

QO-100

Geostationær amatørsatellit

Es'hail-2 satellitten



QO-100 er en – lille – del af TV satellitten Es'hail2, der sender TV programmer til Mellemøsten

QO-100 består af to lineære transpondere. Narrow Band og Wide Band. Begge må bruges af radioamatører!

FalkeilSat betaler og AMSAT DL bistår med kontrolstation mv.

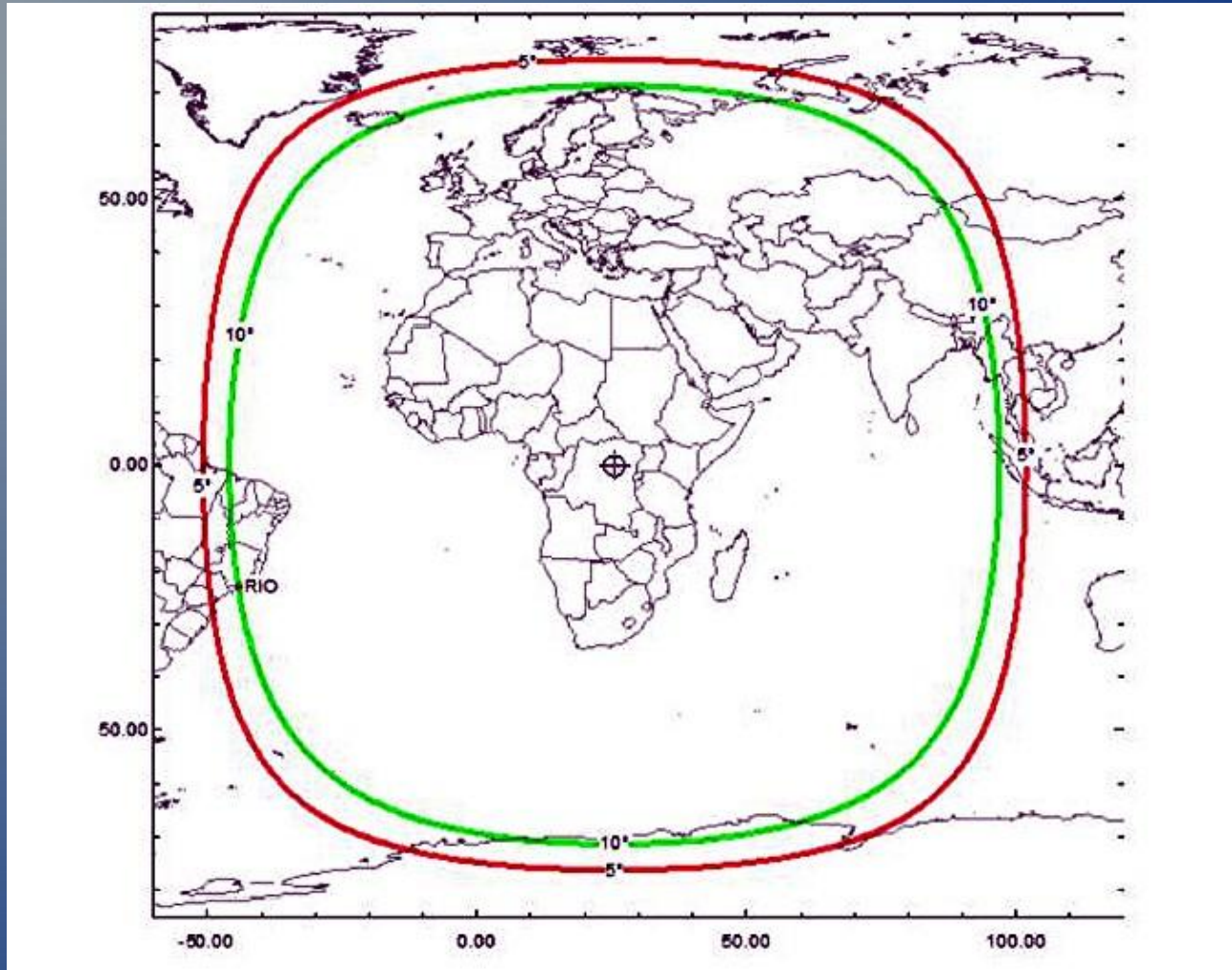
Opsendelse



Opsendt den 15. november 2018 fra Cape Canaveral.

Satellitten er placeret i geostationært kredsløb over Afrika.

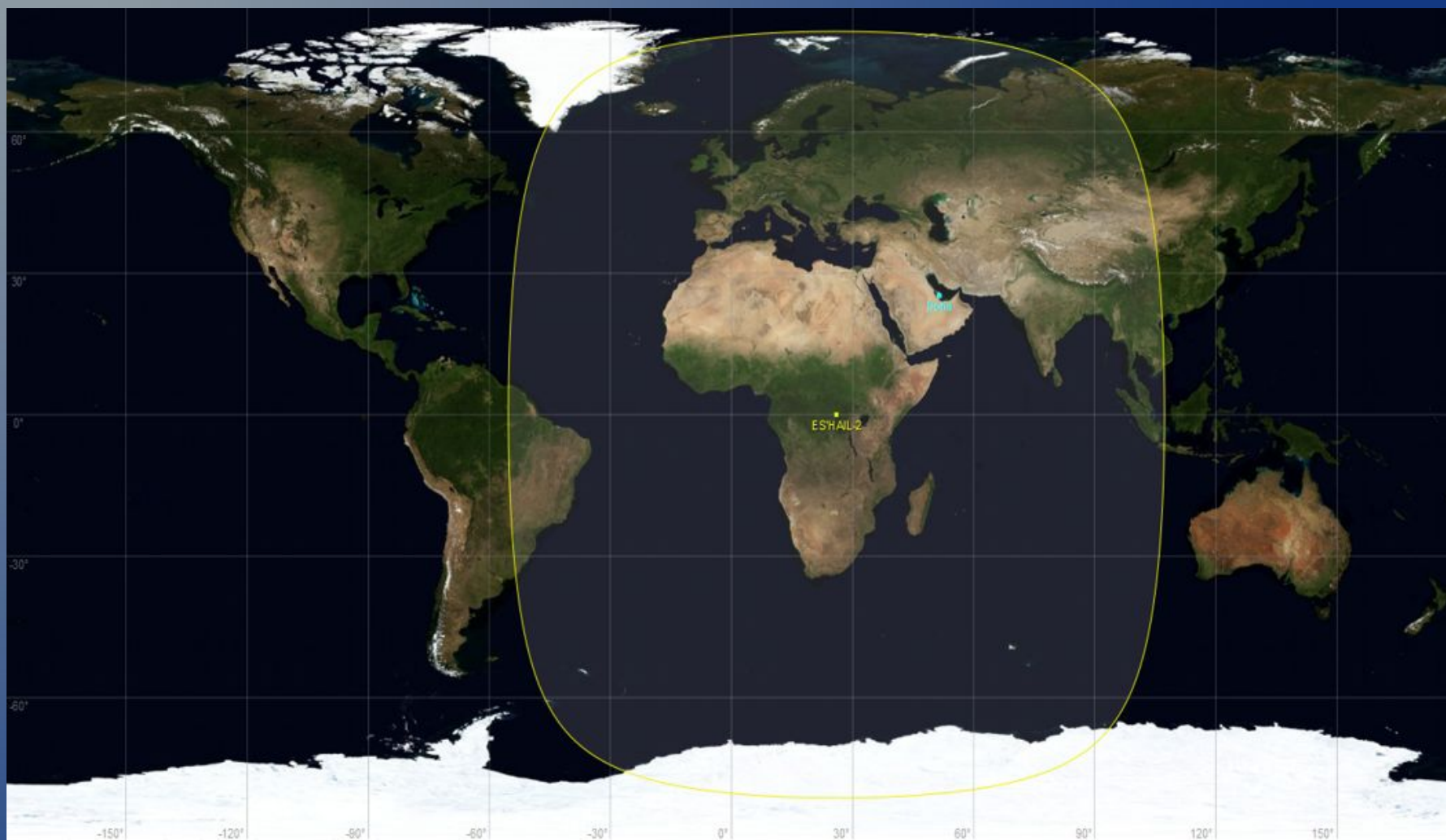
Placering og dækning



Fra en position over ækvator på 25,9 grader øst, dækkes ca. 1/3 af jordens overflade.

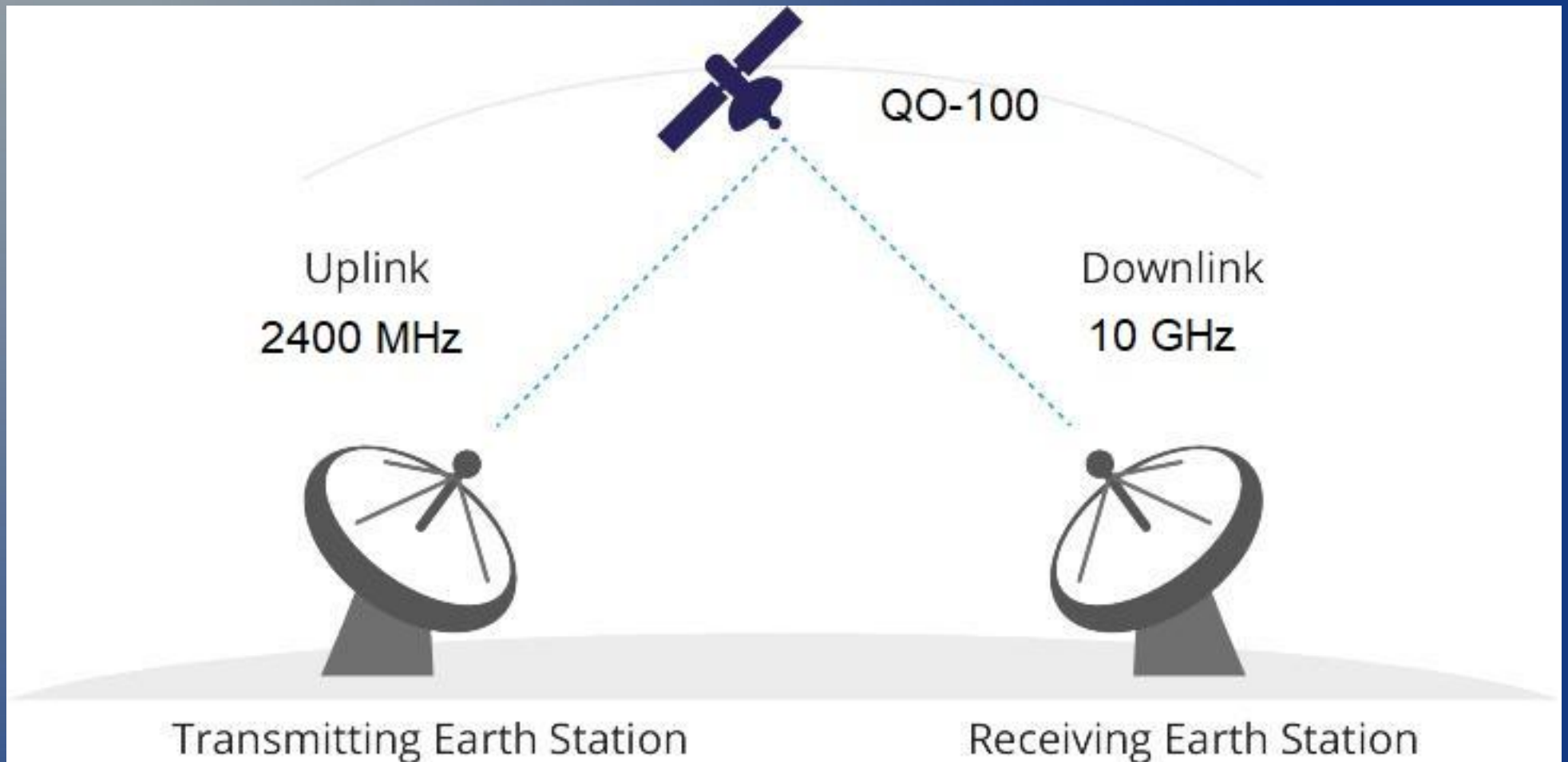
Rød streg angiver 5 grader elevation, grøn 10 grader elev.

