Finland

# *Funding for geospatial innovations related space*

ESA Phi-Lab Finland

Miika Kostamo

Project Manager

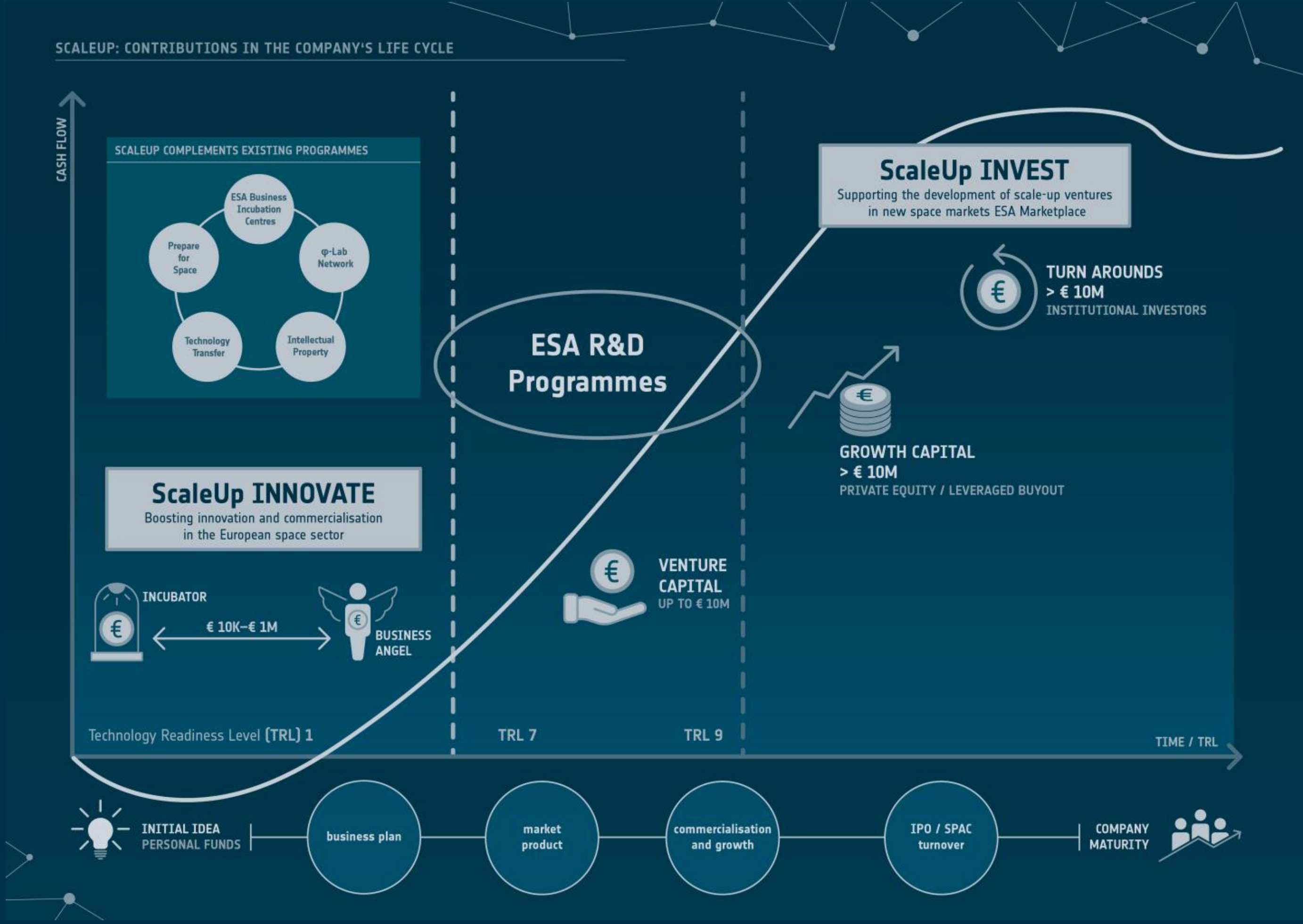
14.11.2025

# ESA Phi-Lab in Finland

European Space Agency Innovation Program

Supporting space-related innovations to commercialise

Part of ESA Phi-Lab network and ESA ScaleUp program




[ESA Commercialisation Gateway](#)

# ESA Phi-Lab Finland Consortium

## ESA PHI-LAB FINLAND PARTNERS

Aalto University

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

NLS
FINNISH GEOSPATIAL RESEARCH INSTITUTE
FGI

Vaasan yliopisto
UNIVERSITY OF VAASA

## FUNDING ORGANIZATIONS

esa

Kaute-säätiö

Teknologiateollisuuden 100-vuotissäätiö

WEISELL SÄÄTIÖ

# What are we looking for?

Launch video in Youtube: ESA Phi-Lab Finland


Shape the future of
space innovation with us
esa
Phi-Lab
NET
Finland

esa | Phi-Lab NET | Finland

# Call and offering

# State-of-the art geospatial innovations related to

## Sensor technologies

- EO sensors upstream
- Navigation sensors
- Distributed sensor systems
- Signals and systems innovation

