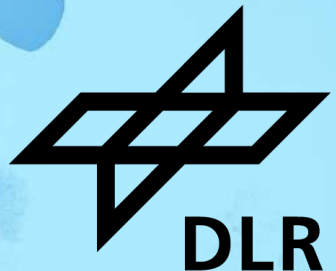


A GLANCE ON

... the Monitoring Network for Evil Waveform and Ionospheric Characterization

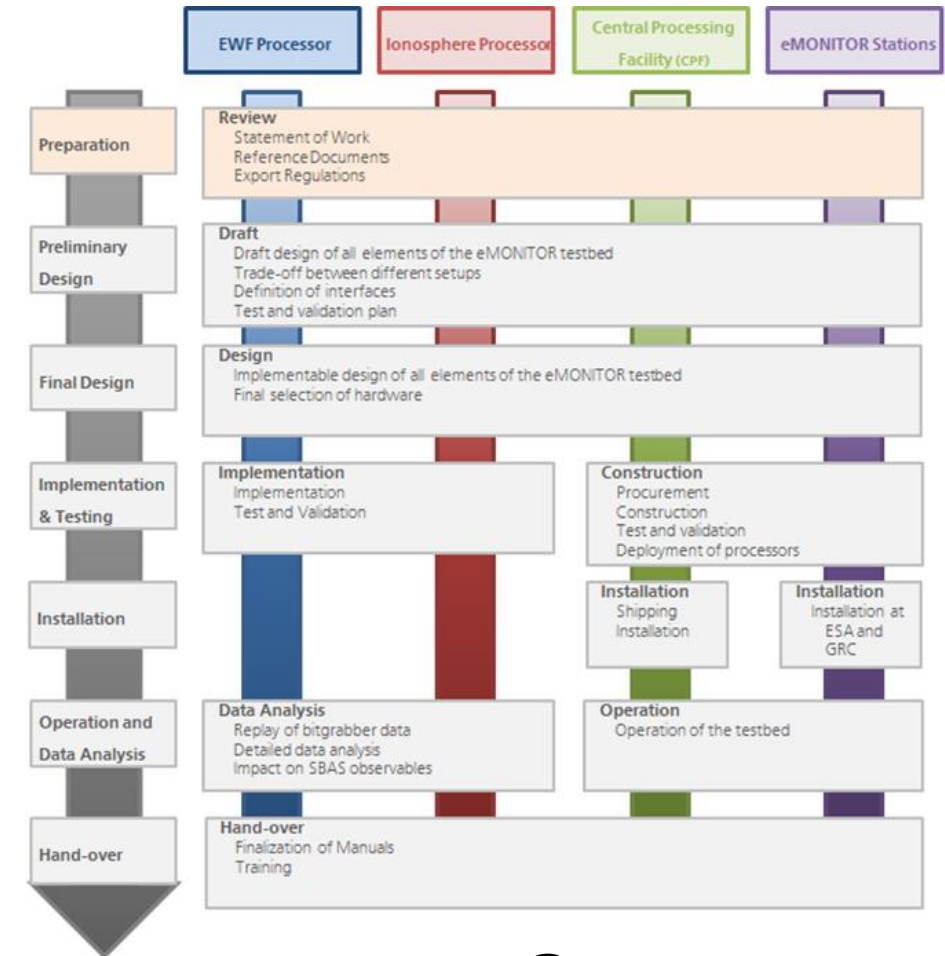
H037-MoNEWIC



MoNEWIC (eMONITOR)



- EU funded H2020 project H037
- lead by DLR, administrated by ESA
- continues
MONITOR project (2010-2013)
MONITOR 2 project (2014-2016)
- testbed with central and 5+3 stations
- integration of previous data/stations
- **test receiver robustness to scintillation**



AIRBUS



@
Volker Wilken

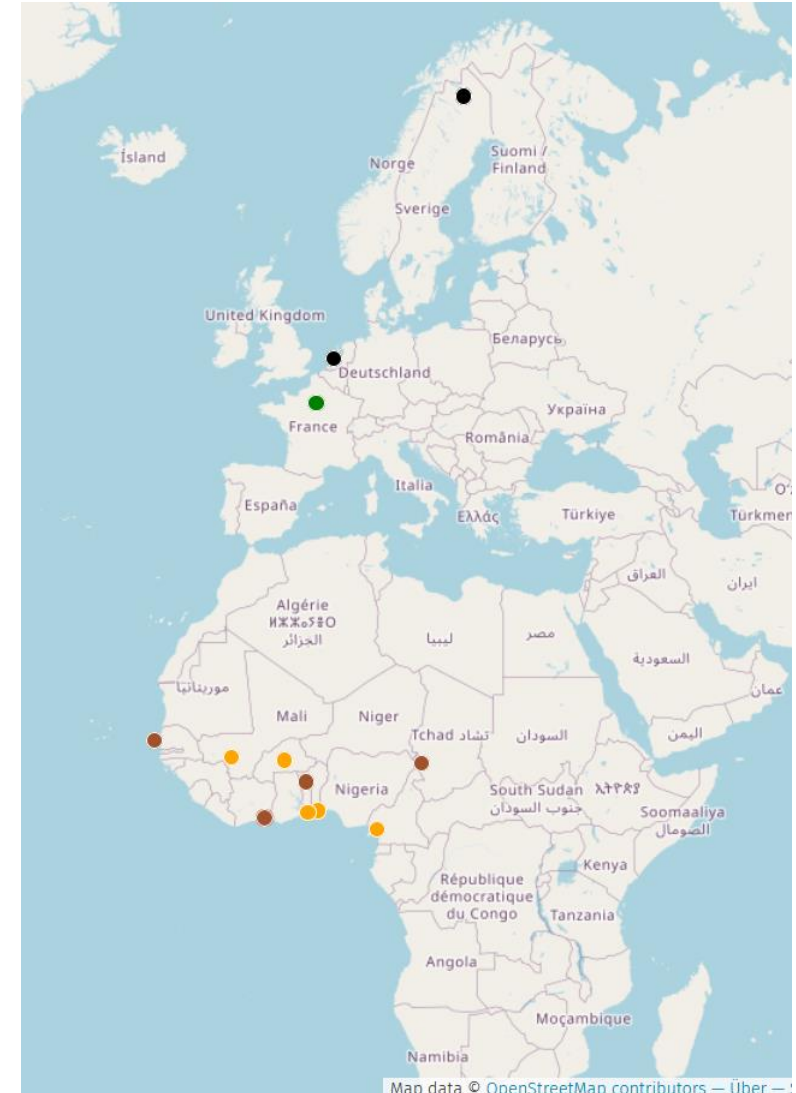
Observation sites



Monitor 2

- united with the CNES/ASECNA network and new receivers in West Africa
- improved central data management/processing
- first tests on bitgrabbing
- no more binaries

ASECNA: L'Agence pour la Sécurité de la Navigation aérienne en Afrique et à Madagascar

