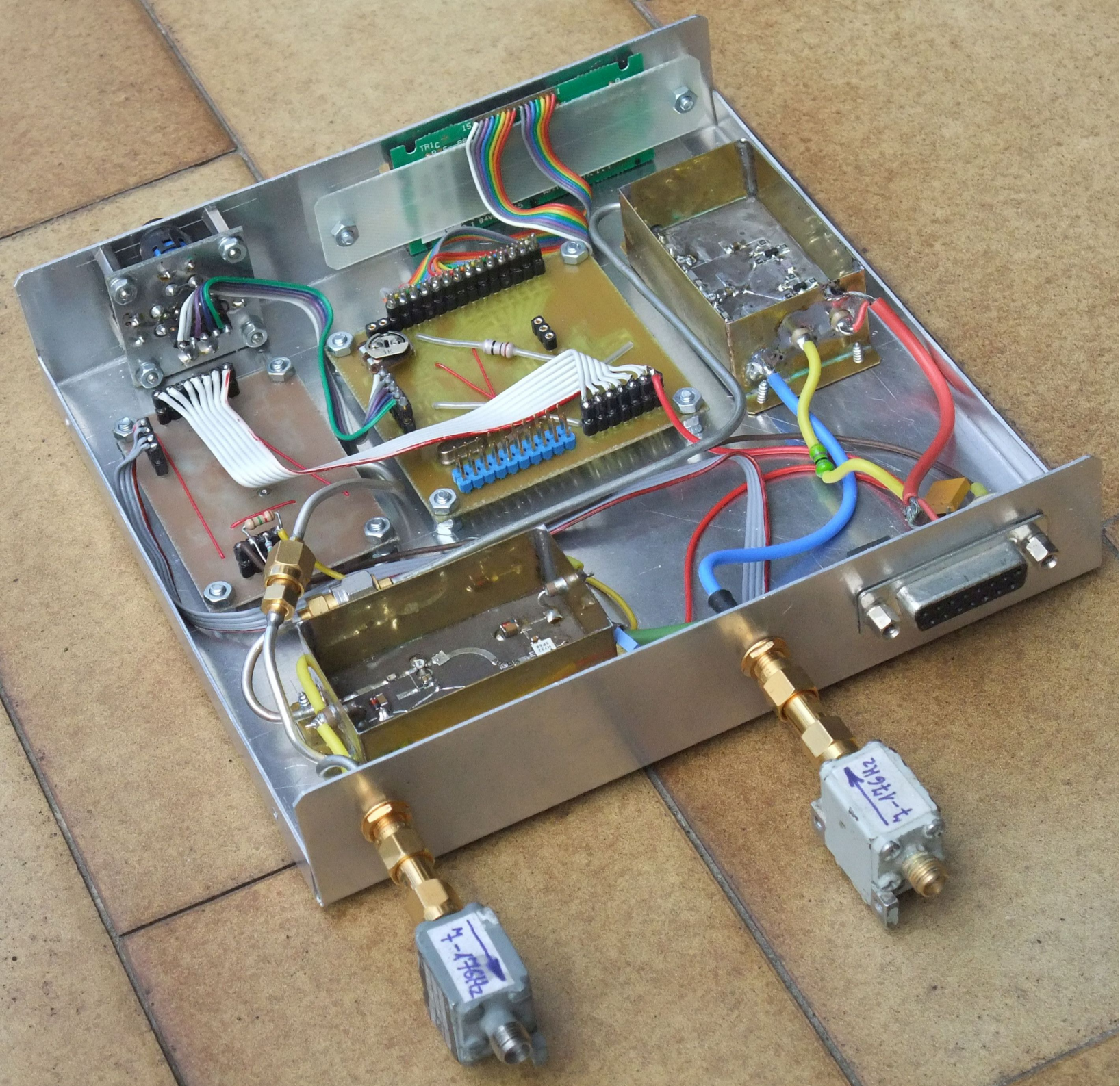




Sprejemni mešalnik

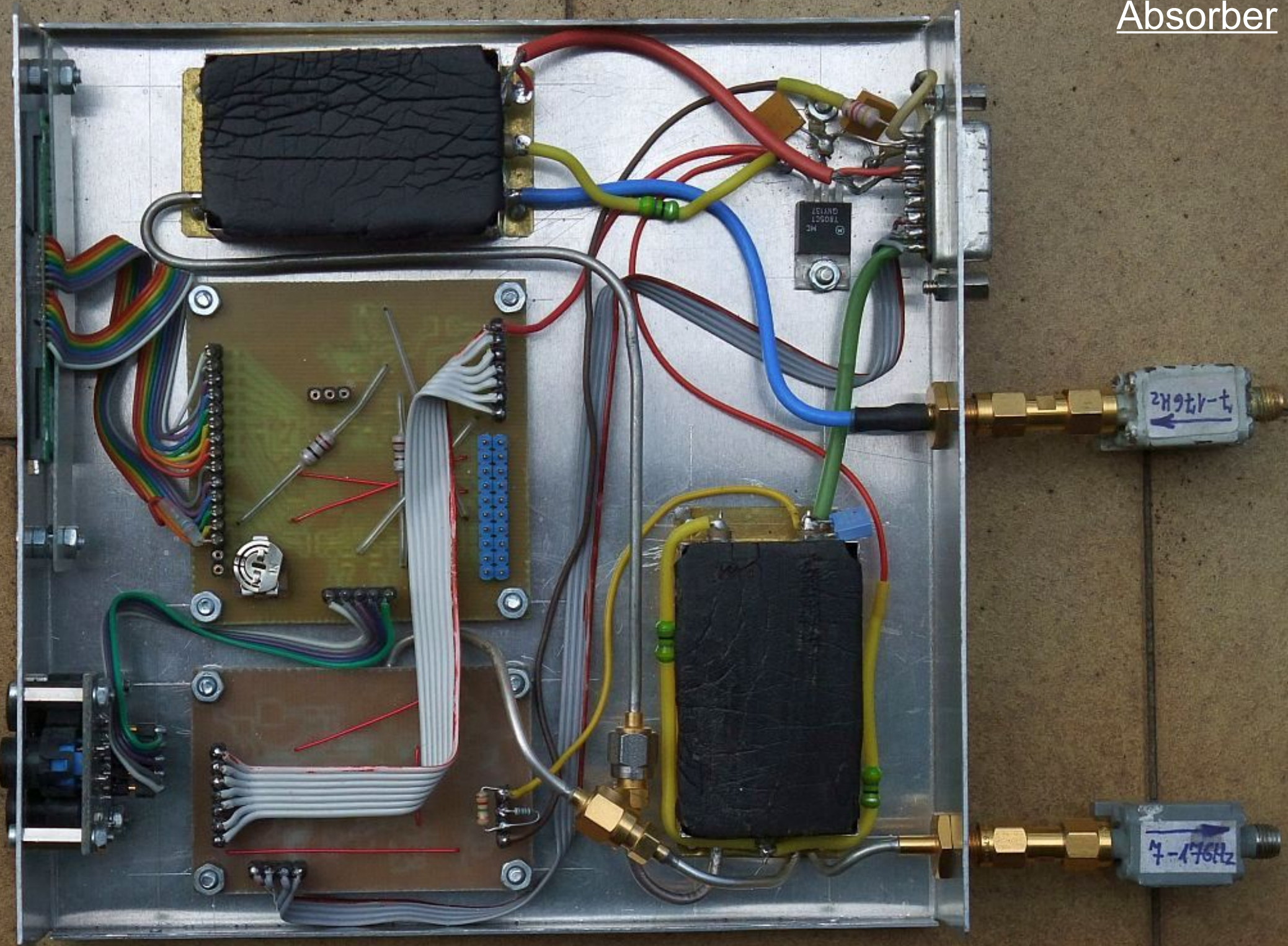


Modul sprejemni mešalnik



Zadaj

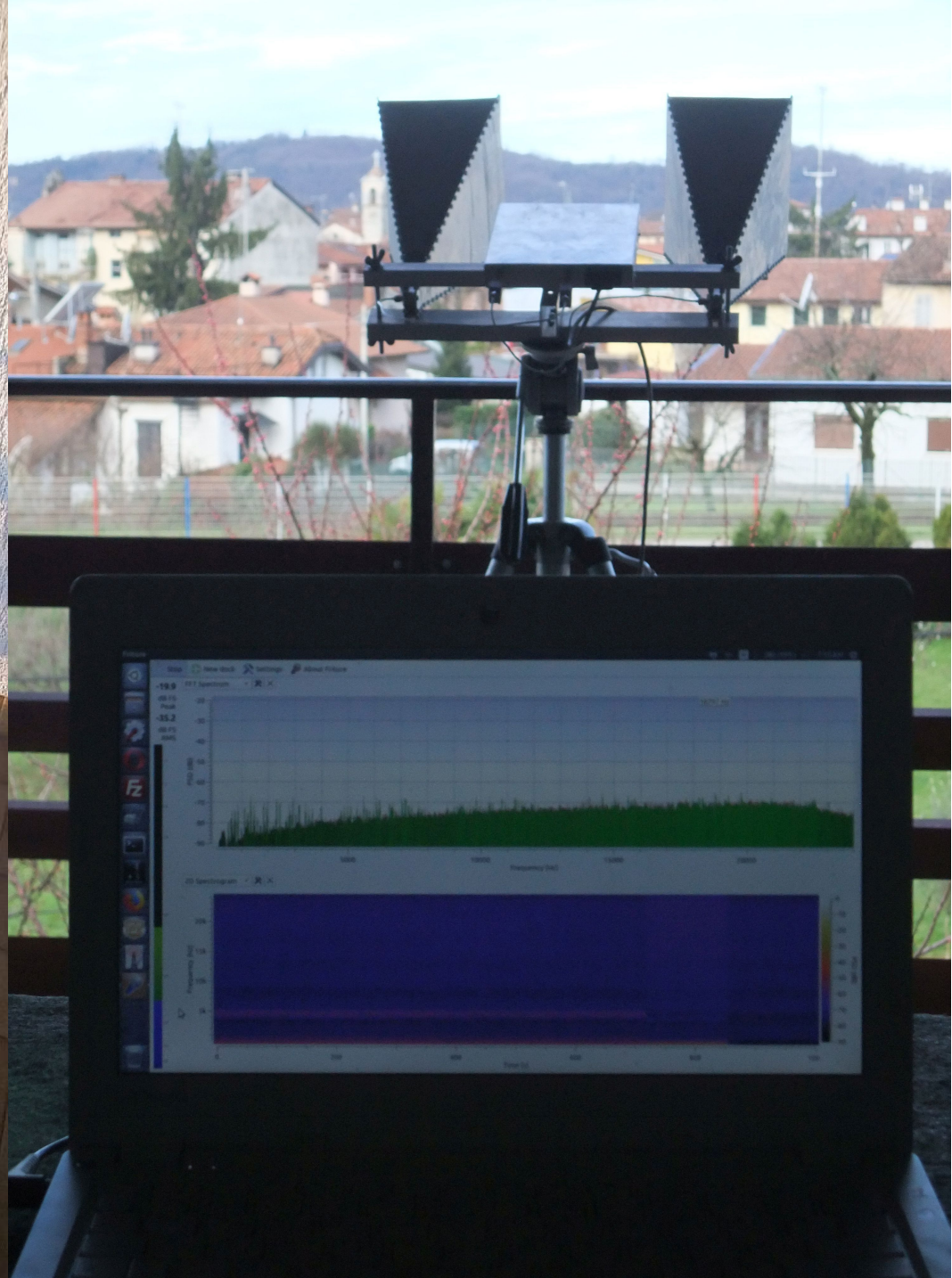
Absorber



Antene



Dva lijaka po 23dBi HP na skupnem stojalu



Prvi poskus z dvema lijakoma 23dBi

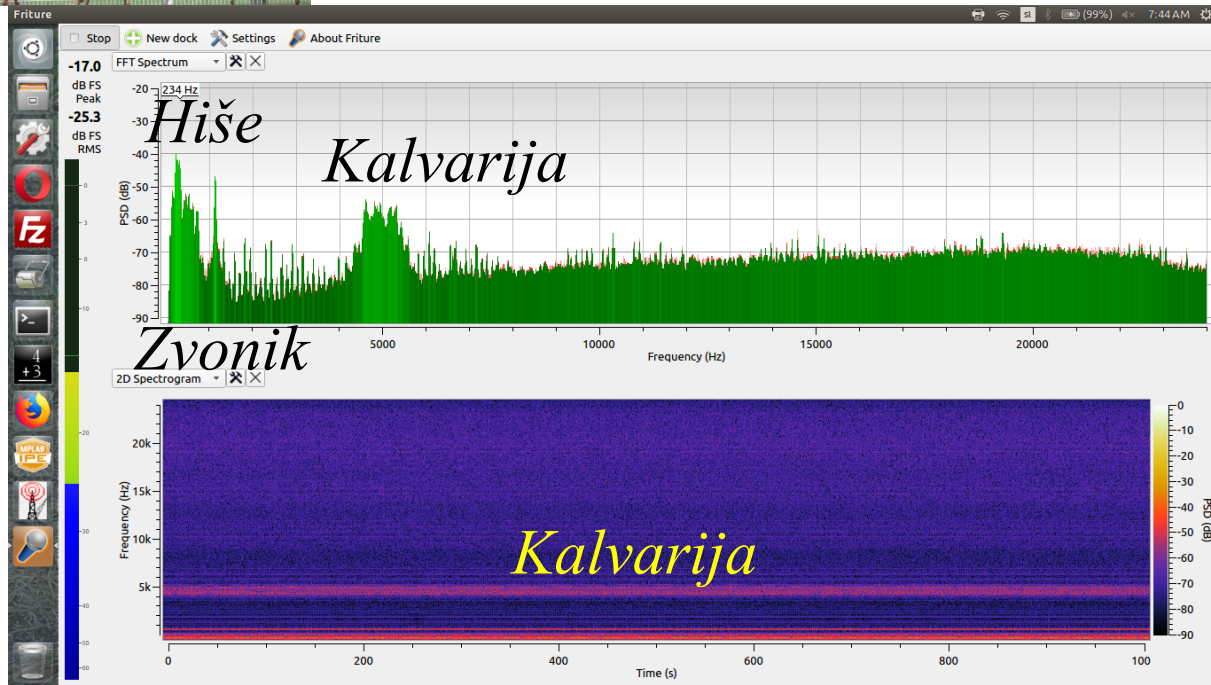
Kalvarija

Zvonik

Hiše

Kalvarija

*Vzorčenje 48kHz
Frekvenčni pas omejen na 20kHz
Program Friture*



Hiše, zvonik in Kalvarija



Števerjan

Kalvarija

Cerje

Zemljevid



EL

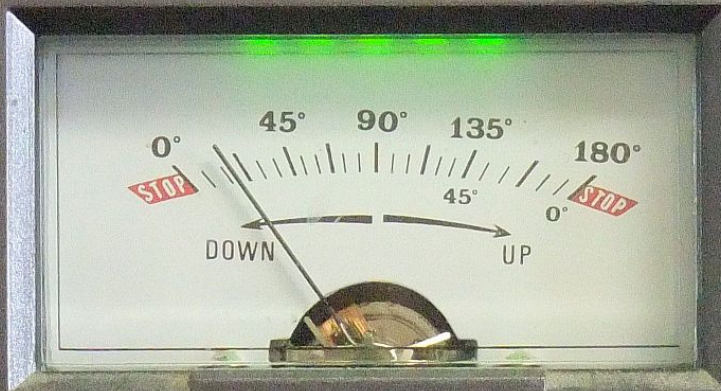
AZ

KR5600

Vrtiljak KR5600

ELEVATION-AZIMUTH DUAL CONTROLLER

MODEL KR-5600A



ELEVATION

O, ADJ.



AZIMUTH

O, ADJ.

DOWN

UP

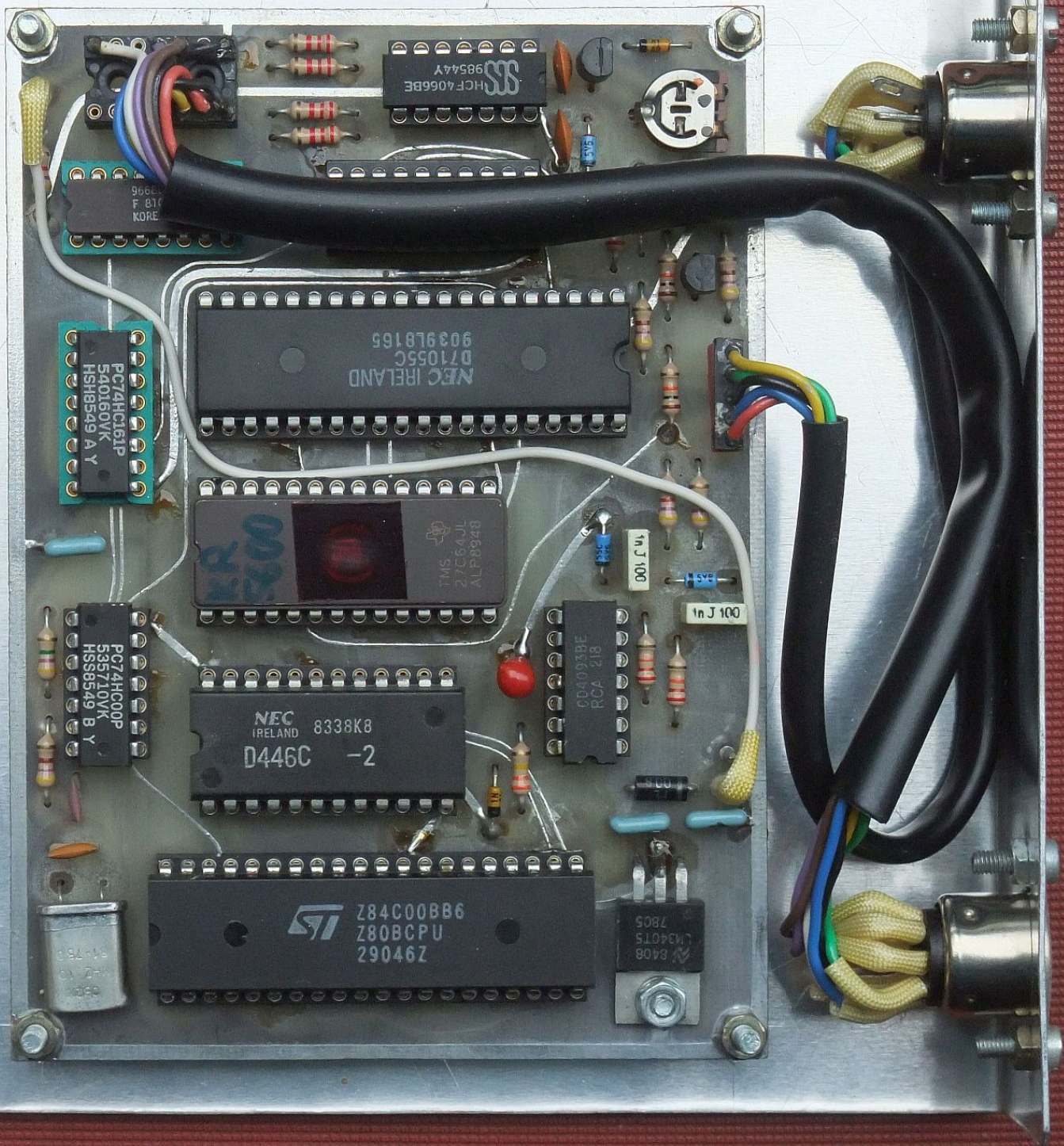
LEFT
(CCW)

RIGHT
(CW)

POWER



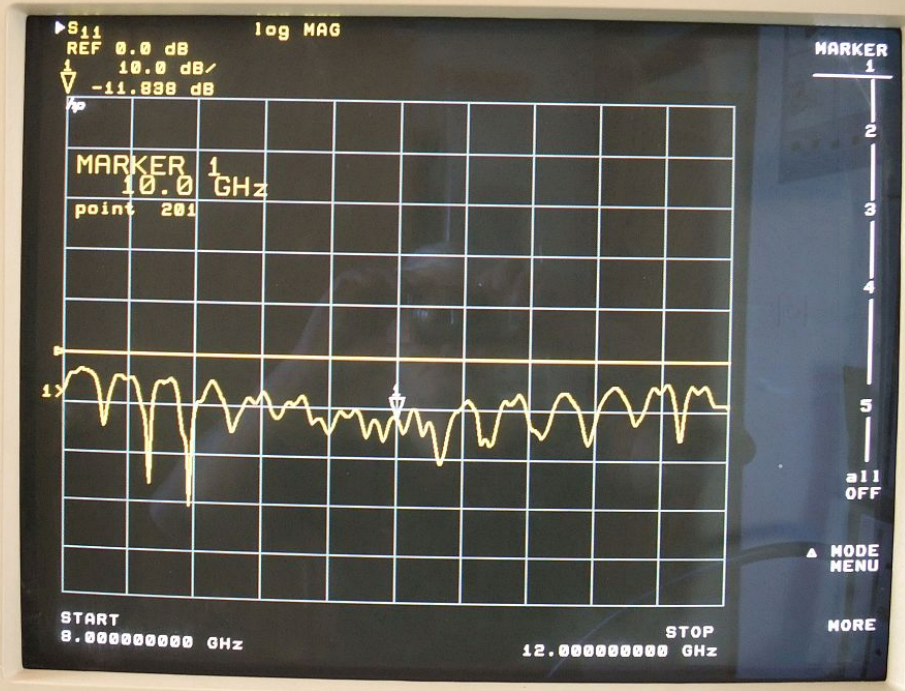
Izdelano ~ 1986



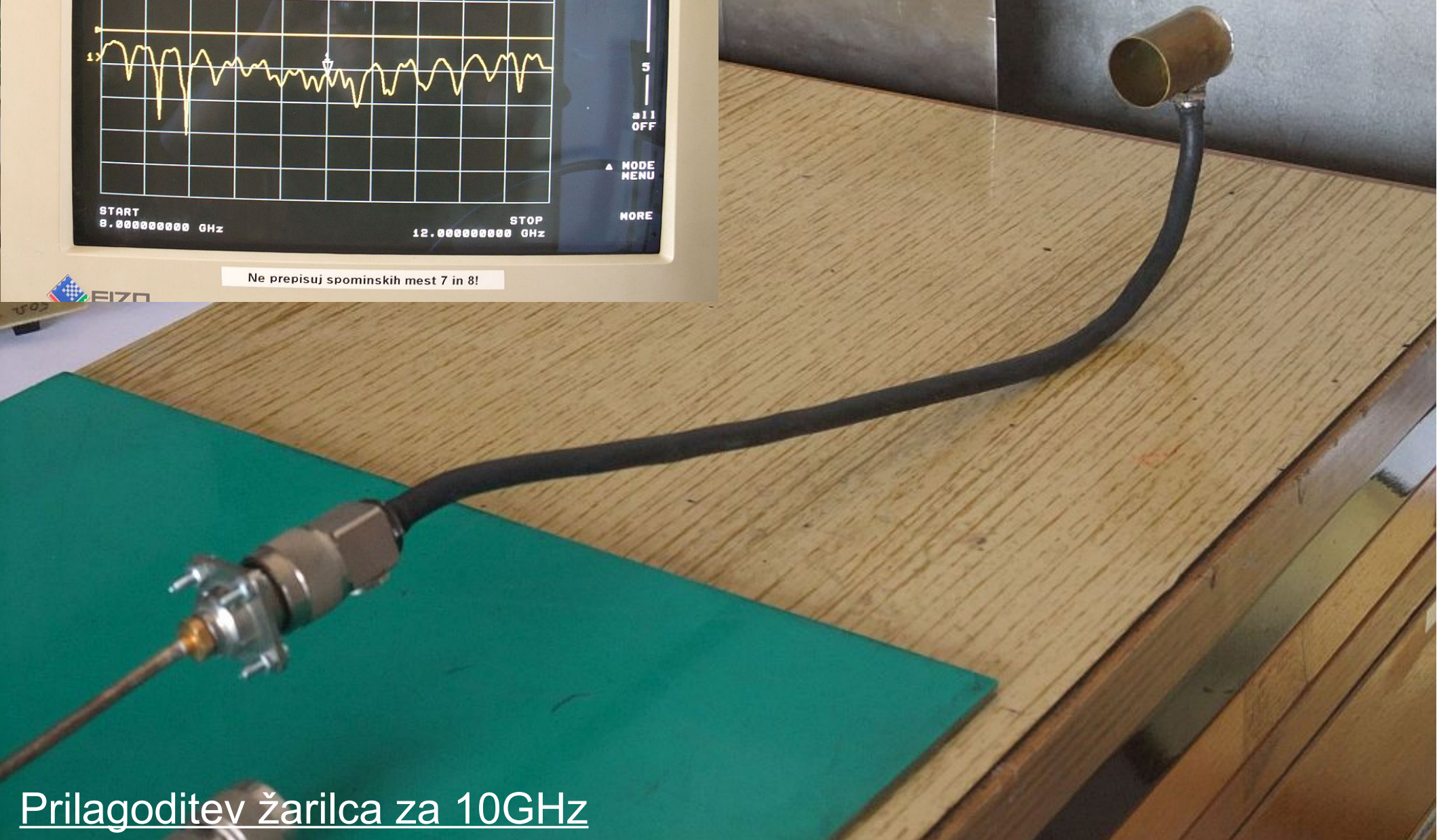
Vmesnik KR5600



Vgradnja zrcala 90cm



Ne prepisuj spominskih mest 7 in 8!



