FINLAND

FINNISH SOLUTIONS FOR **NEW SPACE ECONOMY**

#FINLANDWORKS

Updated for 2023

FINLAND

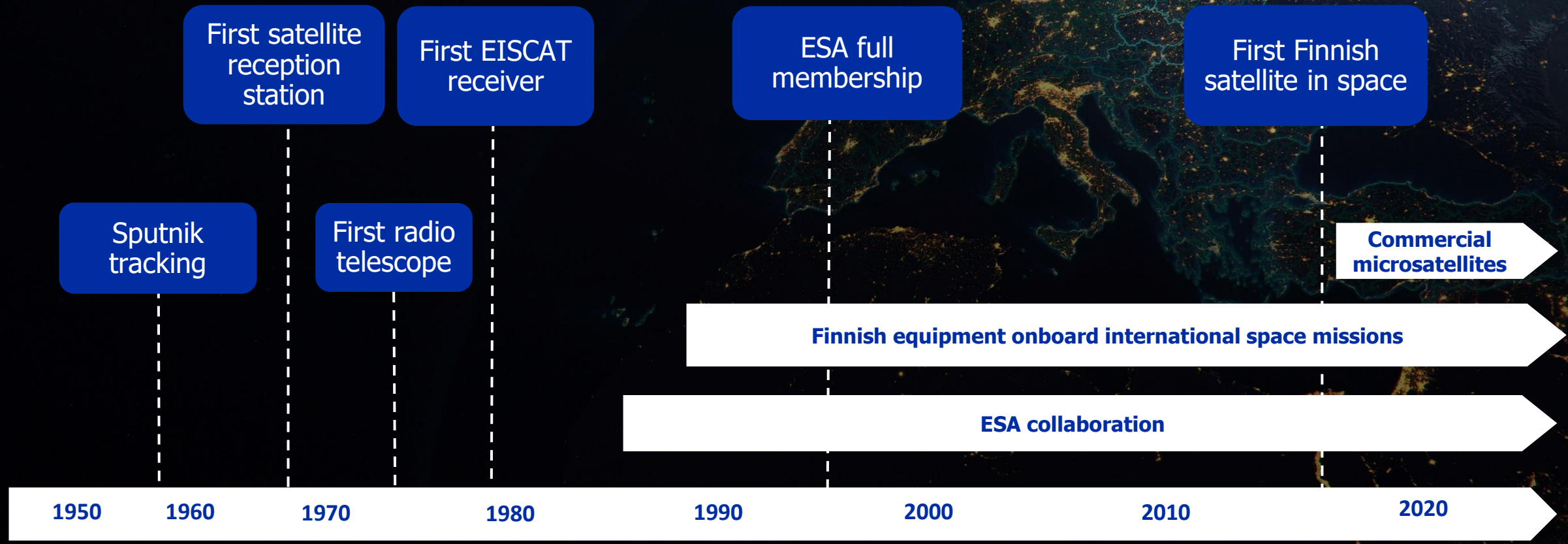
TABLE OF **CONTENTS**

WHY **FINLAND**

- World leading know-how in synthetic aperture radar, RF technology, hyperspectral imaging, pattern recognition and image analytics
- World leading know-how in surveying natural resources and environment
- Related development In Smart mobility, Mobility as a Service, Smart Logistics, autonomous vehicles and vessels
- World leading wireless technology ecosystem
- Existing high-value, high-quality and high-reliability manufacturing capabilities
- Strong AI and cybersecurity clusters
- Strong IPR-protection, stable legislation and regulation
- The most stable country in the world
- Advanced electronic components and materials cluster

FINLAND

ROOTS OF THE FINNISH **SPACE INDUSTRY**



FINLAND

STRATEGIC APPROACH **TO SPACE**

Finnish space expertise comprises cutting-edge space and atmospheric research as well as competence in electronics and software used in space components. Finnish companies and research organizations have participated in the design and preparation process for dozens of satellites, both in European Space Agency (ESA) projects and with international partners.

The Finnish Space Committee operates as an advisory board under the Ministry of Economic Affairs and Employment.

The objective of the national space strategy is to make Finland the world's most attractive and agile space business environment that benefits all companies operating here, by 2025.

See here for more information on the national space policy and objectives.

Picture: Bittium

FINLAND

FINNISH NEW **SPACE OFFERING**

SMALL SATELLITES, SATELLITE SUBSYSTEMS AND COMPONENTS

SATELLITE DATA BASED SERVICES

SOFTWARE, SECURE CONNECTIVITY

THRIVING RESEARCH AND EDUCATION

FINLAND

SMALL SATELLITES, SATELLITE **SUBSYSTEMS AND COMPONENTS**

Finland has an excellent technology base and capabilities to develop and build small satellites and satellite subsystems. Satellite companies in Finland have designed, build and launched satellites into orbit. Several other companies are developing and supplying satellite subsystems and components, ranging from electronics and radio units and software to small satellite maneuvering propulsion systems and large high-resolution optical mirrors for space telescopes.

There are comprehensive competences and testing facilities in Finland, specially in the fields of radio technology and reliability testing as well as capabilities for testing satellite equipment and electronics against radiation.

Picture: DA Group

FINLAND

SMALL SATELLITES, SATELLITE **SUBSYSTEMS AND COMPONENTS**

SMALL SATELLITES

ICEYE
SAR satellite constellation, SAR satellite data services

KUVA SPACE
Near real-time, high fidelity hyperspectral data services and analytics

rebrbit
Software-defined MEO and GEO satellites

ARCTIC ASTRO NAUTICS
Educational, sustainable and innovative CubeSats & services.

SUBSYSTEMS, SENSORS AND COMPONENTS

COMPOSITES
Solution provider for plug-and-produce automated fiber placement (AFP) systems.

Aerial
Design, production & testing of antennas.

ASRO
Instrument development for space, radiation monitoring and space debris observation.

AURORA PROPULSION TECHNOLOGIES
Scalable solutions and services for small spacecraft movement and lifecycle control.

beyond gravity
High performance in space. Precise engineering on Earth.

Bittium
Services for wireless, electronics, and mechanical design.

CoreHW
RF IC turnkey solutions, IP, and design services.

DA GROUP
RF solutions, SAR components, embedded system solutions.

Detection Technology
Application-optimized X-ray detector solutions and subsystems.

EFORIT
Electrolytic surface treatment

ELFYS
The most sensitive photodetector technology for space and satellite applications.

harp technologies
Microwave sensors and technology to detect, localize, and classify RF signals.

huld
Software, testing services and Additive Manufacturing for space.

isaware
Space Weather instruments for LEO and Deep Space missions.

KEYMET
Mechanical solutions for the aerospace industry.

mectalent
Expert services for component and equipment manufacturing.

NORTHBASE
Ground Station as a Service (GSaaS)

OPTEON
Large scale optics manufacturing and testing.

picosun AN APPLIED MATERIALS COMPANY
Atomic layer Deposition (ALD) tools for conformal metal oxide coating.

REJLERS
Ground support equipment and general tools for testing, hoisting, alignment etc

SASKEN
portable LTE based satellite terminal product family.

SCHOTT glass made of ideas
Hermetic packaging for MEMS and optoelectronics based on Glass Micro Bonding technology.

specim SPECTRAL IMAGING
A leading supplier in hyperspectral imaging.

VAISALA
Sensoring for satellite missions.

VALOE
Photovoltaic components for New Space solutions.

VTT
State-of-the-art imaging sensors, small satellite platforms, communication HW and services for satellite imagery analytics.

FINLAND

SATELLITE DATA-BASED SERVICES

Satellite data-based services give businesses new opportunities to benefit from space infrastructure. Combining satellite data with analytics and artificial intelligence creates new customer value and productivity. Finnish knowhow specially in geo sciences and analytics have catalyzed the foundation of several service companies which operate e.g. in the fields of forestry , agriculture, smart cities, maritime services and satellite image analysis. International PECASUS space weather center is also located in Finland.

Picture: ICEYE

SATELLITE DATA-BASED SERVICES

AIRBUS

Satellite imagery and related services, combining radar and optical satellites. Open digital platform and marketplace for earth data, satellite navigation services.

ICEYE

SAR satellite constellation, SAR satellite data services

GISPO

Location intelligence solutions and data analytics.

ROGER GPS repeater

GNSS signal reception or time synchronization.

Terramonitor

Cloud-free mapping and analyzing platform for satellite images.

arbonaut

Mobile client for cloud-based geospatial information platform for project management.

isaware

Space Weather instruments for LEO and Deep Space missions.

huld

Data processing and analytics.

septentrio

Multi-frequency multi-constellation GPS/GNSS positioning technology.

VTT

Sensor data fusion and data analytics with artifical intelligence (AI) and machine learning (ML) algorithms.

BITCOMP

Smartest Forest Solutions on the Planet.

NSION TECHNOLOGIES

Situational awareness services combining SAR data with local data sources.

Indufor

Continuous Forest and Landscape Monitoring.

SKYFORA

Artificial intelligence, space data and ultralight instruments for high-performance weather forecasting.

WÄRTSILÄ

SHIP Traffic Control utilizes satellite data for a coordinated, global approach to maritime traffic control, monitoring and decision support.

COLLECTIVE CRUNCH

Using climate, geo and process data for forest predictive inventories and forest management.

ILMATIETEEN LAITOS

Auroral monitoring with the all-sky cameras and magnetic field alarm systems for Northern and Southern Finland separately.

MARSHALL AI

No-code tools for automating your needs from satellite imagery

Spatineo

geospatial APIs, scalable infrastructures for data sharing, and usage of satellite data

ZERO GRAVITY

Next generation software for smart cities and the smart mobility applications utilizing satellite imagery data.

exafore

Location-based service development.

GIM ROBOTICS

Mobile machines' localisation, mapping and situational awareness with advanced algorithms and sensor fusion.

Reaktor

Data analytics, machine learning systems.

YIELD SYSTEMS

Development of machine learning solutions for agri-food value chain enhancement and video intelligence.

SOFTWARE

The Finnish companies have strong capabilities e.g. in highly reliable embedded SW development, Human Machine Interface (HMI), communication protocols and imaging SW development. Also analytics is widely applied in different applications and services. One of the most widely used operating systems, Linux, was originally developed in Finland.

Finnish research in neural networks and pattern recognition started already in the 80’s, which has led to high-level research of machine learning and AI in several universities and research centers in the country. The level of university education in computer science and AI is high.

Picture: Bittium

SOFTWARE, **SECURE CONNECTIVITY**

SOFTWARE

Aplicom

Telematics solutions including tracking of vehicles usage, vehicle positioning and employee/driver identification.

Fairspectrum

Dynamic spectrum access software and services.

MELUTA

Design, plan, and implement signal processing software, and algorithms for commercially available systems.

SILO AI

Trusted AI partner for AI-driven solutions & products.

awake.ai

Optimisation platform for port bound cargo flow.

huld

Software for satellites, instruments and ground segment.

Netradar

Collect network performance data directly from mobile handsets.

Spatineo

High-level data analytics and data science services.

CGI

Specialists in space security and ground control systems.

INSTA

We safeguard our customers' future.

Qt The Qt Company

Cross-platform software framework for the development of apps and devices.

VTT

Satellite constellation design and optimization.

isaware

Advanced data analytics, data-based decision-making support.

Reaktor

Software design & services.

SECURE CONNECTIVITY

Bittium

Software and systems engineering, Secure connectivity: Secure wireless communications, cyber security.

Missing-Link Wireless Security Solutions

Real-time local monitoring of wireless networks.

ekahau WIRELESS DESIGN

Ekahau designs and manufactures wireless location technology.

NOKIA

Secure communication networks

huld

Systems engineering, software development, data processing and cyber security protection for ground and space segment.

SSH

Software solutions for privileged access, secure file transfers, SSH key management, quantum-safe & more.

MAGISTER SOLUTIONS

Simulation enabled R&D for optimized secure connectivity

XRTC.ORG

POINTR an Augmented Reality based remote collaboration solution for industry and professionals.

OTHER SPACE-RELATED **SERVICES**

TESTING AND SPACE-RELATED SERVICES

UNIVERSITY OF JYVÄSKYLÄ
JYVÄSKYLÄN YLIOPISTO

The Accelerator Laboratory of the University of Jyväskylä's Physics Department hosts the Radiation Effects Facility (RADEF), one of only a few such radiation effects facilities in the world.

CoreHW

RF IC, mm-Wave, Analog, Mixed Signal, Digital, Antenna, Application, and System design.

exafore

Development of GPS/GNSS receivers and other positioning technologies.

REJLERS

Mechanical Ground Support Equipment

COLLECTIVE CRUNCH

Accurate predictions and inventories of forest resources based on sophisticated machine learning models.

Etteplan

EMC, simulation and mechanical testing services.

FIBROBOTICS

Material characterization.

SOLAR FOODS

Use electricity to grow microbial biomass that can be used as edible protein.

Netradar
Mobile Analytics

Network and satellite connectivity monitoring service for telecom operators.

Verkotan

Tailored antenna and radio frequency test solutions.

TRAINING

ARCTIC ASTRO NAUTICS

A fully functional satellite designed for schools, science centers and other space-related educational organizations.

VARJO

VR/XR Training technology provider.

VTT

Solutions for integrating communication technologies in space with terrestrial networks.

FINLAND

FINNISH SUCCESS STORIES

FINNISH SUCCESS STORY

PECASUS SPACE WEATHER SERVICE

- The PECASUS Consortium provides a global aviation space weather service for ICAO. This service is based on seamless and committed collaboration by institutes in ten ICAO member states possessing leading expertise in the space weather impact domains of ICAO's primary interest. PECASUS Consortium is led by the Finnish Meteorological Institute.
- Finnish Meteorological Institute (FMI) has been operating the national 24/7 space weather service since 2014.
- The space weather service monitors Space Weather conditions through ground-based and space-based observational systems and provides analysis and prediction through data fusion and modelling. In cases of extreme activity, the SWX service provides alerts for Governmental and Security Authorities, being part of the national early warning and information system on natural hazards (LUOVA).
- FMI also provides services to the Expert Service Centres (ESC) on Geomagnetic Activity and Ionospheric Weather operating in the ESA Space Safety programme.

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

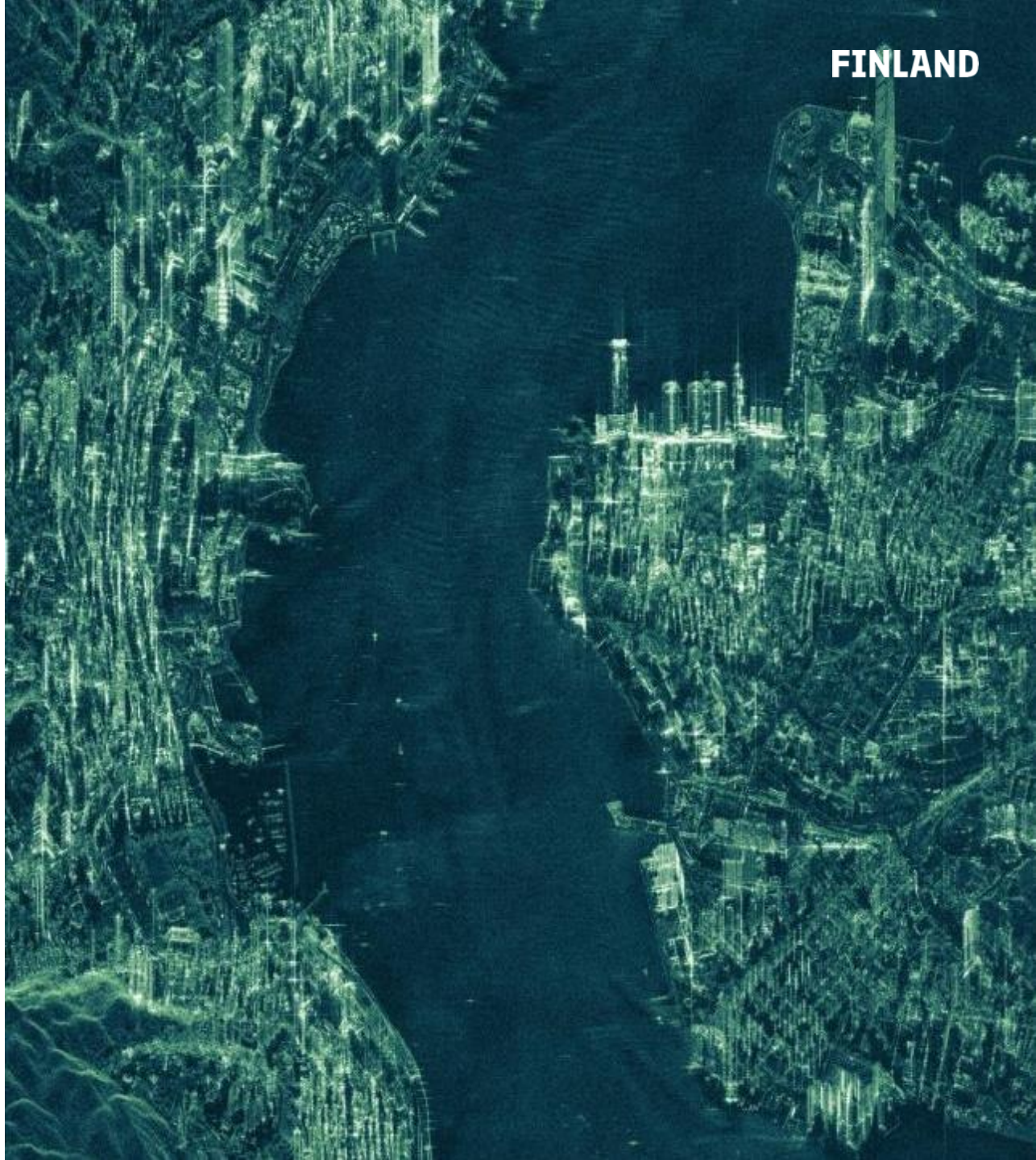
Picture: FMI

FINNISH SUCCESS STORY

EVERY SQUARE METER, EVERY HOUR

- ICEYE is building and operating its own commercial constellation of radar imaging satellites, with SAR data available to global customers since 2018. ICEYE empowers others to make better decisions in governmental and commercial industries.
- ICEYE satellite constellation enables very frequent global coverage, both day and night and helps clients resolve challenges in sectors such as maritime, disaster management, insurance, and finance.

ICEYE



FINNISH SUCCESS STORY

TO THE MOON!

- Nokia Bell Labs' pioneering innovations will be used to build and deploy the first ultra-compact, low-power, space-hardened, end-to-end LTE solution on the lunar surface in 2023. Nokia is partnering with Intuitive Machines for this mission to integrate this groundbreaking network into their lunar lander and deliver it to the lunar surface. The network will self-configure upon deployment and establish the first LTE communications system on the Moon.
- The network will provide critical communication capabilities for many different data transmission applications, including vital command and control functions, remote control of lunar rovers, real-time navigation and streaming of high-definition video. These communication applications are all vital to long-term human presence on the lunar surface.

NOKIA

FINNISH SUCCESS STORY

BOUND FOR MARS

- Building on over 80 years of experience, Vaisala provides observations for a better world, with space-proof measurement technology exploring also Mars, and beyond.
- NASA's Curiosity and Perseverance Mars Rovers are equipped with Vaisala's humidity and pressure sensors. The unforgiving conditions in space pose strict demands on technology, requiring the most reliable sensors that can be trusted to endure without repair.
- The same in-house developed technology is used in numerous industrial and environmental applications on Earth.

VAISALA

FINNISH SUCCESS STORY

A NEW ERA IN TRAINING WITH VIRTUAL REALITY

- With Varjo, the Boeing Starliner program unlocks an entirely new way for astronauts to prepare for spaceflight. Varjo allows astronaut training – from pre-launch to docking to landing – entirely in VR for the first time.