## Advanced computation for geospatial services

- AI applications in upstream and downstream
- Cost efficient computation
- Algorithms and signal processing

## Novel digital geospatial services

- EO service innovation
- Navigation and positioning services
- Service platforms

# Offering for Phi-Lab projects

## Funding

- ESA Seed funding 200-500k€ per project

## 100+ hours of technical and business support + training sessions

- Provided by Phi-Lab partners in Finland

## Access to research infrastructure

- Aalto University, FGI and FMI

## Events and Phi-Lab network in Europe

# Open Call process

Simple application

Research proposal

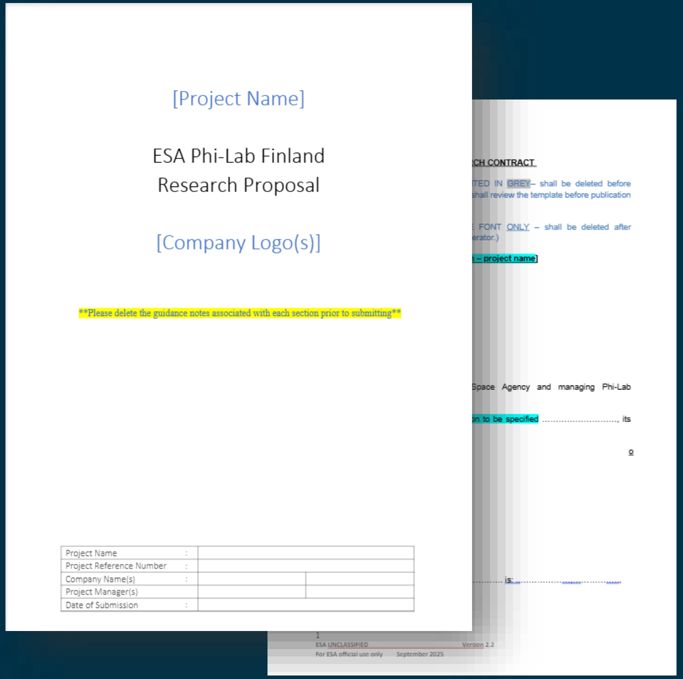
Draft research contract


Application evaluated after set cutoff days

Tender Evaluation Board scoring

For selected projects

1-2 years of project support and funding


[Project Name]

ESA Phi-Lab Finland
Research Proposal

[Company Logo(s)]

**Please delete the guidance notes associated with each section prior to submitting**

| | |
|---|---|
| Project Name | : |
| Project Reference Number | : |
| Company Name(s) | : |
| Project Manager(s) | : |
| Date of Submission | : |

Finland

# Next cufoff day is 20$^{th}$ November 2025

More info at
www.esaphilab.fi

Ongoing:

# Our first ESA Phi-Lab projects!


Delivering Europe's first sovereign LEO-based navigation and timing service – stronger, faster, and more resilient than GNSS

# Sharpnav – A European LEO-PNT Constellation for Secure and Resilient Navigation and Timing

**Contact**

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*Chairman of the board*

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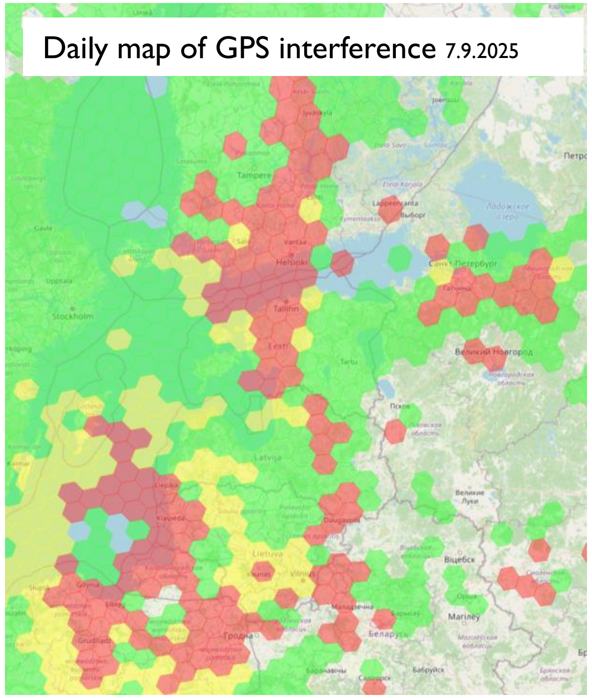
esa Phi-Lab NET Finland

DEFINE

esa BUSINESS INCUBATION CENTRE Finland

# TRADITIONAL GNSS FACES SEVERAL KEY ISSUES - MAKING IT UNRELIABLE IN DEMANDING ENVIRONMENTS

**Operational impact on NATO operations, exercises, aviation, and infrastructure → requires non-GNSS resilient PNT layer**



Daily map of GPS interference 7.9.2025

**Jamming**
Due to the low power of GNSS, even small jamming devices can overpower the satellite signals, leading to complete signal loss