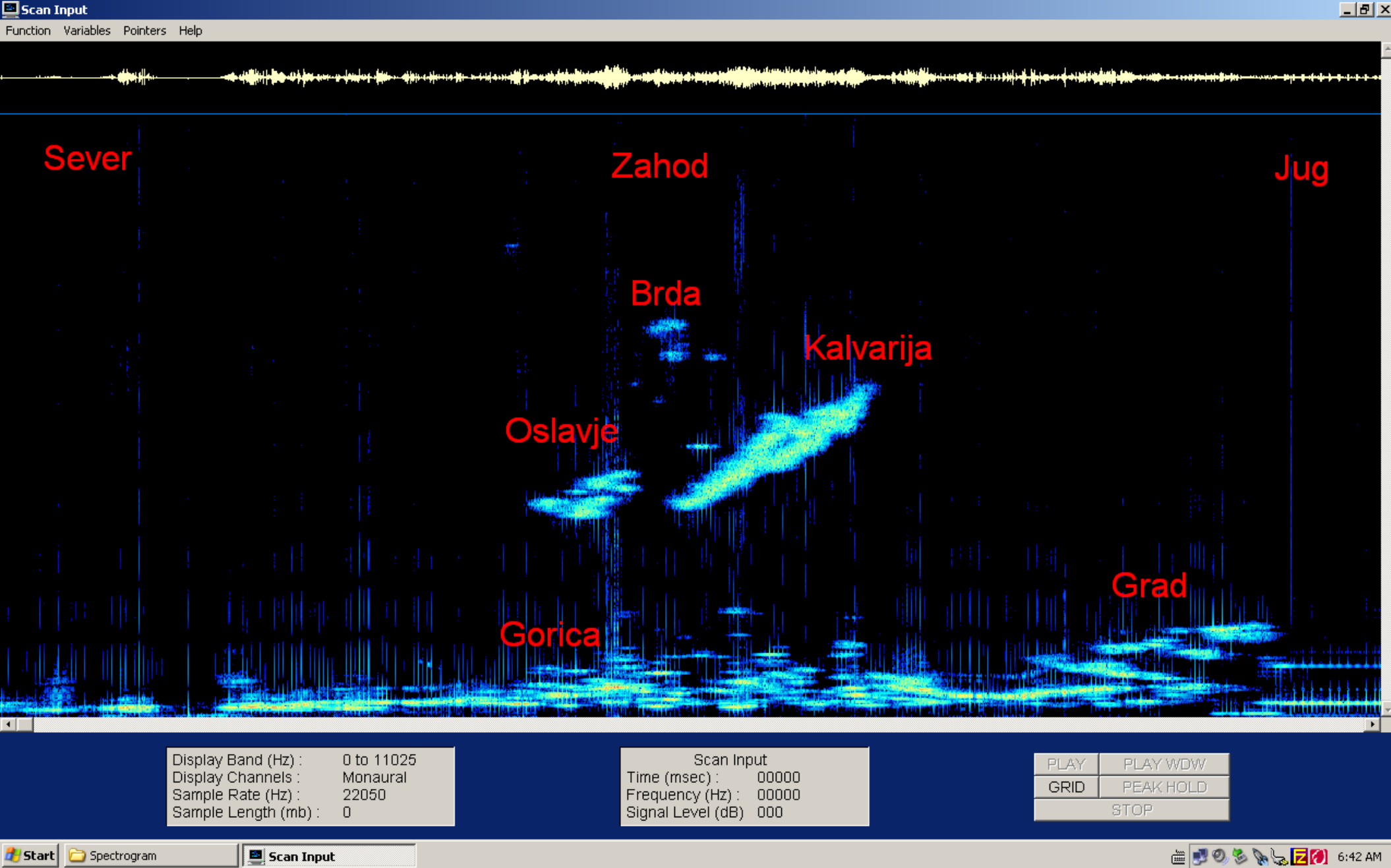
Prilagoditev žarilca za 10GHz



Poskusna namestitev VF glave



Dve zrcali 90cm žarilca HP



*Ročno upravljanje KR5600
Program Gram*

Prva 2D radarska slika



FMCW radar spreadaj

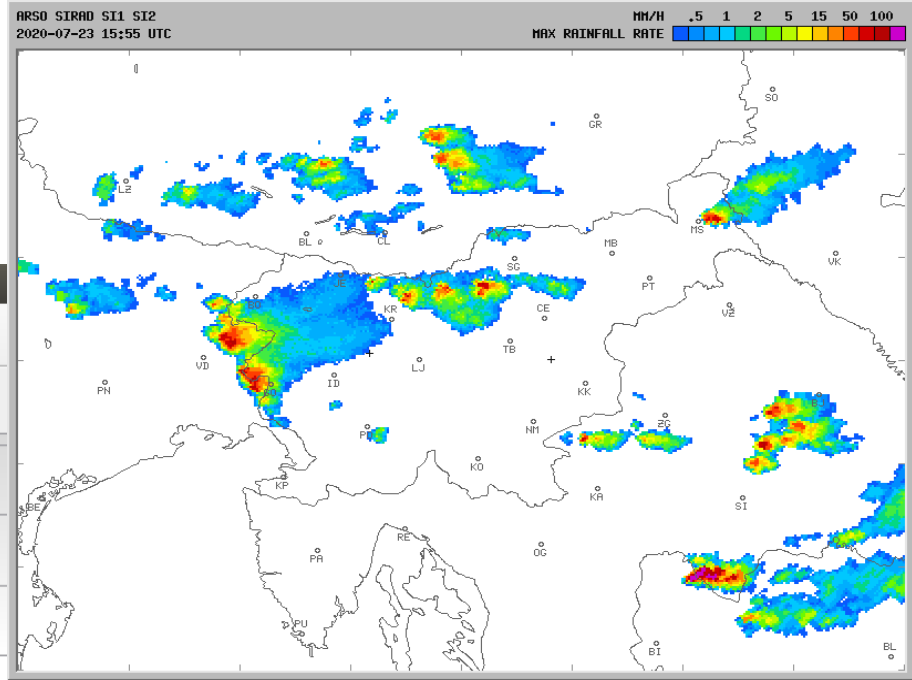


FMCW radar zadaj

Obdelava

Razvoj nevihte 23.7.2020

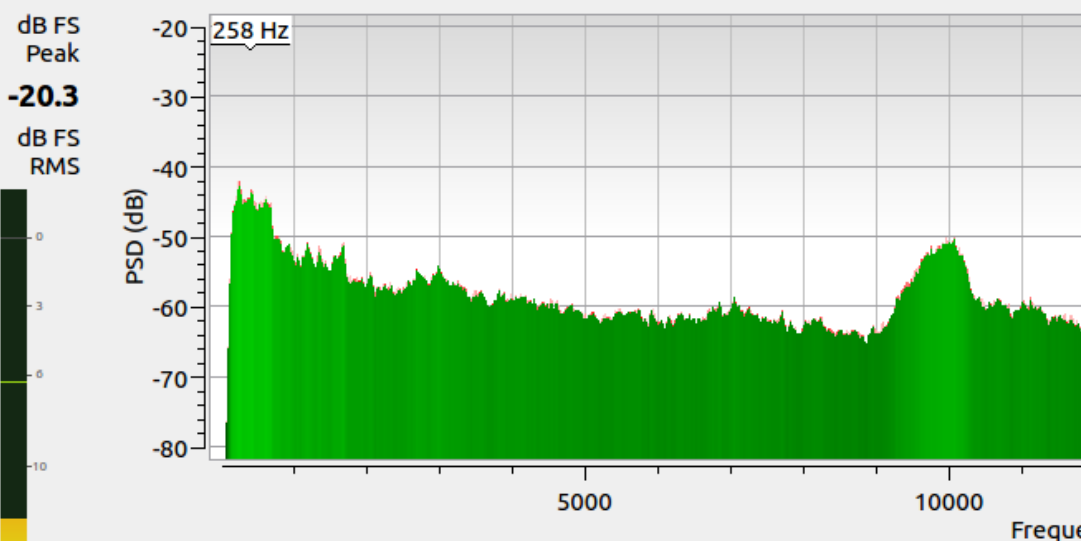
Program Friture – vzorčenje 48kHz
Frekvenčni pas omejen na 20kHz



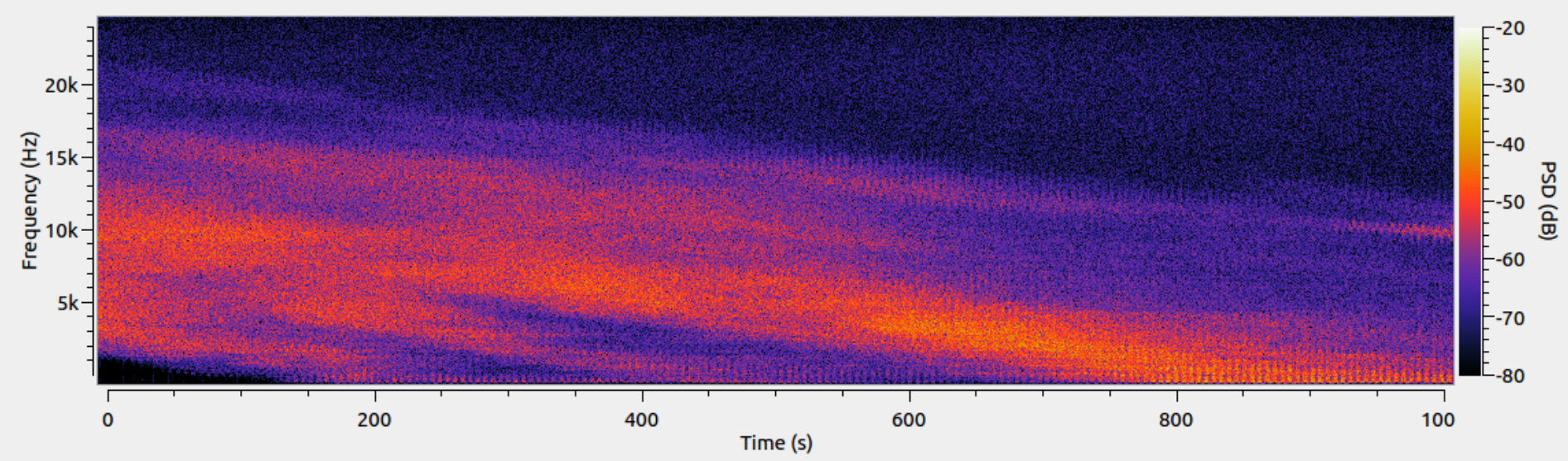
Friture

Stop New dock Settings About Friture

FFT Spectrum



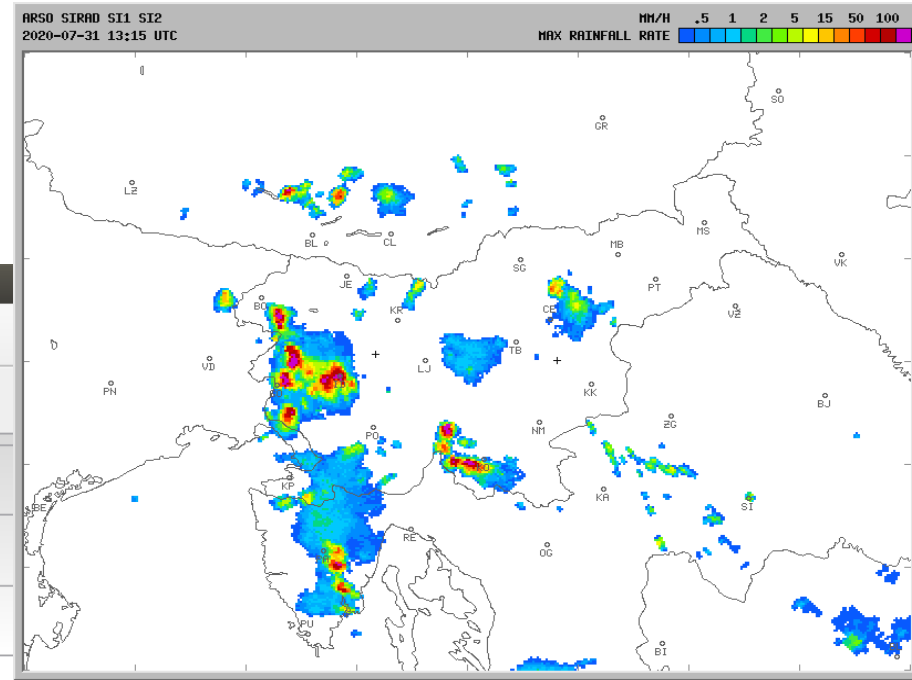
2D Spectrogram



- Home icon
- File explorer icon
- Settings icon
- Terminal icon
- Printer icon
- Friture logo (Fz)
- Network icon
- Volume icon
- 4+3 icon
- TeX icon
- Headphones icon
- Microphone icon
- Speaker icon

Razvoj nevihte 31.7.2020

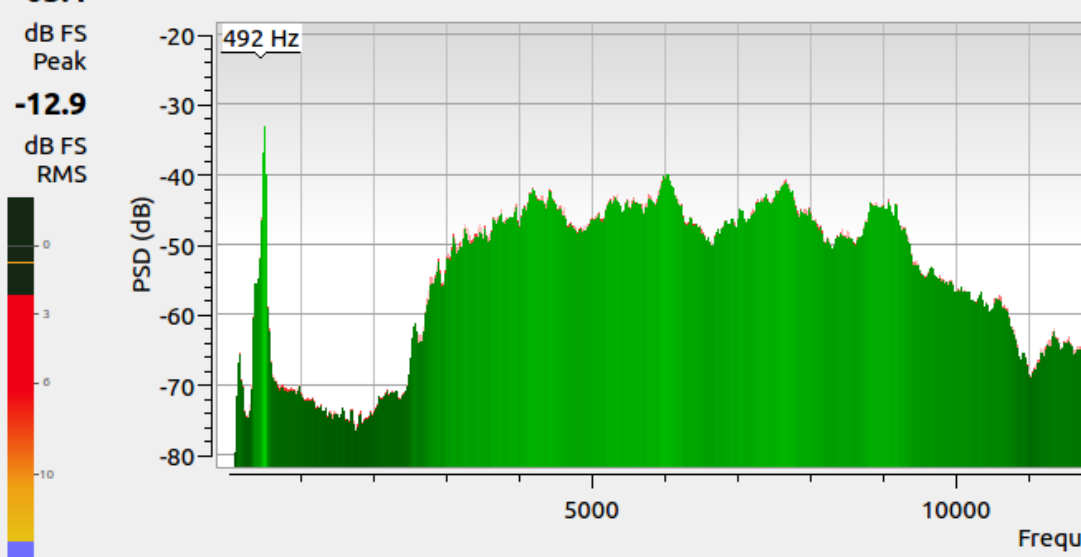
Program Friture – vzorčenje 48kHz
Frekvenčni pas omejen na 20kHz



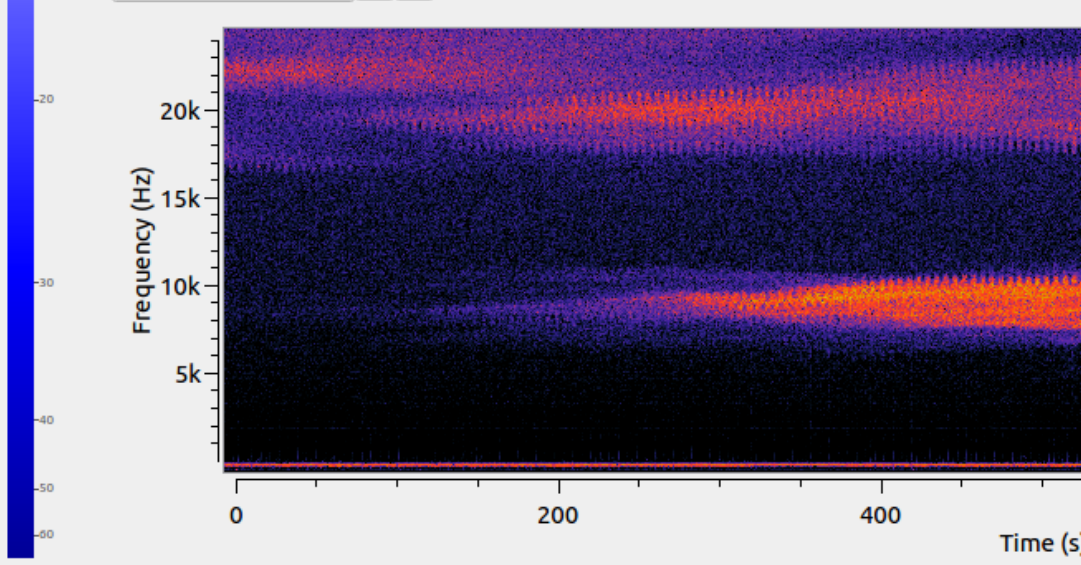
Friture

Stop New dock Settings About Friture

FFT Spectrum

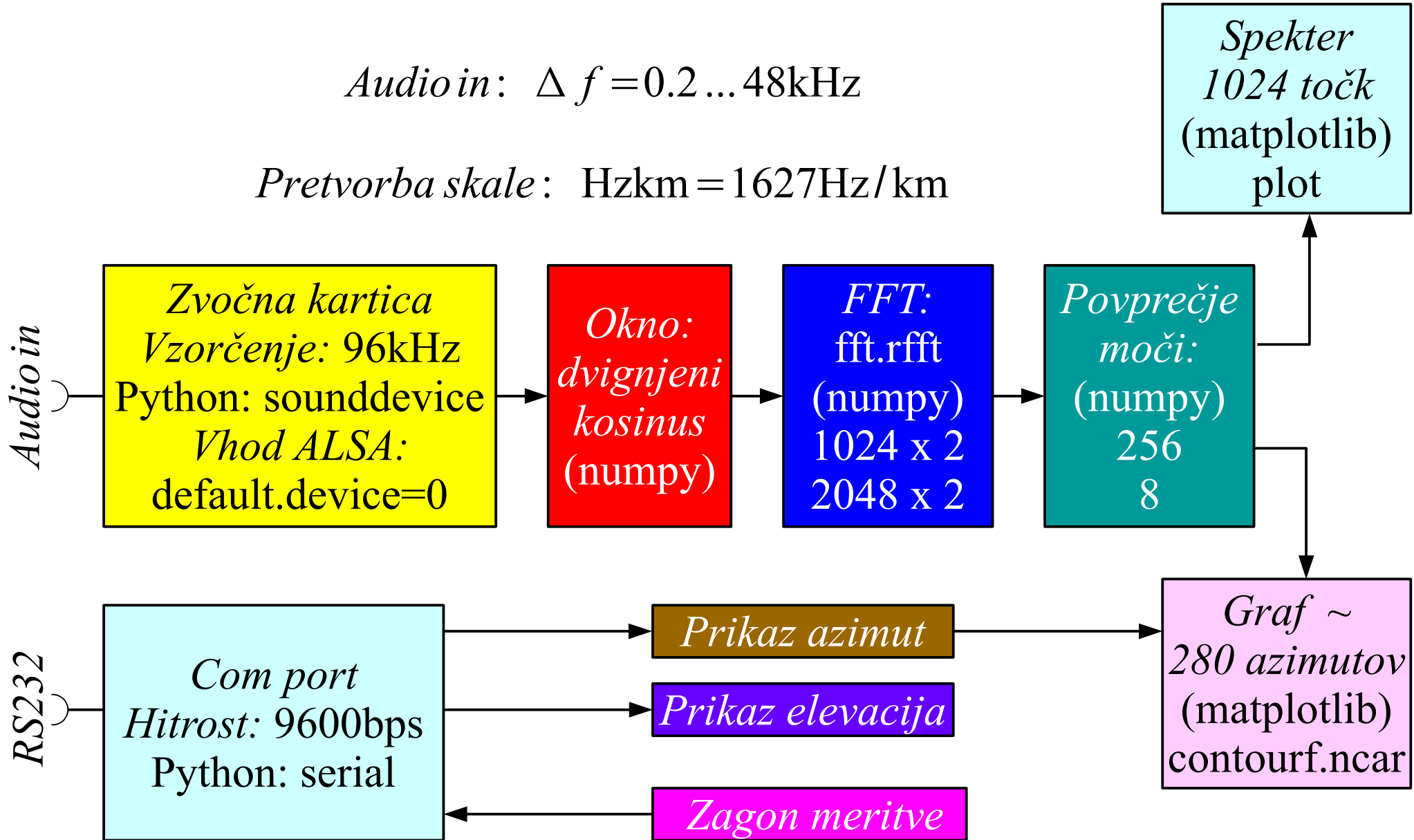


2D Spectrogram



Audio in: $\Delta f = 0.2 \dots 48\text{kHz}$

Pretvorba skale: $\text{Hzkm} = 1627\text{Hz/km}$

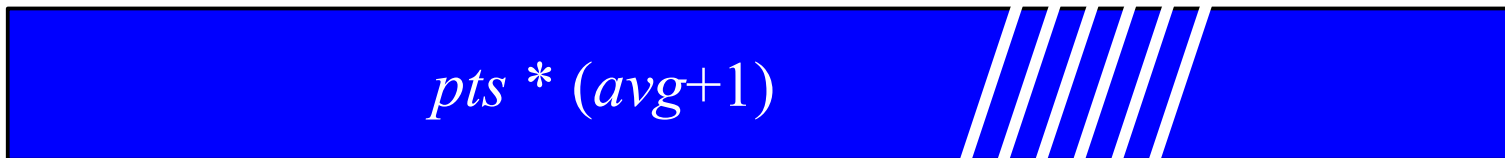


Azimut KR5600: $360^{\circ} \approx 65\text{s} \rightarrow \sim 280$ azimutov

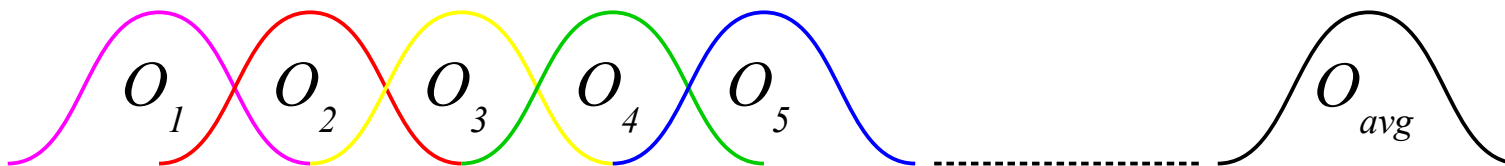
OS: Kubuntu 20.04.1

Namenski program na domačem računalniku

Vhod

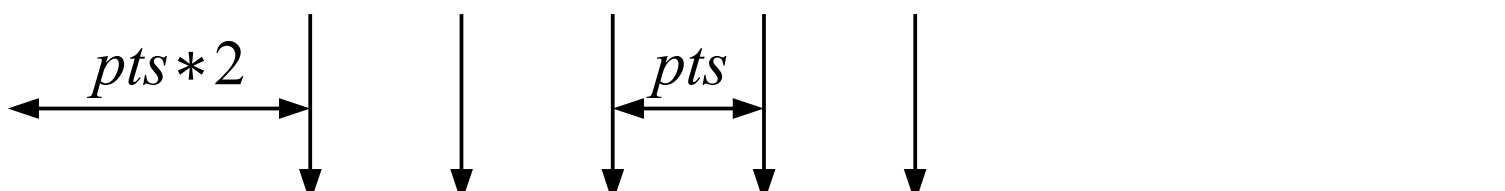
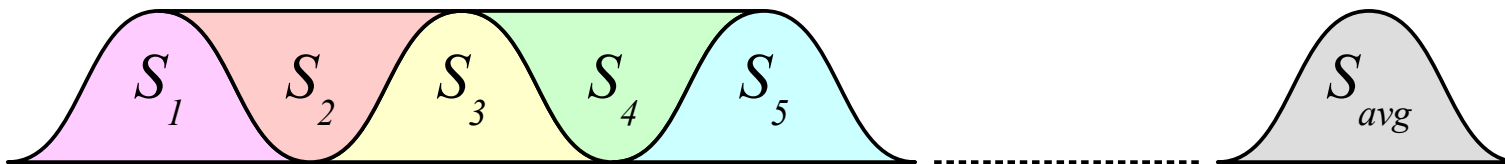