Placering og dækning



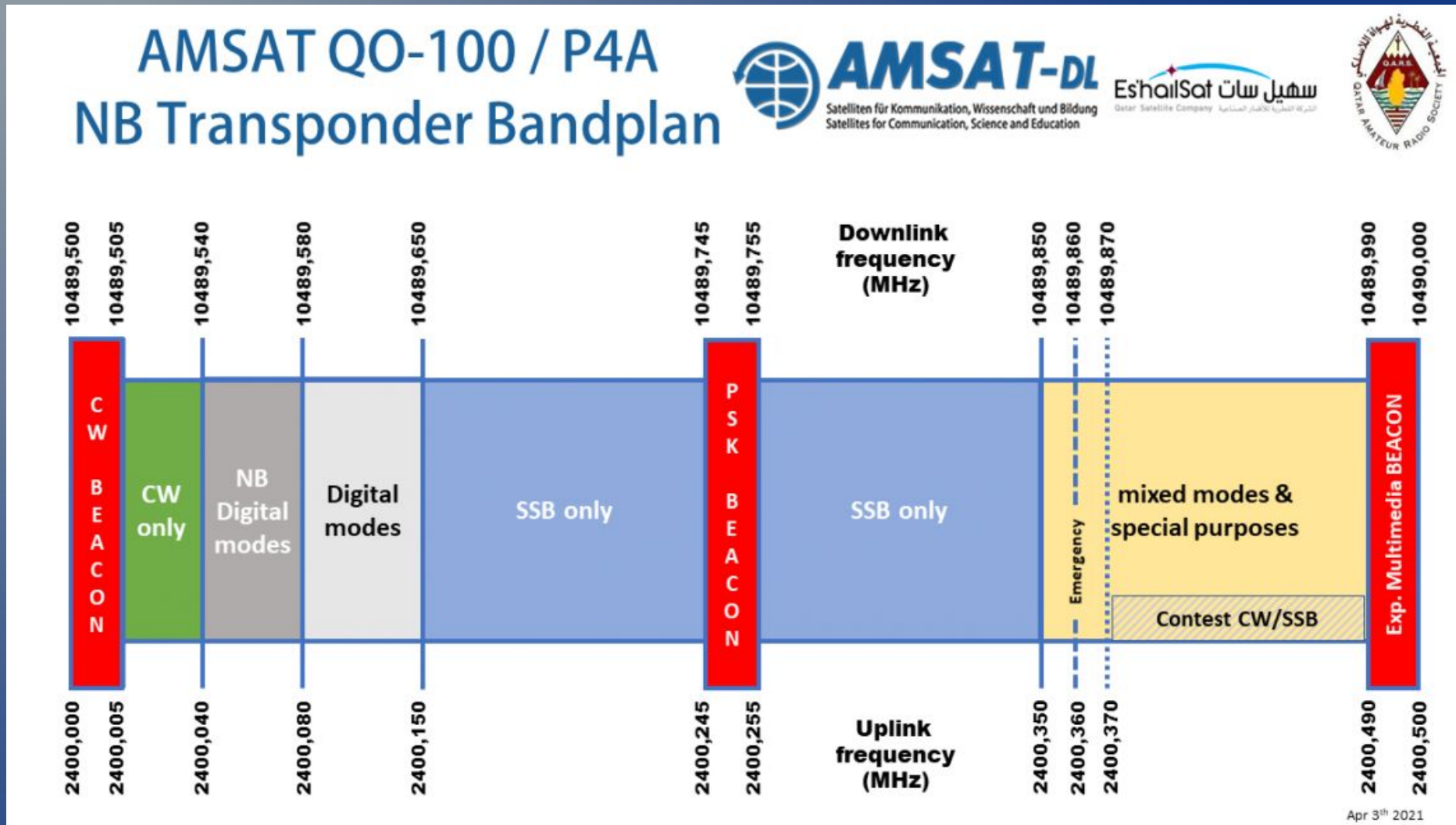
Dækningen ved 0 grader elevation – interessant for eksperimenterende amatører!

Frekvenser



Uplink på 2,4 GHz (13 cm) og downlink på 10,49 GHz (3 cm).
Narrow band transponder 500 kHz bred – CW, SSB, digimode
Wideband transponder 8 MHz bred – digital TV

Narrow Band - båndplan



500 kHz båndbredde – har aldrig været fuld belagt! (endnu)

Minimum setup for **SSB** communications:

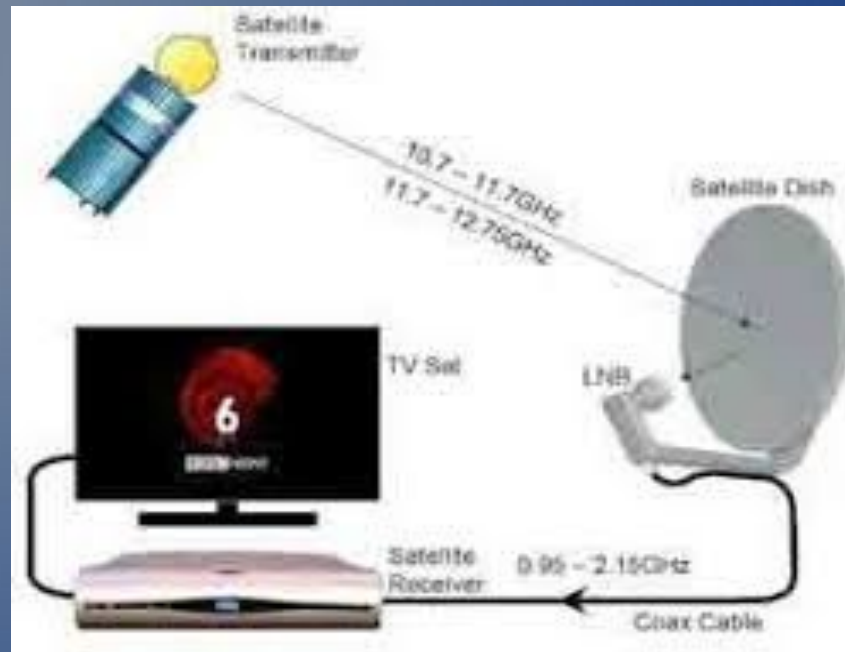
RX Antenna	60-90 cm SAT-TV dish
Receiver	LNB with power injector and DVB-T dongle + SDR software (for example SDR#) OR 3 cm LNA with downconverter to 70cm
Transmitter	10W PEP in 60-90 cm dish plus upconverter from 144 MHz

Minimum setup for **DATV** (DVB-S2) communications:

RX Antenna	60-90 cm SAT-TV dish
Receiver	modified LNB with standard satellite receiver box (DVB-S2) OR modified LNB with PCI DVB-S2 cards for PC use
Transmitter	25W PEP in 2.4m dish plus DVB-S2 modulator for a 2MSym/s videostream

Downconverter: 10,49 GHz til en modtager på 739/432/144/70 MHz
Upconverter: SSB/CW fra 70/144/432 MHz til 2,4 GHz

Modtages ligesom SatTV



SatTV modtages af millioner og elektronikken er billig og god. Vi kan bruge "standard" LNB og paraboler, uanset vores bånd ligger 200 MHz lavere end TV-båndet

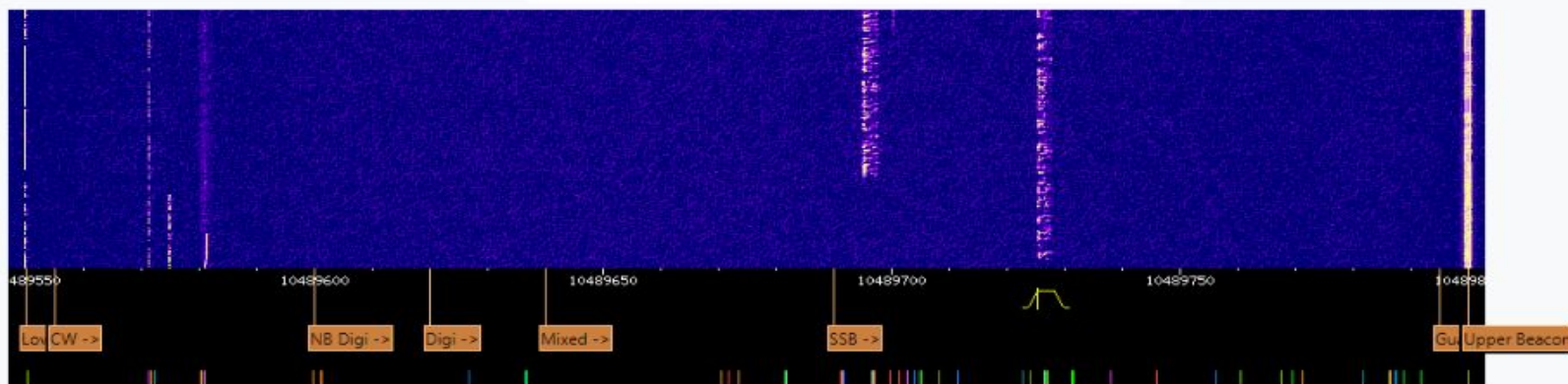
- i stedet for TV og set-top boks tilsluttes en SSB/CW modtager
- IF bliver 739,5 – 740 MHz

QO-100 WebSDR

You can read more about the WebSDR & Spectrum Viewer station at wiki.batc.org.uk/Es'hail-2 Ground Station

- For more details on Qatar-OSCAR 100 see amsat-dl.org/eshail-2-amsat-phase-4-a
- The QO-100 wideband spectrum monitor can be found here eshail.batc.org.uk/wb/
- More information about the WebSDR software can be found on www.websdr.org
- Dish Pointing Calculator & Map: eshail.batc.org.uk/point/
- [QO-100 Bandplan & Operating Guidelines](#)

View: waterfall blind Allow keyboard: Waterfall: HTML5 Sound: HTML5 [Click to start sound!](#) Narrowband listeners: 98



10489725.35 kHz labels
--- -- - + ++ +++
CW LSB **USB**

Memories:

recall erase store (new)

Filter: 2.70 kHz - +

squelch autonotch

Audio recording

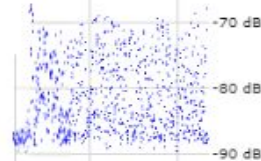
start



-87.7 dB; peak -67.9 dB;

