Building a competitive **low-maintenance** Contest Station

Tobias, DH1TW / EA4GYY

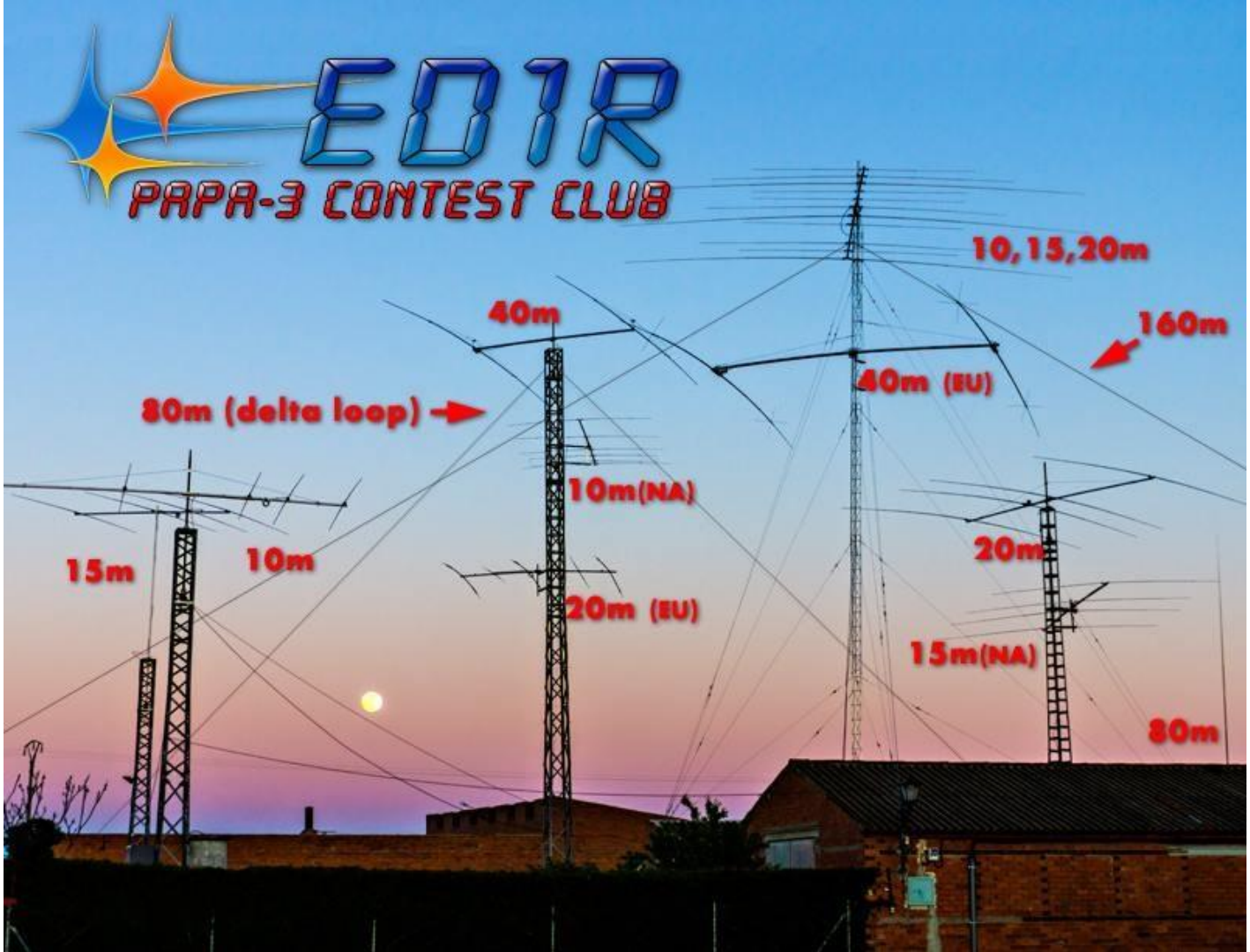

ED1R
Toulouse
Gijón
A Coruña
Oviedo
Bilbao
Donostia-San Sebastián
Perpignan
Santiago de Compostela
Pamplona
Vitoria-Gasteiz
Andorra
León
Vigo
Zaragoza
Barcelona
Braga
Tarragona
Porto
Salamanca
Madrid
Coimbra
Castellón de la Plana
Balearic Sea
Toledo
Mallorca
Palma
Portugal
Valencia
Spain
Lisbon
Badajoz
Alicante
Elche
Murcia
Córdoba
Seville
Huelva
Granada
Algiers
Faro
Almería
Málaga
ILLES BALEARS


FIRST AID

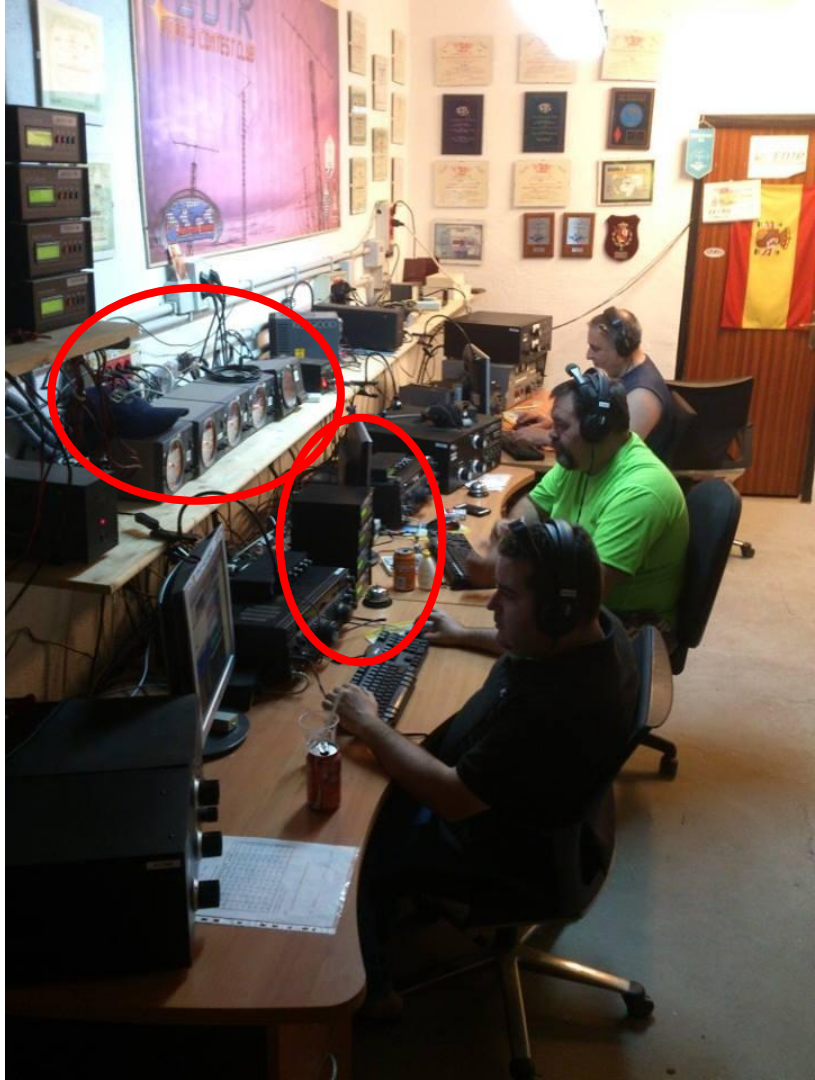
Chapter 1

2010 - 2016

“the more the better”


EA1R
PAPA-3 CONTEST CLUB
10,15,20m
40m
160m
40m (EU)
80m (delta loop)
10m(NA)
15m
10m
20m
20m (EU)
15m(NA)
80m


EUROPEAN HF CHAMPIONSHIP
2012
SSB-HP CHAMPION
Jesus Maria Gomara EC1KR
hole saws
brocas sierra
ARRL INTERNATIONAL
DX CONTEST
EDIR
2012
Europe Winner
Multioperator,Two Transmitter Phone
CQ
2015 - SSB
WORLD WIDE DX CONTEST
STATION ED1R
Oprs.: CT1HXB, DH1TW, DK9TN, DL5AXX,
DL5RMH, EC1KR, EA4AQC, EA4SV,
EA4SG, EA4ZK
winner
EUROPE - MULTI. OP./TWO XMTR.
AKI NAGI, JA5DQH AWARD
SCORE: 16,387,272



Chapter 2

2017 - 2018

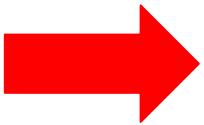
“shutdown & redesign”

Re-Design objectives

- Focus on low-maintenance, high reliability and redundancy
- Simplify & standardize wherever possible
- Everything must be controllable from everywhere
- Allow quick debugging of problems

Antennas & Towers

Use antennas with a mechanically robust design



We standardized on (3x) OB11-3 & (2x) OB2-40

Calculate the expected forces for your masts!

