Total Solar Irradiance, Space Weather, and Ship Detection

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adopted from a presentatio
Pål Brekke, No

Norsk Romsenter

Why NorSat?

se well developed satellite bus
nology for niche technology testing
science.

nber one will fly:

- new and more advanced AIS receiver developed by Kongsberg Seatex (under ESA ARTES Programme)
- Provide a platform for instrument testing within climate/solar physics and space weather (ESA PRODEX).

ure platforms will concentrate on
es essential for Norwegian or
rnational partners.

ORSAT-1 will be a small Norwegian satellite designed to ca
ree scientific payloads

- AIS-receiver - Ship detection - to test new algorithms
- CLARA - Solar Total Irradiance monitor (Sun-Climate)
- Mini-Langmuir probes (Space Weather - Plasma densities)

DR: 10-13 February 2014 - then the construction starts

unch Q4-2015/1Q-2016 (piggyback)

ellite bus: University of Toronto (CA).

e: 20x20x40 cm

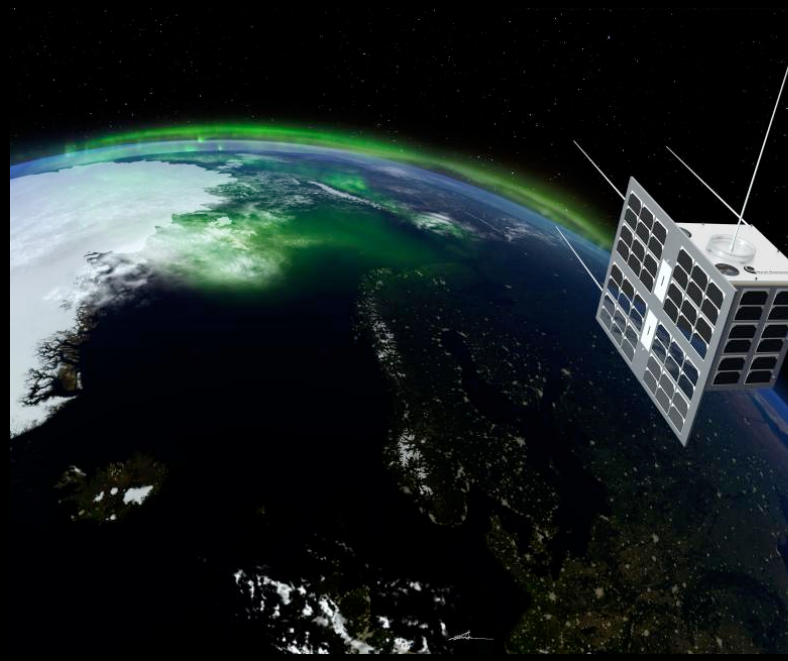
eight: 16kg / 4.6kg payload

st (without payload): 4 mill USD.

bit: 550-650 km - depending on the launcher. Preferrable a dusk-dawn orbit but not a quirement.

itude control system: Reaction weels and magnet-coils. No thrusters or de-orbit chanism.

RSAT-1 is designed for continuous payload operation.



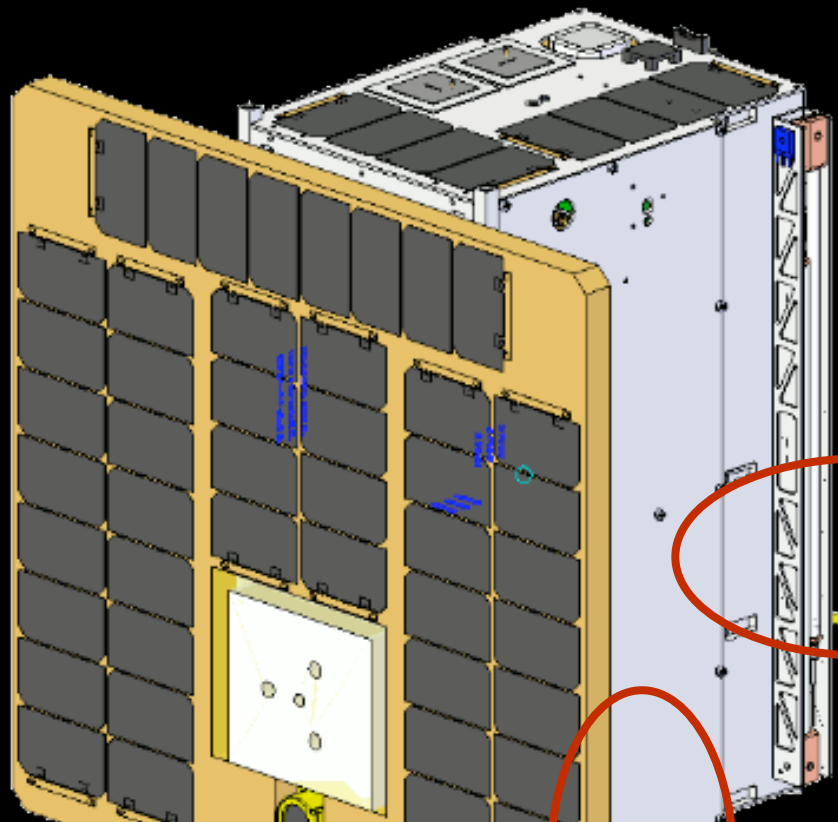
Built by Kongsberg Seatex and The Norwegian Defence Establishment.