THRIVING RESEARCH AND EDUCATION

THRIVING **RESEARCH AND EDUCATION**

Finnish universities and research institutes have a long tradition in space research and in the development of scientific instruments for space missions. Focus areas include astronomy and astrophysics as well as measurements of the gas sphere of the planets, air pollution, carbon cycle, water cycle, ozone and UV-radiation research, earth science, physics of aurora borealis zone, cosmology, and space weather.

Finnish instruments have been on board around 70 space missions during the past decades. There are currently close to 20 missions under planning which potentially carry Finnish space technology on board.

Finnish universities give high level education in engineering and natural sciences. Aalto university has also initiated education in small satellite technologies and design. University research and education have catalyzed the founding of many start-ups and feed a vibrant ecosystem.

FINLAND

WORLD CLASS
SPACE RESEARCH

- SATELLITE TECHNOLOGY
- MAGNETIC MEASUREMENTS
- AURORA BOREALIS
- MICROWAVE REMOTE SENSING
- MICRO SATELLITES
- HYPERSPECTRAL IMAGING
- ASTRONOMY
- ARCTIC IONOSPHERIC OBSERVATIONS
- SUSTAINABLE SPACE
- SPACE WEATHER

Aalto University

ILMATIETEEN LAITOS

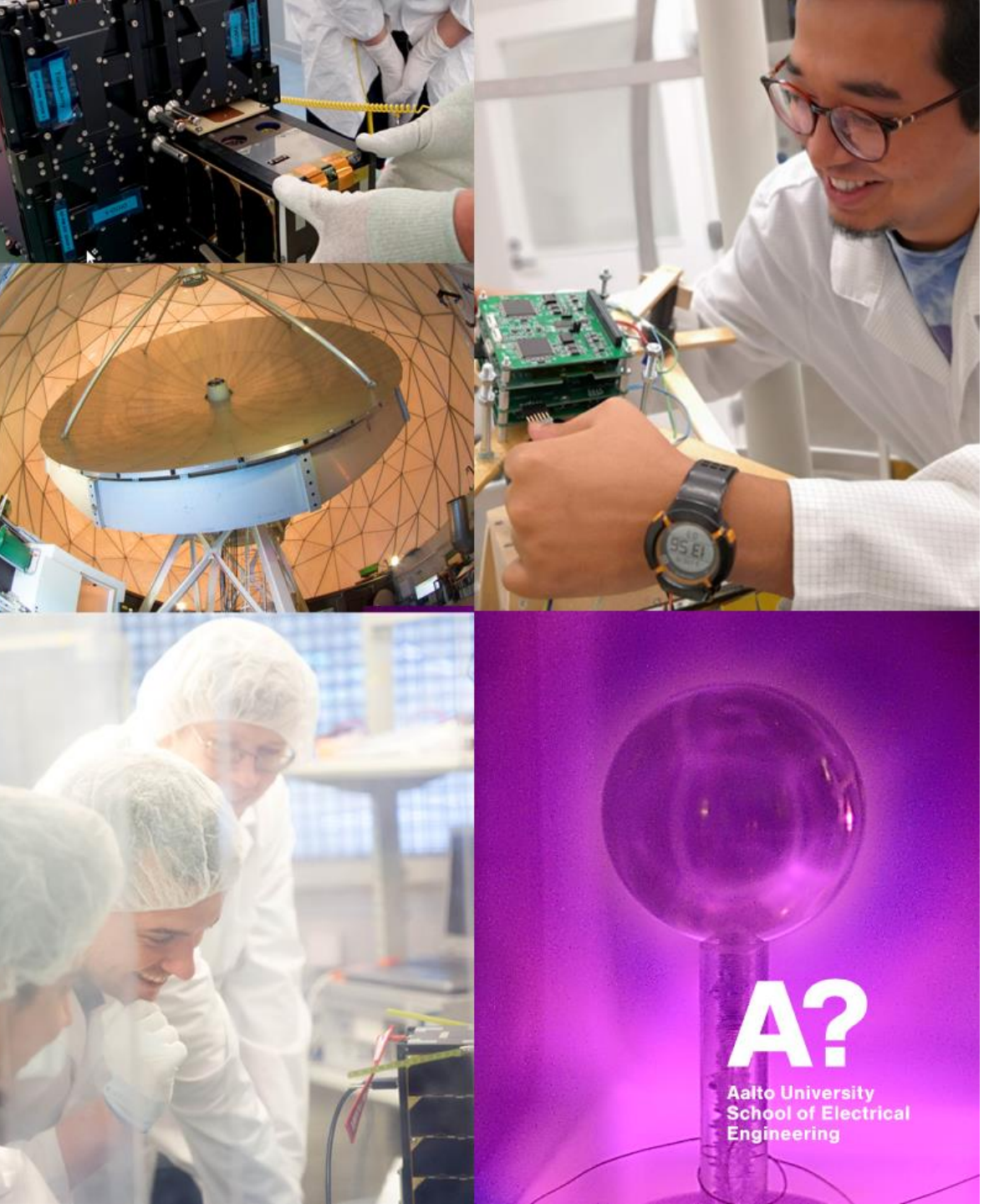
HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

NLS
FINNISH GEOSPATIAL RESEARCH INSTITUTE
FGI

UNIVERSITY OF OULU

UNIVERSITY OF TURKU

FINLAND



AALTO UNIVERSITY

EDUCATION
Aalto University is the biggest technical university in Finland and the only one in which the curriculum includes space science and technology. The Aalto space curriculum covers space science, space technology, remote sensing and radio astronomy in the Space Science and Technology major. Aalto is a member of international SpaceMaster programme and Nordic Master in Cold Climate Engineering Space Track.

SATELLITE MISSIONS
Aalto is the leading university in Finland in small satellite and space mission development. Aalto has already launched and operated three CubeSat missions, Aalto-1, Aalto-2 and Suomi 100, and is currently involved in development of many new satellite missions. Aalto space technology team is developing satellites also in the framework of Finnish Centre of Excellence in Research of Sustainable Space. Aalto participates in many ESA and NASA missions with science and instruments.

FACILITIES
Aalto University operates modern well equipped small satellite development facility and many science labs. Aalto University Metsähovi Radio Observatory has the only astronomical radio telescope in Finland. Aalto and VTT are partners in MilliLab, which is ESA external laboratory on millimeter wave technology, and Micronova, the biggest cleanroom facility and nanotechnology development environment. Aalto is also providing acceleration to it's many startups and operates ESA Business Incubation Centre Finland. Otaniemi campus is the fastest growing space technology hub in Finland.

RESEARCH
Aalto University has many research teams covering topics like space science and planetary environments, radio astronomy, very long baseline interferometry, astroinformatics, small satellite technology, microwave remote sensing, sustainable space, space sensors, CubeSat technology, mission design and systems engineering, materials for space applications, environmental testing and many others.

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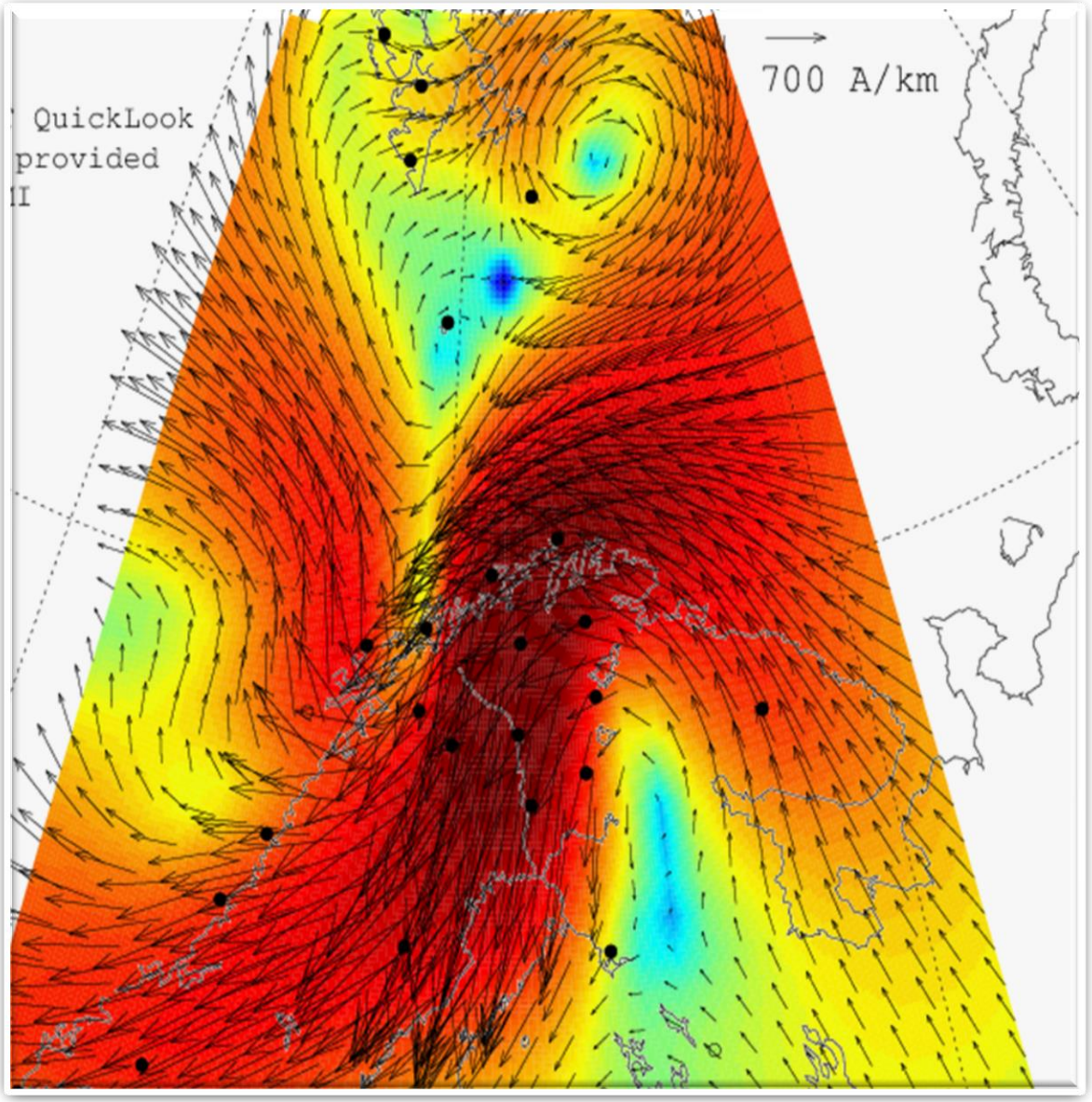
Aalto University



Space weather services can be obtained also through ground-based measurements. The pictures show reconstructions of electron density and ionospheric currents in the ionosphere. These analyses enable to estimate the quality of over-the-horizon HF-communication as well as harmful geomagnetically induced currents in power networks.

FINLAND

FOR THE SAFETY AND SMOOTH OPERATION OF THE SOCIETY

SERVICES

Finnish Meteorological Institute (FMI) investigates and monitors the atmosphere, marine, cryospheric and space environment to provide high-quality weather, marine and climate services and space situational awareness for societal decision-making. This is based on extensive observational and research activity on meteorology, Earth observation and space science. The international dimension is closely linked to all of FMI operations. The operational Earth Observation (EO) satellites and most importantly EU's Copernicus Sentinel satellites enable creating services that depend on the EO data. Moreover, extending and complementing this with global EO infrastructure will open new markets for commercial New Space sector.

Today a new challenge in the field of research of solar-terrestrial physics is to understand and predict the impacts of space weather. This involves studies on the dynamic space environment, influenced by conditions on the Sun, and its potentially hazardous effects on technical and biological systems, both in space and on ground. FMI is playing a crucial role in the establishment of European space weather activities.

Finnish Meteorological Institute is also developing scientific instruments for space probes. Versatile scientific payloads including plasma spectrometers and planetary atmospheric instruments designed at FMI have travelled to Mars, Venus, Saturn and other solar system bodies onboard numerous American and European spacecraft. We consider that new knowledge on planetary environments will also enhance our understanding of the Earth.

ORGANIZATION

The Finnish Meteorological Institute produces societal services on weather, climate and space weather for the needs of public safety, business activities and citizens. FMI is an administrative branch of the Ministry of Transport and Communications.

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ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

FINLAND

GEOSPATIAL SCIENCE AND SOLUTIONS FOR SOCIETY

Finnish Geospatial Research Institute (FGI) of the National Land Survey of Finland conducts innovative research and expert work within the field of spatial data and offers reliable information for the benefit of society. Space technology is an integral part in all our research.

REMOTE SENSING AND DRONES. We are global forerunners in developing and integrating laser, hyperspectral, and photogrammetric technologies and GNSS-positioning in drones and other platform e.g. backpacks and autonomous cars. We integrate in-situ data with space data and develop AI based analytics solutions. We coordinated the Academy of Finland Center of Excellence in Laser Scanning Research.

NAVIGATION AND POSITIONING. The use of GNSS and EGNSS for positioning, navigation, and timing belongs to our core expertise. We develop solutions for both high-precision applications, resilience of GNSS to jamming and interference, as well as hybrid solutions for improved positioning and situational awareness. We utilize the data from the national GNSS reference station network FinnRef and the positioning service based on it.

S**PACE GEODESY.** Metsähovi geodetic research station is part of the global network of geodetic core stations within the Global Geodetic Observing System. Together with FinnRef, Metsähovi is used in maintaining global terrestrial and celestial reference frames, computation of satellite orbits, geophysical studies, global change studies, and linking national and global reference frames.

FLAGSHIP UNITE. We are part of the Academy of Finland Flagship UNITE Forest-Human-Machine Interplay – Building Resilience, Redefining Value Networks and Enabling Meaningful Experience. In UNITE we will create new technology breakthroughs, holistic solutions, and great societal impacts for sustainable forest management.

LOCATION INNOVATION HUB. FGI coordinates the Location Innovation Hub (LIH), one of the European Digital Innovation Hubs selected by the European Commission. The LIH will unleash the vast potential of location, services and technology to improve our society. The world-leading competence centre is targeting value chains of the built environment, bioeconomy (agri-food, forestry), transportation and health & wellbeing.

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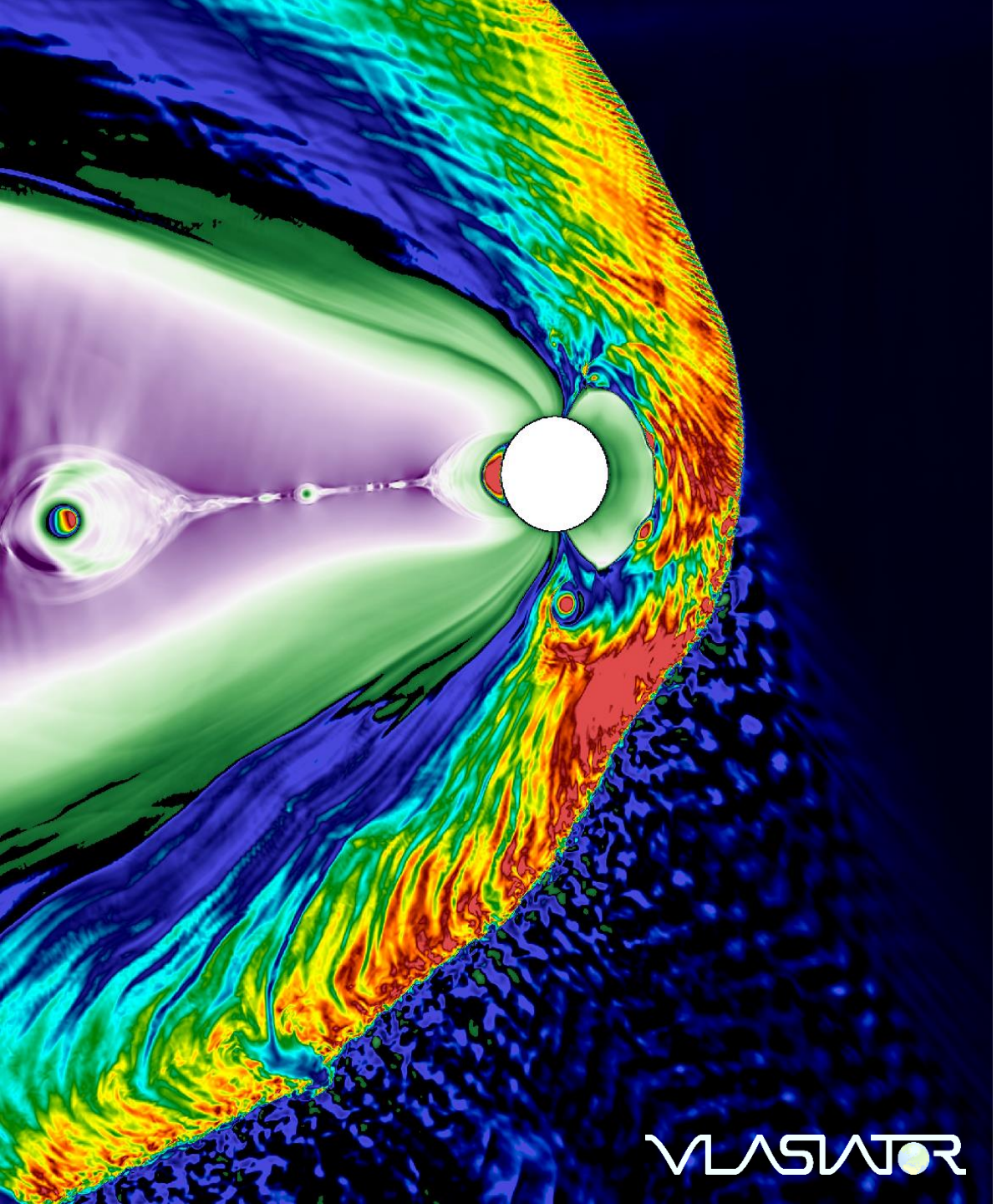
NLS FINNISH GEOSPATIAL RESEARCH INSTITUTE FGI

UNITE



FINLAND

UNIVERSITY OF HELSINKI

SPACE PHYSICS AT THE UNIVERSITY OF HELSINKI

The Space Physics Group at the University of Helsinki is a leading European research group specialised in modelling, observations, and theoretical analysis of space plasmas. We aim at a profound understanding of the physics behind space weather phenomena and at using this knowledge to develop services for society. We are the lead institute for the Finnish Centre of Excellence in Research of Sustainable Space, and have several active national and international research grants, including an European Research Council (ERC) project and several Horizon 2020 projects.

VLASIATOR (HELSINKI.FI/VLASIATOR)

Vlasiator is the world's most accurate space environment simulation developed with two past ERC projects and several Academy of Finland projects. Numerical simulations are key in modern space physics, as they can be used to 1) provide context to data, 2) predict future behaviour of the system, 3) understand the system using unforeseen boundary conditions, and 4) discover new phenomena.

SUN AND SOLAR WIND

The UH team develops advanced models for simulating solar eruptions, coronal and heliospheric dynamics and interpreting and analysing a wide range of remote-sensing and in-situ observations of the Sun and solar wind, including the latest spacecraft and radio observations. These efforts lead to better understanding of solar eruptions and estimating their space weather response.

THEORETICAL ANALYSIS:

High-resolution measurements of the Earth's radiation belts enable probing the validity of long-held radiation models. The UH team combines theoretical models and information-theoretic data analysis to quantify the evolution and energisation of electrons up to relativistic energies. Our results are relevant to satellite and communication systems exposed to threatening radiation levels.