**Spoofing**
Malicious operators can broadcast counterfeit signals to trick civilian receivers into using false position or timing data due to GNSS's lack of encryption

**Natural interference**
Ionospheric effects such as signal bending and solar activity can negatively affect the signal – particularly in polar regions

**Limited indoor penetration**
Urban environments and enclosed spaces suffer from weak and inaccurate GNSS signal

**Legacy systems are not designed for the future needs of PNT**
GNSS cannot answer the modern demand for reliability, security, accuracy and fast signal connectivity

*"EASA and IATA reported that GPS signal losses increased globally by 220% between 2021 and 2024"*

*"There were around 7 500 reports about GPS disruptions in 2023, compared to around 1 500 in 2022"*

*"As NATO forces conducted training exercises, GPS spoofing, potentially by Russia, complicated the operation"*

*"EU chief's plane hit by suspected Russian GPS interference during landing"*

*"Russian signal interference—specifically GPS jamming and spoofing—disrupted around 123,000 flights in the Baltic–Nordic region from January to April 2025"*

# LOW EARTH ORBIT POSITIONING SATELLITES OFFER A SOLUTION TO THE LIMITATIONS OF TRADITIONAL GNSS

### Unmatched Positioning Accuracy

**LEO-PNT satellites have centimetre-scale accuracy even under non-ideal conditions**, where as GNSS satellites are likely to suffer accuracy loss under poor conditions and interference caused by external factors

### Resilient to Interference

Our solution ensures operational capability under intentional interference, even under active electronic warfare conditions

### Coverage of GPS Blind Spots

LEO-PNT satellites enable better coverage due to **stronger signal intensity in all circumstances** due to closer proximity to Earth, while GNSS suffers from its low signal intensity driven by high altitude

### Location services in the polar regions

Launching the first LEO-PNT constellation in the northern hemisphere **unlocks robust and reliable positioning near the arctic circle** – current GNSS systems have worse coverage near the poles

### Robust functionality in challenging environments

LEO-PNT satellites are vastly superior to GNSS systems with indoor positioning due to stronger signal intensity which helps penetrate structures, as well as proof functionality in demanding natural environments such as canyons and dense forests

### Traditional GNSS[1] constellations

- Satellites in Medium Earth Orbit
- Altitude ~ 20 000 kilometres
- Time to first fix typically between 10-115 seconds
- Signal is very prone to interference, leading to signal loss within buildings & busy cityscapes

### LEO-PNT[2] constellations

SHARPNAV

- Satellites in Low Earth Orbit
- Altitude 600 – 2000 kilometres
- Significantly faster time to first fix compared to traditional systems
- Up to **100x signal strength** with same transmitted power compared to GNSS
- Significantly lower latency & shorter convergence times due to quickly changing signal paths

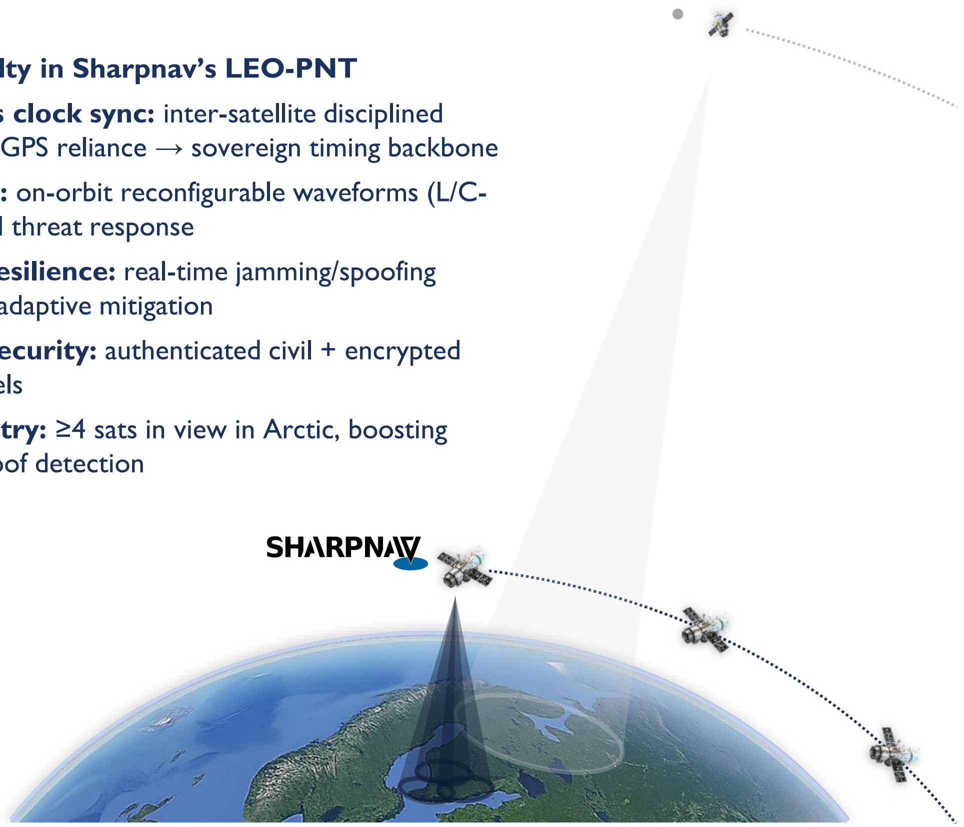
*Illustration of GNSS & LEO-PNT satellite constellations*