Dimension towers & antennas

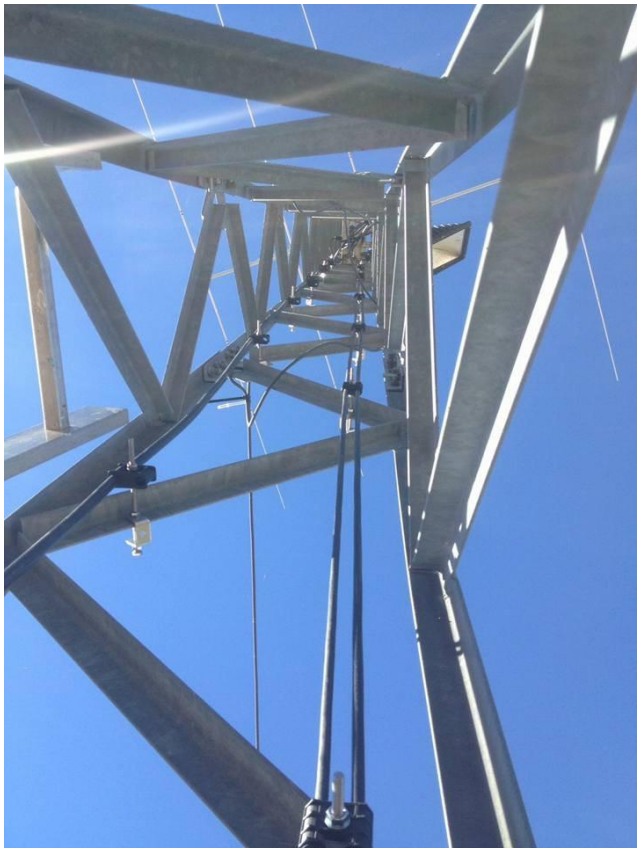
2x 120mm tubes from the shack to each tower

800m of ½” LCF Cellflex, Rotator, Power, Ethernet

Ensure easy access at junction points

At each tower base and behind the shack

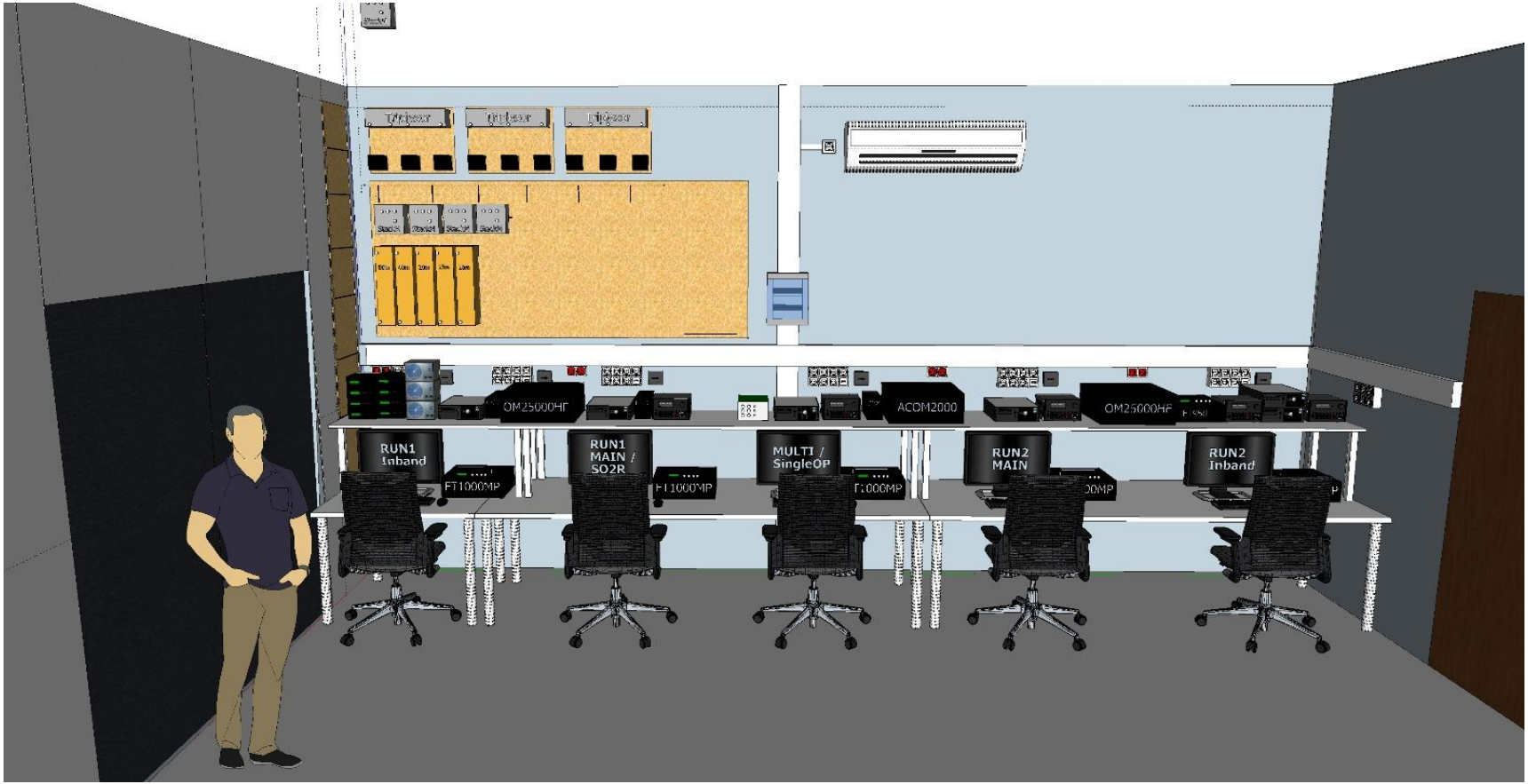
Multiple RF + Rotator cables up the tower



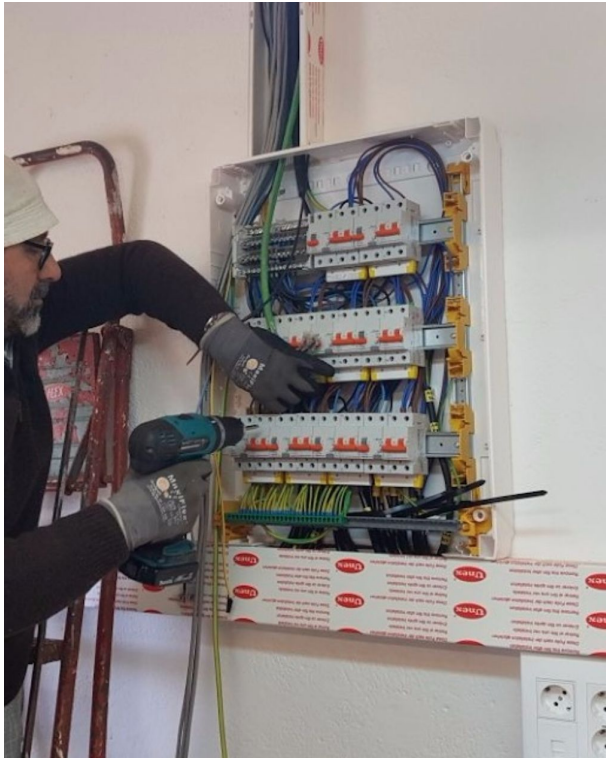
Ensure proper Bonding (Top, Bottom, Shack)

