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EISCAT Scientific Association



CRIRP, PRC



Suomen Akatemia,
Finland



NIPR, Japan



Forskningsrådet,
Norway



Vetenskapsrådet, Sweden



UKRI, U.K.

Associates

Affiliates



IRA, Ukraine



JHUAPL & METI
International, U.S.

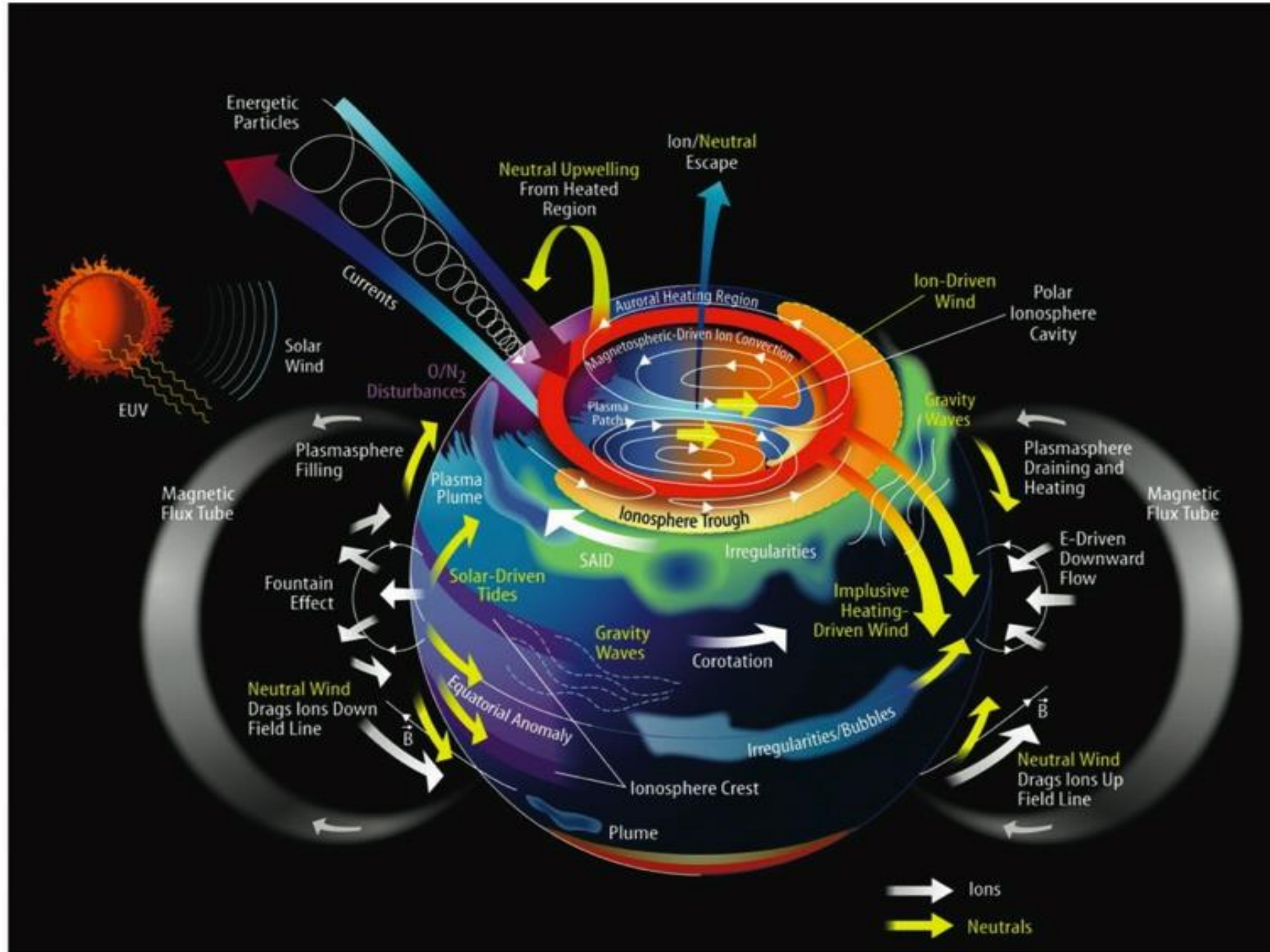


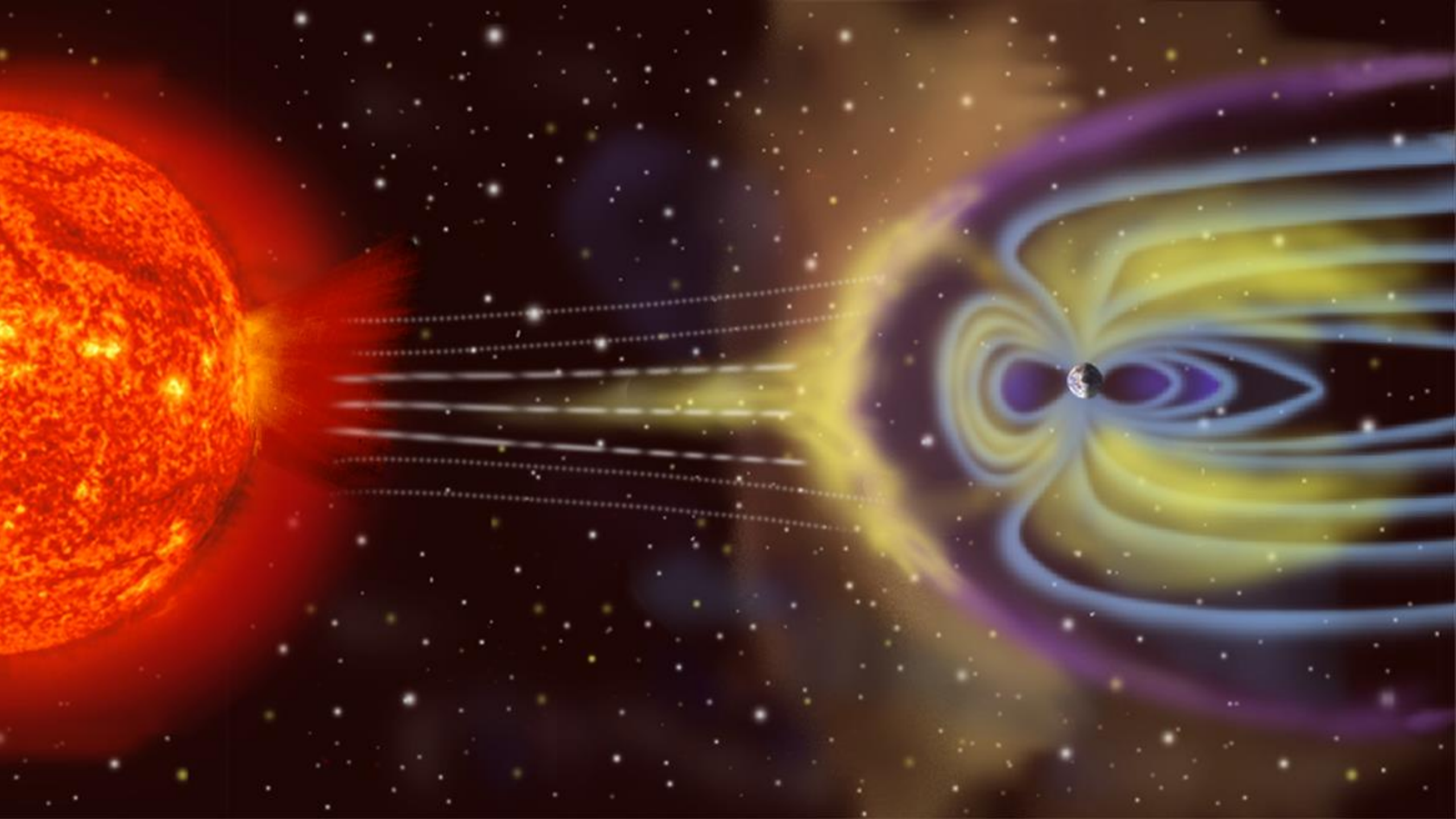
KOPRI & KASI,
S. Korea



DLR-SO, Germany

- Atmospheric physics and climate change
- Space and plasma physics
- In- and outflow of matter in Earth's atmosphere
- Space debris, near-earth objects
- Space weather, continuous monitoring
- Radio astronomy
- Combining measurements from other instruments





