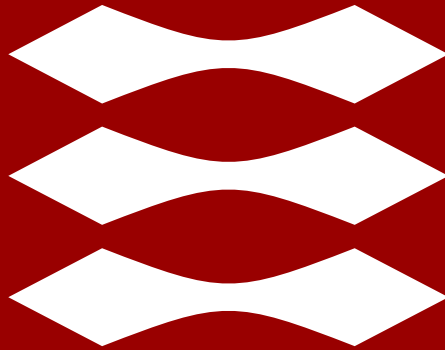


DTU



What we do at...

Jammertest



Jammertest 2024



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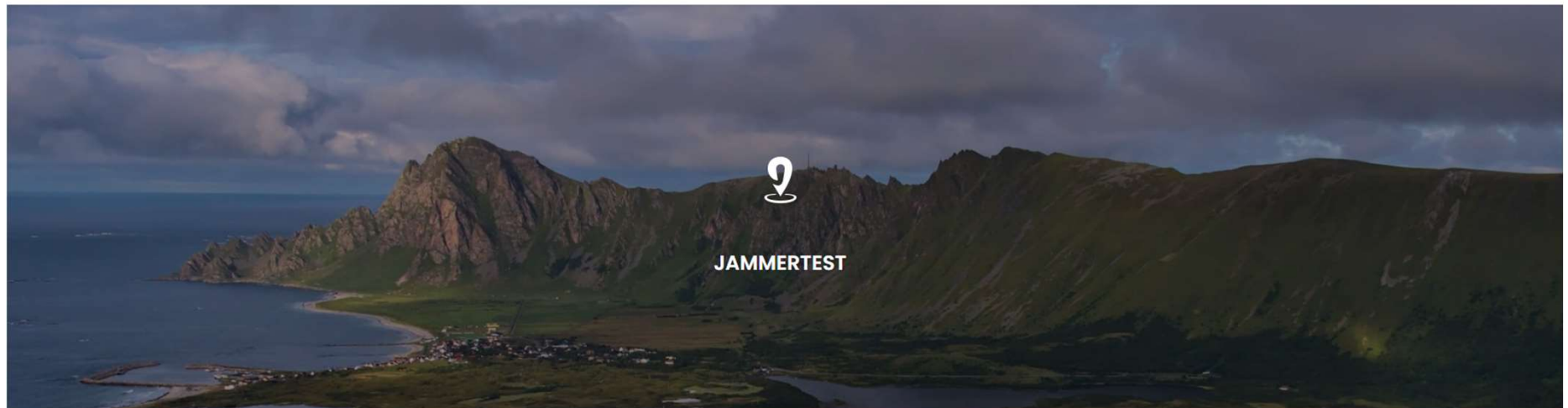
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FEB 13, 2024 EVENTS

Jammertest Forum 2024 - Can we trust the systems?

Time and date: Thursday April 11th 09:00 – 16:00 Location: Rebel, Universitetsgata 2, Oslo Security threats and vulnerabilities within PNT services Critical societal functions

Jammertest 2023

Test locations

(Yellow: Andenes)