Okna

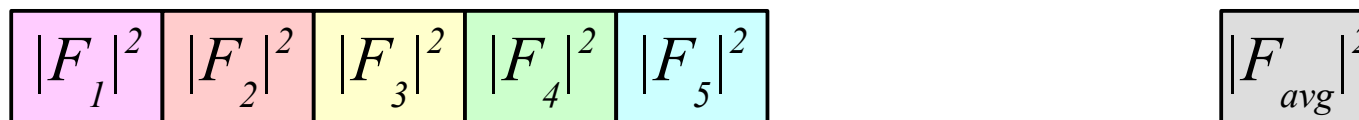


Dvignjeni kosinus

$f_j(t)$



$|FFT_j|^2$



*Povprečenje
(video sito)*

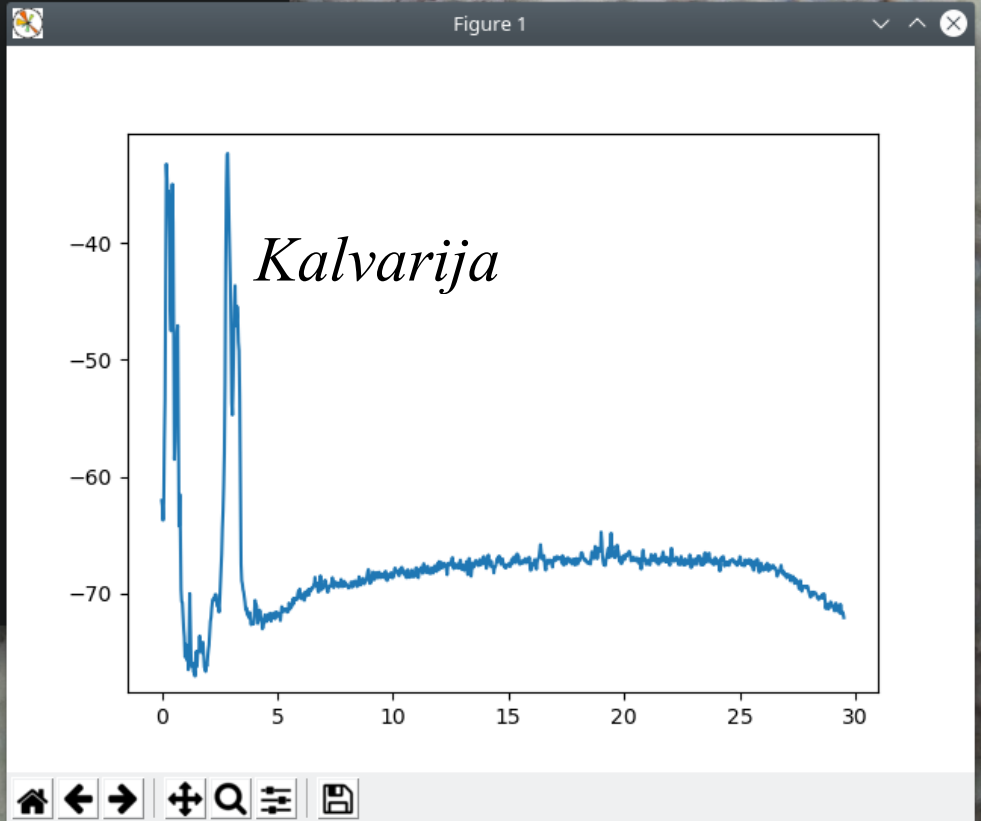
$$\langle |FFT|^2 \rangle = \frac{1}{avg} \sum_1^{avg} |F_j|^2$$

$$\Delta \log P \approx \frac{10\text{dB}}{\sqrt{avg}}$$

Računanje FFT

```

Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.8dB Vrh:-11.8 dB Max:-33.0dB @0.2km
Vrtiljak 71/17 AZ=264.5/EL=00.8 Jakost:-24.6dB Vrh:-10.9 dB Max:-32.9dB @2.8km
Vrtiljak 71/17 AZ=264.5/EL=00.8 Jakost:-24.8dB Vrh:-12.5 dB Max:-32.8dB @2.8km
Vrtiljak 71/17 AZ=264.5/EL=00.8 Jakost:-25.1dB Vrh:-12.4 dB Max:-33.2dB @2.8km
Vrtiljak 71/17 AZ=264.5/EL=00.8 Jakost:-25.0dB Vrh:-12.5 dB Max:-33.3dB @2.8km
Vrtiljak 71/17 AZ=264.5/EL=00.8 Jakost:-24.9dB Vrh:-11.6 dB Max:-32.6dB @2.9km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.9dB Vrh:-10.8 dB Max:-32.7dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.3dB Vrh:-11.7 dB Max:-32.8dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.0dB Vrh:-12.6 dB Max:-32.8dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.0dB Vrh:-11.4 dB Max:-32.5dB @2.9km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.9dB Vrh:-12.0 dB Max:-32.9dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.1dB Vrh:-12.2 dB Max:-33.2dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.7dB Vrh:-11.8 dB Max:-32.3dB @2.9km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.1dB Vrh:-12.5 dB Max:-32.9dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.2dB Vrh:-11.6 dB Max:-33.1dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.5dB Vrh:-12.8 dB Max:-33.2dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.4dB Vrh:-11.6 dB Max:-33.2dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.2dB Vrh:-12.8 dB Max:-33.4dB @2.8km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.0dB Vrh:-11.4 dB Max:-33.0dB @2.9km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.2dB Vrh:-13.0 dB Max:-33.4dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.2dB Vrh:-11.4 dB Max:-33.1dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.1dB Vrh:-12.8 dB Max:-32.7dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.1dB Vrh:-12.4 dB Max:-32.8dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.2dB Vrh:-12.7 dB Max:-32.7dB @0.2km
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Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.8dB Vrh:-11.7 dB Max:-32.9dB @0.2km
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Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.0dB Vrh:-11.8 dB Max:-32.8dB @0.2km
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Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.1dB Vrh:-12.1 dB Max:-32.6dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.0dB Vrh:-10.8 dB Max:-32.7dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-25.0dB Vrh:-12.3 dB Max:-32.7dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.8dB Vrh:-12.1 dB Max:-31.6dB @2.9km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.6dB Vrh:-11.6 dB Max:-32.2dB @2.9km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.9dB Vrh:-12.5 dB Max:-32.8dB @0.2km
Vrtiljak 70/17 AZ=263.0/EL=00.8 Jakost:-24.9dB Vrh:-12.0 dB Max:-32.3dB @2.9km
    
```



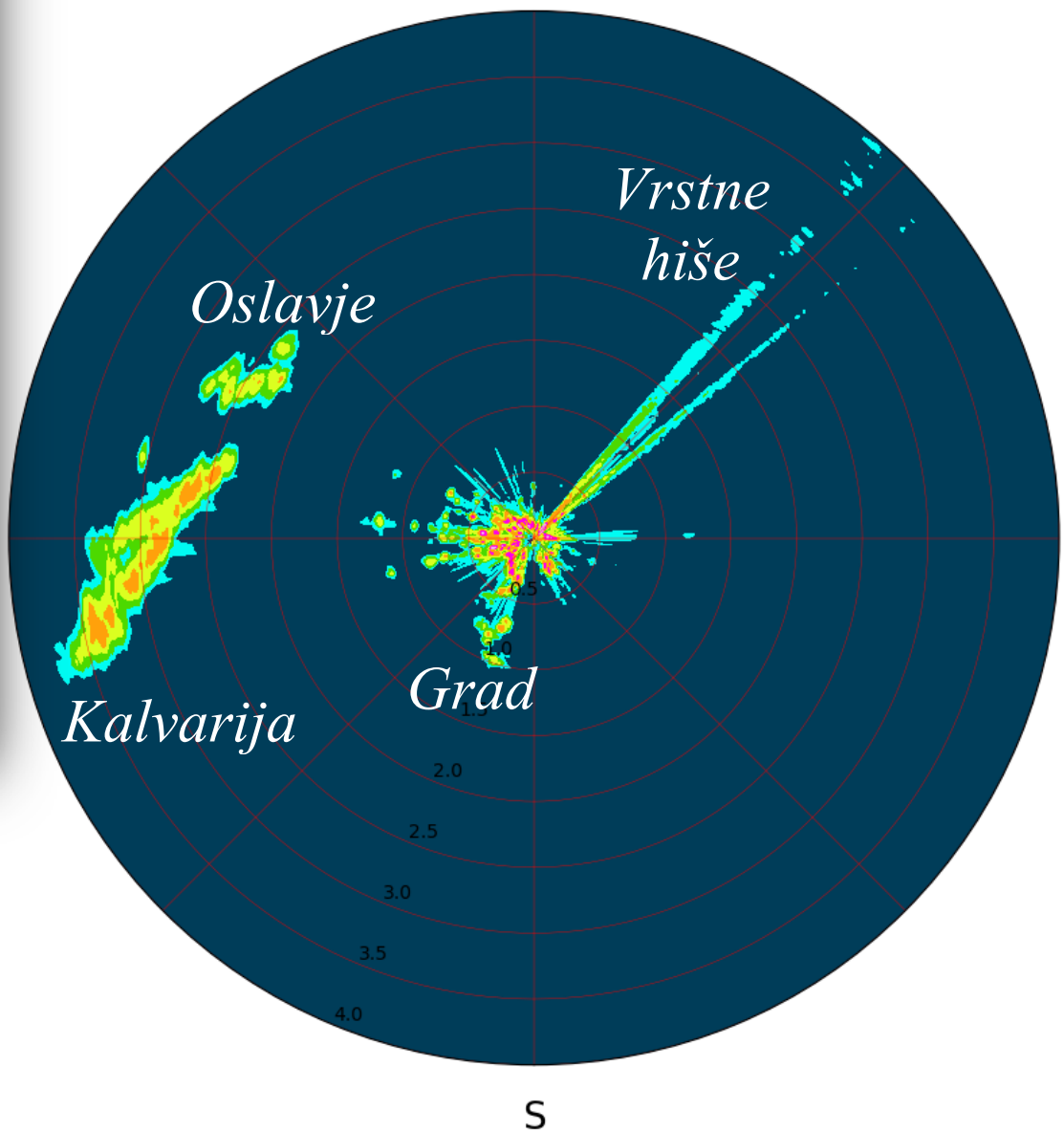
File Edit View Bookmarks Settings Help

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Vrtiljak 220/17 AZ=137.7/EL=00.8 Jakost -39.8dB Vrh -27.6dB Max -47.1dB @@.2k
Vrtiljak 221/17 AZ=139.3/EL=00.8 Jakost -37.6dB Vrh -26.1dB Max -41.6dB @@.2k
Vrtiljak 222/17 AZ=140.9/EL=00.8 Jakost -31.2dB Vrh -20.7dB Max -32.6dB @@.2k
Vrtiljak 223/17 AZ=142.4/EL=00.8 Jakost -30.4dB Vrh -19.0dB Max -32.6dB @@.2k
Vrtiljak 224/17 AZ=144.0/EL=00.8 Jakost -29.2dB Vrh -17.3dB Max -34.5dB @@.2k
Vrtiljak 225/17 AZ=145.6/EL=00.8 Jakost -28.1dB Vrh -15.3dB Max -32.8dB @@.2k
Vrtiljak 226/17 AZ=147.1/EL=00.8 Jakost -27.5dB Vrh -18.2dB Max -30.1dB @@.2k
Vrtiljak 227/17 AZ=148.7/EL=00.8 Jakost -27.2dB Vrh -15.5dB Max -31.4dB @@.2k
Vrtiljak 227/17 AZ=148.7/EL=00.8 Jakost -30.5dB Vrh -19.8dB Max -36.2dB @@.2k
Vrtiljak 229/17 AZ=151.8/EL=00.8 Jakost -29.5dB Vrh -19.0dB Max -33.7dB @@.2k
Vrtiljak 229/17 AZ=151.8/EL=00.8 Jakost -29.0dB Vrh -16.0dB Max -32.9dB @@.2k
Vrtiljak 230/17 AZ=153.4/EL=00.8 Jakost -27.3dB Vrh -17.0dB Max -31.3dB @@.2k
Vrtiljak 231/17 AZ=155.0/EL=00.8 Jakost -26.2dB Vrh -14.3dB Max -30.9dB @@.3k
Vrtiljak 232/17 AZ=156.5/EL=00.8 Jakost -27.2dB Vrh -16.1dB Max -31.2dB @@.2k
Vrtiljak 233/17 AZ=158.1/EL=00.8 Jakost -26.0dB Vrh -15.6dB Max -28.6dB @@.2k
Vrtiljak 234/17 AZ=159.7/EL=00.8 Jakost -27.5dB Vrh -16.2dB Max -30.3dB @@.2k
Vrtiljak 234/17 AZ=159.7/EL=00.8 Jakost -28.8dB Vrh -17.7dB Max -34.0dB @@.2k
Vrtiljak 235/17 AZ=161.2/EL=00.8 Jakost -31.3dB Vrh -18.8dB Max -33.4dB @@.2k
Vrtiljak 236/17 AZ=162.8/EL=00.8 Jakost -34.8dB Vrh -24.0dB Max -36.6dB @@.2k
Vrtiljak 237/17 AZ=164.3/EL=00.8 Jakost -37.4dB Vrh -25.6dB Max -42.8dB @@.2k
Vrtiljak 238/17 AZ=165.9/EL=00.8 Jakost -34.2dB Vrh -23.7dB Max -35.6dB @@.2k
Vrtiljak 239/17 AZ=167.5/EL=00.8 Jakost -36.6dB Vrh -23.9dB Max -40.0dB @@.2k
Vrtiljak 240/17 AZ=169.0/EL=00.8 Jakost -36.3dB Vrh -22.5dB Max -40.3dB @@.2k
Vrtiljak 240/17 AZ=169.0/EL=00.8 Jakost -36.9dB Vrh -21.1dB Max -41.0dB @@.2k
Vrtiljak 241/17 AZ=170.6/EL=00.8 Jakost -38.5dB Vrh -27.3dB Max -42.9dB @@.2k
Vrtiljak 242/17 AZ=172.2/EL=00.8 Jakost -40.0dB Vrh -27.2dB Max -49.4dB @@.2k
Vrtiljak 243/17 AZ=173.7/EL=00.8 Jakost -40.1dB Vrh -27.1dB Max -50.7dB @@.1k
Vrtiljak 244/17 AZ=175.3/EL=00.8 Jakost -40.9dB Vrh -29.0dB Max -51.5dB @@.0k
Vrtiljak 245/17 AZ=176.9/EL=00.8 Jakost -41.3dB Vrh -27.6dB Max -54.3dB @@.0k
Vrtiljak 246/17 AZ=178.4/EL=00.8 Jakost -38.3dB Vrh -26.1dB Max -42.6dB @@.0k
Vrtiljak 247/17 AZ=180.0/EL=00.8 Jakost -40.1dB Vrh -28.1dB Max -47.6dB @@.0k
Vrtiljak 247/17 AZ=180.0/EL=00.8 Jakost -41.3dB Vrh -29.2dB Max -56.0dB @@.0k
Dolzina zapisa 281 azimutov
Ime meritve: 2023May03-093420
Smer vrtenja 1
Domet 29.5 km
EL=00.8°
Polmer[km] risbe: 4
Polmer 4.0 km
Prečitano 281 azimutov

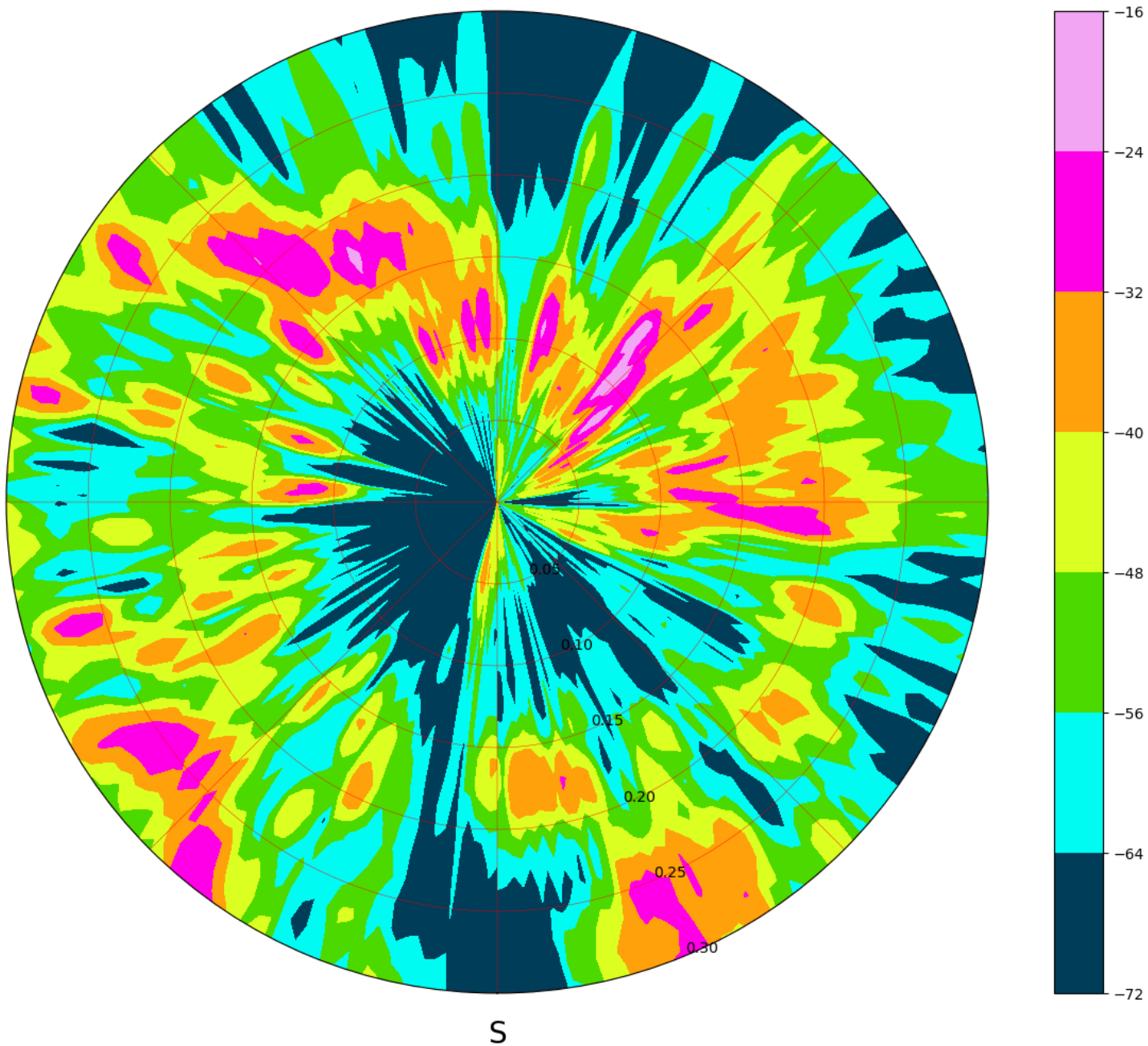
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2023May03-093420 EL=00.8° Smer=1 4.0/29.5km