Aurora



Aurora

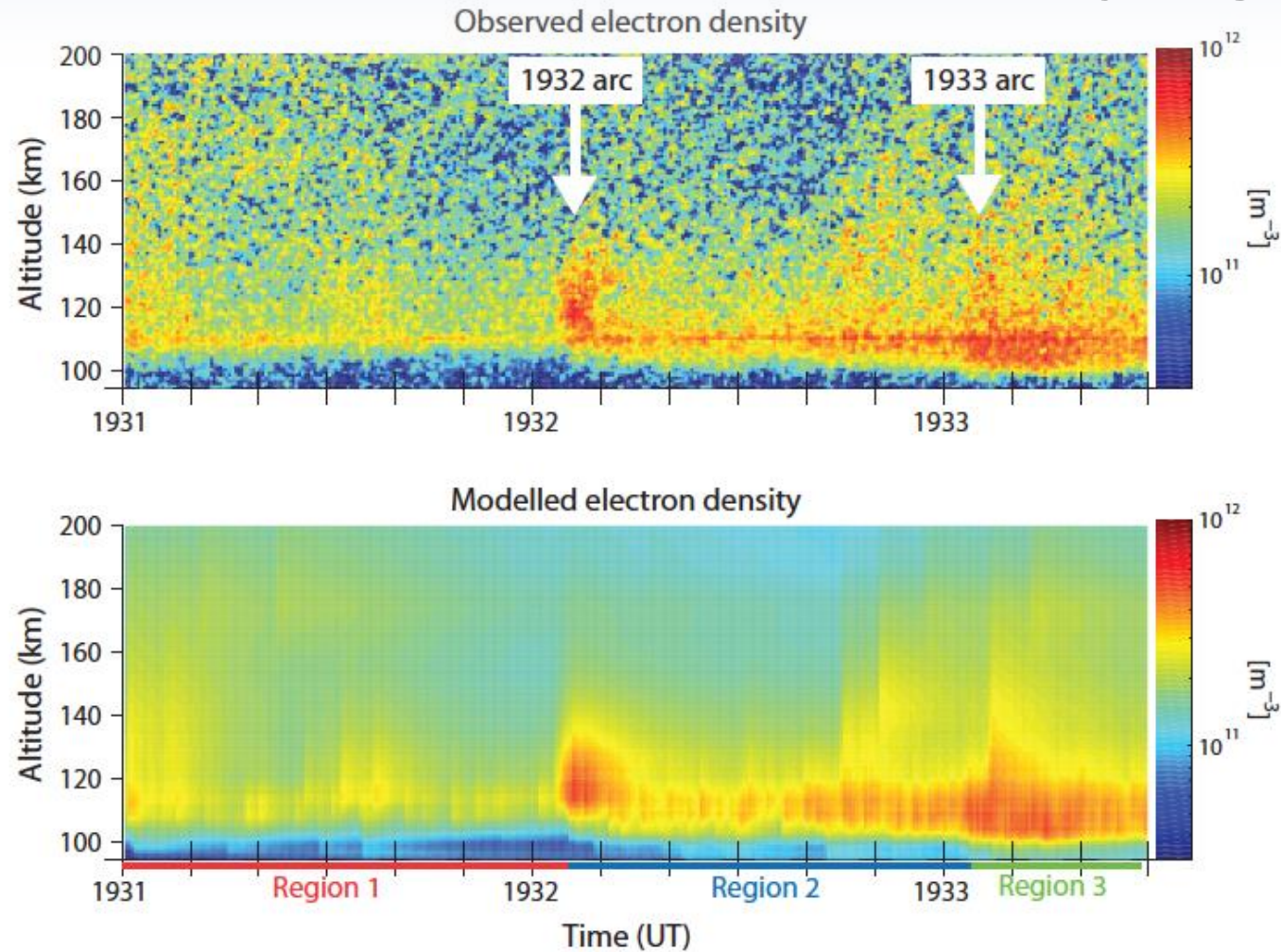


Fig. 7. Top: E-region enhancements in electron density corresponding to auroral arcs drifting over EISCAT. Bottom: modelled electron density.

