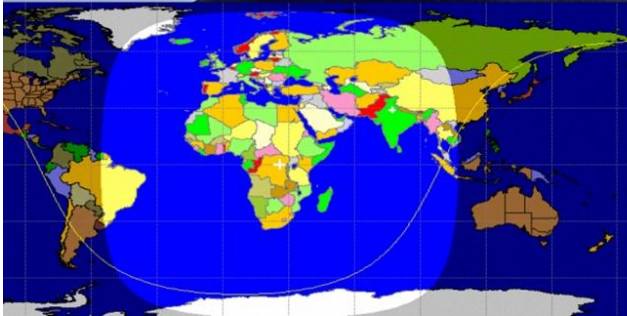




3Y0K - Bouvet Island February 2026



3Y0K QO-100 SAT Concept

3Y0K DX-Expedition February/March 2026

Wolfgang Sidler HB9RYZ
28. November 2025
Version 1.8 – internal use only
Final
Internal use only

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1 Introduction

This document describes the setup, installation and operation of the QO-100 satellite system for the DX expedition 3Y0K in Bouvet Island.

Bouvetøya is a Norwegian volcanic island in the Southern Ocean. Bouvetøya is one of the most isolated islands in the world and 89 percent of the island is covered by glaciers. Bouvetøya is the Norwegian claim area in the seethe of the polar regions we have the most knowledge about. The island has status as a nature reserve.

It is the most remote island in the world, located about 1,700 km (1,100 miles) north of Antarctica and 2,600 km (1,600 miles) south-southwest of South Africa.

Peter 1. Island is **not** in the footprint of the QO-100 Satellite. Peter 1. Island is the next planned DX-Expedition in 2027.

1.1 QO-100 Satellite

QO-100 is an amateur radio payload which is integrated on the Es'hail-2 satellite as a so-called "hosted payload". Es'hail-2 is a telecommunications satellite from Qatar, which has a geostationary orbit with a position at 26° East. It was launched on November 15, 2018.

QO-100 stands for "Qatar-OSCAR 100". OSCAR is short for "Orbiting Satellite Carrying Amateur Radio". The number 100 is a sequence number and therefore means that it is the one hundredth satellite with a recognized amateur radio payload in orbit at the time of successful commissioning. Traditionally, AMSAT assigns a new OSCAR number as soon as a satellite meets the requirements.

The amateur radio payload consists of 2 transponders: A **narrowband** transponder for SSB/CW and other transmission types, which must not exceed a bandwidth of 2.7kHz. The second transponder is a **wideband** transponder, which is mainly used for digital amateur radio television in DVB-S2 format. QO-100 is not only the first geostationary amateur radio satellite, but also the first OSCAR with such a DATV transponder.

Peter Gülzow DB2OS is the spiritual father of QO-100, he started the project at a lecture in Doha/Qatar at the end of 2012 and was the project leader for AMSAT-DL. Together with the Qatar Amateur Radio Society (QARS) and the satellite operator Es'hailSat (Qatar Satellite Company), the AMSAT-DL team specified the amateur radio payload under the project name AMSAT Phase 4-A and made the design specifications. At AMSAT, Phase 4 stands for geostationary satellites and "A" because it is the first of its kind.

The two amateur radio transponders differ significantly from conventional television transponders and are therefore not comparable, if only because of the amateur radio uplink in the 2.4 GHz range and the antennas on the satellite, which do not illuminate individual countries but the entire visible globe.

The amateur radio load, as well as the entire Es'hail-2 satellite, was financed by the government of Qatar.

The transponders were built by the main contractor for the entire satellite, Mitsubishi Electric Corporation (MELCO) in Japan. AMSAT-DL experts were involved in all phases, right up to the critical design review directly at the manufacturer in Japan and the official launch on February 14, 2019.

Es'hail-2 itself is controlled from Qatar. AMSAT-DL has installed the ground equipment required for QO-100 in the Satellite Control Center (SCC) built in Qatar and in Bochum. A further backup station is located at QARS in Doha. Currently, the DATV beacon is sent to the satellite from Qatar.

1.2 Terminology and Acronyms

This section defines the terminology and common acronyms used in this document.

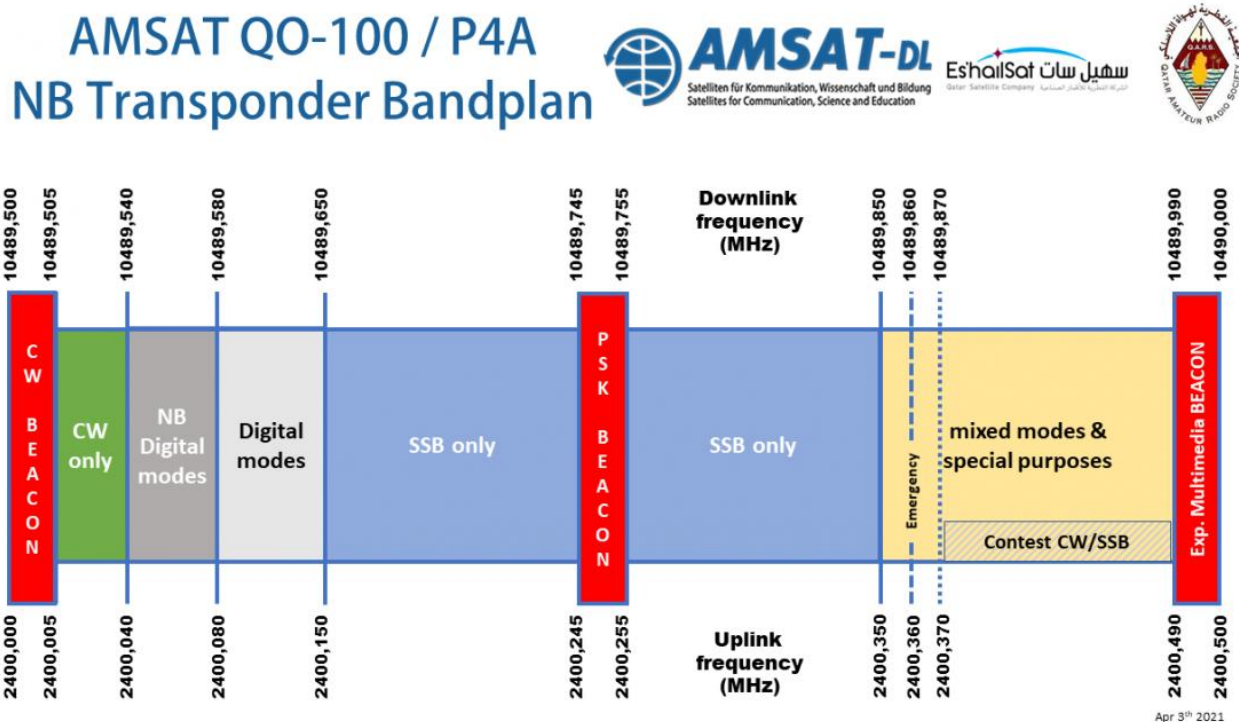
Term	Description
QO-100	Es'hailSat (Qatar Satellite Company)
AMSAT-DL	Radio Amateur Satellite Corporation, Germany www.amsat-dl.org
AMSAT-HB	Radio Amateur Satellite Corporation, Switzerland www.amsat-hb.org
GPSDO	GPS disciplined oscillator with 10 MHz
SDR	Software Defines Radio (Waterfall Spectrum)
RFI	Radio frequency interference
UDL-16	QO-100 Multi-Transverter from Hilberling www.hilberling.de
IC-9700	ICOM Multiband Transceiver 2m, 70cm, 23cm https://www.icomjapan.com/lineup/products/143/
LNB	Low-noise block downconverter