Shack

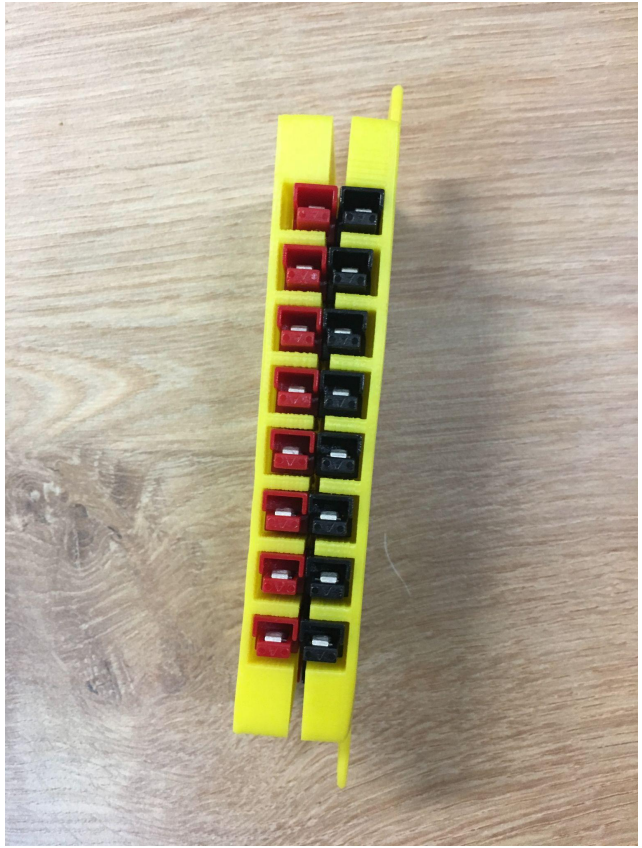
CAD Modelling of the new shack



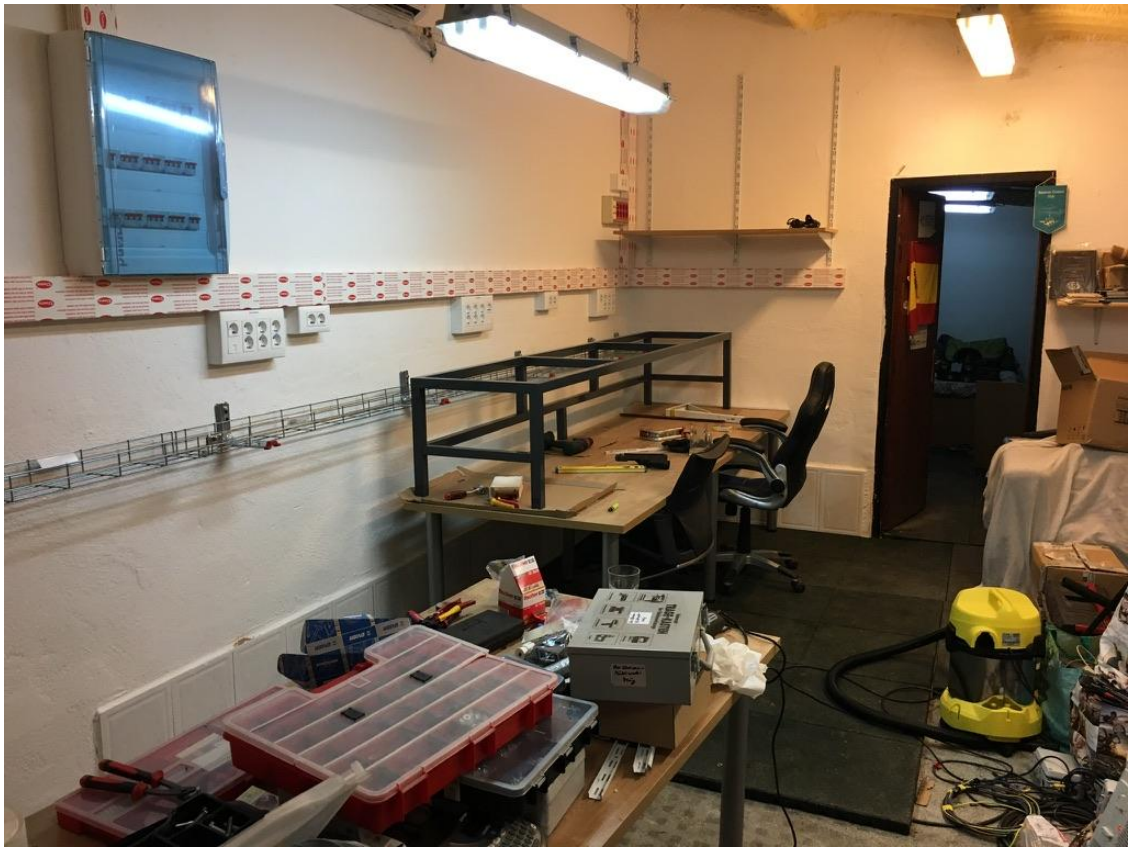
New electrical wiring

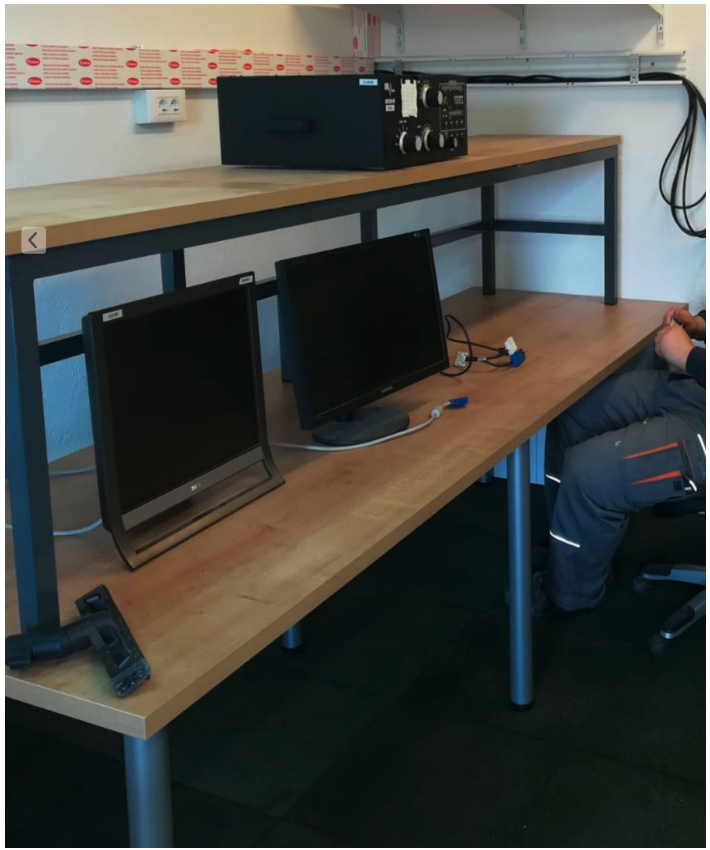


Power, GbE, 12V & Bonding for each Position



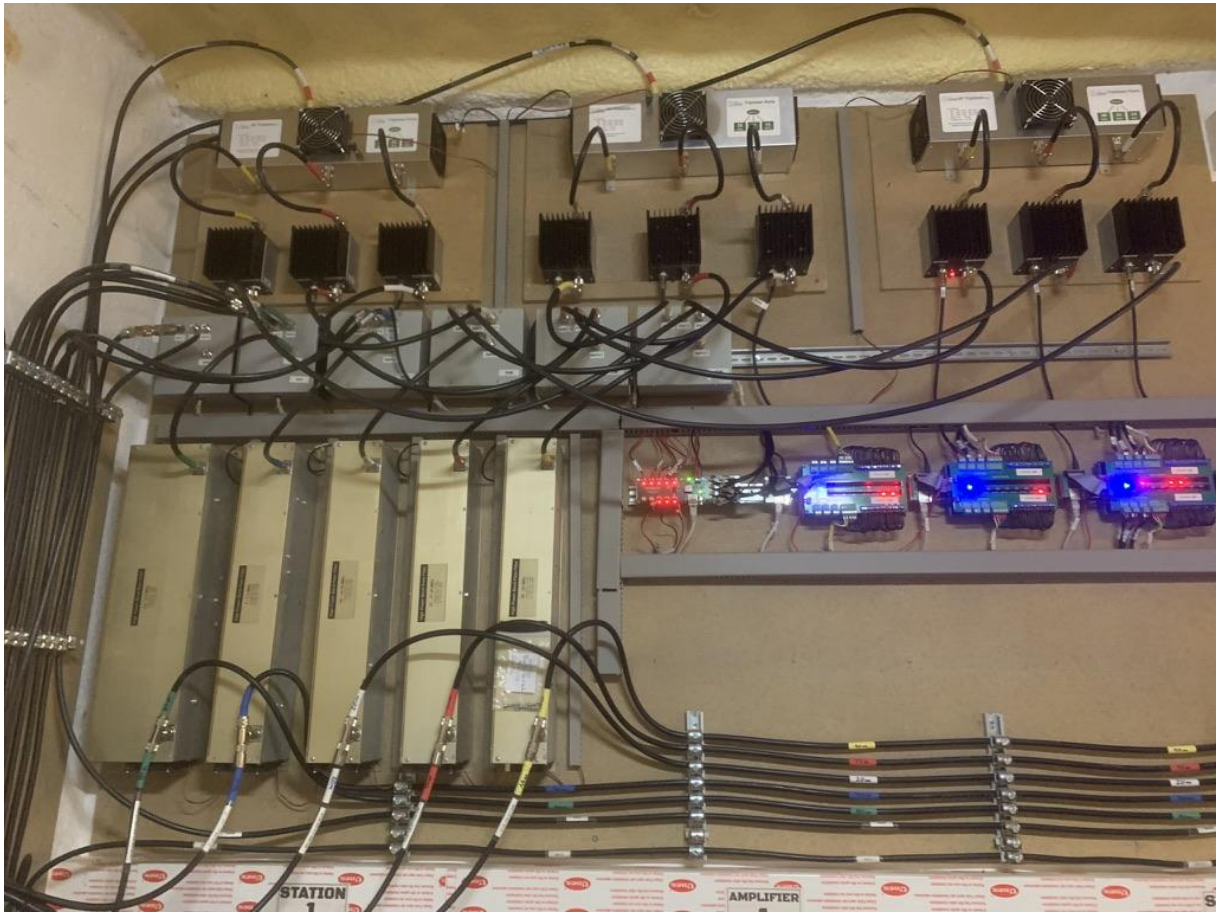
Cable Management & new custom tables



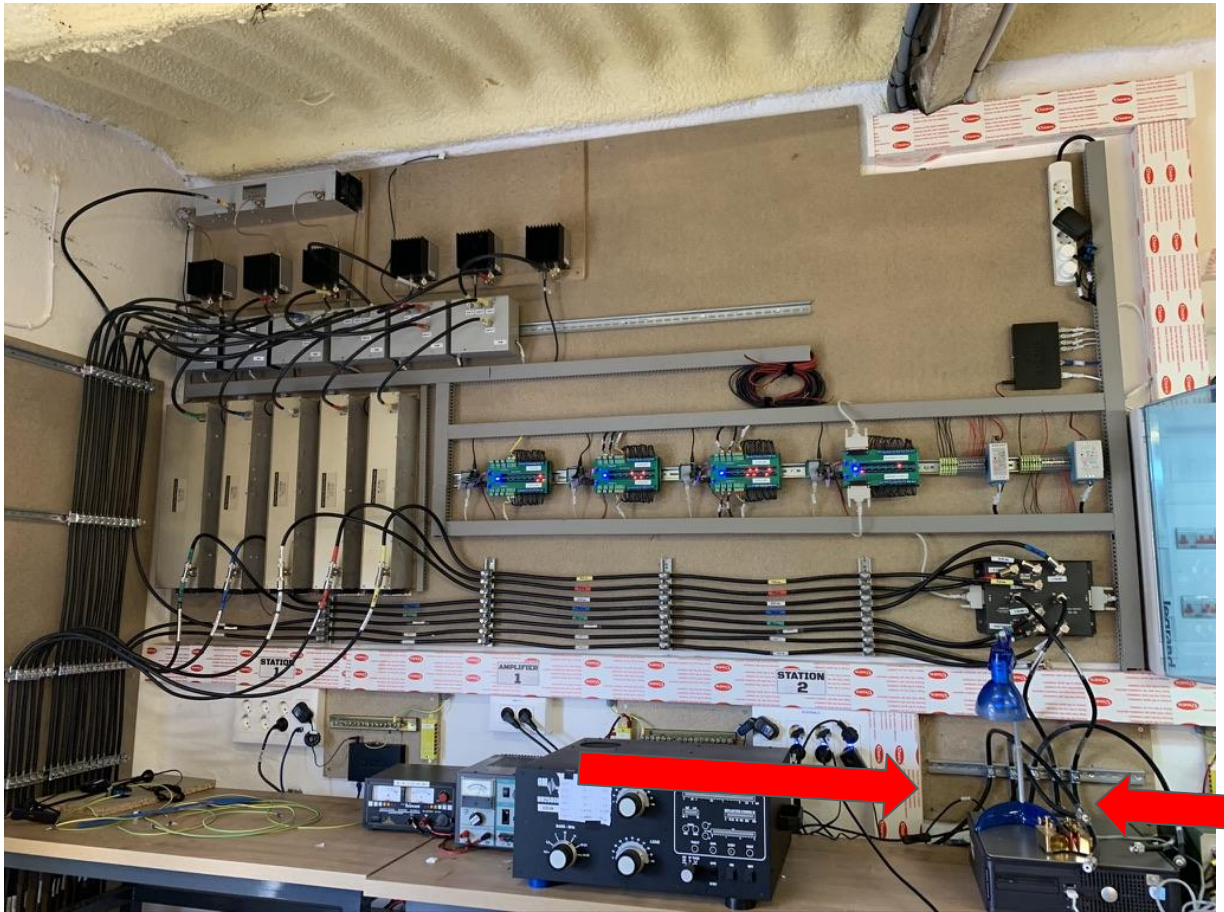


Almost ready

RF distribution (incl color coding!)