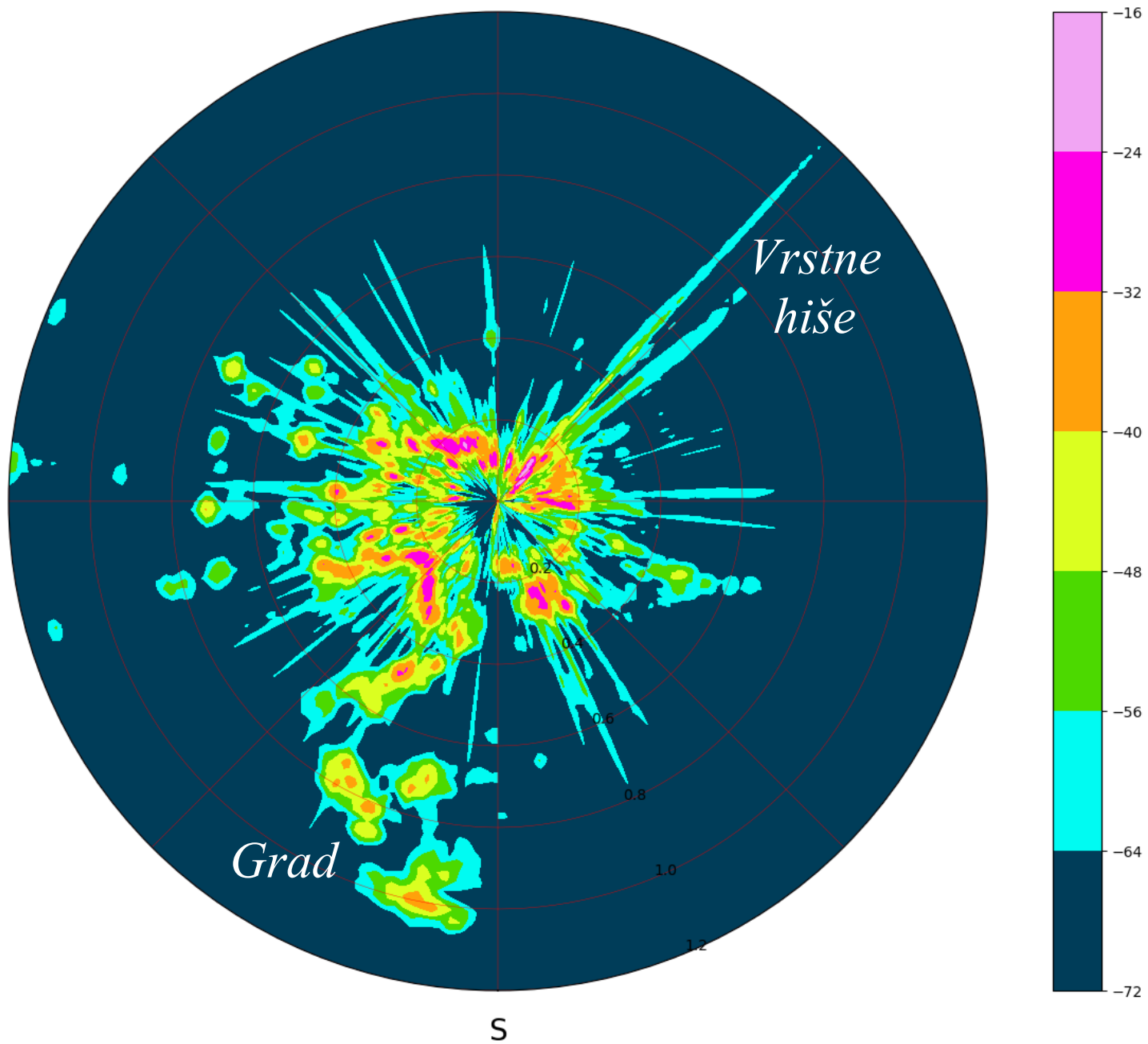
Graf s programom wxr1.py

2023Mar20-120310 EL=01.6° Smer=-1 0.3/29.5km



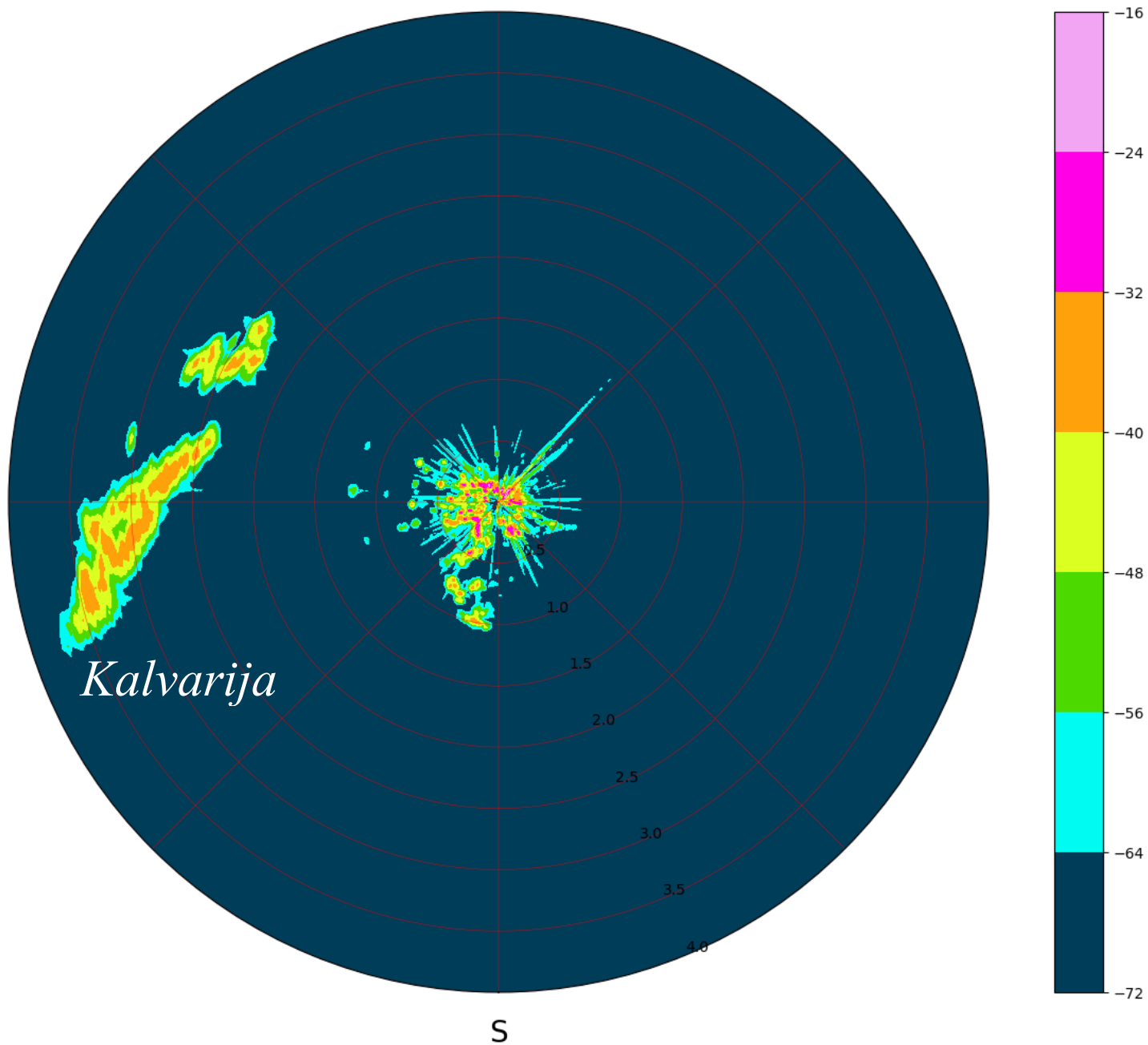
Elevacija 1.6° domet 300m

2023Mar20-120310 EL=01.6° Smer=-1 1.2/29.5km



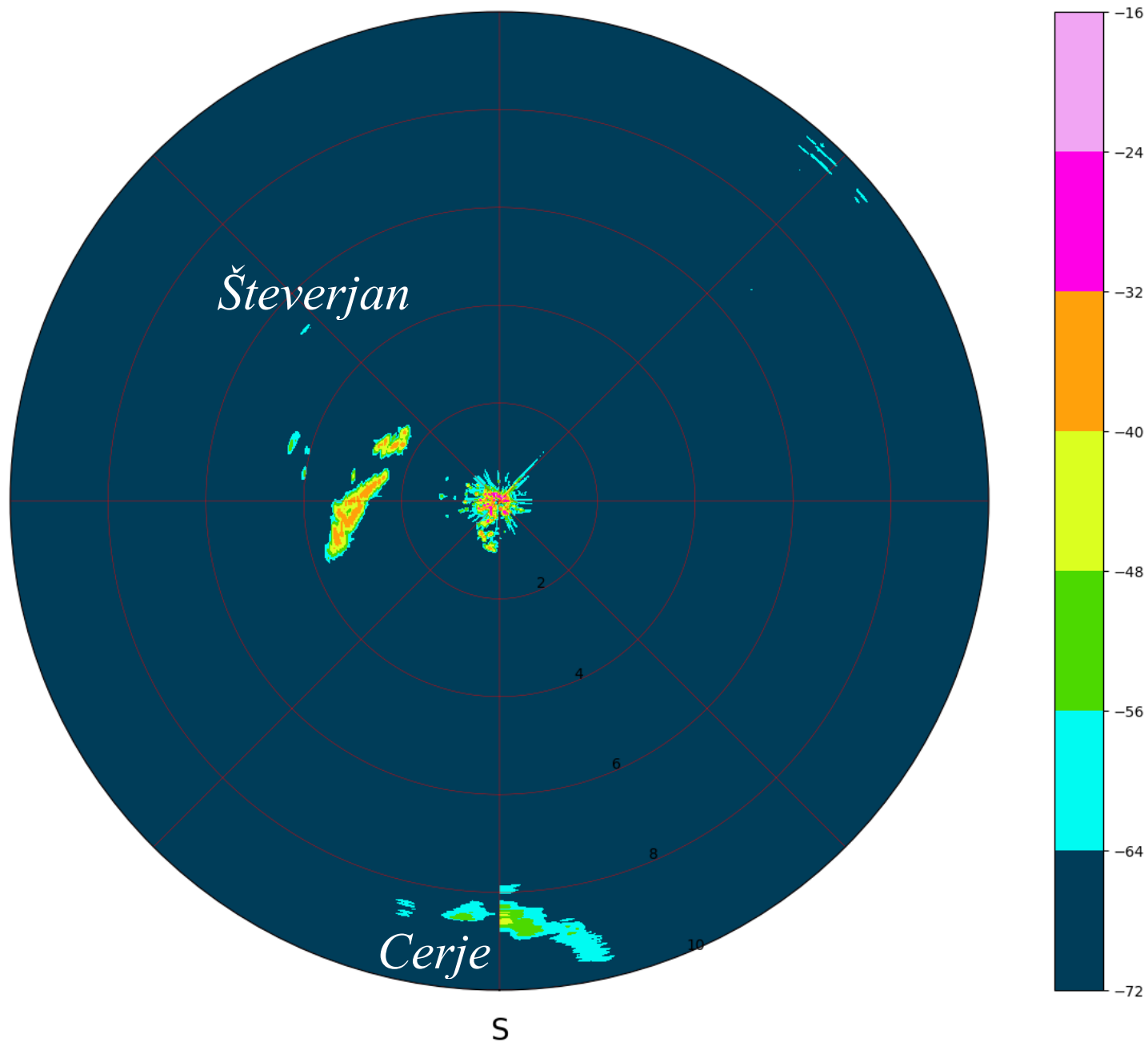
Elevacija 1.6° domet 1.2km

2023Mar20-120310 EL=01.6° Smer=-1 4.0/29.5km



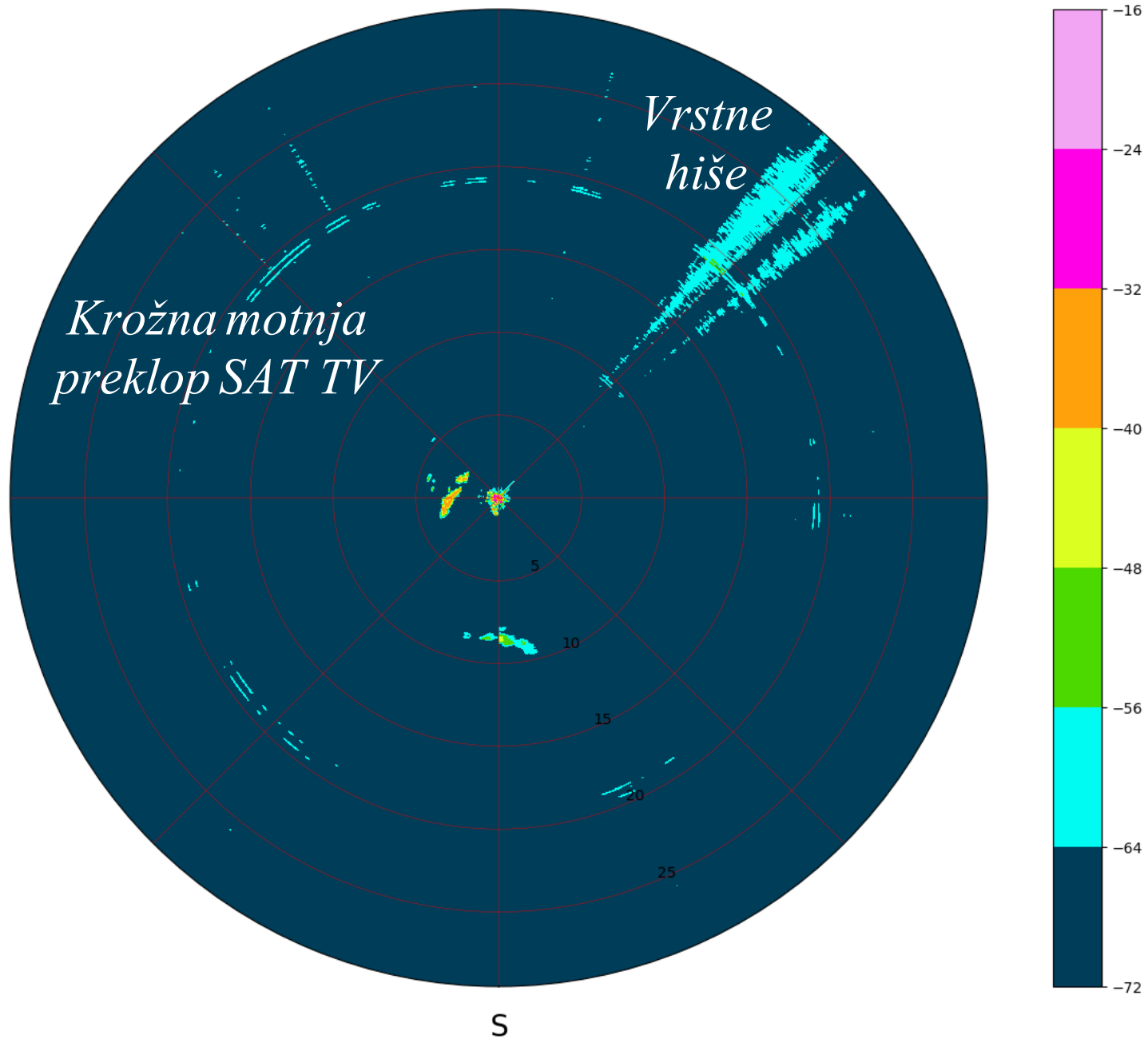
Elevacija 1.6° domet 4km

2023Mar20-120310 EL=01.6° Smer=-1 10.0/29.5km



Elevacija 1.6° domet 10km

2023Mar20-120310 EL=01.6° Smer=-1 29.5/29.5km

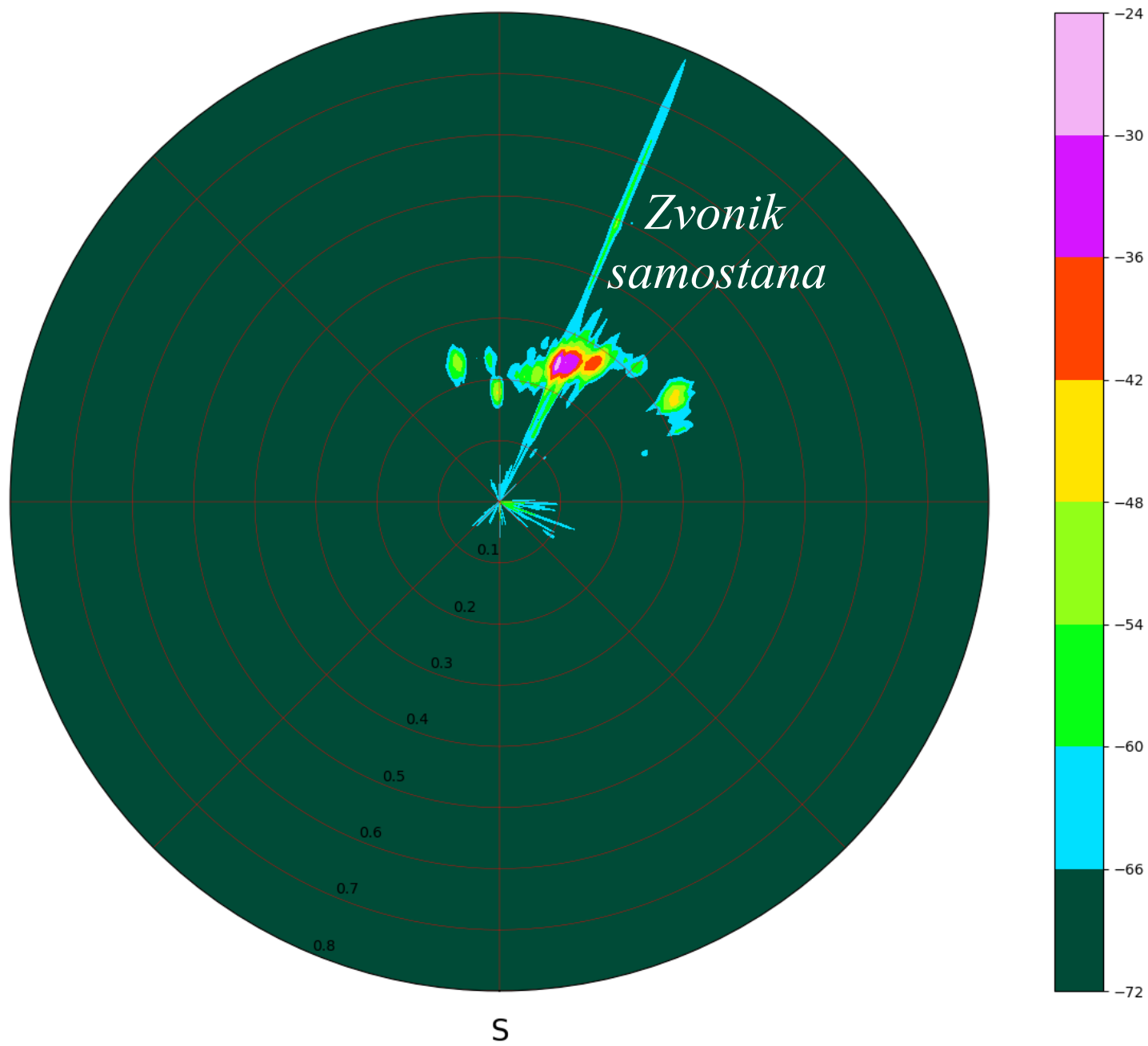


Elevacija 1.6° domet 29.5km



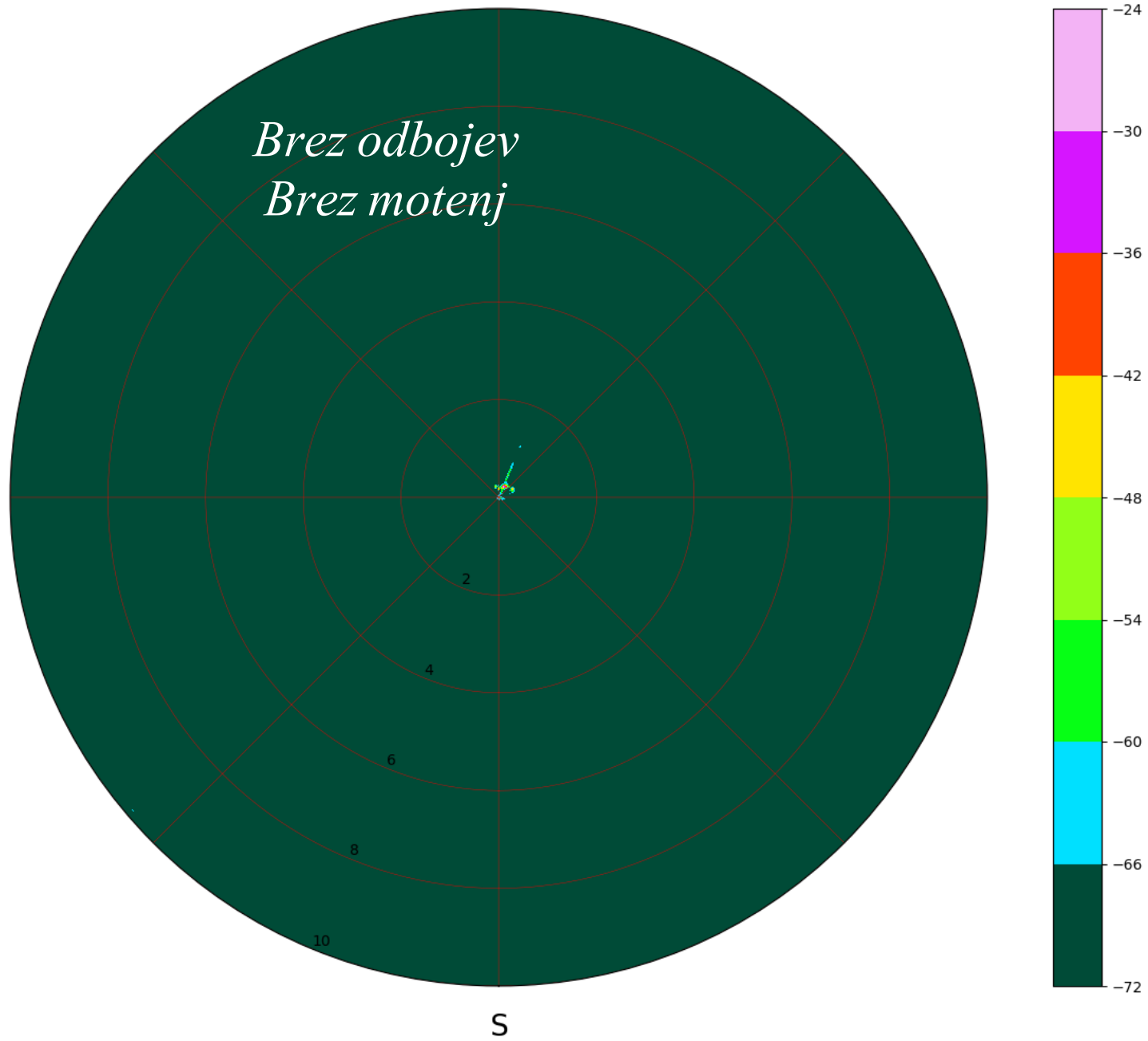
Samostan Kostanjevica

2023Apr02-161838 EL=15.0° Smer=1 0.8/29.5km



Elevacija 15° domet 800m

2023Apr02-161838 EL=15.0° Smer=1 10.0/29.5km

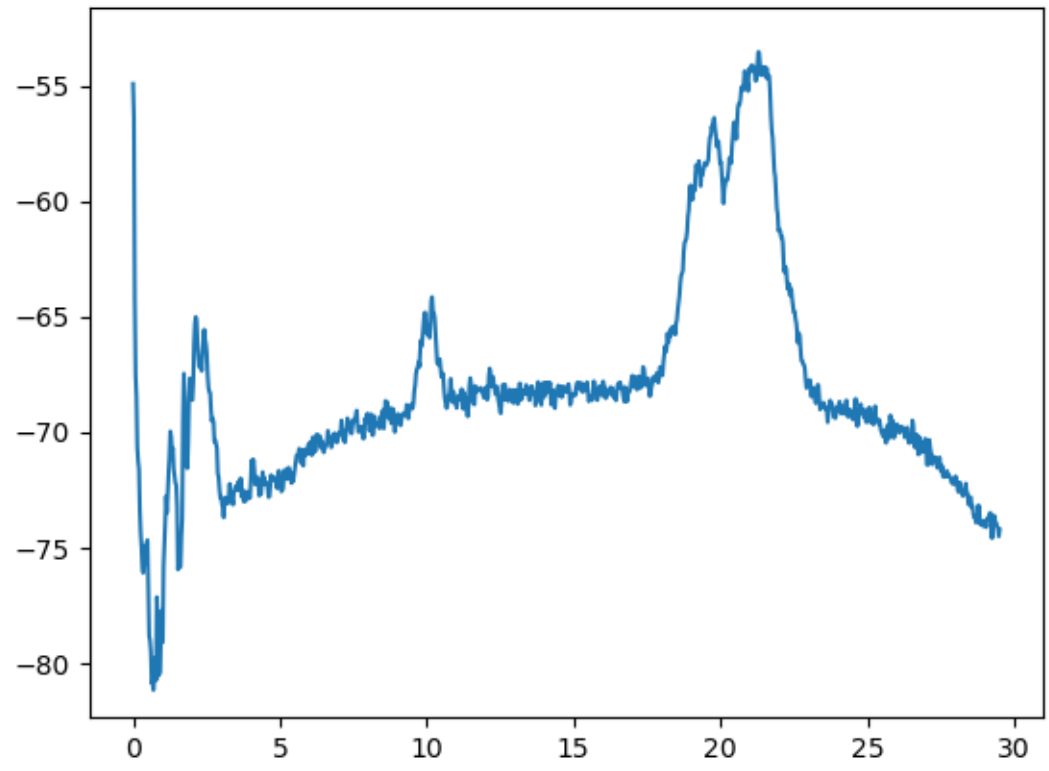
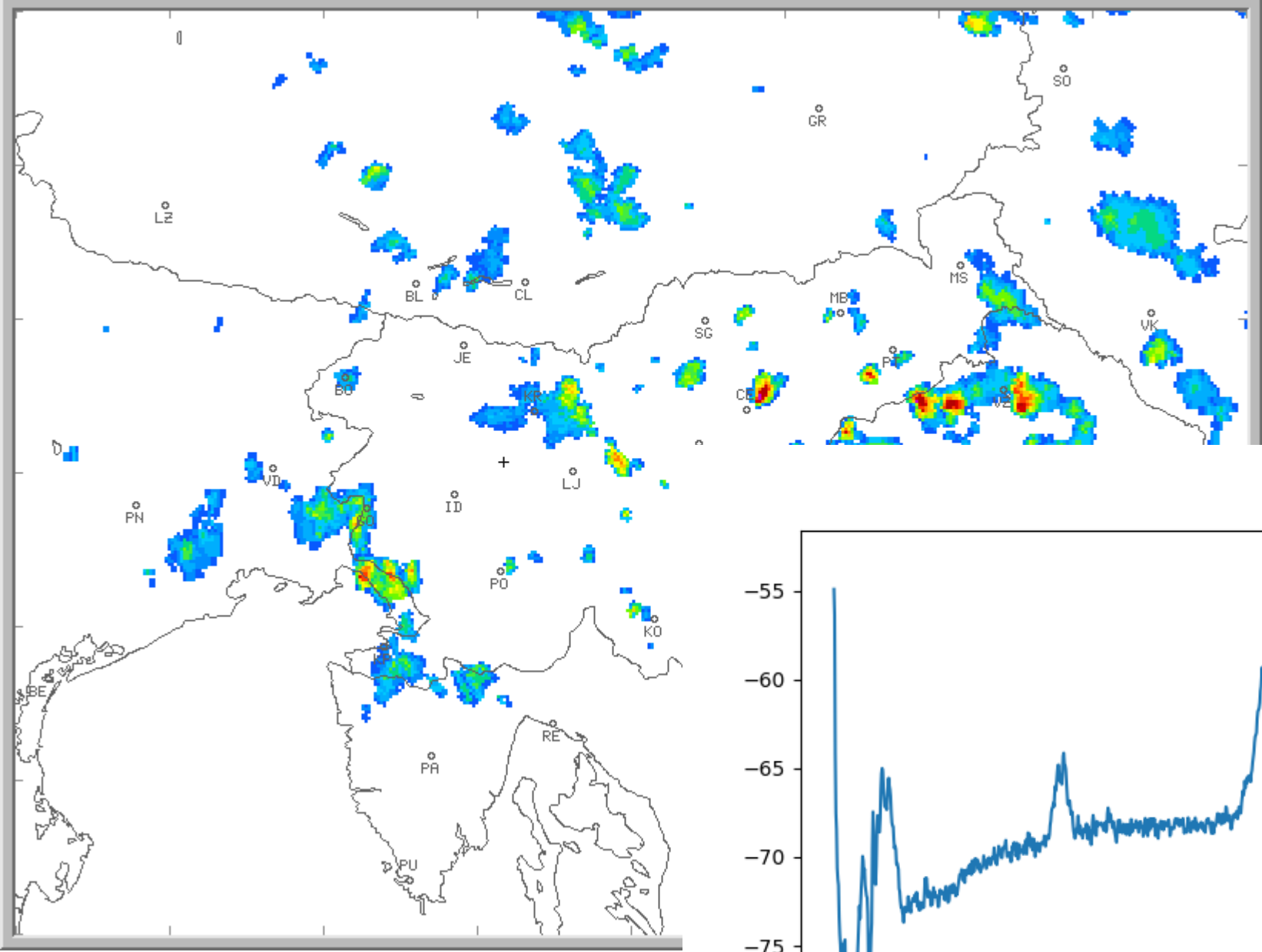