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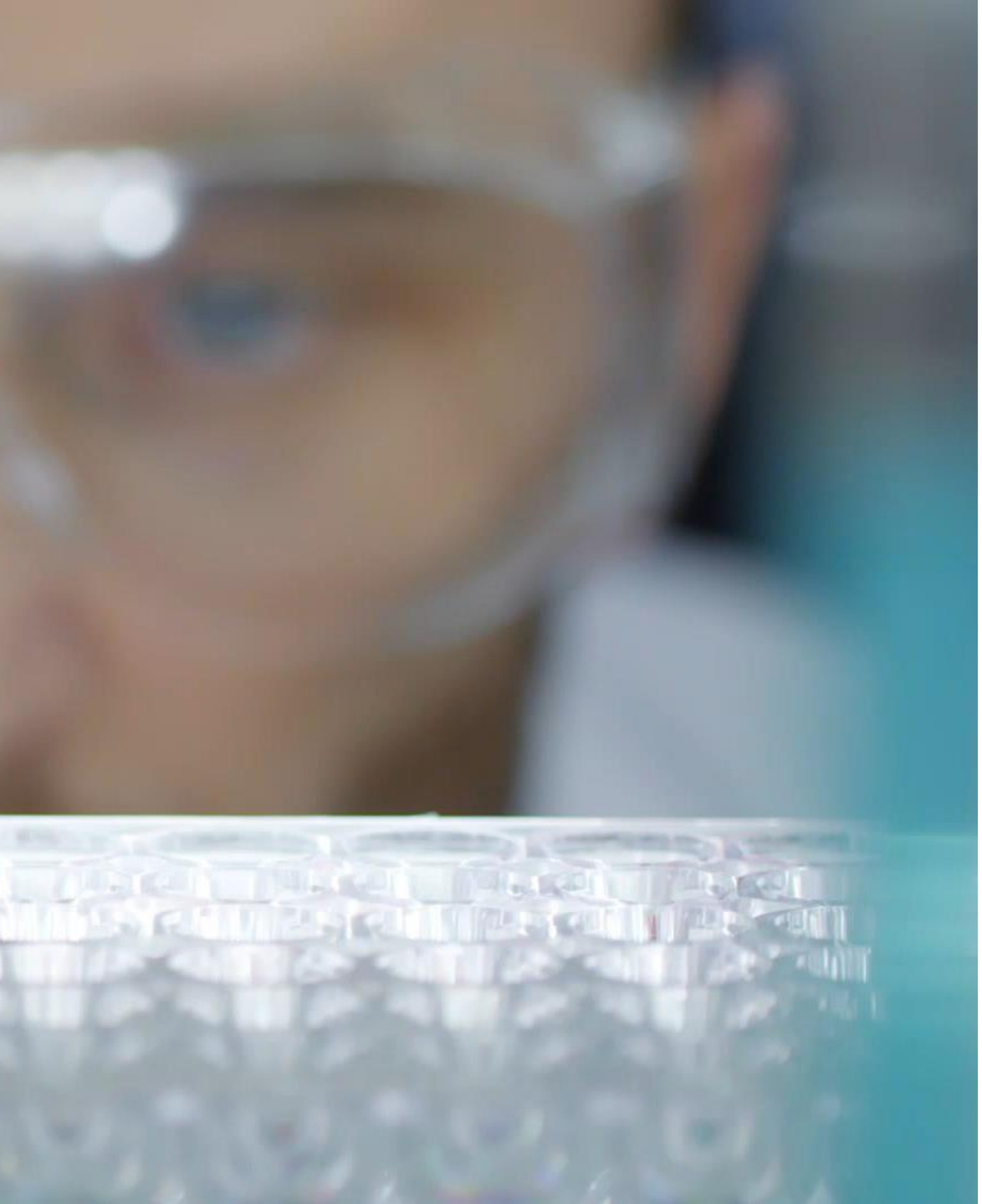
UNIVERSITY OF HELSINKI
FACULTY OF SCIENCE



FINLAND

LUT UNIVERSITY SPACE TECHNOLOGY

WATER, AIR & ENERGY

Everything else can be grown or synthesized.

Bioastronautics & resources – sustaining human life in space is our focus of space technology.

Sustaining human life in space requires a multidisciplinary approach and brings together multiple engineering fields, natural sciences, life sciences and social sciences.

We design habitats and contribute to the sustainable utilization of resources.

Janne Hokkanen, Strategy Director
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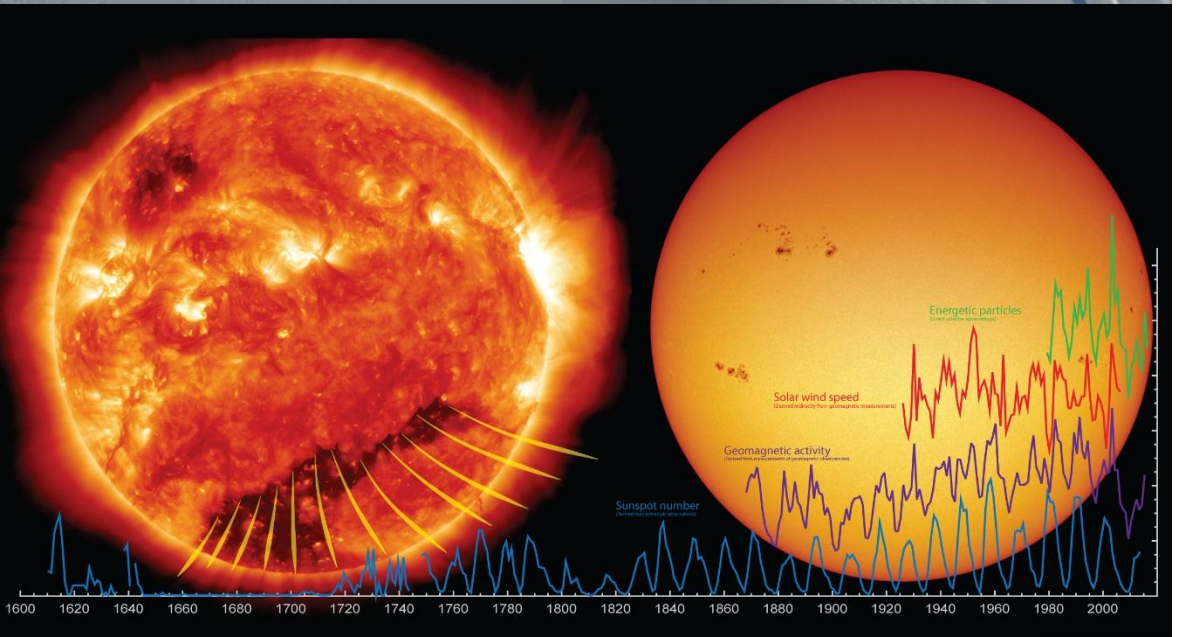
LUT University

EISCAT Svalbard radars



FINLAND

WORLD-CLASS IONO-SPHERIC, SPACE PHYSICS AND ASTRONOMY RESEARCH

SOLAR VARIABILITY AND HAZARDS INDUCED BY SOLAR STORMS

The Sun exhibits long-term (Space Climate) and short-term (Space Weather) variations. We study space weather and the occurrence, predictability, and effects of extreme solar events, including radiation storms, on the geospace. We are the leading experts in space climate research (ReSoLVE CoE) and investigate the connection between space climate and Earth's climate.

EARTH'S IONOSPHERIC DISTURBANCES

The upper ionized part of the atmosphere, the ionosphere (80-1000 km altitudes) at high latitudes is a window to the space. We study Space Weather events in the ionosphere, e.g. electron density variations and electrical currents in the ionosphere as well as currents that are induced to the ground during geomagnetic storms. We utilize measurements from incoherent scatter radars (international EISCAT facility), magnetometers, and optical instruments, both ground-based and satellite-borne.

ASTRONOMY RESEARCH

Extragalactic astronomy uses telescopes of ESO facilities. Solar system research utilizes CASSINI spacecraft measurements, and is involved in several ESA (JUICE mission) and NASA missions.

METHODS AND MODELS

- We develop world-leading methods for pulsed radar measurements to study the ionosphere.
- We perform reference monitoring of cosmic-ray variability using neutron monitors in Finland and Antarctica as well as at ISS for the Space Situational Awareness Program by ESA.
- We provide a world-leading quantitative model of cosmic-ray induced effects in the atmosphere (ionization, radiation doses, climate response).
- We develop methods to identify structures in solar maps of magnetic field and EUV activity.
- We develop software for data analysis of the Euclid space telescope.

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UNIVERSITY OF OULU

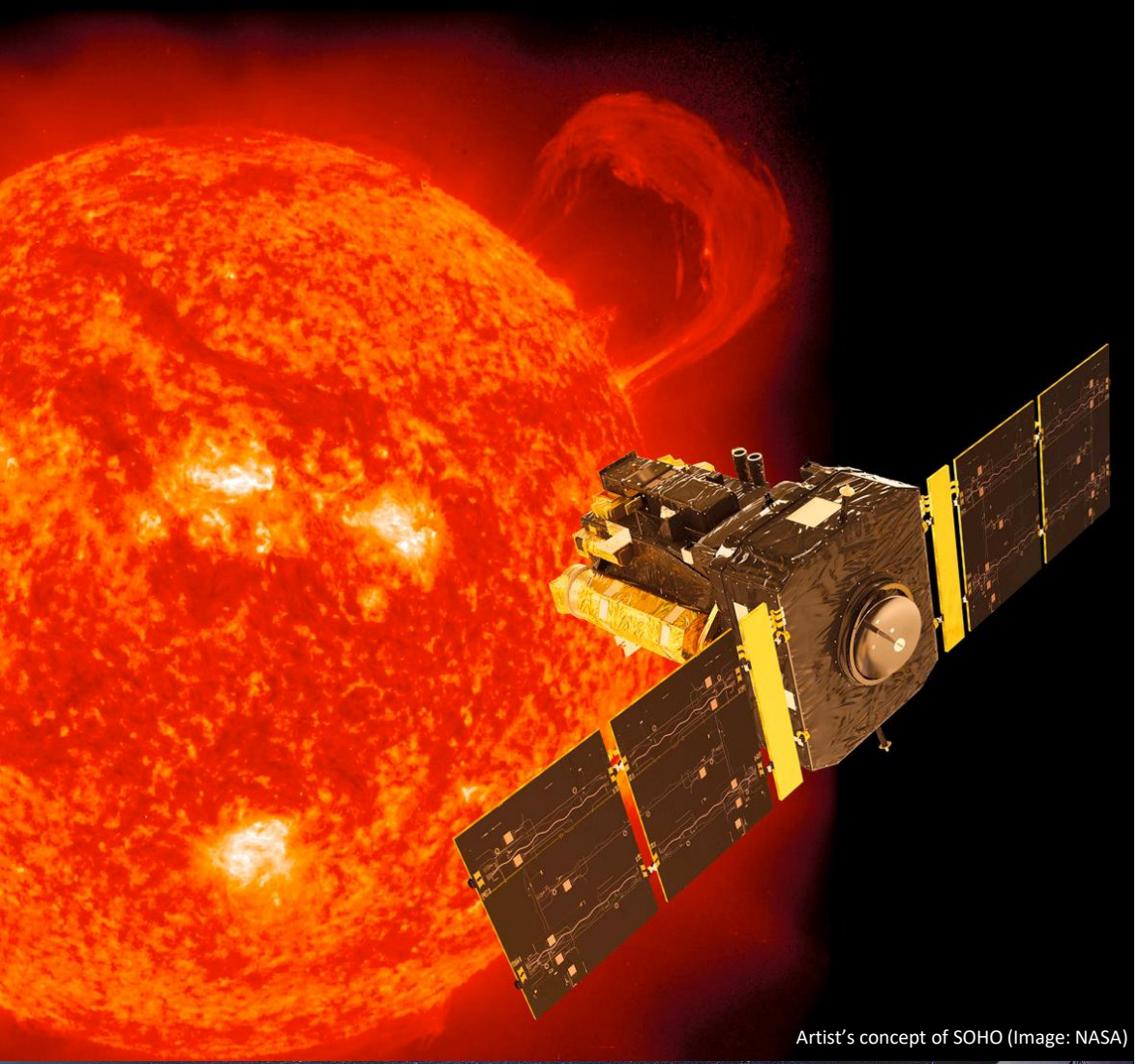
Artist's concept of SOHO (Image: NASA)


Image: ESO

FINLAND

SPACE RESEARCH AND ASTRONOMY

DEPARTMENT OF PHYSICS AND ASTRONOMY (DPA)

SPACE RESEARCH LABORATORY (SRL) in University of Turku was founded in the end of 1980's and is one of the seven laboratories of DPA. The objectives of the laboratory are to explore space physics, particularly solar and heliospheric physics related to energetic particles, and to develop instrumentation for the research. The first spacecraft instrument built and operated by SRL was the ERNE instrument aboard Solar and Heliospheric Observatory (SOHO), launched in December 1995 and still taking measurements in the solar wind. SRL is also involved in the Solar Orbiter and BepiColombo missions.

SRL is part of the Finnish Centre of Excellence in Research of Sustainable Space (FORESAIL, 2018-2025) funded by the Academy of Finland, where its main responsibility is to develop new instruments for detecting space radiation aboard CubeSats. It is also one of the Expert Groups of ESA's Space Radiation Expert Service Centre, where it develops empirical data-driven models for predicting space radiation conditions.

TUORLA OBSERVATORY conducts research on astronomy concentrating on high-energy astrophysics of accreting neutron stars and black holes, and research of extragalactic astrophysical transients, such as supernovae and tidal disruption events.

FINNISH CENTRE FOR ASTRONOMY WITH ESO (FINCA)

FINCA has a national mandate to practise and promote high quality research in astronomy, and European Southern Observatory (ESO) related technological development work. The research of its staff is focused on extragalactic astrophysics and in particular active galaxies.

Together Tuorla Observatory and FINCA are involved in the development of astronomical instrumentation: MICADO diffraction limited imager and spectrograph for the ESO Extremely Large Telescope (ELT), SOXS spectrograph for ESO/NTT and NTE spectrograph and imager for the University of Turku owned Nordic Optical Telescope (NOT). Members of the Observatory have also designed and built high-precision optical polarimeters DIPol-2 and DIPol-UF.

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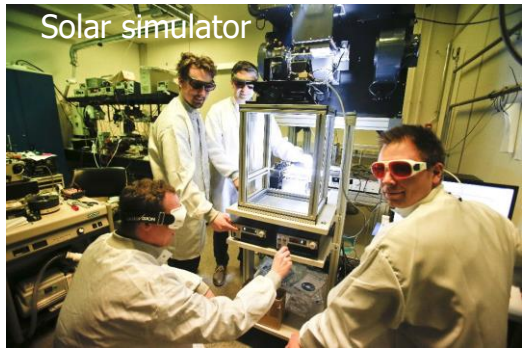
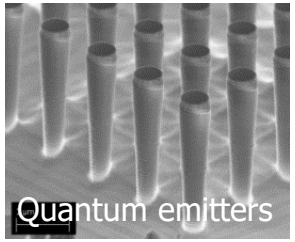
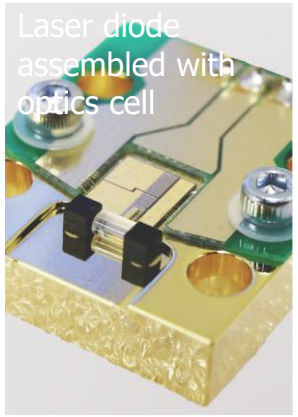
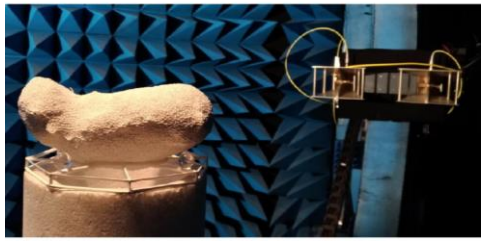
https://www.utu.fi/en/university/faculty-of-science/physics-and-astronomy

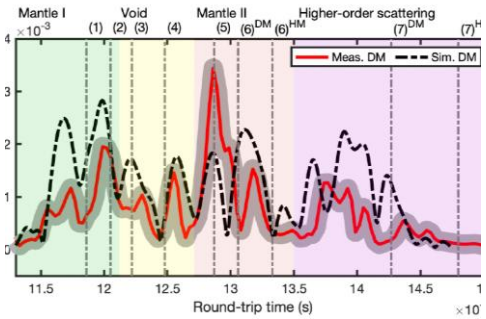
UNIVERSITY OF TURKU

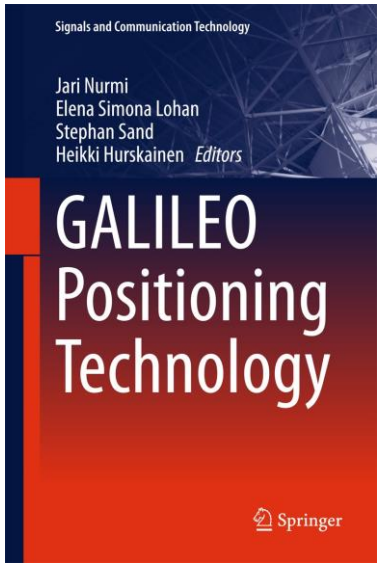












TAMPERE UNIVERSITY

FINLAND

EDUCATION

Tampere University is the second largest multidisciplinary university in Finland educating 25% of all engineers graduating yearly. Our educational curriculum has several STEM courses addressing skillsets for space economy business, covering new hardware sub-systems, communication, and navigation aspects. Tampere University is also operating in large scale European networks ensuring a multidisciplinary education.

RESEARCH

Tampere is a leading European R&D hub in several areas of high relevance for space economy. Tampere University is leading major R&D activities concerning photonics technology, signal processing, inverse problems and imaging processing, and free-space communication, providing a unique and rich environment for industrial interaction. We have a long-lasting collaboration history with leading space organization, including ESA and NASA, and active research programs that are topical for the space economy, which include:

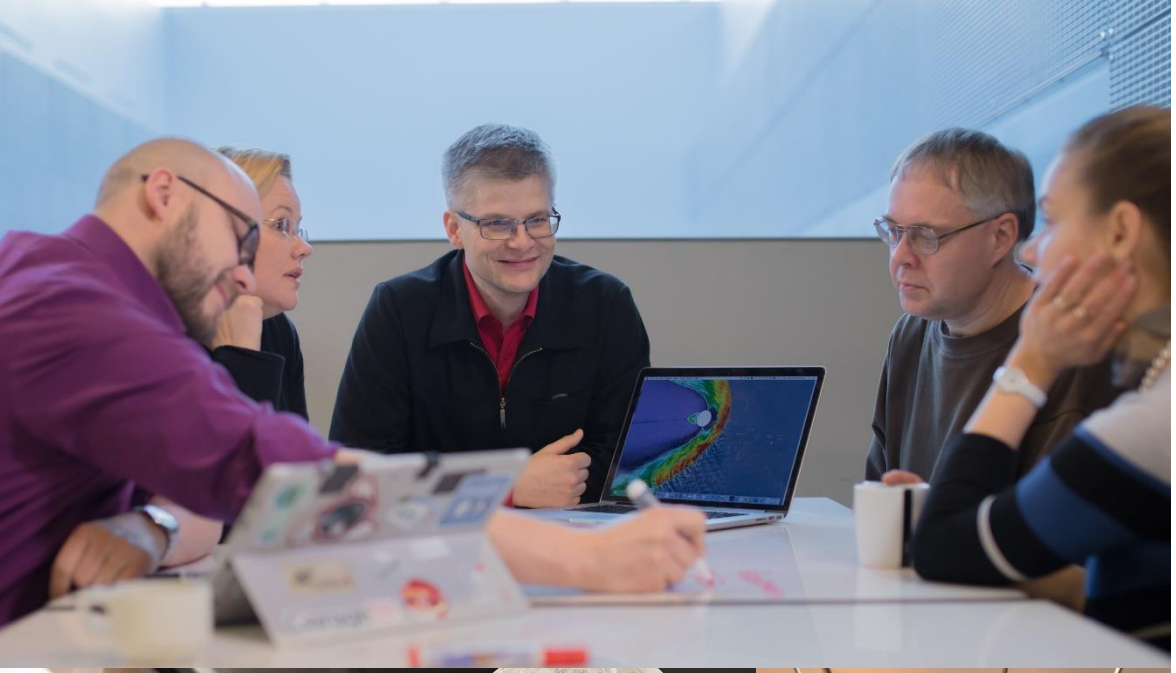
- High-efficiency novel III-V solar cells for satellite power generation
- Lasers for free-space communication and optical clocks
- Quantum light sources for secure communications (quantum key distribution)
- Satellite based navigation
- Asteroid reconstruction and modelling
- Advanced system-on-chip design capabilities

FACILITIES

We are hosting state-of-the-art research infrastructure in wireless communications and photonics technology. We are coordinating Photonics Flagship program (PREIN) and we are partner in 6G Flagship project that provide access to infrastructure complementarity supporting space related research by utilizing our partners infrastructure (e.g. Micronova or LUMI supercomputer.