2 QO-100 Overview

On a 250 kHz wide band, radio amateurs can communicate and experiment simultaneously in SSB, CW or narrowband digital modes. The uplink is at 2.4 GHz, the downlink in the 10 GHz band.

2.1 QO-100 Bandplan

Source of the band plan: <https://amsat-dl.org/neuer-qo-100-bandplan/>



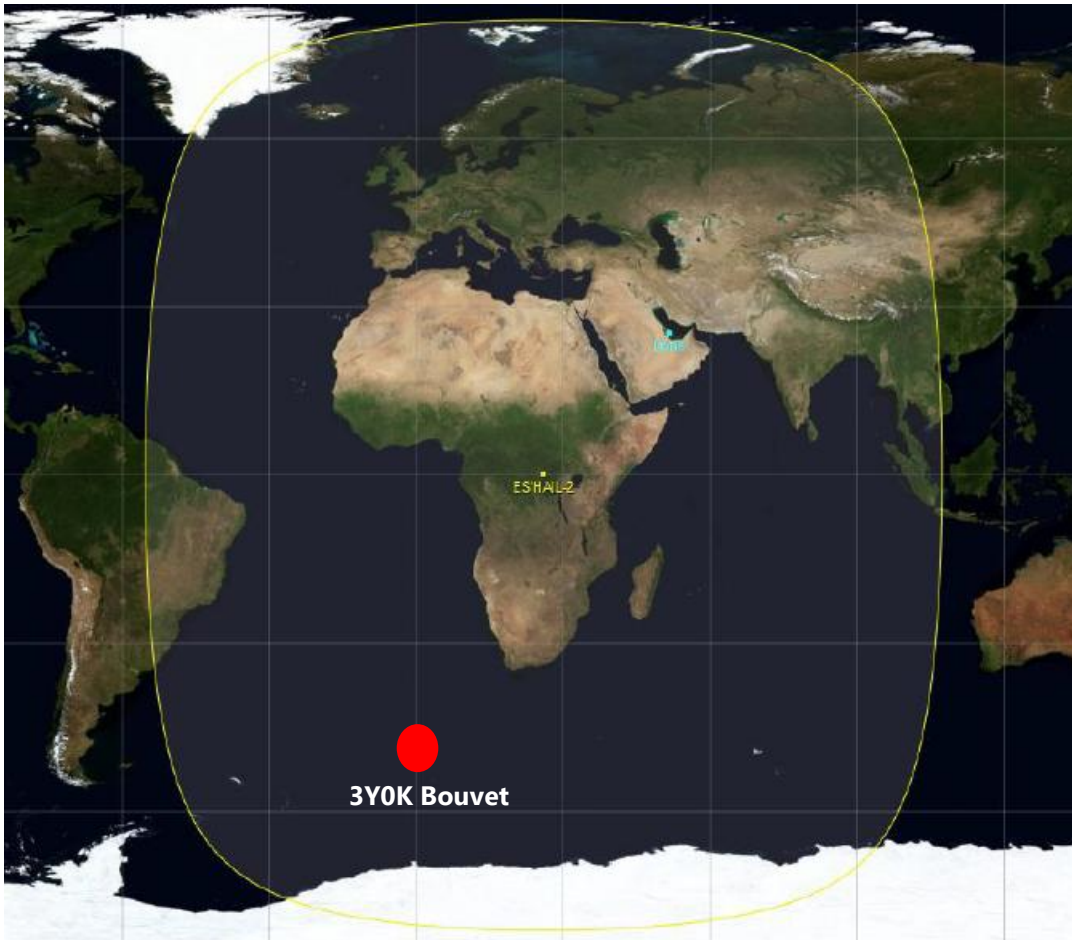
Frequencies of the narrow band (NB) transponder (bandwidth 250 kHz)		
Uplink	2400.000 – 2400.500 MHz	Polarization RHCP
Downlink	10489.500 – 10490.000 MHz	Polarization vertical



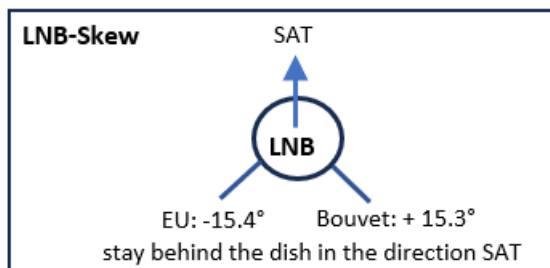
Uplink		Downlink		Available [MHz]	Comment
Start [MHz]	End [MHz]	Start [MHz]	End [MHz]		
		10489,500	10489,505	0,005	Lower Beacon 10489,500 MHz, CW F1A, + guard band
2400,005	2400,040	10489,505	10489,540	0,035	CW only
2400,040	2400,080	10489,540	10489,580	0,040	digimodes (500 Hz max. BW)
2400,080	2400,150	10489,580	10489,650	0,070	digimodes (2700 Hz max. BW)
2400,150	2400,245	10489,650	10489,745	0,095	SSB only (2700 Hz max. BW)
		10489,745	10489,755	0,010	Middle Beacon 10489,750 MHz, 400 Bit/s BPSK + guard band
2400,255	2400,350	10489,755	10489,850	0,095	SSB only (2700 Hz max. BW)
2400,350	2400,495	10489,850	10489,995	0,145	mixed modes (2700 Hz max. BW) & special purpose
		10489,995	10490,000	0,005	Experimental Beacon 10490,000 MHz, CW and other modulations + guard Band

2.2 QO-100 Footprint and Dish-Pointing

Aligning the antenna (dish) is very simple and is not a challenge.