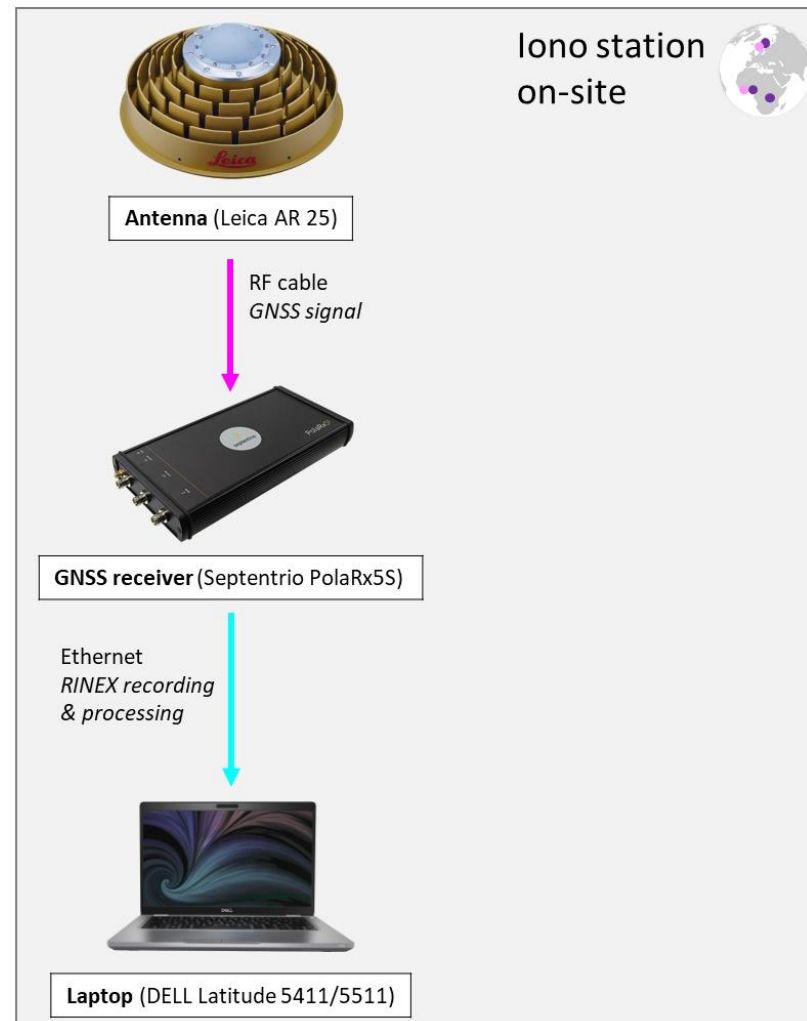


Observation sites

MoNEWIC

Ionosphere recording station

- high-rate rinex3, scintex, binary (S4, SigmaPhi)
- cp. EVnet (DLR)



@
Martin Kriegel
Youssef Tagargouste

Ionosphere recording station

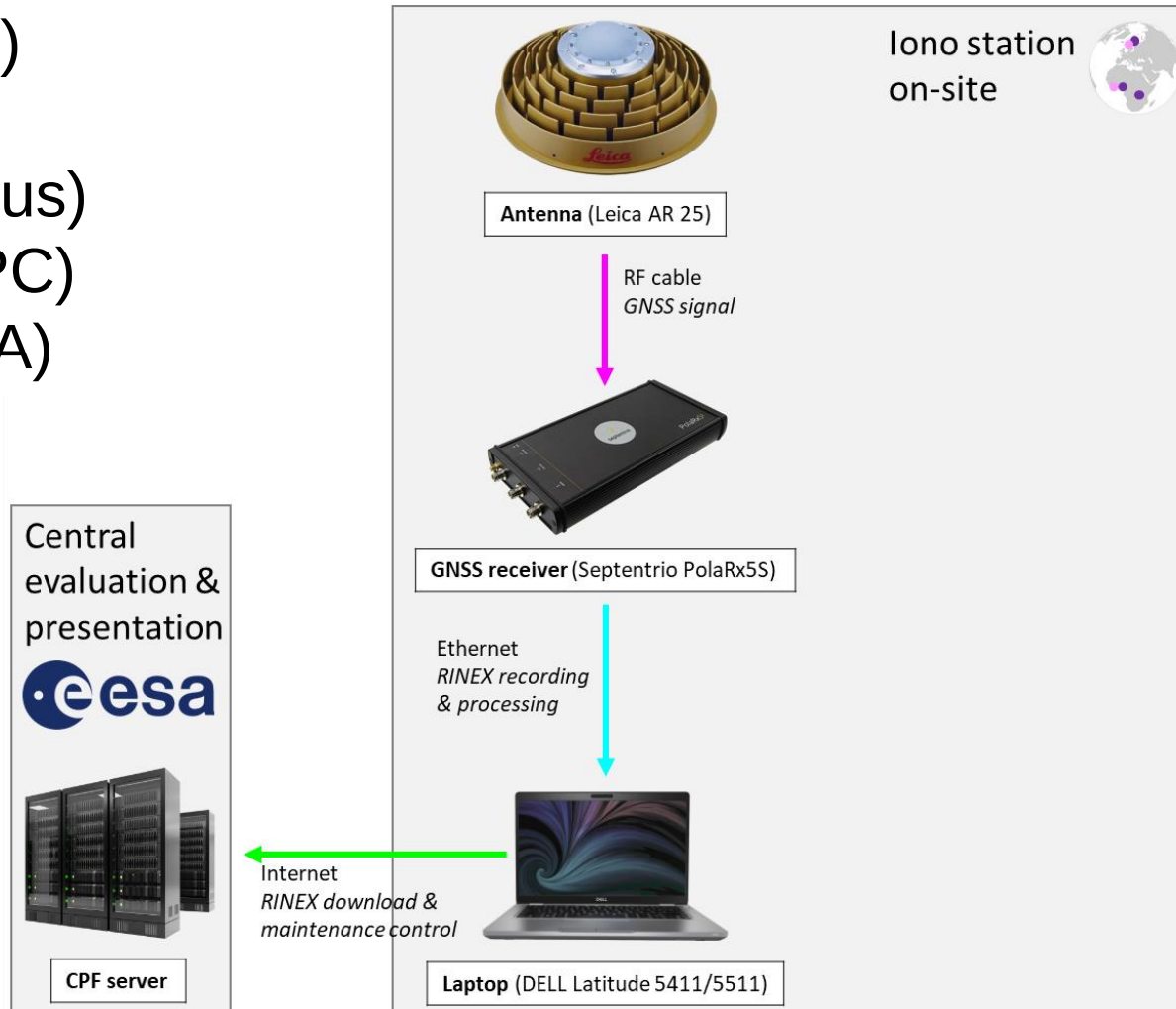


CPF (NLR)

EWF (Airbus)

MUIIP (UPC)

Scint (IEEA)