# TECHNICAL NOVELTY & CONCEPT

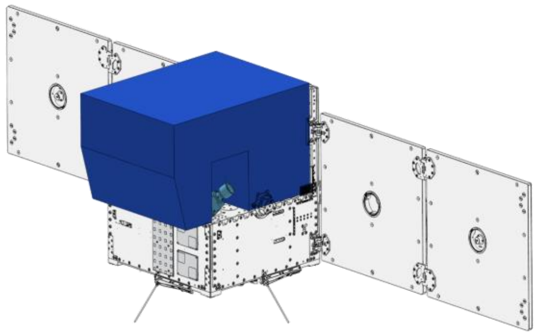
- **Autonomous LEO timing: inter-satellite disciplined clocks; no GPS reliance for synchronization**
- **SDR payload: on-orbit reconfigurable waveforms (L/C-band), enabling rapid adaptation to emerging threats**
- **AI-assisted interference rejection: adaptive onboard processing to mitigate jamming and spoofing in real time**
- **Dual-signal security: authenticated open civil signal + encrypted high-assurance military signal for integrity & access control**
- **Receiver adoption path: firmware update + optional dual-band antenna → full GNSS coexistence, no rip-and-replace**

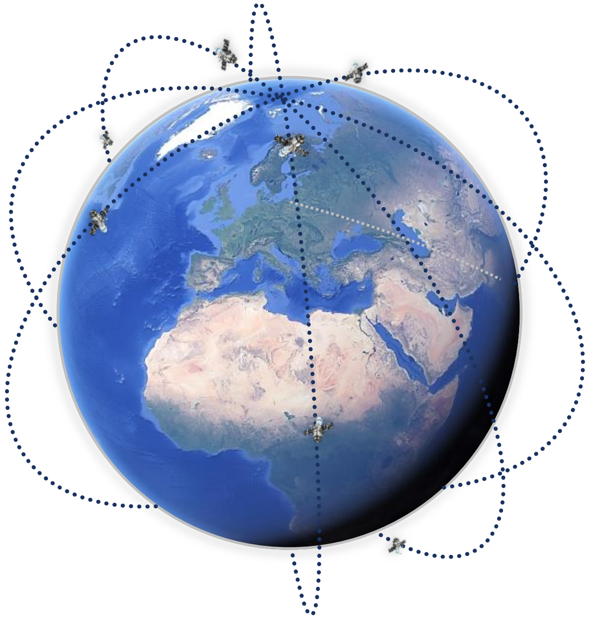
### Technical Novelty in Sharpnav's LEO-PNT

- **Autonomous clock sync:** inter-satellite disciplined oscillators, no GPS reliance → sovereign timing backbone
- **SDR payload:** on-orbit reconfigurable waveforms (L/C-band) for rapid threat response
- **AI-assisted resilience:** real-time jamming/spoofing detection and adaptive mitigation
- **Dual-signal security:** authenticated civil + encrypted military channels
- **Polar geometry:** ≥4 sats in view in Arctic, boosting accuracy & spoof detection



# WE AIM TO BUILD A SIGNIFICANT SATELLITE CONSTELLATION IN A TIGHT SCHEDULE





**Our current operations aim for an operational LEO-PNT constellation**

| | | |
|---|---|---|
| 1st phase: | Development of the dedicated LEO-PNT[1] constellation is completed by **2027** and **first satellites are launched to build initial coverage in the Nordics sufficient to pilot the constellation** | **2-6** satellites in orbit (dependant on regulation, etc.) |
| 2nd phase: | Further launches of ~45 satellites **by the end of 2028** to build operational capability in Northern Europe – **enabling commercial viability beginning with the defence sector** | **~50** satellites in orbit |
| 3rd phase: | Further launches of ~250 satellites between **2029-2030** to reach global coverage with our constellation – **enabling expansion to other sectors and consumer applications** | **~300** satellites in orbit |

**Compelling academic results with renowned technical universities**

**Leading technical knowledge in LEO-PNT constellations**

**Substantial head start compared to competitors**

www.zerogravity.fi

# ZERO GRAVITY

**Zero Gravity Therm :**

**EU 1st high-resolution Thermal Earth Observation (EO) Demonstrator**

Deck 2025

# UrbanAI Recognition

1 [illegible]