New generation AIS-receiver with new algorithms

The AIS payload is a dual antenna VHF receiver supporting four VHF channels each.

Two antennas (to be deplyed after launch).

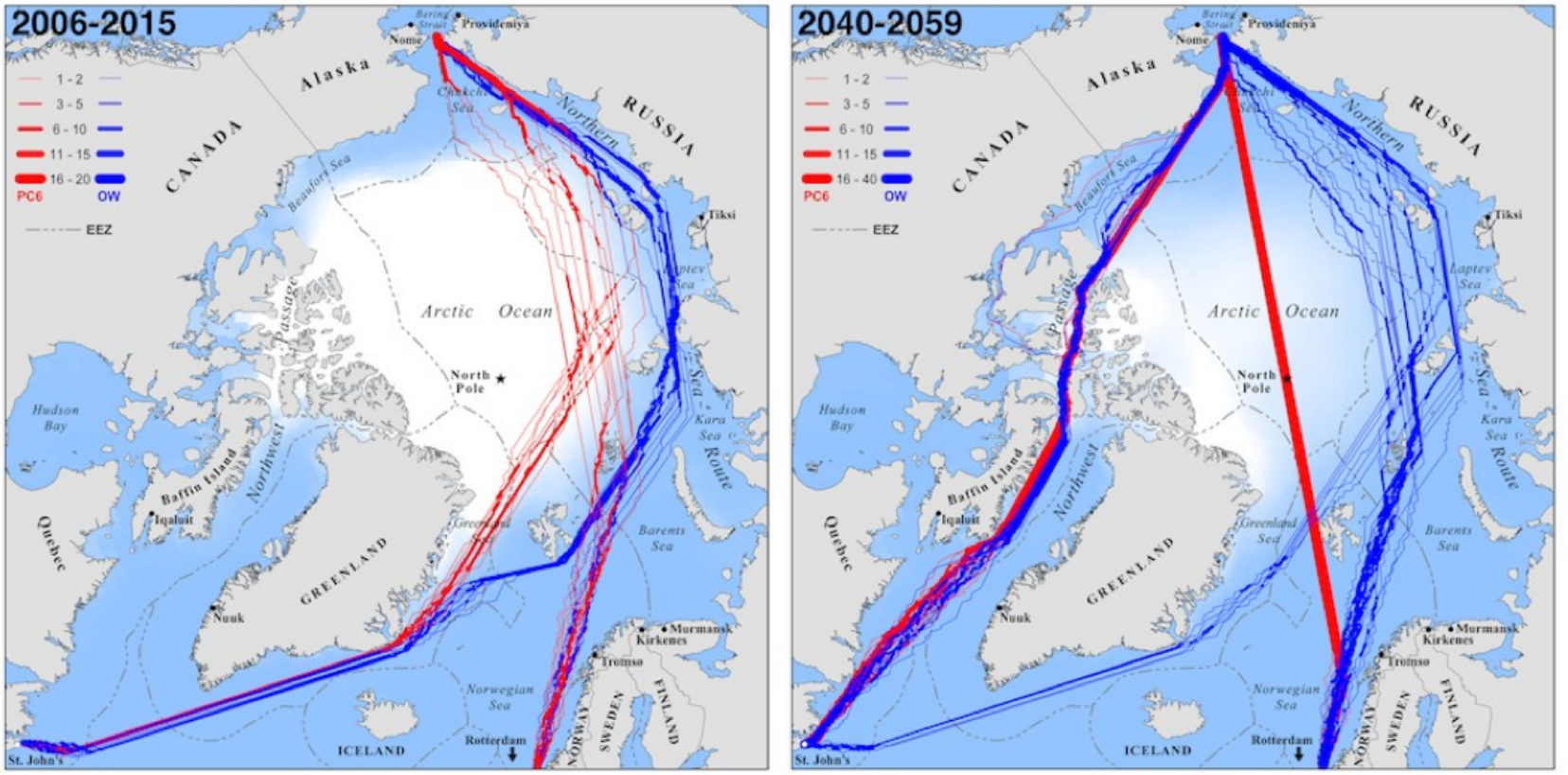
Operated by StatSat and data piped to the Norwegian Coastal Administration ++



Climate change in the Arctic imporant for future activities in the High North

Where will the ice edge be in 50 years?