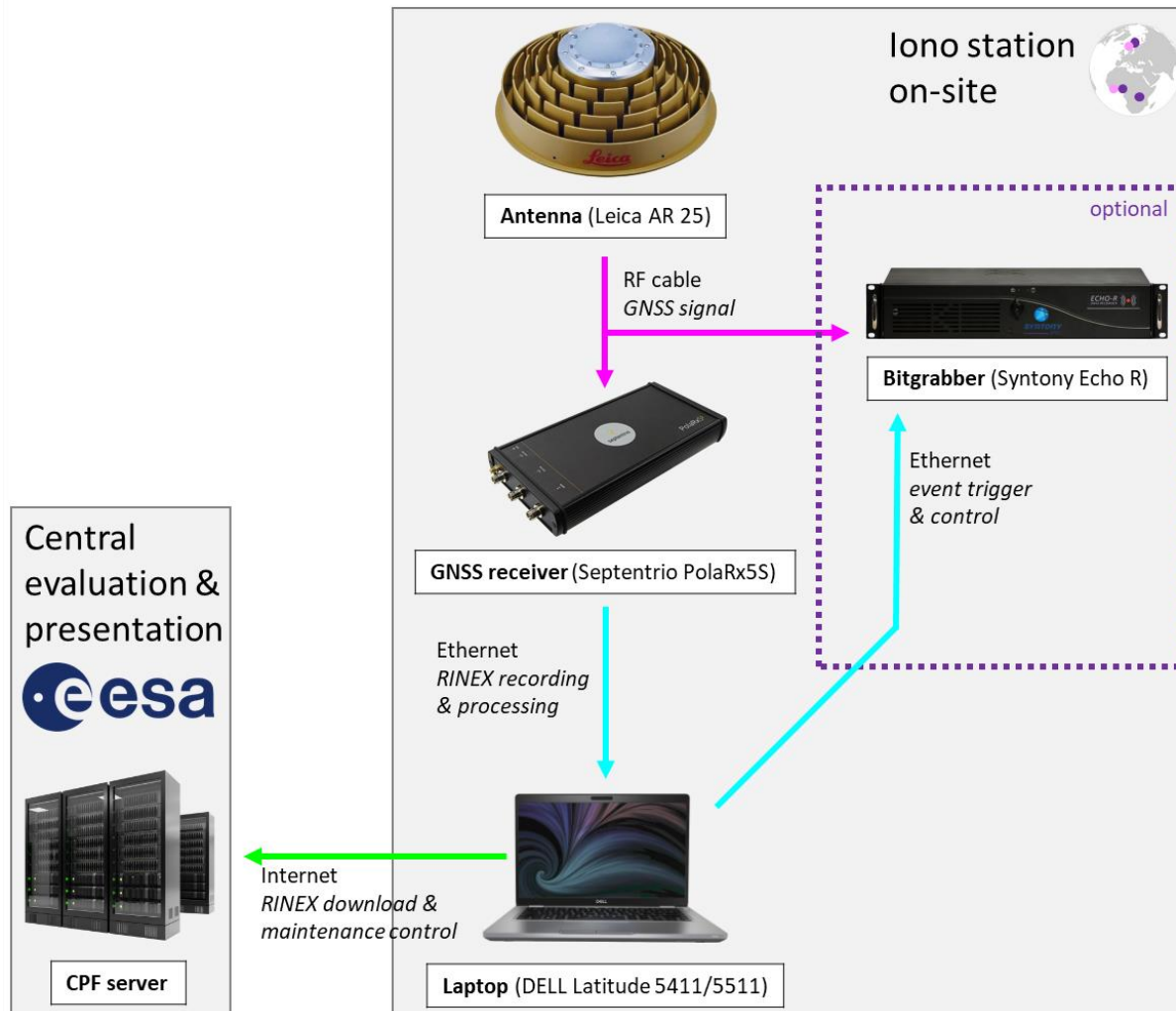


@
Hein Zelle
Erik Baalbergen

Miguel Odriozola Olavarria
Manuel Hernández-Pajares
Yannick Béniguel

Ionosphere recording station

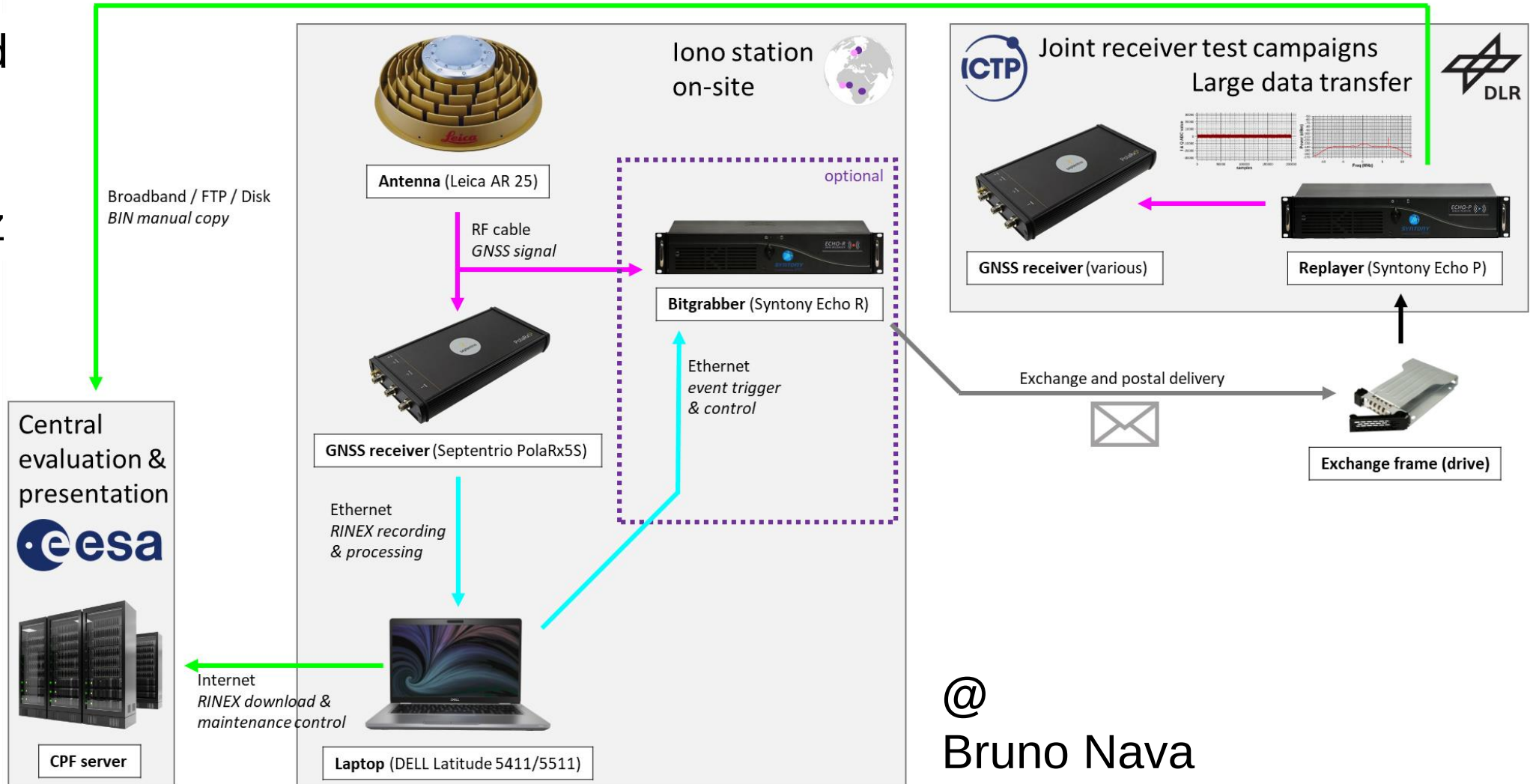
Aim:
library of
events for
testing



- Tromsø Geophysical Observatory (Tromsø / Norway)
- Center for Atmospheric Research (Abuja / Nigeria)
- ICTP-East African Institute for Fundamental Research (Kigali / Rwanda)