Elevacija 15° domet 10km

Vreme

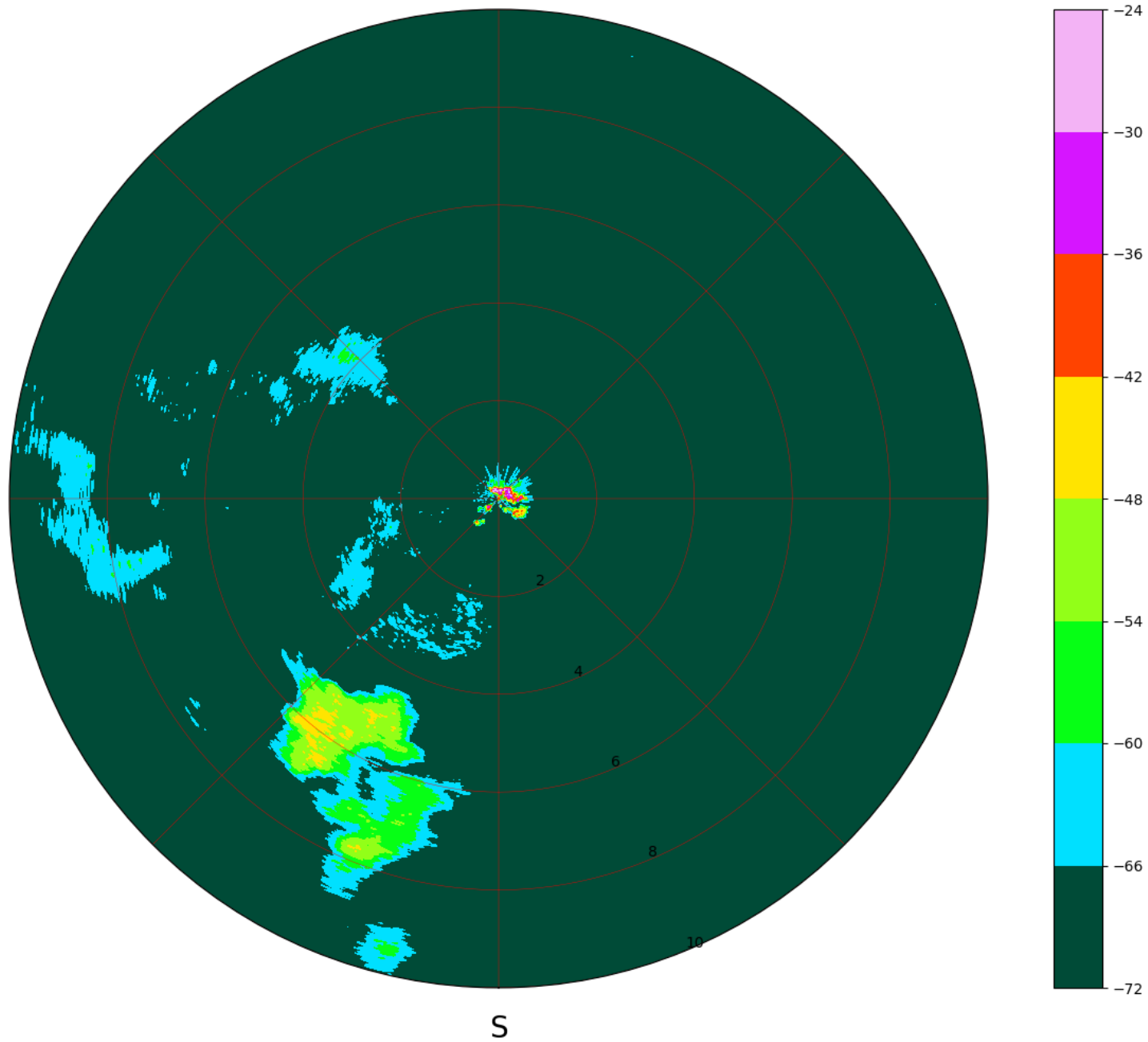
ARSO SIRAD SI1 SI2
2022-05-09 15:45 UTC

MM/H .5 1 2 5 15 50 100
MAX RAINFALL RATE



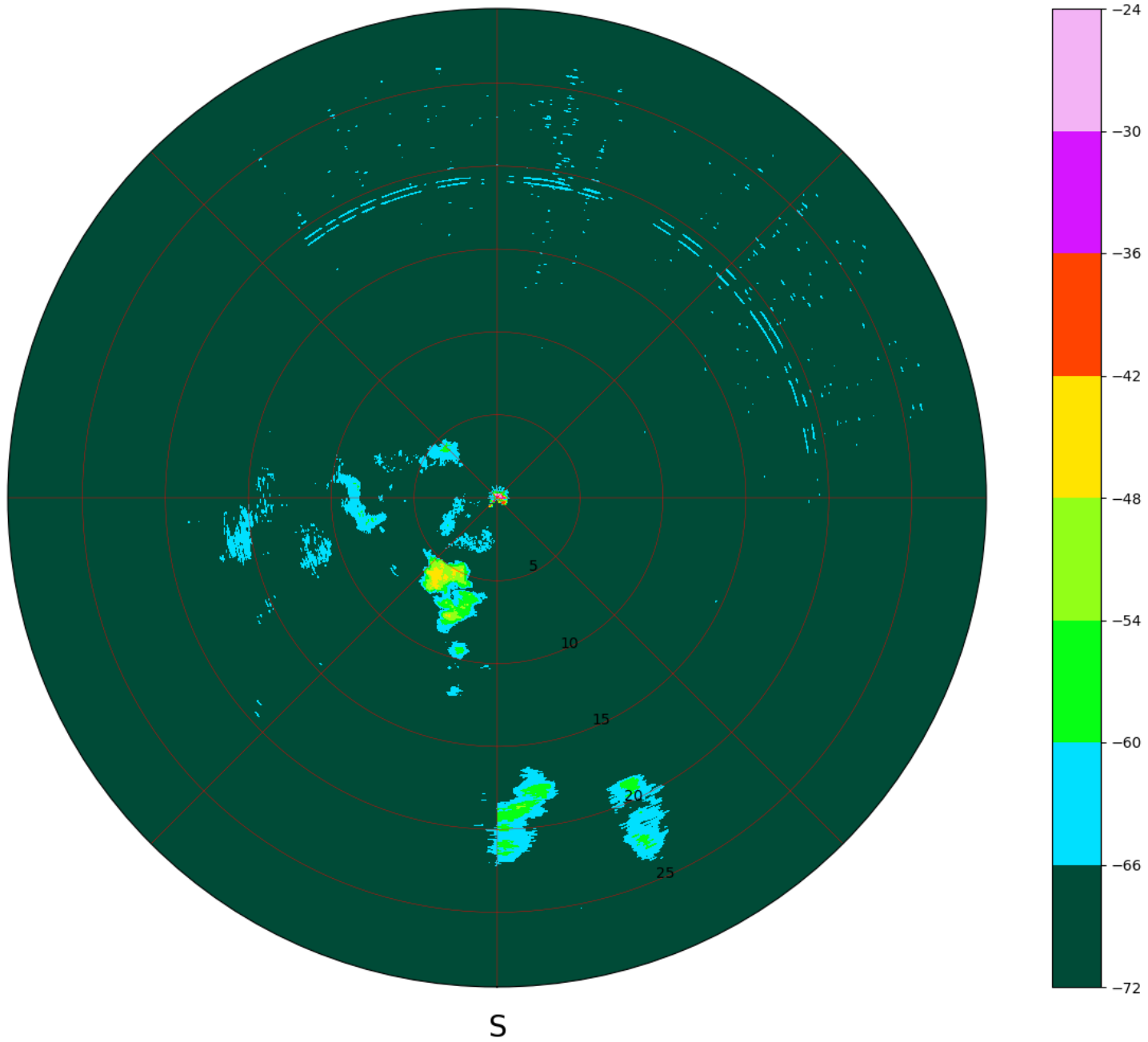
2022.05.09 smer jug

2022May09-154701 EL=07.9° Smer=-1 10.0/29.5km



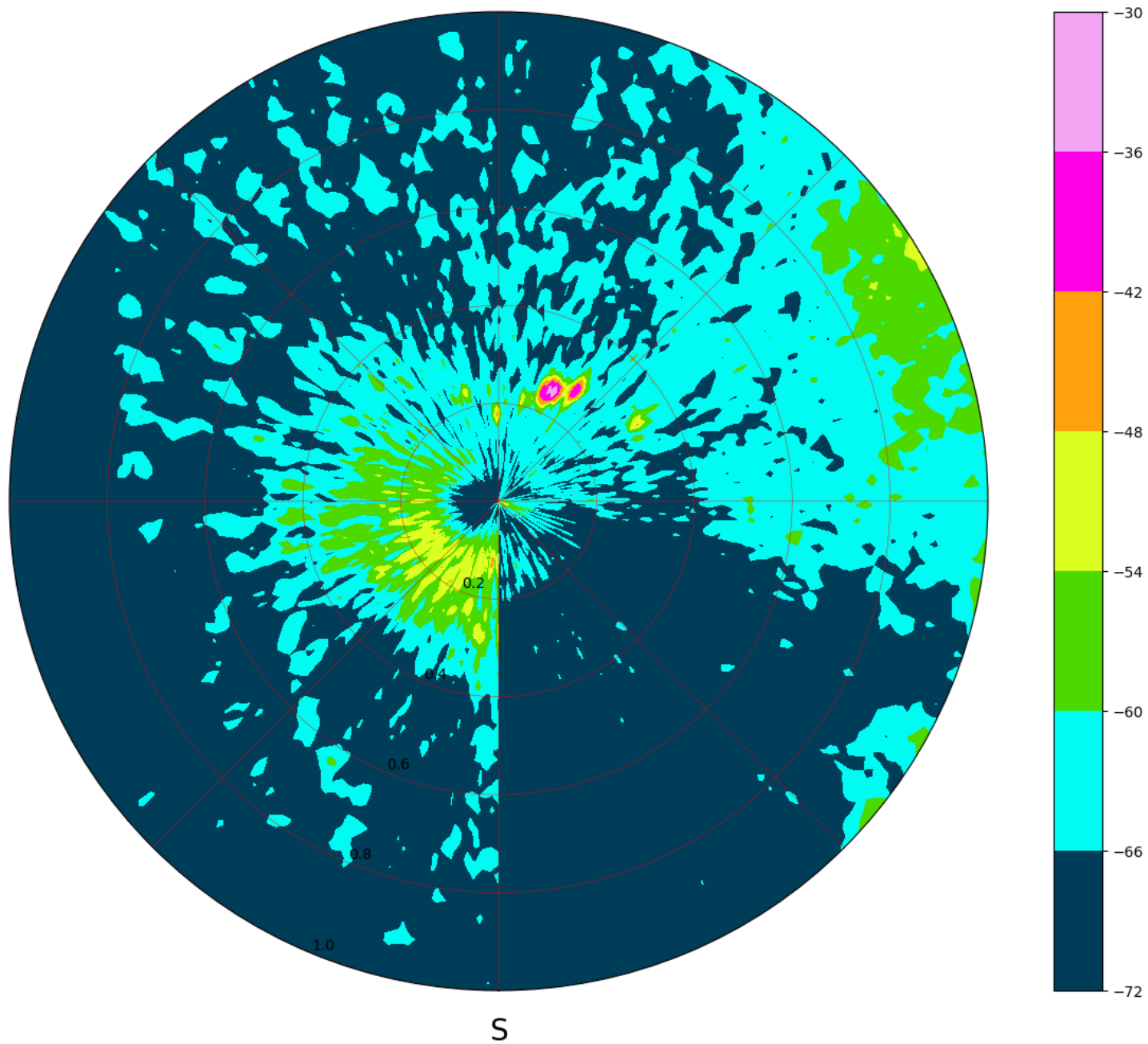
2022.05.09 domet 10km

2022May09-154701 EL=07.9° Smer=-1 29.5/29.5km



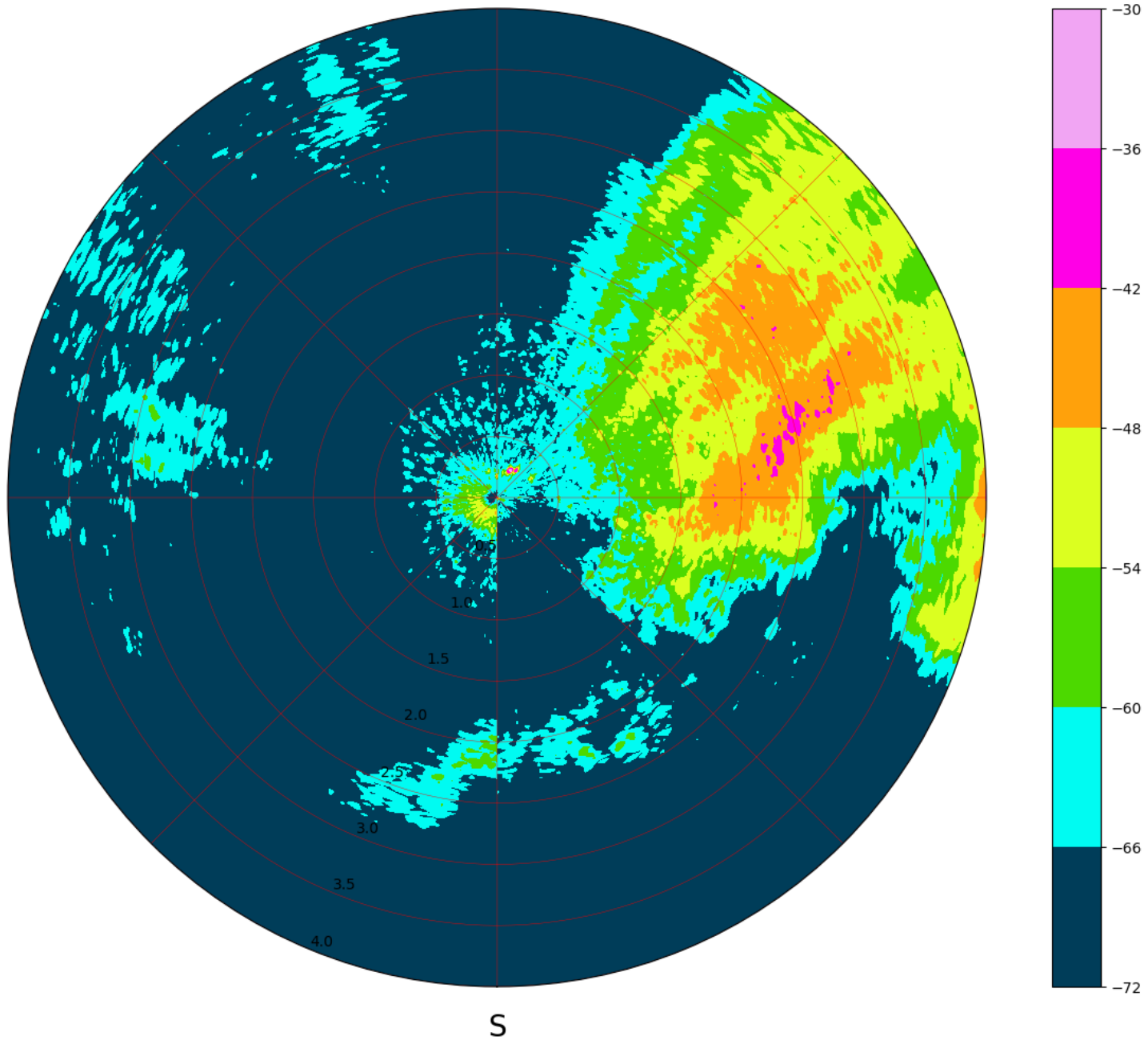
2022.05.09 domet 29.5km

2022May24-234758 EL=16.6° Smer=1 1.0/29.5km



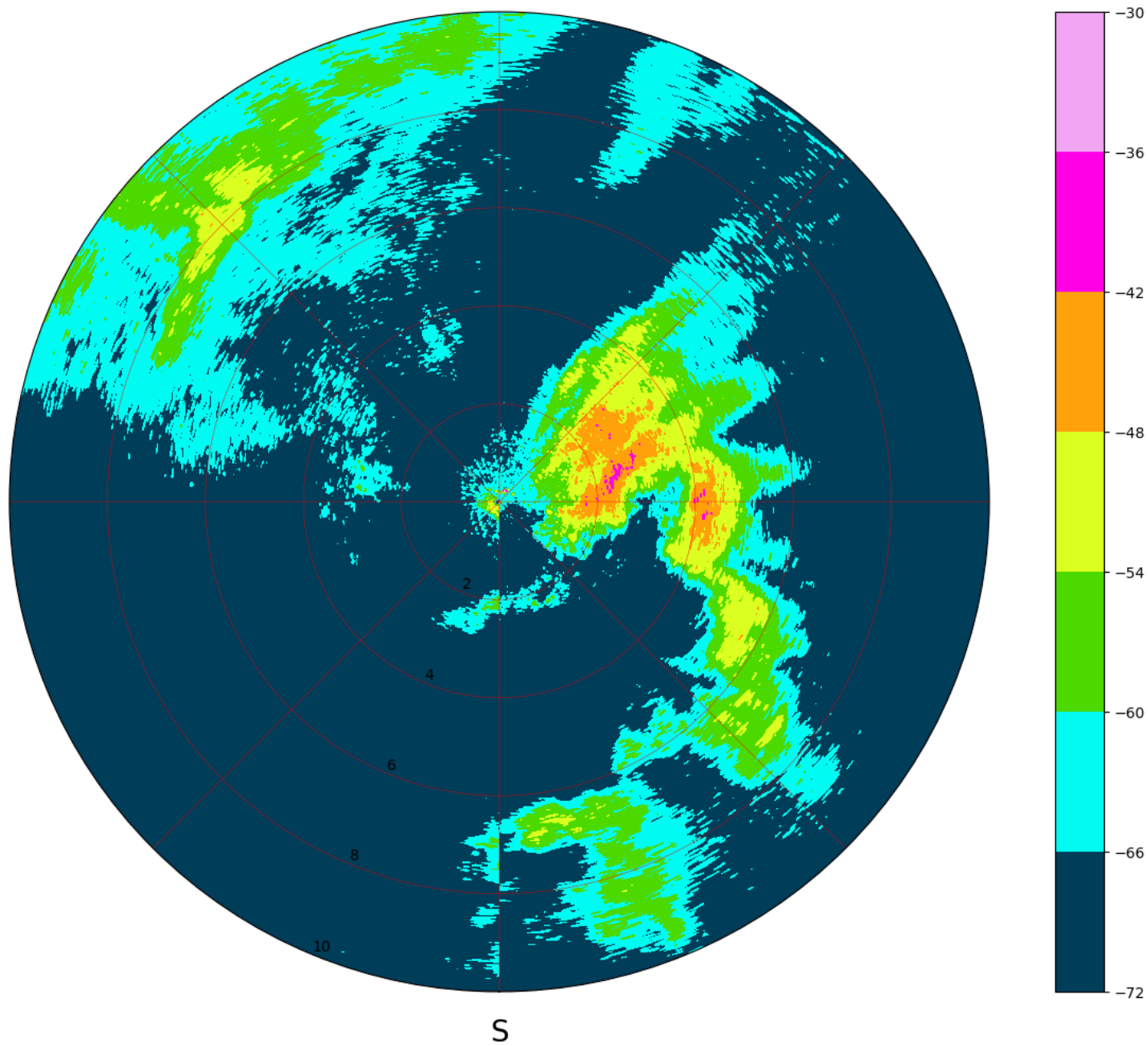
2022.05.24 domet 1km

2022May24-234758 EL=16.6° Smer=1 4.0/29.5km

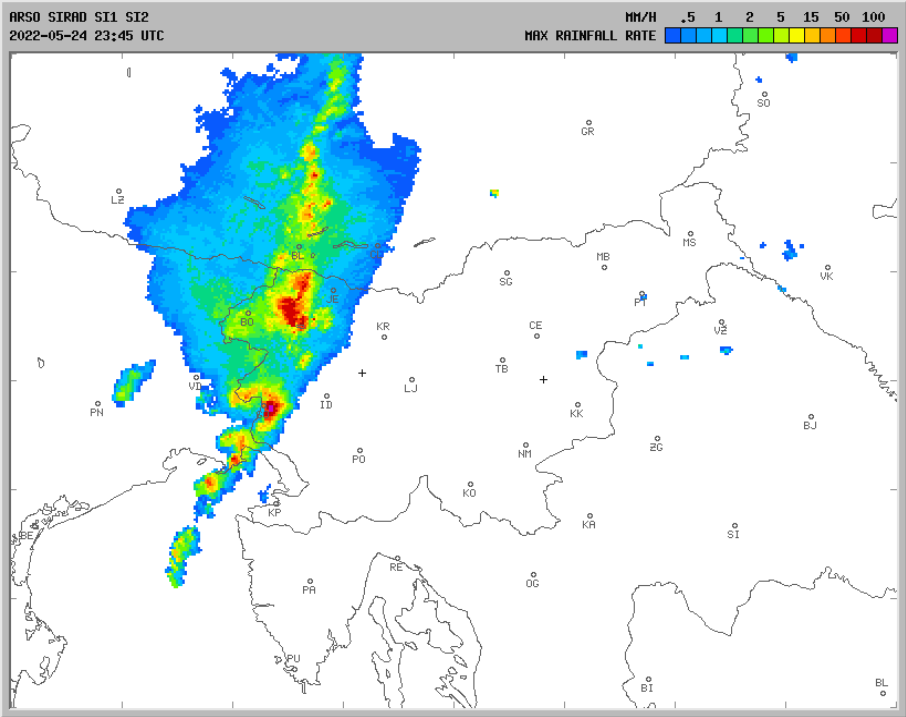


2022.05.24 domet 4km

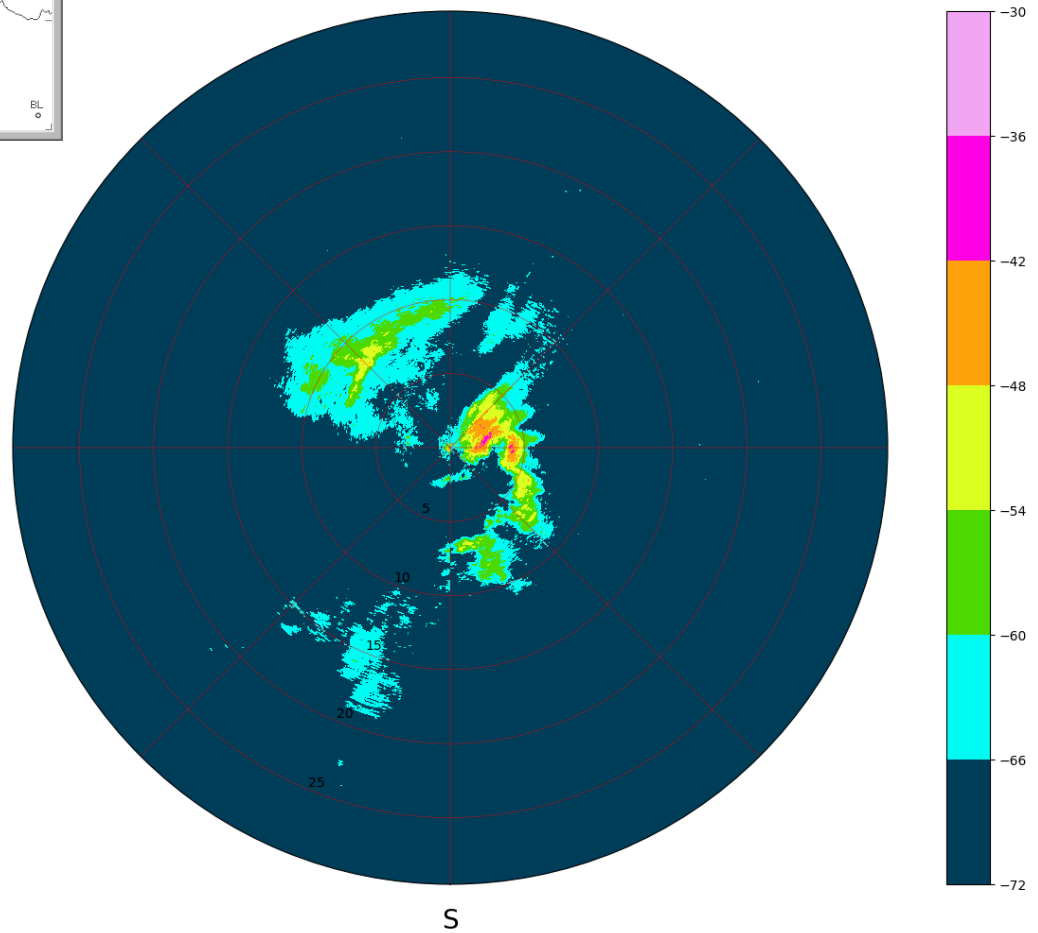
2022May24-234758 EL=16.6° Smer=1 10.0/29.5km



2022.05.24 domet 10km



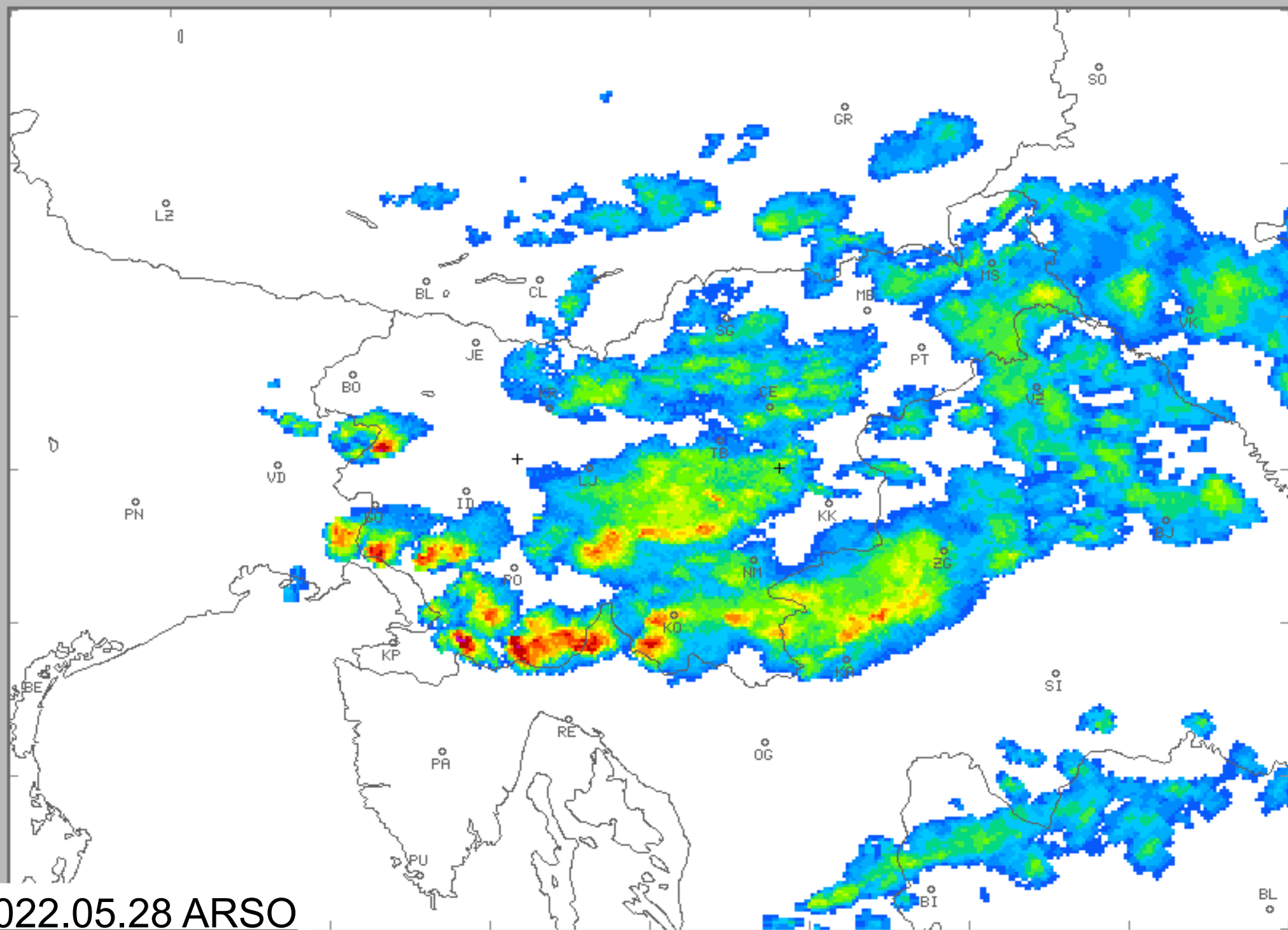
2022May24-234758 EL=16.6° Smer=1 29.5/29.5km