2 Winner of European & Singaporean startup Competition:

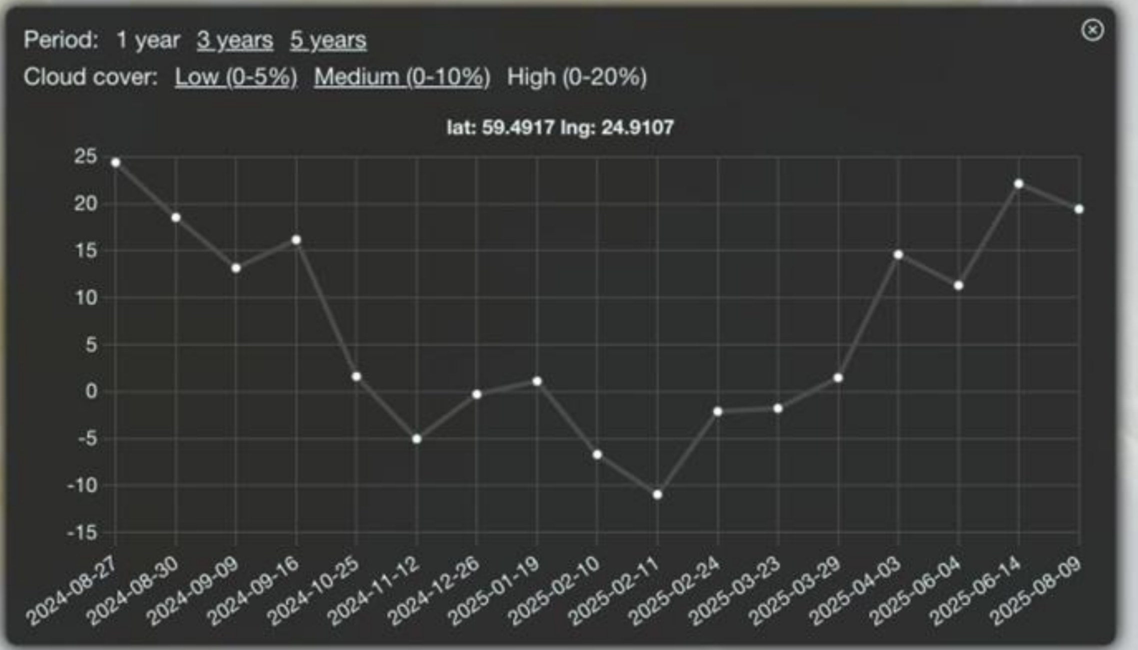
3 [illegible]

4. [illegible]

5 2018 European Space Agency Space App Camp: Top prize with “Urbansat” App

6 Junction 2017: Space Track winner with „Bioplanner“  App


# UrbanAI Layer example: Land surface temperature (sentinel 3 L)




time series over 1 year for urban temperature for selected location

User can select the area the area:
-the latest value of land surface temperature will be shown for this area:

19.43 on date 2025-08-09

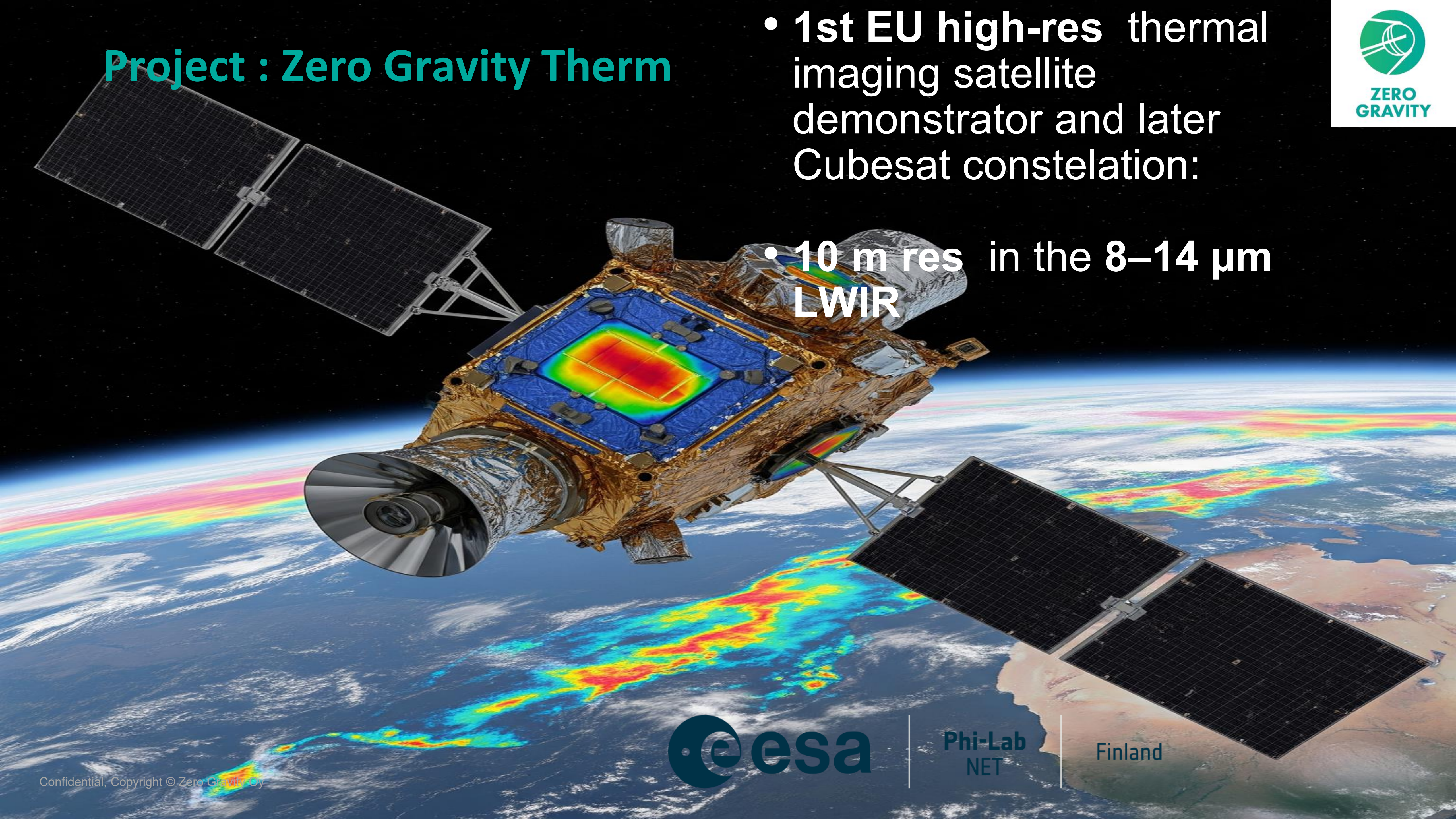
-time series over 1, 3 or 5 years for urban temperature (user can chose)