Dish-Pointer: <https://eshail.batc.org.uk/point/>
Bouvet Island: 54°25.8'S 3°22.8'E
Locator: **JD15QN**



Pointing

- Azimuth: 27.4° (49.9° magnetic)
- Elevation: 24.8°
- LNB Skew: +15.6°
- Current Sun-Earth-Satellite Angle: 48°

GPS COORDINATES OF BOUVET ISLAND, BOUVET ISLAND

DD COORDINATES

-54.4333316 3.3999984

DMS COORDINATES

-54°25'59.99" S 3°23'59.99" E

GEOHASH COORDINATES

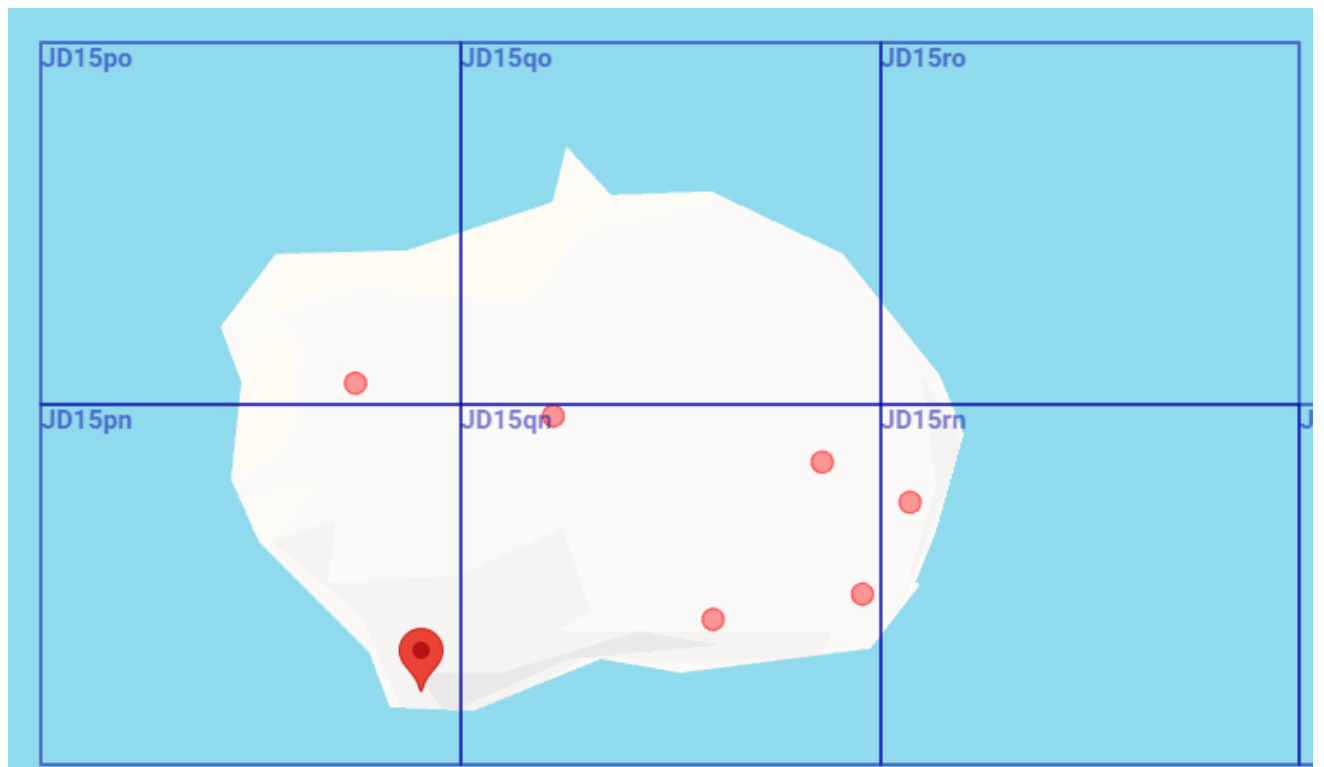
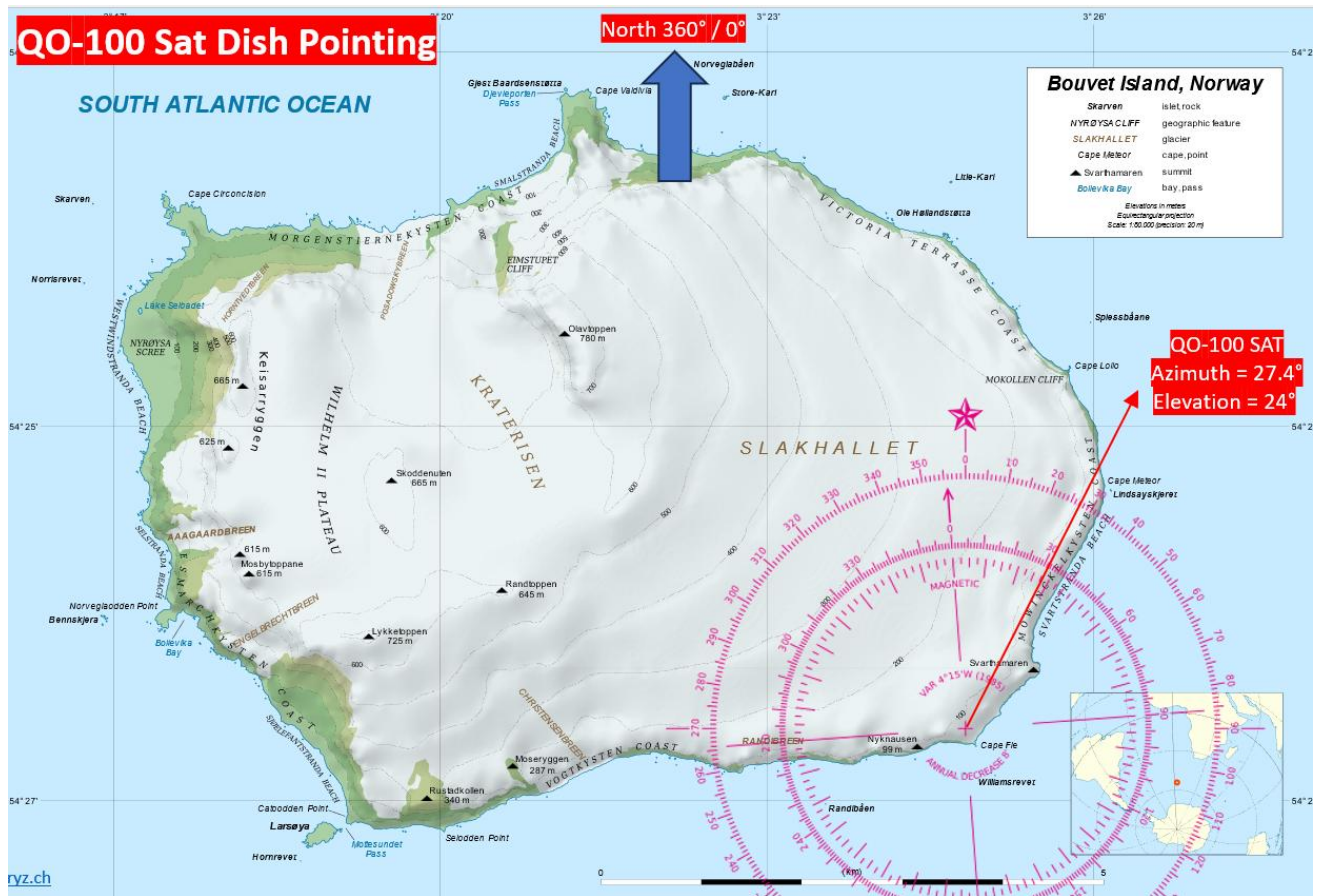
hn66m6eycew91