Dahlgren et al., 2011

Tromsø, NO



Kiruna, SW



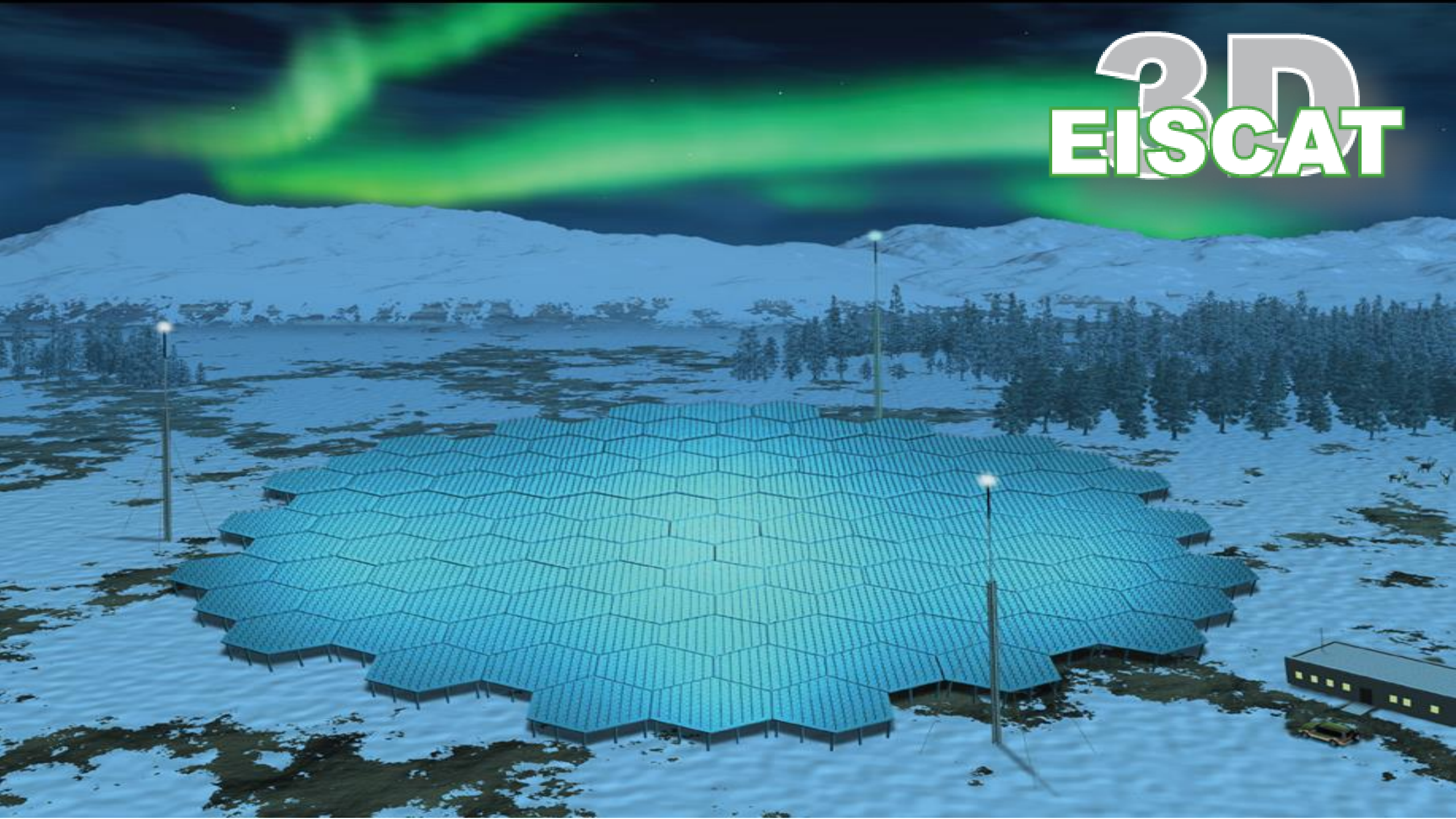
Sodankylä, FI

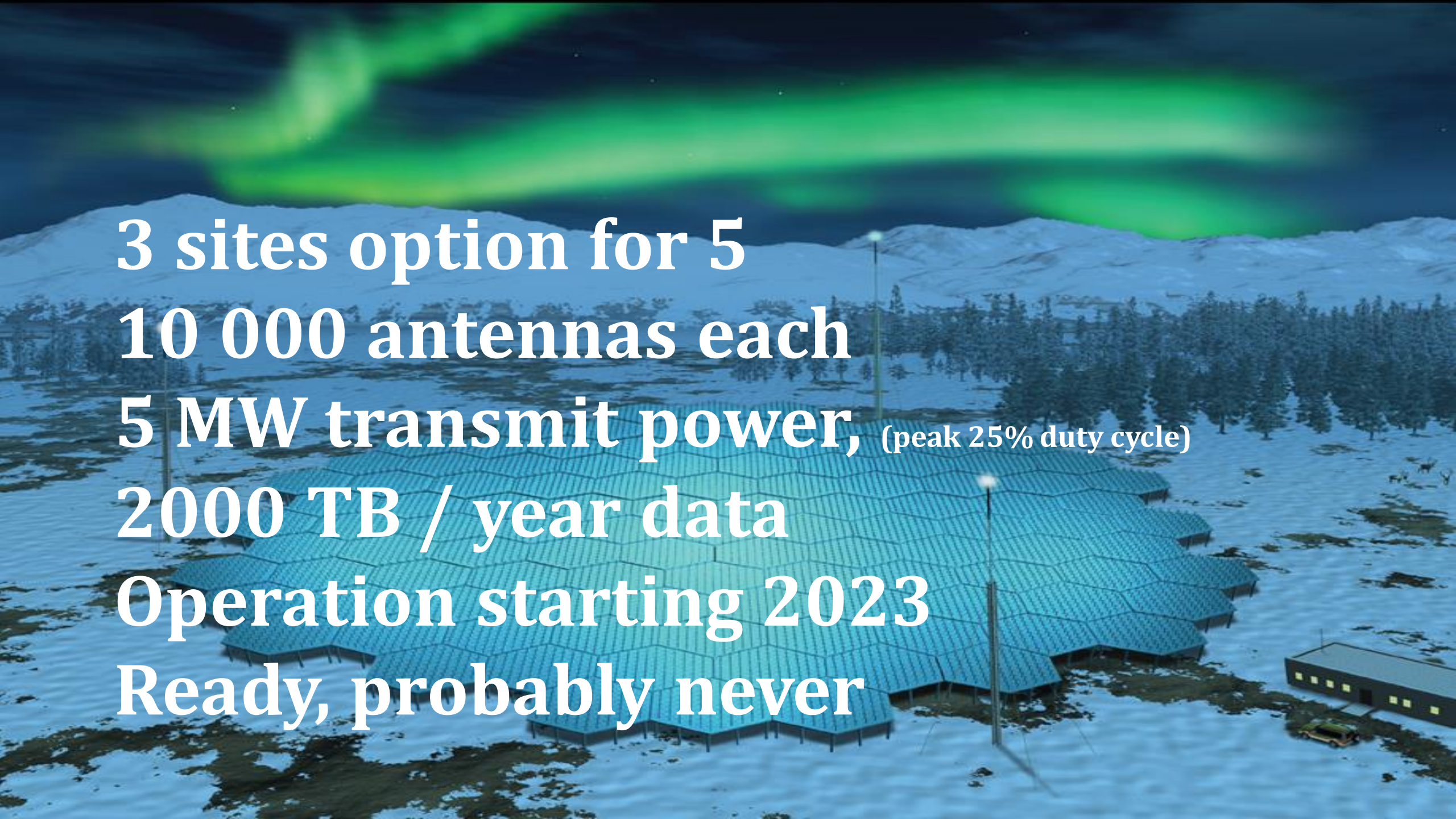


Svalbard, NO

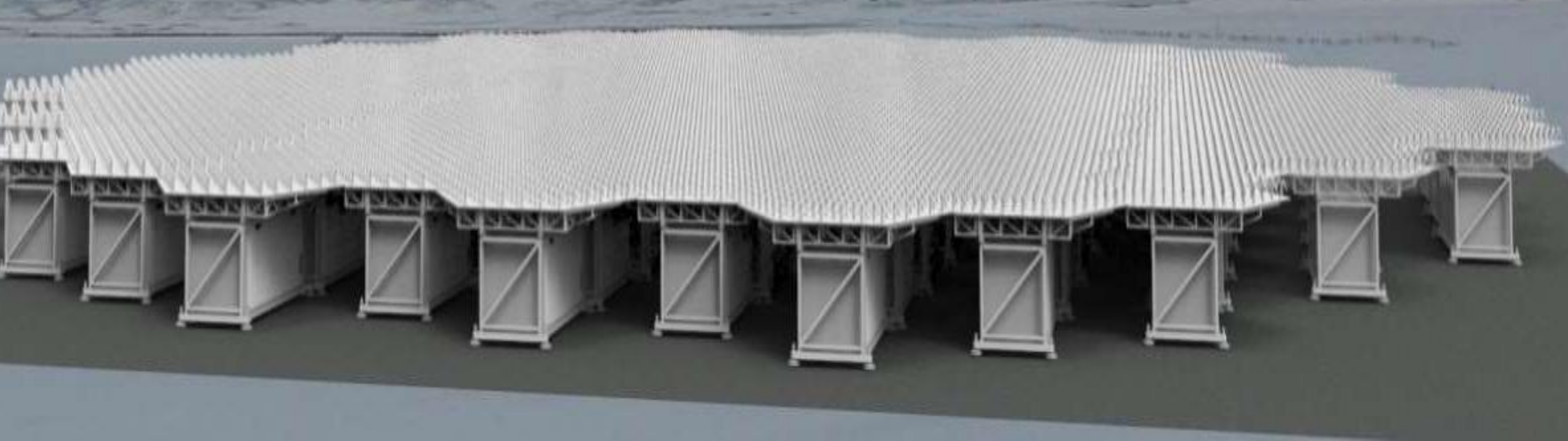


3D EISCAT



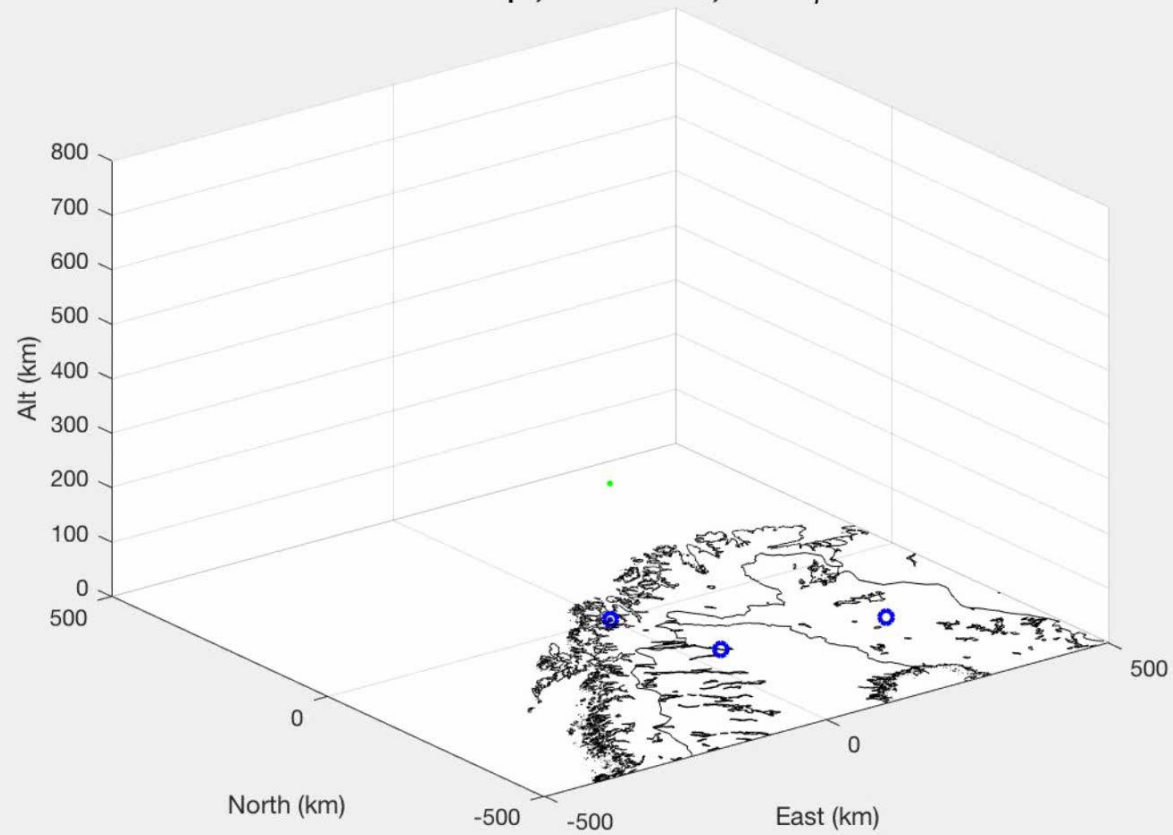
An aerial photograph of a large-scale scientific facility, likely the Square Kilometre Array (SKA) Phase 1. The facility consists of a vast array of green, hexagonal-shaped antenna dishes arranged in a honeycomb pattern across a flat, snow-covered landscape. In the background, there are snow-capped mountains and a dense forest of evergreen trees. The sky is dark, and a vibrant green aurora borealis is visible in the upper portion of the frame. Several tall, thin masts with lights at the top are scattered throughout the site. In the bottom right corner, there is a small, dark building with yellow lights and a few vehicles parked nearby.