-corresponding cloud percentage: 0-5%, 0-10%, 0-20%

# Project : Zero Gravity Therm

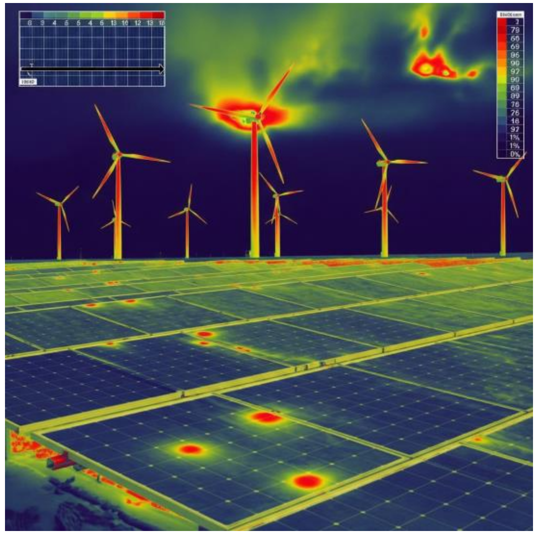
- **1st EU high-res** thermal imaging satellite demonstrator and later Cubesat constelation:

- **10 m res** in the **8–14 µm LWIR**



# 300+ Bn in assets rely on thermal intelligence

oil spills detection



solar & wind-farm maintenance

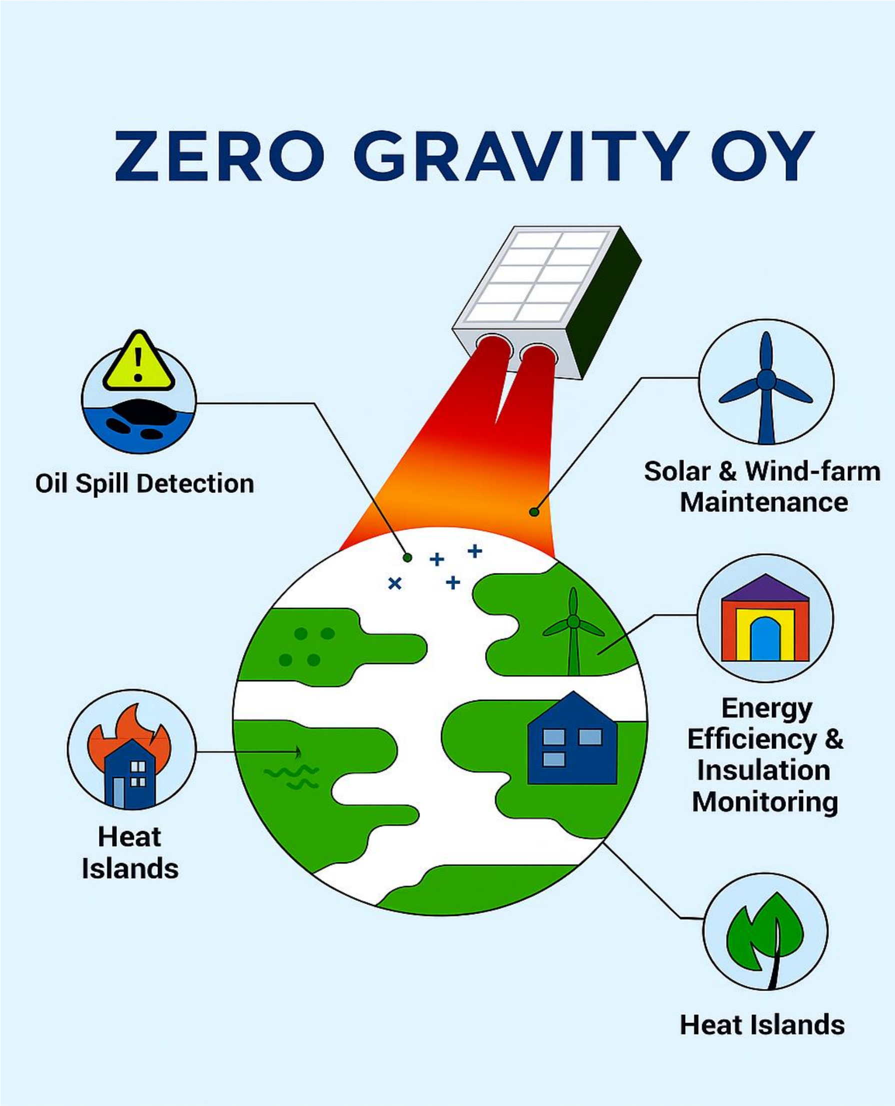
energy efficiency & insulation monitoring