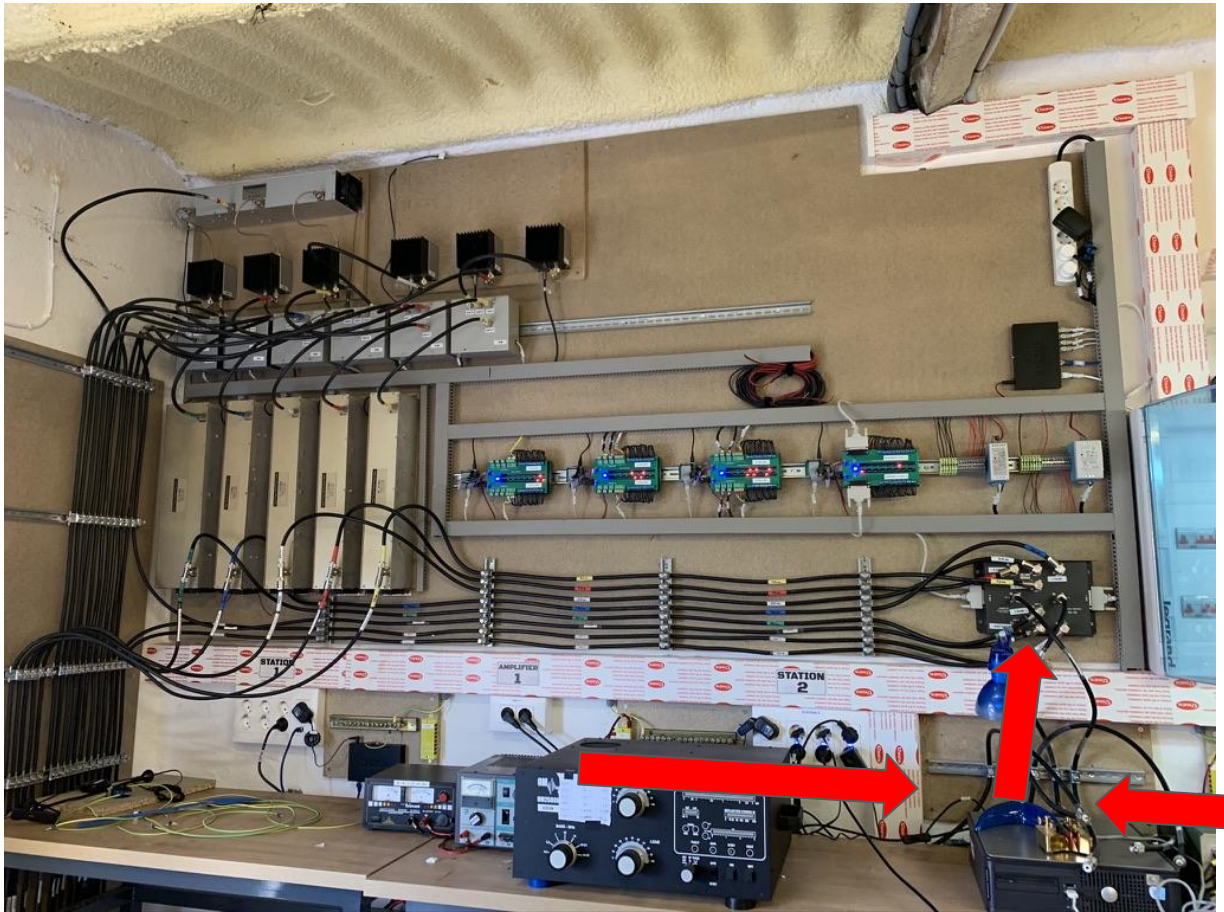


Logical RF Flow for easy understanding & debugging

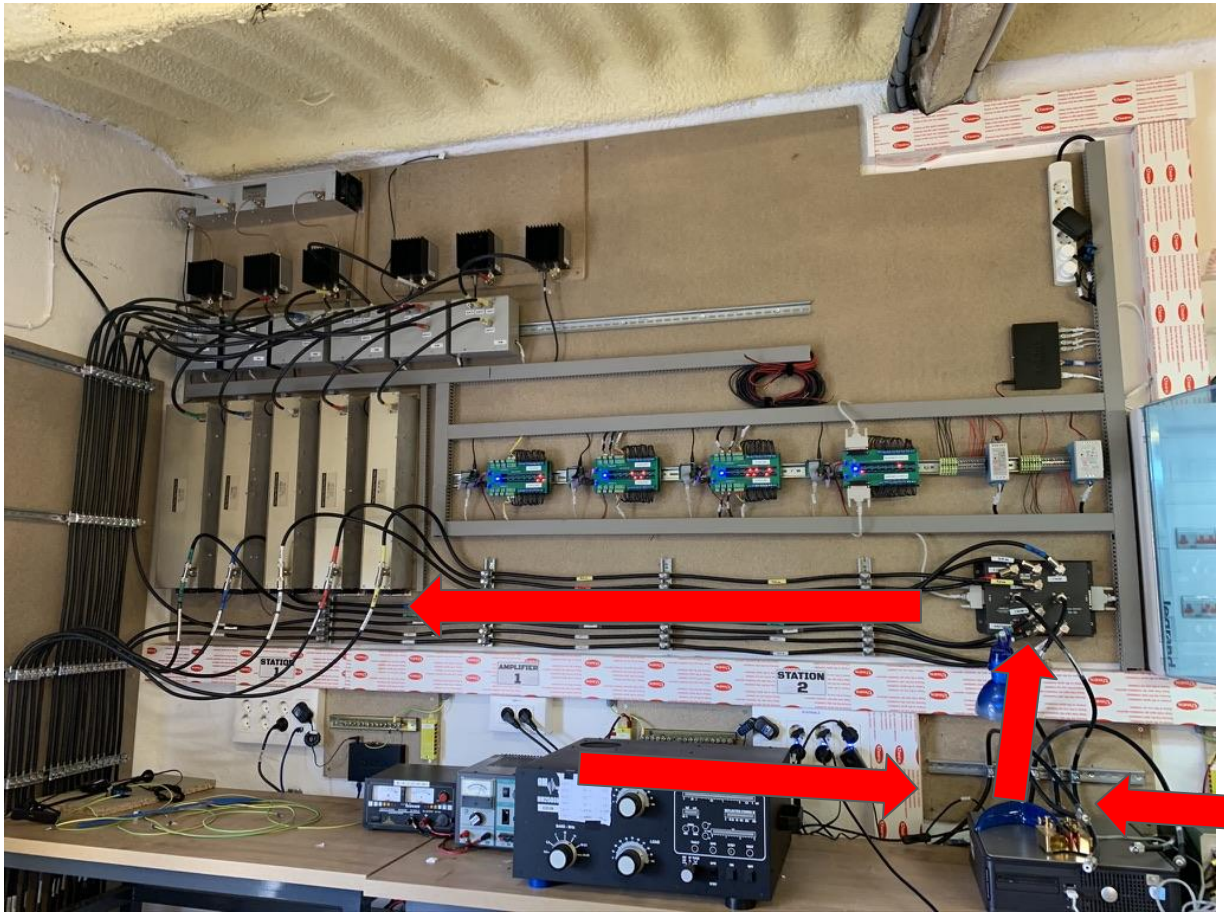


From Radios

Logical RF Flow for easy understanding & debugging



Logical RF Flow for easy understanding & debugging

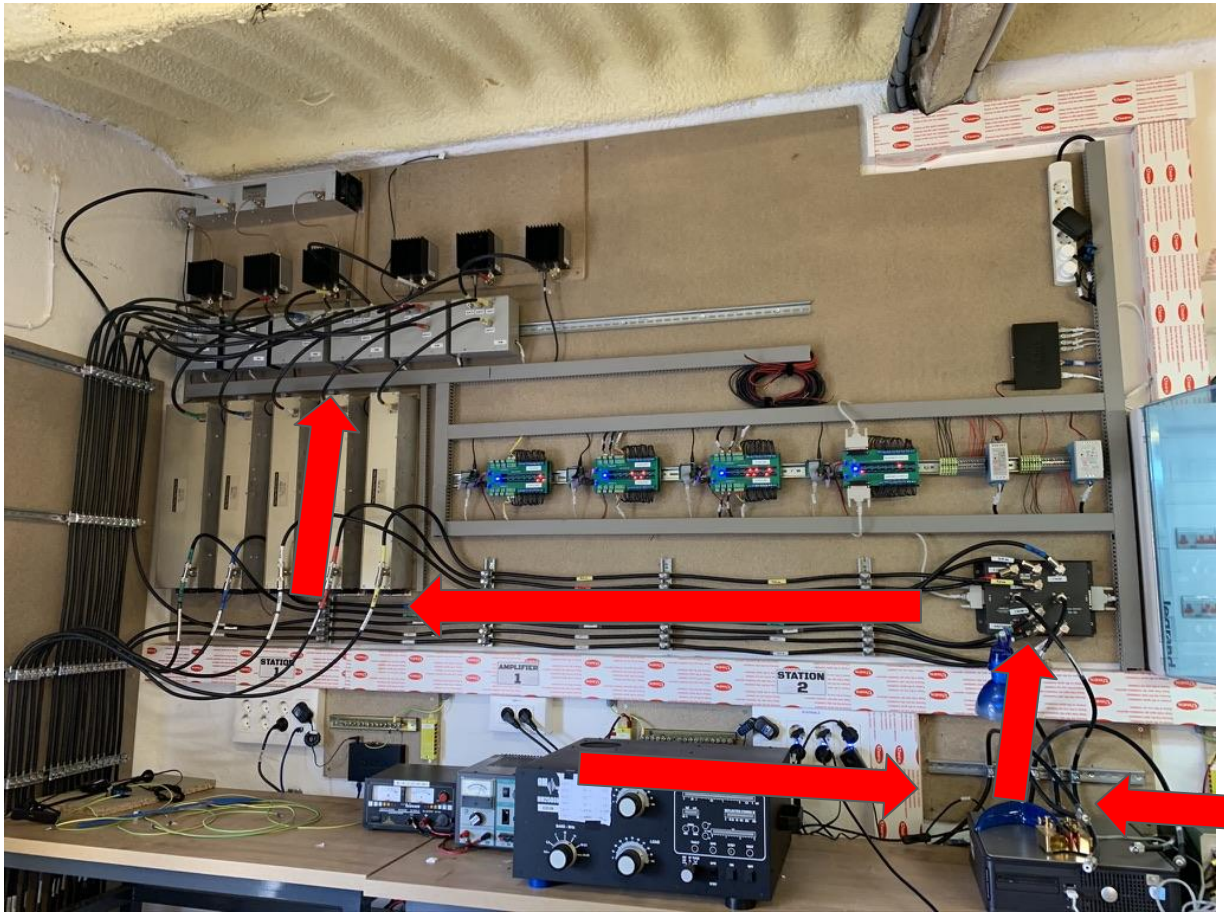


Bandfilters

8x2 Switch