Melting the Arctic leads to increased shipping



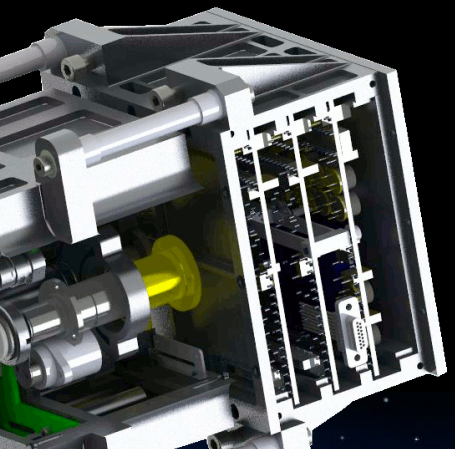
Red lines indicate fastest available routes for moderately ice-hardened vessels (PC6)
Blue lines indicate fastest available routes for common open-water ships.
Credit: L.C. Smith and S.R. Stephenson, PNAS.

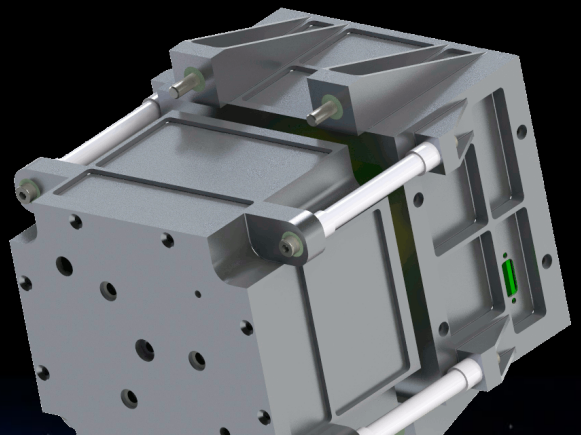
Compact and Light-weight Absolut RAdiometer

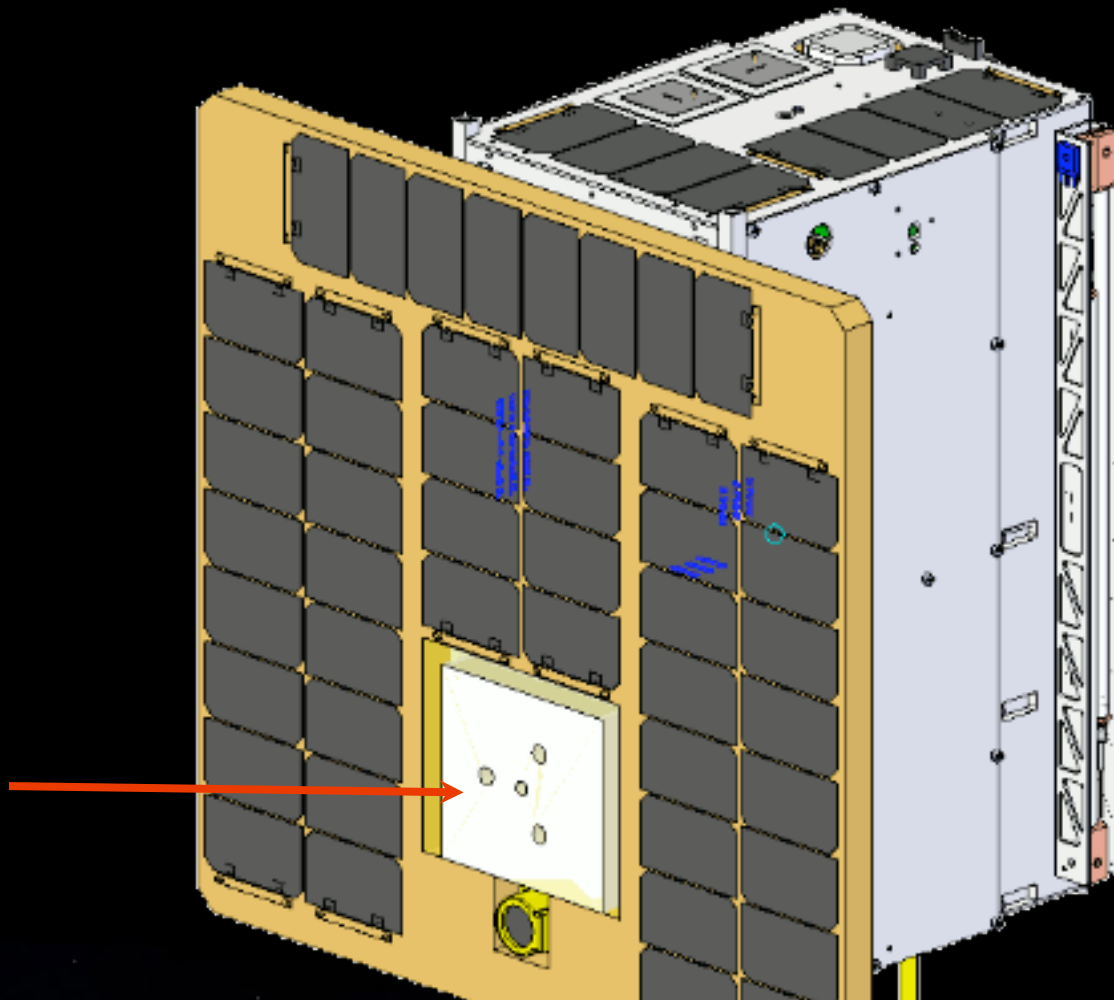
LARA is based on a new design by PMOD/WRC which minimizes size.
eight while improving the radiometric performance.