UTM COORDINATES

31F 525946.58472824 3968190.2352601

<https://latitude.to/articles-by-country/bv/bouvet-island/1268/bouvet-island>

Satellite Dish pointing direction:



2.3 QO-100 Community

The QO-100 DX-Club is the most active QO-Club at the moment. Currently there are about 1'200 – 1'300 QO-100 Users active. This means that we can count on about **1'200 – 1'300 QO-100 users**.

This project is an original idea of F. Costa CT1EAT with technical contribution of H. Silva CT7AOV. Our goal is to promote informed and responsible DX activity on QO-100 satellite Narrow Band transponder.

This is the QSO-Statistic of the 3DA0DL DX-Expedition. They made 1'095 QSOs over the QO-100 SAT.

QSO-Statistik von 3DA0DL nach Bändern und Sendarten					
Band	CW	SSB	FT4	FT8	total
160 m	0	0	0	1	1
80 m	0	0	0	205	205
60 m	0	0	0	66	66
40 m	43	0	0	1300	1343
30 m	527	0	114	4029	4670
20 m	714	294	1	6815	7824
17 m	630	190	36	5464	6320
15 m	1562	694	1066	5303	8625
12 m	1808	367	1368	5362	8905
10 m	2285	599	1252	5589	9725
6 m	0	0	0	413	413
QO-100	149	144	281	521	1095
gesamt	7718	2288	4118	35 068	49 192

<https://qo100dx.club/>

News

3Y Bouvet Is. ****Update****

2024-10-19

Update 12 Jan 2025: The **3Y0K** Dxpdition [website](#) is now online and it has been updated with the latest information. Given the budget size, **donations** are welcome!

From **AMSAT-HB**: "Founding member and vice president of AMSAT-HB, **Wolfgang Sidler HB9RYZ** (QO-100 Dx Club #194), will personally take part in the Dxpdition **3Y0K**."

The island is located approximately 1,700 km off the coast of Antarctica and is one of the most searched countries of all. And it looks like Bouvet has never been activated on satellite! Wolfgang told us that Bouvet will also be activated via QO-100.

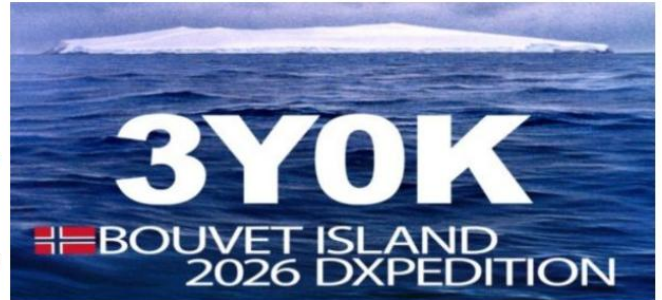
Bouvet is a tough place. Dokufunk lists 24 expedition projects on Bouvet (not including the last one from 3Y0J). Some projects did not make it past the planning phase, others were unable to land or had to end the expedition early.

Activation via satellite is not documented on the Dokufunk website.

We wish Wolfgang much success and fantastic experiences on Bouvet!

Activation is planned for **January 2026**. Of course, we will report on further events here as soon as possible."

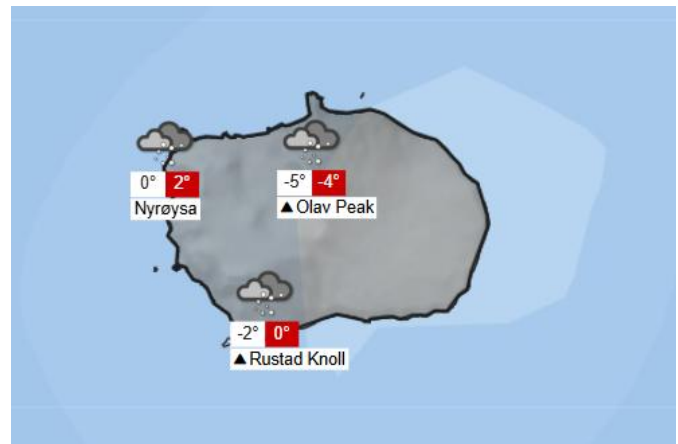
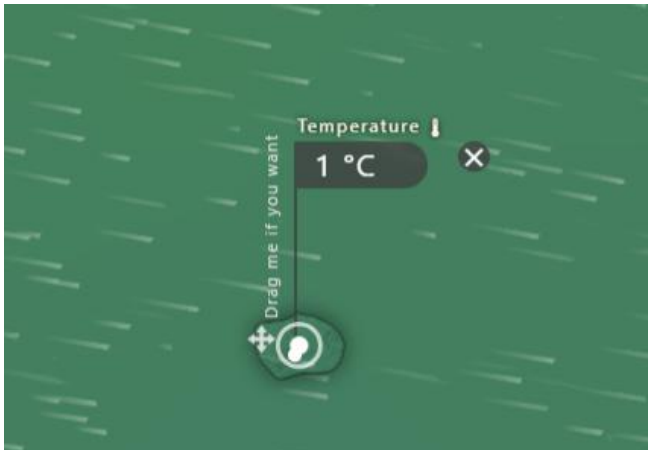
TNX AMSAT-HB and Florian, DF2ET for the fantastic news.