From Radios

Logical RF Flow for easy understanding & debugging



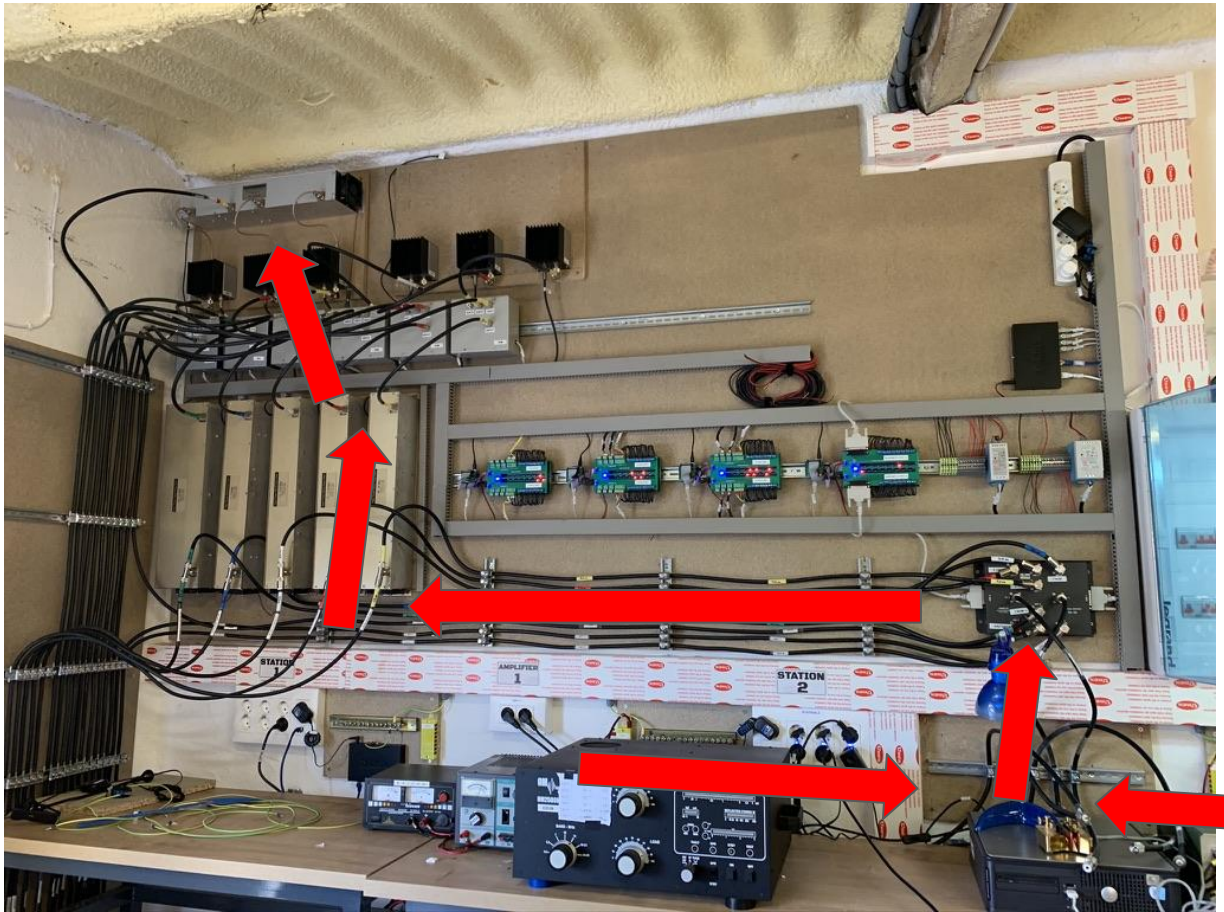
Stackmatches

Bandfilters

8x2 Switch

From Radios

Logical RF Flow for easy understanding & debugging



Triplexors

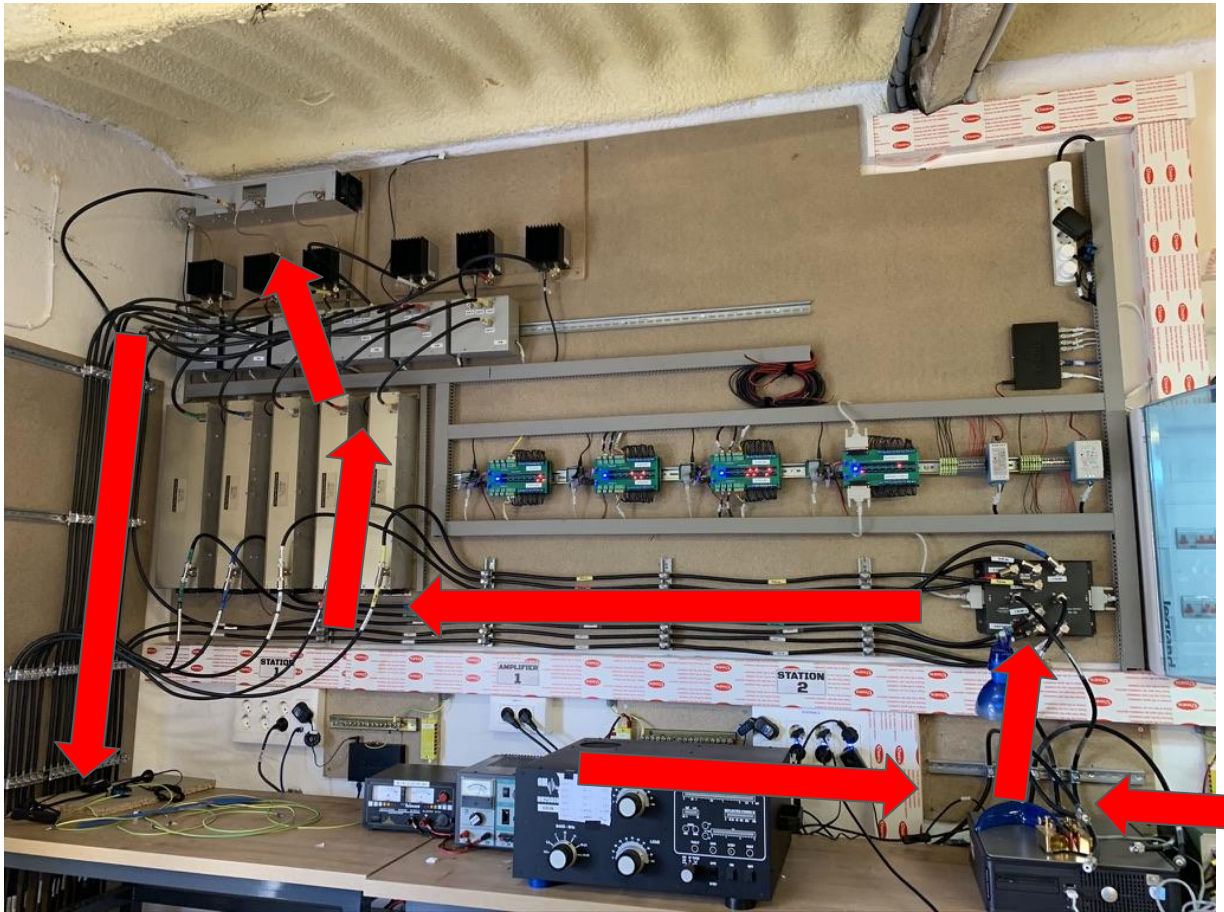
Stackmatches

Bandfilters

8x2 Switch

From Radios