Volume: mute

Signal strength plot: slow



Waterfall zoom

- +
>< <>

Speed: slow

Size: large

View: waterfall

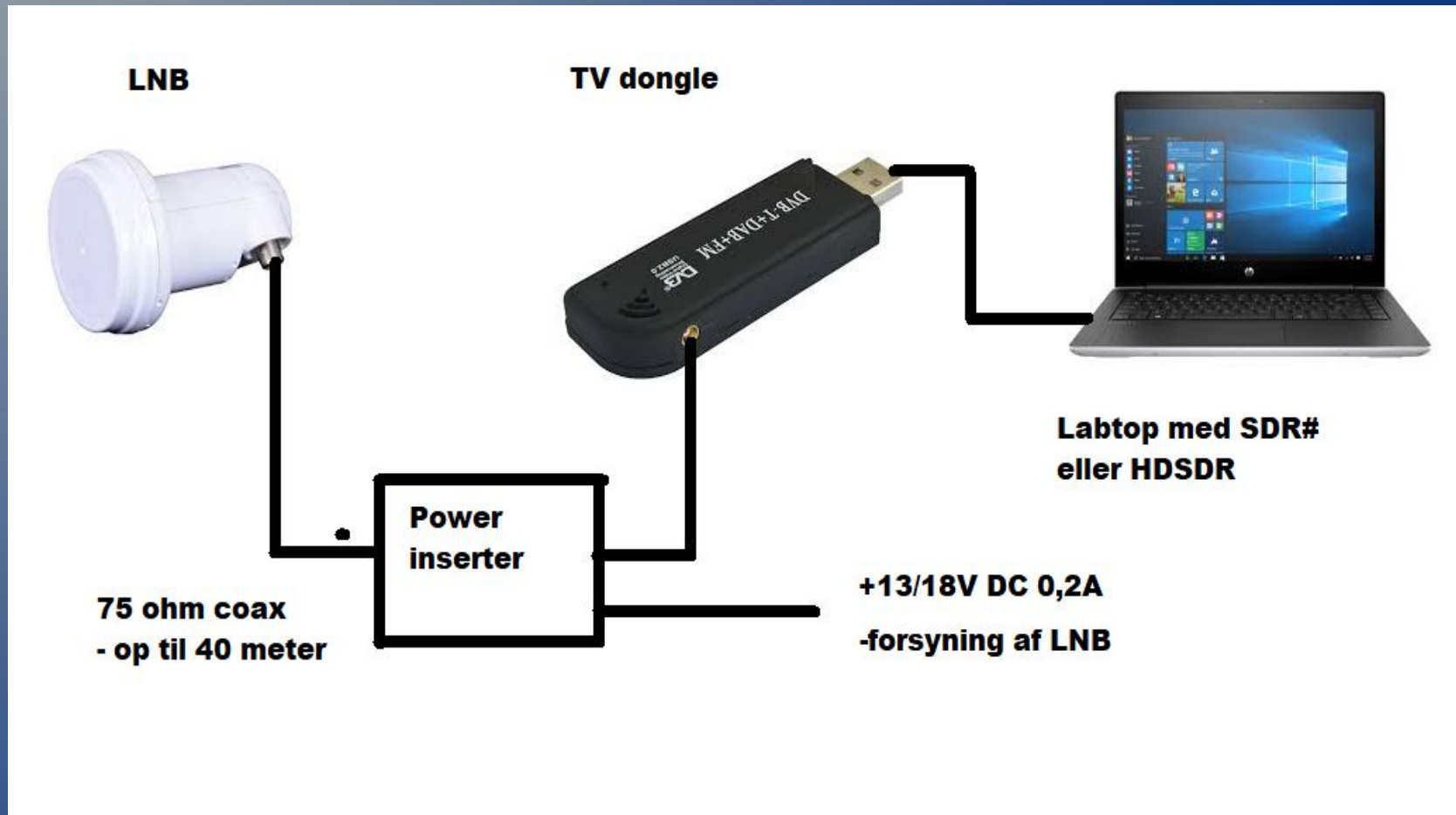
Goonhilly WebSDR: <https://eshail.batc.org.uk/nb/>

Udstyr til modtagning



Parabol – 60 til 90 cm – gammel TV parabol er fin
Sat-TV LNB'en skal være PLL type! (det er de idag)
TV dongle + PC med f.eks *SDR Console* eller *HDSDR* installeret.
- eller scanner som dækker IF frekvensen ca. 739 MHz

Opbygning

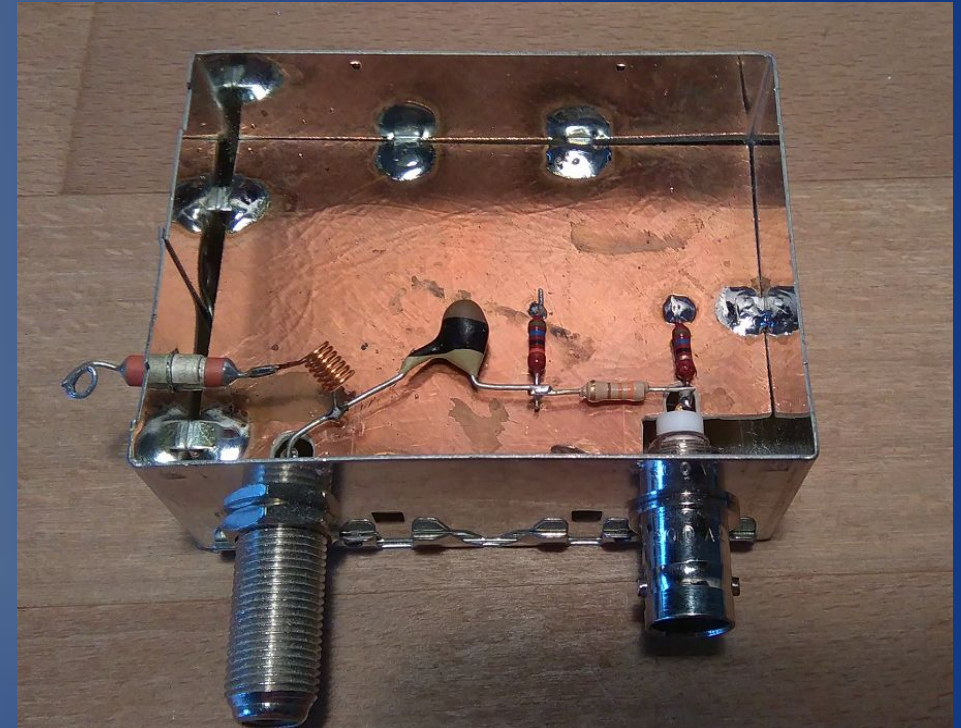
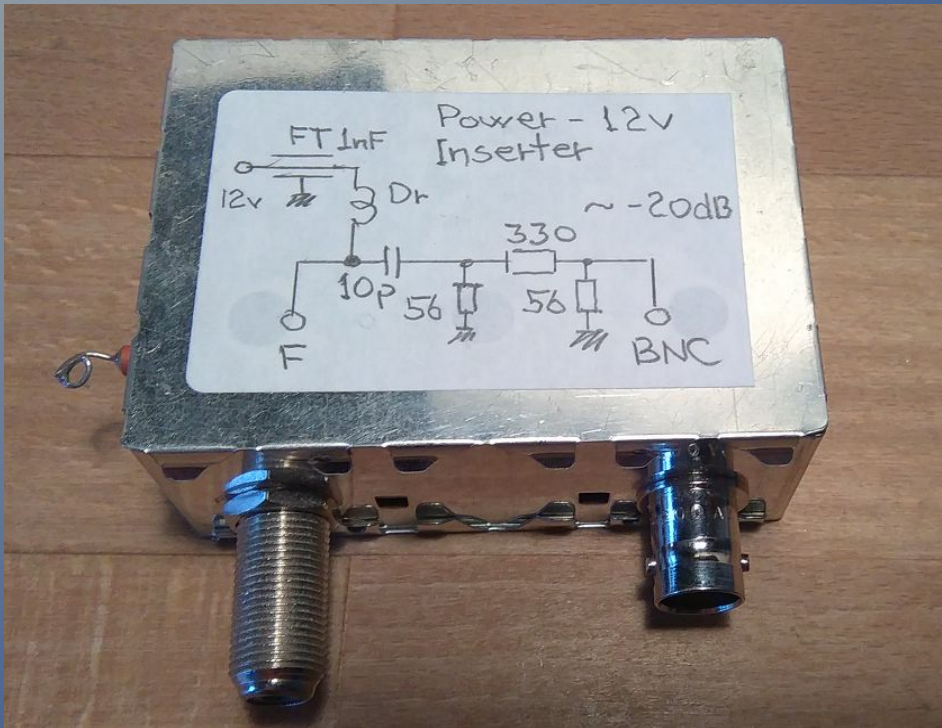


LNB anbringes i parabolens brændpunkt

Power inserter forsyner LNB med 13/18V igennem coaxkablet

Coaxkablet kan være op til 40 meter uden problem

Power inserter

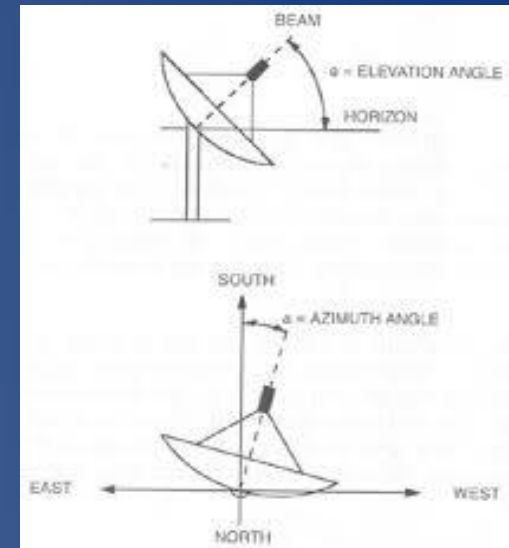
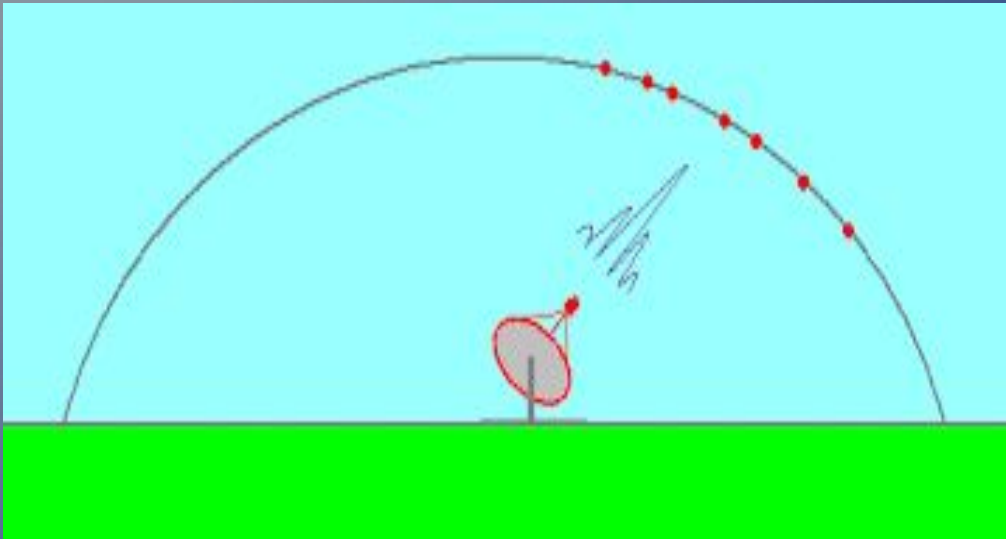


Forsyner LNB'en med spænding

Output fra LNB 739,5 - 740 MHz føres igennem 10 pF til modtager
Dæmpeled 20 dB da LNB har >60 dB forstærkning