Ionosphere recording station

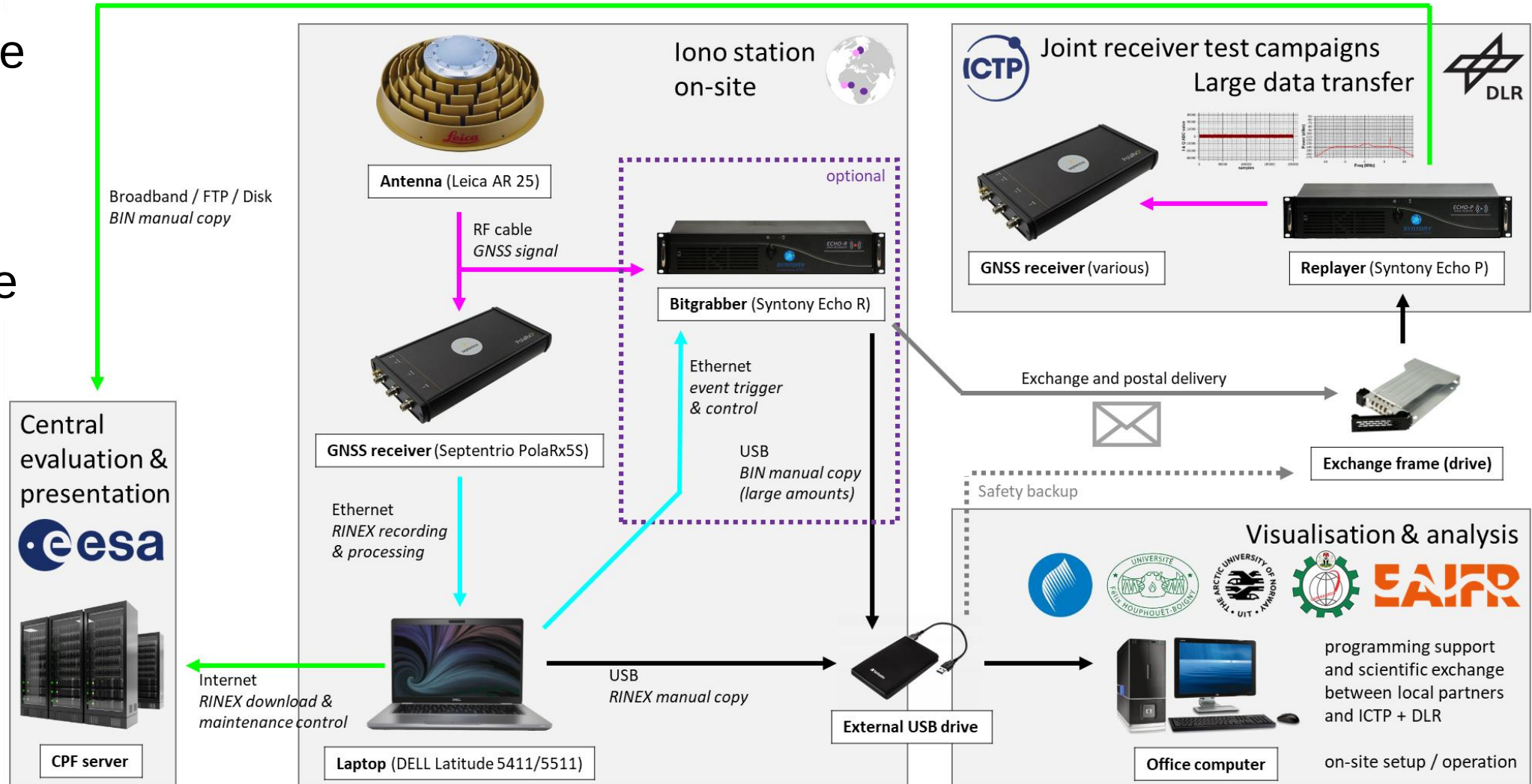
Check and
upload via
DLR at
Neustrelitz



@
Bruno Nava

Ionosphere recording station

Collaborate
with local
partners
→ direct
data usage



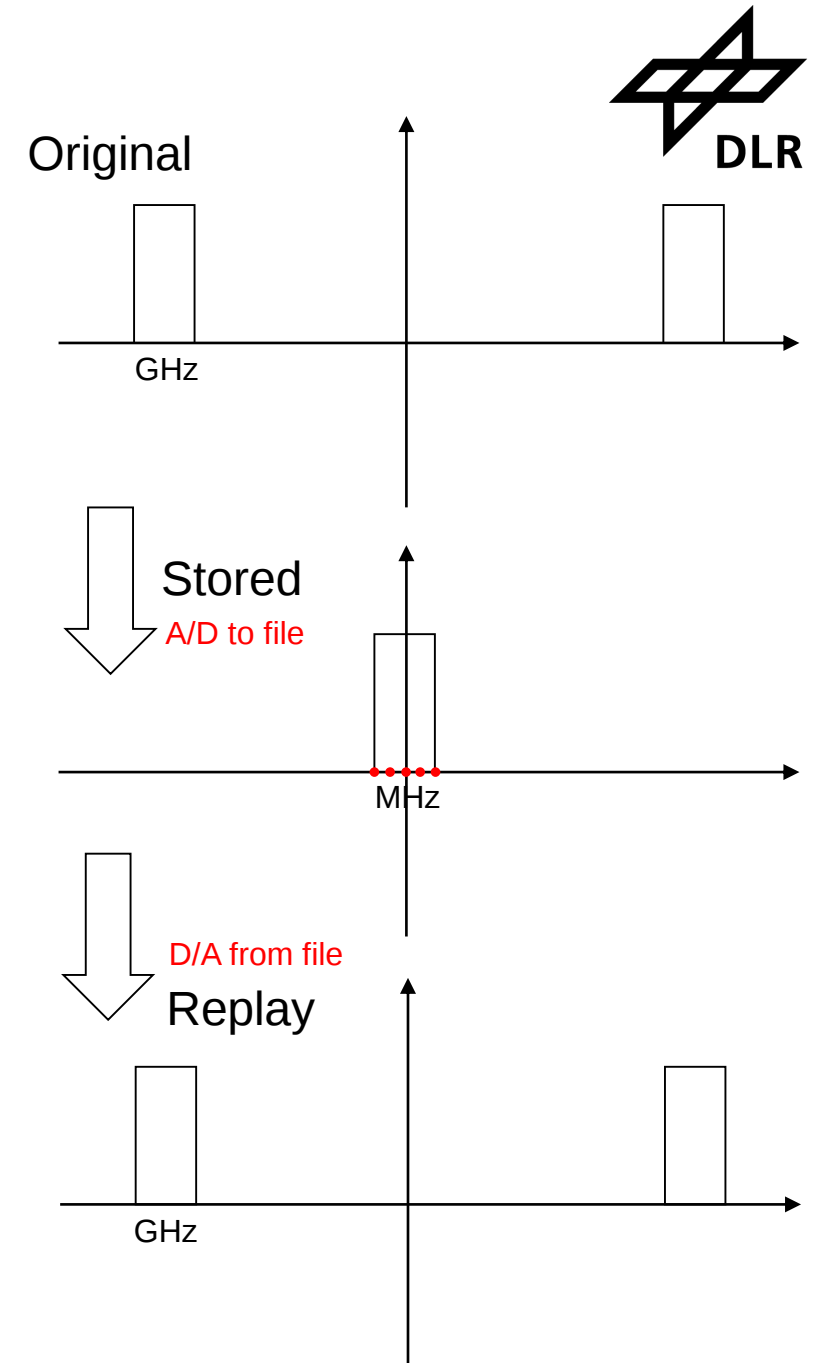
Bitgrabber in general

Basic principle

- store raw radio data in a dedicated frequency band
- down-convert to lower frequency band to save space and/or reconstruct via up-conversion

Use cases

- replay same signal to different receivers (settings)
→ evaluate correction algorithms
- test receiver reactions on solar/ionospheric events
- analyze raw data for ionospheric relations
- alter recorded data for simulating critical events



Bitgrabber in the IRS



ESA specifications

- bitgrabber is an optional addon
 - catch signal before receiver (splitter)
 - block for antenna's power
- no playback required on sites
 - more recorders than players
- synchronously monitoring L1 and L5
- adequate precision
- **monitoring time right before events**
 - event-driven trigger mechanism

Syntony Echo R+P features

- separate devices for rec and play
- open format
- exchangeable drives (up to four SSDs with 2, 4, 8 TB each)
- **GUI-based device**
 - ➔ modified with ring buffer (RAM) and remote controlling scripts (idle/monitor switching, event trigger, disk change)

Bitgrabber limitations



- up to 3 channels with up to 16 bit and 100 MHz
→ the higher the better certain effects can be captured (and analyzed or replicated in replay), but also the more increases data size
- write speed 300 MB/s (1200 MB/s via RAID 0)
- unsuitable events may be deleted after analysis only

Channels	Quantization	Bandwidth	Data rate	Buffer time 24 GB	Record time 2 TB
1	4 bit	10 MHz	10 MB/s	40 min	55.5 hrs
2	8 bit	10 MHz	40 MB/s	10 min	13.8 hrs
3	16 bit	100 MHz	1200 MB/s	0.3 min	0.4 hrs