2022.05.24 domet 29.5km

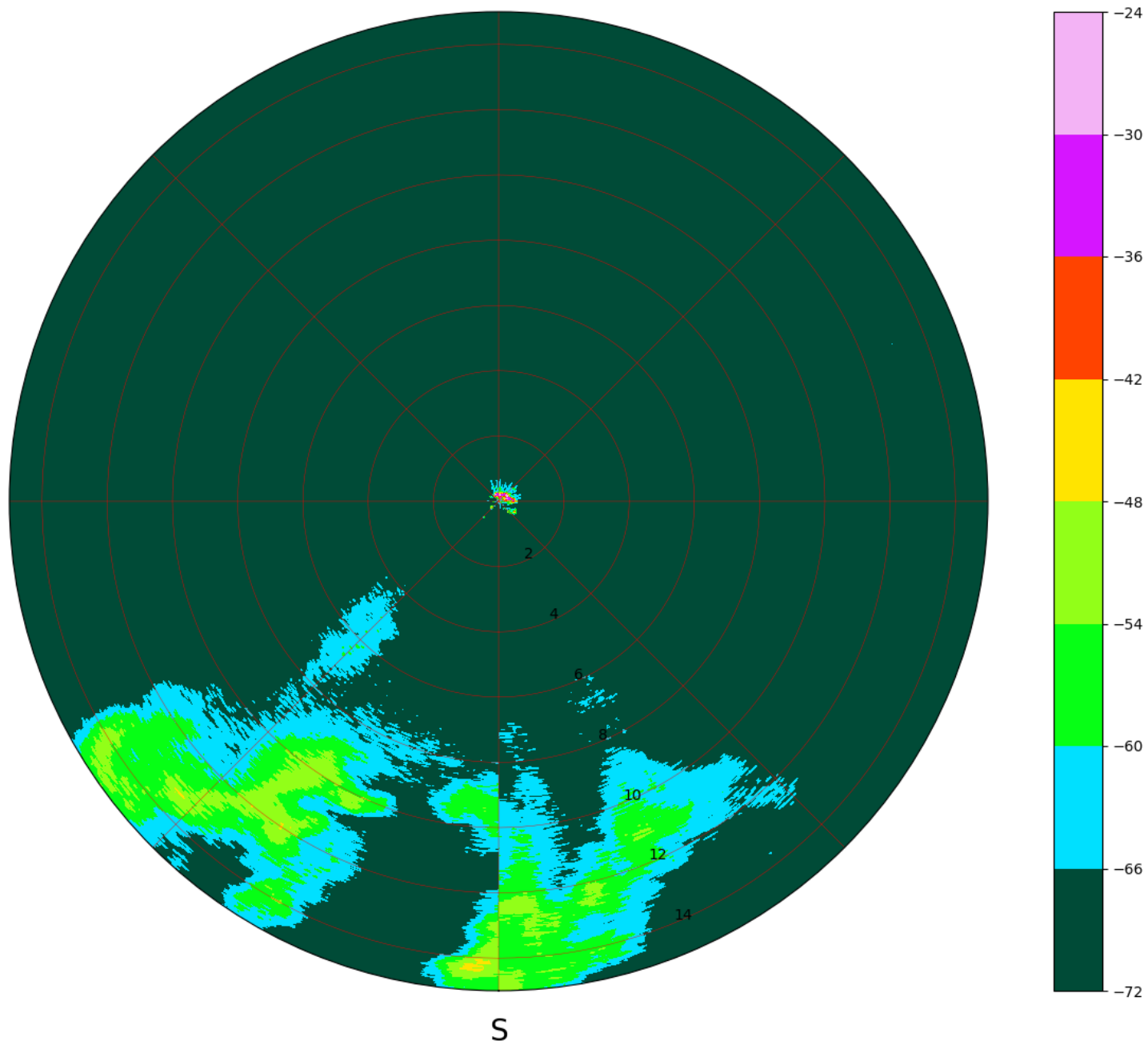
ARSO SIRAD SI1 SI2
2022-05-28 07:45 UTC

MM/H .5 1 2 5 15 50 100
MAX RAINFALL RATE



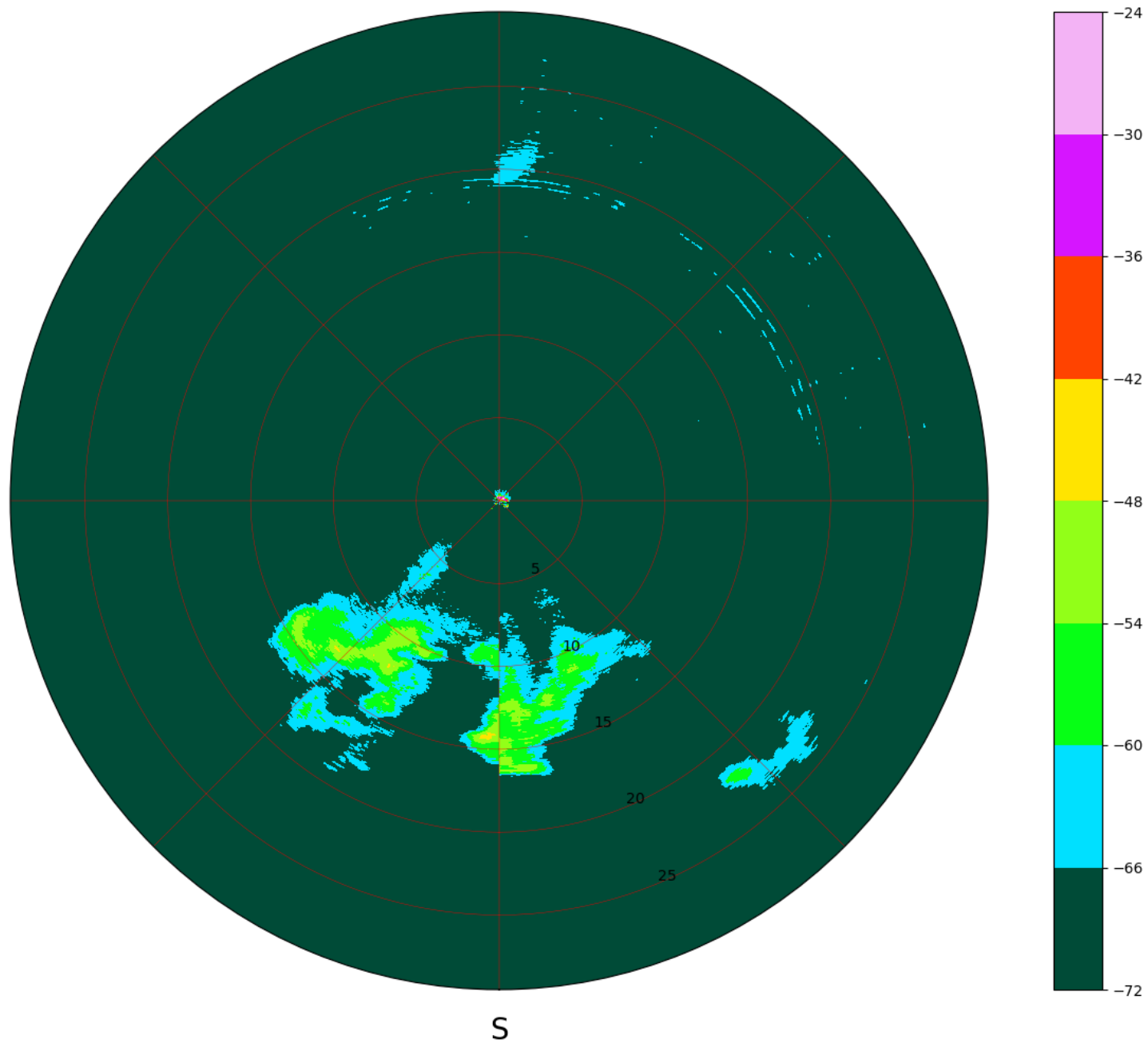
2022.05.28 ARSO

2022May28-074344 EL=10.3° Smer=-1 15.0/29.5km

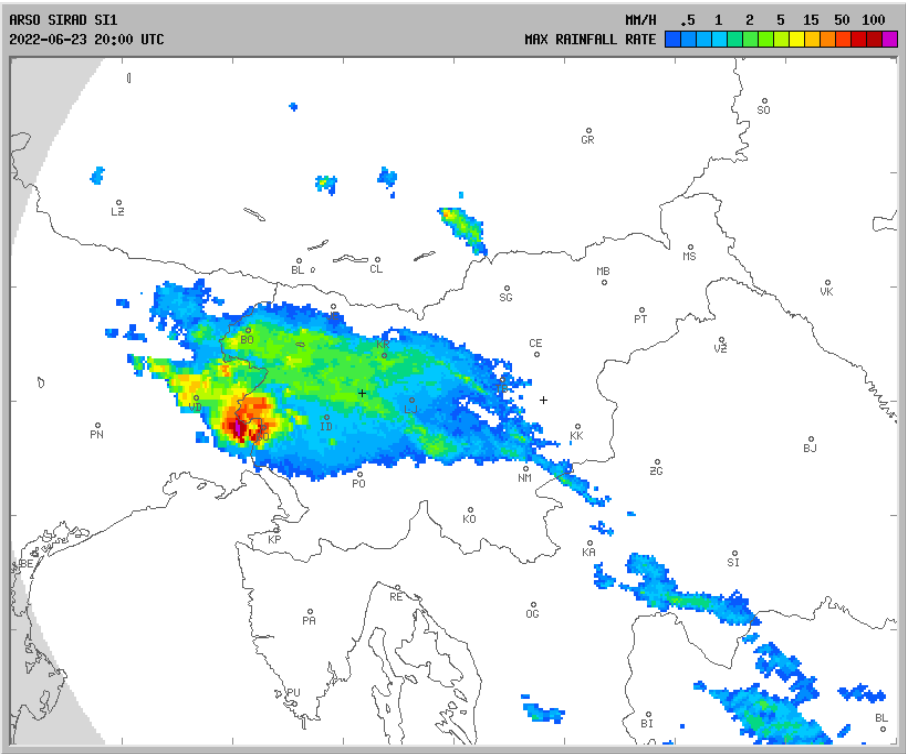


2022.05.28 domet 15km

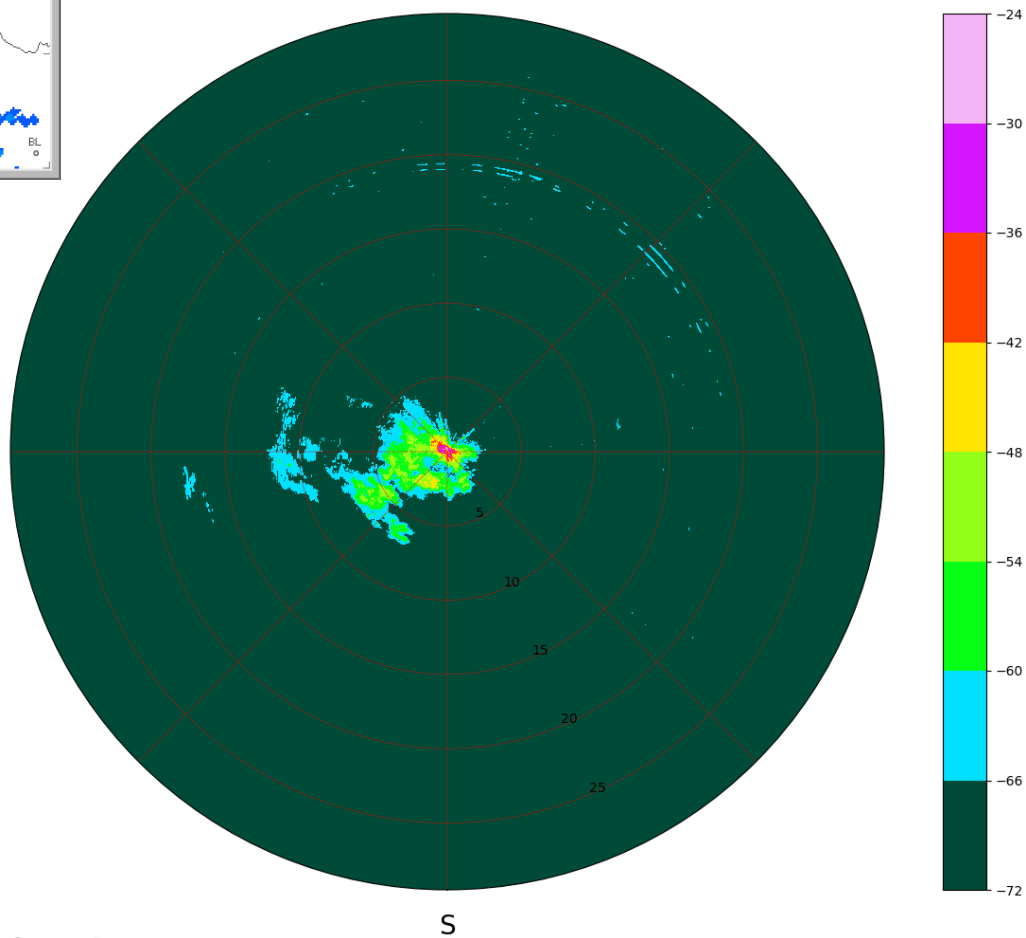
2022May28-074344 EL=10.3° Smer=-1 29.5/29.5km



2022.05.28 domet 29.5km

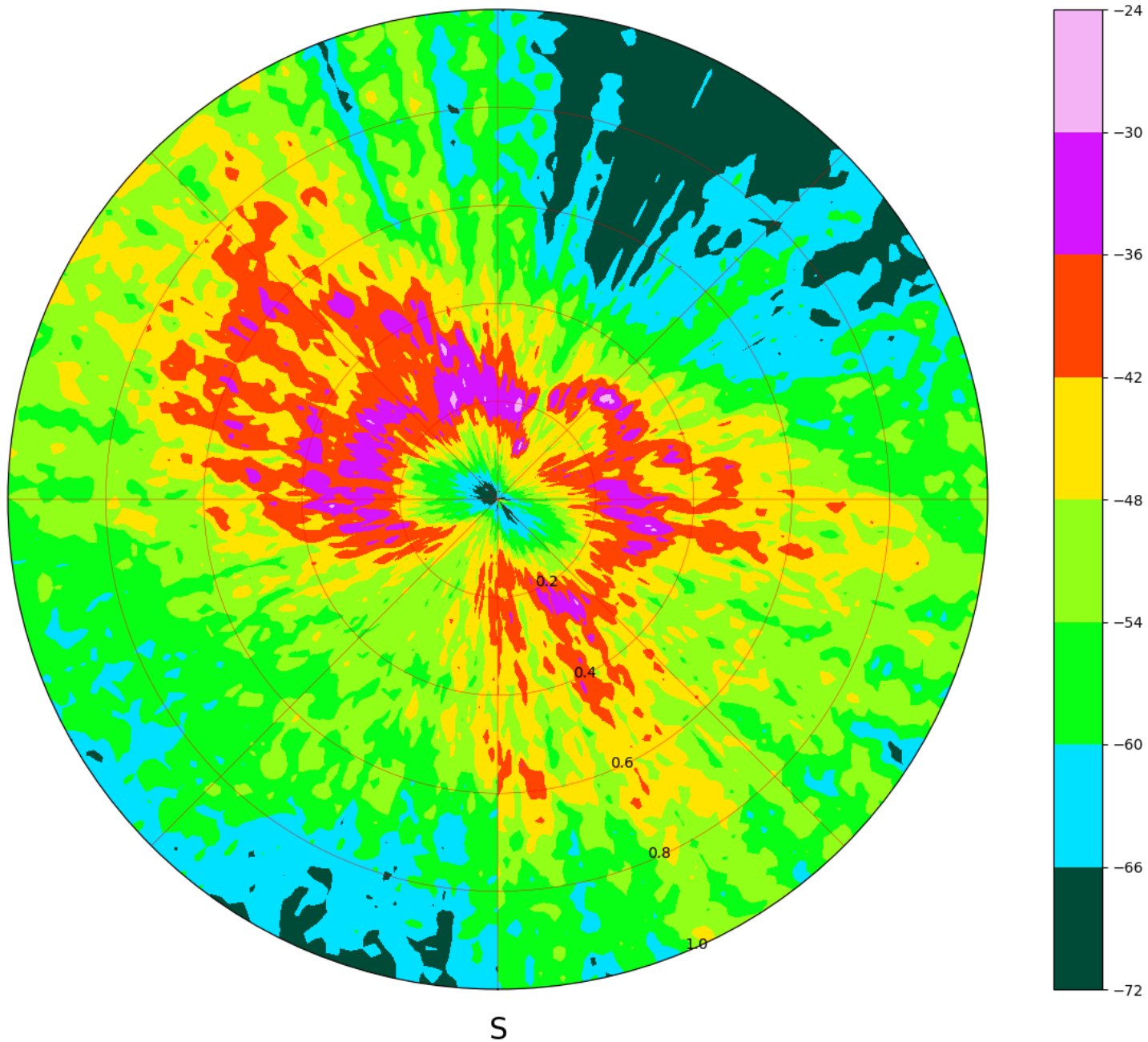


2022Jun23-195957 EL=10.3° Smer=-1 29.5/29.5km



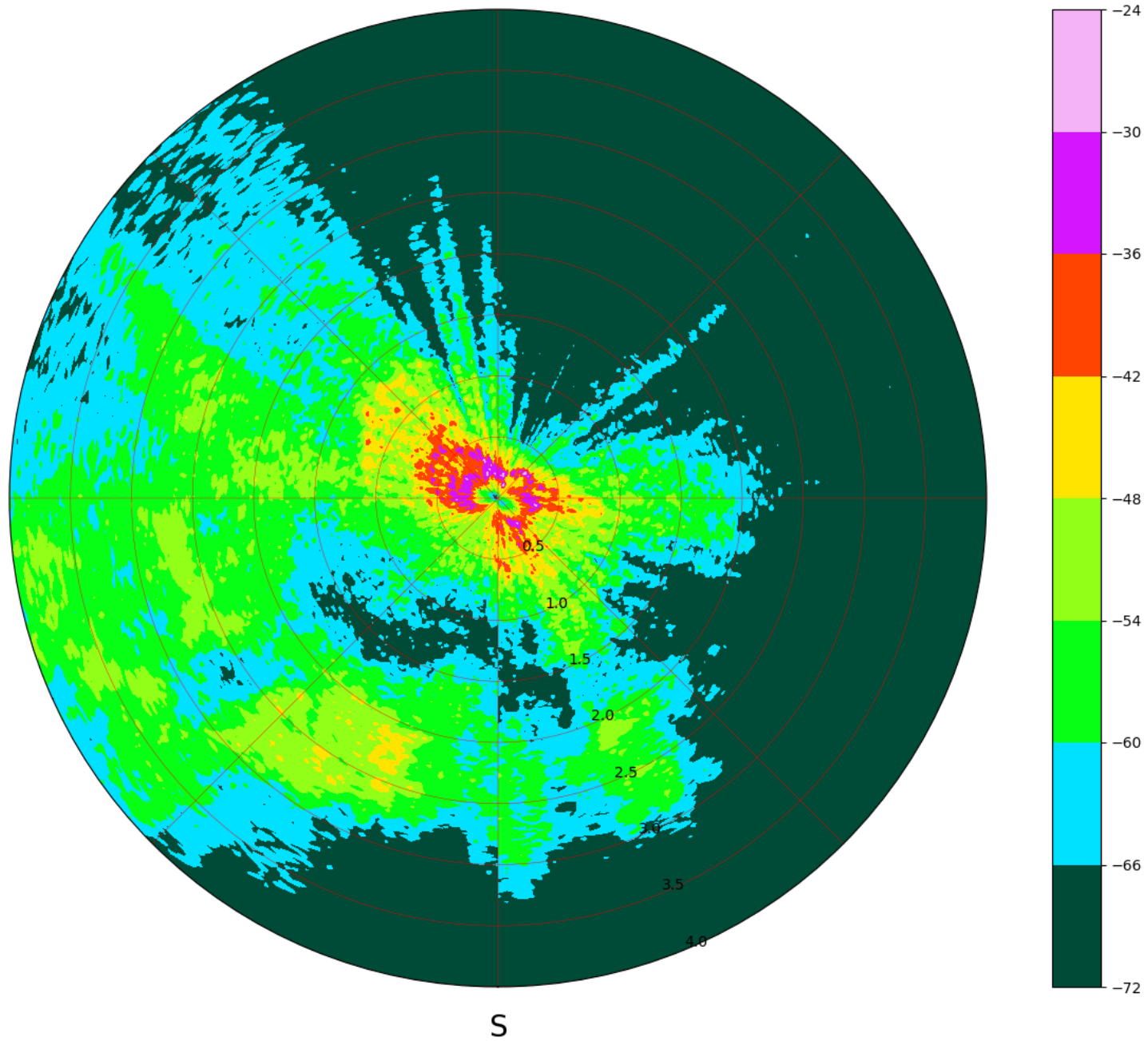
2022.06.23 ARSO + domet 29.5km

2022Jun23-195957 EL=10.3° Smer=-1 1.0/29.5km



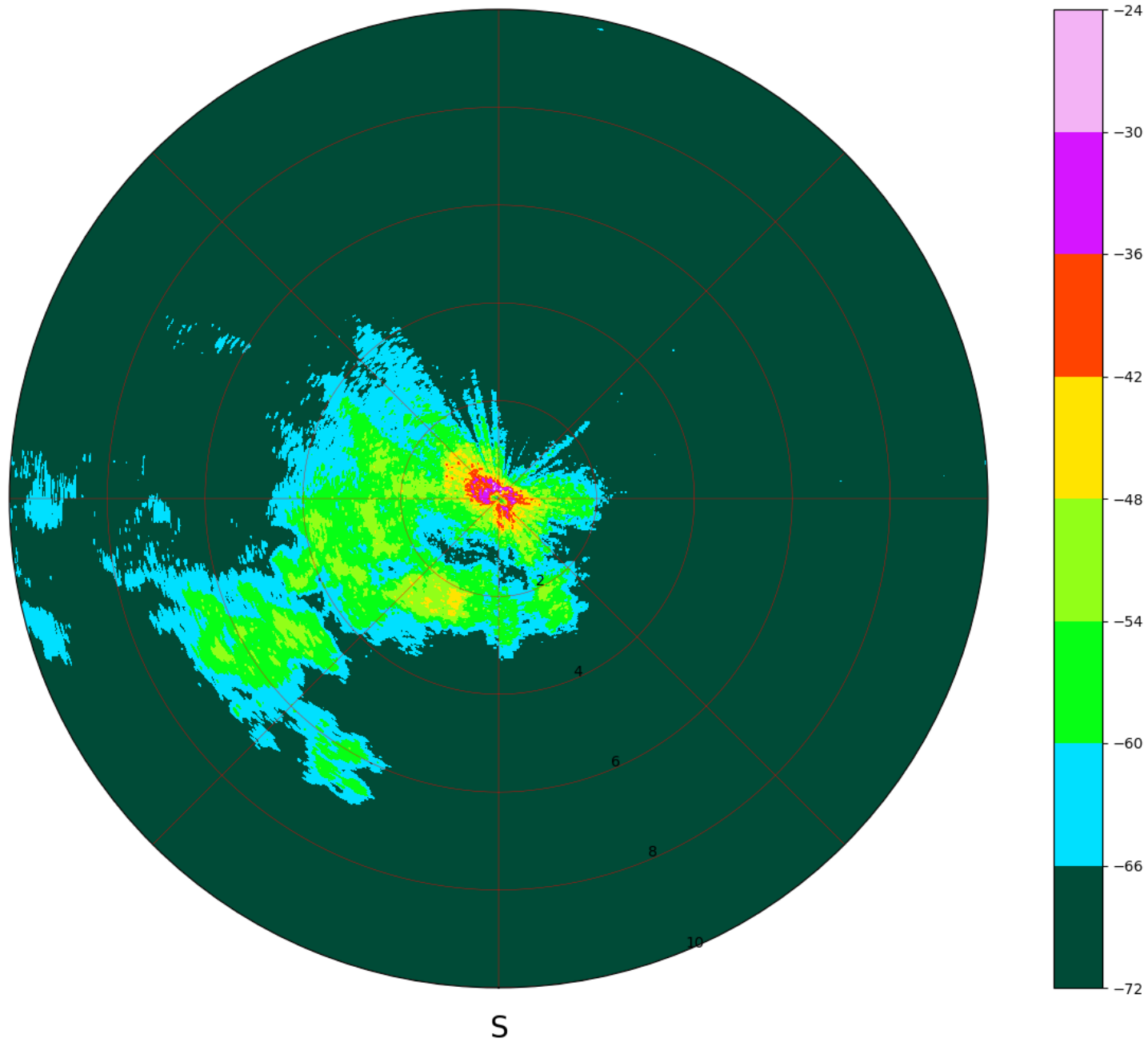
2022.06.23 domet 1km

2022Jun23-195957 EL=10.3° Smer=-1 4.0/29.5km



2022.06.23 domet 4km

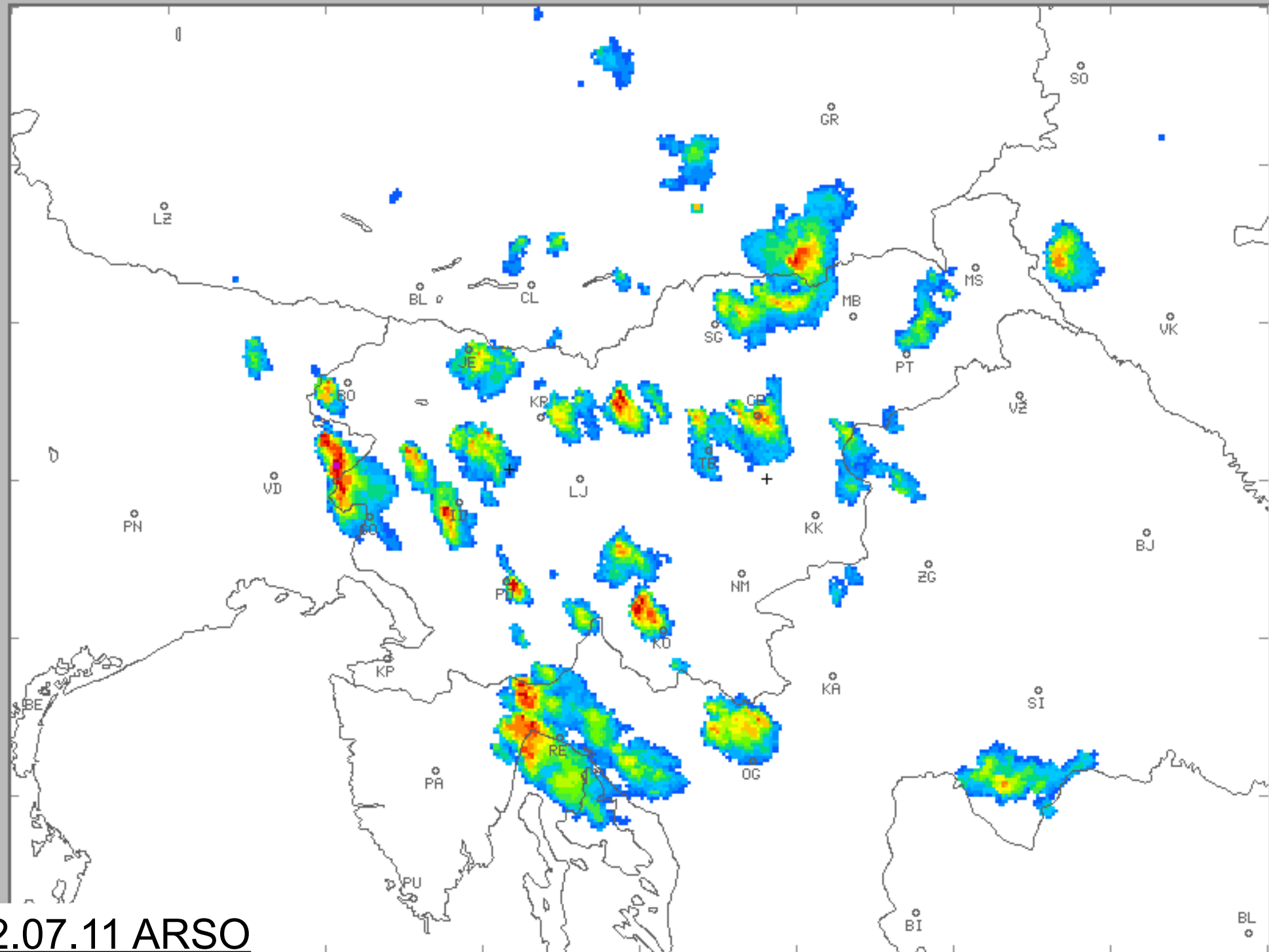
2022Jun23-195957 EL=10.3° Smer=-1 10.0/29.5km