Bygget som "fuglerede". Ikke kritisk

Indstilling af antenne

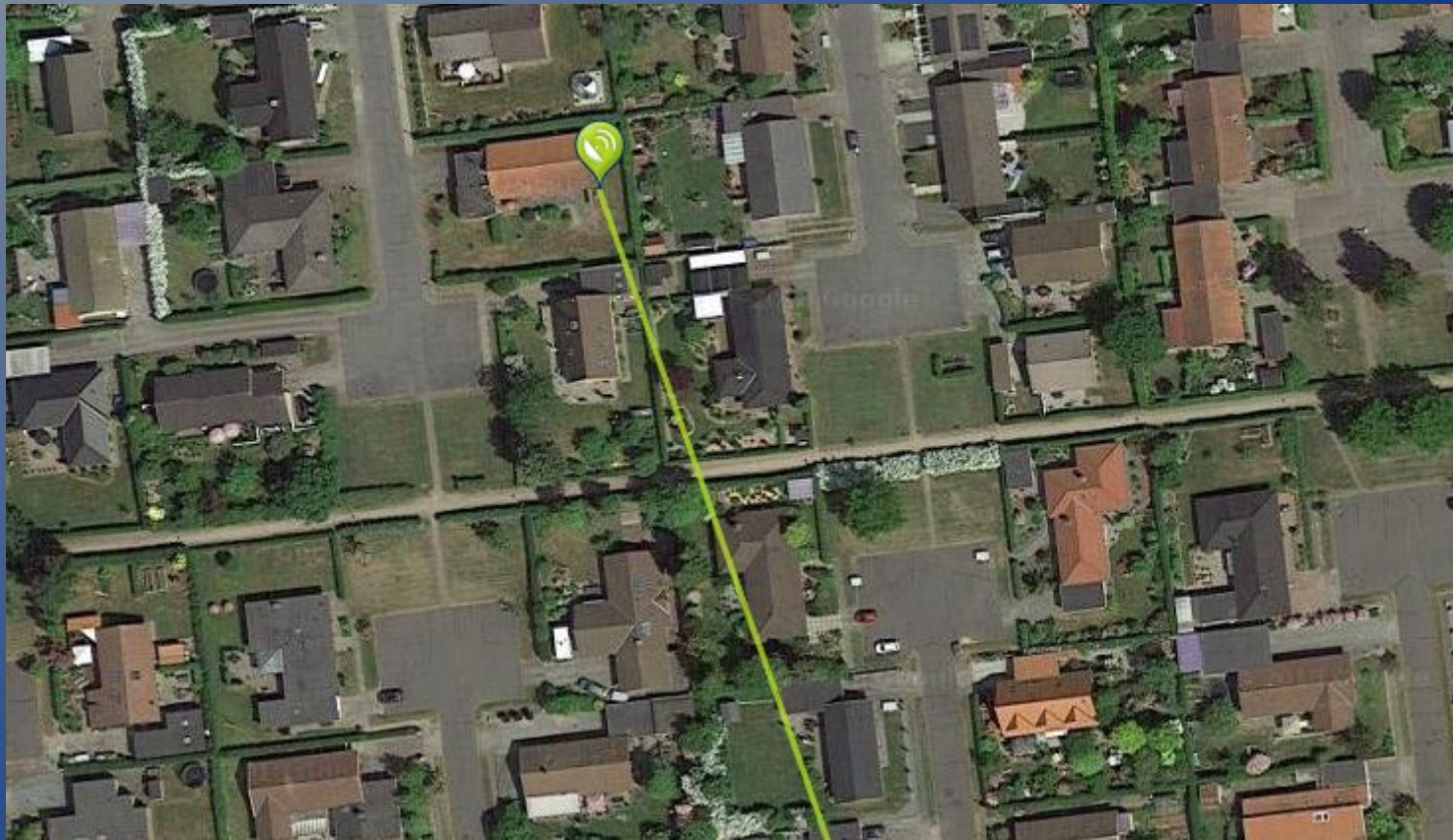


- Elevations vinkel = "højde"
- Azimuth vinkel = "kompasretning"
- SatFinder "kan" bruges?

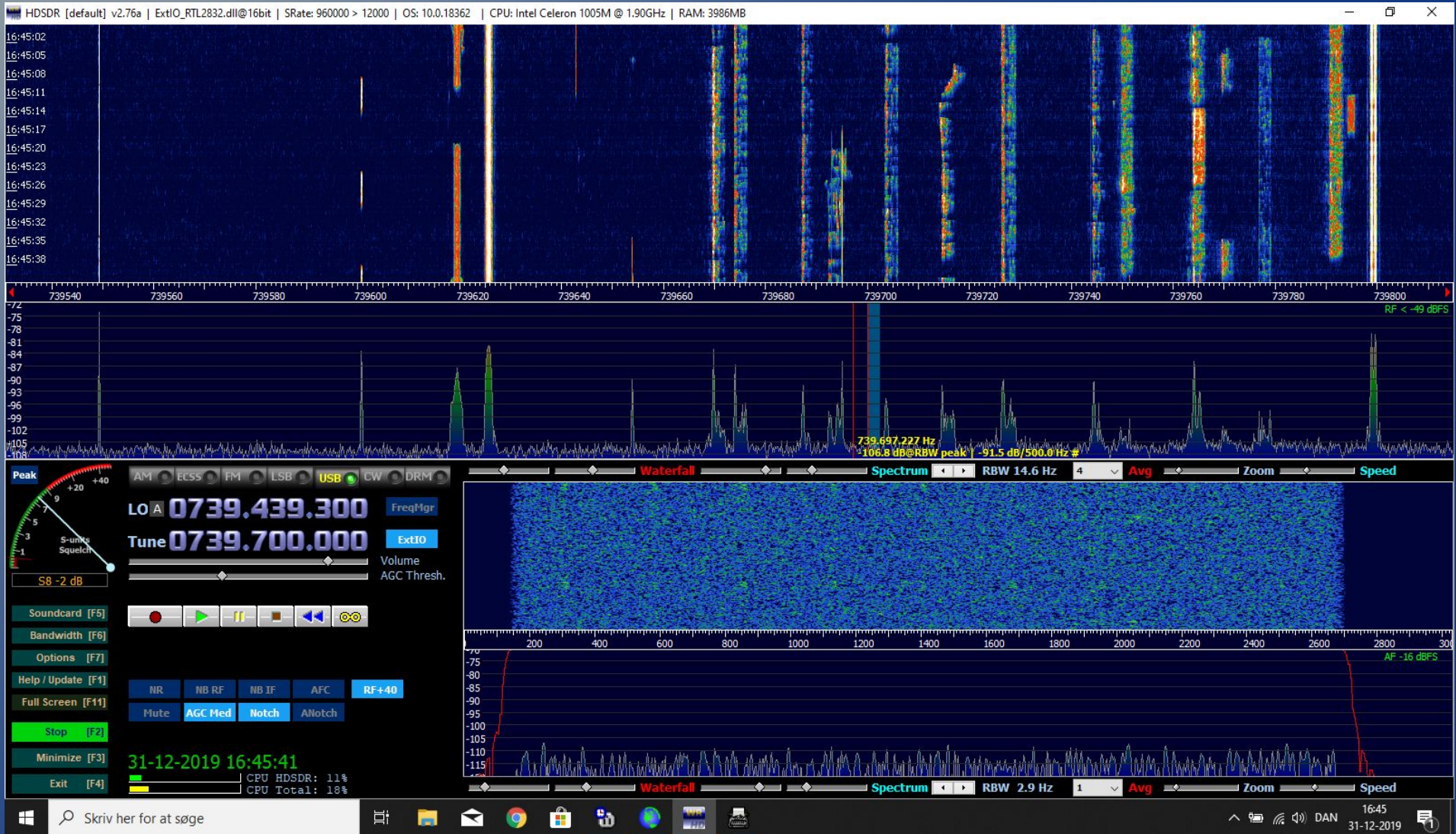


Hvordan finde retning?

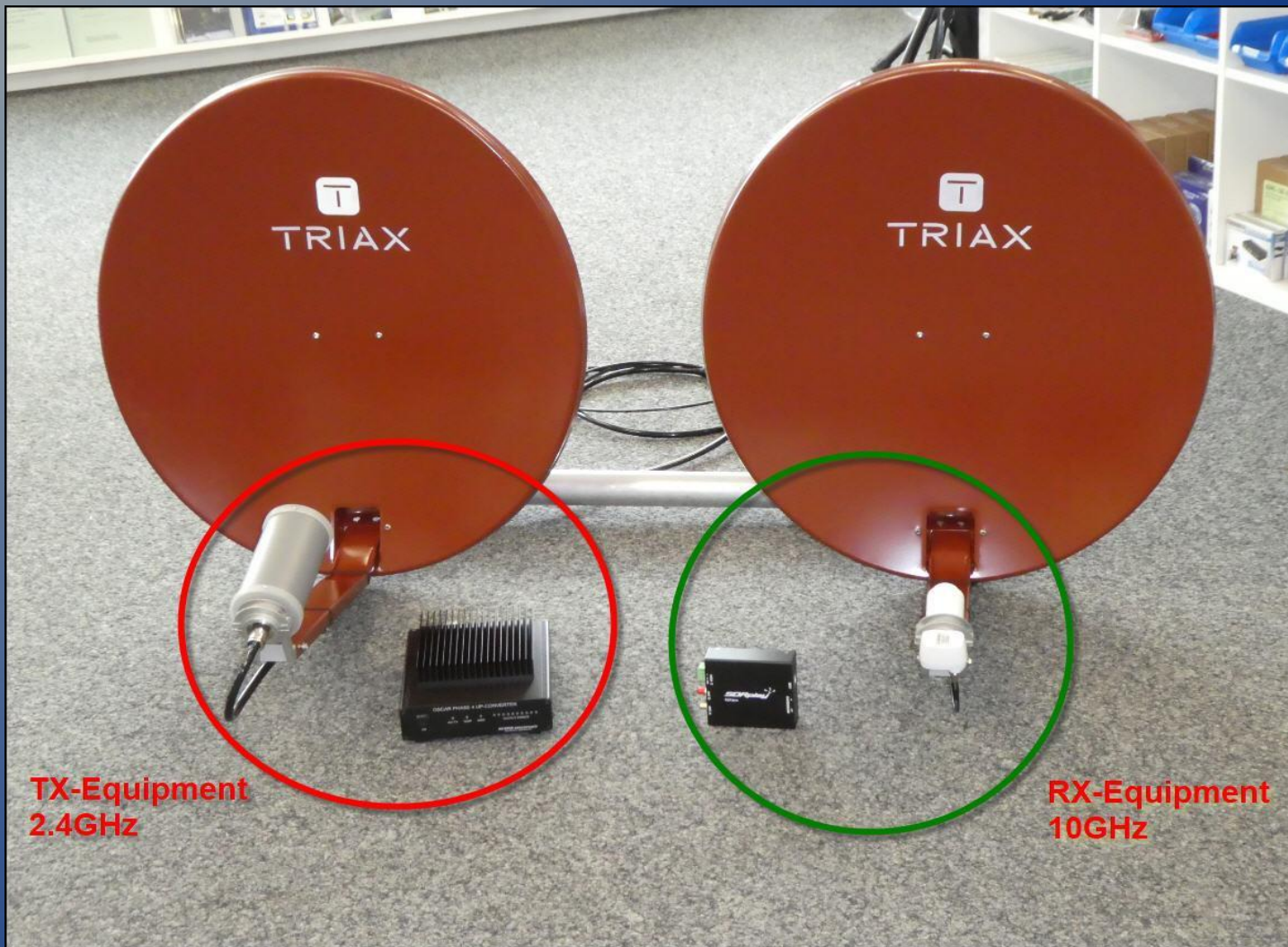
Internettet: www.dishpointer.com - giver Az, El og et kort



Aktivitet – stadig ledige pladser!



Udstyr til QO-100



**TX-Equipment
2.4GHz**

**RX-Equipment
10GHz**

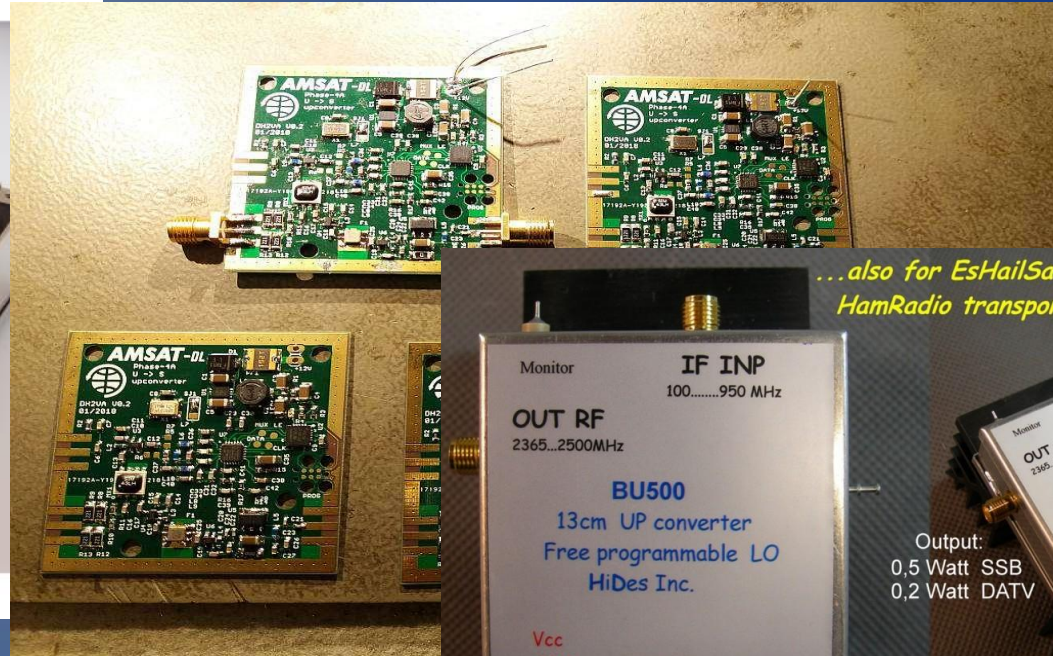
Købe færdigt – komplet sender, modtager og antenner.