2.4 Local Weather Information

The weather on site is a major challenge. There is a lot of wind, fog or rain. 90% of the wind comes from the west with 31 – 40 km/h.

<https://www.windy.com/-54.421/3.359?-54.782,3.359,8,m:8saggK>



5. February 2025

3 QO-100 Ground Station Setup

The following section covers general prerequisites for the QO-100 setup. Deviations can apply depending on the features used.

3.1 Beam and Antenna Gain

A Satellite dish with a diameter of **65 cm** for reception (Downlink) 10 GHz and a helix or patch antenna with a 20W amplifier for the 2.4 GHz (Uplink) are completely sufficient for a very good audio (SSB) signal. Even the **35cm** dish for the QO-100 Backup equipment will give a good signal.



3.2 Satellite Dish, Tripod and Installation

The satellite dish is installed on a tripod and secured to the ground with three guy ropes to protect the satellite antenna from the west-wind. **A clear view of the satellite is a prerequisite.**

The high-end coax cable (Hyperflex 7) for 2.4 GHz must be as short as possible to prevent high attenuation. The TX coax cable is **8 m** long. This means that the 65cm satellite antenna (dish) on the tripod must be positioned very close to the tent or in the tent. **The tent does not interfere with the QO-100 signals.**

3.3 Multiband Transceiver

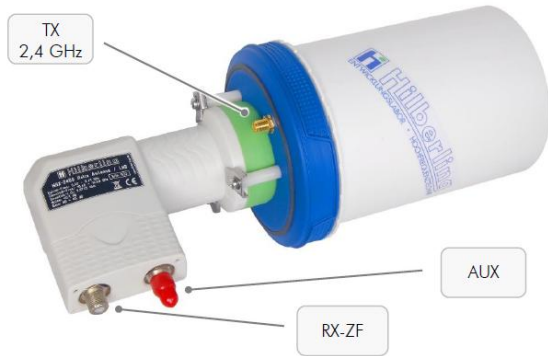
The ICOM IC-9700 is used as the transceiver. This transceiver has 144 - 148 MHz, 430 - 450 MHz and 1240 - 1300 MHz and is therefore ideally suited for satellite operation with the "SAT" mode and full duplex incl. split operation. It provides sufficient power to control the QO-100 transverter and can be easily connected to a network (LAN) and a notebook (CAT), including audio channels for digital operation.

3.4 Uplink and Downlink Setup

All uplink transmissions should use the minimum power possible. We will use only 1-10 Watts from the transceiver to control the QO-100 Transverter UDL-16 from Hilberling. The Hilberling QO-100 Transverter will give us 20W max for the 2.4 GHz Up-link.

The combined transmitting and receiving antenna HHX-2400 consists of a helix transmitting antenna and a modified feedhorn LNB. For the 2.4 GHz uplink frequency and the 10 GHz reception range, the HHX-2400 enables operation with just one SAT dish.

HHX-2400 Helix-Antenne / LNB



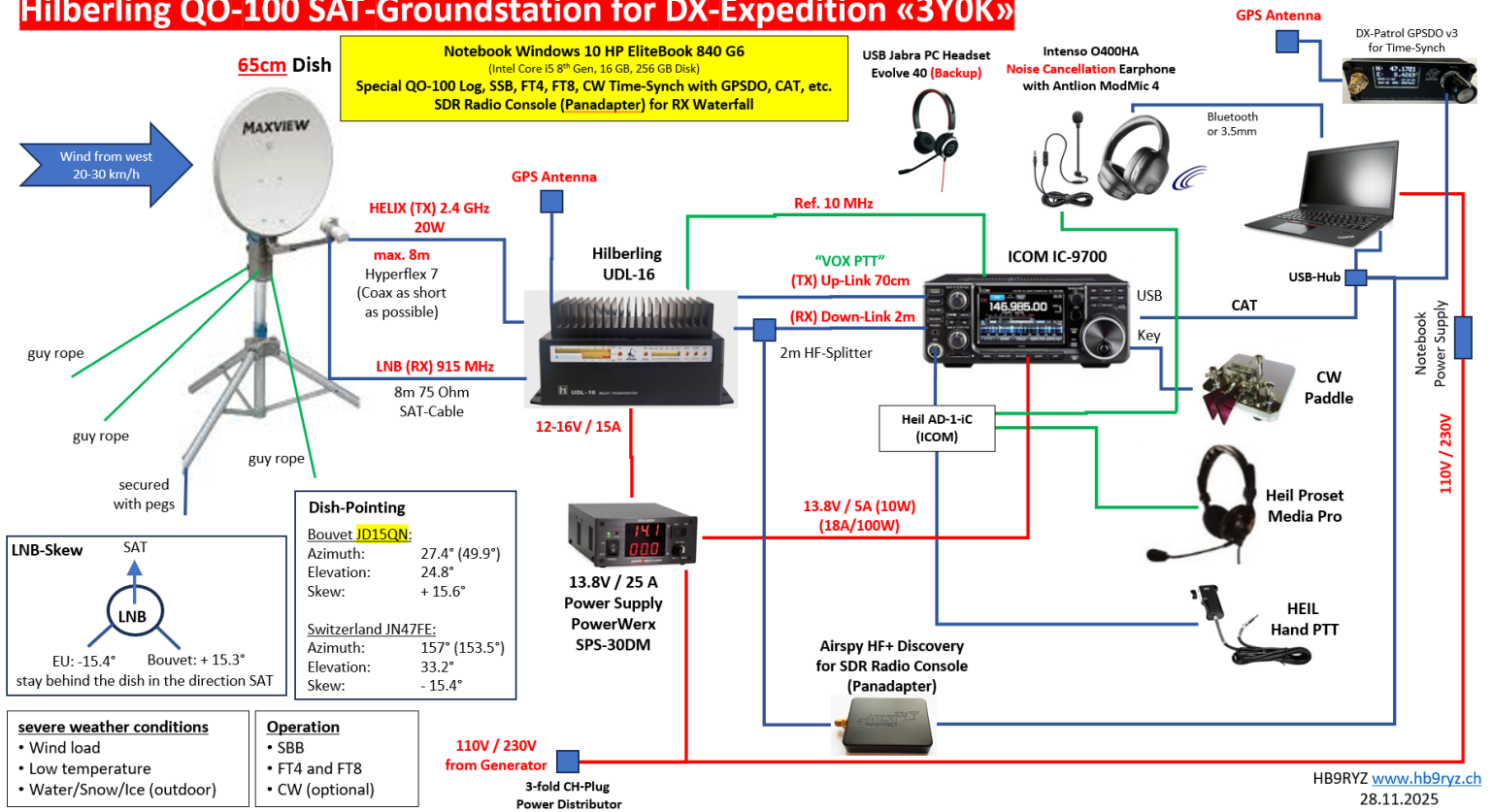
Helix-Antenna	For Uplink 2.4 GHz
TX Freq.-Range	2.4000 – 2.400,5 MHz
Antenna Gain	6 dBd
Feed-in power max.	200 W
Connection socket	SMA-Type
Impedance	50 Ohm