Test locations

Red: Area 1

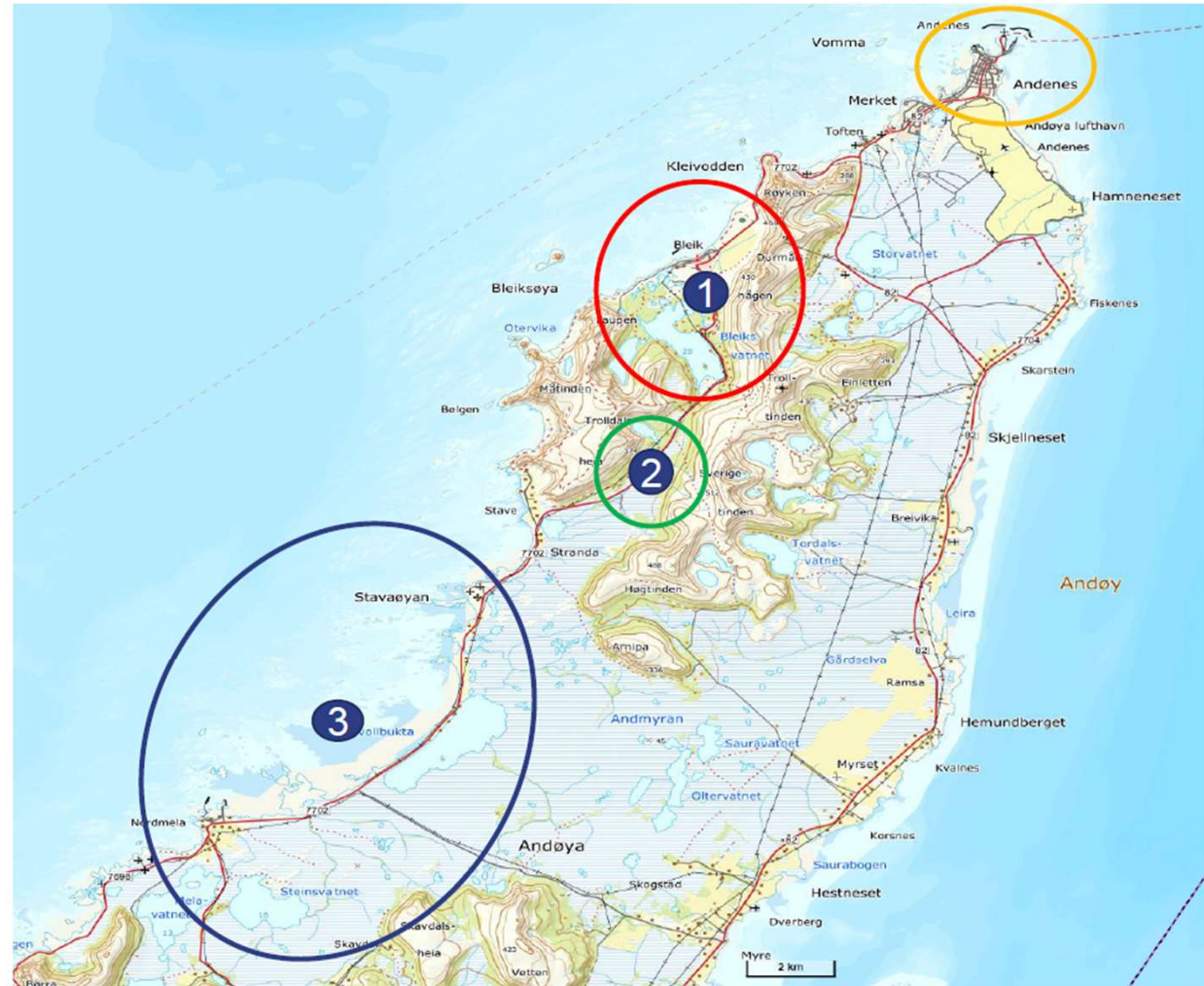
Green: Area 2

Blue: Area 3

Bleik

Grunnvatnet

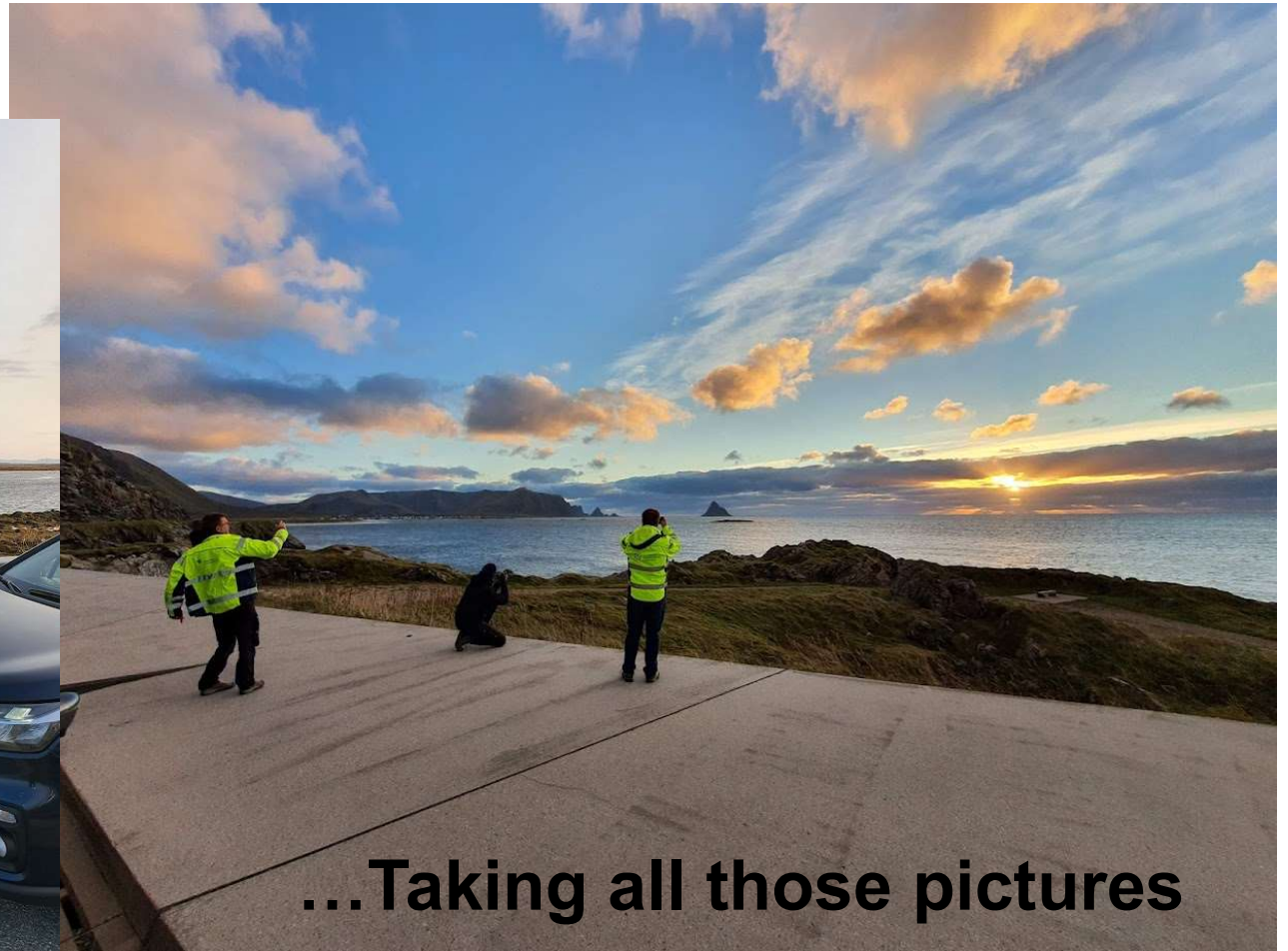
Stave-Nordmela



Tests performed in 2023

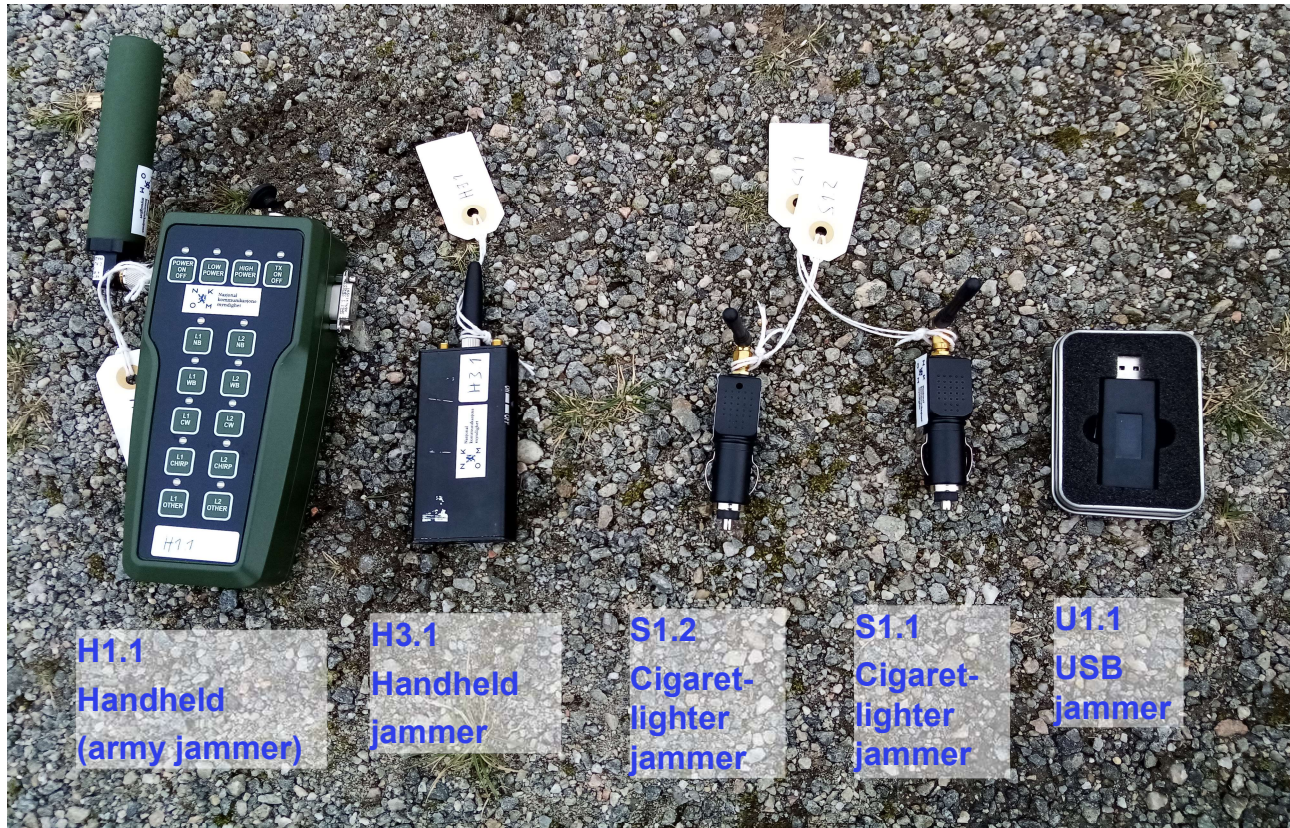
1. Jammer range tests
2. Road side tests
3. Direction of Arrival tests
4. Power of Arrival tests

It's hard work



...Taking all those pictures

Range tests: Equipment



H1.1
Handheld
(army jammer)