3 sites option for 5
10 000 antennas each
5 MW transmit power, (peak 25% duty cycle)
2000 TB / year data
Operation starting 2023
Ready, probably never

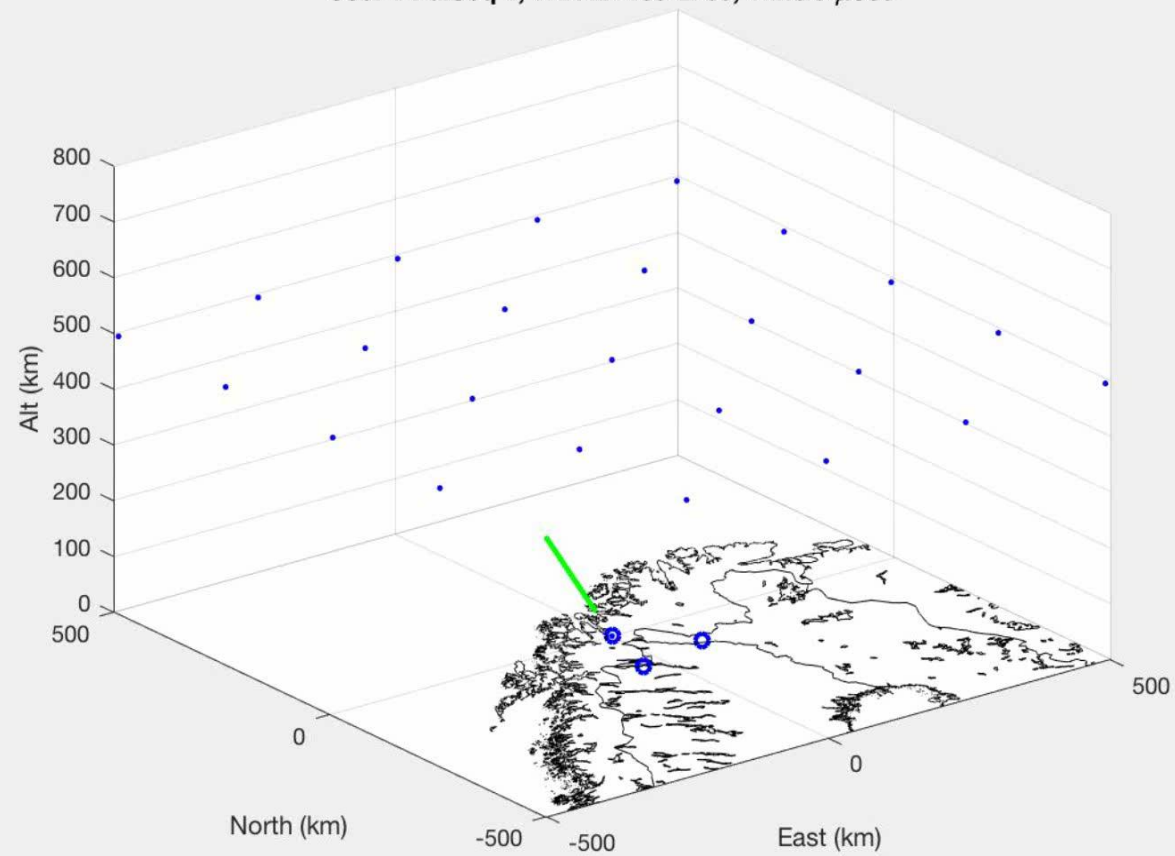




User 1 PulSeq 1, TX: Az 0 El 90, Time 0 μ sec



User 1 PulSeq 1, TX: Az -100 El 30, Time 0 μ sec

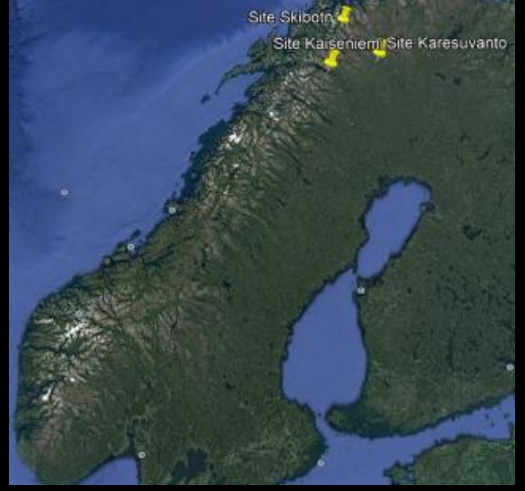




EISCAT_3D Skibotn

EISCAT_3D Karesuvanto

EISCAT_3D Kaiseniemi



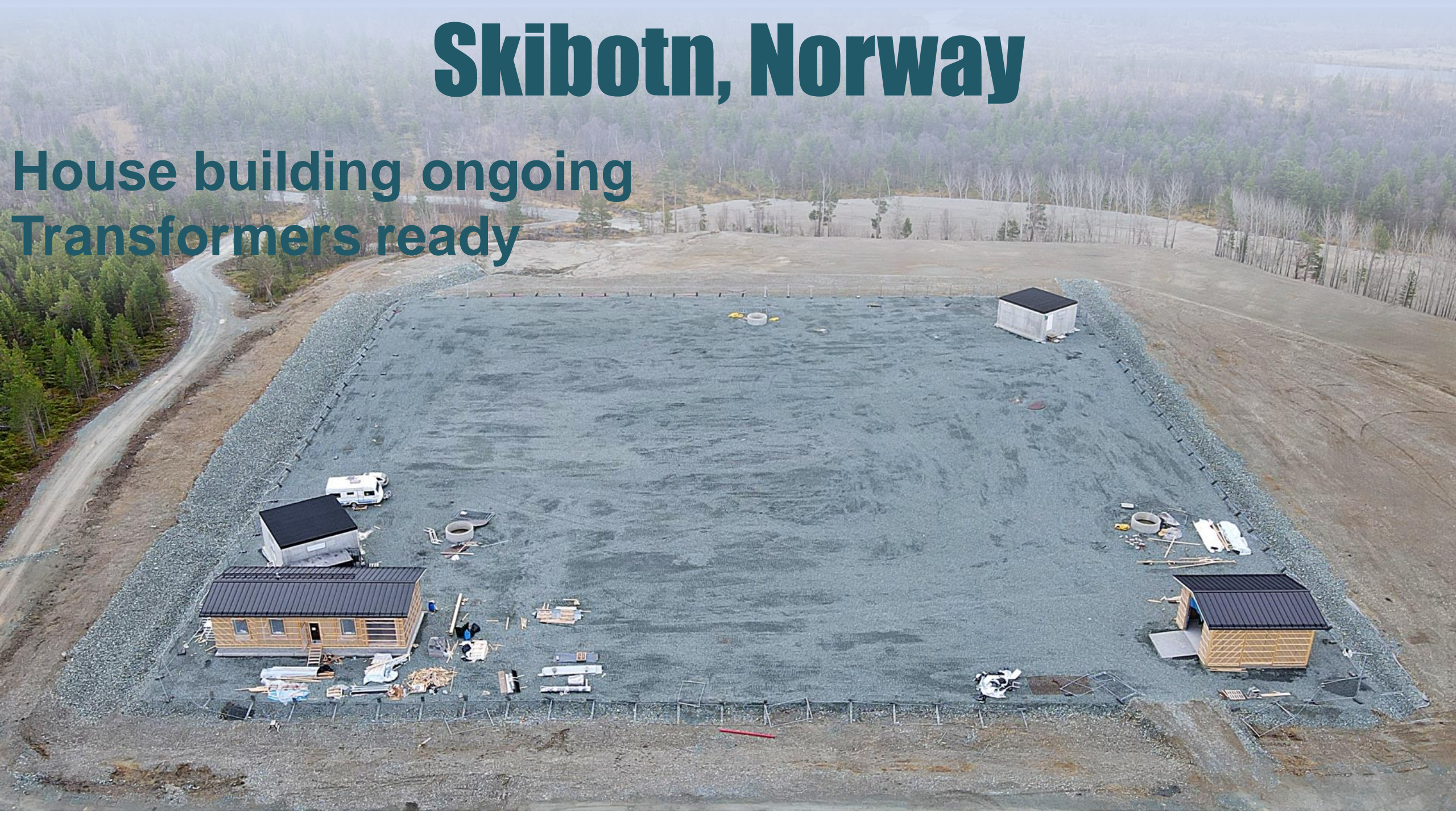
Site Skibotn
Site Kaiseniemi
Site Karesuvanto

E45

E8

Skibotn, Norway

House building ongoing
Transformers ready



Skibotn, Norway

10 additional subarrays for imaging



Karesuvanto, Finland

Groundwork done
House building ongoing



Kaiseniemi, Sweden

Building permits delayed start of the construction.
Ground isolation installed.
Work should be ready this summer.



Main parts

Antenna Unit:

- Production ready
- Delivery to sites Autumn 22
- Installation 22/23

Exciter:

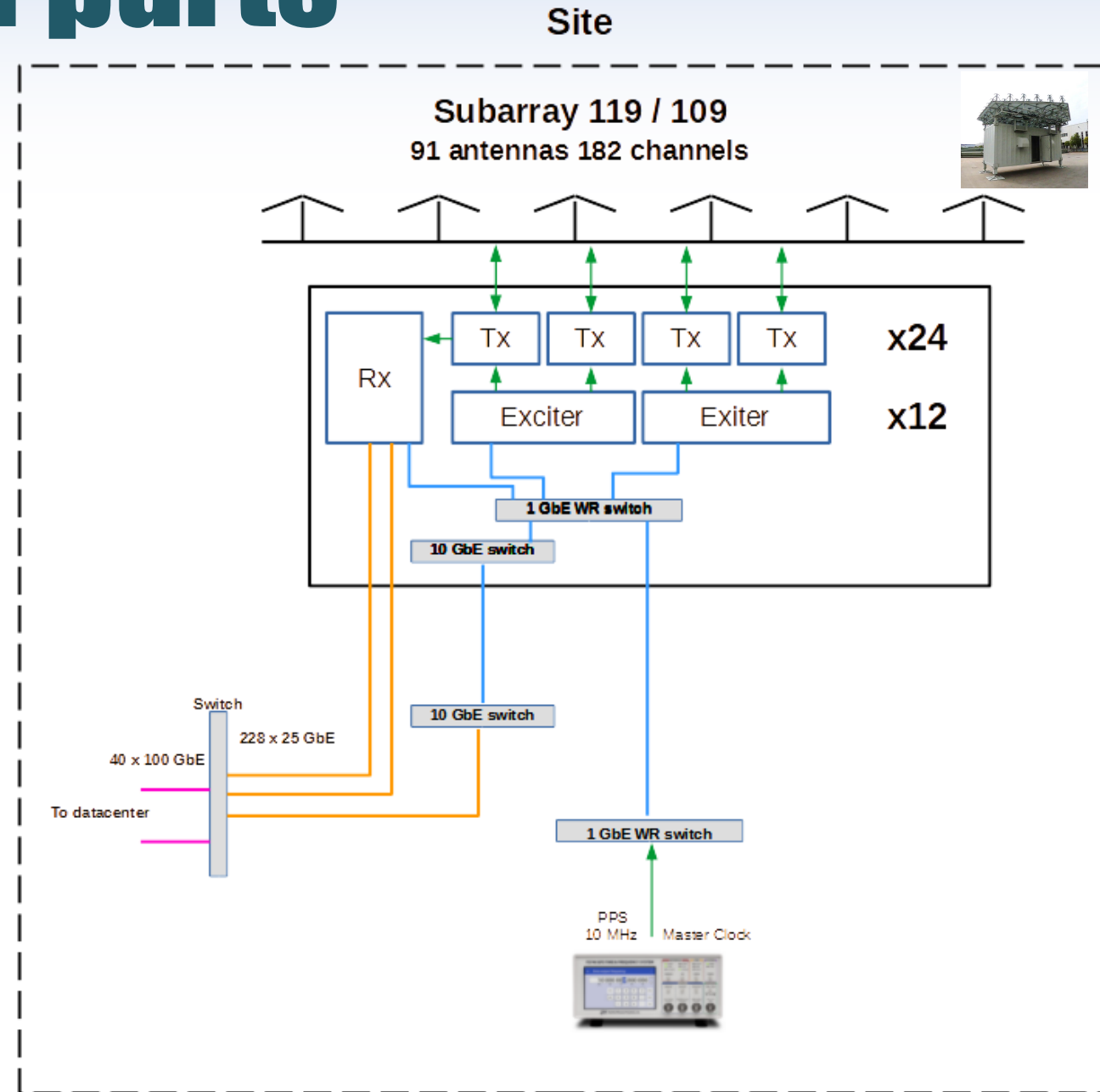
- All 444 ready

Receiver:

- 109 ready for delivery to remote sites
- 119 waiting for components
- All manufactured end of 2022