Currently no reliable solutions (US-uncertainty, drones-cost/coverage)

USD 196 trillion investments in clean technologies through 2050.

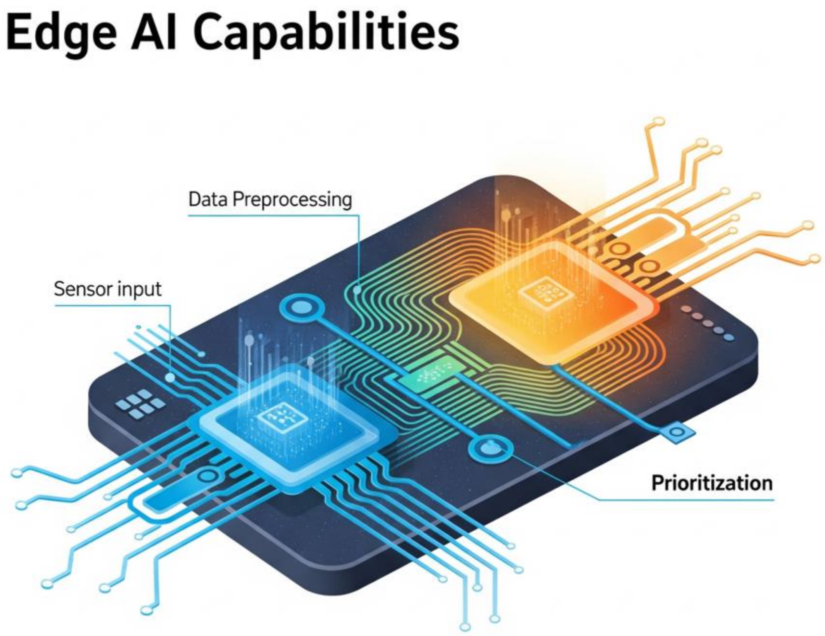
# Bridging the market gap

- Thermal EO data demand is rising globally
- Gap: No EU high-res thermal satellite capability
- EU  sovereign capability
- EO thermal imaging is transitioning from a wildfire/agriculture niche to a mainstream urban & industrial tool
- Key markets: smart cities, energy infrastructure, and environmental regulation
- Only governmental providers: Sentinel 3 LST, NASA fire sa



# Sovereign thermal overview capabilities

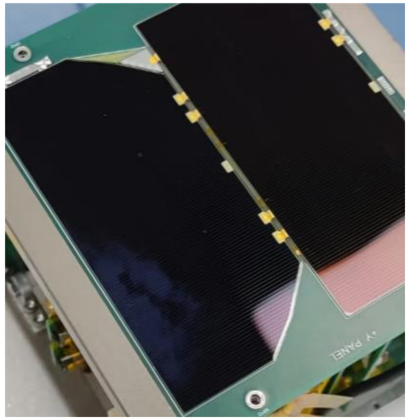
3.5-10 m miniaturized TIR satellite payload for LEO