LNB	For Downlink 10 GHz
RX Freq.-Range (FE)	10.480,0 – 10.500,0 MHz
Reception frequency range (Ref.)	25,0 MHz \pm 2,5 MHz / P-IN -6 ... -24 dBm
LO-Freq.	= (Ref. * 390) MHz
Output-ZF (IF)	= (FE - LO) MHz
Gain	60 ~ 65 dB
Noise figure	< 0,1 dB
Power	12 V DC for vertical / 18 V DC for horizontal polarization / via the 75 Ω cable
Connection socket	F-Type
Impedance	75 Ohm



Hilberling UDL-16 Multi-Transverter

Hilberling QO-100 SAT-Groundstation for DX-Expedition «3Y0K»

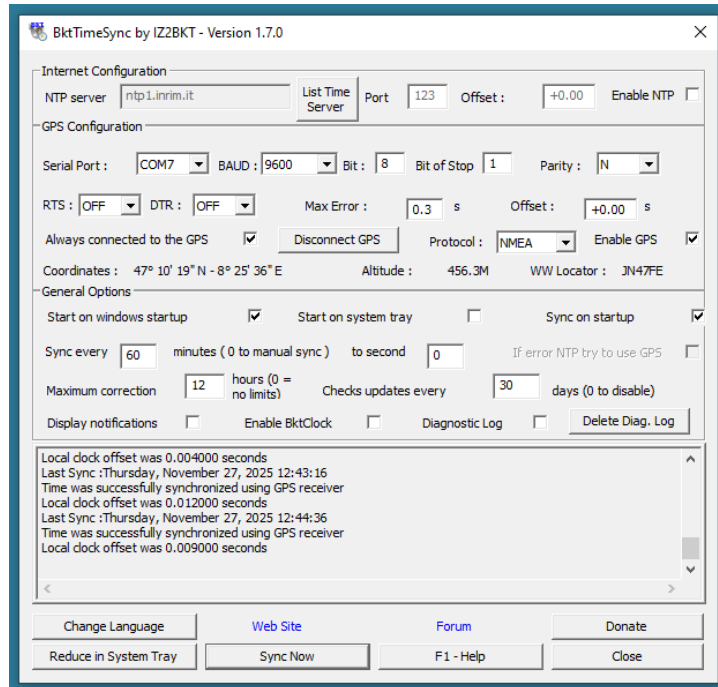


3.5 GPSDO for Hilberling Transverter

A GPSDO is already integrated in the UDL-16 and the 10 MHz reference signal is for the stabilization of the up and down link and also for the IC-9700 transceiver.

3.6 GPSDO for QO-100 Notebook

I will use the new GPSDO v3 from DX-Patrol with the Timesync Software BktTimeSync v1.20.6 in order to have the correct UTC time without any network and Internet-Connection (NTP-Server). My QO-100 notebook will be independent from the Camp-Network.



3.7 SDR Panadapter for Downlink

The SDR Panadapter with the Airspy HF+ Discovery is used to display the entire QO-100 frequency spectrum with SDR Radio Console in a waterfall on the notebook for better readability.

3.8 Required Power and Network

Required Power	Consumers
110-230V	13.8V / 25 A Power Supply for IC-9700 and QO-100 Transverter
110-230V, 1.1 A	HP EliteBook Power-Supply 45W – 19.5V 2.31A
110-230V	For Table lamp (LED) without RFI

Required Network	Consumers
WiFi (WLAN), Internet	Notebook to access the Internet for Log Update, time Synch, QO-100 SDR in Goonhilly

3.9 Coax-Cable

High-end 50 Ohm coax cable Hyperflex 7 for the uplink (2.4 GHz) with a maximum length of **8m** and a satellite coax cable 75 Ohm (downlink) and some short 50 Ohm coax cables for the connection between UDL-16 and the IC-9700 transceiver.

3.10 Notebook

The HP EliteBook is a professional notebook with sufficient RAM and hard disk storage and has the necessary communication ports (USB-A, WiFi, Bluetooth, Network, HDMI, USB-C, 3.55m audio jack, Windows 10, etc.).



Right

- | | |
|-----------------------------------|--|
| 1. Power Connector | 6. USB 3.2 Gen 1 Port |
| 2. USB Type-C™ with Thunderbolt™ | 7. Audio Combo Jack |
| 3. Docking Connector | 8. SIM Card Slot |
| 4. Ethernet Port | 9. Touch Fingerprint Sensor (Optional) |
| 5. HDMI Port (Cable not included) | |

3.11 Internet Access with Starlink

Internet Access is required for the log update, access to the QO-100 WebSDR in Goonhilly, QRZ.com and other HAM services.

There is really no need to have a 24x7 Internet-Access. Time synchronization is done by the GPSDO.

It's ok to upload the QO-100 Log once a day.

4 Operation

The QO-100 operation will be mainly in SSB and the digital modes (FT4, FT8) and will be carried out by the operator HB9RYZ. Other QO-100 operators are of course welcome.