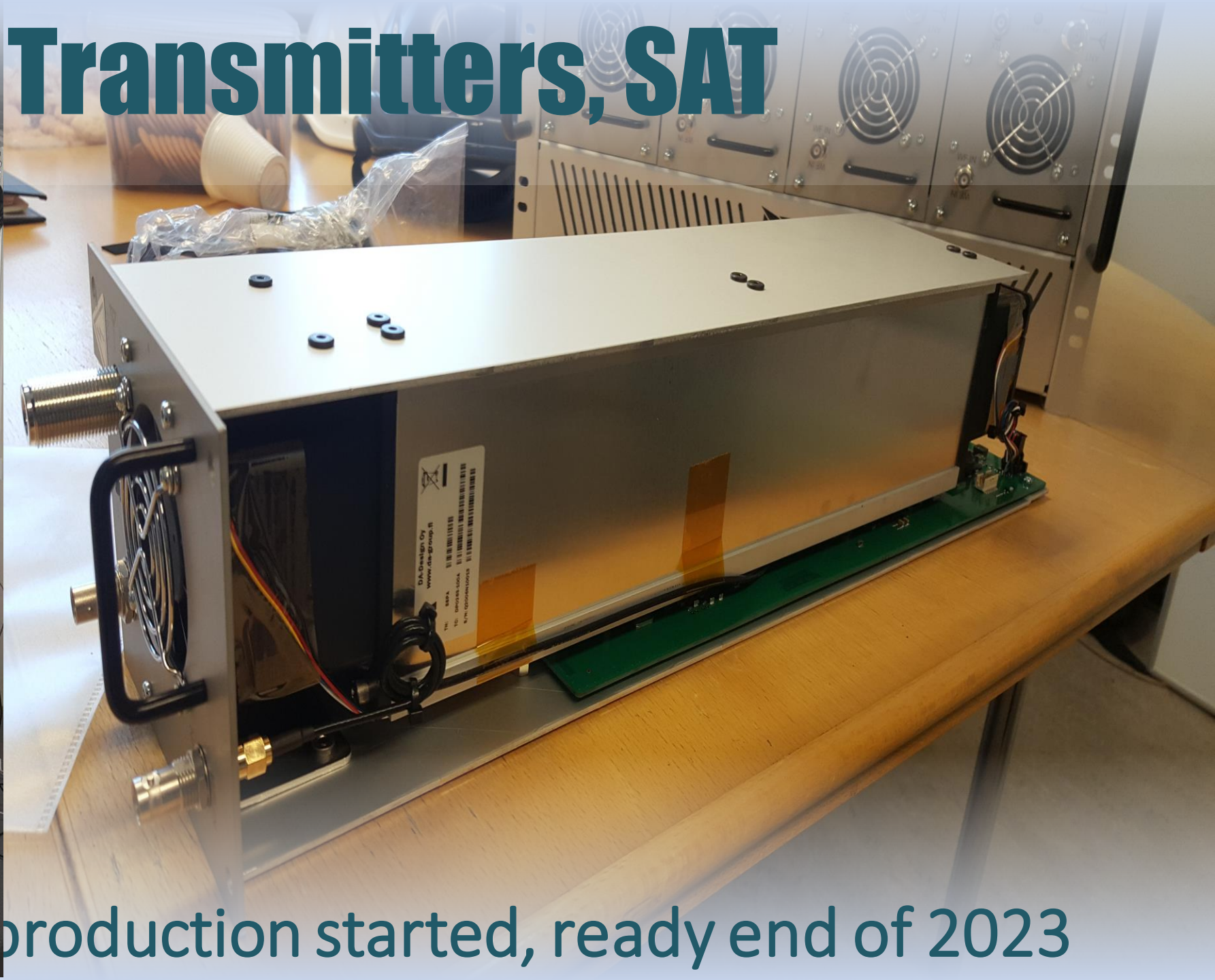
Transmitters:

- Ready for 3 full subarrays
- Waiting for components
- Production from now to end of 23





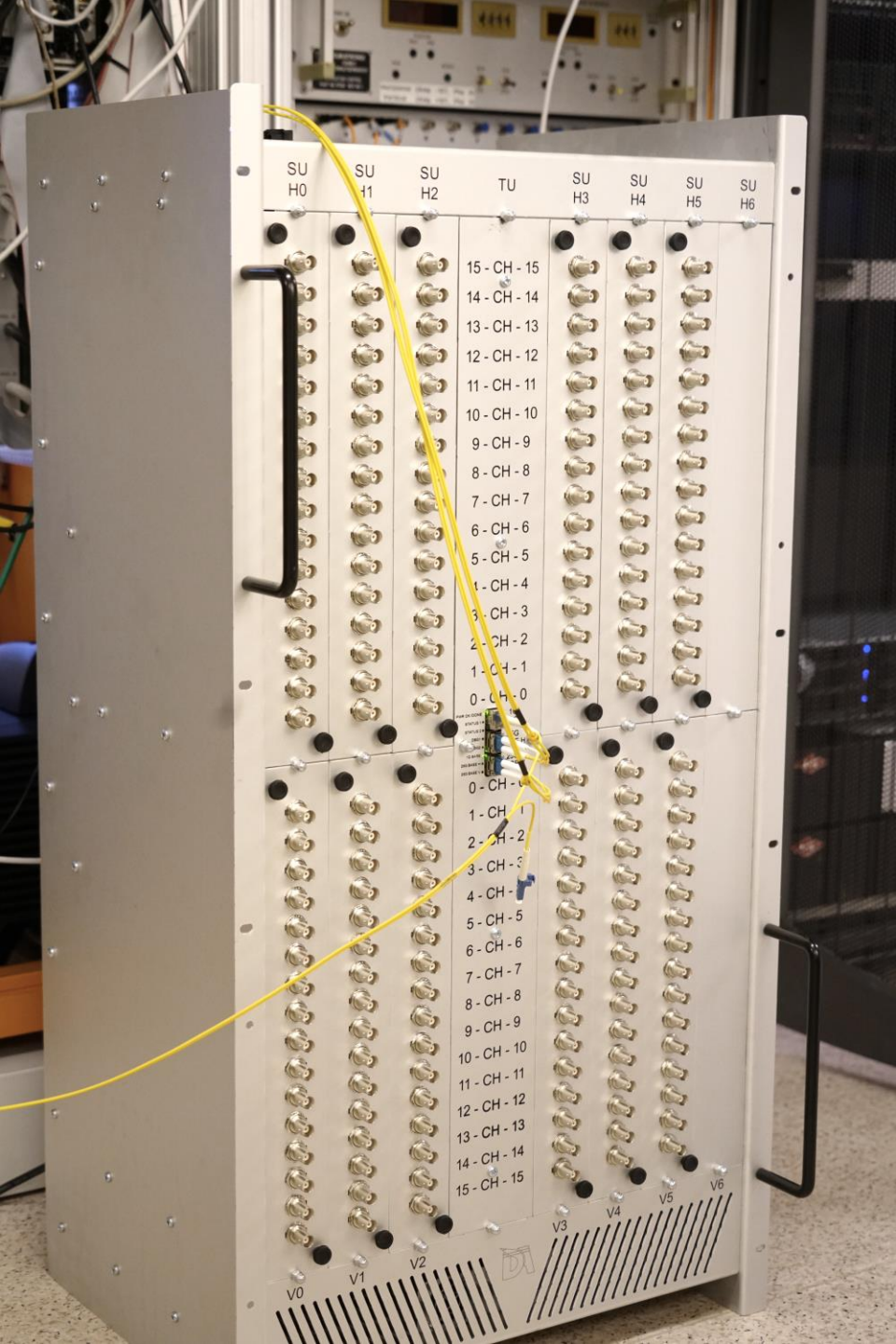
Transmitters, SAT



production started, ready end of 2023

Receiver

- 182 channels
- 104 MSPS ADC Nyquist sampling
- 223 MHz +/- 15 MHz analog bandwidth
- First level of beamforming in FPGA
- 10 simultaneous beams, data streams
- 25 GbE link for both polarizations
- True Time Delay filters
- White Rabbit timing



Exciter, PSCU



Qamcom, Sweden, 16 channels arbitrary waveform upconverter with independent phasing, WR timing