Logical RF Flow for easy understanding & debugging



To Antennas

Triplexors

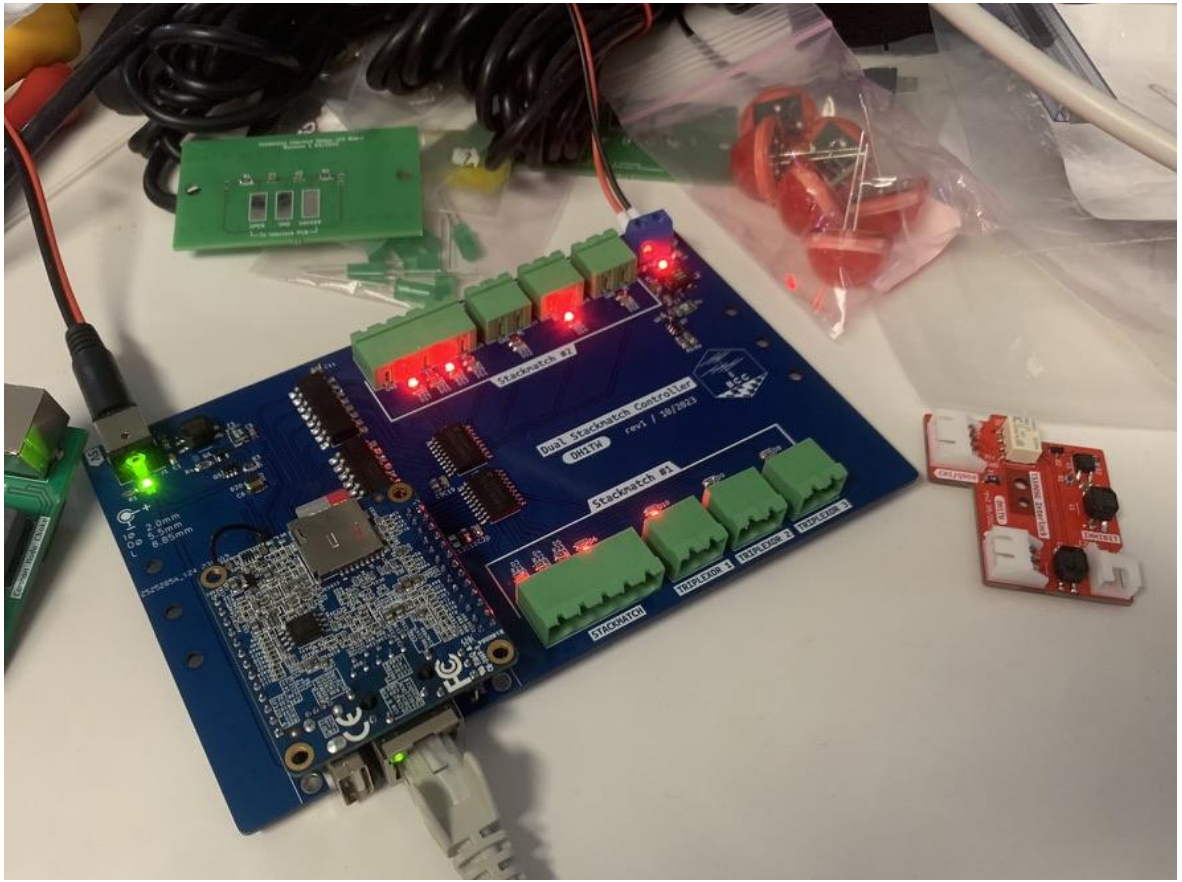
Stackmatches

Bandfilters

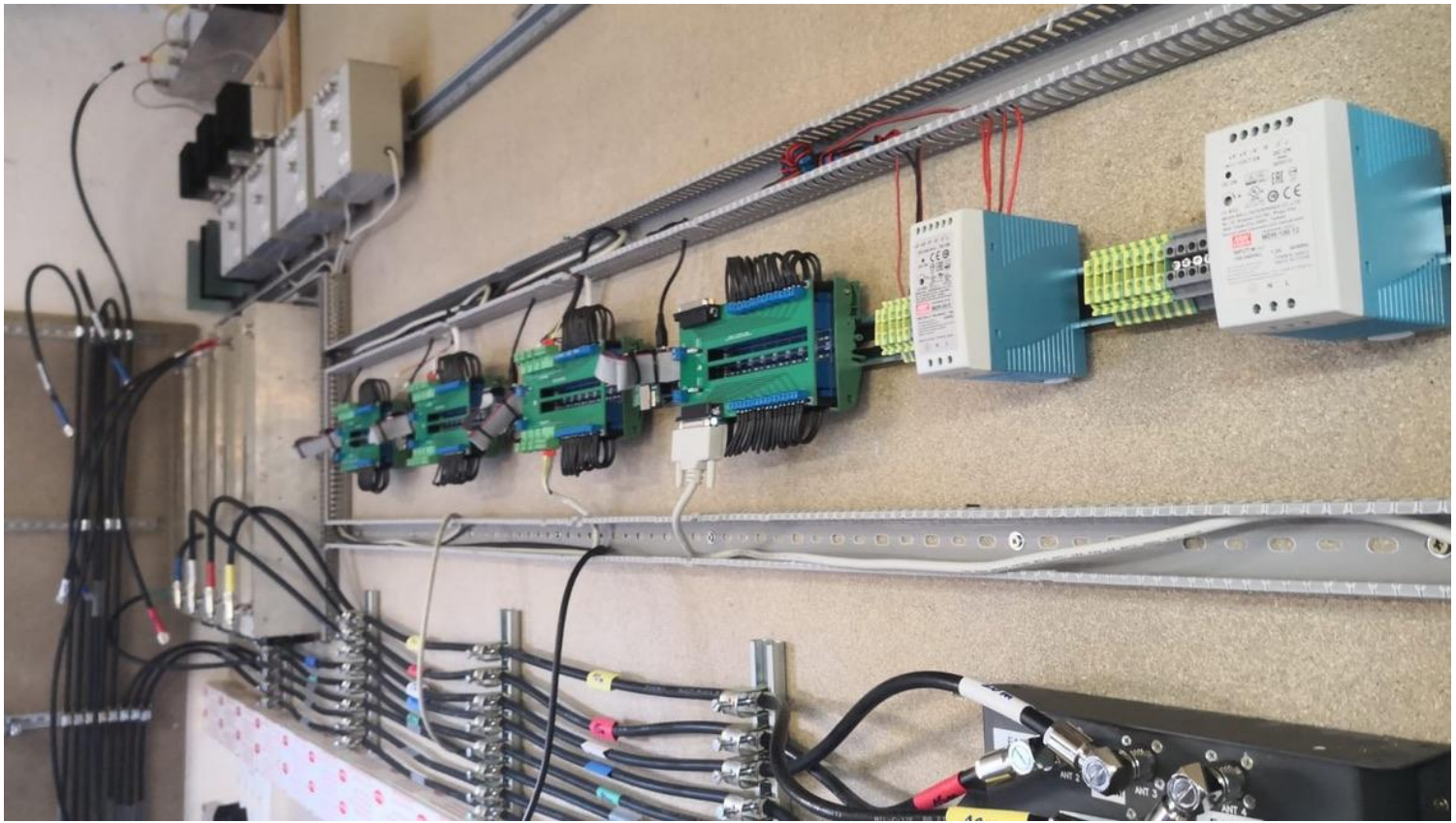
8x2 Switch

From Radios

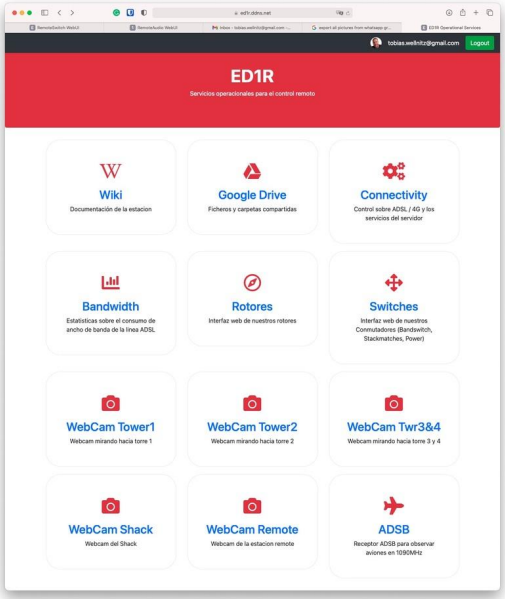
Stackmatches & Custom Control PCBs

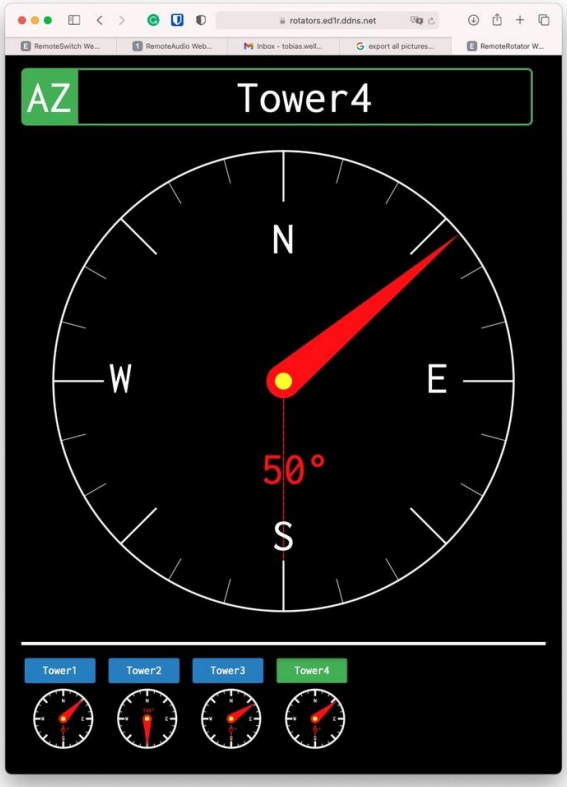