Udstyr til QO-100



Købe færdig up-converter og LNB med 23 cm IF (DB6NT).

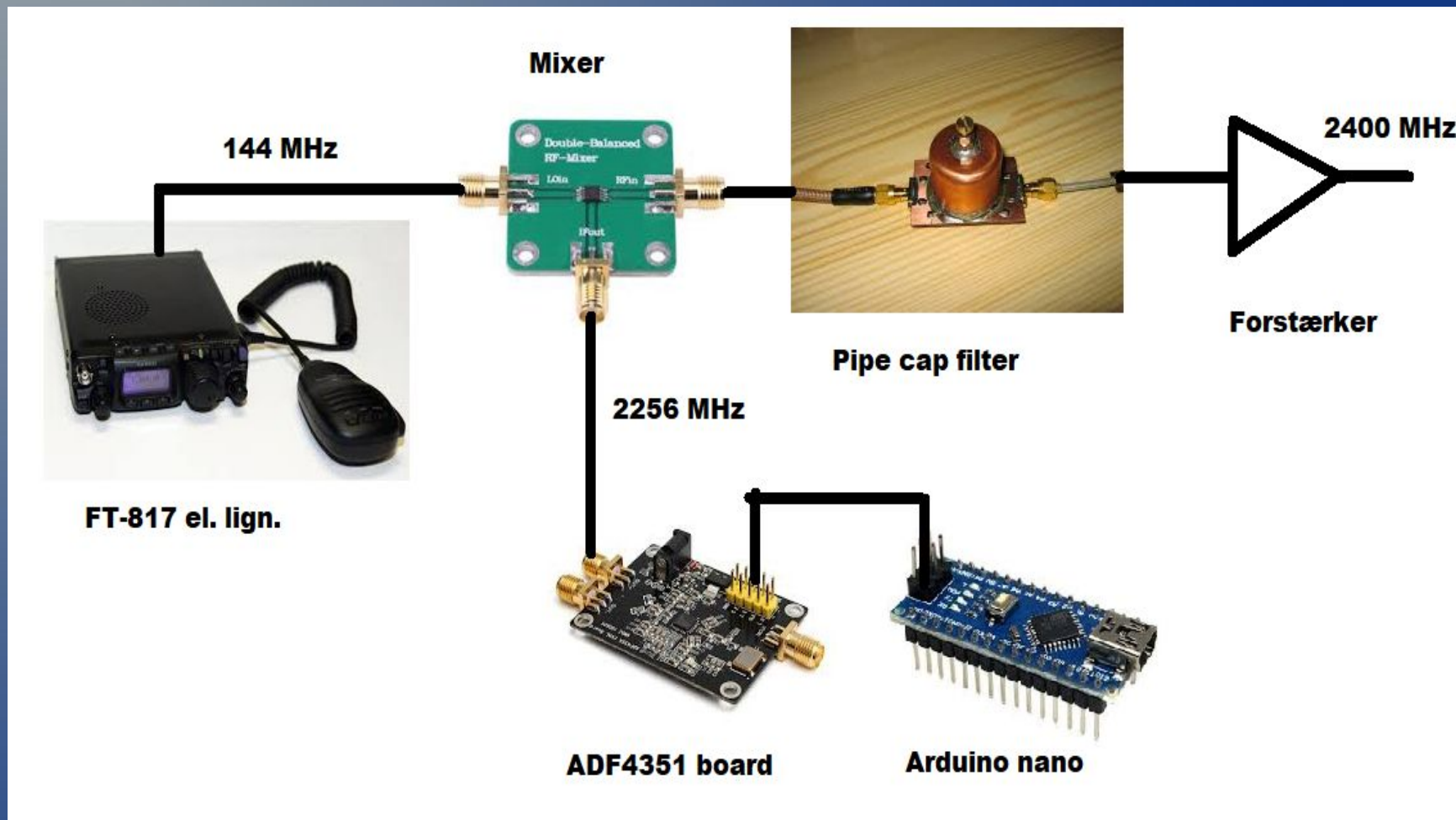
Upconverter til 2400 MHz



SG Lab 13 cm transverter. RX og TX
AMSAT DL up/downconverter
DX Patrol – løsninger til RX og TX
BU-500 upconverter – kun TX
Flere udbydere af PA-trin i 10-20 W

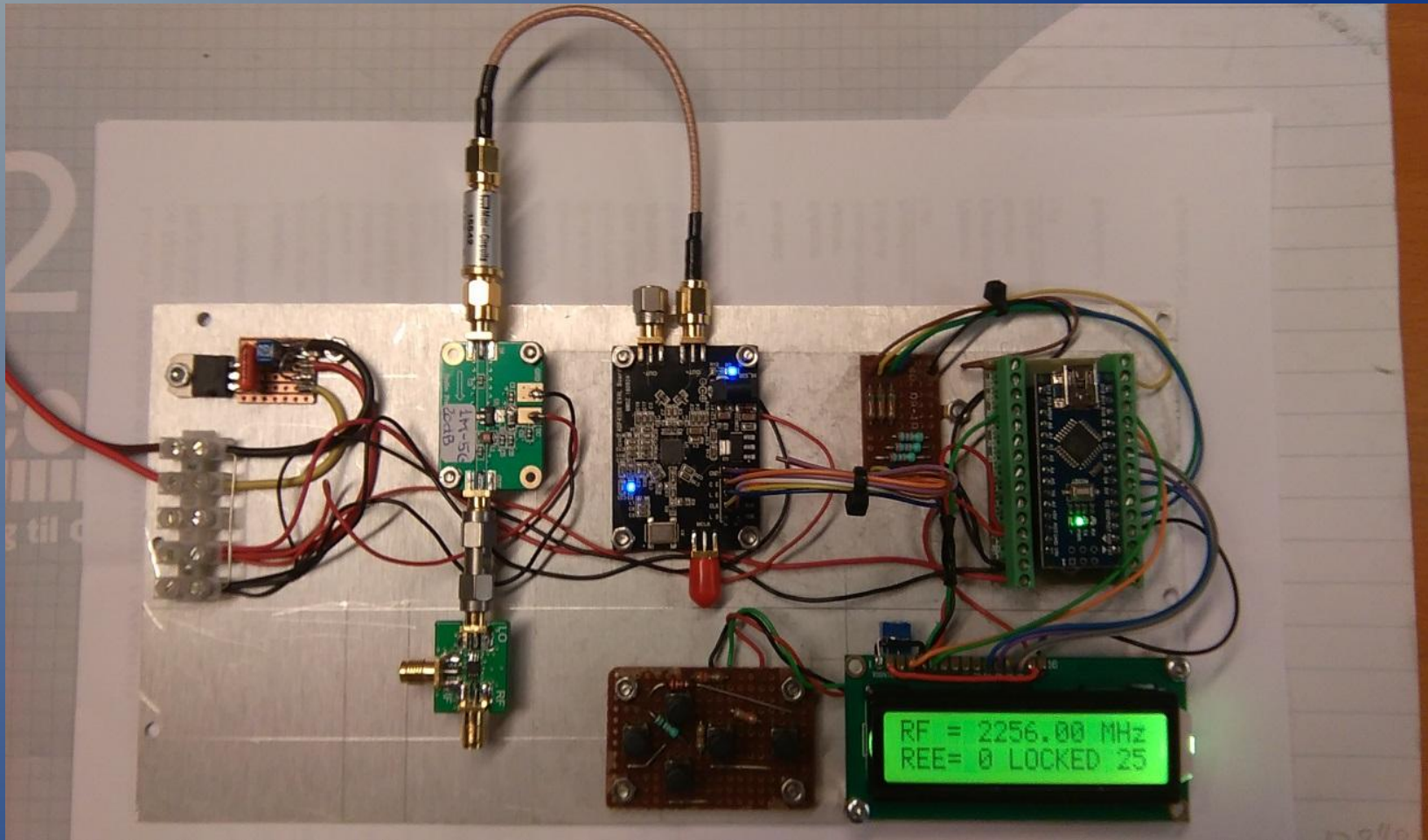


Byg-selv upconverter til 2400 MHz



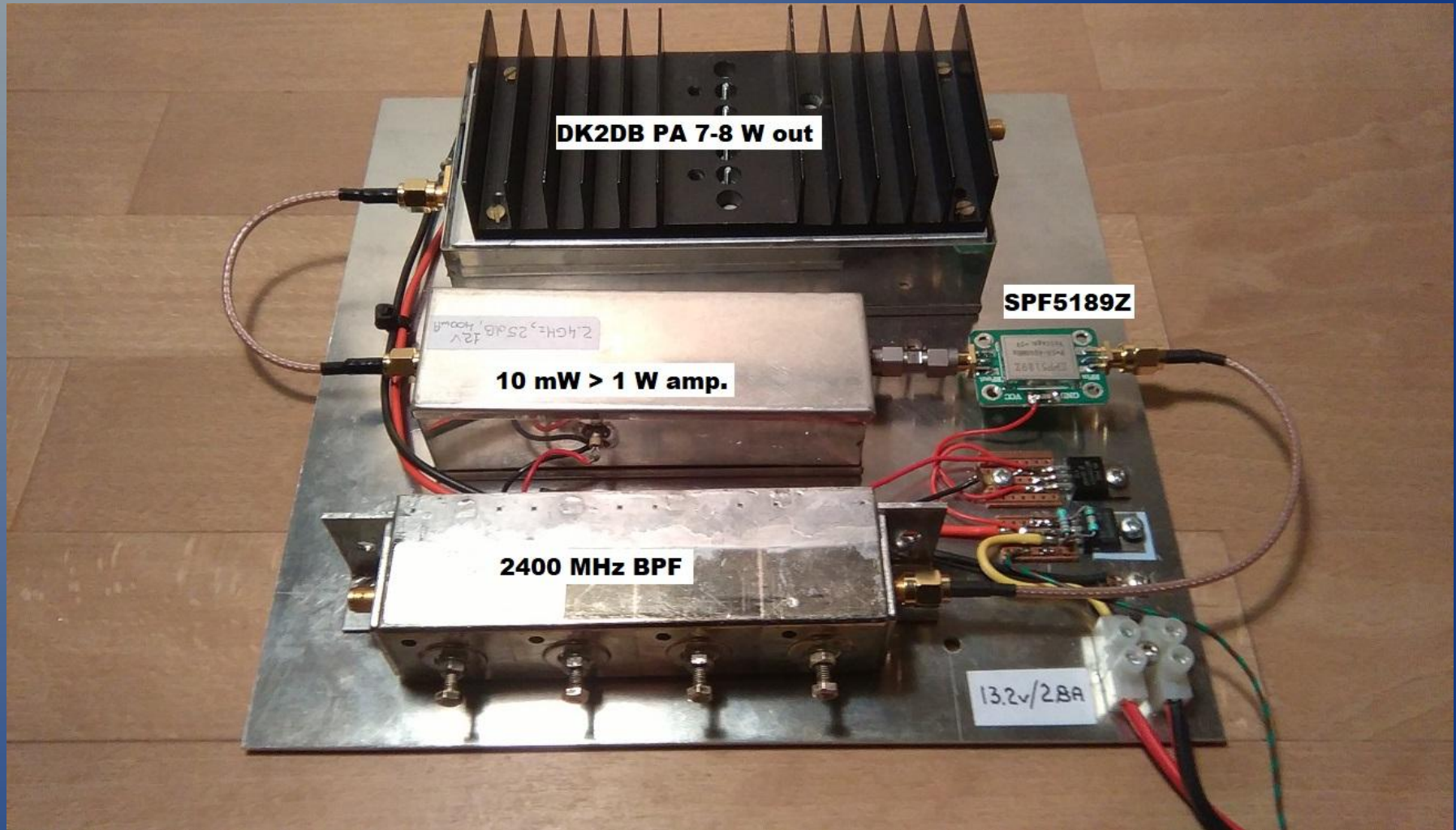
Upconverter 144 til 2400 MHz. Samlet af moduler fra Kina.