H3.1
Handheld
jammer

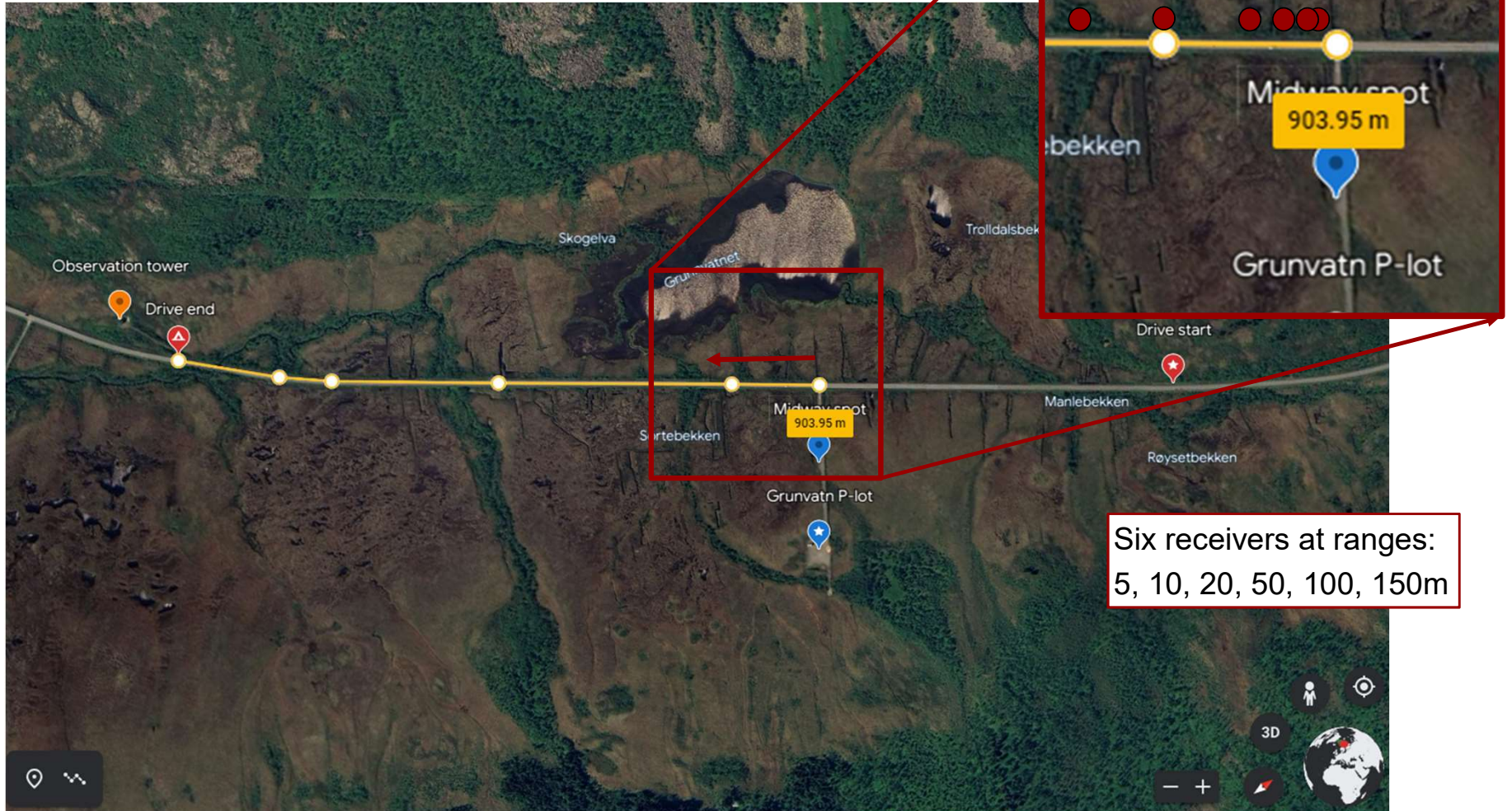
S1.2
Cigarette-
lighter
jammer

S1.1
Cigarette-
lighter
jammer

U1.1
USB
jammer



Range tests

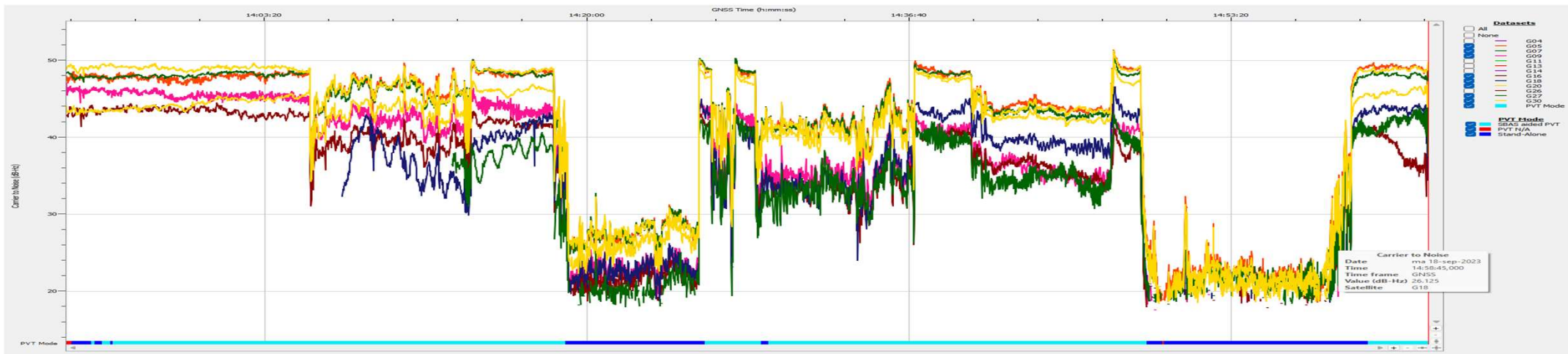


Six receivers at ranges:
5, 10, 20, 50, 100, 150m

Afstandstest

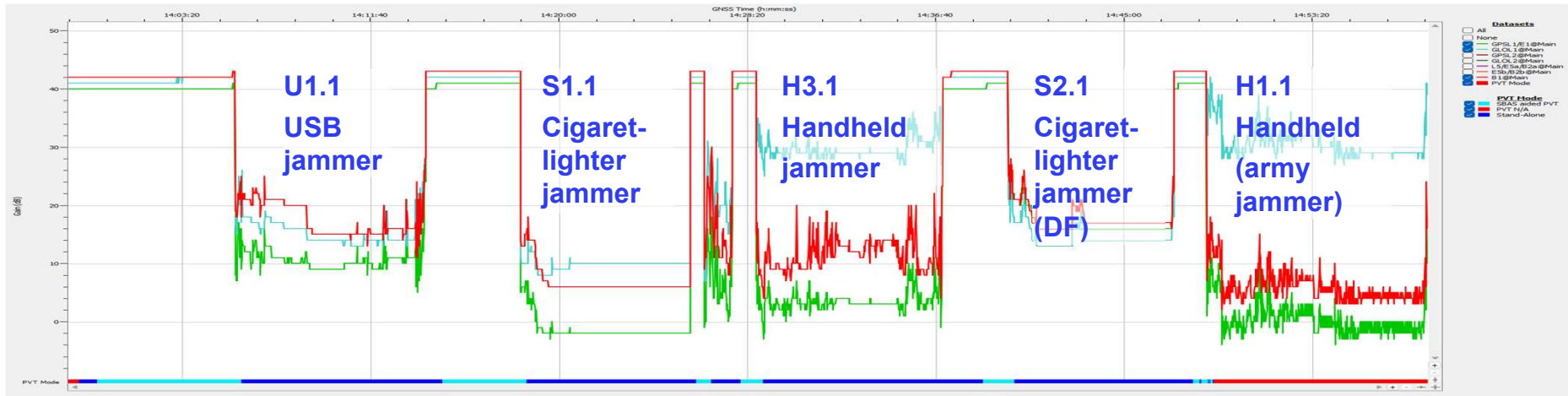
- Afstande: 5, 10, 20, 50, 100, 150m (KORT!)
- Ca. 10dB dæmpning gennem bilens bagagerum/bildør
- Jammere:
 - 16:05 – USB1. u1.1
 - 16:18 – cigartænder, s1.2
 - 16:28 – Håndholdt L1, h3.1
 - 16:39 – Dual frequency cigar, s2.1
 - 16:48 – Militær, High Power, Narrow Band, h1.1

Range tests: C/N0 at 20m and 150m





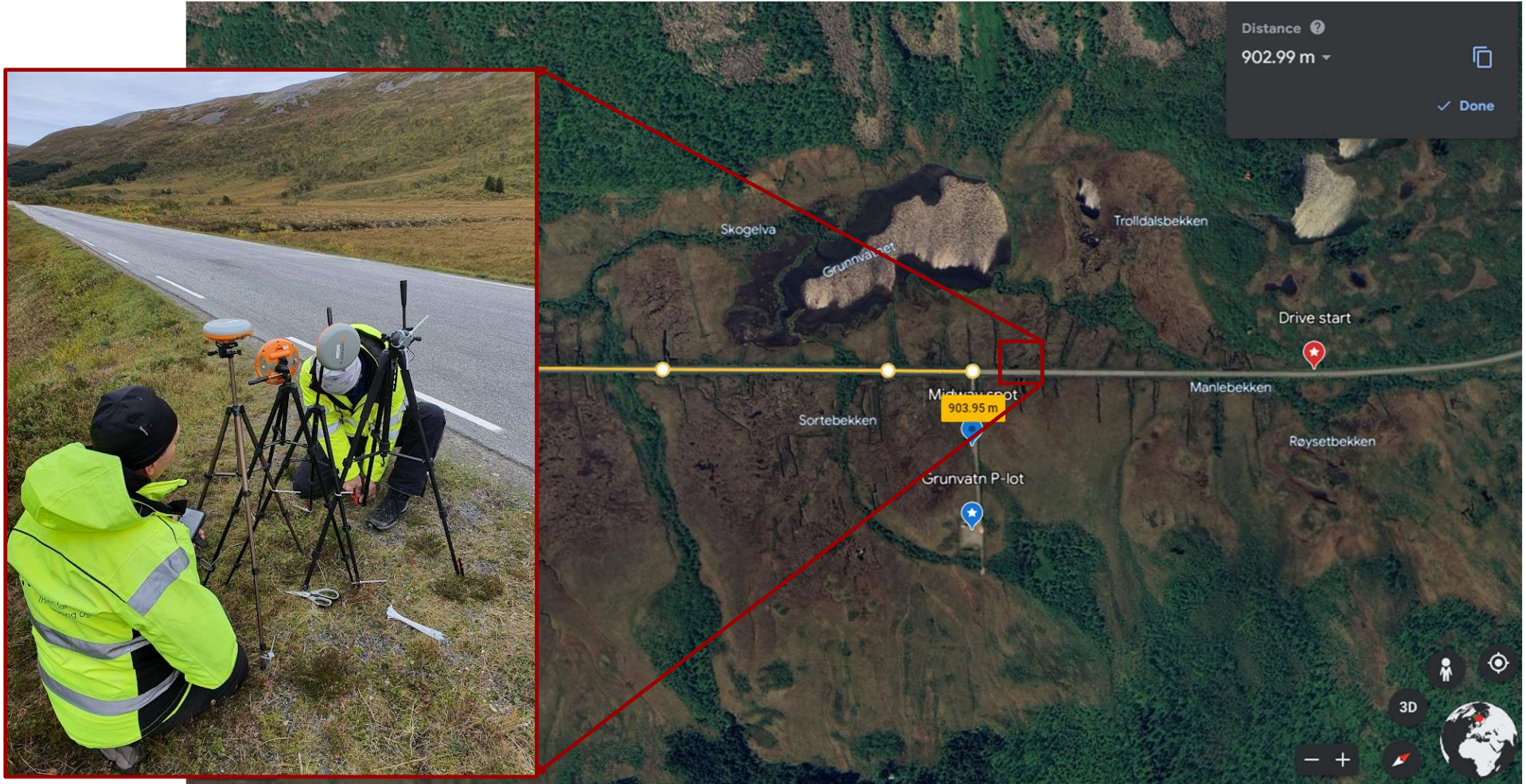
Range tests: Front End Gain at 20m and 150m



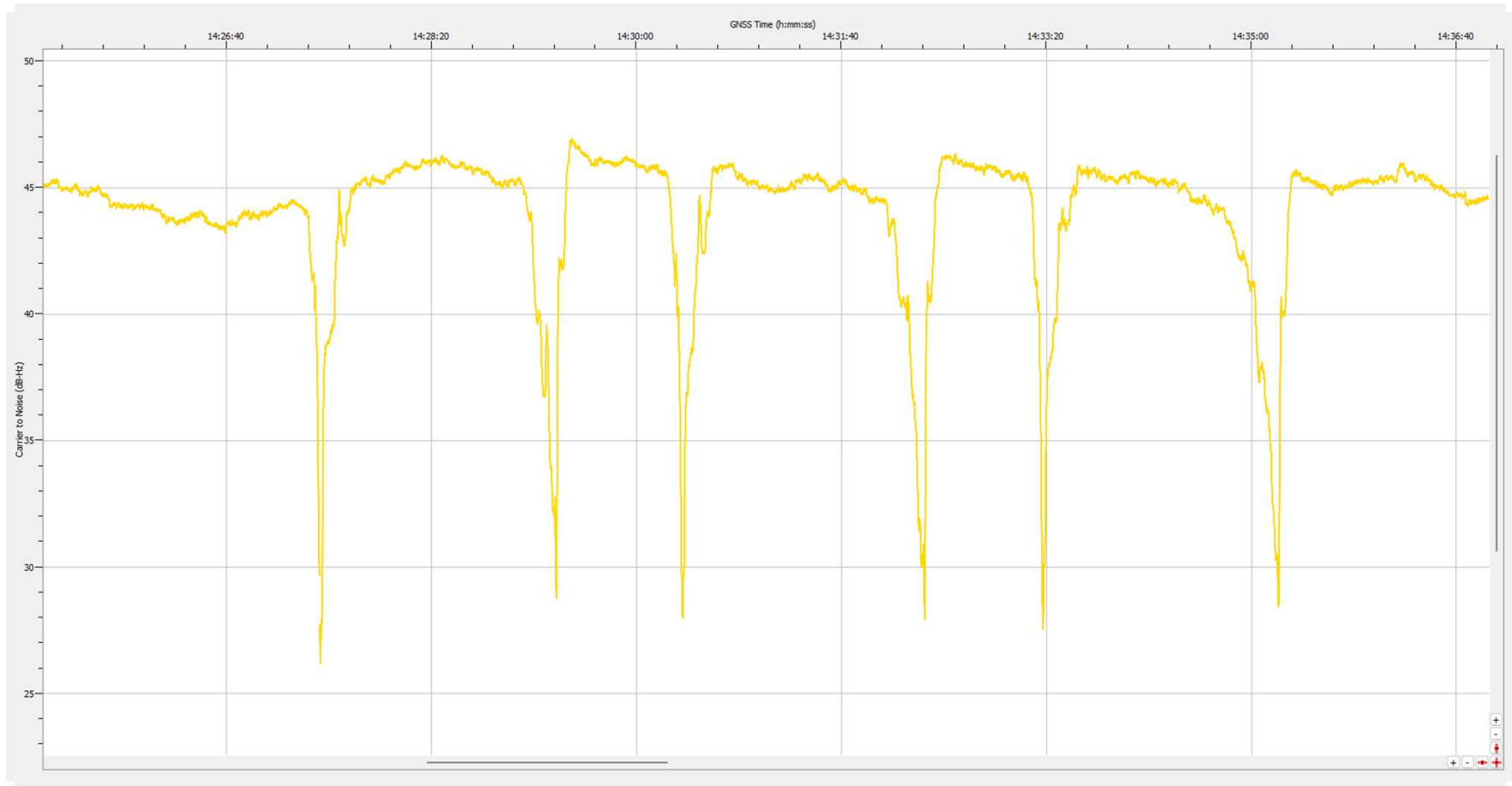
Jammertest: Practice your crafting skills