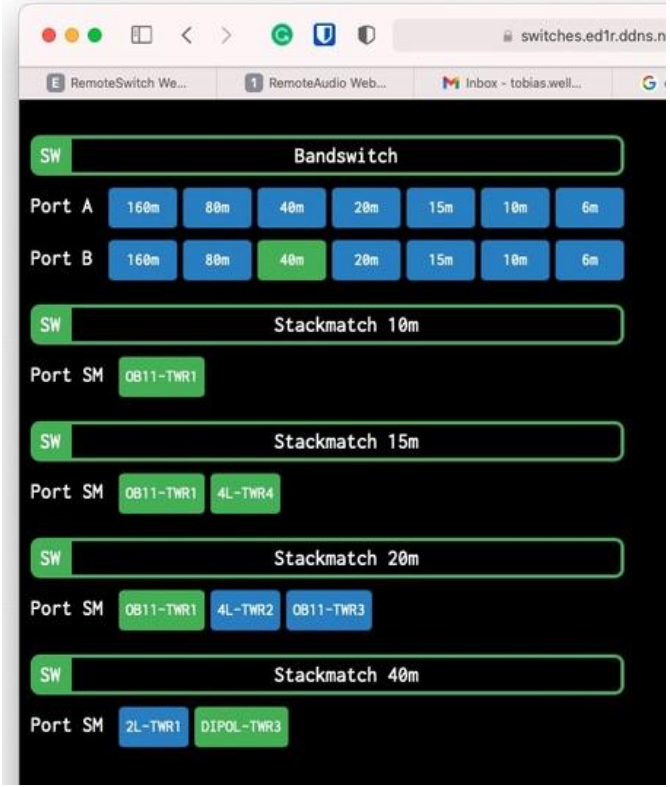
Mounted on DIN Rails for quick replacement



Web Based Software to control the station







https://github.com/dh1tw

Hardware Controller

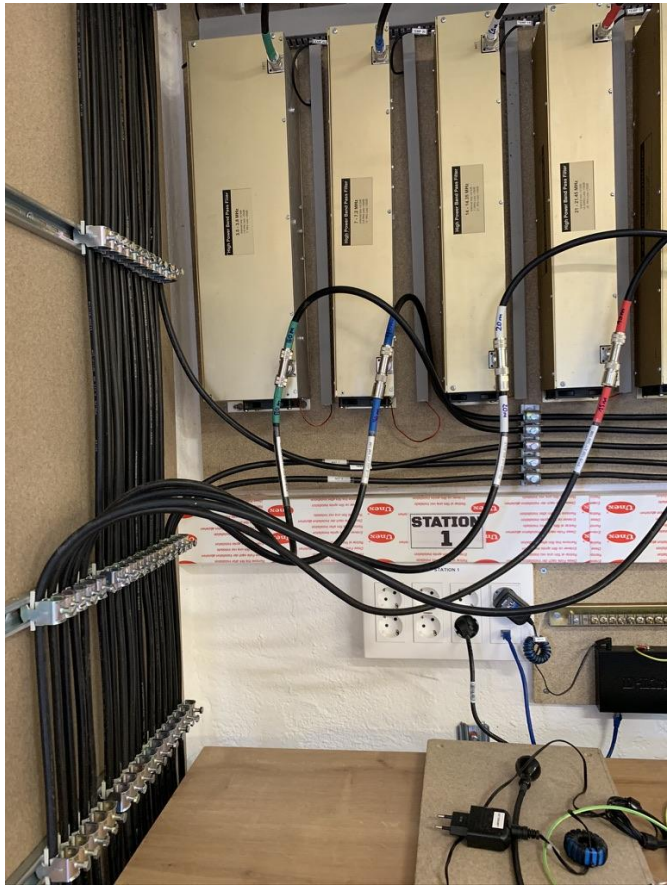
Chapter 3

2019 - today

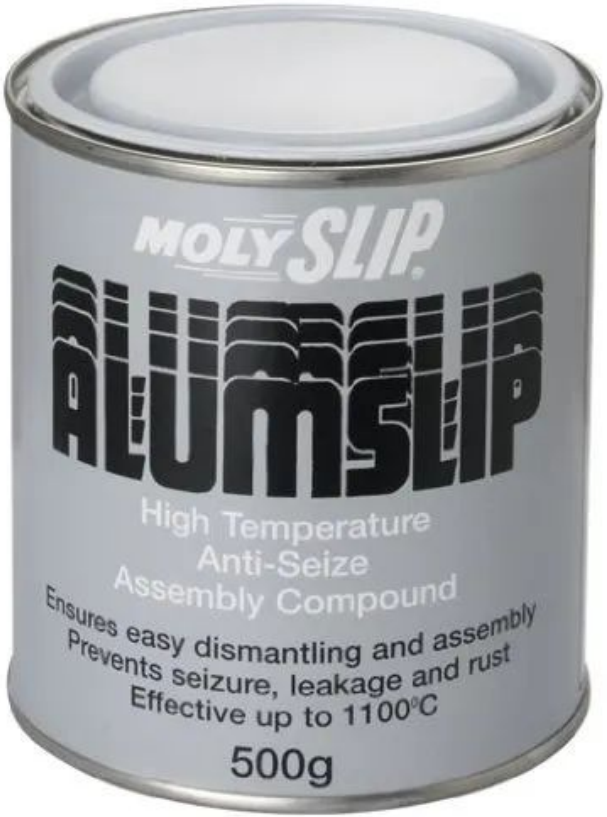
“the good, the bad, the ugly”