Breadboard - upconverter



- Upconverter 144 → 2400 MHz af "Aliexpress stumper"
- High level bredbånds mixer. Output 2400 MHz ca. 1 mW
- Efterfølgende skal LO og spejl filtreres væk

Genbrug af "gamle" 13 cm moduler



- BPF fjerner LO og spejl. Moduler fra gamle 13 cm projekter.

Antennetyper

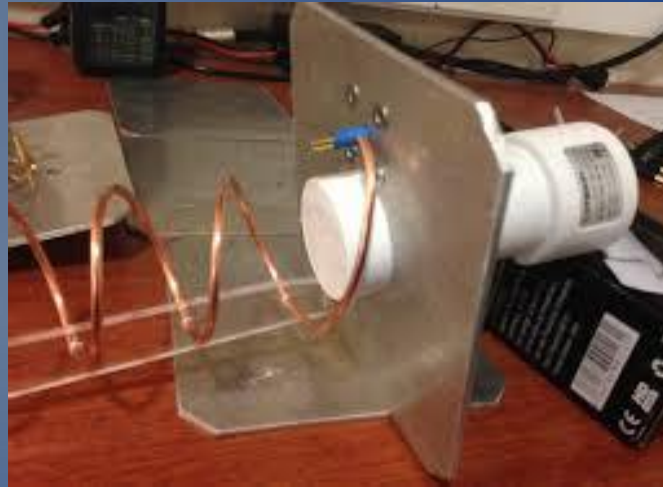
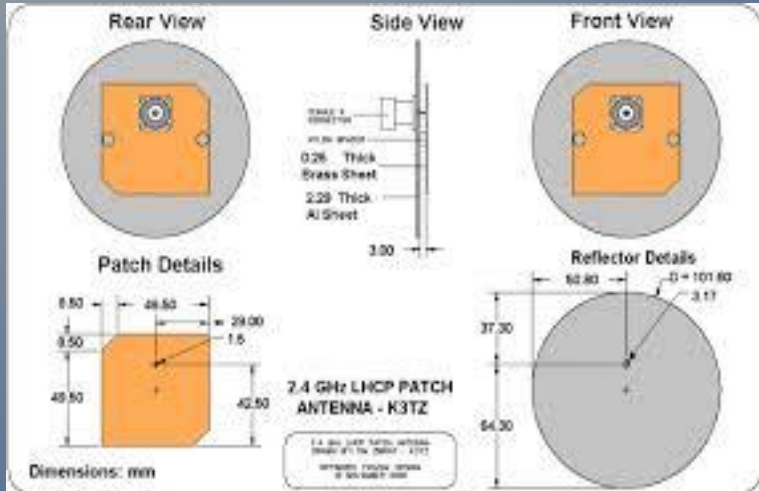
- Uplink 2400 MHz:
- 22-23 dB gain og 4W
- Cirkulær polarisering RHCP
- (-eller lineær og mere pwr)
- (-eller yagi og endnu mere pwr)



- Downlink 10,49 GHz:
- 60-90 cm parabol
- Lineær polarisering
- Man kan godt bruge samme antenne – parabol – til både up- og downlink

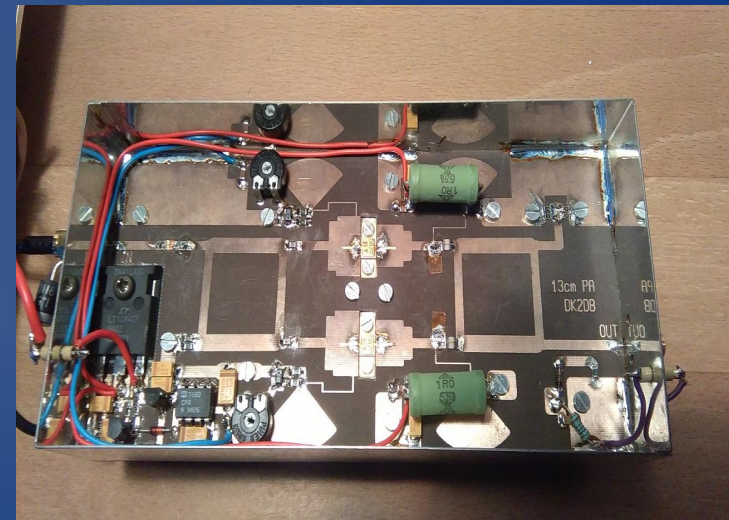
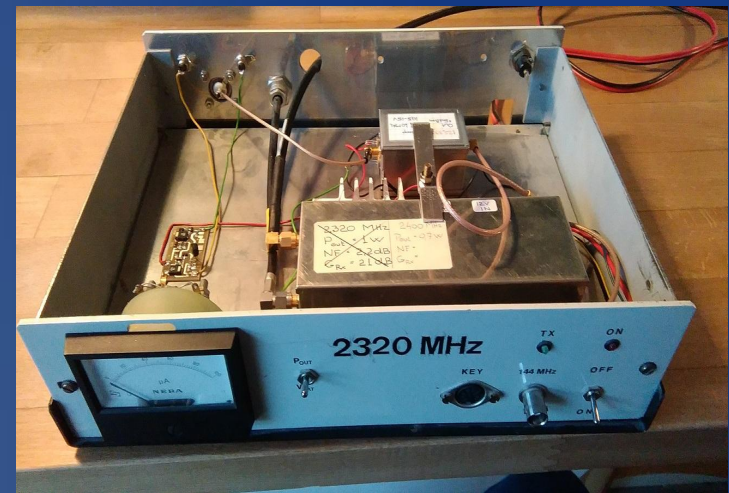


Fødeantenner



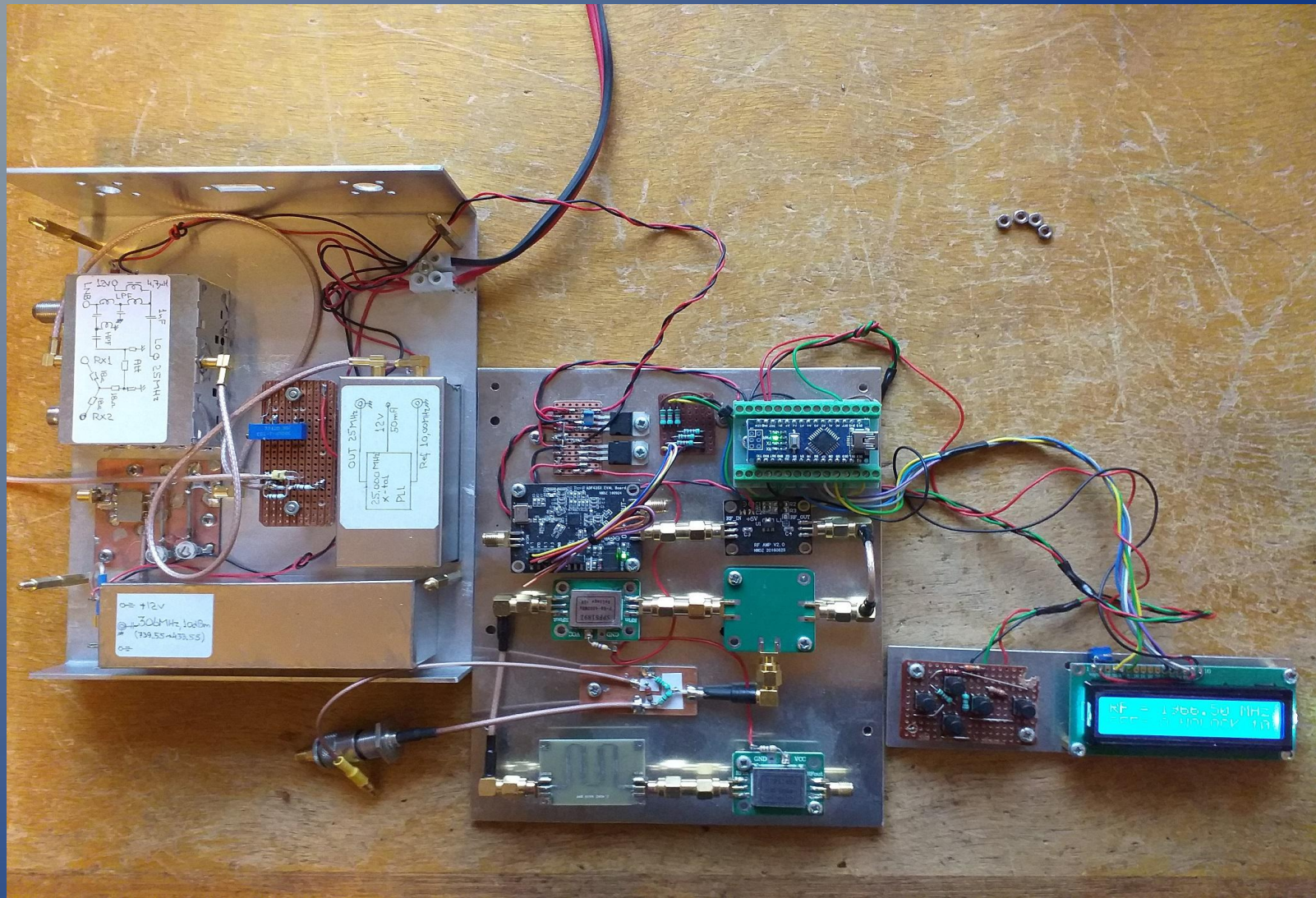
- Uplink 2400 MHz er cirkulær RHCP. Lineær feed mister 3 dB
- Patch- og helical antenner kan give cirkulær polarisering
- Downlink 10,4 GHz er lineær "vandret" polariseret. Passer med LNB, så ikke noget problem (-dog husk skew)
- Kombi fødeantenne helical+LNB og patch+LNB kan bygges
- Med kombifeed skal der kun bruges én parabol!