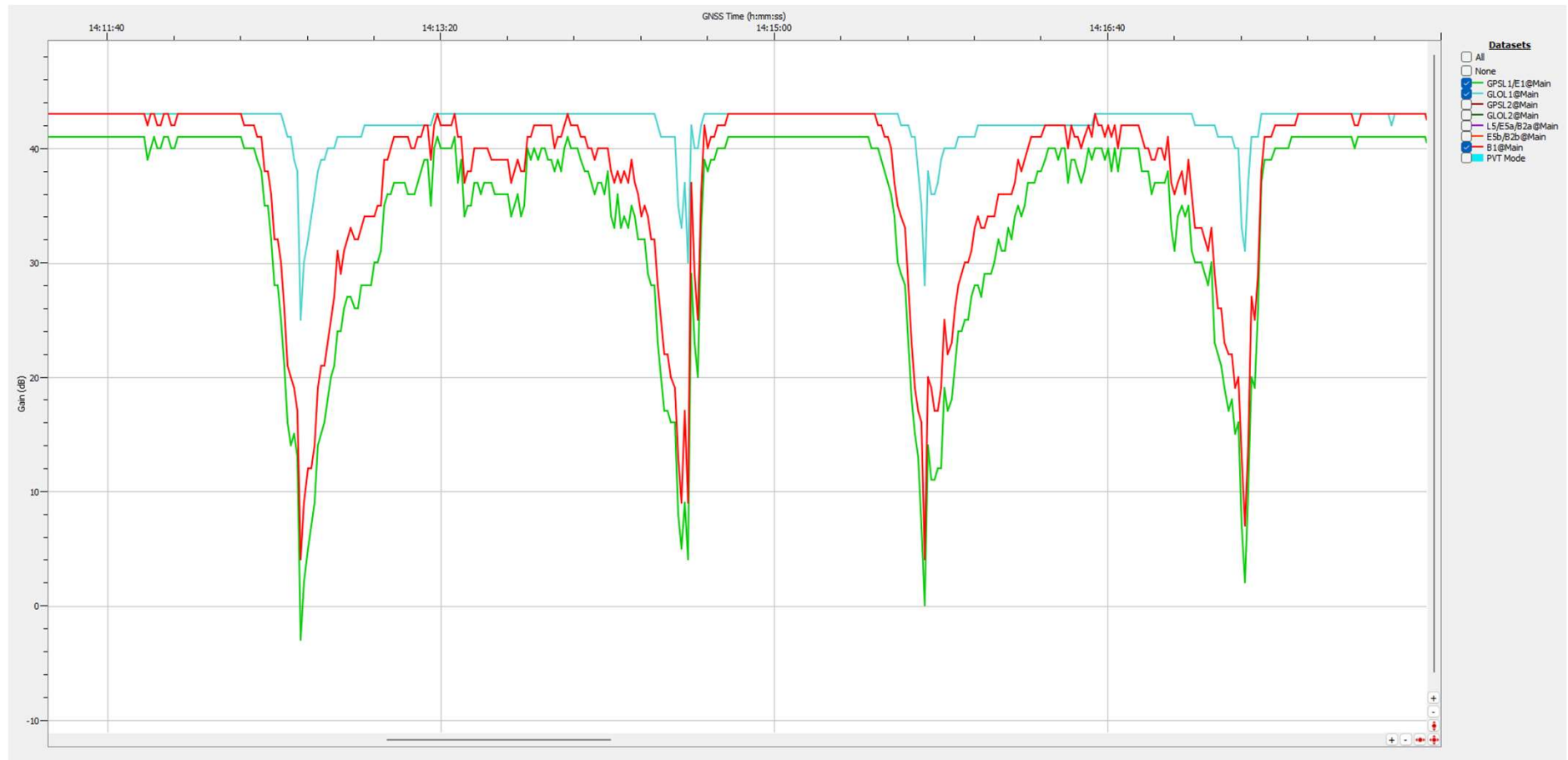
Road side tests



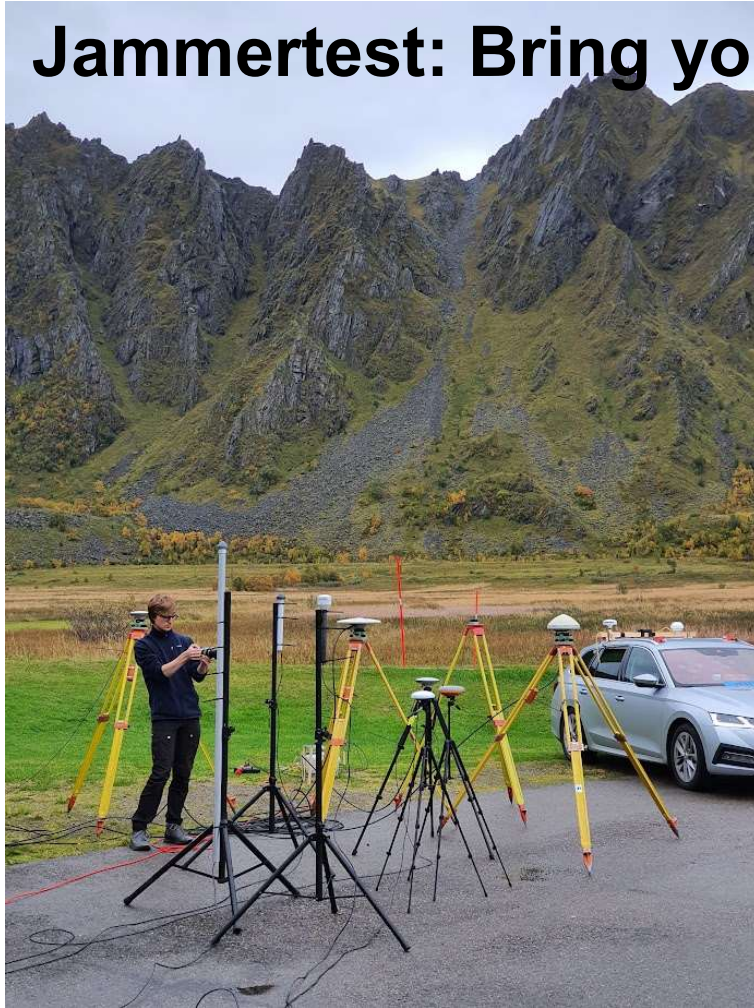
Road side tests: Can we detect lanes/heading of a jammer?



Road side tests: Can we detect lanes/heading of a jammer?