90% of RF problems identified with Dummy Loads

Clamps disencourage modifications



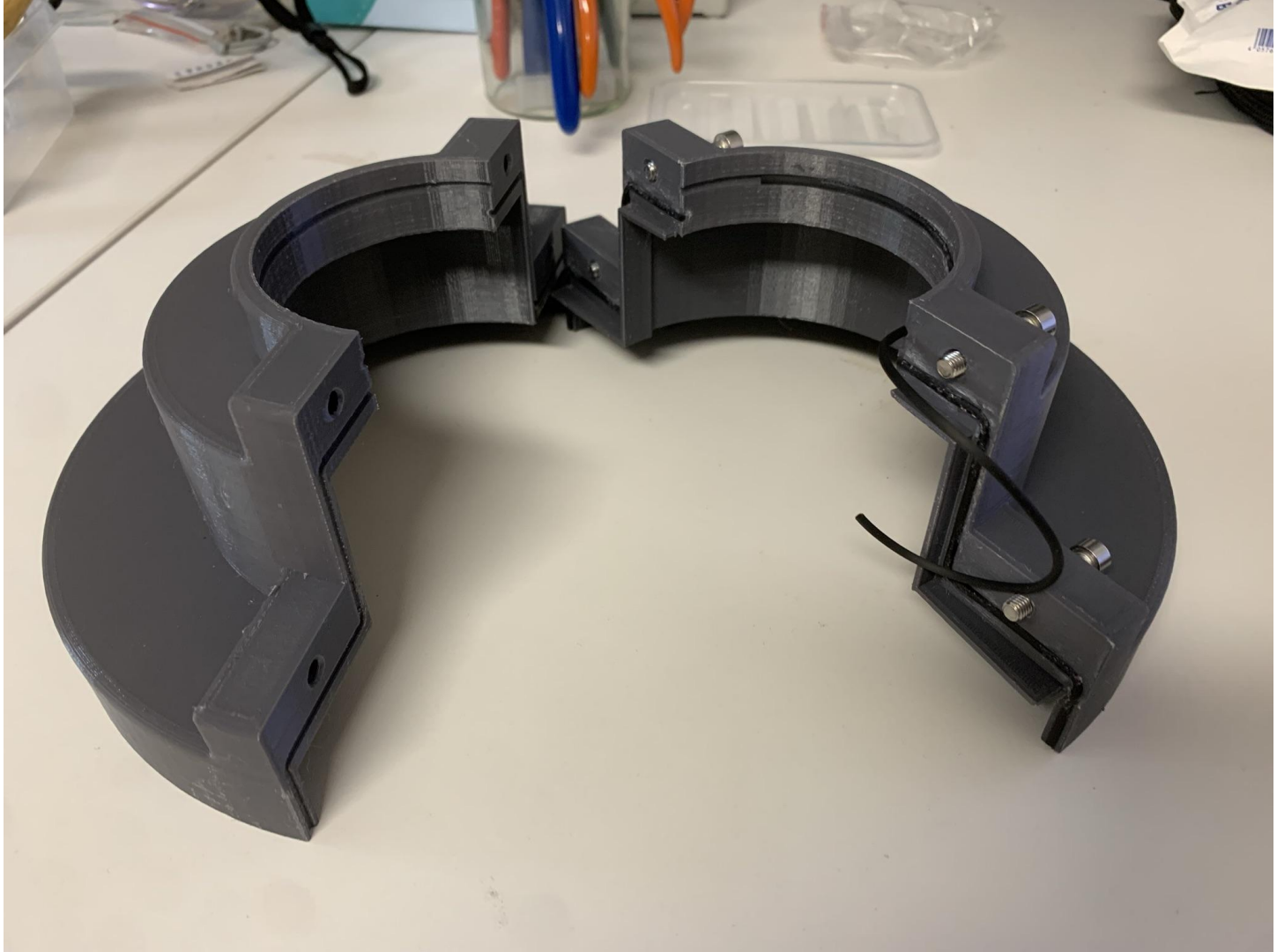
Tape + Alumslip avoid oxidation



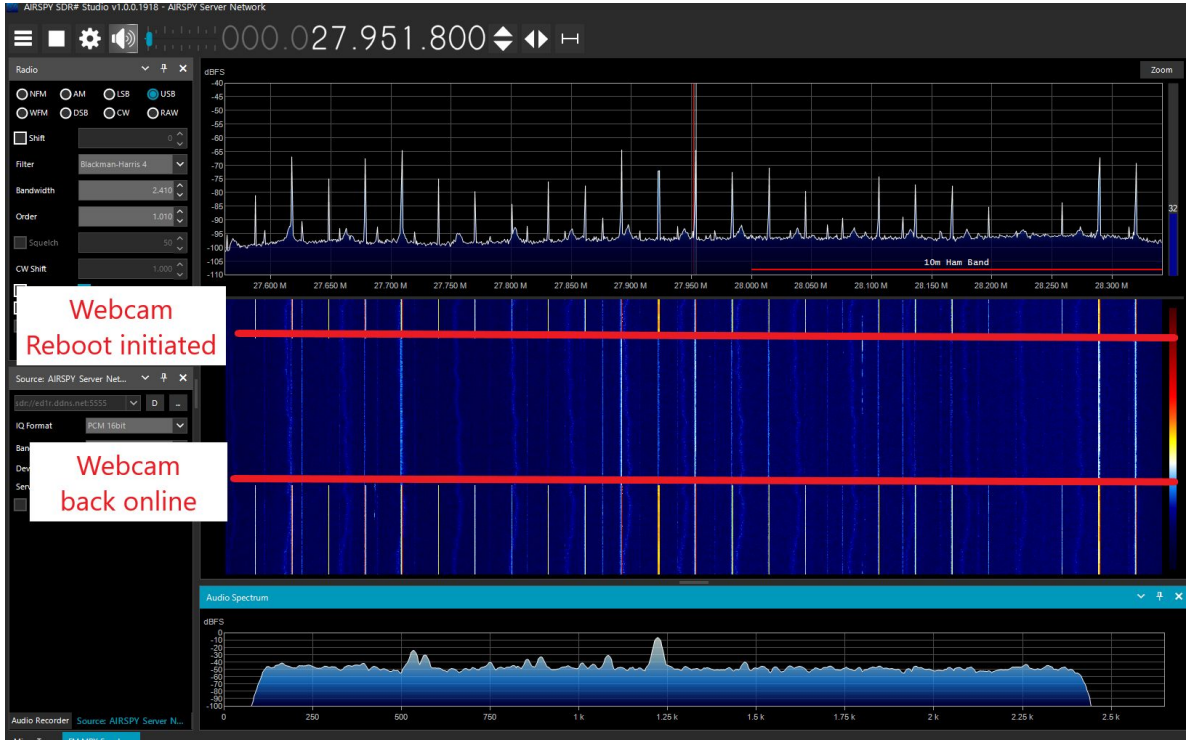
Easy accessibility & safe working in altitude is key

Industrial bearing are great, but …

3D Printer to the rescue

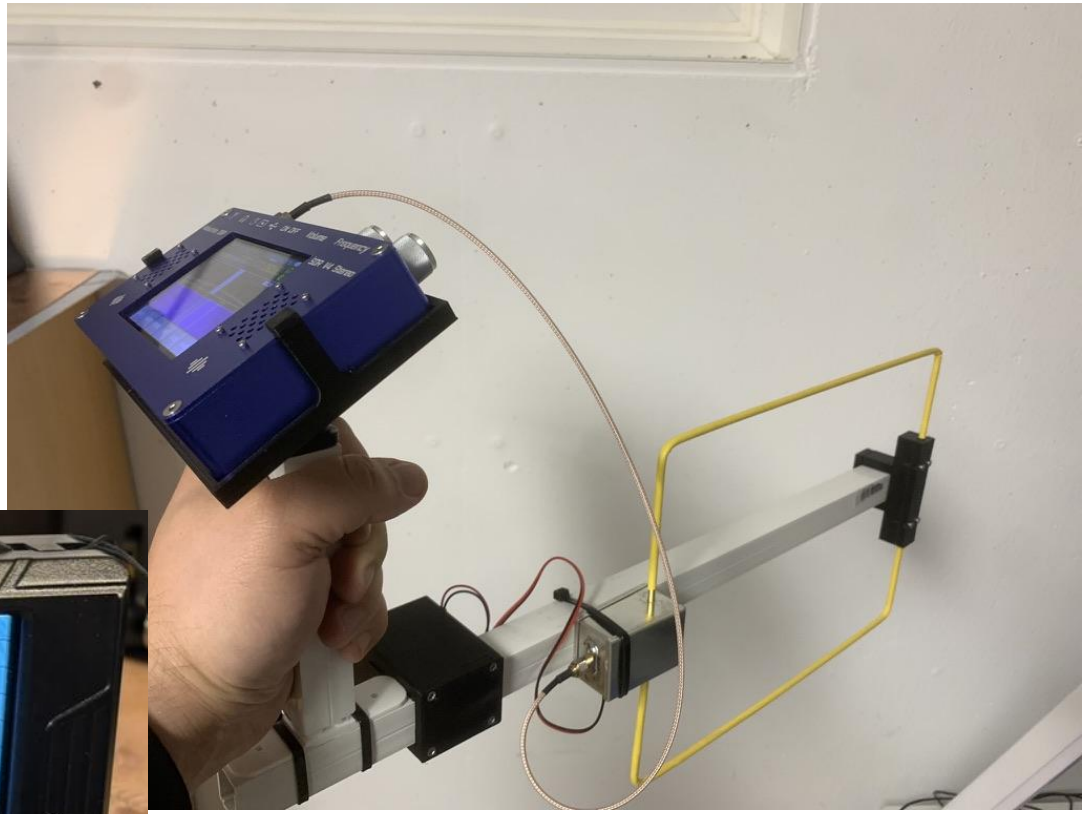


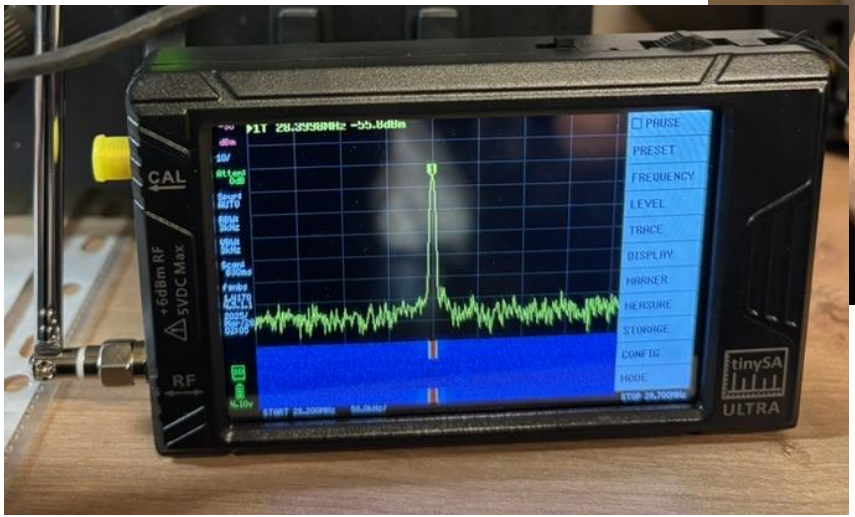
100MBit Ethernet can be noisy!



125MHz (clock) / 2047 = ~61kHz (harmonics)

Little EMI Helpers





RCD behind RCD

Thermal cameras have become also afforable

Summary

Our guidelines for a low-maintenance Contest station

- **Never compromise on safety**!
- **Less** antennas can actually **be more**
- Prefer **mechanically simple Antenna** Design (Optibeam vs M2)
- Build your **towers** only as tall as you can **reach them comfortably**
- **Move complexity** off the tower to the **ground**
- Design for **redundancy** of all major components
- **Standardize** on components (Plug & Replace)
- Change as little as possible. **Make changing things hard!**
- Design for **easy & quick debugging** (e.g. with Dummy load)
- Label everything! Make your station concept easy understandable
- Ethernet brings a lot of flexibility!