Mit 1. setup



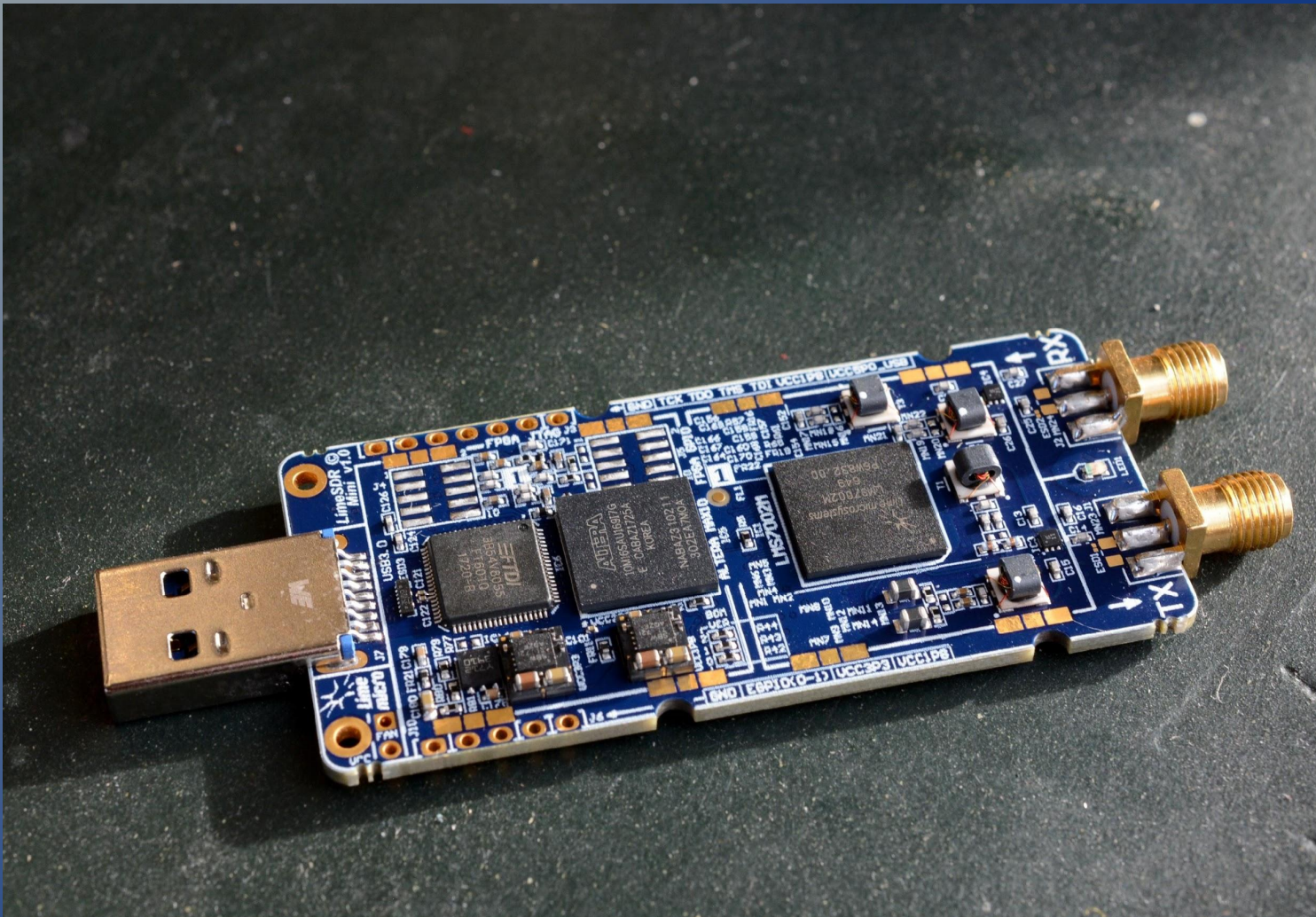
- 85 cm SatTV parabol og 1 m prime focus netparabol (lin pol.)
Fuld duplex: RX 10,49 GHz LNB + TV dongle, TX modificeret
13 cm transverter og ca. 7 W PA.

Portabel setup - 432 MHz IF



- Baseret på "Kina-stumper" og IF 433,50 til 433,80 MHz. (IC-705)
- Uplink 433,5 til 2400,5 MHz. Down 10489,5 til 739,5 til 433,5 MHz

Løsning med SDR



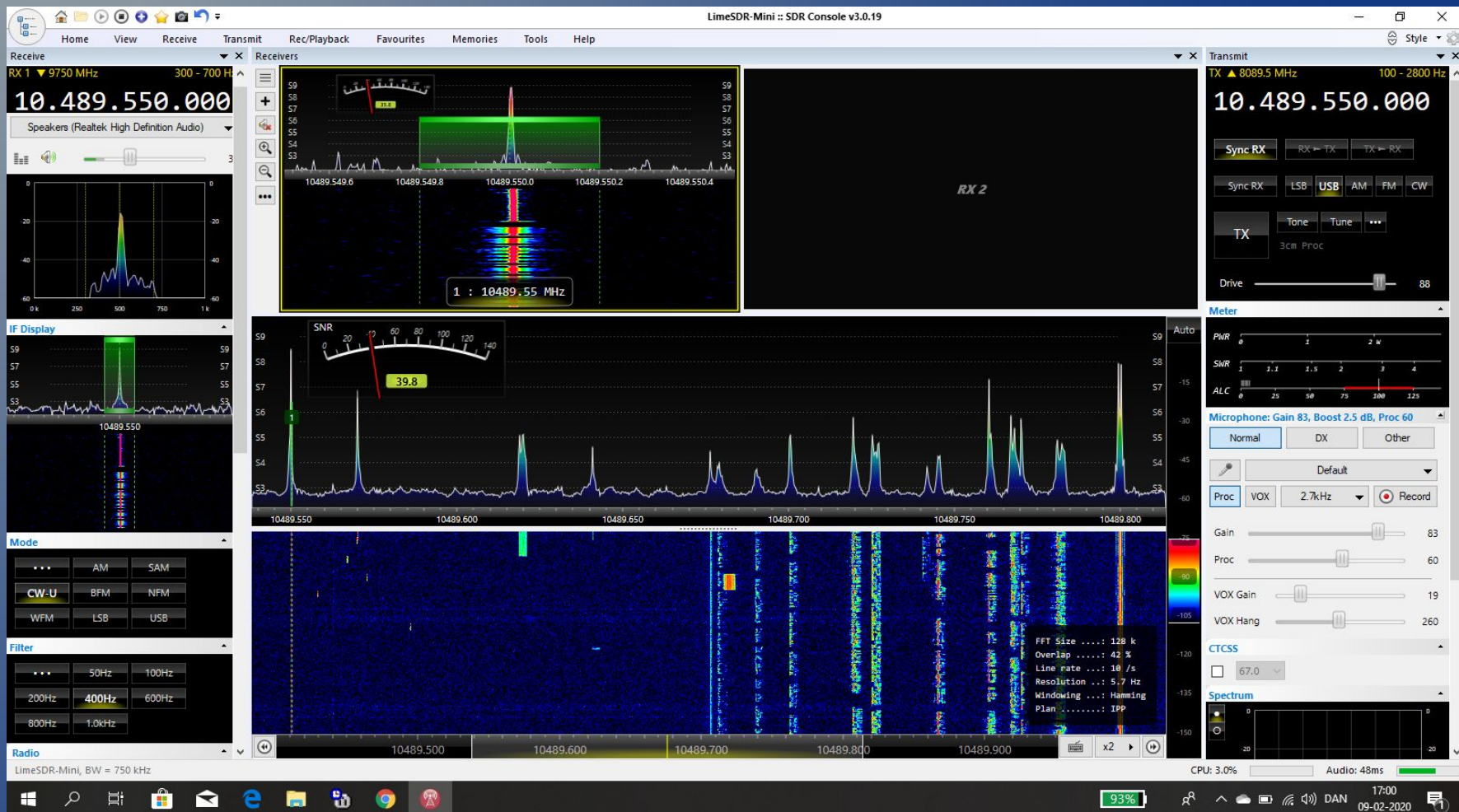
- Lime Mini er en fuld duplex SDR i området 10 – 3500 MHz. Kan køre alle modes incl. DATV. Kan bruges til meget andet end QO-100. Pris 199 \$.

Løsning med SDR



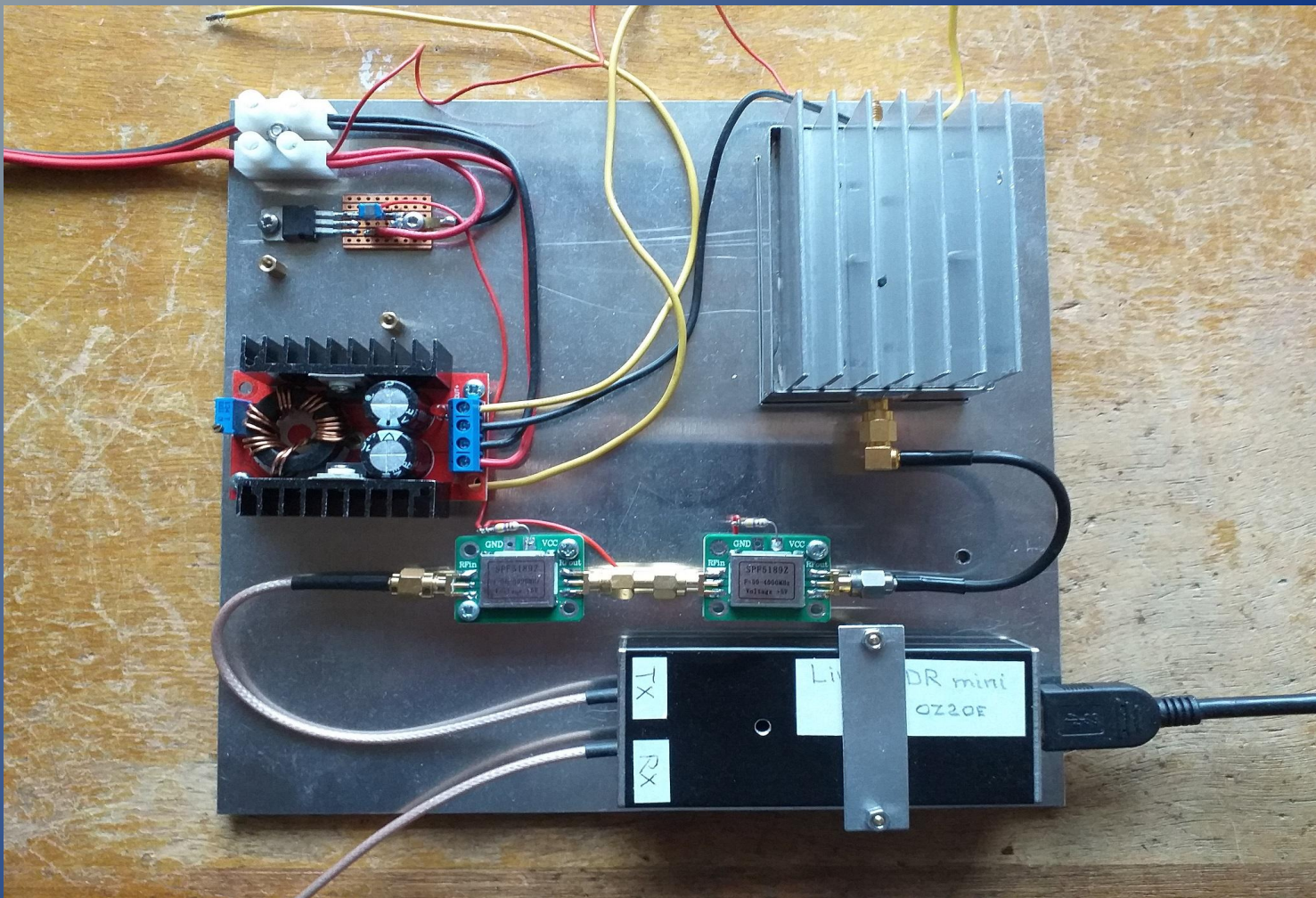
- Analog Devices PLUTO en fuld duplex SDR i området 325 MHz – 3,8 GHz. Meget brugt på QO-100. Pris ca. 1350 kr.

Løsning med SDR



- Programmet SDR Console bruges i forbindelse med SDR løsninger baseret på Lime Mini eller PLUTO.