Relevant contacts for space-related R&D activities

Prof. Mircea Guina (photonics) mircea.guina@tuni.fi +358408490004
Prof. Simona Lohan (navigation) simona.lohan@tuni.fi +358408490669
Prof. Sampsa Pursiainen (asteroids) sampsa.pursiainen@tuni.fi +358407505677



Pictures: Academy of Finland, Jaan Praks

FINLAND

SAFE ORBITS FOR THE FUTURE: CENTRE OF EXCELLENCE IN RESEARCH OF SUSTAINABLE SPACE

SPACE IS AN EMERGING MEGATREND

The increasing number of satellites threatens the sustainable use of space, as without removal, space debris will make critical orbits unusable. A central factor affecting spacecraft lifetime is the radiation environment, which is unpredictable due to an incomplete understanding of plasma dynamics.

THE CENTRE OF EXCELLENCE IN RESEARCH OF SUSTAINABLE SPACE

The Centre combines top Finnish assets in space physics and satellite resources to achieve an international paradigm change in the sustainable utilization of space. The Centre builds a next-generation radiation-tolerant nanosatellite fleet to advance the understanding of the radiation environment to an unprecedented level. They will also demonstrate sustainability by implementing controlled de-orbiting of the spacecraft back into the atmosphere.

COMBINING DATA, SUPERCOMPUTERS AND TOP-NOTCH CUBESAT DESIGN

The Centre performs cutting-edge experimental analysis utilizing international space missions and the world's best supercomputer modelling tools. It will exploit top-tier science to secure safe orbits for the future and revolutionize experimental space physics based on nanosatellites.

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

Aalto University

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

UNIVERSITY OF TURKU

Minna Palmroth, Professor
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www.helsinki.fi/en/researchgroups/finnish-centre-of-excellence-in-research-of-sustainable-space

FINLAND

UNIVERSITY OF VAASA





Several units of the University of Vaasa conduct space-related activities. Digital Economy research platform and School of Technology and Innovations develop space technology in the form of small satellite design, satellite remote sensing methods, and satellite-positioning technologies for e.g. autonomous vehicles, logistics and supply chain monitoring needs.

The School of Management has expertise in geospatial analysis in the field of regional studies for urban and regional development and rural planning. The Schools of Marketing and Communications as well as Accounting and Finance have expertise in the field of space business and innovation ecosystems, especially in the development of new space data innovations, new business models in the space economy and space-based data utilization in economic forecasting.

Our multidisciplinary space-related expertise has grown in the past years, especially with the EU-funded Finnish-Swedish Kvarken Space Economy project (www.kvarkenspacecenter.org). It has developed and promoted methods for utilizing satellite data and GNSS in, for example, agriculture and forestry, fisheries, nature conservation, logistics, energy/power grids and sustainable transport. The university now hosts the Kvarken Space Center that helps companies use the information available from space in their business development to create novel space-based competencies and innovations. Accompanying the center's activities is a Space Data Lab. The University also hosts the ESA BIC West Coast Finland in the Technobothnia technology research and education center.

Additionally, the University of Vaasa hosts a satellite data ground station and will host a Finnish-Swedish cubesatellite called KvarkenSat to be launched from Kiruna, Sweden as a technology demonstration mission. The University of Vaasa's STEM education center LUMA-keskus Pohjanmaa promotes satellite and space-based data related training and workshops in its curriculum for schools and teachers.

Heidi Kuusniemi, Director of Digital Economy,
Professor in Computer Science
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https://www.uwasa.fi

Vaasan yliopisto
UNIVERSITY OF VAASA


Picture: FMI

FINLAND

FMI – ARCTIC SPACE CENTRE

The Arctic Space Centre of the Finnish Meteorological Institute (FMI-ARC) is Finland's primary infrastructure for utilization of Earth Observation (EO) data for operational services and research of Arctic environment.

The Arctic Space Centre operates satellite ground station and National Satellite Data Centre focusing to fast delivery of remote sensing products for operational safety critical services, G/S services for partners and clients, and to support of scientific research of Artic environment and atmosphere. FMI-ARC, located north of the Arctic Circle, in Sodankylä lies in an excellent location for receiving data from all polar orbiting spacecraft.

Arctic Space Centre's ground-based observation instrumentation is the most representative scientific site in boreal taiga forest region. Measurement and research programs for upper-air chemistry and physics, snow and soil hydrology, carbon fluxes, biosphere-atmosphere interaction and intelligent traffic are hosted in Sodankylä. The Arctic Space Centre focuses on calibration and validation of Earth Observation (EO) satellite data and model and algorithm development.

The Arctic Space Centre serves as the production centre for Copernicus Services and EUMETSAT Satellite Application Facilities. FMI leads the cryosphere theme of the Copernicus Global Land Service, coordinates the Atmosphere Composition SAF and leads the snow cluster of the Hydro SAF.

Jyri Heilimo, Head of Unit
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https://en.ilmatieteenlaitos.fi/arctic-space-centre

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

OTHER SPACE **RELATED ACTORS**

EISCAT is an international scientific association with member institutes in several countries.

Finnish Centre for Astronomy (FINCA) with ESO practises and co-ordinates Finnish high-quality research in fields of astronomy with European Southern Observatory (ESO) and promotes technological development work related to ESO.

Kvarken Space Center's primary objective is to support regional businesses to develop opportunities within the "new space economy" and commercialize existing space-based data.

MilliLab is a joint laboratory between VTT Technical Research Centre of Finland and Aalto University School of Electrical Engineering. MilliLab is also an ESA External Laboratory on Millimetre Wave Technology.

Centre of Excellence in Research of Sustainable Space FORESAIL

Aalto University Metsähovi Radio Observatory is the only astronomical radio observatory in Finland.

http://pia.teknologiateollisuus.fi/node/60

EISCAT SCIENTIFIC ASSOCIATION

Finnish Centre for Astronomy with ESO

Kvarken Space Center

esa

ACADEMY OF FINLAND

ASSOCIATION OF FINNISH DEFENCE AND AEROSPACE INDUSTRIES

ESA COLLABORATION

Finland joined the European Space Agency (ESA) as an associate member 1987 and full member 1995. Since then the Finnish industry have contributed actively different ESA programs. Key programs for Finland have been in the fields of Science&Exploration, Safety&Security and Applications . Overall the Finnish industry have contributed over 50 ESA missions. Over one hundred Finnish companies have participated in ESA programs. The current key priorities of Finland are satellite 5G integration, natural resources monitoring, autonomous systems and cyber security.

www.esa.int

FOUR THEMES OF ESA COLLABORATION

SCIENCE & EXPLORATION

SAFETY & SECURITY

APPLICATIONS

ENABLING & SUPPORT

ESA-BIC FINLAND

The European Space Agency's (ESA) Business Incubation Centre in Finland was founded in 2017 to support aspiring innovative entrepreneurs and young ambitious startups financially and technically to reveal their full space potential. ESA BIC Finland is a part of the wide European ESA-BIC network. The objective is to help young startup companies to introduce new technologies to the ESA and its partner network or to transfer existing ESA space technologies from hardware to data such as satellite data to terrestrial uses, whether consumer, business or both.

Close to 20 start-ups have participated in the program.

www.esabic.fi

COMPANIES CURRENTLY IN THE PROGRAM (STATE 11/2022)

avoin map
broadbit
FLEETONOMY
YIELD SYSTEMS

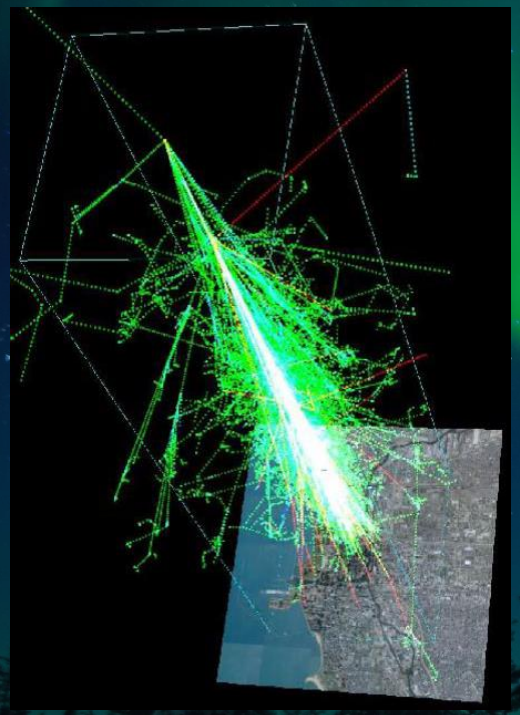
ALUMNI COMPANIES

APS
ARCTIC ASTRO NAUTICS
AURORA PROPULSION TECHNOLOGIES
awake.ai
COMPOSITES
Climatica
COLLECTIVE CRUNCH
ELFYS
FIBROBOTICS
KUVA SPACE
KYOCERA Tikitin
Missing-Link Wireless Security Solutions
Netradar Mobile Analytics
SKYFORA
SOLAR FOODS
Terramonitor
ZERO GRAVITY

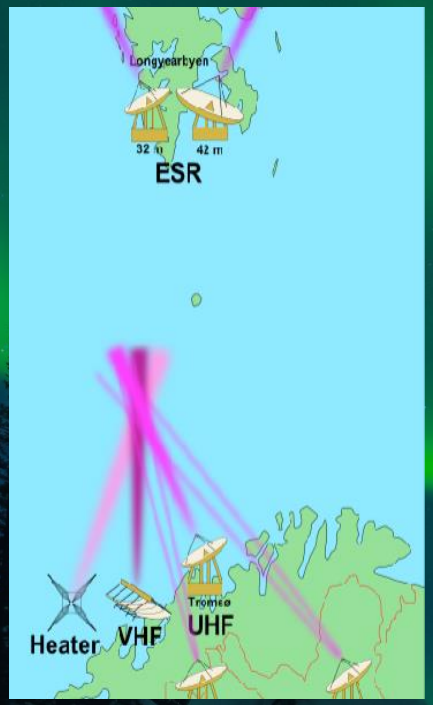
FINLAND

SODANKYLÄ GEOPHYSICAL OBSERVATORY

Operations extend from Arctic to Antarctic covering the longitude of Finland.



World's leading model of atmospheric ionisation by cosmic rays



High-power incoherent scatter radars in the Arctic

The current parabolic dish antennas will be replaced by 30 000 individual antennas with no moving parts. Construction started in 2017, expected to finish by 31.12.2021

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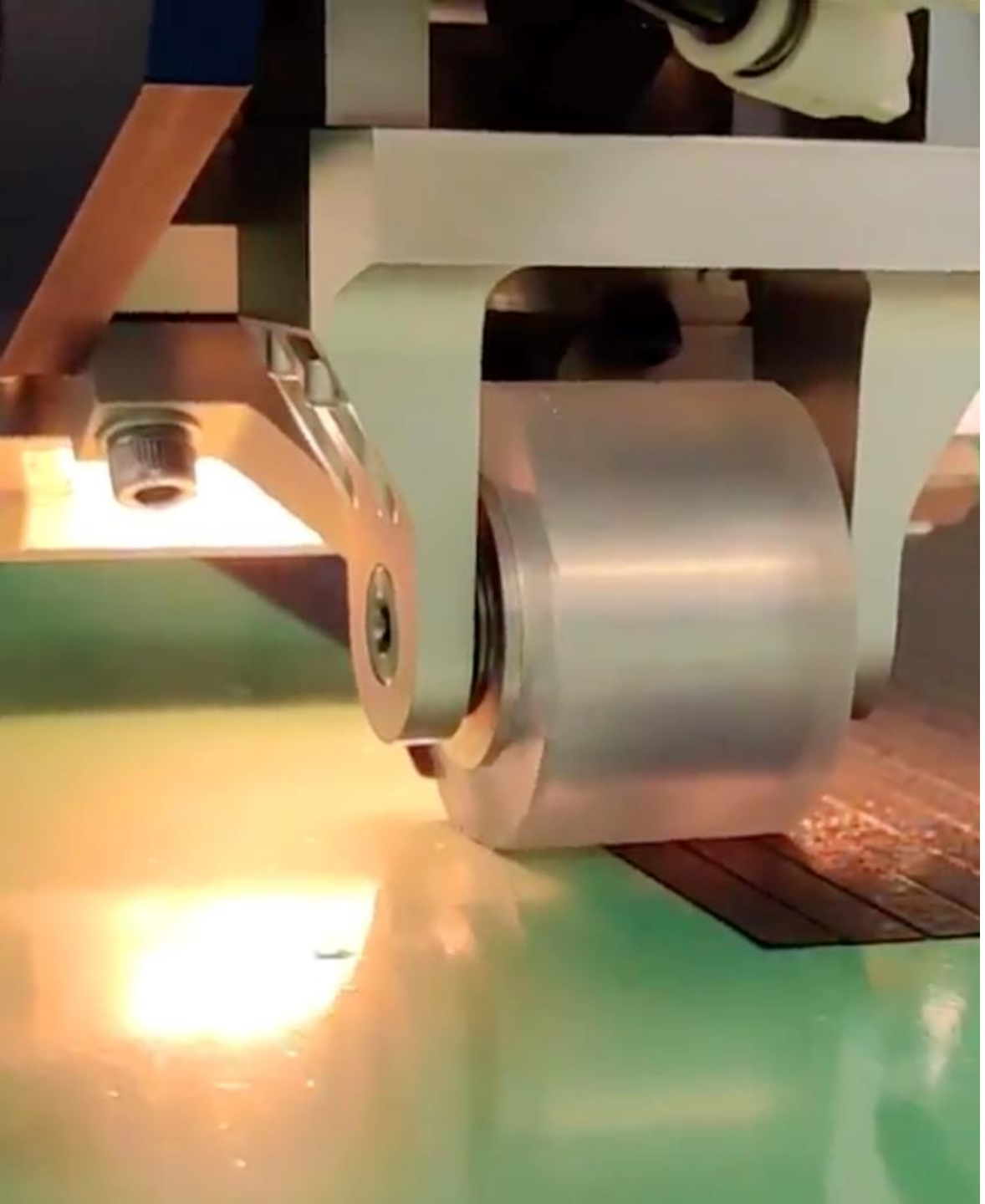
FINNISH METEOROLOGICAL INSTITUTE

UNIVERSITY OF OULU

SPACE INNOVATIONS
FROM FINLAND



FINLAND

CREATED FOR AEROSPACE APPLICATIONS. AVAILABLE TO EVERY INDUSTRY

OUR SOLUTION

Addcomposites provide a 100x cost-effective solution for advanced additive manufacturing on a subscription basis. The solution automates the production of space-grade carbon fiber parts for aerospace, automotive, etc. Simple plug-n-play operation enables 1st-day production. Multiple TRL-7 installations completed in EU and NA and are operational on industrial R&D projects.

Pravin Luthada
pravin.luthada@addcomposites.com
www.addcomposites.com/

FINLAND

NEW HEIGHTS WITH REFINED ANALYTICS

OUR SOLUTION

Advian offers Edge AI solutions utilizing real-time drone data from variety of sensors- video camera, thermal camera, multi-/hyperspectral, LiDAR, GNSS, inertia etc. With sensor fusion we combine drone data to other data sources to create new insights to automate customer's business processes.

Our solutions works within various business functions like asset management, condition monitoring, precision farming and forestry, safety & security. Our Edge AI solutions are widely used also in manufacturing, energy, retail and transportation industries.

COMPETITIVE ADVANTAGE

Advian offers a unique combination of edge computing, location intelligence and artificial intelligence / machine learning to provide edge AI solutions for multiple industries and countless amount of business use cases. Our competence ranges from electronics and sensors to novel machine learning models, from spatial analysis to sensor fusion algorithms, we always focus on business value for the customer.

IDEAL CLIENT

Advian's ideal clients are pioneer companies or organizations in their respective fields who want to take advantage of data and emerging technologies. Our clients truly understand the value of data and wants to transform their businesses or disrupt existing business models.

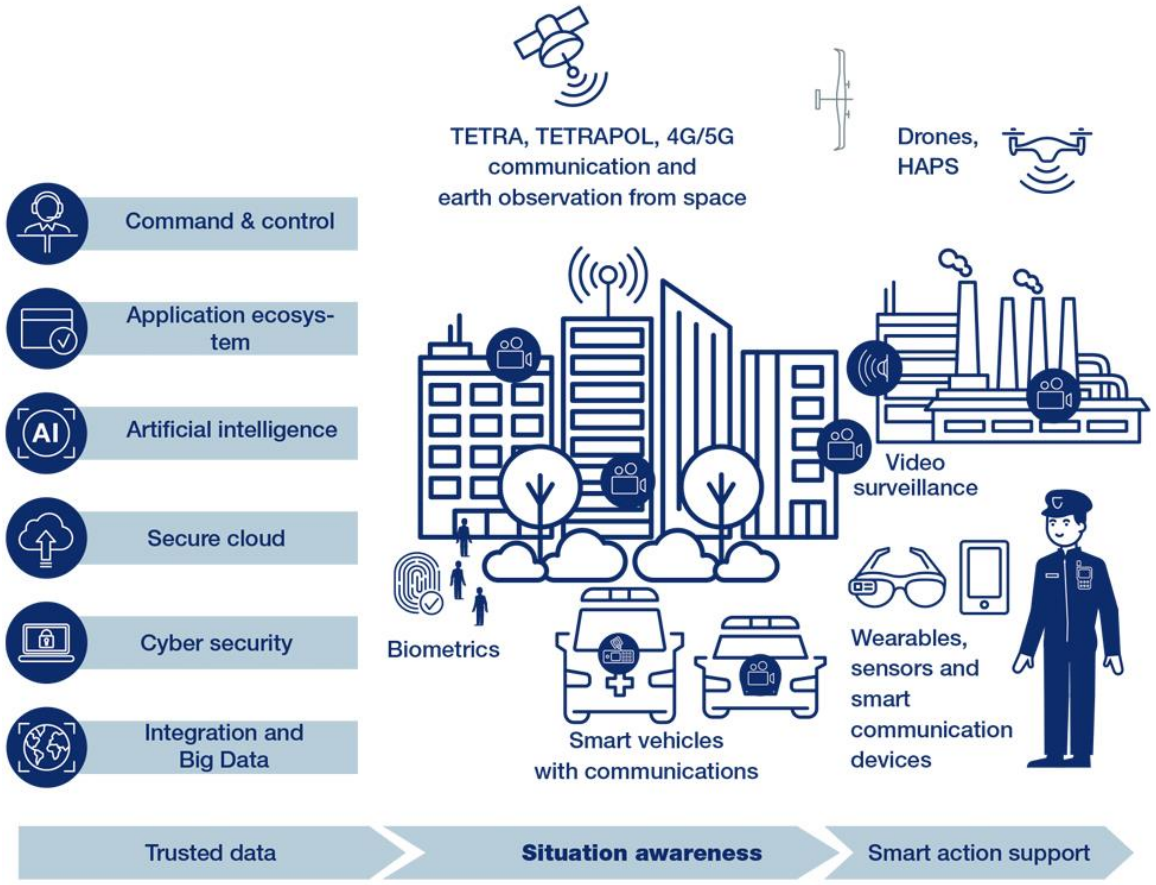
COMPANY

Advian enables you to gain an unfair competitive advantage with refined analytics solutions. With our help, you bring analytics into your processes and tie data to your business strategy. Our solutions consist of location data, external data and edge analytics - powered by AI and machine learning.