2022.06.23 domet 10km

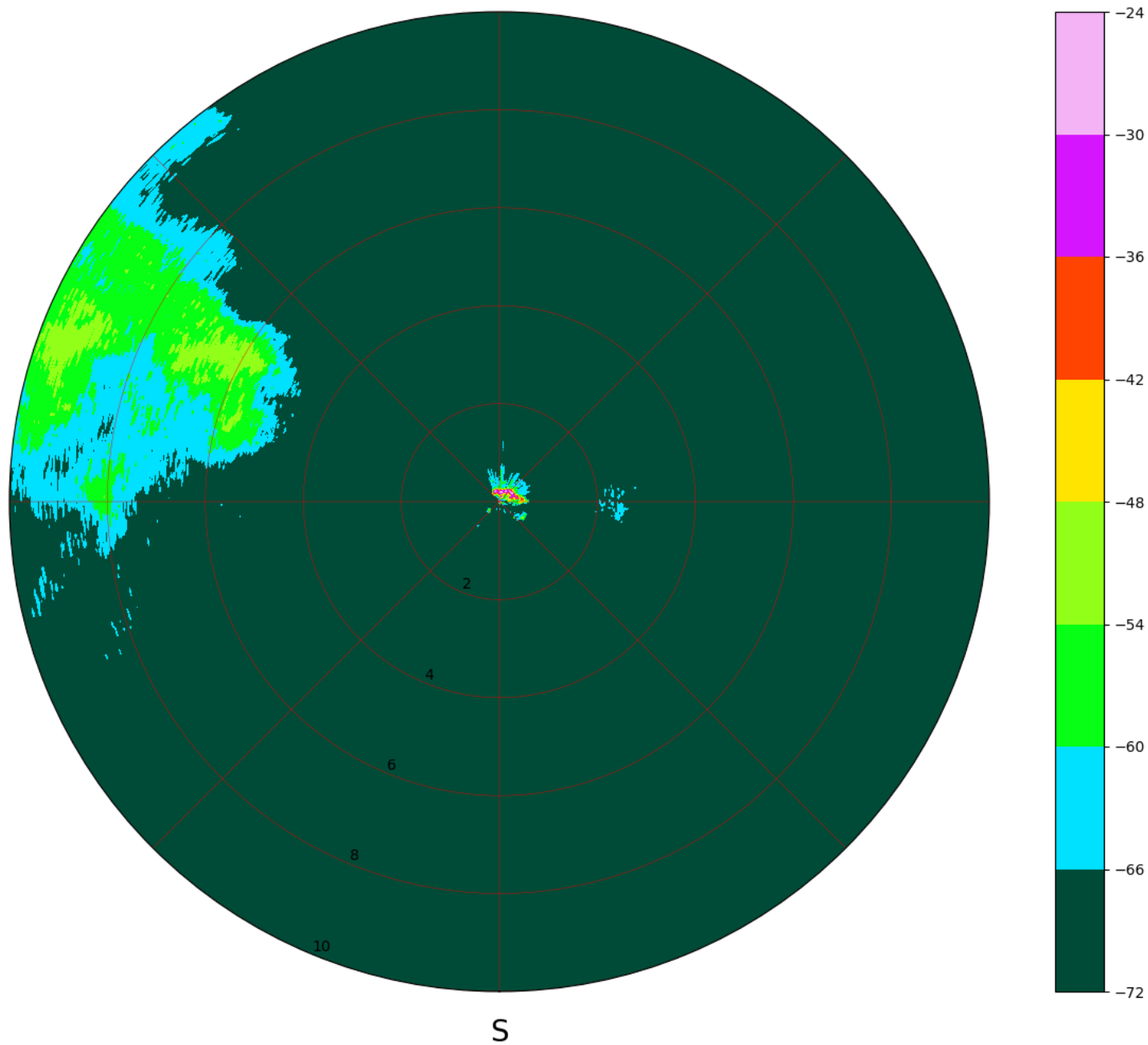
ARSO SIRAD SI1 SI2
2022-07-12 15:10 UTC

MM/H .5 1 2 5 15 50 100
MAX RAINFALL RATE



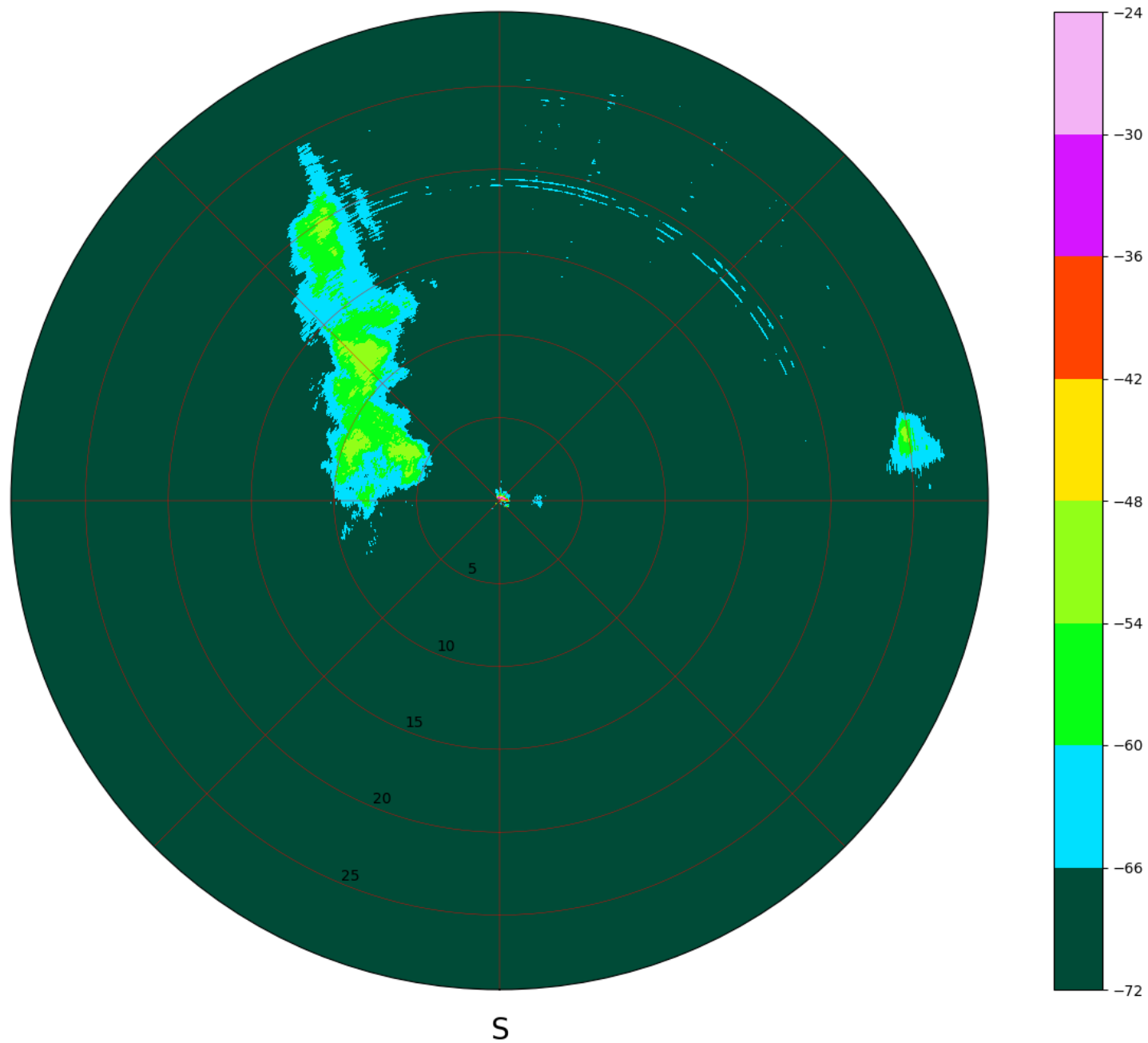
2022.07.11 ARSO

2022Jul12-151106 EL=10.3° Smer=1 10.0/29.5km

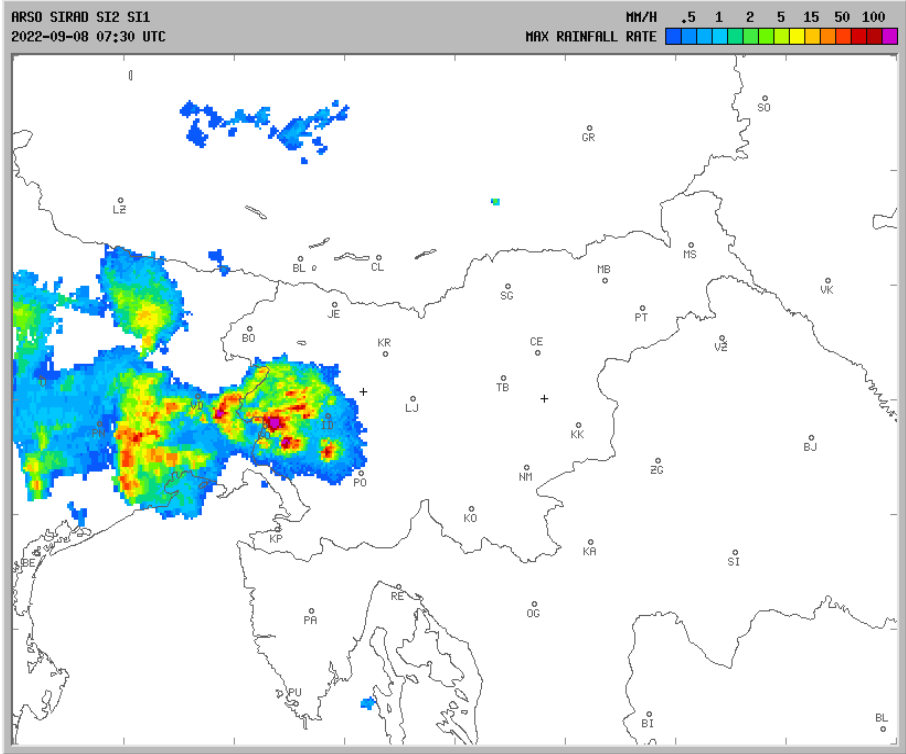


2022.07.11 domet 10km

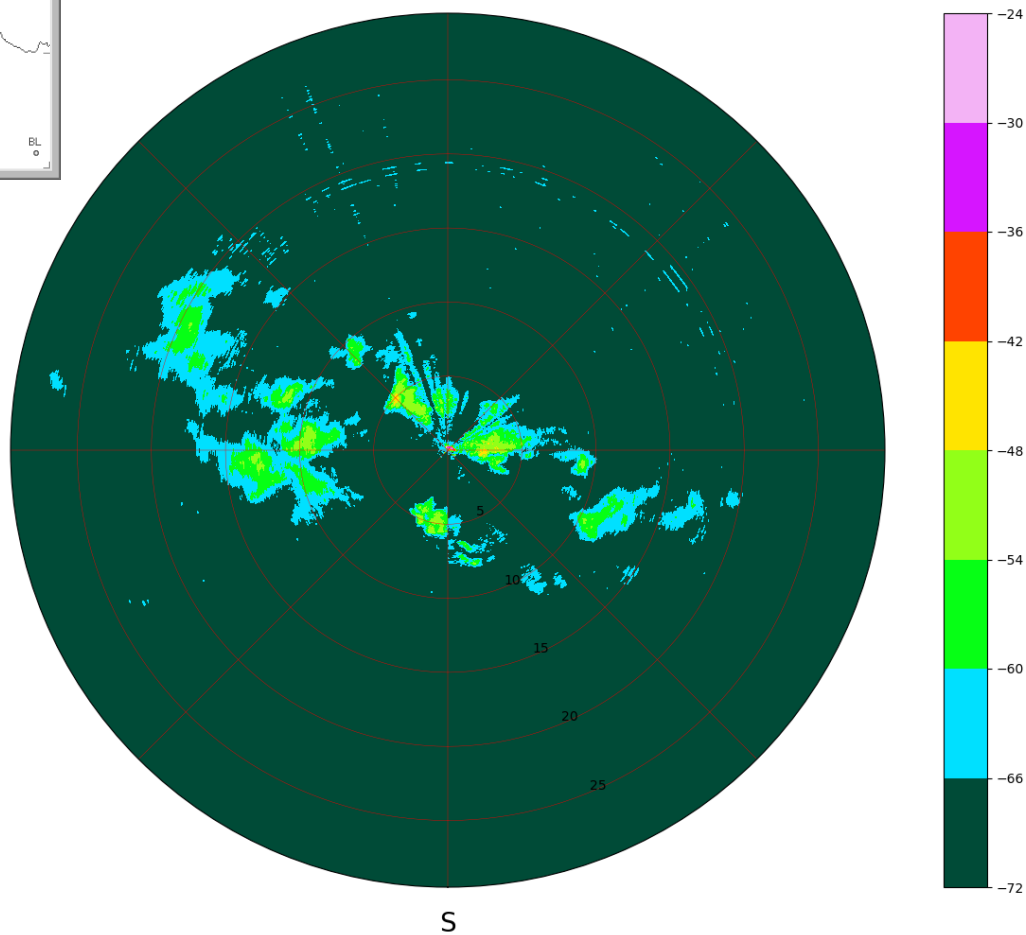
2022Jul12-151106 EL=10.3° Smer=1 29.5/29.5km



2022.07.11 domet 29.5km

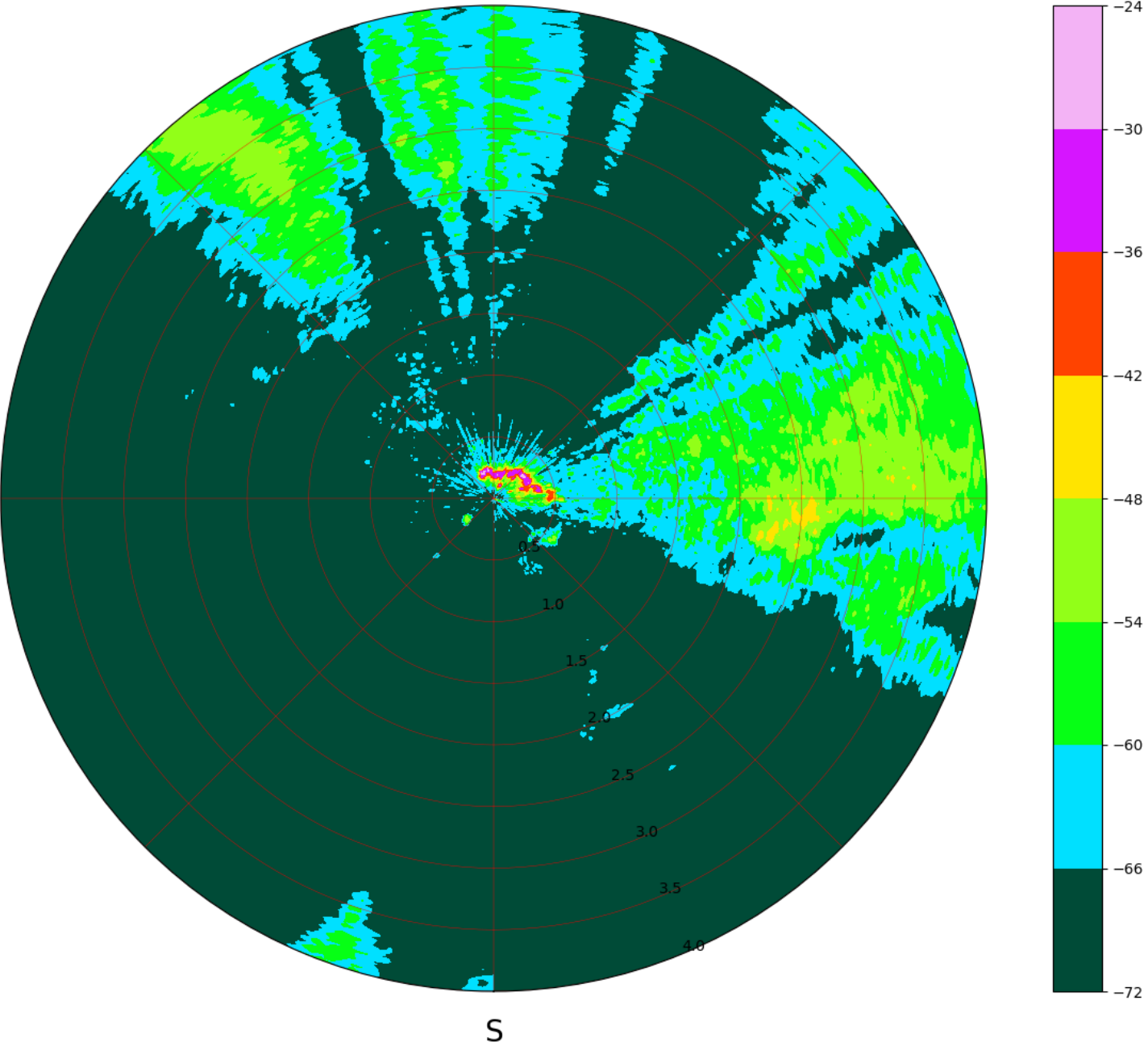


2022Sep08-073240 EL=10.3° Smer=-1 29.5/29.5km



2022.09.08 ARSO + domet 29.5km

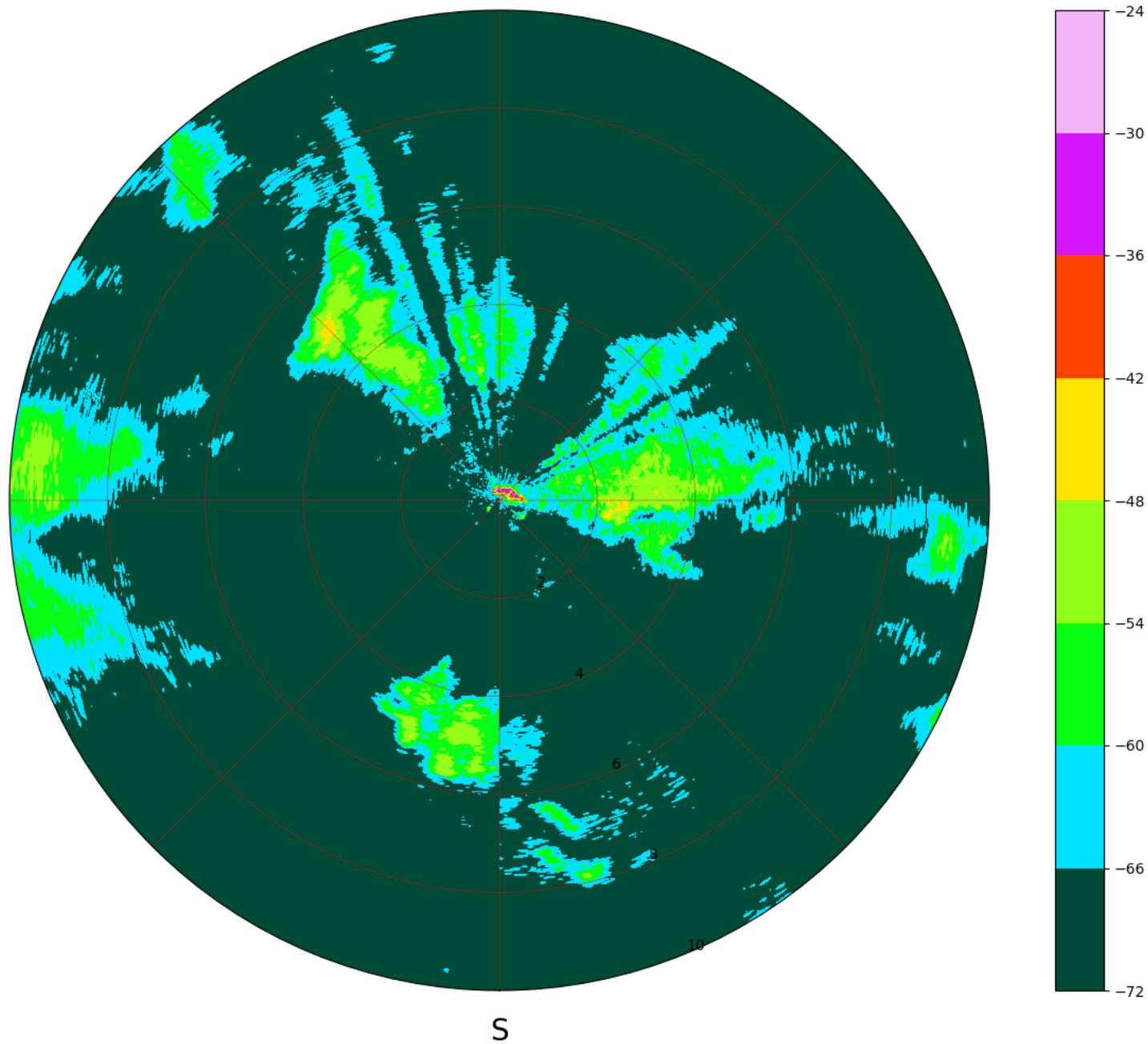
2022Sep08-073240 EL=10.3° Smer=-1 4.0/29.5km