A will be characterized in house in Davos and calibrated against the World Radi
ence in Davos as well as compared to the TRF (LASP).

CLARA specs	
Dimensions	114 x 141 x 155 mm^3
Mass	2.63 kg
Power consumption	5.6 W
Measuring cadence	30 s







CLARA Science Goals

Radiometry
- Confirm WRR-to-SI scale offset found with PMO6/PREMOS
- Confirm design improvements (optical/thermal and weight reduction)
- Meet or exceed highest currently achievable uncertainty level (by PMO6/PREMOS)

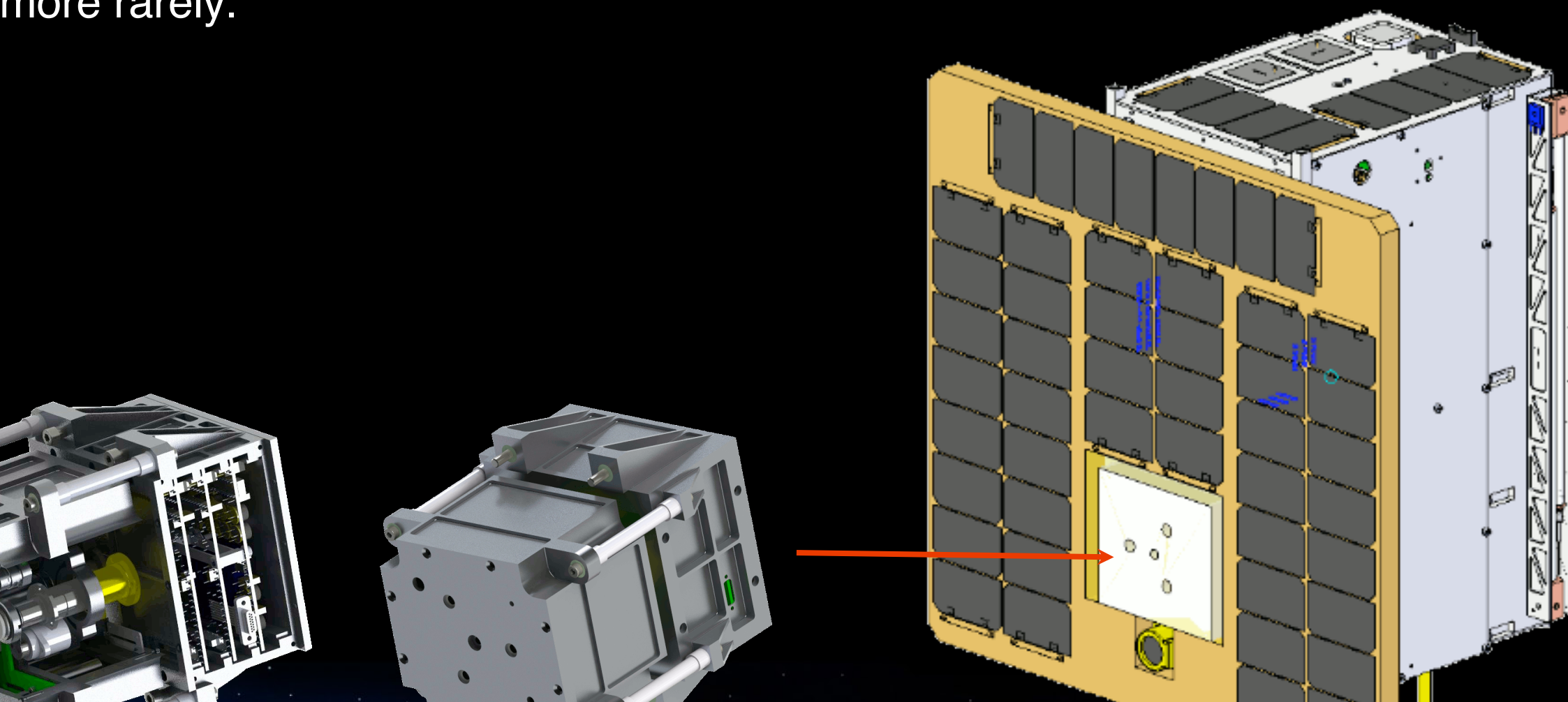
Climate Research
- Extend the TSI data record for solar atmosphere and climate modellers (solar variability, global warming)

Helioseismology
- Assess the acoustic energy carried into the solar atmosphere by high frequency sound waves (above the acoustic cut-off frequency)

Compact and Light-weight Absolut RAdiometer

g daylight the CLARA will measure the TSI continuously every 30 seconds with
rimary cavity.