Antenna Unit

All units will be ready for shipments on February 22



Antenna Unit



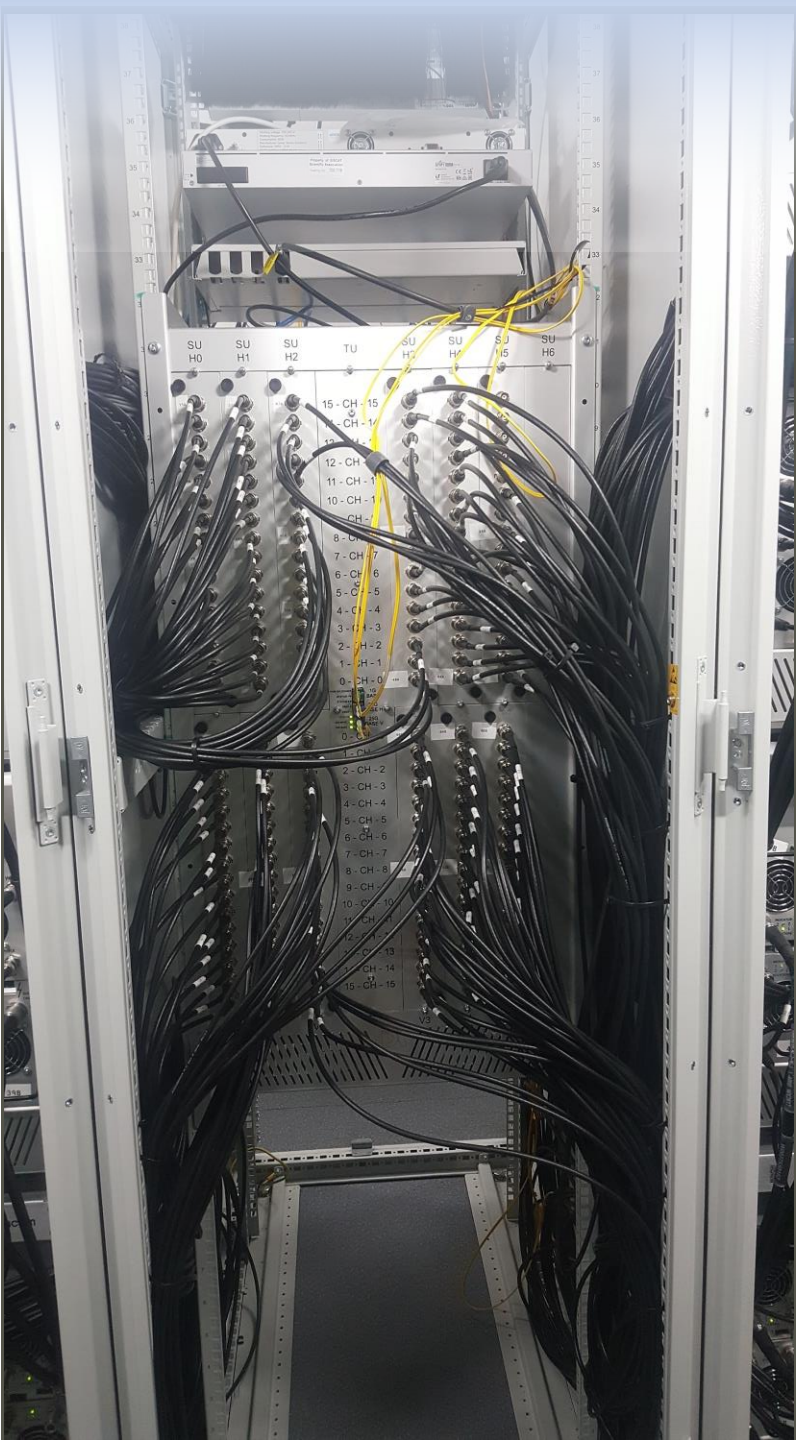
Antenna Unit



Subarray



Kiruna Subarray



Full subarray of transmitters installed.

We can now run 91 antennas having nominal 1kW peak 25% duty cycle (2 polarizations).

Transmitting license for 30 MW ERP

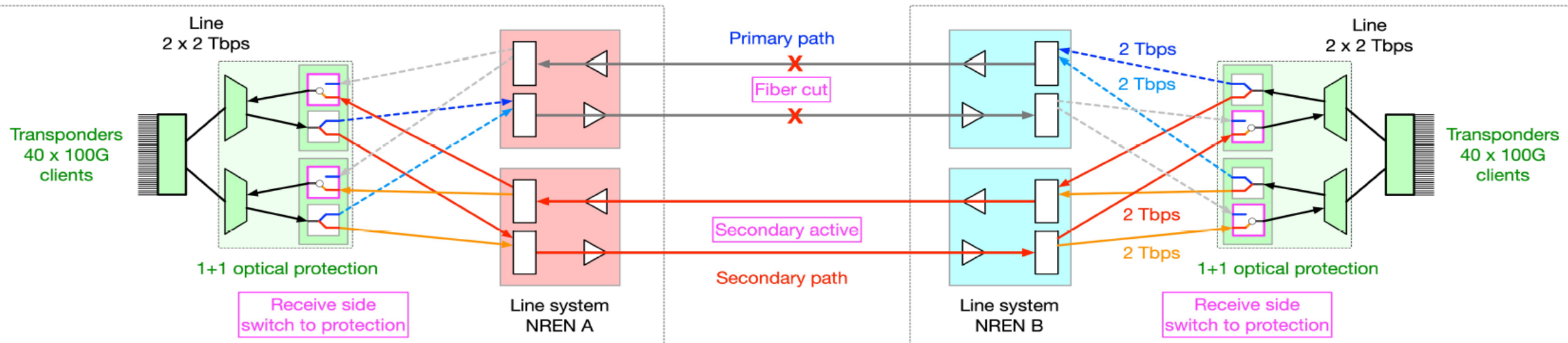
Integration work and testing ongoing.

Computing network

Protection circuits works automatically in fractions of a second.
Data drop is minimal and allows radar operation continue.

EISCAT-3D 1+1 optical protection (primary fail, secondary active)