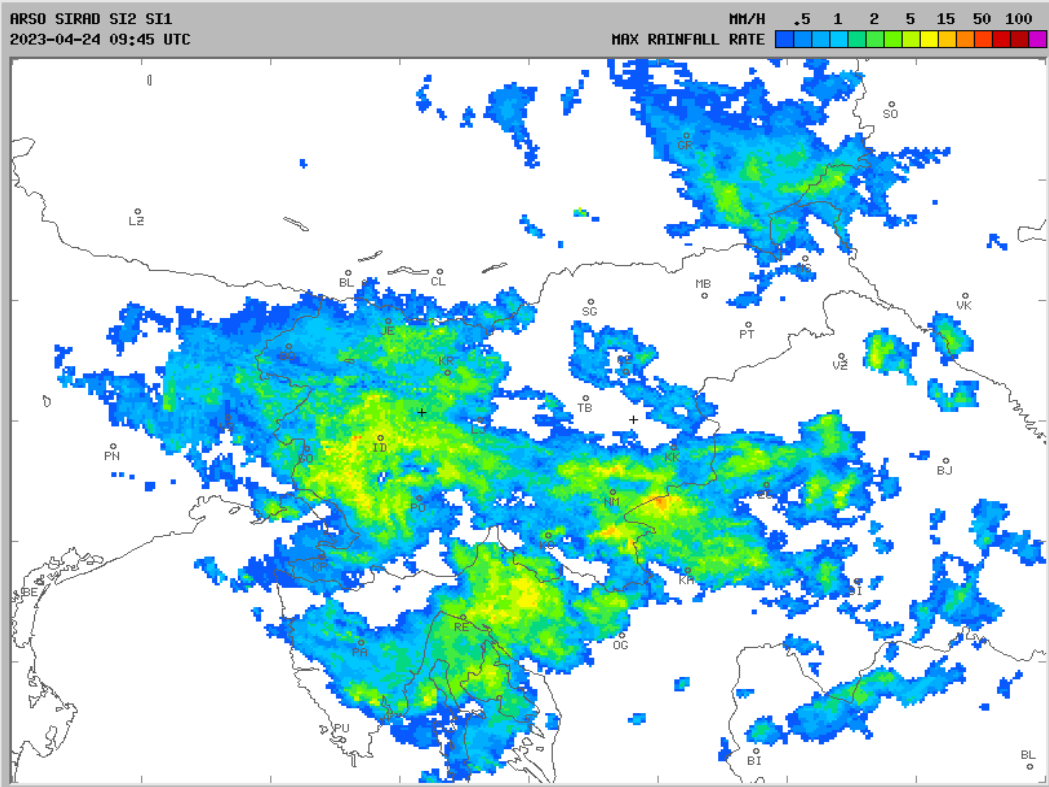
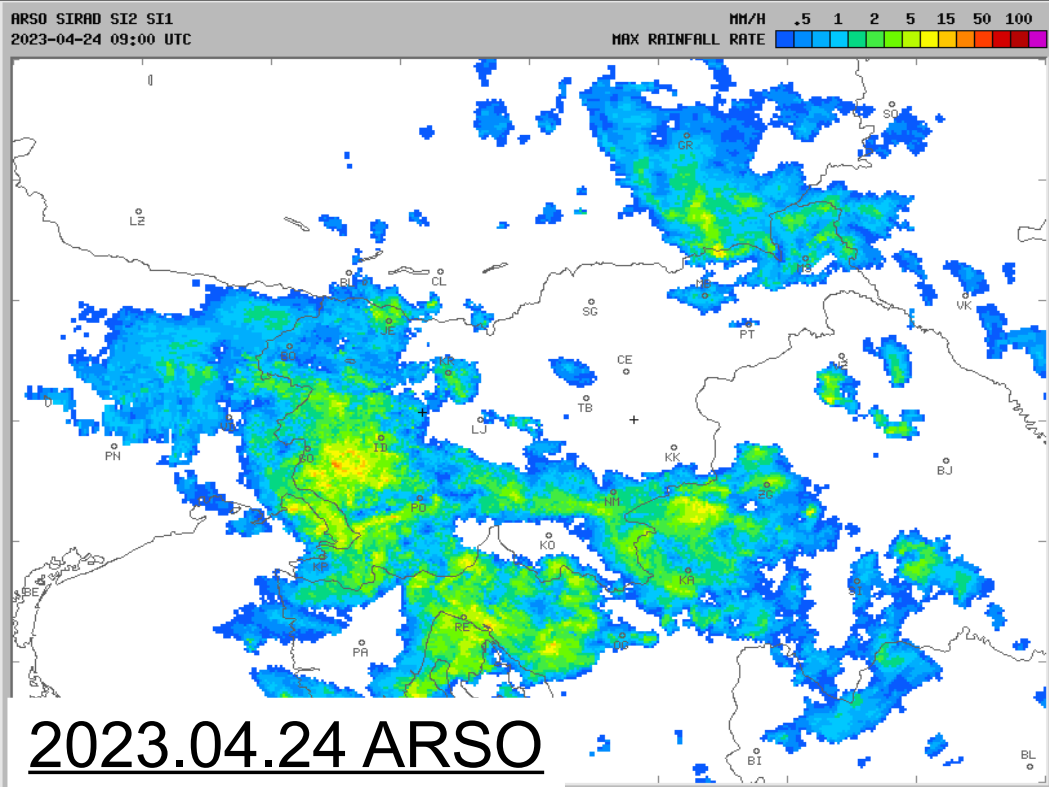
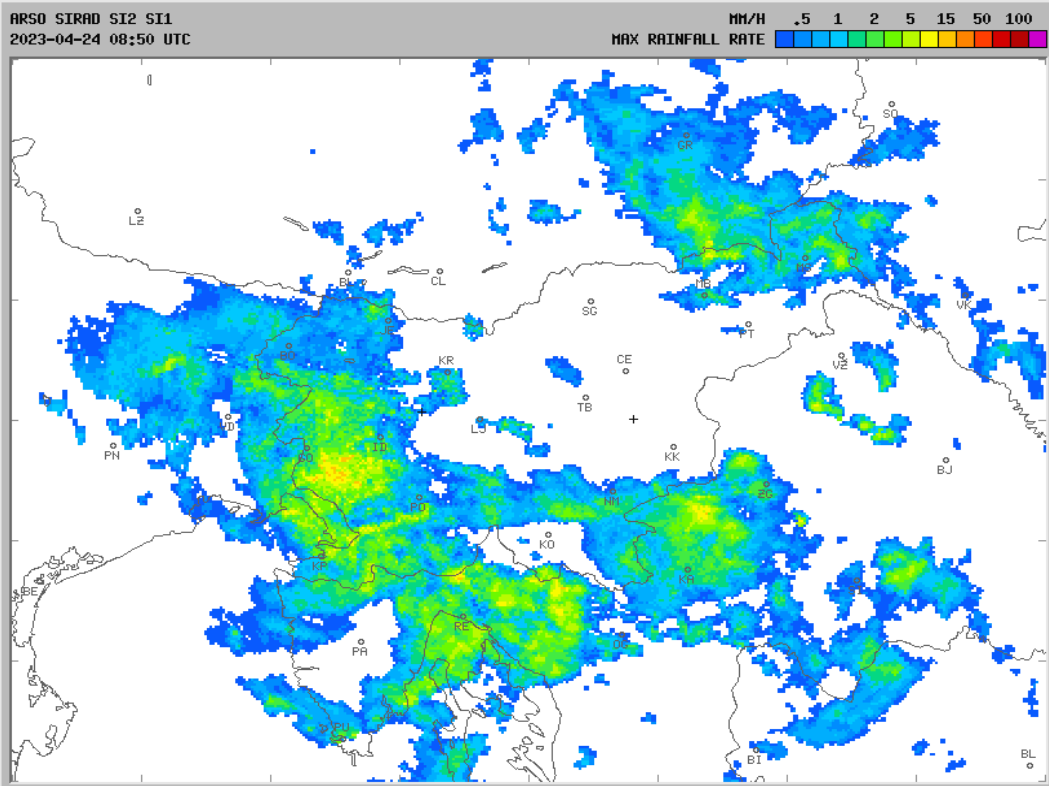
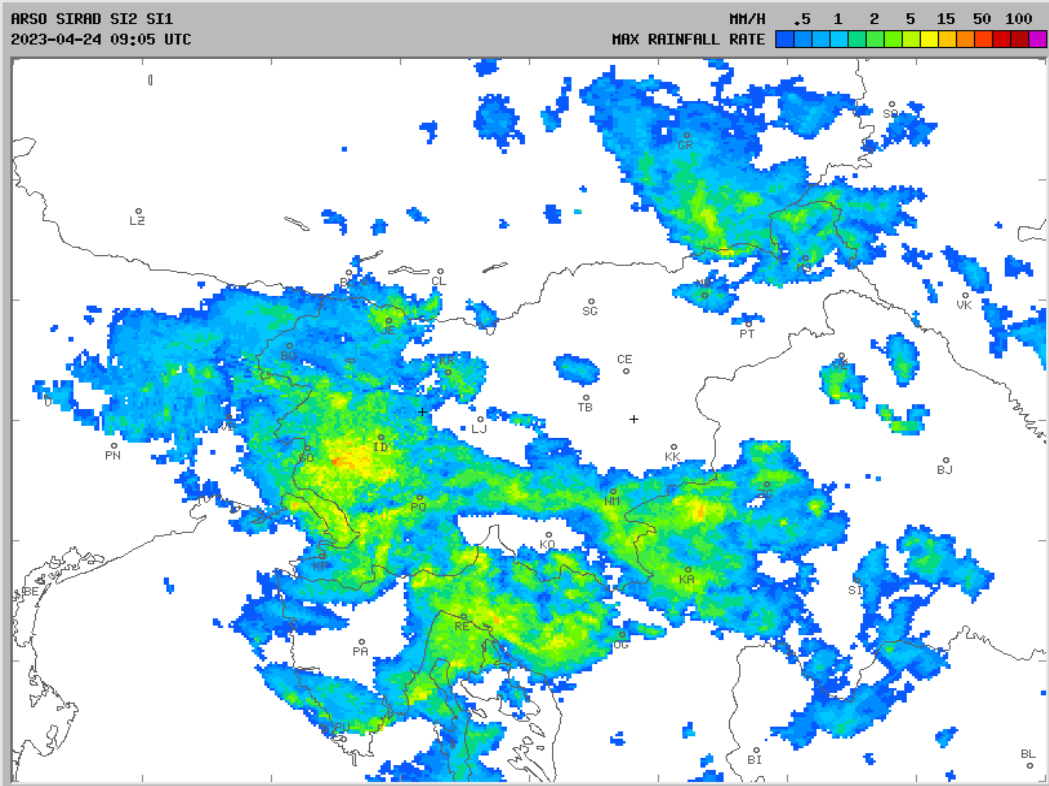
S

2022.09.08 domet 4km

2022Sep08-073240 EL=10.3° Smer=-1 10.0/29.5km

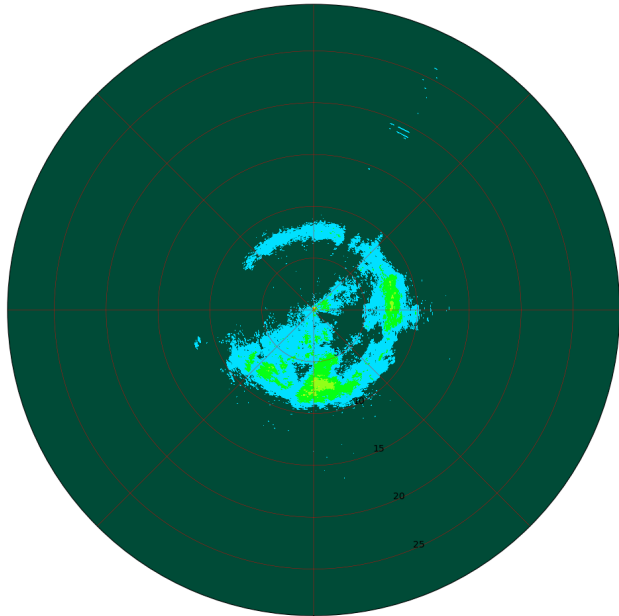


2022.09.08 domet 10km



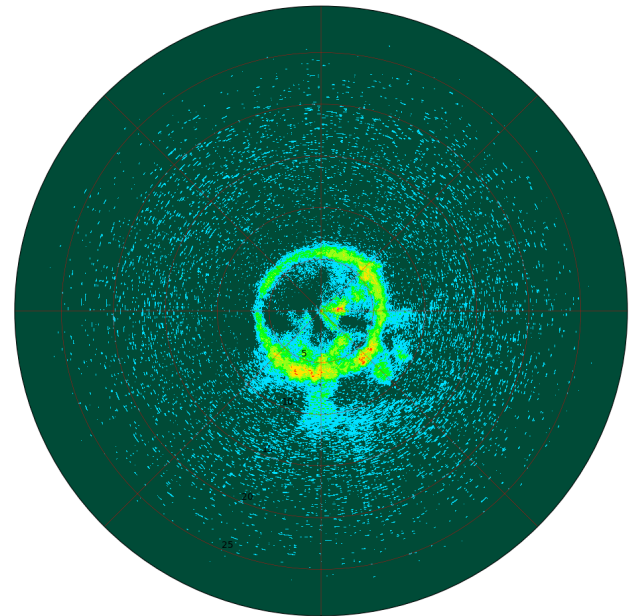
2023.04.24 ARSO

2023Apr24-090425 EL=15.0° Smer=-1 29.5/29.5km



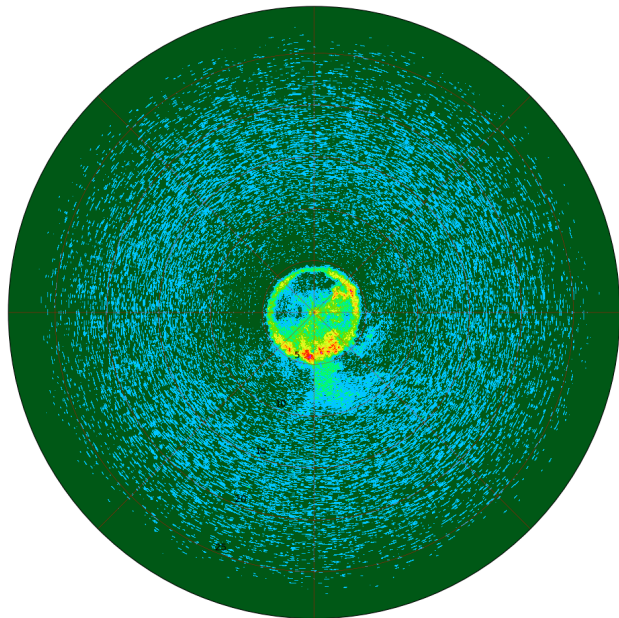
S

2023Apr24-085231 EL=20.5° Smer=1 29.5/29.5km

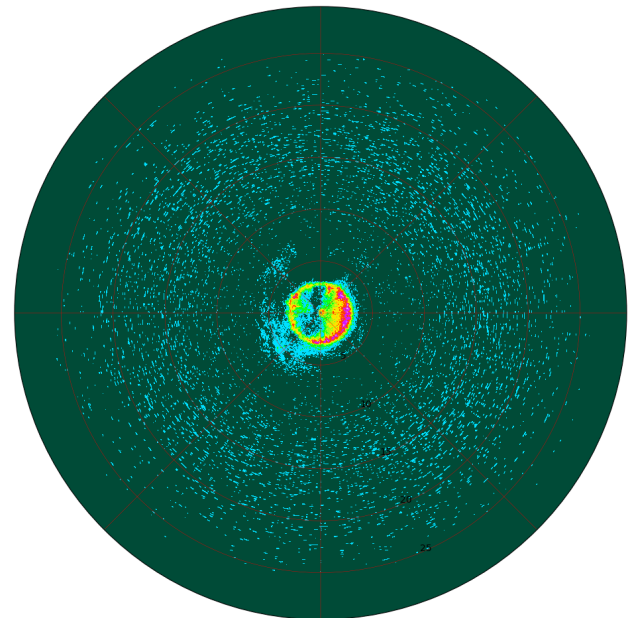


S

2023Apr24-085930 EL=30.8° Smer=1 29.5/29.5km



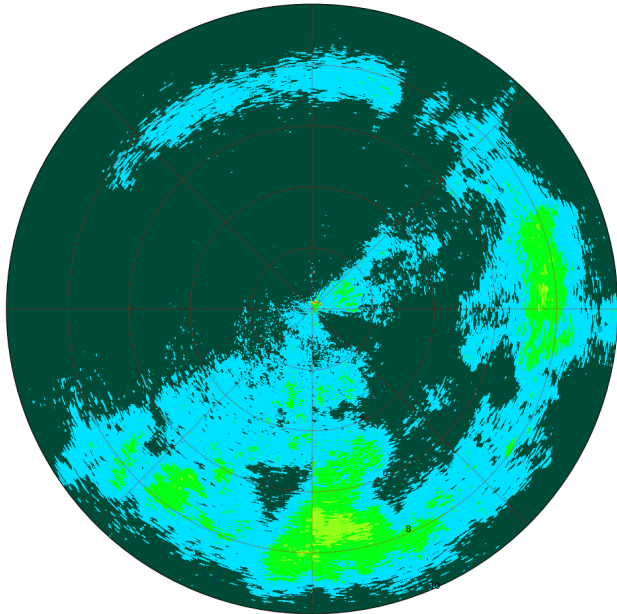
2023Apr24-094530 EL=45.0° Smer=-1 29.5/29.5km



S

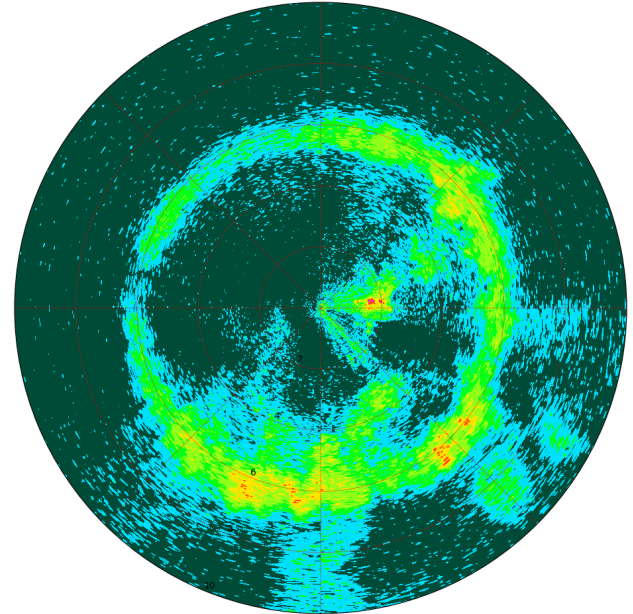
2023.04.24 domet 29.4km

2023Apr24-090425 EL=15.0° Smer=-1 10.0/29.5km



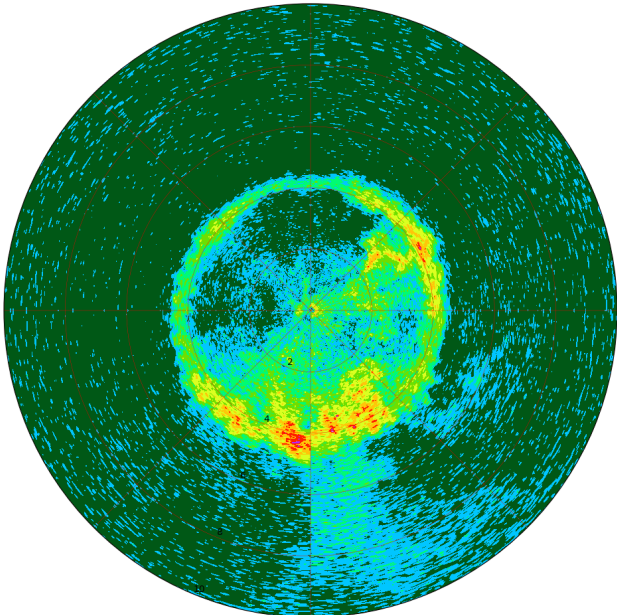
S

2023Apr24-085231 EL=20.5° Smer=1 10.0/29.5km

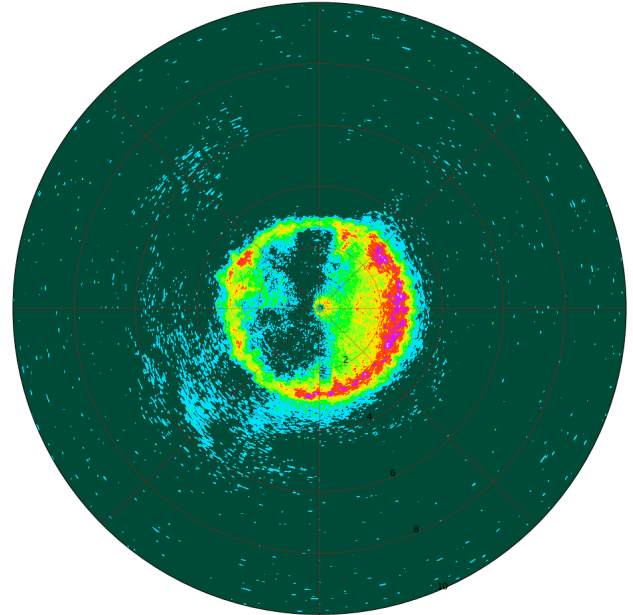


S

2023Apr24-085930 EL=30.8° Smer=1 10.0/29.5km



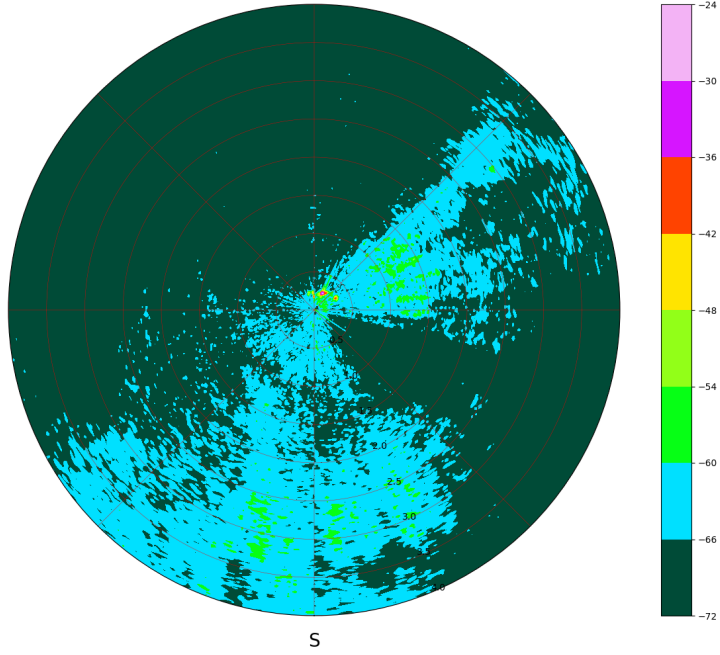
2023Apr24-094530 EL=45.0° Smer=-1 10.0/29.5km



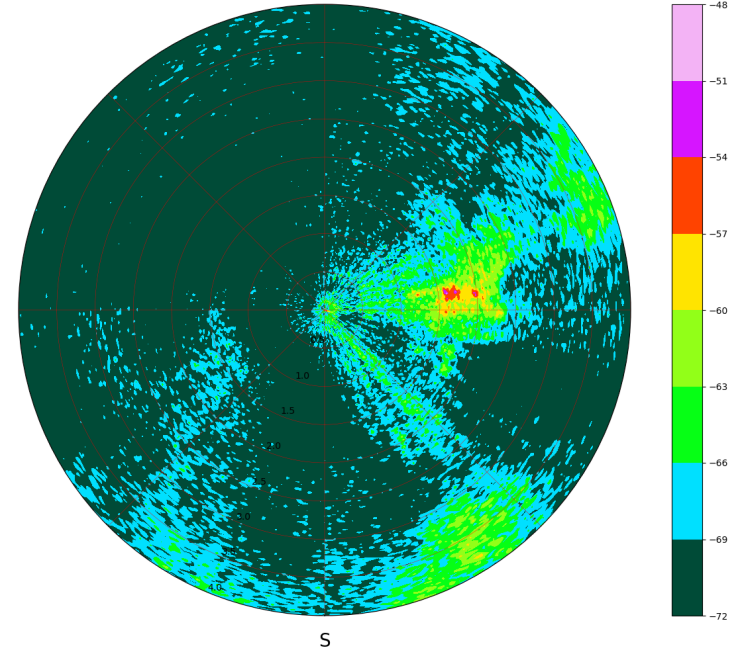
S

2023.04.24 domiet 10km

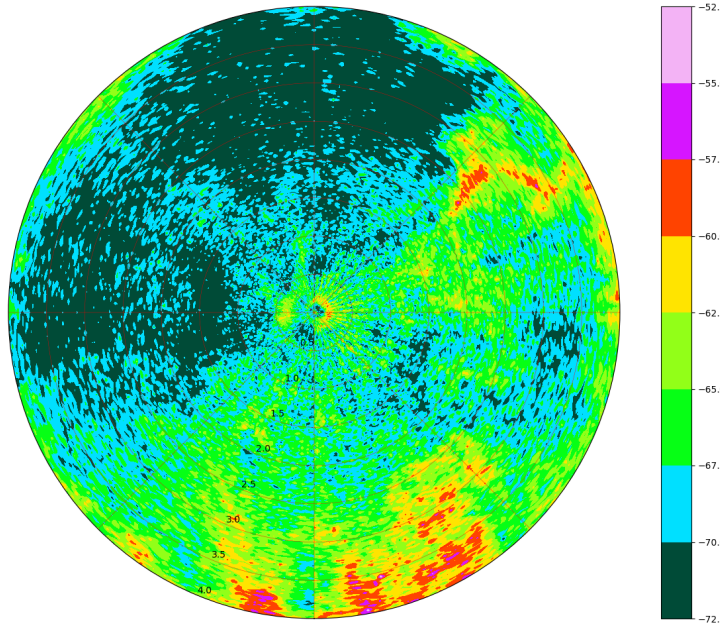
2023Apr24-090425 EL=15.0° Smer=-1 4.0/29.5km



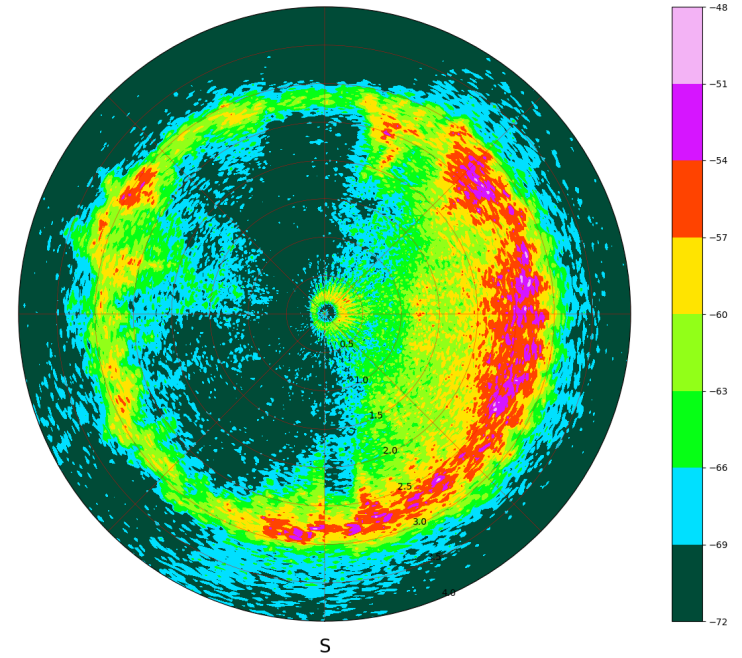
2023Apr24-085231 EL=20.5° Smer=1 4.0/29.5km



2023Apr24-085930 EL=30.8° Smer=1 4.0/29.5km



2023Apr24-094530 EL=45.0° Smer=-1 4.0/29.5km



2023.04.24 domet 4km