Installation plan

Connections

Antenna

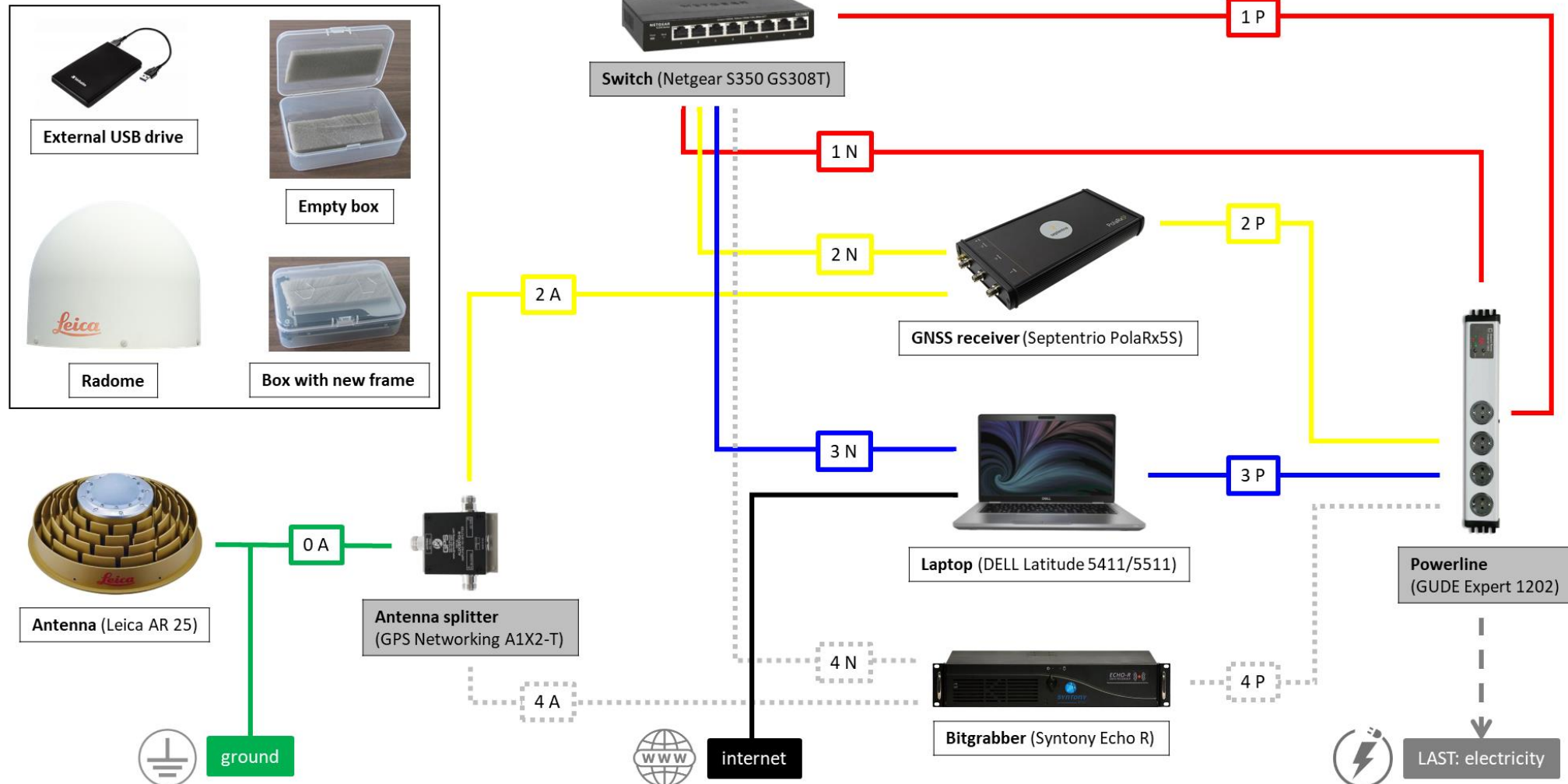
Receiver

Laptop

Bitgrabber

Switch

→ simplify
right setup



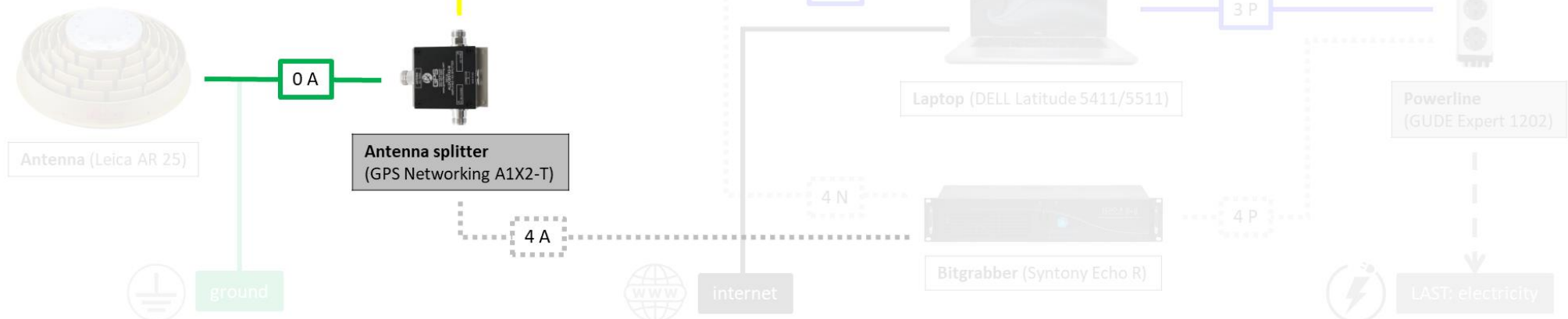
Installation plan

Connections

Antenna
cables



Splitter



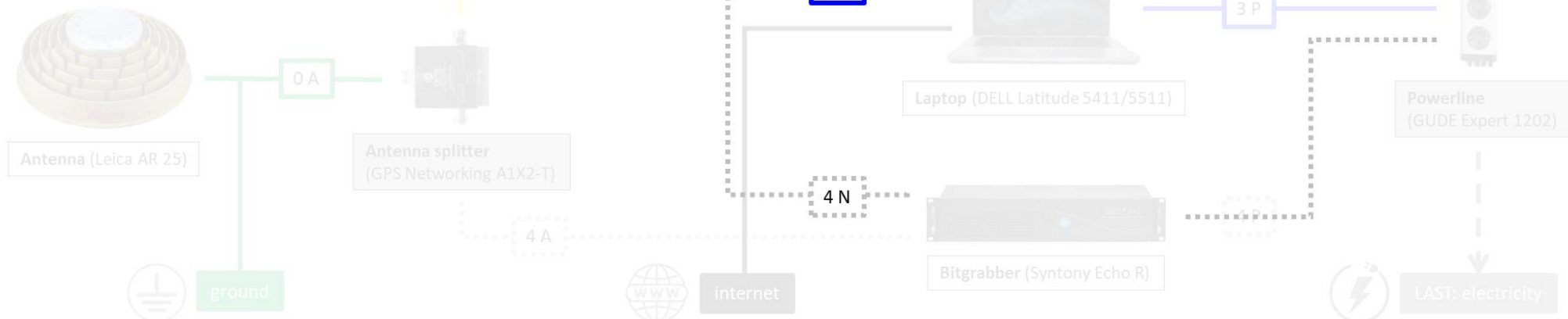
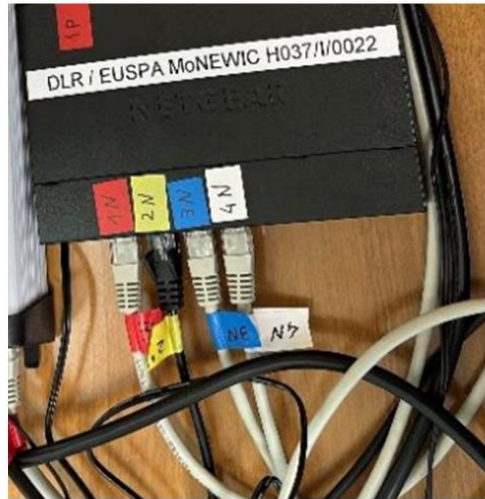
Installation plan