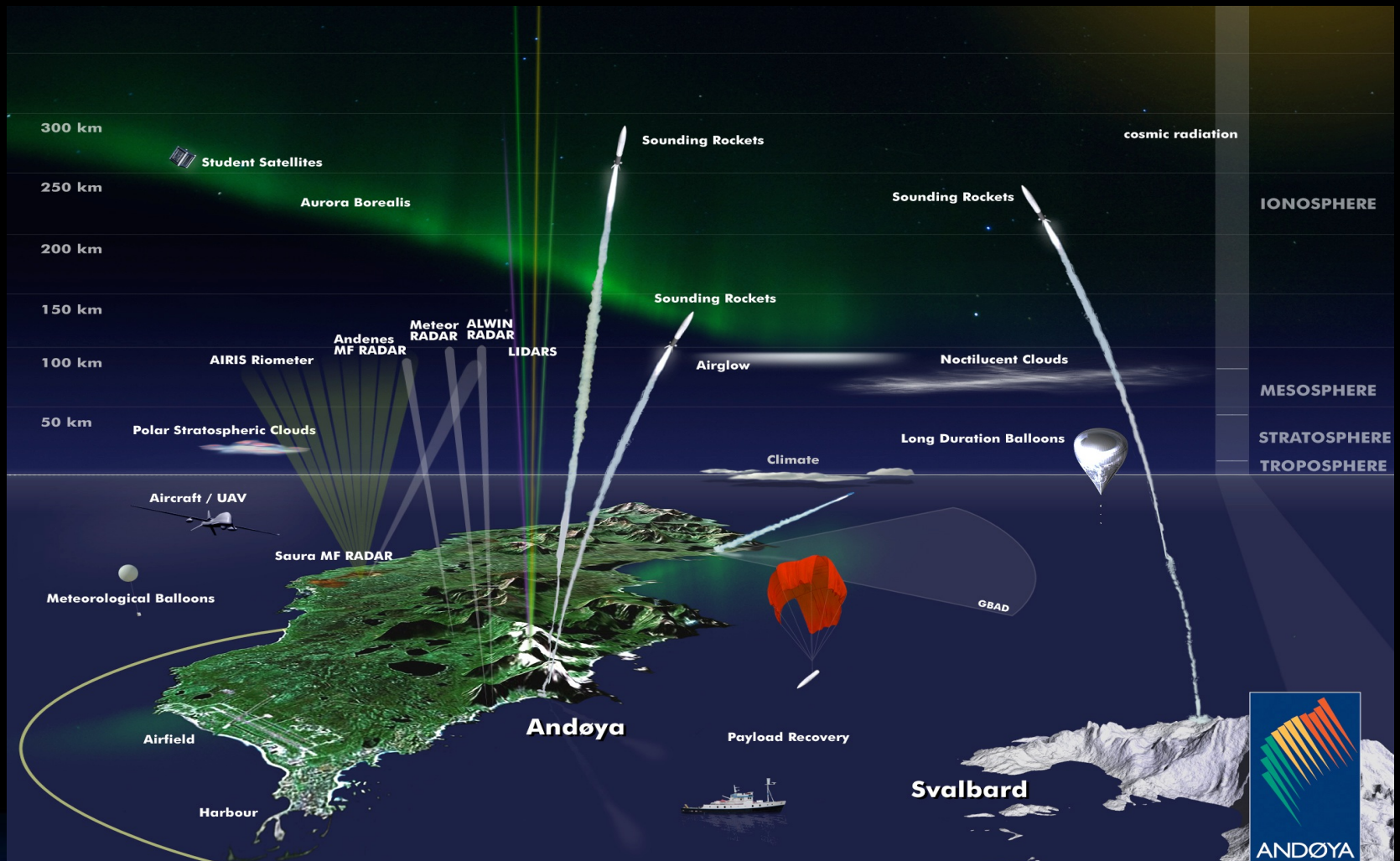
per month or so, two cavities will simultaneously measure the TSI during one
o assess the degradation of the primary cavity. The third cavity will be exposed
more rarely.