Janne Honkonen, CEO and Founder
janne.honkonen@advian.fi, +358 400 494 492
https://www.advian.fi/

FINLAND

WE MAKE IT FLY



OUR SOLUTION

Airbus is a dynamic company that continuously adapts its offering to provide better and more customized solutions through innovation and integrating of new technologies.

CUSTOMER BENEFIT

Airbus helps secure people, nations and our environment by providing superior operational views and data from trusted sources to form better situational awareness supporting smart measures in the field.

Airbus' expertise in Finland is covered by two program units; Secure Land Communication and Intelligence. In Finland, Airbus has a strong competence centre for TETRA and 4G/5G communication solutions including mobile application ecosystem and integration services of sensors for secure networked airborne communications.

COMPETITIVE ADVANTAGES

We combine and add value to our customer missions on land, in the air and at sea. We provide the whole value chain from cyber resilience and protection to secure connectivity and data and analytics from various sources.

SERVICES

- Secure communication solutions for public safety and critical industries based on TETRA, TETRAPOL and 4G/5G technologies
- Orchestrating application ecosystems for mobile software companies
- Solutions and integration services for protecting borders, maritime areas and critical infrastructure
- Cyber security design and integration with managed services and cloud-based services
- Satellite imagery and related services, access to imagery and reference layers from the smartest constellation, combining radar and optical satellites

Tapio Mäkinen, Director
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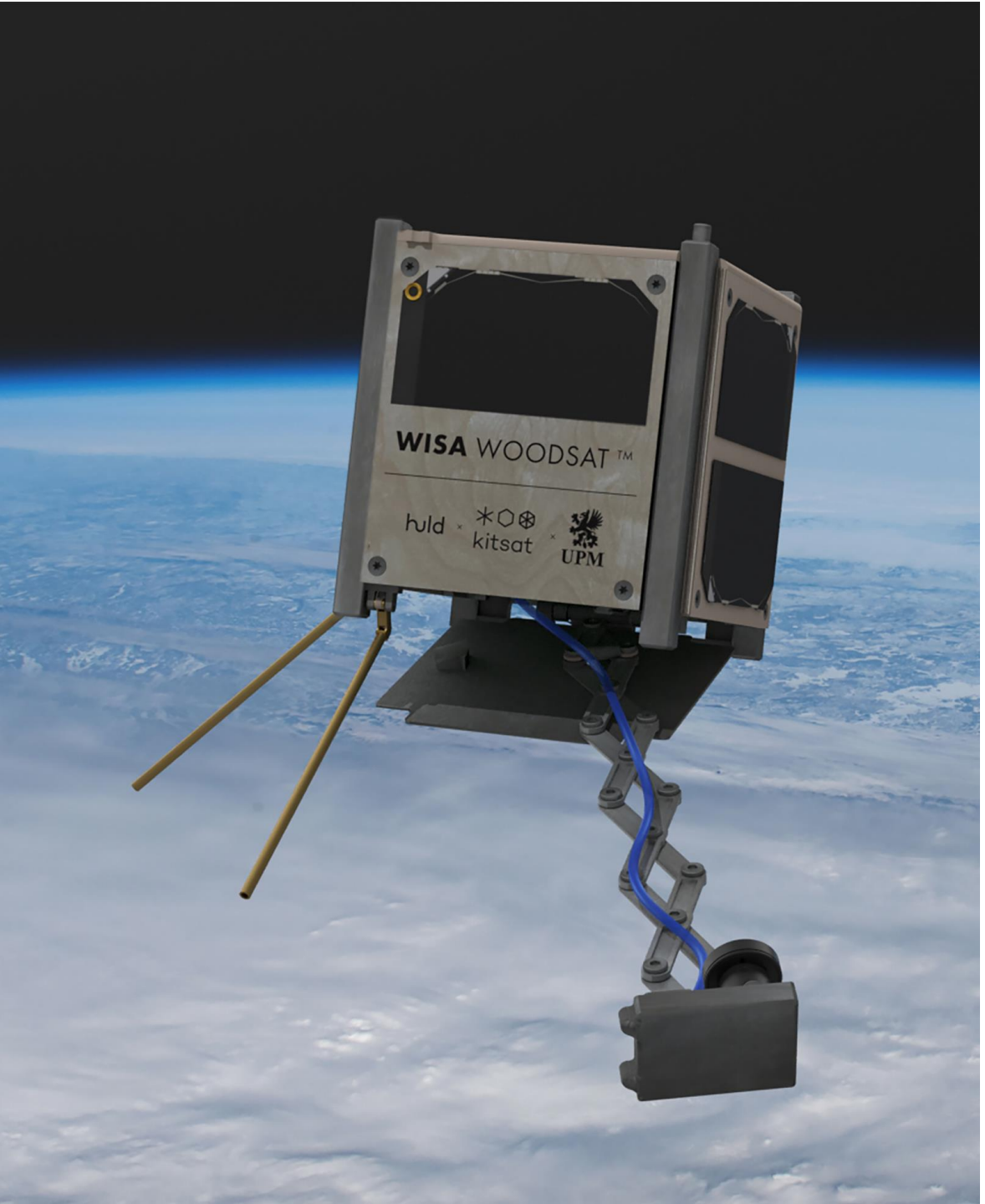
www.airbus.com

AIRBUS



FINLAND

WE INSPIRE THE NEXT SPACE GENERATION

OUR SOLUTION

Our original and main product is Kitsat, a real 1U CubeSat used for educational purposes at schools, science centres and other places that train and inspire young people. Kitsat can also be used for science missions with balloons in the stratosphere. Our first satellite, WISA Woodsat, is based on Kitsat, and it studies ways to make small satellites more sustainable and inexpensive.

CUSTOMER BENEFIT

Kitsat provides a unique hands-on learning experience, almost comparable to building and using a "real" satellite – but with a fraction of the cost. WISA Woodsat's bus is a cost-effective and sustainable way to do science missions in orbit (with a wooden structure only as an option).

COMPETITIVE ADVANTAGE

Kitsat has no real competition. It is already used in several countries around the globe. WISA Woodsat bus is an economical and versatile solution for many small satellite science missions. Wooden structures sound strange but are ecological, inexpensive and simple – soon also flight-proven.

COMPANY

Arctic Astronautics is an innovative company founded in 2018 by space technology engineers and education professionals. It is an ESA BIC Finland alumni and has been awarded the Finnish Quality Innovation 2018 and World Challenge Finland 2018.

Jari Mäkinen
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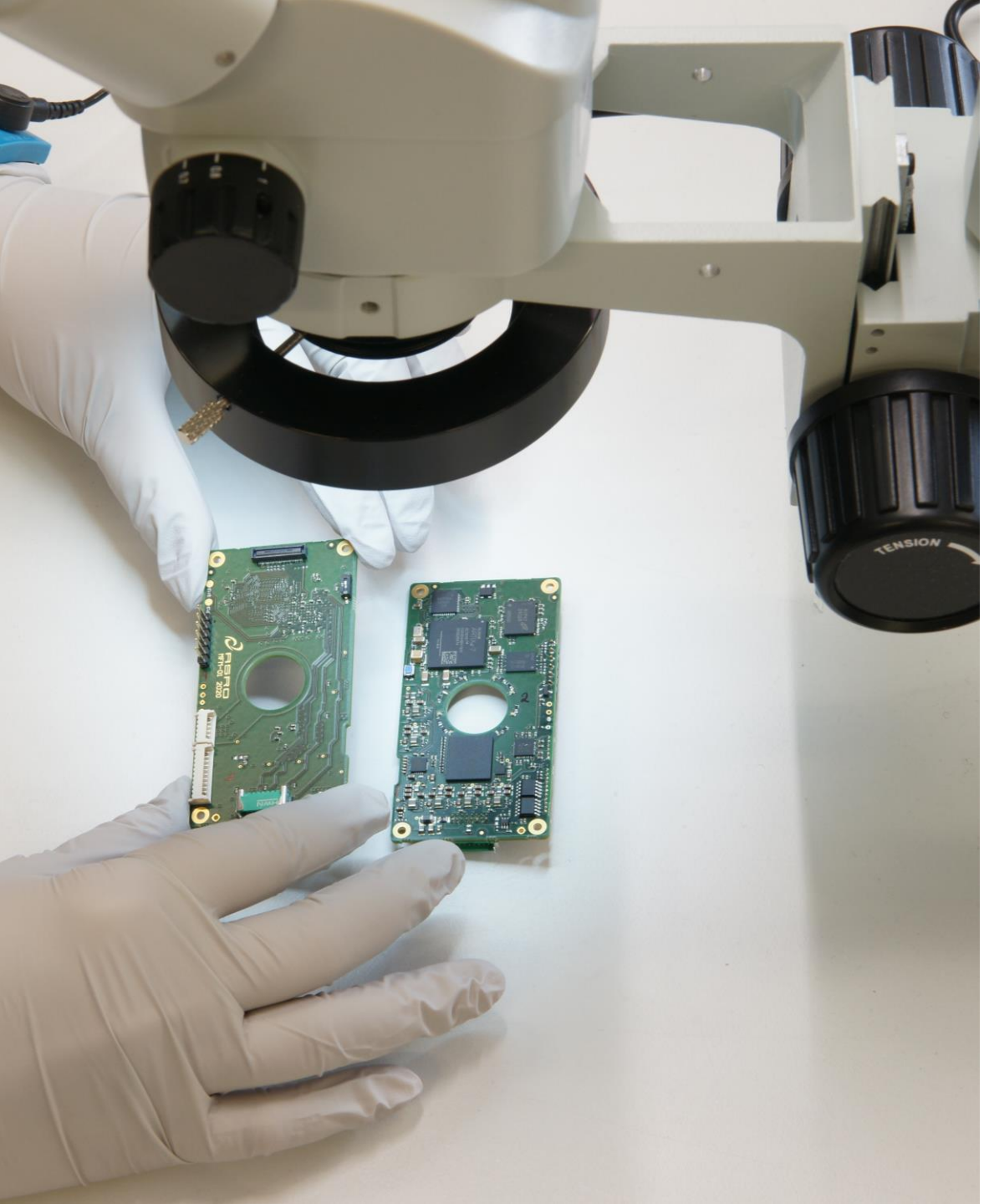
www.arcticastronautics.fi

ARCTIC ASTRO NAUTICS



FINLAND

YOUR PARTNER IN TECHNOLOGY SOLUTIONS

OUR SOLUTION

ASRO is your partner in demanding space instrument development projects. We offer tailored solutions according to the customer's needs.

Our core expertise lies in developing high quality electronics systems for our customer instrumentation projects. ASRO has recognized expertise in analogue and digital electronics design, space weather instrumentation and radiation modelling, and has contributed to missions like BepiColombo, Artemis-1 and the International Space Station.

Over the years, we have accumulated proven concepts and know-how adaptable to new instruments.

CUSTOMER BENEFIT

ASRO has over 20 years of experience with demanding international space projects. The company has comprehensive electronics competence related to design, manufacturing and testing together with our partner network.

Our turnkey solutions have helped New Space start-up companies to focus on their expertise, and R&D projects have been tailored to solve customers' technological challenges.

COMPANY

ASRO provides services for space technology customers (radiation monitoring, space debris observation) and industrial customers (electronics design, embedded systems).

The company was founded in 1999 and is located in Turku, Finland.

Jussi Lehti
Jussi.lehti@asro.fi, +358 40 7420 626
https://asro.fi/en-index.php

ASRO

FINLAND

ATTITUDE FOR YOUR SPACE MISSION

OUR SOLUTION
Aurora enables small (under 30-150 kg) satellite and spacecraft owners to conduct their satellite missions effectively and take their satellites anywhere, be it to Low Earth Orbit or other planets. Our satellite movement solutions enable attitude control for satellite instrument pointing, de-tumbling and torsion wheel de-saturation as well as regulative conformance to the de-orbiting requirements.
Our future products will enable propellant less interplanetary travel.

CUSTOMER BENEFIT
We provide our customers a mass-customizable, modular solution that enables a full operational capability envelope. Our engines provide one of the best thrust per Watt ratios in the industry and our Plasma Brakes enable propellant-less de-orbiting.

COMPETITIVE ADVANTAGE
We are able to provide a significantly competitive, pricing level for a quality that exceeds current industry reliability standard. Auroras' products are be built and tested in house with our patented technology.

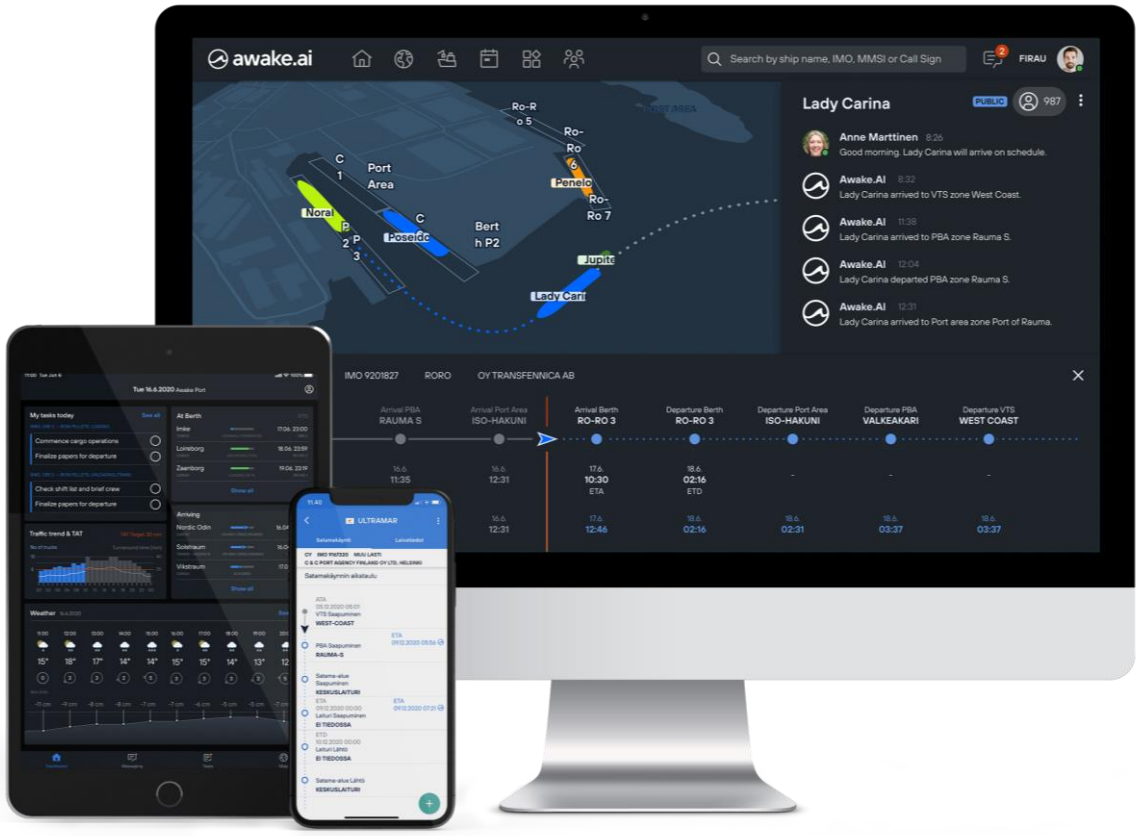
COMPANY
Aurora Propulsion Technologies Oy has a mission to supply satellite manufacturers with highly reliable mass produced and high-quality components for attitude (orientation) and orbit control. Established in 2018, it employs 23 persons. The company is located in Otaniemi, Espoo, Finland.

Roope Takala, CEO
roope.takala@auroraptf.fi, +358 50 482 0860
www.auroraptf.fi

AURORA
PROPULSION TECHNOLOGIES

FINLAND

SUSTAINABLE & INTELLIGENT MARITIME LOGISTICS



OUR SOLUTION

Holistic AI software platform digitalizes all logistic operations while enabling intelligent optimization and automation giving real-time sea, port, and land situational awareness, communication and collaboration. The company delivers a holistic AI-driven software platform, APIs, prediction and optimization models, Smart Port as a Service application and Berth planning solution.

CUSTOMER BENEFIT

Value propositions are: - over 20% reduced cost of transport & cost of port calls, - up to 30% increased productivity, - 5-20% additional revenue from shared data, - 10-40% reduction in emissions.

COMPETITIVE ADVANTAGE

Customers don't need to invest years and millions in AI/ML-driven logistics SaaS, instead they can get it from us deployed in a few weeks as a service Industry leading optimisation platform for sea-port-land interactions Smart port ecosystem with over 100 partners bringing network and learning effects.

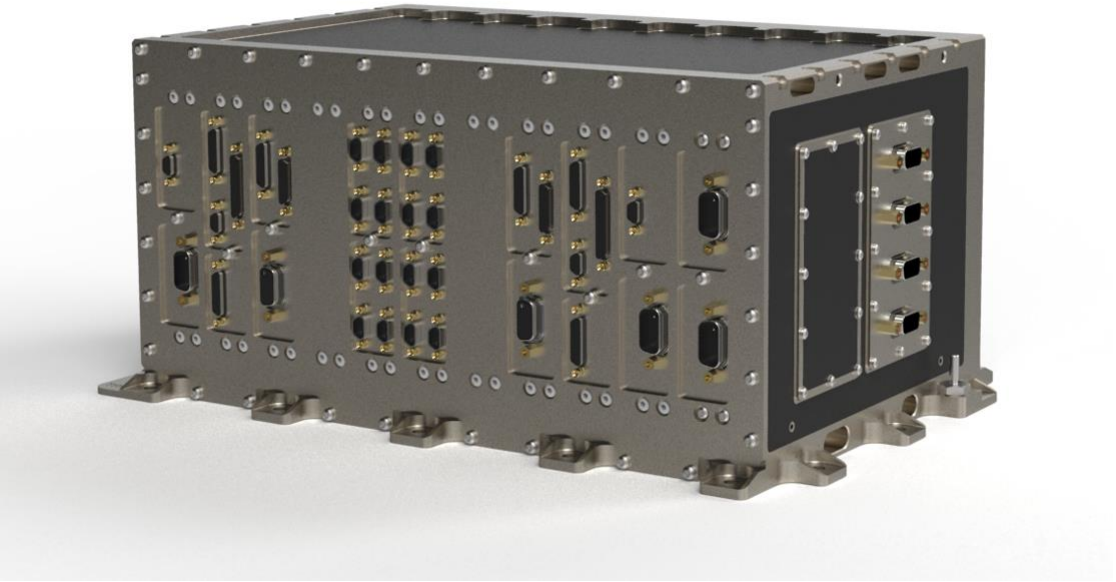
COMPANY

Winner of the Frost & Sullivan Entrepreneurial Company Award for maritime logistics, Selected as National Growth Engine by Business Finland, European Space Agency (ESA) awarded funding to develop and pilot Awake Marketplace.