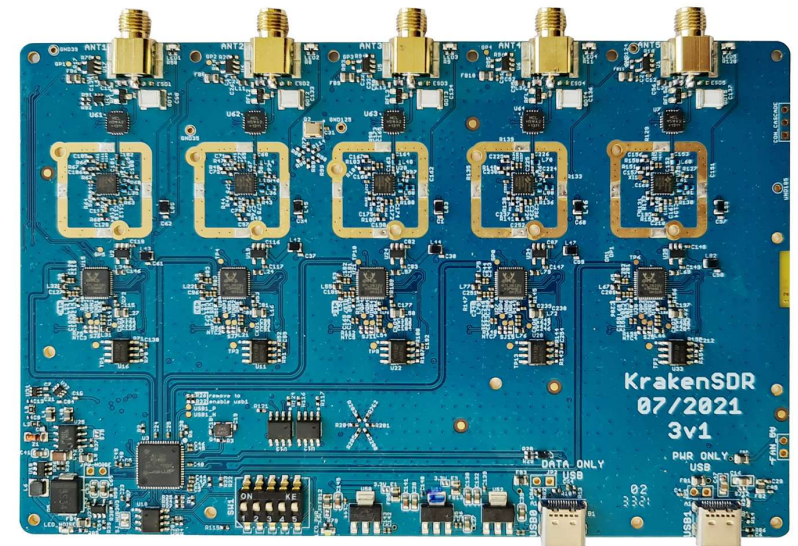


Jammertest: Bring your own antenna

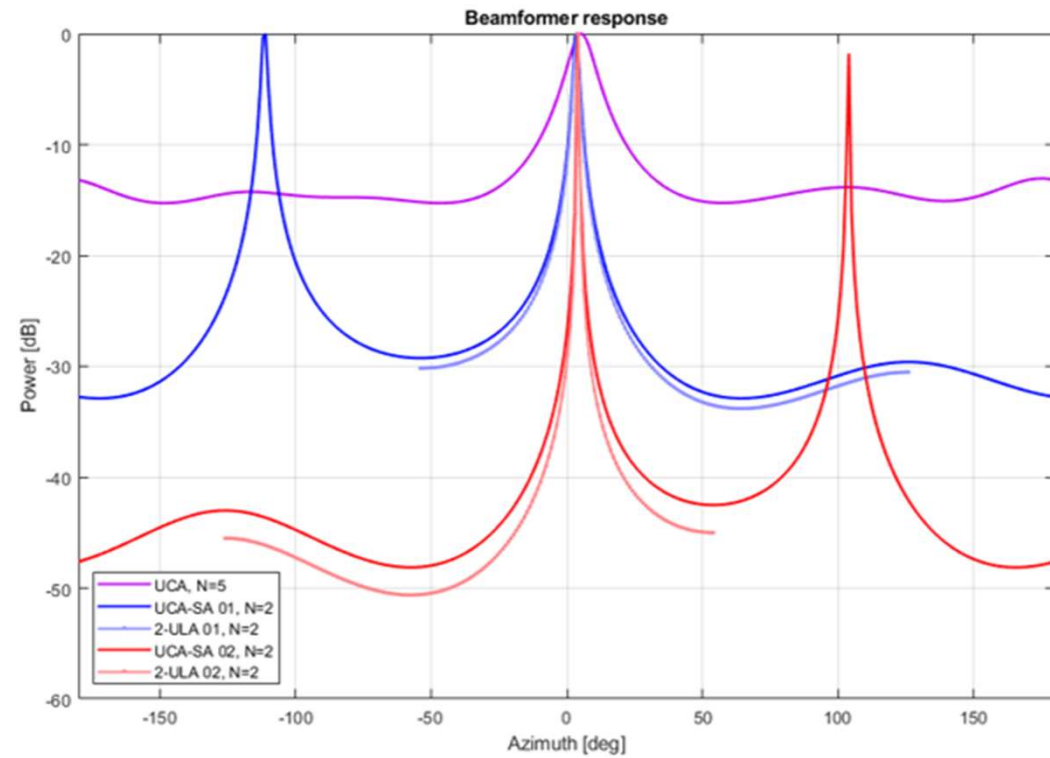
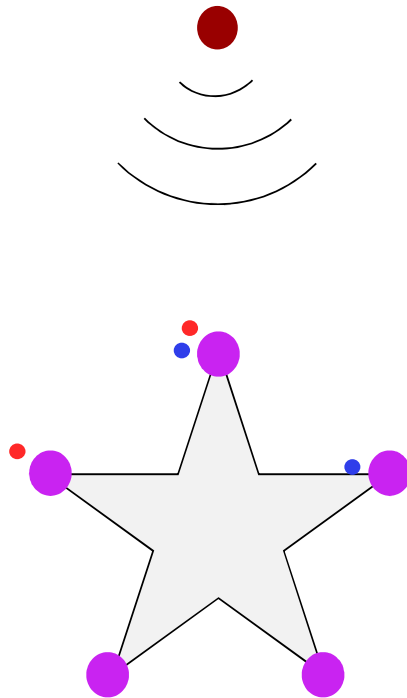


...Or bring five

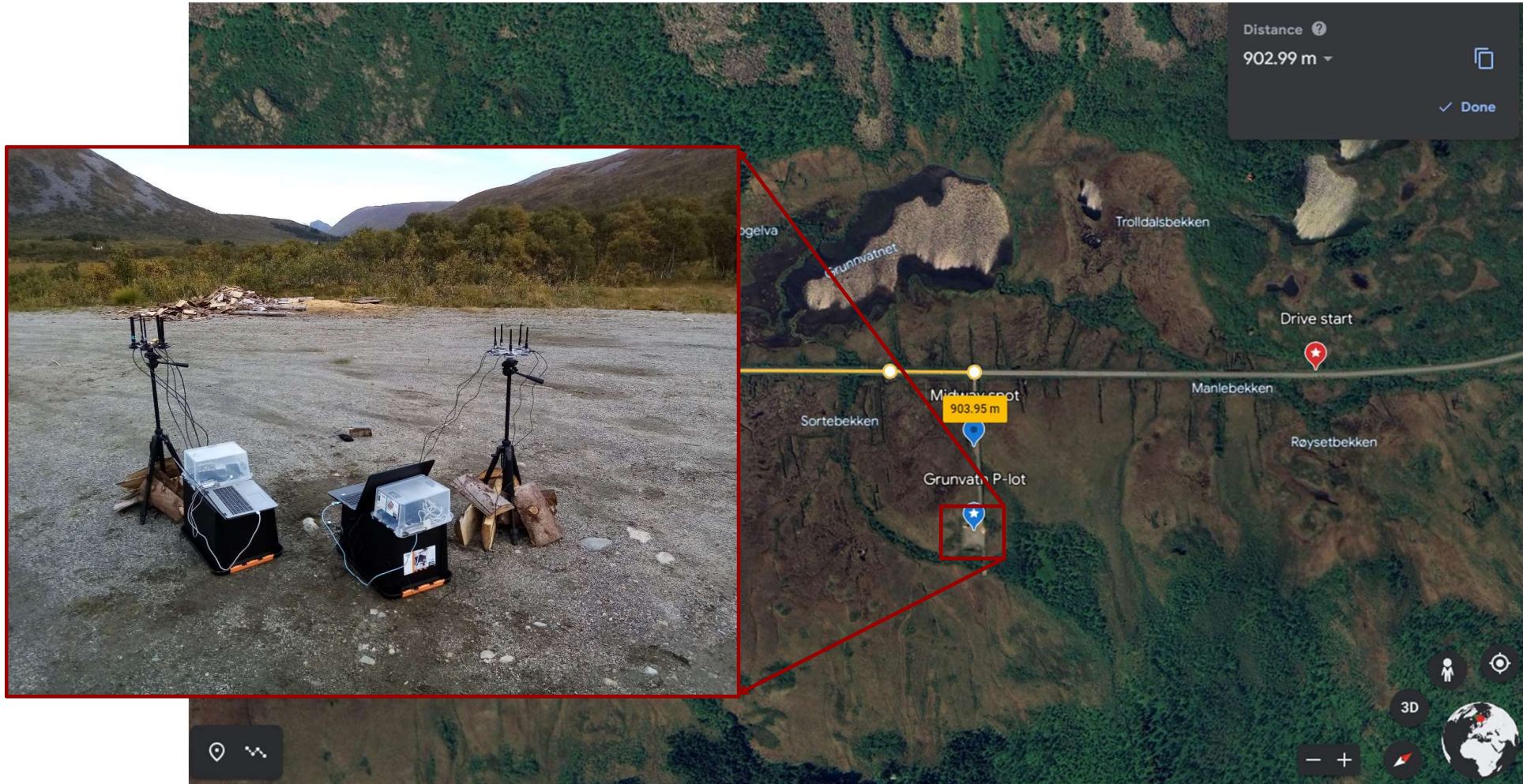
Direction of Arrival: Kraken SDR



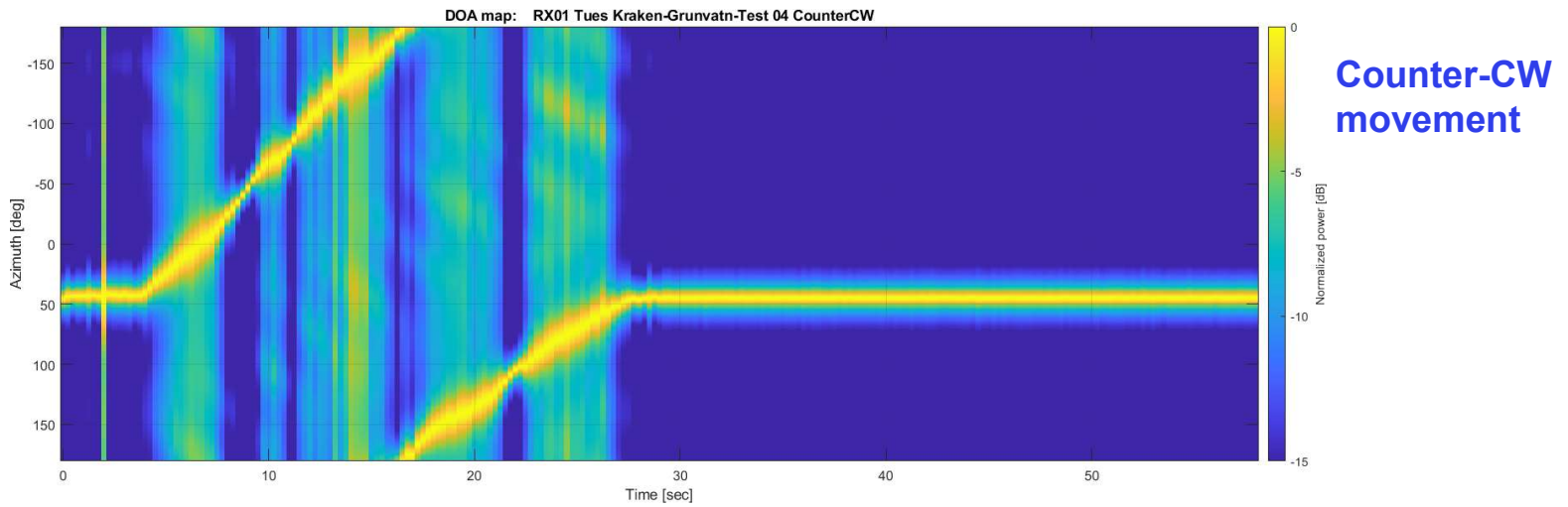
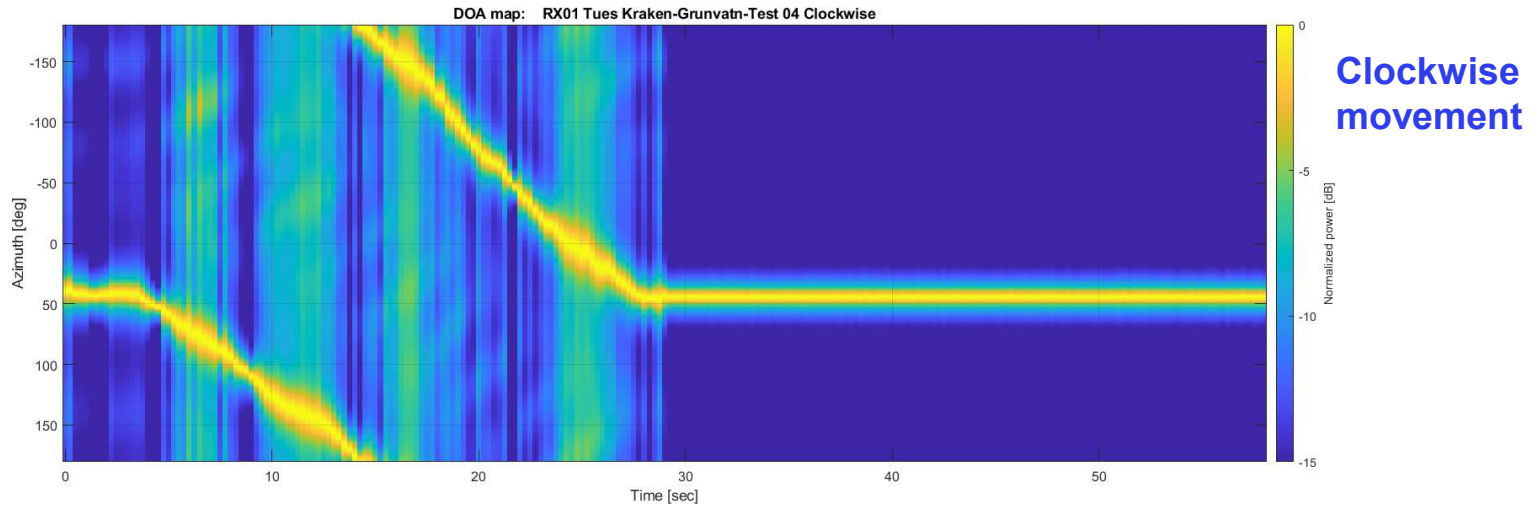
Direction of Arrival: Beamforming