EISCAT-3D antenna site



Computing network

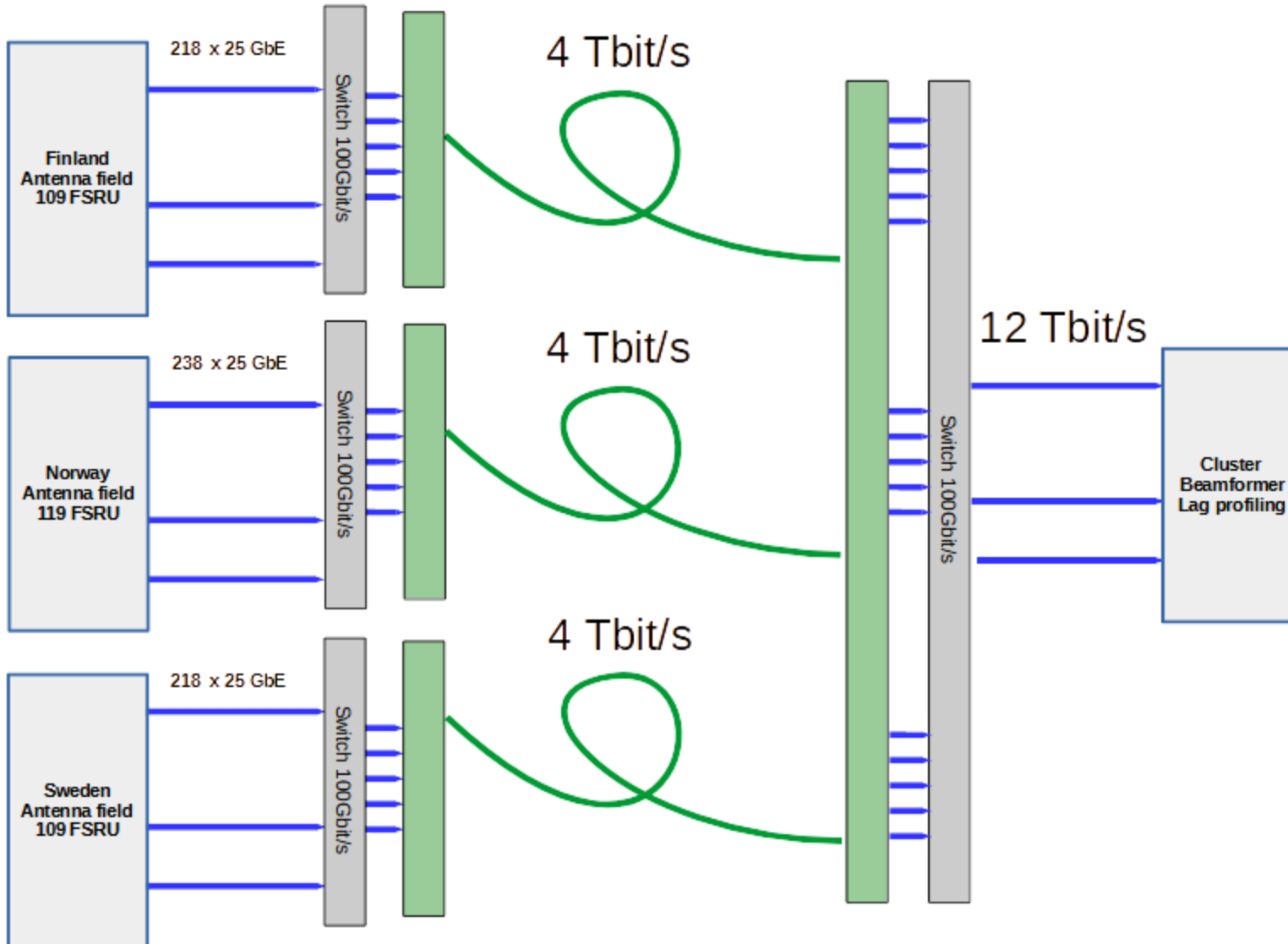
Sites

Data Center

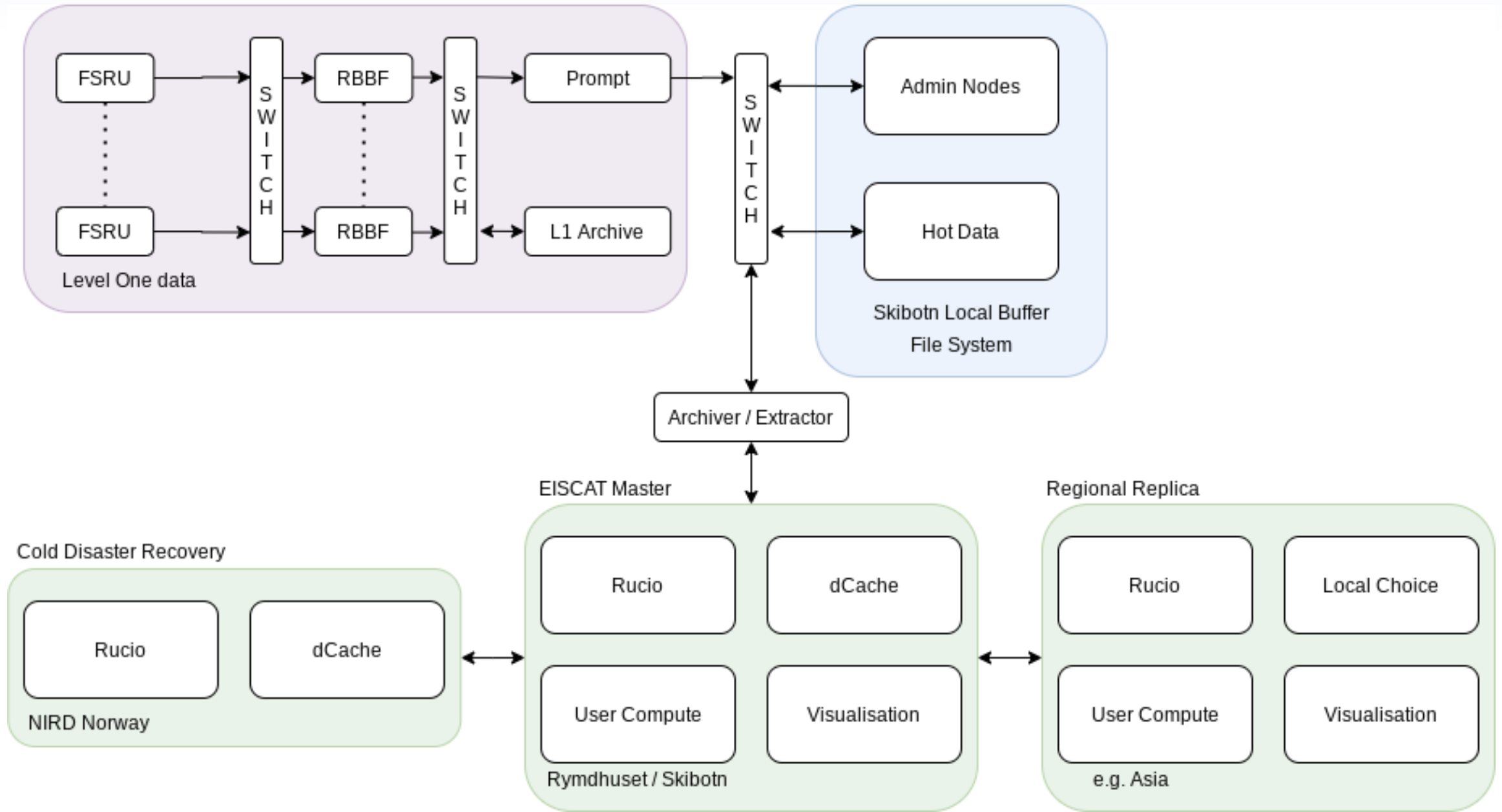
An optical ring of 4 sites will be constructed.

Each site has logical point-to-point connection to data center.

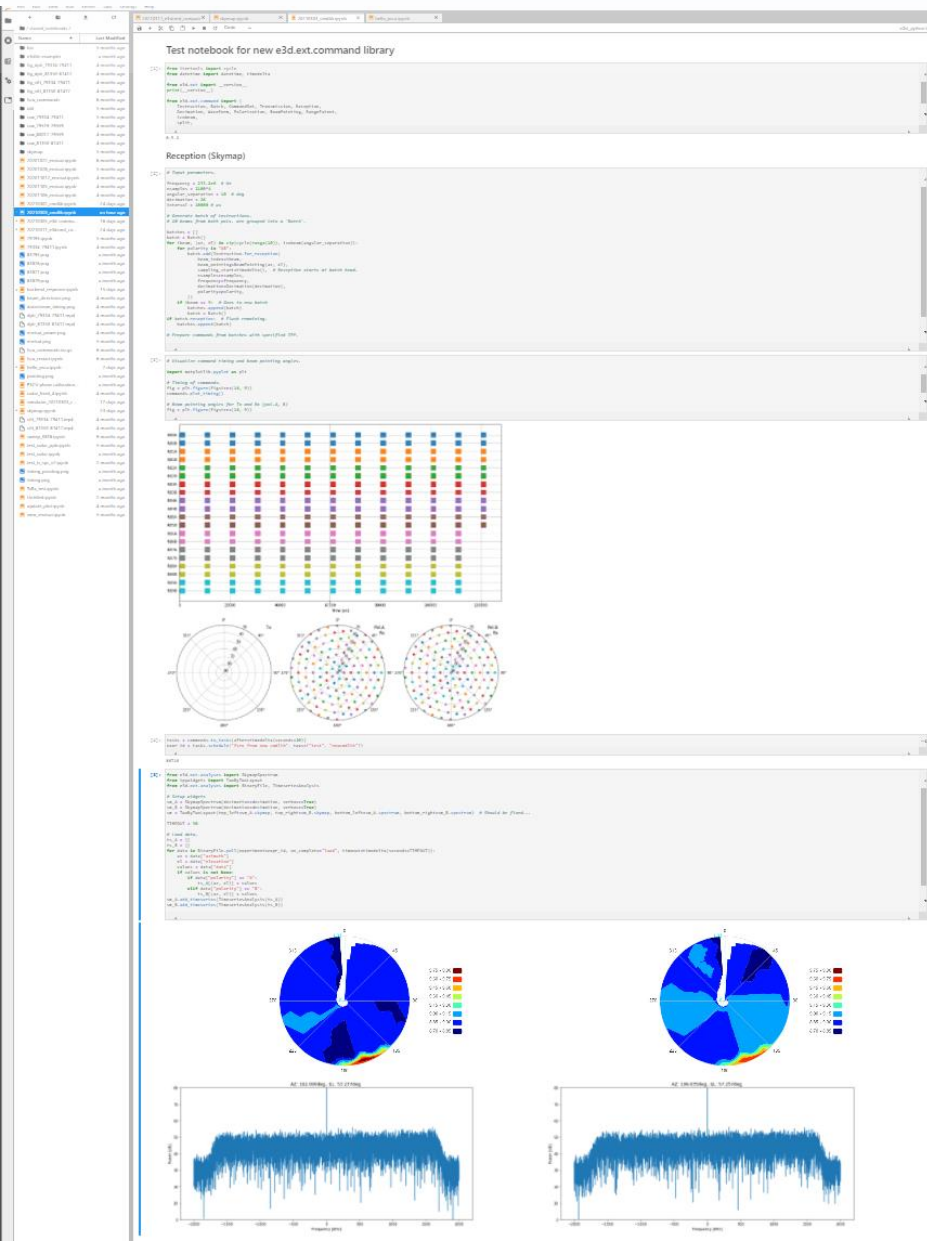
Data center can be located into any or multiple places in the ring.



Network and cluster



Jupyter Notebook as a user interface



- User defines experiment in a notebook and gets results back to the same page