Karno Tenovuo, CEO
Karno@awake.ai, +358 40 579 9552
www.awake.ai

awake.ai

SPACE ELECTRONICS SERVICES IN FINLAND



OUR SOLUTION

Beyond Gravity offers space & defense ecosystem in Finland and abroad project management, procurement, design, manufacturing, assembly, integration and testing services. Radiation and environmental testing is part of portfolio.

Beyond Gravity portfolio consists of high-quality spacecraft flight electronics equipment and subsystems based on either traditional hi-rel, or cost-efficient automotive COTS components. Key applications include:

- Interface electronics e.g. Remote Terminal Units
- Control electronics e.g. Control and Data Processing Units
- Power electronics e.g. Power Supply/Distribution Units

CUSTOMER BENEFIT

- Our experience, outstanding capability to innovate, customer focus and a comprehensive, clearly structured product portfolio all make Beyond Gravity the preferred supplier of structures for all types of launch vehicles as well as a leader in selected satellite products and constellations in the New Space sector.

COMPETITIVE ADVANTAGE

- Local presence, global scale.
- Space engineering and project management.
- ESA qualified production personnel.
- 100% success rate in our missions since 1985.

Sami Kallio, Marketing and Sales
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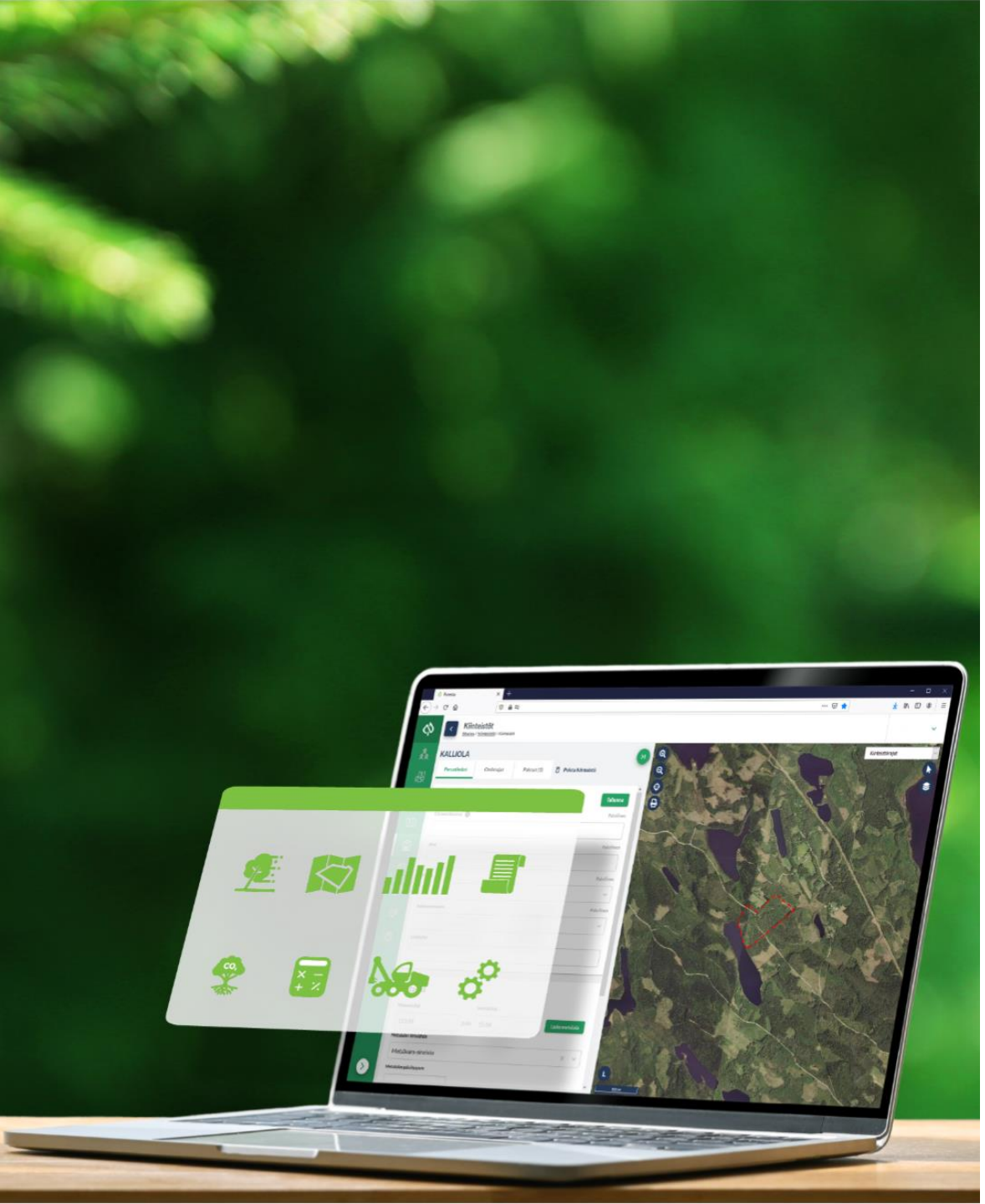
www.beyondgravity.com

beyond gravity



FINLAND

SMARTEST FOREST SOLUTIONS ON THE PLANET

OUR SOLUTION

Intelligent Forest Systems - Forest Analytics - GIS solutions. We offer forestry professionals intelligent forest information systems and up-to-date forest analytics based on satellite data. We put modern data and digital solutions to work for more sustainable forests. With our help, we make forest professionals everyday work easier. Our systems are a gateway to the best GIS datasets available.

CUSTOMER BENEFIT

Save money and time by focusing field work to the correct areas. By processing satellite data with the help of artificial intelligence, automated monitoring of environment becomes faster than ever before. For example, storm and insect damages can then be quickly estimated.

COMPETITIVE ADVANTAGE

We have a unique combination of expertise – ICT, GIS, project management and bio-economy. With our ready and tested solutions and services, we can make implementations quickly and with reasonable costs. Our scalable cloud-based applications can easily be integrated to third-party platforms.

COMPANY

We have been making challenging geographic information systems in Finland for more than 20 years. Today our main business field is to focus on the forestry sector. Since the acquisition of Summer 2022, Bitcomp Oy is part of Sitowise Oyj.

Tapani Stjernvall, CEO
tapani.stjernvall@bitcomp.fi, +358 40 765 6508
https://bitcomp.com

BITCOMP

FINLAND

WORLD-CLASS R&D SERVICES FOR SPACE INDUSTRY

OUR SOLUTION

Bittium specializes in the development of reliable, secure communications and connectivity solutions. Complementing its communications and connectivity solutions, Bittium offers world-class R&D services for any stage of product development. Bittium's expertise includes system, architecture, wireless, electronics, mechanics, and software design.

BENEFIT FOR THE CUSTOMER

As a world-class R&D services provider, Bittium can help your business thrive and you can focus on your core business. We can help at every stage, from technology consulting and concept strategy to turnkey product and service development.

COMPETITIVE ADVANTAGE

Bittium leverages its over 35-year legacy of expertise in advanced radio communications. Project examples: World's first satellite/4G smartphone - Mexsat satellite/4G hybrid user terminals World's first satellite/3G smartphone - TerreStar Genus Research projects for ESA and NASA.

COMPANY

Bittium has approximately 650 employees and offices in Finland, Germany, USA, Mexico, and Singapore. Bittium is listed in the Nasdaq Helsinki Exchange.

Markku Pikkarainen, Director
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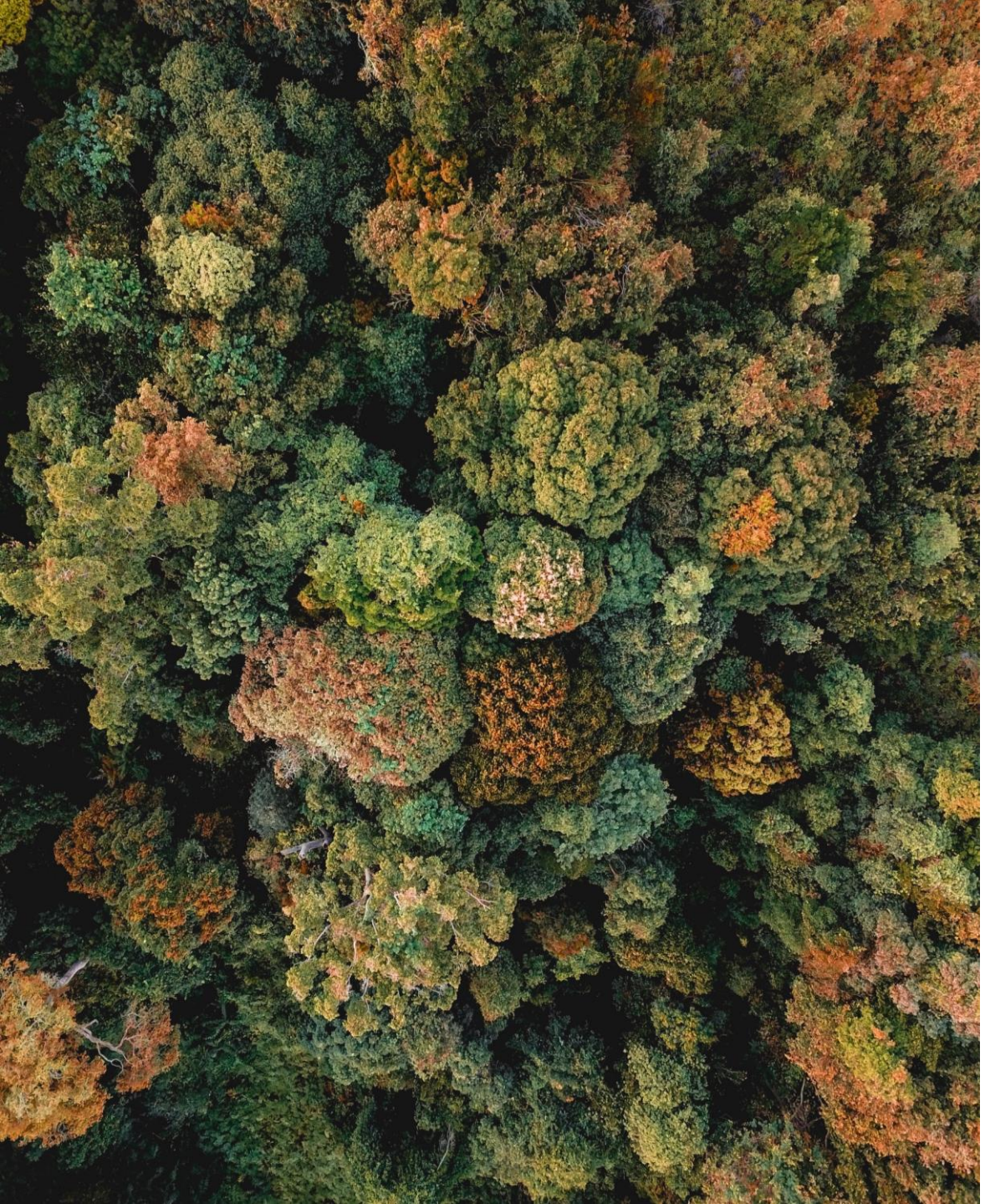
www.bittium.com

Bittium



FINLAND

A SUSTAINABLE FUTURE WITH FORESTS, POWERED BY AI

OUR SOLUTION
Our solution enables accurate, cost-efficient and scalable forest inventories, monitoring of carbon projects and tracking of biodiversity by combining multiple data sources into AI models.

CUSTOMER BENEFIT

- Sustainable practices and better utilization of renewable natural resources
- Transparency in carbon trading markets
- Support in tracking biodiversity at scale
- More accurate AI-based forest inventories
- Cost-efficiency in forest inventories

COMPETITIVE ADVANTAGE
CollectiveCrunch utilizes a unique approach to forest inventories and forest resource monitoring by applying new sophisticated methods and tools to change the conventional way the industry is working. We are driving sustainable forestry by providing better insights of the forests in all major regions.

COMPANY
We provide accurate data on forests using multiple input datasets by utilizing AI. We change the way the forestry industry works by providing accurate predictions and inventories based on our machine learning models.

SERVICES
CollectiveCrunch provides a self-updating SaaS solutions for sustainable forestry.

Rolf Schmidt, Co-CEO
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COLLECTIVE CRUNCH

FINLAND

WE ENABLE THINGS BEYOND POSSIBLE

OUR SOLUTION
CoreHW IC design team is experienced with Space and Satellite Communication Radiation hard design. Our expertise areas are RF, mm-wave, Analog and Mixed Signal ICs, and Antennas including RF FE, Radar, NIR Imaging, Photon Counting, X-ray Imaging, Sensor Interface, Interfaces, and Power Management. We also offer Indoor Location Reference Design including high-quality locators and position SW.

CUSTOMER BENEFIT
We are your one-stop IC solution provider partner. We offer RF IC, mm-Wave, Analog, Mixed Signal, Digital, Antenna, Application, and System design.

COMPETITIVE ADVANTAGE
We design and deliver components to leading semiconductor companies worldwide by leveraging our extensive experience in semiconductor design services, our broad IP portfolio (over 250 IP cores), and a global partner network.

COMPANY
CoreHW is a fabless semiconductor company established in 2013 in Tampere, Finland. For decades, we have been developing Integrated Circuit technologies for leading IoT, Telecommunication, Automotive, Space, and Wireless companies, and research hubs.

Tomi Moilanen, VP Sales and Marketing
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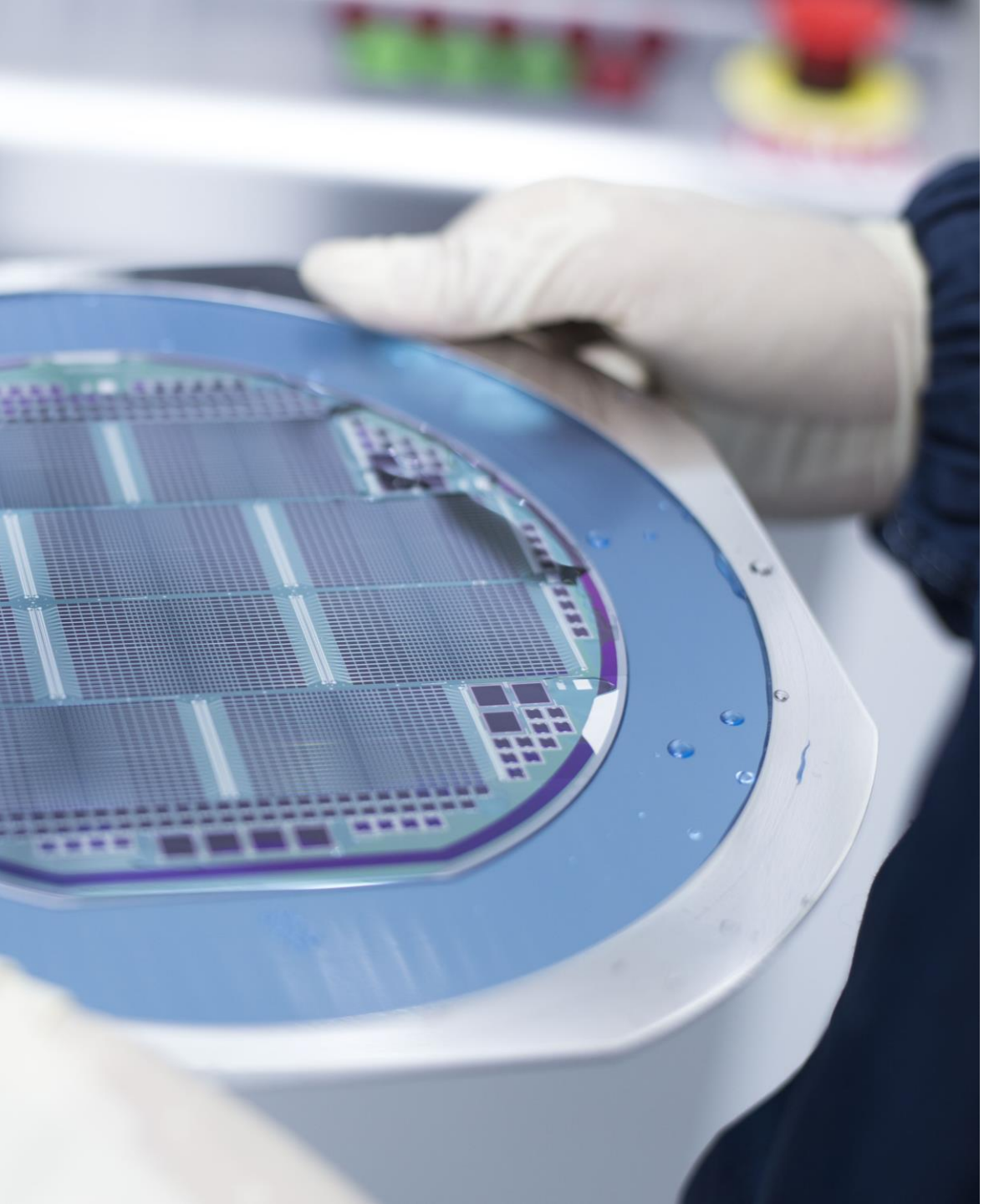
CoreHW



FINLAND

THE MOST TRUSTED PARTNER IMAGING THE UNKNOWN

OUR SOLUTION
Detection Technology offers off-the-shelf and customized X-ray detector solutions. Our solutions range from sensor components to optimized detector subsystems with ASICs, electronics, mechanics, software, and algorithms.

CUSTOMER BENEFIT
We are known as a trusted one-stop shop for all detector needs. Our solutions meet the performance and reliability requirements of the most stringent X-ray imaging applications. Furthermore, our products are built on modular, scalable, and easily customizable platforms.

COMPETITIVE ADVANTAGE
We have comprehensive design capabilities of photodiodes, ASICs, electronics, mechanics, firmware, software and algorithms, and knowhow on system integration, and manufacturing and material technologies. In addition, we have critical production processes and testing capabilities in-house.

COMPANY
Detection Technology is a global provider of X-ray detector solutions for industrial, medical and security applications. It has sites in Finland, China, France, and the US. The company's shares are listed on Nasdaq First North Growth Market Finland.

Detection Technology

Arve Lukander, Vice President, Security Business Unit
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www.deetee.com

PERFORMANCE FOR YOUR PRODUCTS

OUR SOLUTION

Advanced embedded technology solutions to produce excellent end-user experience and performance for your products.

BENEFITS

With a 25-year proven track record DA-Group offers comprehensive high-tech services, all under one roof.

Solid experience in delivery projects with international companies and organizations. We deliver systems, subsystems and equipment, including all phases of development design, manufacturing and testing, for both spaceflight and ground-based applications, in-house. This work is supported by continuous research and technology development.

Our services meet the strictest industrial, defense & space technology quality and safety standards.

COMPETITIVE ADVANTAGES

Our design and implementation services transform complex technical problems into intelligent and functional product solutions.

COMPANY

DA-Group provides advanced electronics and high technology solutions and products. We serve industrial, defence and space industry customers globally.

SERVICES

We provide product development and design,
testing, manufacturing and product lifecycle management services for high-tech solutions.

We are experts in embedded software solutions, FPGA designs, electronics, mechanics, naval technology simulations, as well as RF, microwave and milimeter wave engineering.