Norway has long traditions in Sun-Earth connection/SW science

Large number of ground based instrumentation

Increased activities in the Arctic make Space Wether knowledge important

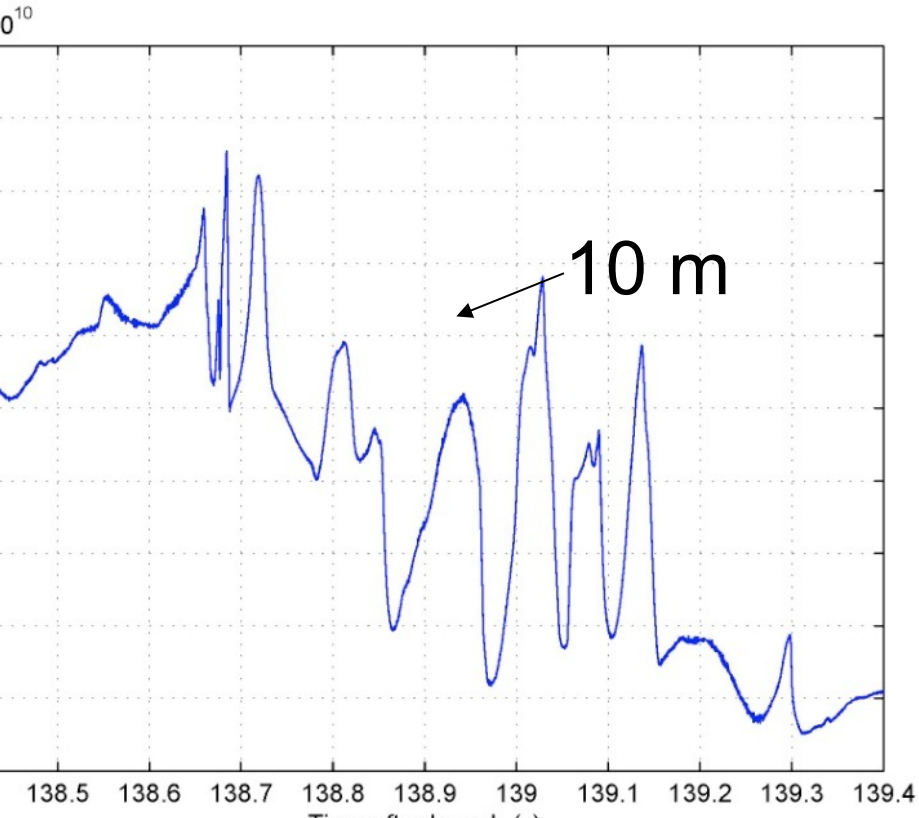


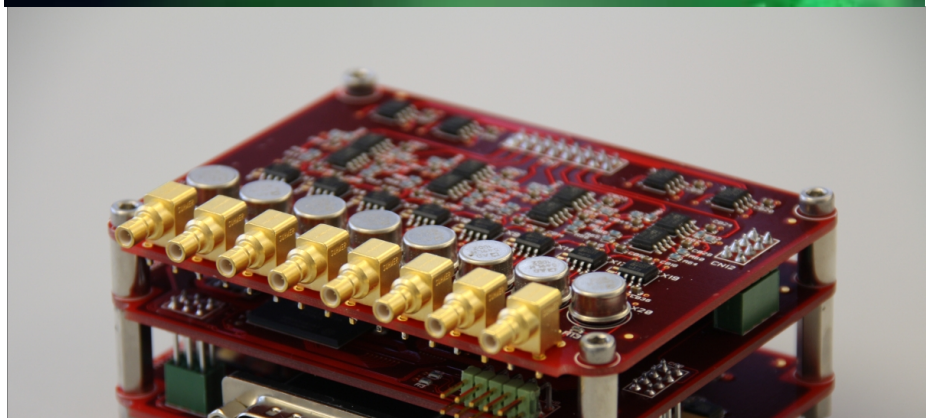
Needle Langmuir Probe (4-NLP)

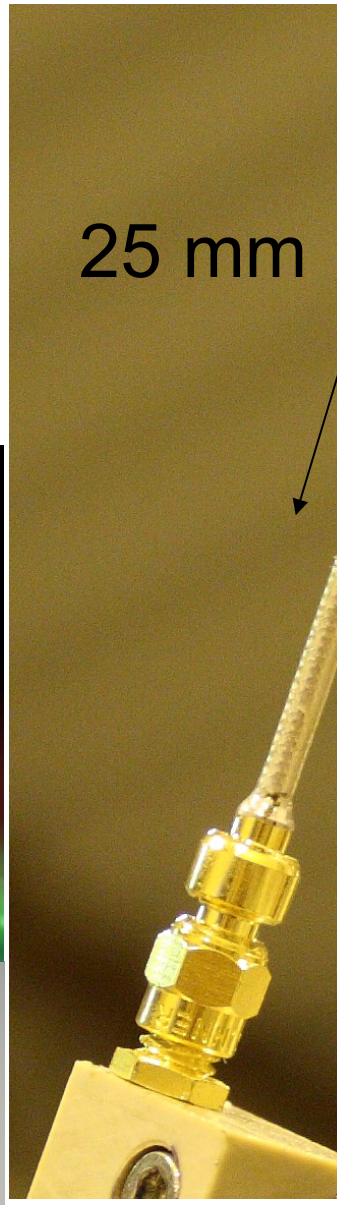
A new concept Langmuir probe system for ionosphere space weather monitoring

Miniaturized system consisting of 4 x cylindrical probes of
Length: 25 mm and Diameter: 0.51 mm

Key parameters: Absolute electron density & platform potential (up to 10 kHz sampling rate).