According to the QO-100 band plan, the range from 10'489.870 to 10'489.990 is intended for DX-Peditions. The following Ranges for the pileups are expected: CW = up to 50 kHz, SSB = up to 100 kHz.

We expect about 1'200 to 1'300 SSB QSOs and a corresponding number of FT4/FT8 QSOs.

Since the QO-100 satellite is **always available** (no propagation issues), operation can take place at any time - it's like a relay station in space.

Call and Name	QO-100 Operator
HB9RYZ, Wolfgang	I have a lot of experience with QO-100 (SSB and FT8) since the beginning in March 2019

Conclusion / Decision: QO-100 CW Operation	
Date:	3.2.2025
Decided by:	The Team
Reason for the chosen solution: If it is desired that CW is available via the QO-100 satellite, a QO-100 operator with CW knowledge must be nominated.	

Mode	Description
SSB	Phone QSO with 5-15 up or by numbers
FT8 and FT4	Only one stream and Test with SuperFox (Multistream)
CW	CW (Morse) with 5-15 up

As a backup for the Heil Pro headset, the Jabra Evolve 40 PC headset with the Antlion ModMic 4 is used with the notebook. The audio with SDR Radio Console is better than directly with the IC-9700, so I can hear well with the Jabra headset including noise reduction (NR) and can transmit directly with ModMic 4 via the IC-9700.

Maritime Mobile 3Y0K/MM

The QO-100 community would also like to see a QO-100 activation on the ship from Cape Town to Bouvet in order to be able to work as many squares (locators) as possible. In any case, a test on the ship is certainly worth trying. However, this requires two operators, one to align the dish and one to operate the radio.

4.1 Software

No special software is required to operate QO-100 in SSB or CW. The SDR Radio Console software is used for the panadapter and the JTDX improved version software is used for FT8 and FT4. The Log4OM software or other software is used for the log.

I plan to program a special log program that will allow me to enter only the callsign, mode and locator in a pile-up. All other SAT parameters such as date, time, frequency, sat mode and sat name will be automatically created in ADIF format for the LOTW/Club log update.

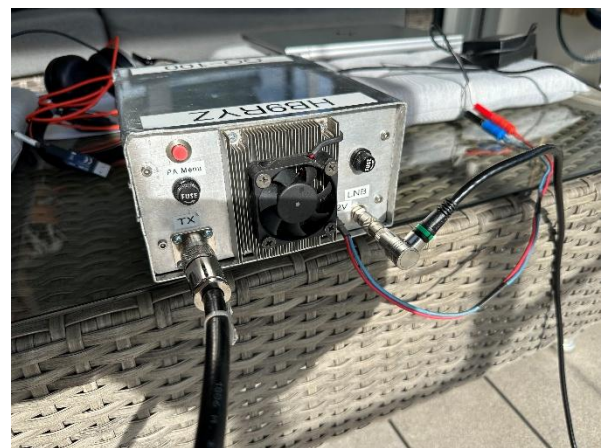
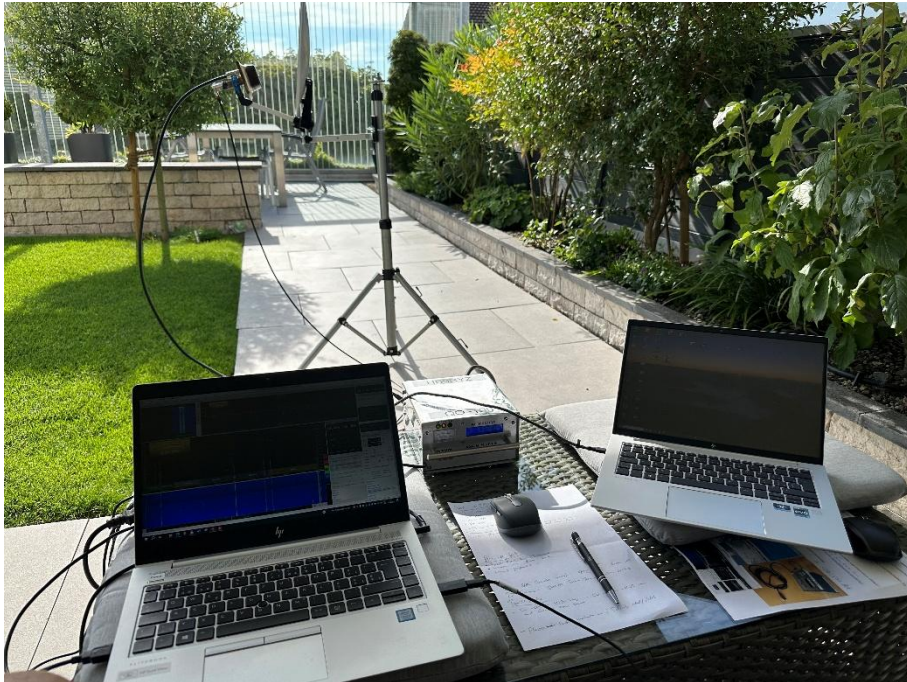
It's ok to upload the QO-100 Log once a day with the Starlink connection in the camp.

4.2 Backup Solution

In the event of a broken Hilberling SAT solution, the portable QO-100 solution from HB9RYZ shall be used as a backup solution.

The QO-100 portable SAT-Station is approx. 9kg incl. travel case and 11kg incl. tripod.



- MEGASAT Camping dish **35cm**
- Pluto SDR TCXO modified and in metal case by DG9BFC
- Patch-Antenna and LNB TCXO modified by DG9BFC
- 10-15W Amplifier with skyworks 65017 as preamp (20 dB gain)
- mw4ic2230 (30-31 dB gain) as amplifier
- Notebook Power Supply 19V and 4.74A
- DC-DC Step Down Converter (19V > 5V) for the Pluto SDR
- SDR Console v3.x with the beacon synchronization
- **No** GPSDO necessary to stabilize the frequency
- USB Jabra Headset for Notebook
- 4-Port USB Hub