Timo Lättilä, Head of Business Unit, Space
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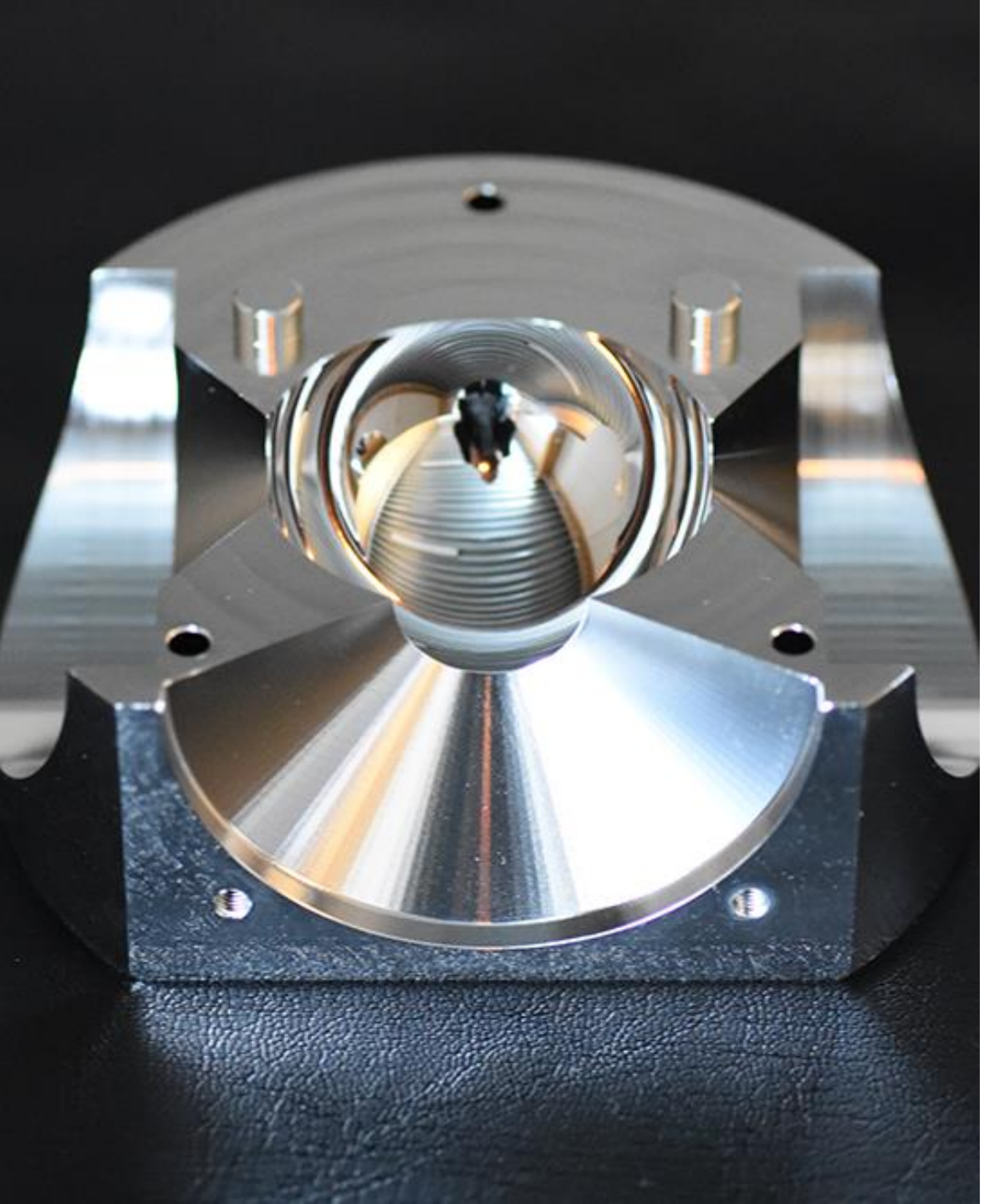
DA GROUP



FINLAND

PRECIOUS METAL SURFACE TREATMENTS

OUR SOLUTION

Eforit Provides high quality precious metal surface treatments for high-tech companies. We have already reached Saturn with our gold-plated aluminium parts! Eforit has also helped many other companies to find solution with their "head scratching" plating problems in space industry, like SOHO and BepiColombo.

CUSTOMER BENEFIT

Eforit's benefit is that it's a family-owned company that drives to serve customers with the best interest to find solution to their problems.

COMPETITIVE ADVANTAGE

Even gold can be better when you know how! We have developed a gold plating that's at least twice harder than the regular hard gold, with less friction. Other competetive advantages are Eforit's over 35 year know how of surface treatment for metals, reliability and ambition to offer only the best.

COMPANY

We offer gold, rhodium, silver, bright-, semi bright-, and electroless nickel. Eforit is specialized to aluminium plating. Family based company. Eight workers.

EFORIT

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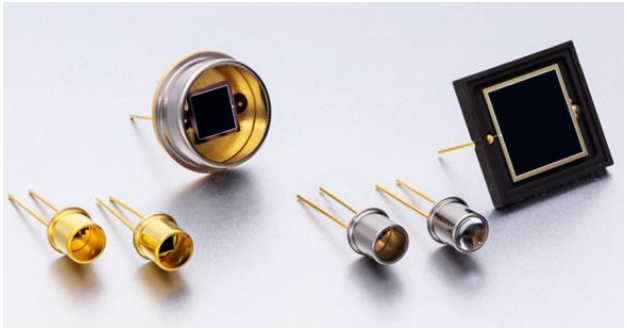
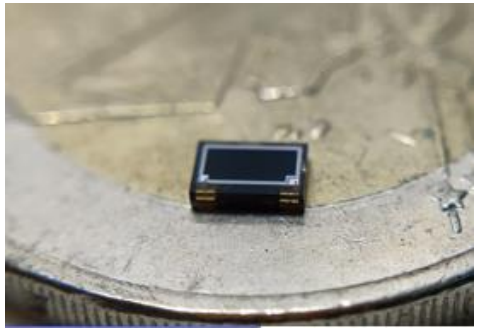
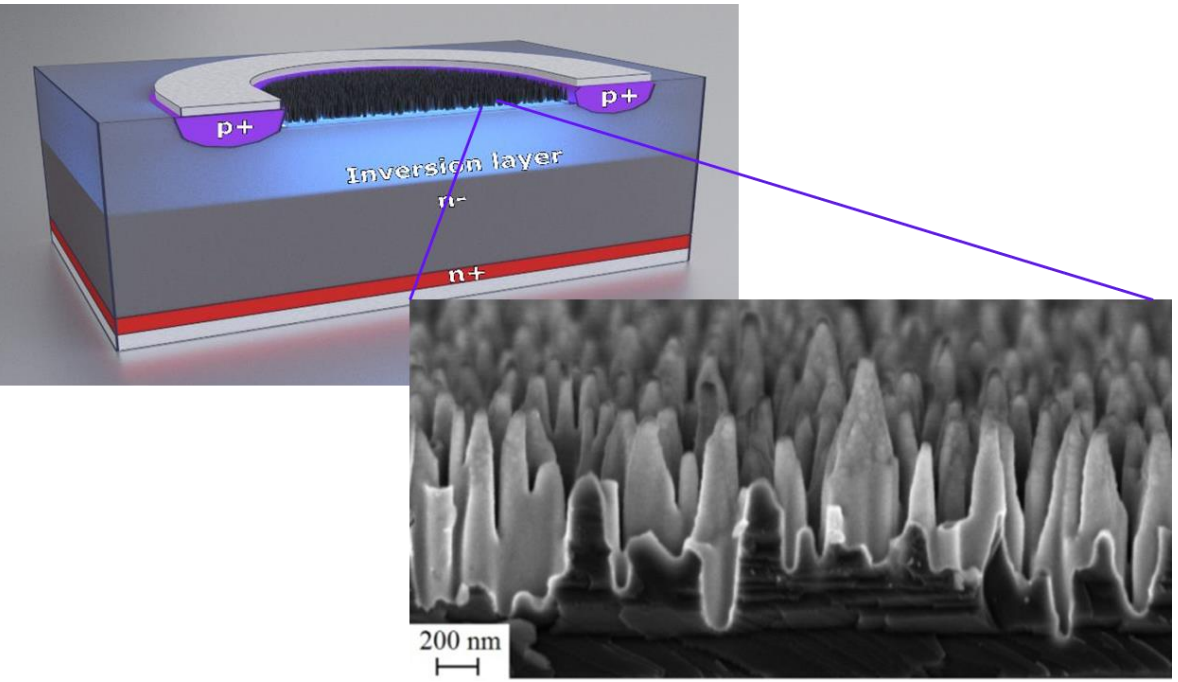
www.eforit.fi

FINLAND







CAPTURING EVERY RAY OF LIGHT

OUR SOLUTION

ELFYS provides the most sensitive and innovative photodetector technology for light and radiation detection with photosensitivity better than any commercial photodiodes. Our core patented technology is black silicon induced junction photodiode. It is combination of advanced 3D surface nano-structure and atomic layer deposition based passivation technique. It opens new possibility for deep UV detection all the way extending to NIR applications.

Our technology's reliability and robustness are proved by space requirements. We offer standard products as well as customized design to customers. We are the Finnish partner you can trust.

COMPETITIVE ADVANTAGE

ELFYS offers fundamental technology to improve detection efficiency of light. Our unique photodetector black silicon surface prevents any optical reflection losses from incoming radiation. In addition, the electrical losses are also minimized by the induced junction and perfect passivation. It offers a true board-band photodetector capability. All photodetection applications could benefit from extremely high photosensitivity of our black silicon photodiodes.

Lower light level can be detected with same size of device, or smaller device can be used to detect required light level. Lower radiation doses are needed to achieve certain X-ray imaging quality, or better images can be captured with justified radiation doses. It simply improves the signal noise ratio and efficiency and compactness of system. New business can be explored with applications that were not feasible due to detector limitations.

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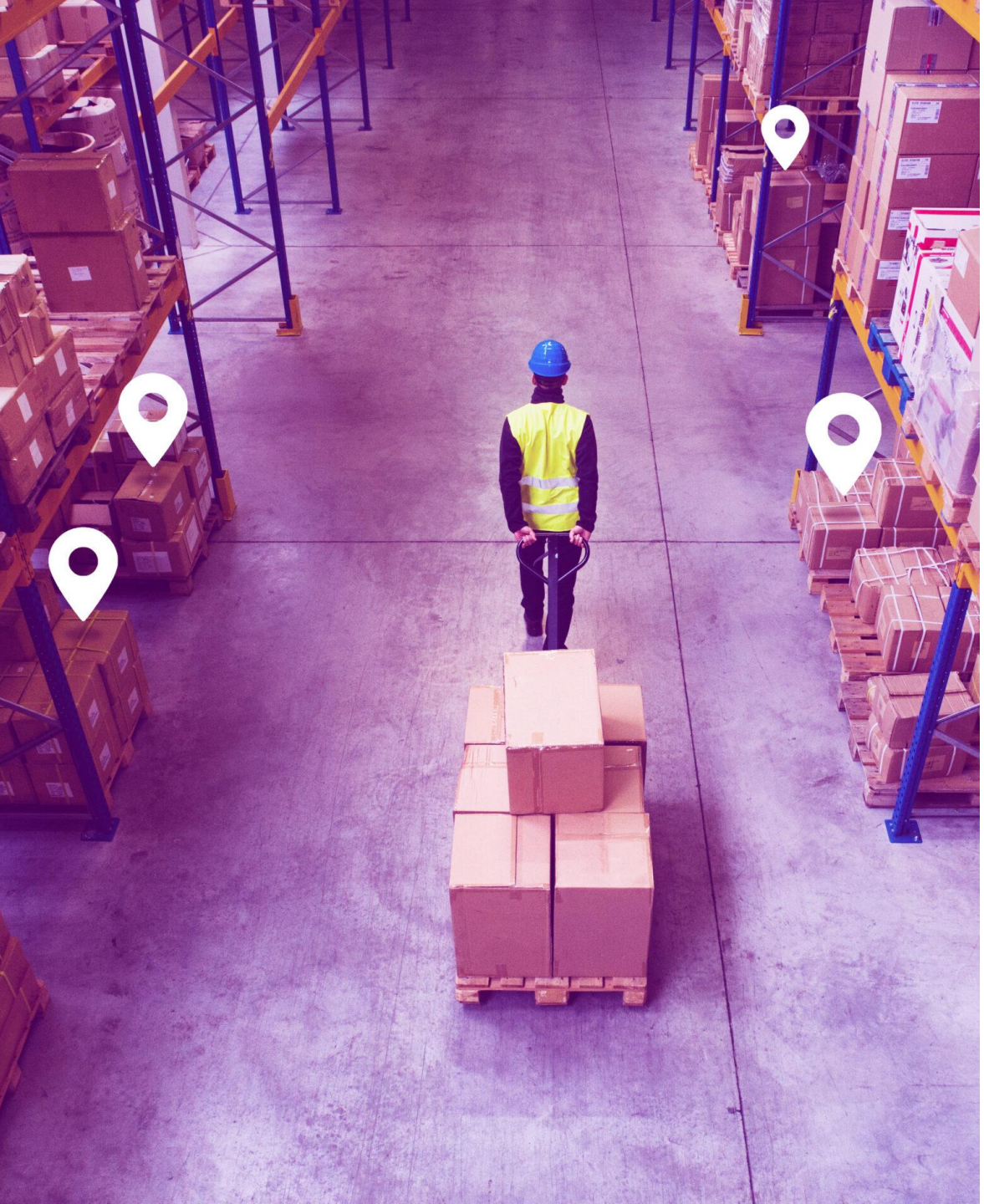
ELFYS



FINLAND

WORLD-CLASS GNSS CONSULTING AND DEVELOPMENT

OUR SOLUTION
Exafore offers independent development services for GPS/GNSS technologies and devices as well as other radio positioning and sensor systems.

CUSTOMER BENEFIT
Exafore is not tied to a single product or technology. We offer world-class expertise which enables optimal solution down to every component.

COMPETITIVE ADVANTAGE
Principal/Senior level team with hundreds of person years of relevant experience.

COMPANY
Independent, world-class consulting to deliver a complete GPS/GNSS or embedded system solution for your business.

Ilkka Saastamoinen, Business Development Director
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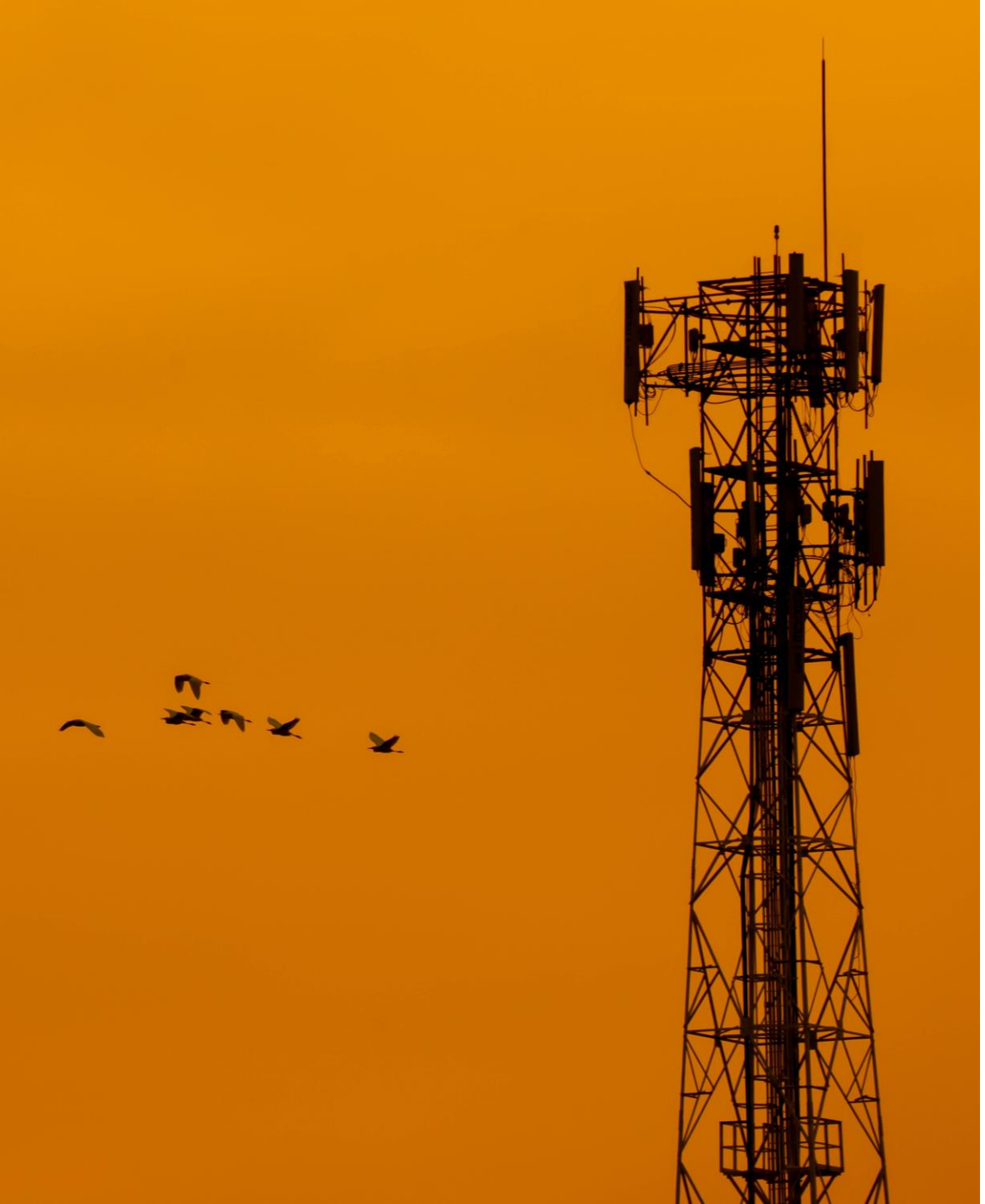
exafore



FINLAND

NAVIGATE THROUGH RADIO SPECTRUM

OUR SOLUTION
Fairspectrum provides software and simulation services for the performance analysis of the spectrum sharing between 5G/6G terrestrial and 5G/6G satellite network. Fairspectrum has simulated two approaches for spectrum sharing between 5G mobile networks and 5G satellite networks. 3GPP frame-based spectrum sharing allows the coverage areas of mobile and satellite networks to overlap.

CUSTOMER BENEFIT
The MNOs can extend their service coverage with 5G/6G satellite networks. They can decrease the impact from interference and close the gaps between the mobile and satellite coverage areas. The satellite operators get a faster access to spectrum supported by massmarket devices of the 3GPP ecosystem.

COMPETITIVE ADVANTAGE
Fairspectrum has developed simulation tools to analyse the performance of these spectrum sharing technologies, including interference, bitrate, coverage and spectrum utilization efficiency analysis.

COMPANY
Fairspectrum is the leading Dynamic spectrum access provider in Europe. In addition to standard Dynamic spectrum solutions, we can adapt the Dynamic spectrum access systems according to local regulations and customers' device categories.