Connections

Network
cables



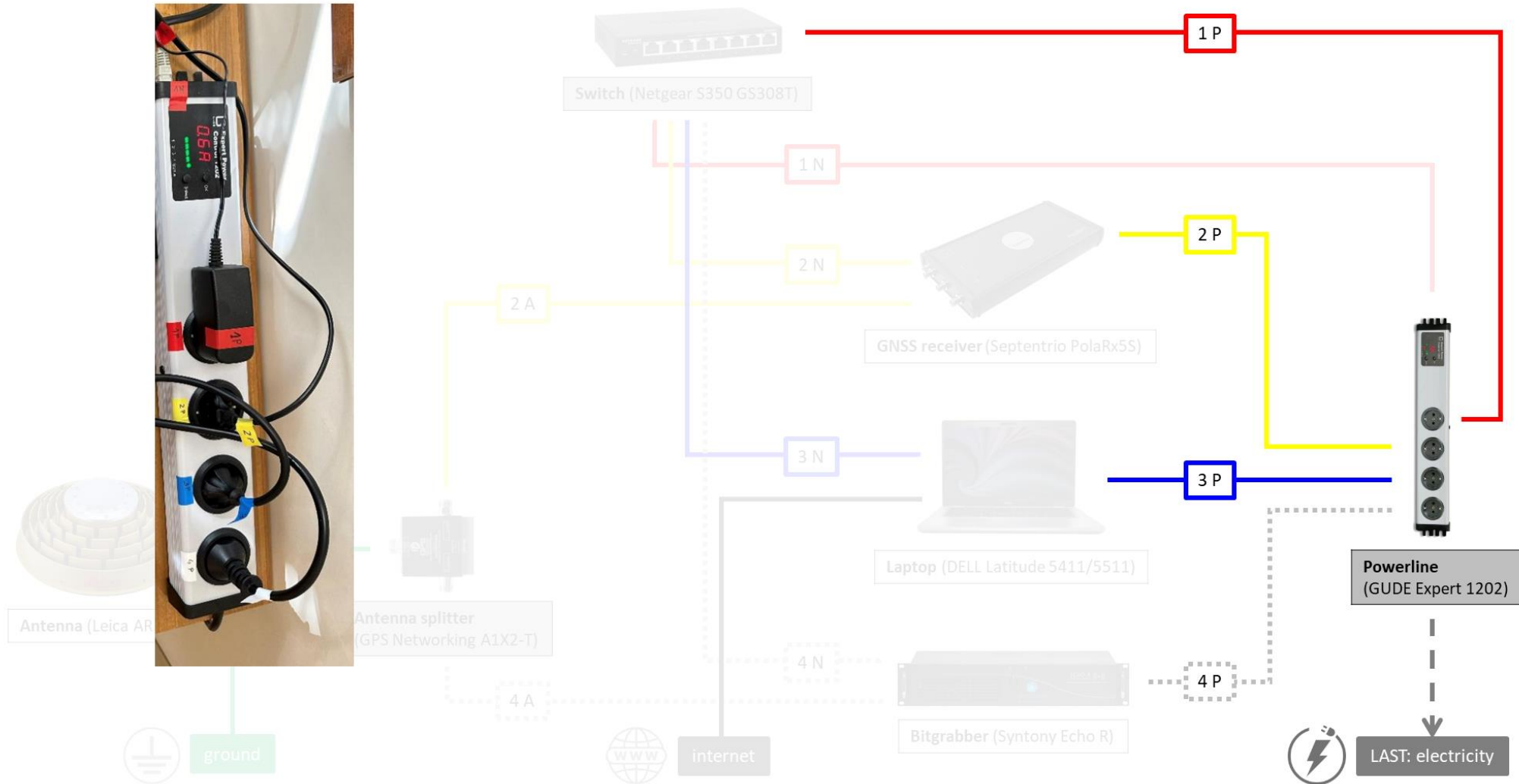
Switch



Power cables

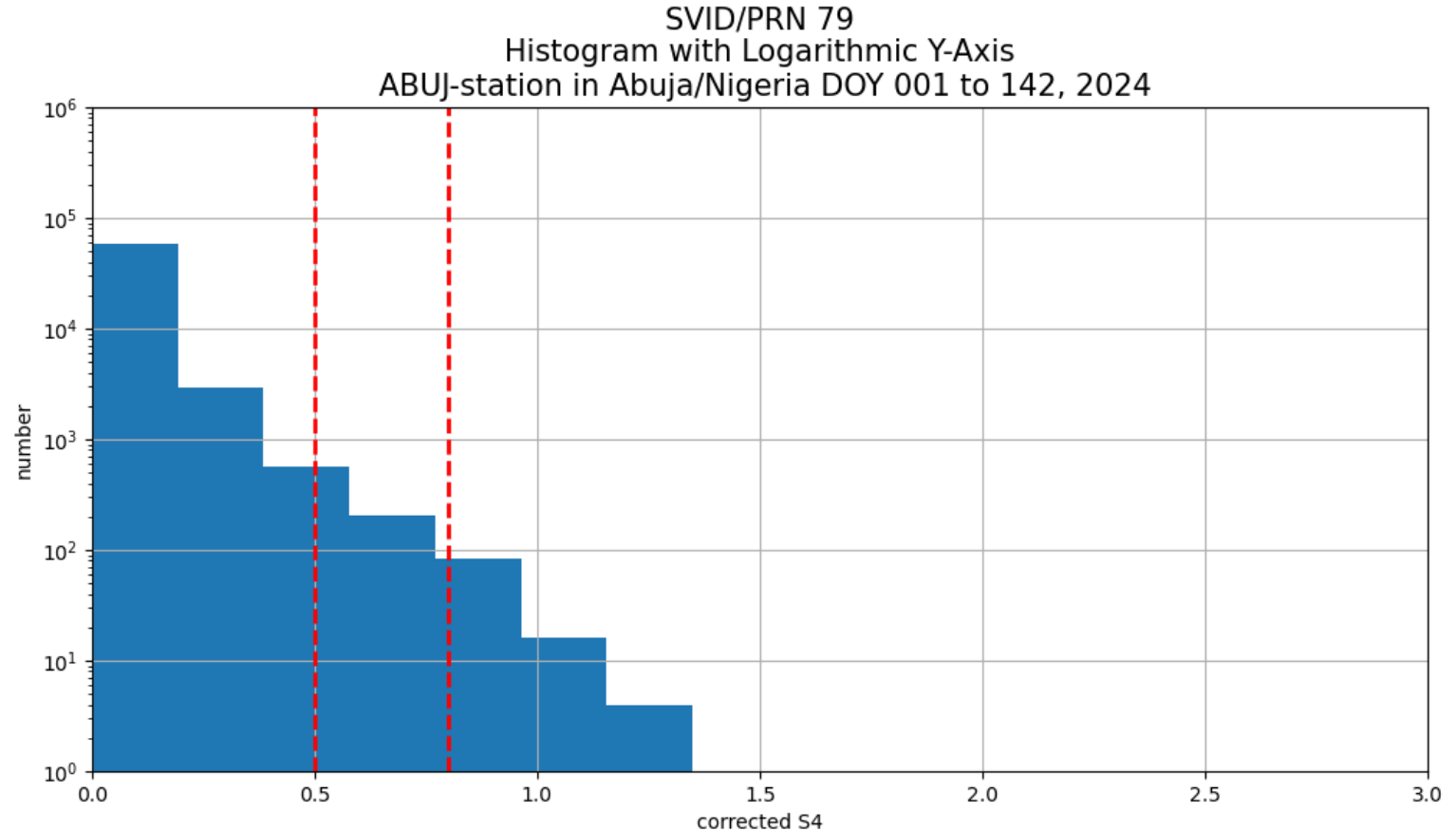


→ ensure proper device control



Example: Abuja

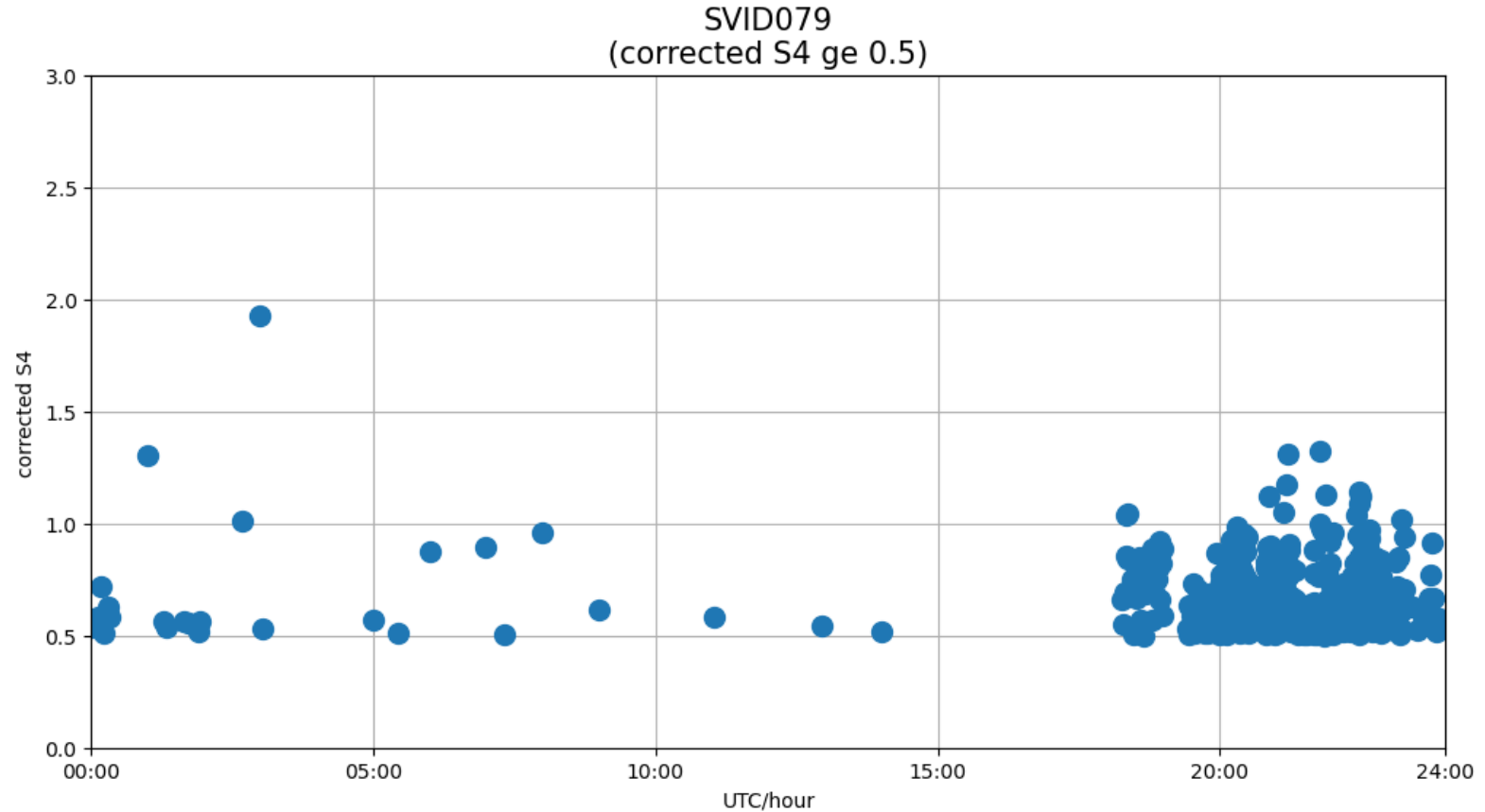
- installed December 2023
- normal iono indices fine
- test mode for bitgrabber
→ trigger parameters?