SDR løsning til QO-100



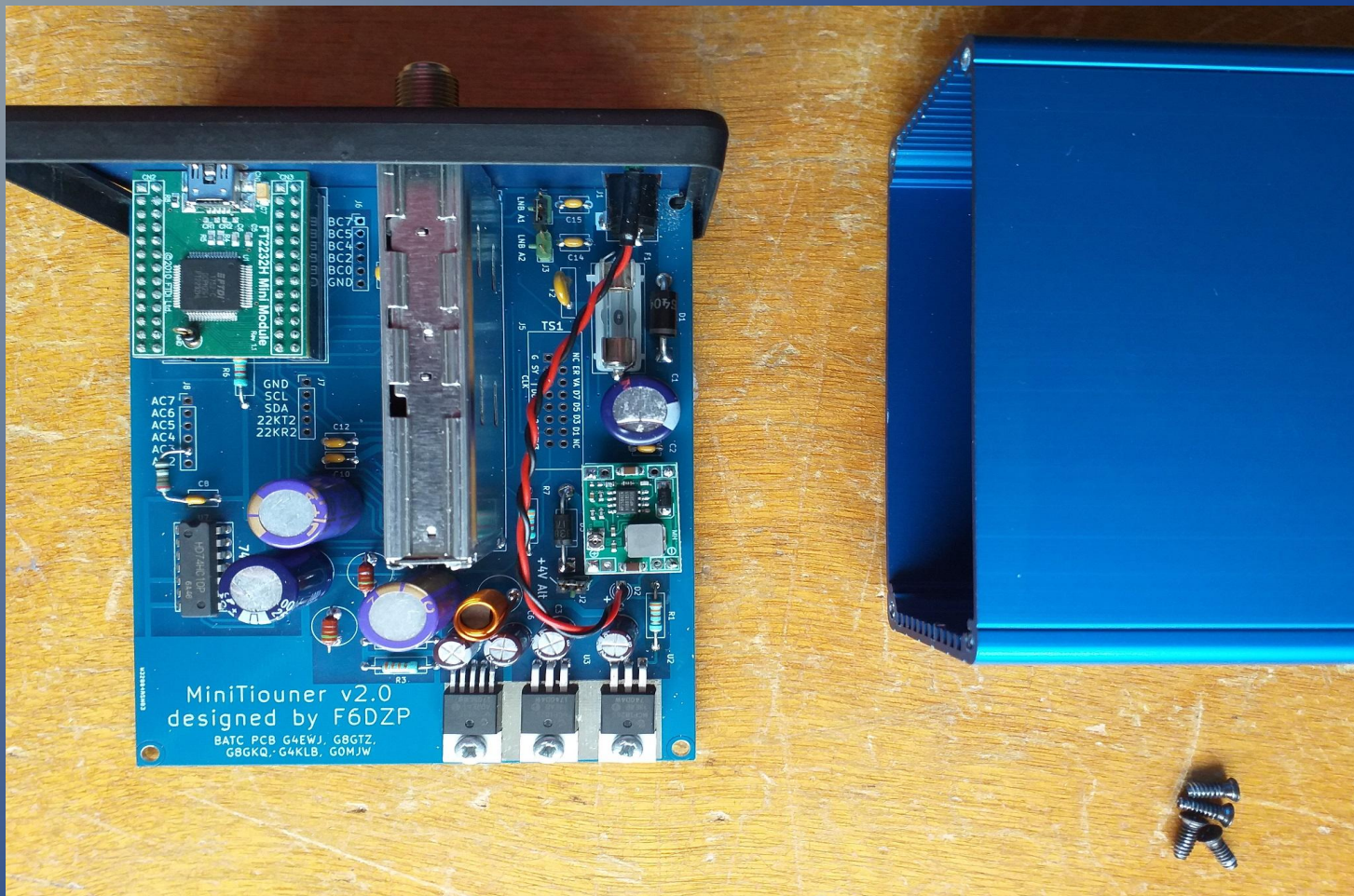
- Min QO-100 transceiver baseret på Lime Mini SDR. Kører fuld duplex 2400/739,5 MHz. Styres af SDR Console software. PA er hjemmebygget 20 – 25 W.

Digital Amatør TV via QO-100



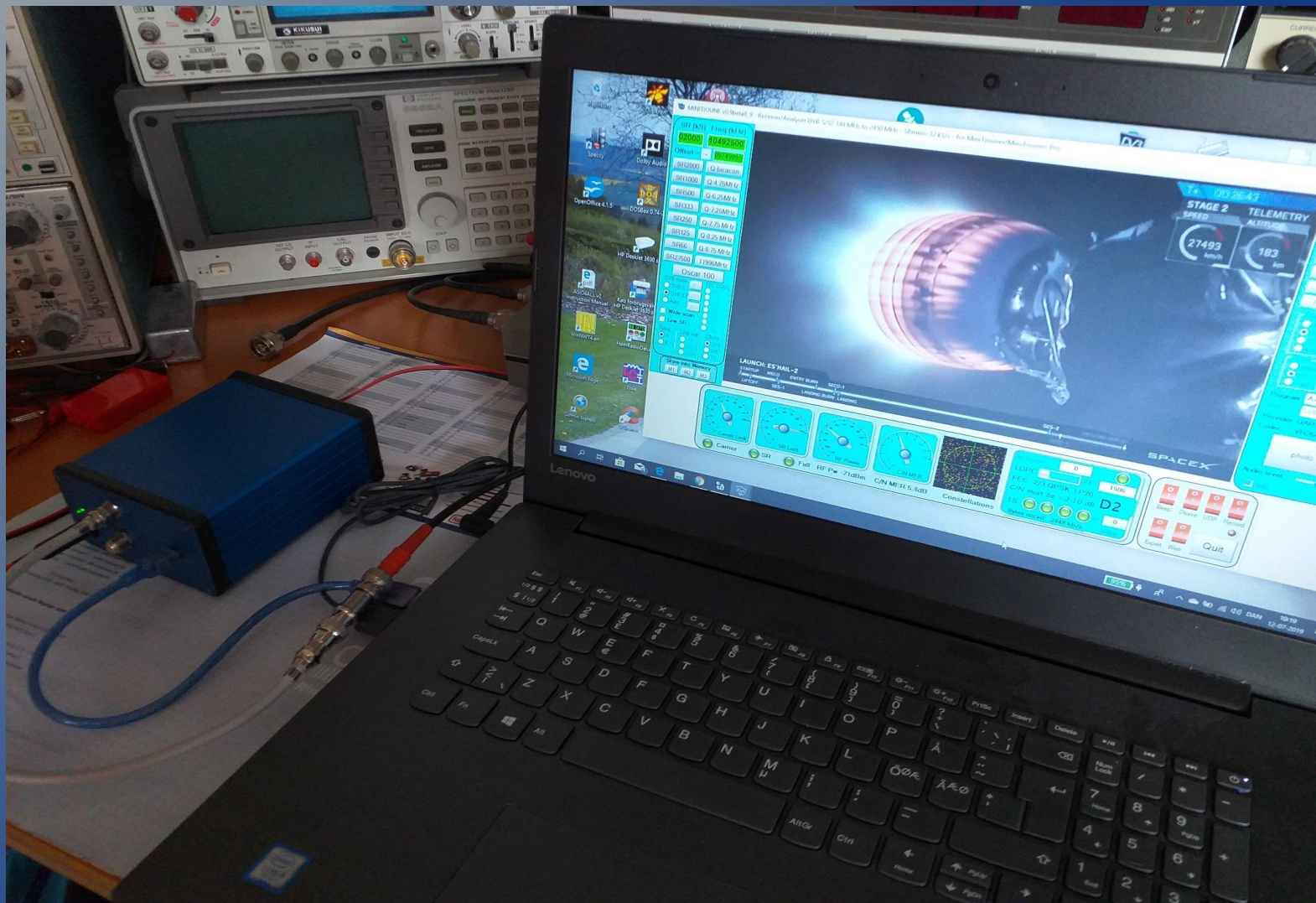
- WB transponder er 8 MHz bred og kan overføre mange samtidige tv signaler. Modtages på samme måde som NB transponderen.

Tuner til DATV



- Byggesæt fra BATC indeholder de vigtigste komponenter
- (dækker 144 MHz til 2400 MHz, så kan også bruges til terrestisk DATV forsøg)

WB transponder - DATV



- Modtaget på 85 cm antenne af MiniTiouner og PC
- (billedet viser QO-100 TV-beacon. 2MS QPSK signal)

Live TV fra Kina

The screenshot displays the MINIOTIUNE v0.9beta8_9 software interface, which is used for receiving and analyzing DVB-S/S2 signals. The main window shows a live video stream of a sunset over a city. The interface is divided into several sections:

- Left Panel:** Contains settings for SR (kS) and Freq (kHz), with values 00250 and 10497750 respectively. It also includes a list of SR options (SR2000, SR1000, SR500, SR333, SR250, SR125, SR66, SR27500) and a "Store into Memory" section with M1, M2, and M3 buttons.
- Top Center:** A large video window displaying the live stream.
- Right Panel:** Contains "PIDs" settings, including "Pid from .ini", "Auto PID", "PID Video" (00256), and "PID audio" (00257). It also has "Format" and "Zoom" options, and a "GRAPH" section with a "Reset" button.
- Bottom Center:** A status panel showing "BCH errors" (8), "LDPC" (15%), "FEC 2/3 QPSK_S20", "C/N must be > 3,10 dB", and "Bytes rcvd: 201 kb/s". It also includes a "Constellations" graph and a "Quit" button.
- Bottom Right:** A spectrum analyzer showing a signal at 10.497 MHz and 10.498 MHz.

The Windows taskbar at the bottom shows the system tray with a 95% battery level, the date 12-07-2019, and the time 10:06.

- Billedet er sendt med QPSK 250 kS – reduceret båndbredde kræver ikke så stor effekt

DATV via QO-100

The screenshot displays the MiniTouner v0.9.1j software interface for receiving and analyzing DVB-S/S2 signals. The main window shows a video stream with a grid overlay and a circular inset of a girl with a puppet. The interface is divided into several functional areas:

- Left Panel (Parameters):** Shows current settings for SR (00333 kS), Freq (10495762 kHz), and Offset (-09749997). It includes a list of SR options (SR1500 to SR27500) and a selected preset 'Oscar 100'. DVB mode is set to DVB-S2, and various modulation and scan options are visible.
- Right Panel (PIDs):** Lists active PIDs: 00256 (PID Video) and 00257 (PID audio). It also shows video format (16/9, 800x448) and audio codec (AAC) settings.
- Bottom Panel (Status):** Features four gauges for Carrier Lock, SR Lock, RF Power (-79dBm), and C/N MER (4.2dB). It also displays BCH errors (0), LDPC (28%), FEC (1/2 QPSK_L35), and C/N MER (D3) requirements. A 'Constellations' window shows a clear signal constellation.
- Bottom Right (Controls):** Includes buttons for Beep, Dsave, UDP, Record, and a 'Quit' button.

The Windows taskbar at the bottom shows the system time as 16:40 on 15-04-2023, with a temperature of 13°C and network status 'DAN'.

- prøvebillede fra OZ2OE

Eksperimenter



Antenner, elektronik, modulationsarter, DXCC?

Portabel satellitterminal – 60 cm med kombifeed.

- expedition til "sjældne" lande/felter.
- eller som backchannel for DXpeditioner?

Eksperiment med små antenner, QRP og digimode

- f.eks ø30 cm og FT4/8 via satellit?
- eller håndholdt satellit terminal.

Næste geostationære satellit?

2023: Geostationary Microwave Amateur Payload Proposal. Frank Zeppenfeldt PD0AP, ESA



Definition of a future amateur satellite GEO payload



ESA Satellite Communications Group
October 2023

Frank.Zeppenfeldt@esa.int PD0AP

00:00:28

ESA UNCLASSIFIED - For ESA Official Use Only

00:13:36

Support for GEO payload RSBG AMSAT UK introduction v3 [0J_fbPObgW0]

+ THE EUROPEAN SPACE AGENCY

9°C Partly sunny 1:28 / 18:11

Search Full ned for at see info

19:45 10/10/23

- tidshorisont er nok 5 – 10 år.