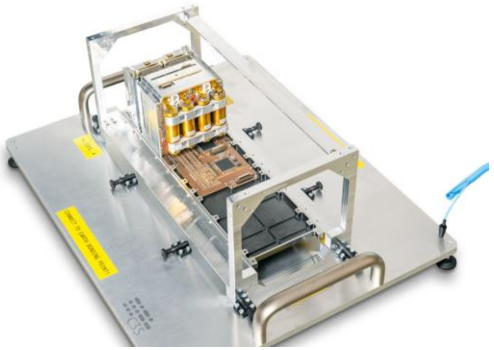

Edge AI:
-onboard anomaly detection
-data prioritization


UrbanAI SAAS integration: analytics insights on thermal EO data fusion

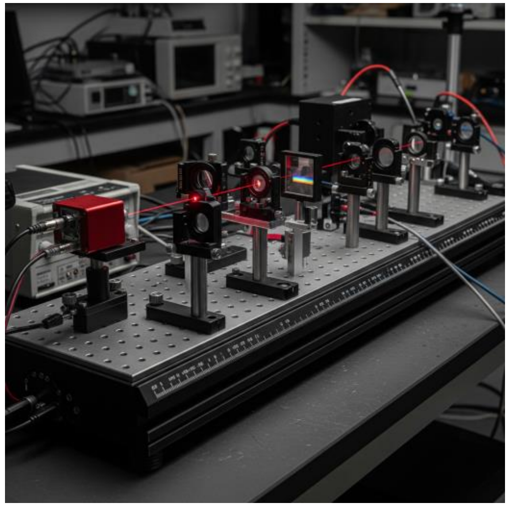
# Architecture & Payload development



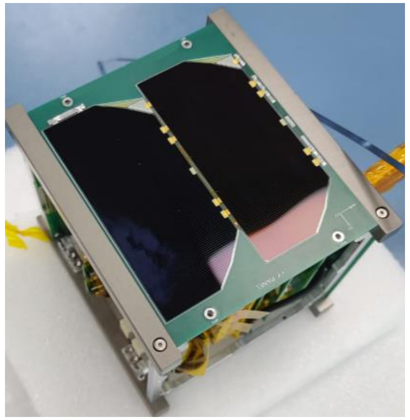
*CUBESAT PAYLOAD DESIGN WITH AALTO UNIVERSITY SMALL SATELLITE LAB*



*PROTOTYPING VIA FLAT-SATELLITE PLATFORMS*

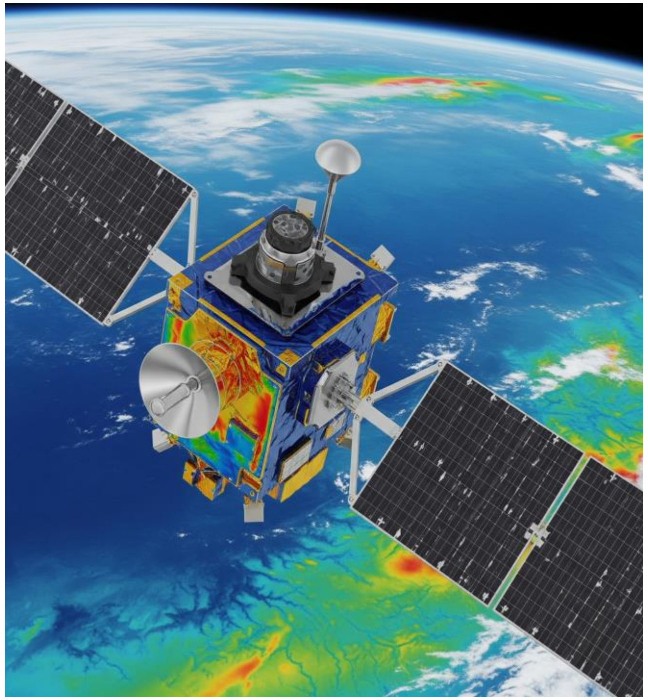


*IN-HOUSE THERMAL OPTICS AND CALIBRATION SYSTEM*



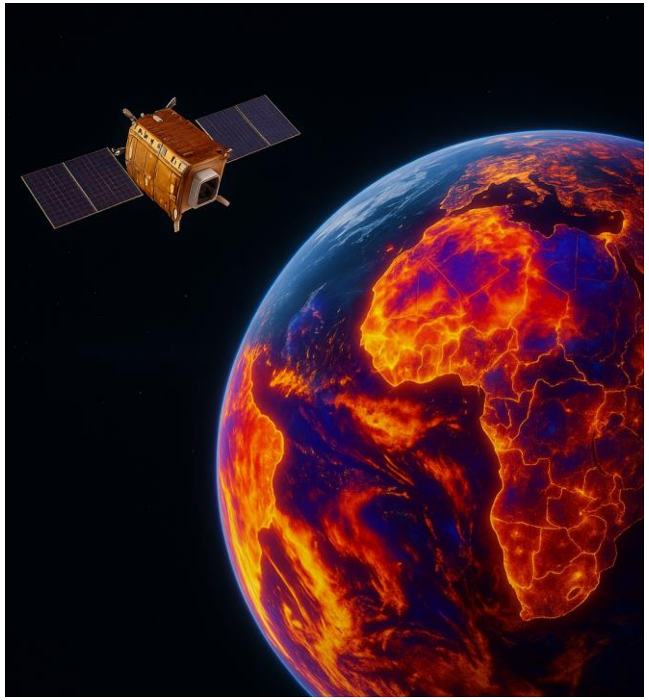
*FLIGHT-READY SENSOR ARCHITECTURE VALIDATED THROUGH AIRBORNE and space validation TESTS*

# Why Zero Gravity Therm?



**High–res TIR satellite** demonstrator **beyond the state of the art**

**establish EU leadership** in **high-res thermal intelligence**



**strategic importance** for **EU**

geopolitical uncertainty, energy transition, climate resilience

**sovereign high-res EU thermal** data

# Thank you for your attention