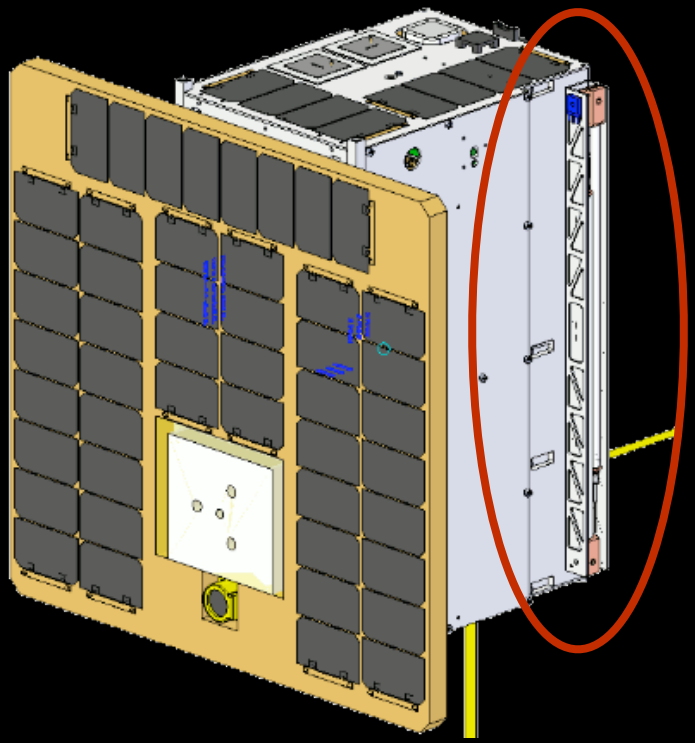


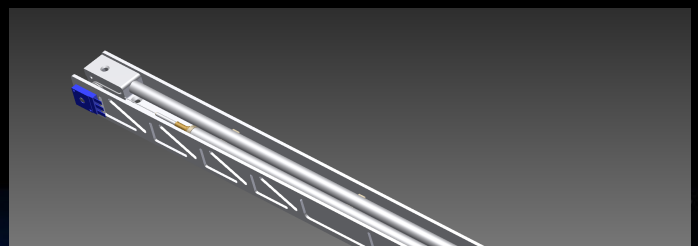


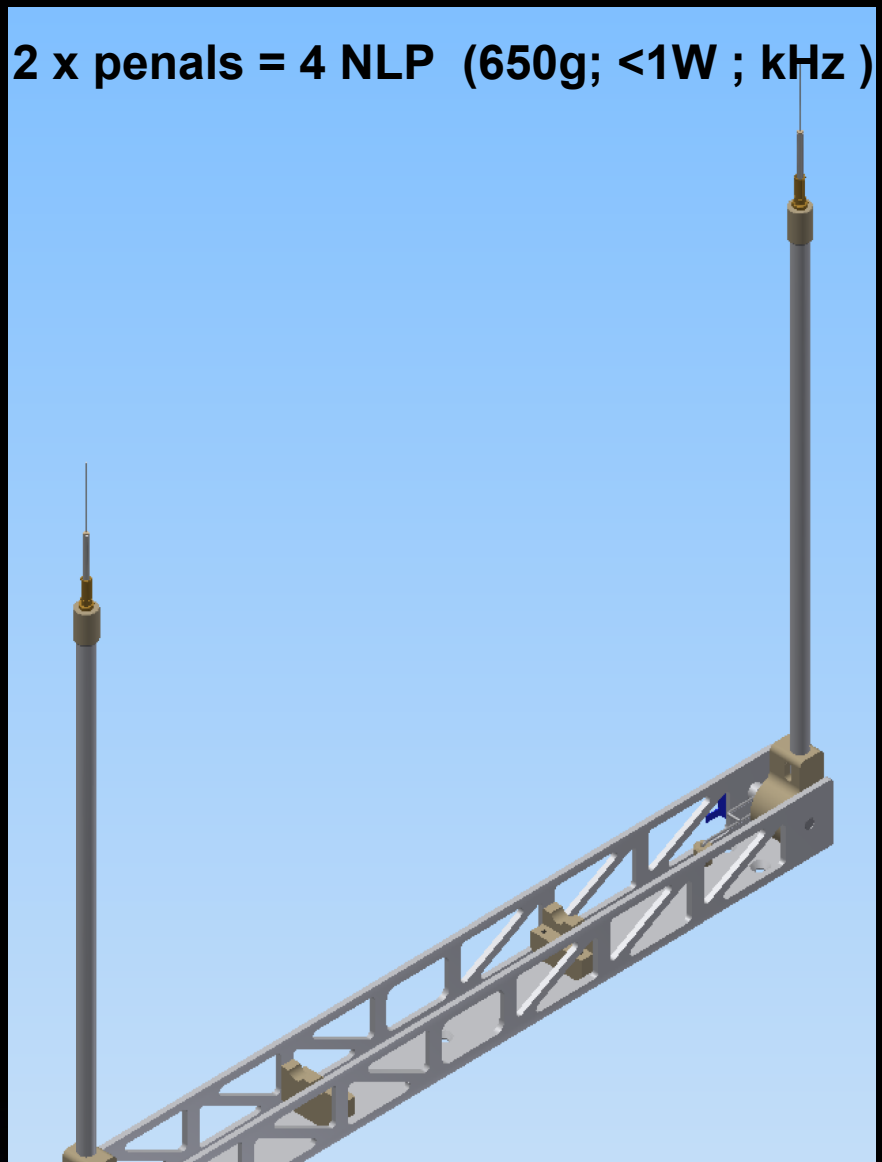


uilt by University of Oslo (PI: Jøran Moen) and EIDEL

ngmuir Probe instrument consists of 4 individual probes each mounted at the end of a
s total). The instrument will measure electron density and the platform floating potenti
bit.







he platform shall have an attitude determination and
ontrol (ADC) capability that will facilitate full 3D pointing
ontrol (Pointing withing 0.5 degree)

he CLARA instrument determines the orientation/pointing
f the satellite when the satellite is illuminated by the sun.

During eclipse the CLARA will normally point to the Earth to
tay in thermal balance

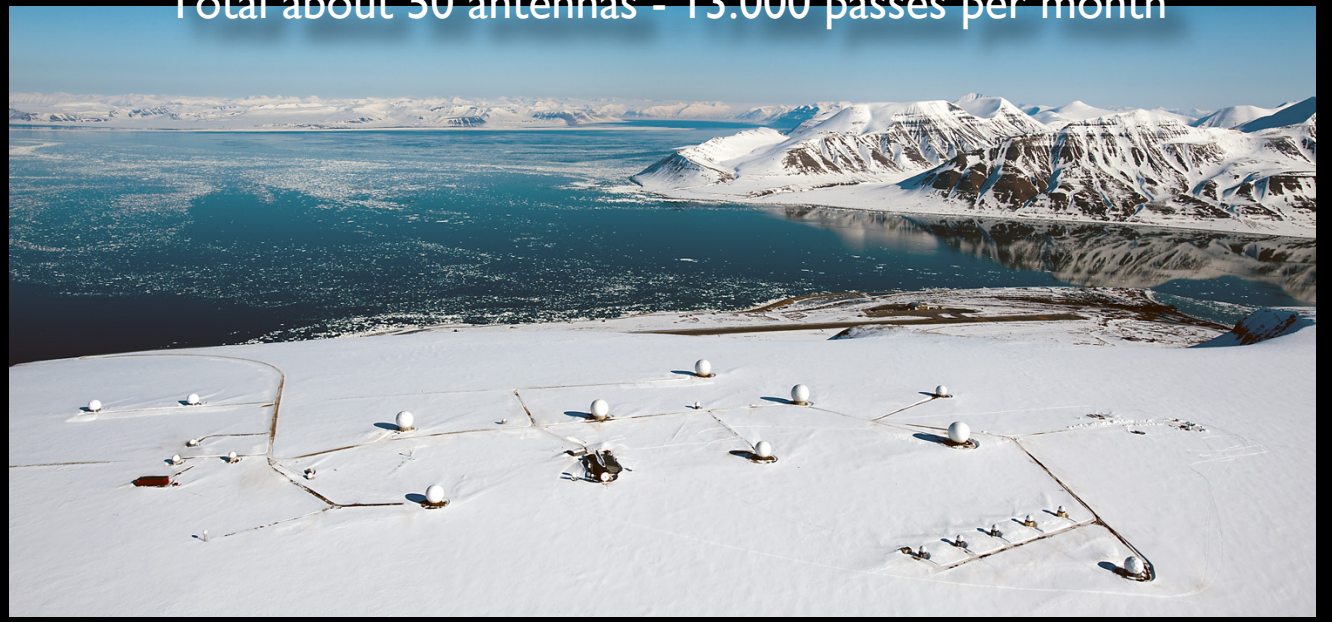
n eclipse the satellite may be oriented to achieve optimal
erformance of the AIS receiver, the Langmuir Probe or to
erform calibration of the CLARA instrument.

World largest satellite station for polar orbiting satellites

NASA/CSOC missions supported at SvalSat

- LANDSAT-7
- QuickScat
- AM-1 (Terra)
- SAC-C
- ERS-2
- Acrimsat
- Champ
- Grace
- EO-1
- Kompsat
- Cobe
- Aqua
- Quicktoms

Total about 50 antennas - 13.000 passes per month



NORSAT provides a fast-track possibility to test new technologies and to extend imp
time series scuh as TSI.

Provides an important ship traffic monitoring system.

Will extend the TSI time series

Low cost mission

Future NORSAT missions open for good proposals/international collaboration