5 Material, Costs and Logistics

Material (Inventory)	Price in EURO	Sponsoring
QO-100 Transverter UDL-16 from Hilberling.de - UDL-16 Transverter - 8m Hyperflex 7 Coax-Cable 50 Ohm incl. connectors - 8m SAT-Cable 75 Ohm incl. connectors - HHX-2400 LNB and Helix Antenna - GPS-Antenna incl. 5m cable and connector	1019.00	50% by Hilberling 50% by HB9RYZ Full price: 2190.00
65cm Satellite Dish		100% by DX-Expedition
Professional Tripod and guy rope	130.00	100% by HB9RYZ
Heil Proset Media Pro Headset and Heil AD-1-iC Adapter	190.00	100% by HB9RYZ
HEIL Hand-PTT	60.00	100% by HB9RYZ
Airspy HF+ Discovery for Downlink Panadapter on Notebook	169.00	100% by HB9RYZ
HF-Spitter 144-148 MHz for Downlink Panadapter	50.00	100% by HB9RYZ
Jabra USB Headset for the PC	50.00	100% by HB9RYZ
Small material (USB-Cable, TX/RX Cable TX to Transverter, etc.)	100.00	100% by HB9RYZ
HP EliteBook 840 G6 14"	350.00	100% by HB9RYZ
DX-Patrol GPSDO v3	180.00	100% by HB9RYZ
13.8V / 30A Power Supply for 110-230V (SPS-30DM), 2.5kg	250.00	100% by HB9RYZ
ICOM IC-9700 Multiband Transceiver		100% by ICOM
Total Costs:	2'548.00	

5.1 Inventory and packing list

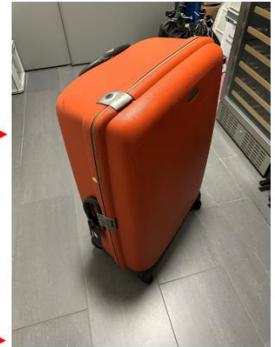
Complete SAT Equipment (Inventory)	Weight in kg	Dimension (WxDxH) (width, depth, height)
<p>65 cm Satellite Dish from Triax and a Professional Tripod (77 – 155 cm) A hole is pre-drilled in each of the three legs for the peg to be inserted through.</p> <div style="display: flex; justify-content: space-around;">   </div>	6.77	650 x 630 x 130 mm
<p>orange suitcase in the Container</p> <ul style="list-style-type: none"> - QO-100 Transverter UDL-16 from Hilberling.de - UDL-16 Transverter, Manual, Adapters - HHX-2400 LNB and Helix Antenna - GPS-Antenna incl. 5m cable and connector - 8m Hyperflex 7 Coax-Cable 50 Ohm incl. connectors - 8m SAT-Cable 75 Ohm incl. connectors - Heil Proset Media Pro Headset and Heil AD-1-iC Adapter - HEIL Hand-PTT 	20.00	

<ul style="list-style-type: none"> - Airspy HF+ Discovery for Down-Link Panadapter on Notebook - 2m-Spitter 144-148 MHz for Downlink Panadapter - Jabra USB Headset for the PC - Small material (USB-Cable, Power-Cable, TX/RX Cable TX to Transverter, etc.) - 13.8V / 30A Power Supply for 110-230V, 1.7kg - Tripod and guy rope for Tripod - 110-230V power rail with CH plugs <p>Provided by HB9RYZ, ICOM IC-9700 provided by ICOM</p>		
<p>Backup SAT-Kit with 35cm Dish and Pluto-SDR Box in ruggedized plastic Box.</p>  <p>Provided by HB9RYZ</p>	11.00	530 x 470 x 210 mm
<p>Total Weight in kg:</p>	<p>47.77</p>	

5.2 Packing for Container & Heli-Transport

Packing for Container and Heli-Transport

- 8m Hyperflex 7 Coax-Cable 50 Ohm incl. Connectors
- 8m SAT 75 Ohm coax cable for RX incl. Connectors
- Heil Proset Media Pro Headset and Heil AD-1-iC Adapter
- HEIL Hand-PTT
- Airspy HF+ Discovery for Down-Link Panadapter on Notebook
- 2m-Spitter 144-148 MHz for Downlink Panadapter
- Jabra USB Headset for the PC
- USB-Cable, Power-Cables, TX/RX Cable TX to Transverter
- Tripod and guy rope for Tripod
- 110-230V power rail with CH plugs



Height 69cm, Length = 30cm, Wide= 49cm

QO-100 Notebook



326x234x18 (1.5kg)

ICOM IC-9700



240x238x94mm (4.7kg)

SAT Backup 35cm Dish Kit



1x Pelicase case



530x470x210mm (11kg)

65cm Dish



Total 6.77kg

6 Some other Topics

6.1 Risks

This section covers the initial steps required to start the QO-100 project and during operation at Bouvet.

Risk	Remarks
Equipment Failure	In case of a broken Hilberling solution, the homemade backup solution from HB9RYZ shall be used with the 35cm dish
Lost of Timesync.	Possible loss of UTC timesync. over GPS for the notebook. Timing issue for FT4 and FT8 operations
Heavy wind & wet weather conditions	Too heavy wind for the tripod. Dish will fall to ground or problems with the LNB or Helix-Antenna (SWR)

To mitigate the risks, the entire Hilberling and Backup SAT solution shall be extensively tested and documented at HB9RYZ's home (JN47FE).

6.2 Emergency Option over QO-100

The QO-100 satellite equipment can also be used if all other communications such as Starlink fail.

6.3 Document History

When	Version	Who	Description
5. February 2025	1.1	Wolfgang HB9RYZ	Draft – Version 1.1, input Packing List
10. February 2025	1.2	Wolfgang HB9RYZ	Draft – Version 1.2, input Tripod and Power Supply
15. February 2025	1.3	Wolfgang HB9RYZ	Draft – Version 1.3, input Packing for Container & Heli transport
7. March 2025	1.4	Wolfgang HB9RYZ	Draft – Version 1.4, input LNB-Skew, Azimuth and Elevation Information
12. March 2025	1.5	Wolfgang HB9RYZ	Draft – Version 1.5, input drawing Satellite Dish pointing direction
16. March 2025	1.6	Wolfgang HB9RYZ	Draft – Version 1.6, input Jabra USB Headset and ModMic 4
21. September 2025	1.7	Wolfgang HB9RYZ	Final – Version 1.7
28. November 2025	1.8	Wolfgang HB9RYZ	Final – Version 1.8, added GPSDO for Notebook

6.4 Appendix

Topic	Remarks
Datasheet	UDL-16 Hilberling QO-100 Multi Transverter
Datasheet	HHX-2400 Helix-Antenna and LNB
Operation Manual	UDL-16 Hilberling QO-100 Multi Transverter (available only in German)