- high S4 is “rare”



@
Babatunde Rabi

Example: Abuja

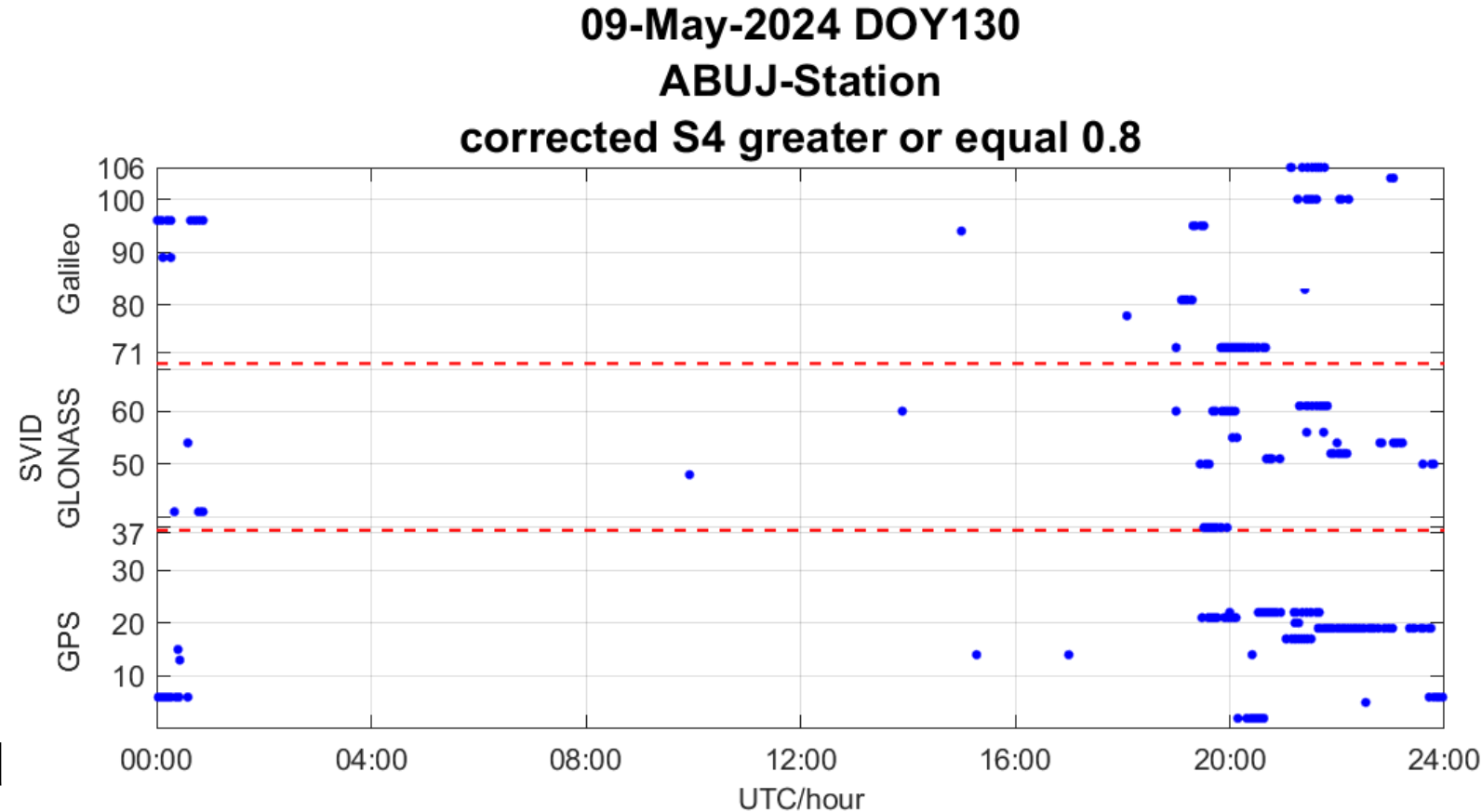
- installed December 2023
- normal iono indices fine
- test mode for bitgrabber
→ trigger parameters?
- high S4 is “rare”
- events often at night



@
Babatunde Rabi

Example: Abuja

- installed December 2023
- normal iono indices fine
- test mode for bitgrabber
→ trigger parameters?
- high S4 is “rare”
- events often at night
- different satellites affected



@
Babatunde Rabi

Example: Abuja



Trigger test for May 2024:



- 32 events
 - non-uniformly spreaded
 - often short (10 min record)
 - also long/accumulated (up to 25 min record)
- ➔ 12 hours would already fill the disk