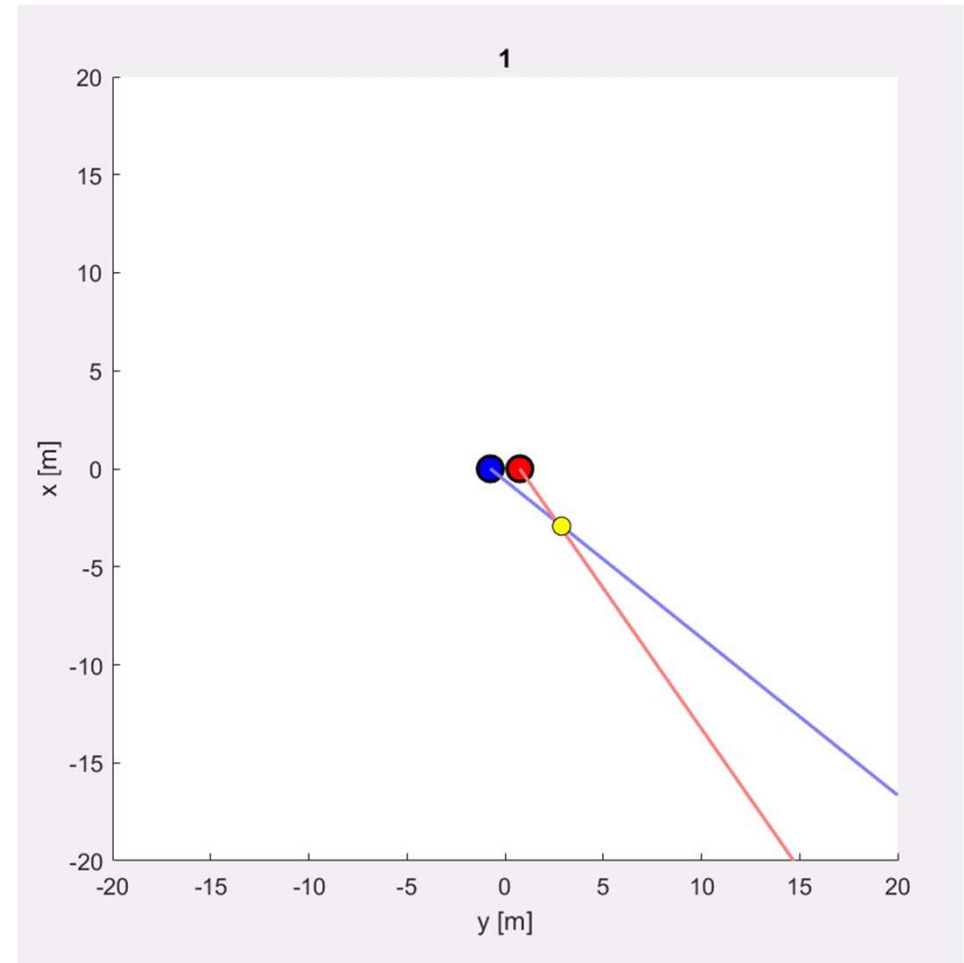
Direction of Arrival tests



Direction of arrival – Moving in circles



Direction of Arrival: Triangulation (WiP)

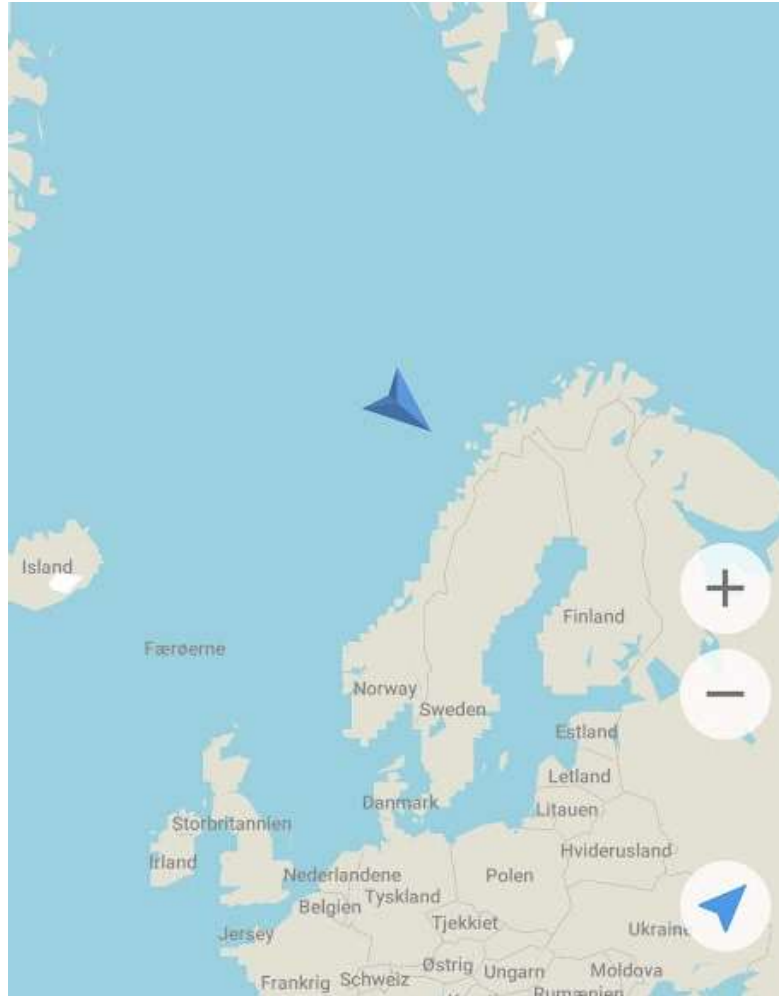


Get up early to avoid the traffic jam



...by helicopters

We also went swimming



The screenshot shows the Septentrio GNSS software interface. The main content area displays OSNMA configuration and status. The OSNMA Configuration section includes:

- OSNMA Mode: off loose strict
- NTP Client Configuration: Mode: on off, Server: default

The OSNMA Status section shows:

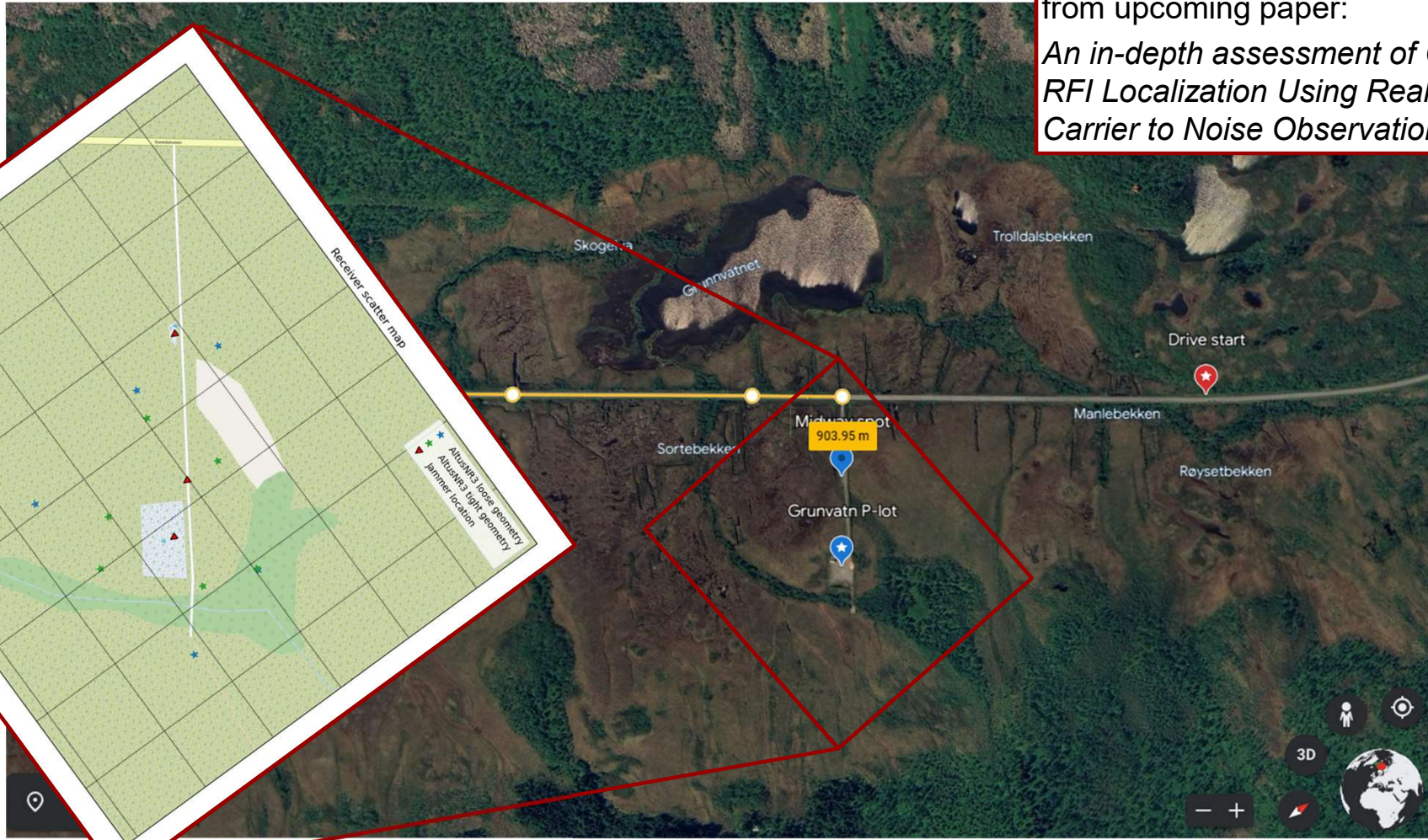
Status	Authenticating
Trusted Time Delta	N/A
Trusted Time Source	N/A
Maskle free renewal in progress	No
Galileo Active Mask	0xA0414250B
Galileo Authentic Mask	0x0
GPS Active Mask	0x0
GPS Authentic Mask	0x0

At the bottom of the interface, there are buttons for "Default" and "OK".

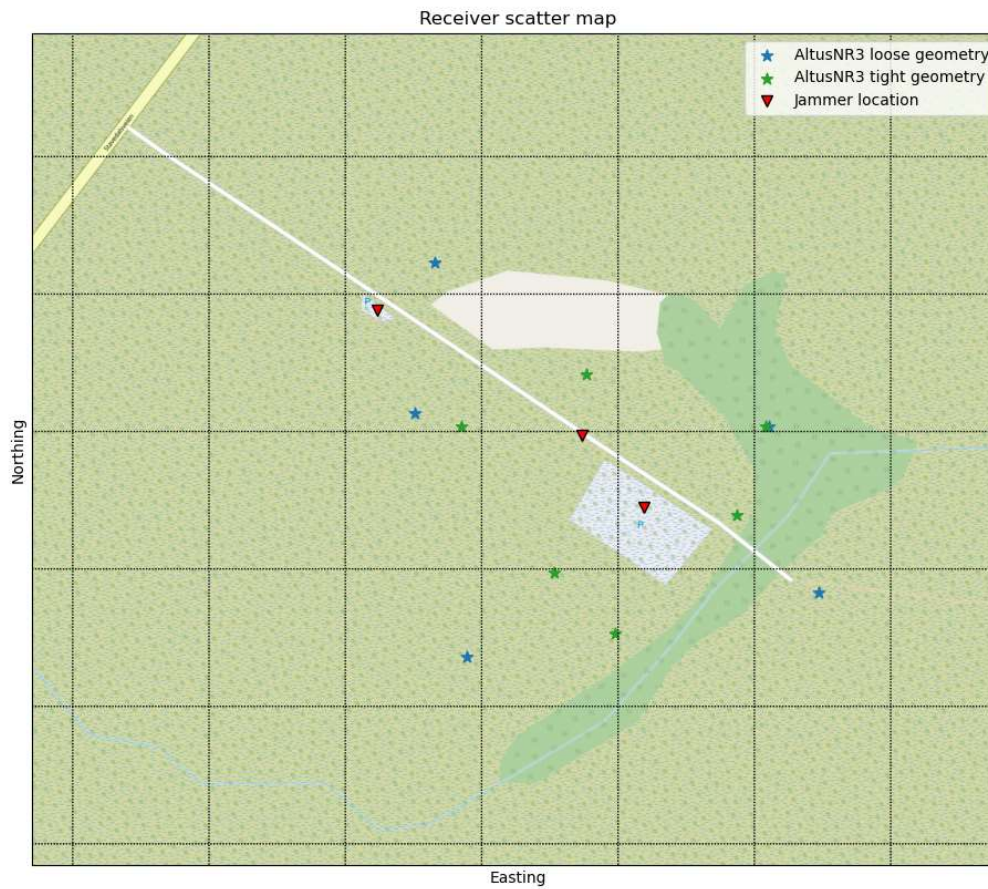
Good thing we have Galileo to tell us it wasn't real

Power of Arrival tests

The following figures are borrowed from upcoming paper:
An in-depth assessment of GNSS RFI Localization Using Real World Carrier to Noise Observations



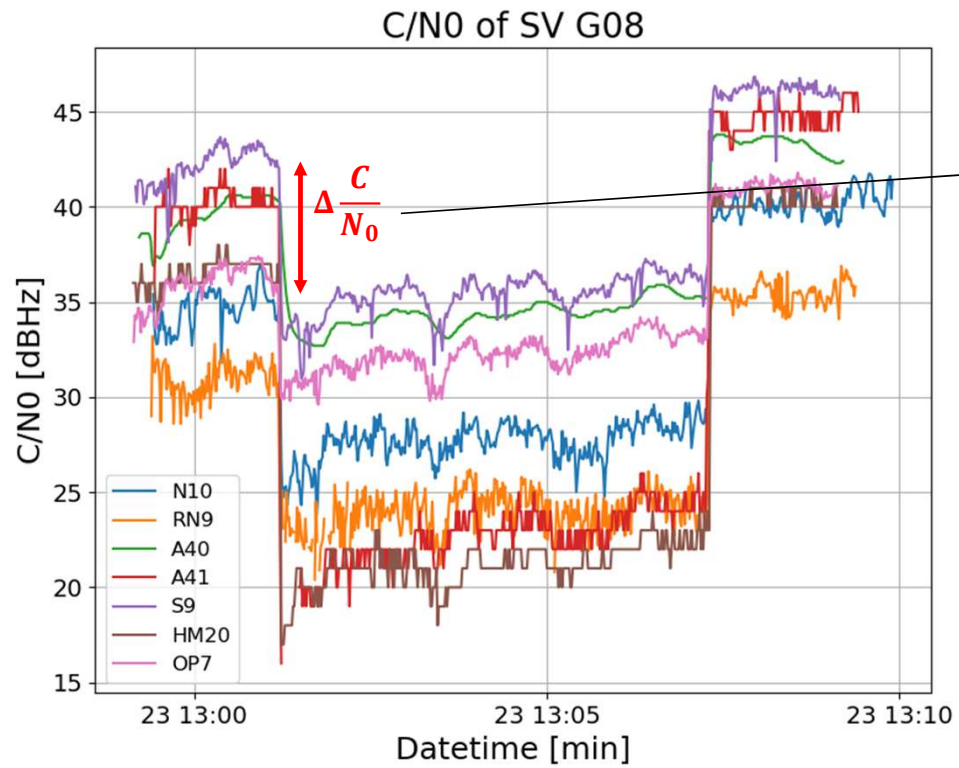
Power of Arrival tests



The following figures are borrowed from upcoming paper:

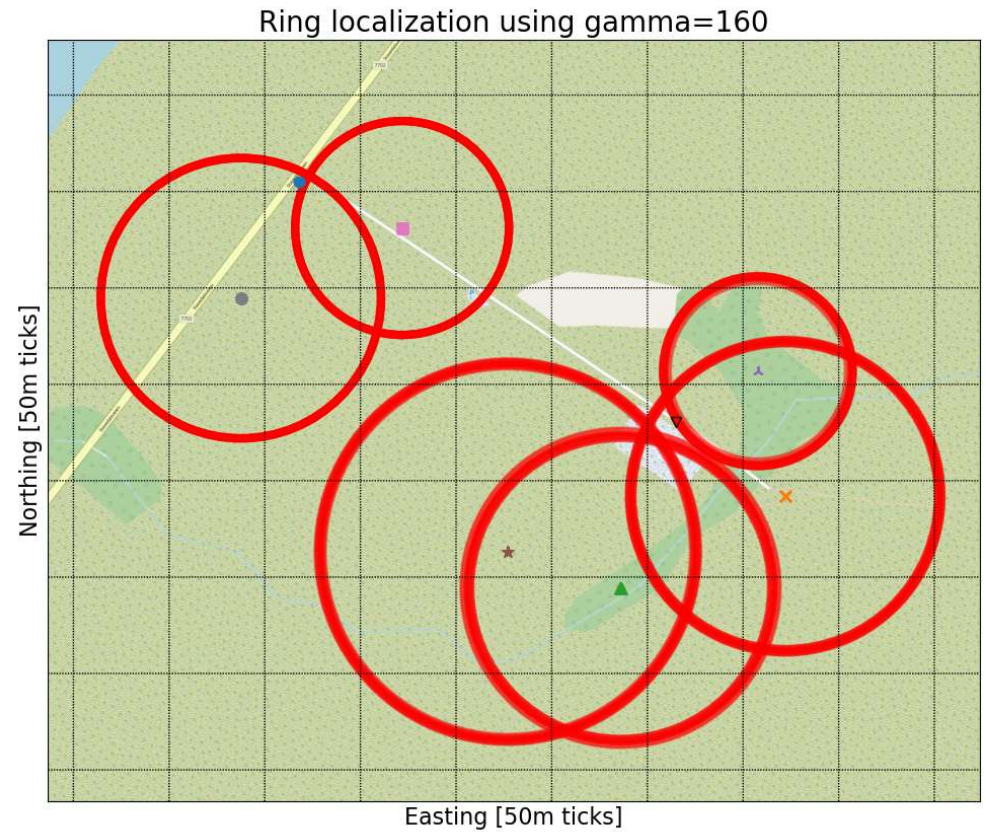
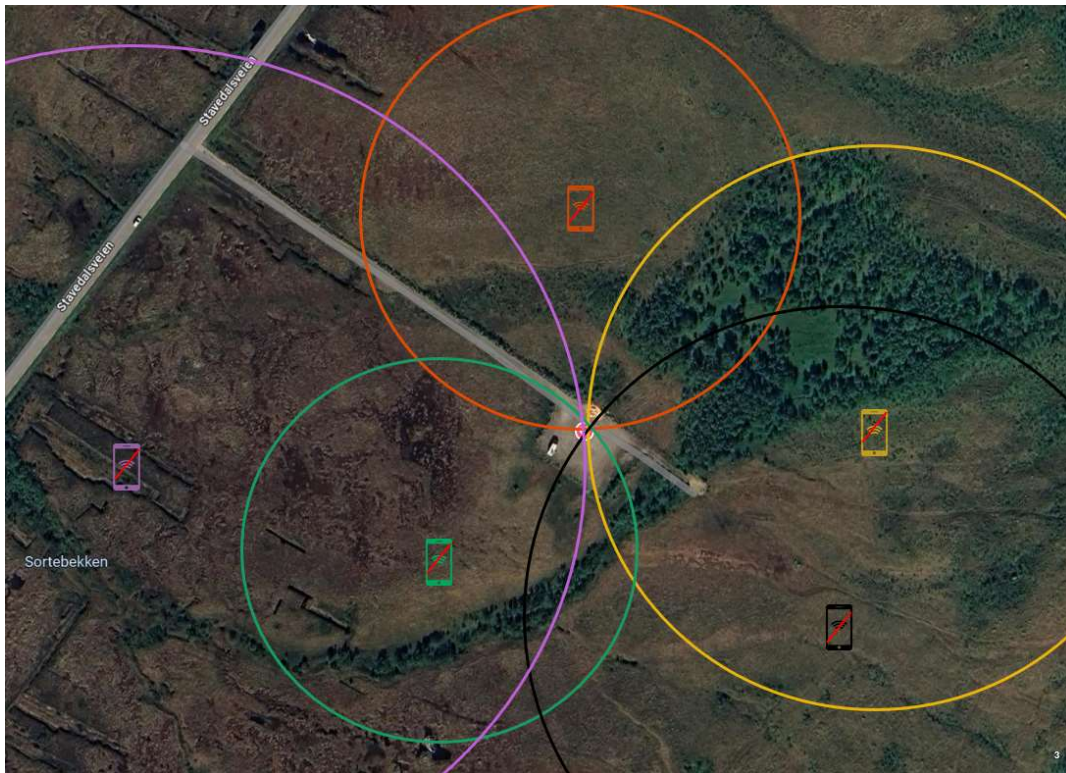
An in-depth assessment of GNSS RFI Localization Using Real World Carrier to Noise Observations

Power of arrival



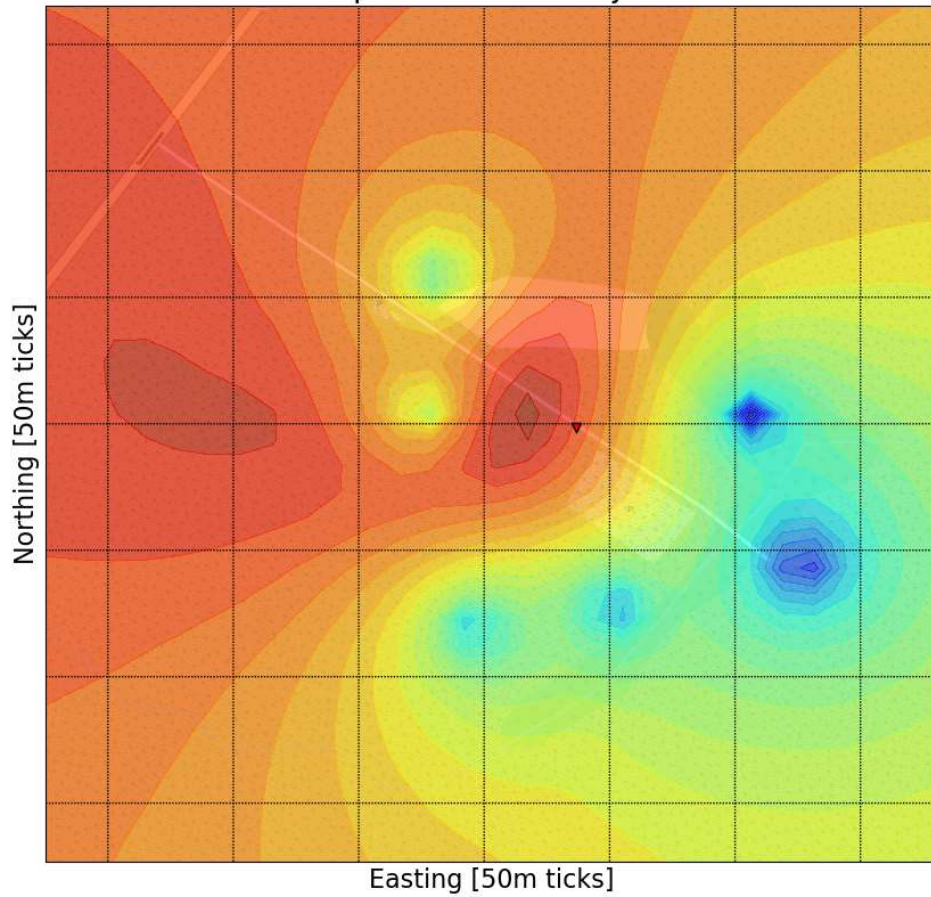
$$\Delta \frac{C}{N_0} \rightarrow d$$

Power of Arrival: Theory vs. reality

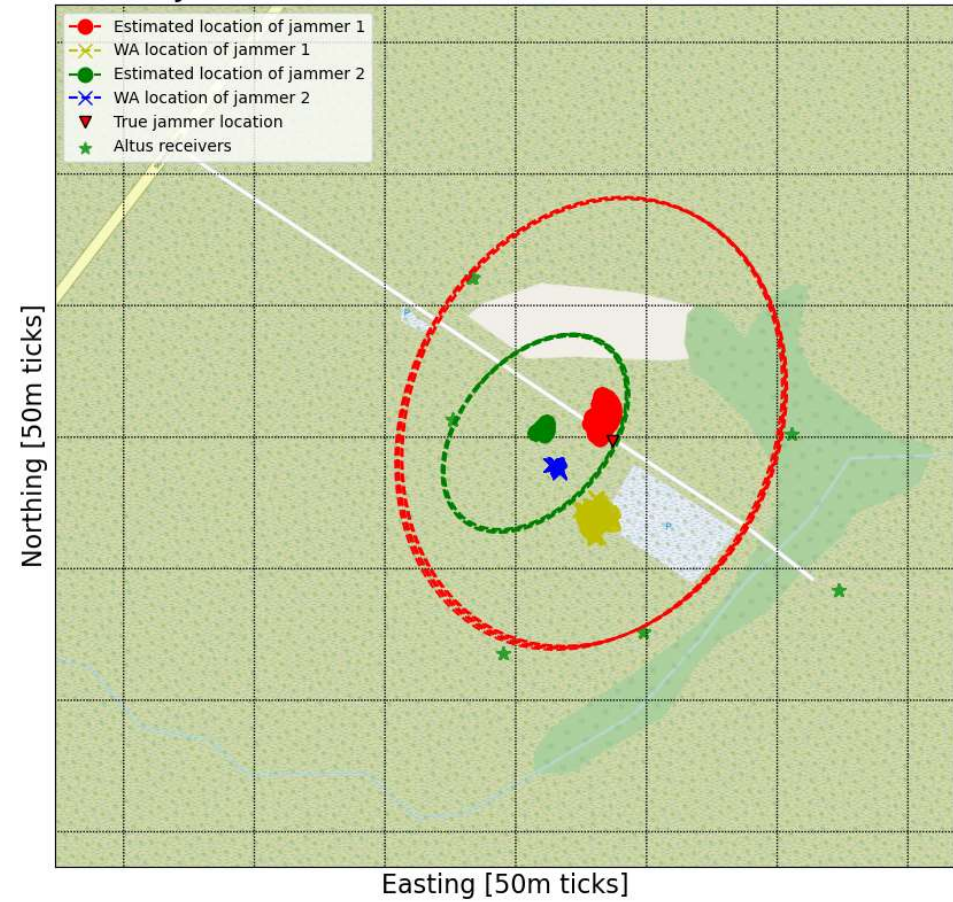


Power of Arrival: Can we find the jammer?

Heat map localization of jammer 2



Jammer localization with Smart antennas



The most important test



Thank you for listening!
Join Jammertest 2024