Fairspectrum

Heikki Kokkinen, CEO
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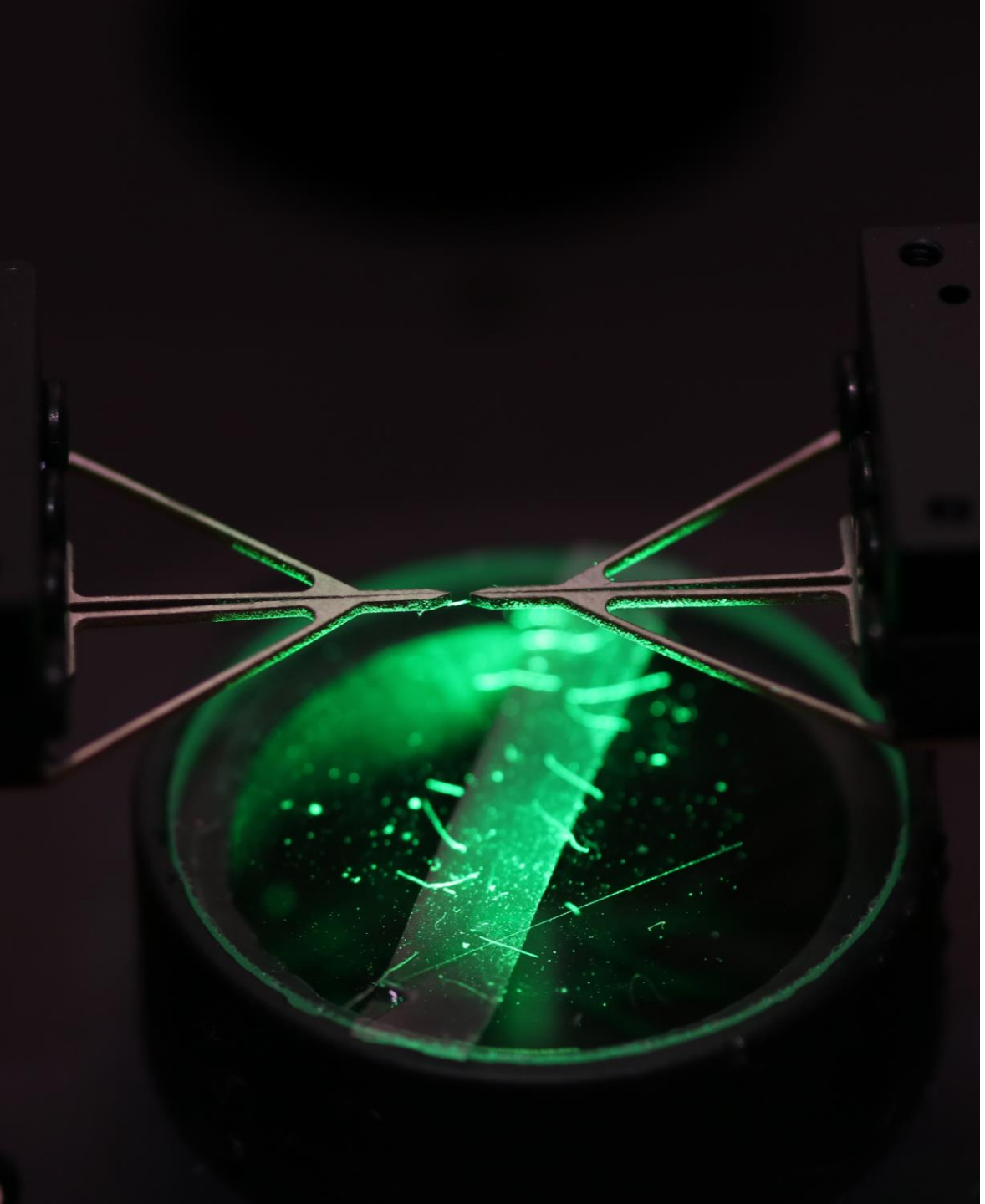

FINLAND

KNOW YOUR EVERY FIBRE

OUR SOLUTION
Fibrobotics develops and offers solutions for micromechanical testing of composite materials and material interfaces. The solutions are based on proprietary test devices and software developed and manufactured by Fibrobotics. Fibrobotics has also developed measurement platforms for short fibres (e.g. Pulp or chopped fibres).

CUSTOMER BENEFIT
With the help of our solutions, research institutes and companies developing new materials are able to test the mechanical properties of new materials faster and get more accurate data about the properties of the materials.

COMPETITIVE ADVANTAGE
Through customers and through contacts at research organizations, it has become clear that Fibrobotics' solutions are unique and could offer significant value for companies developing new materials for use in aerospace applications such as space shuttles, rockets and satellites.

COMPANY
Fibrobotics Oy is a company founded in 2019 by a group of materials experts from the Tampere University of Technology.

Olli Tanhuanpää, CEO
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www.fibrobotics.com/

FIBROBOTICS

FINLAND

OPERATOR SOFTWARE FOR AUTONOMOUS FLYING VEHICLES

OUR SOLUTION

Fleet management / Ground control systems for autonomous flying vehicles.

COMPETITIVE ADVANTAGE

Proven capability to manage autonomous operations in any point to any point operations in highly complex and varied environments (including urban) across the World. We have been measurably faster, more flexible and safer operations platform to our competition. Simulation first approach where we can test, simulate, verify and develop operations exactly the same way we operate in real environment.

IDEAL CLIENT

Our ideal client is an operator of fleet of autonomous flying vehicles or service provider for those operators. Also, we provide services to research institutions for art of possible research of the ecosystem.

COMPANY

Fleetonomy.ai Oy develops solutions to manage autonomous vehicle operations in the most complex environments.

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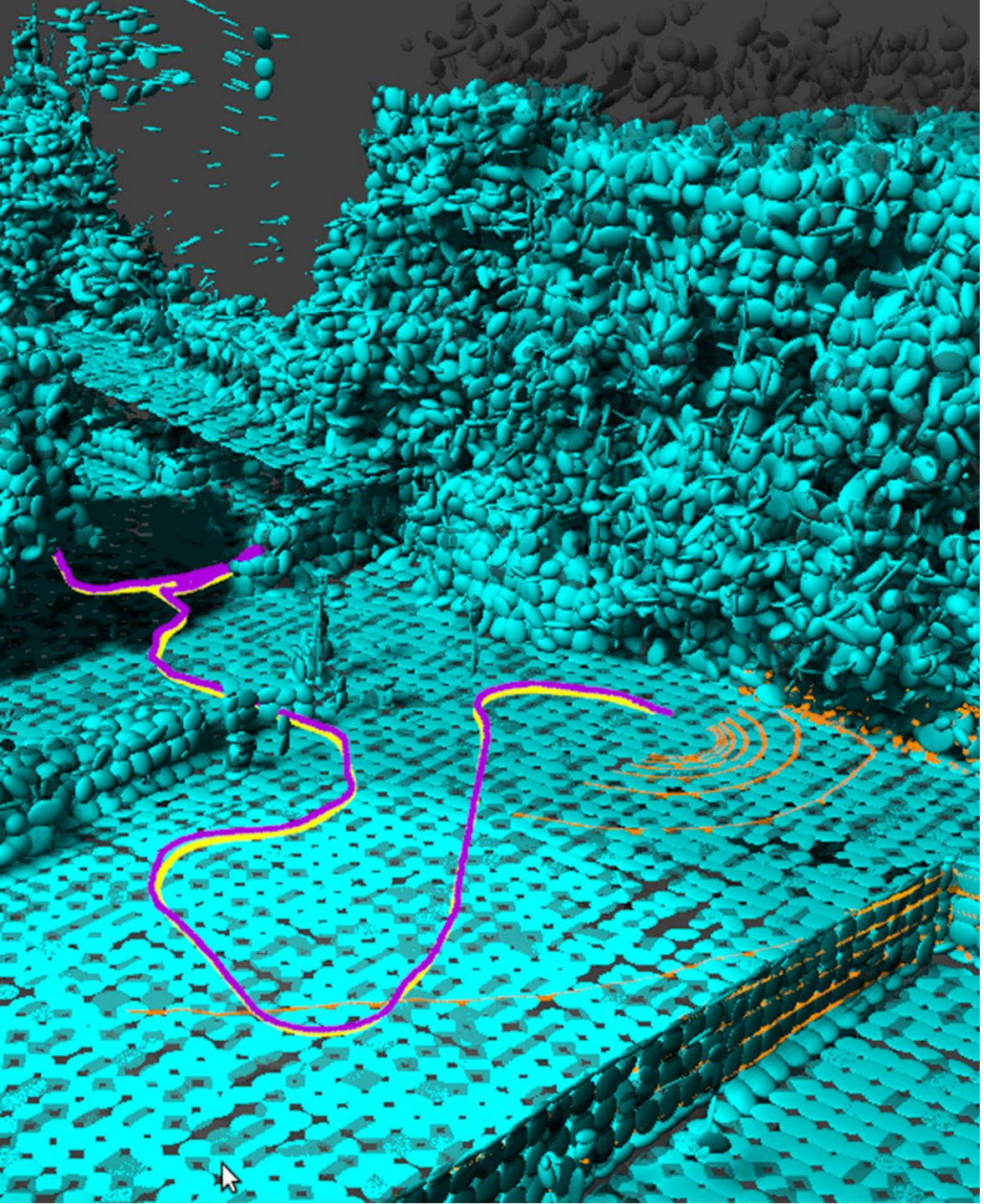
FLEETONOMY



FINLAND

WHEN GNSS IS NOT THE OPTION

OUR SOLUTION
GIM-Locator utilizes point cloud producing 3D-sensors, such as LiDAR, to generate a location estimate. While satellite-based location estimate (where available) is prone to different types of errors, GIM-Locator combines different sensor modalities and fuses them into one, reliable and accurate, 6D location estimate. While localizing a mobile machine, a detailed map of the environment can be generated. The format can be point cloud or mesh map with cm level accuracy. The map can be updated continuously if required. With this map and localization, man and machine can have a shared world model (and understanding) to plan, direct and document the work performed by the machine.

CUSTOMER BENEFIT
The future is built on an increased amount of data. Data should be precise and up to date. The productivity improvements require more advanced automation which is dependent on good localization and accurate model of the environment. GIM Robotics can deliver this data to you, also in GNSS-challenged or even GNSS-denied environment.

COMPETITIVE ADVANTAGE
GIM-Locator provides infrastructure-free localization, working in all-weather conditions with unprecedented accuracy. It is combines multiple localization methods and thus is very robust and reliable. The technology is based on decades of solid basic research, and it continues to improve (accuracy, usability, robustness, etc.) every day with our constant R&D activities.

COMPANY
GIM Robotics was founded in 2014 as a spin-off, from decades of research in Automation Technology at Aalto University. GIM has been providing more intelligence to the mobile machines in various domains ranging from logistics to marine and everything in between.

Pertti Lukkari, CEO
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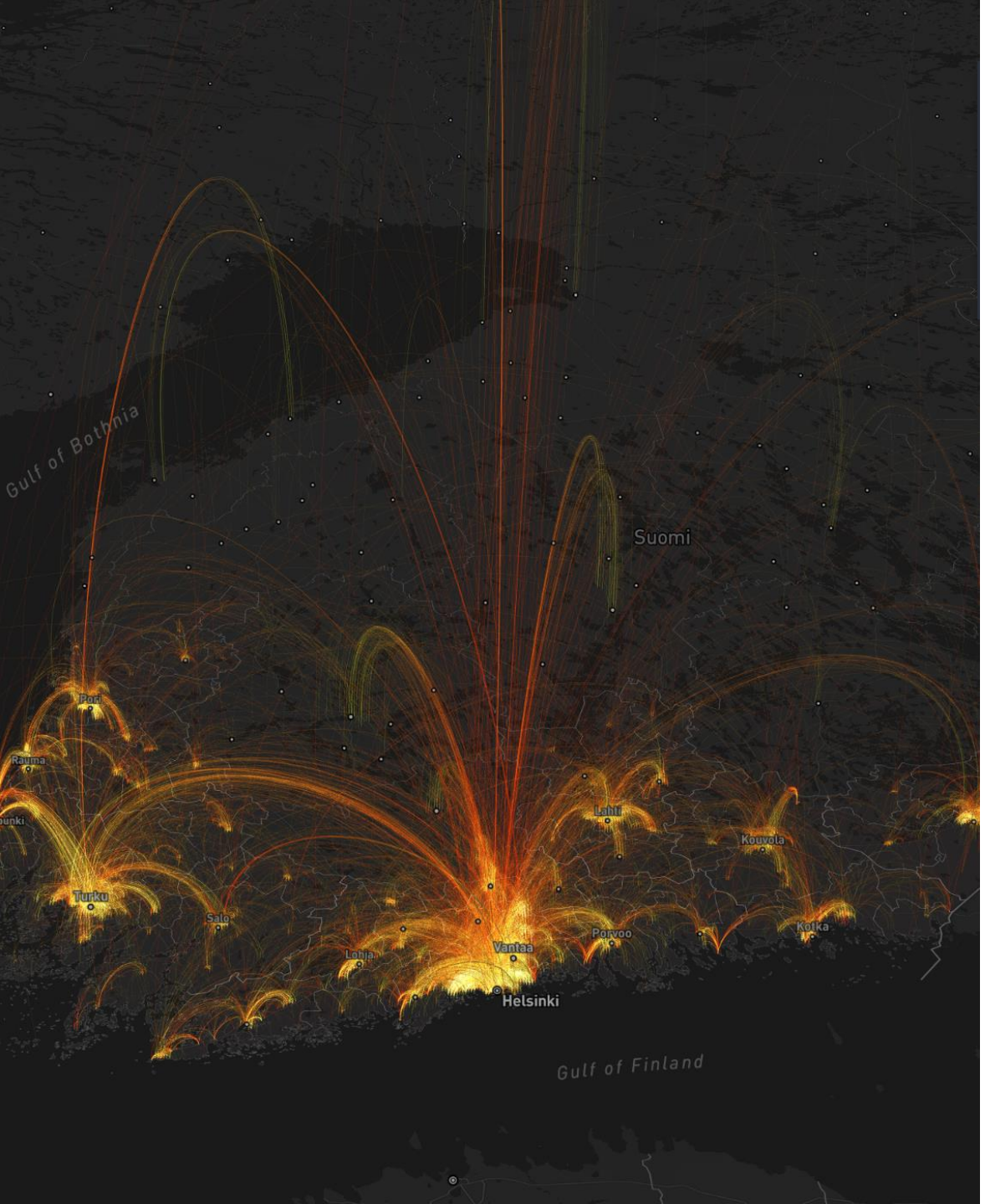
GIM ROBOTICS



FINLAND

ENTERPRISE GEOSPATIAL SOLUTIONS

OUR SOLUTION
Gispo adds value to its clients' businesses by maximizing the value of geospatial data. We guarantee that our clients get the most out of geographic data by providing Geographic Information System (GIS) consulting, GIS training, and GIS support for open source geospatial technologies.

CUSTOMER BENEFIT
Organizations can not leverage location data if it is not easily accessible and users are not exposed to the data. Open source geospatial software have proven their long-standing popularity as part of the modern GIS enterprise architecture.

COMPETITIVE ADVANTAGE
The "where" questions are becoming more and more central to all data analyses, and modern open source location-based technologies are the forces behind these developments.We are confident in addressing pressing societal issues with open source software for the greater good.

COMPANY
Gispo Ltd is one of the world’s enterprise leaders in open source GIS systems and geospatial technologies.

Santtu Pyykkönen, Sales Manager
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www.gispo.fi/en

GISPO

FINLAND

HARP TECHNOLOGIES BEYOND LIMITS

OUR SOLUTION

Harp Technologies Ltd is an expert on RF, microwave, and millimeter wave technology that provides high-quality design and development services. We focus on the design and development of microwave instruments (active and passive), microwave components (e.g., ferrite components), signal processing equipment (e.g. for the detection, localization, and classification of RF signals), and antennas.

BENEFIT

We support our customers and provide them with solutions in the area of radio frequency engineering (RF, microwave, and millimeter-wave technology). We - help our customers to develop innovative and competitive products - develop methods and technology to acquire critical measurement data.

COMPETITIVE ADVANTAGE

We provide superior added value and short development cycles to our customers. This is accomplished by our long experience, strong competence and know-how, state-of-the art design and development tools, and a wide range of testing equipment.

COMPANY

Harp Technologies was founded in 2007 and is privately owned. Our company is located in Espoo, Finland. We employ 15 professionals and have 1-2 M€ turnover. Our customers include companies, research institutes and governmental organisations.

Janne Lahtinen
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www.harptechnologies.com/

harp technologies ®

FINLAND

MORE THAN 30 YEARS IN SPACE DOMAIN

OUR SOLUTION

Huld has experienced and talented space engineer team, who can support many types of space projects in various domains. We have experience in both institutional and New Space projects. We can quickly deploy a team to support our customers. We support both SW and systems engineering in any phase of projects, of any size, from small work packages to large projects, remotely or collocated.

BENEFIT

We provide planning, developing and testing to our clients in space domain. Our customers have greatly benefitted of our services, including system assessment, testing and documentation support. We have revealed critical matters in our customers' systems and software, thus improving their business.

COMPETITIVE ADVANTAGE

Huld has worked within the European space industry since 1989. We have delivered more than 150 space projects, and several satellites carry our software. Huld has been supporting NewSpace missions with the experience gathered in the European Space Agency programmes, and in the non-space industry.

COMPANY

Huld is a European technology design house with over 450 employees. We bring more intelligence to our customers' business – and to the entire world. Huld has 13 offices in Finland & Czech Republic.

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https://huld.io/

huld
Beyond tomorrow

FINLAND

IT'S A NEW ERA IN CHANGE DETECTION

OUR SOLUTION

ICEYE delivers unmatched persistent monitoring capabilities for any location on Earth. Owning the world's largest synthetic-aperture radar constellation, the company enables objective, data-driven decisions in sectors such as insurance, natural catastrophe response and recovery, security, maritime monitoring and finance. ICEYE's data can be collected day or night, and through cloud cover.

BENEFIT

- Access accurate SAR images of any location on Earth – every few hours, day and night and in any weather.
- Benefit from rapid delivery of SAR satellites or get satellites as a service.
- Stay on top of increasing economic and insured losses with ICEYE's near real-time natural catastrophe monitoring.

COMPETITIVE ADVANTAGE

Truly effective change detection requires persistent monitoring. ICEYE's large constellation of new space satellites unlocks new access to valuable data on any location on Earth. From tracking fast-moving objects to addressing national security issues to potentially predicting natural disasters.

COMPANY

ICEYE is the first organization in the world to successfully launch SAR satellites with a mass of less than 100 kg. With the world's largest SAR constellation, ICEYE delivers unlimited global access and the highest frequency revisits on the market.

Tero Vauraste, Senior BD Advisor
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http://iceye.com/

ICEYE

FINLAND

CONTINUOUS FOREST AND LANDSCAPE MONITORING

OUR SOLUTION
We use satellite data to monitor landscapes to support managers and decision-makers active in the forest industry, conservation, impact investment and international development sectors.

CUSTOMER BENEFIT
Our routines continuously track change across forests and landscapes. Governments, regional authorities, industry and investors use our alerts and monitoring layers to confirm afforestation success and environmental compliance and demonstrate supply chain security.

COMPETITIVE ADVANTAGE
We leverage the power of satellite data to monitor forests and landscapes continuously. Indufor's process provides customers with the information and insights they need to manage resources efficiently.

COMPANY
Indufor Group is among the world's leading forest sector consulting groups with more than 42 years of experience providing high-quality information, analysis, and services for our clients throughout the forest industry value chains.

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https://induforgroup.com/

Indufor ...forest intelligence

FINLAND

INSTA - WORTH YOUR TRUST

OUR SOLUTION
Insta is a longtime provider and system integrator of C4ISR systems in defense area. Our expertise and solutions span from Cyber, network security and military protocols to full blown C2 systems and simulators. We also have experience on integration of sensors and effectors to command networks, data fusion and utilizing machine learning solutions on C4ISR systems.

CUSTOMER BENEFIT
We enable our customers to safeguard and leverage their data and networks and gain situation awareness over their operations. We do digitalization for you - with safety and security.

COMPETITIVE ADVANTAGE
Insta has long track record in delivering solutions in high security and quality requirement environments. Insta also has EMAR-21, EMAR-145 and EASA PART -145 and AQAP certifications which enable us to design, develop and maintain software and hardware solutions for military and civilian aviation.

COMPANY
Insta is a trusted partner for its customers in industry, defence and cyber security. We improve our customers' performance and profitability in a digitalizing world that is changing at an increasing pace.

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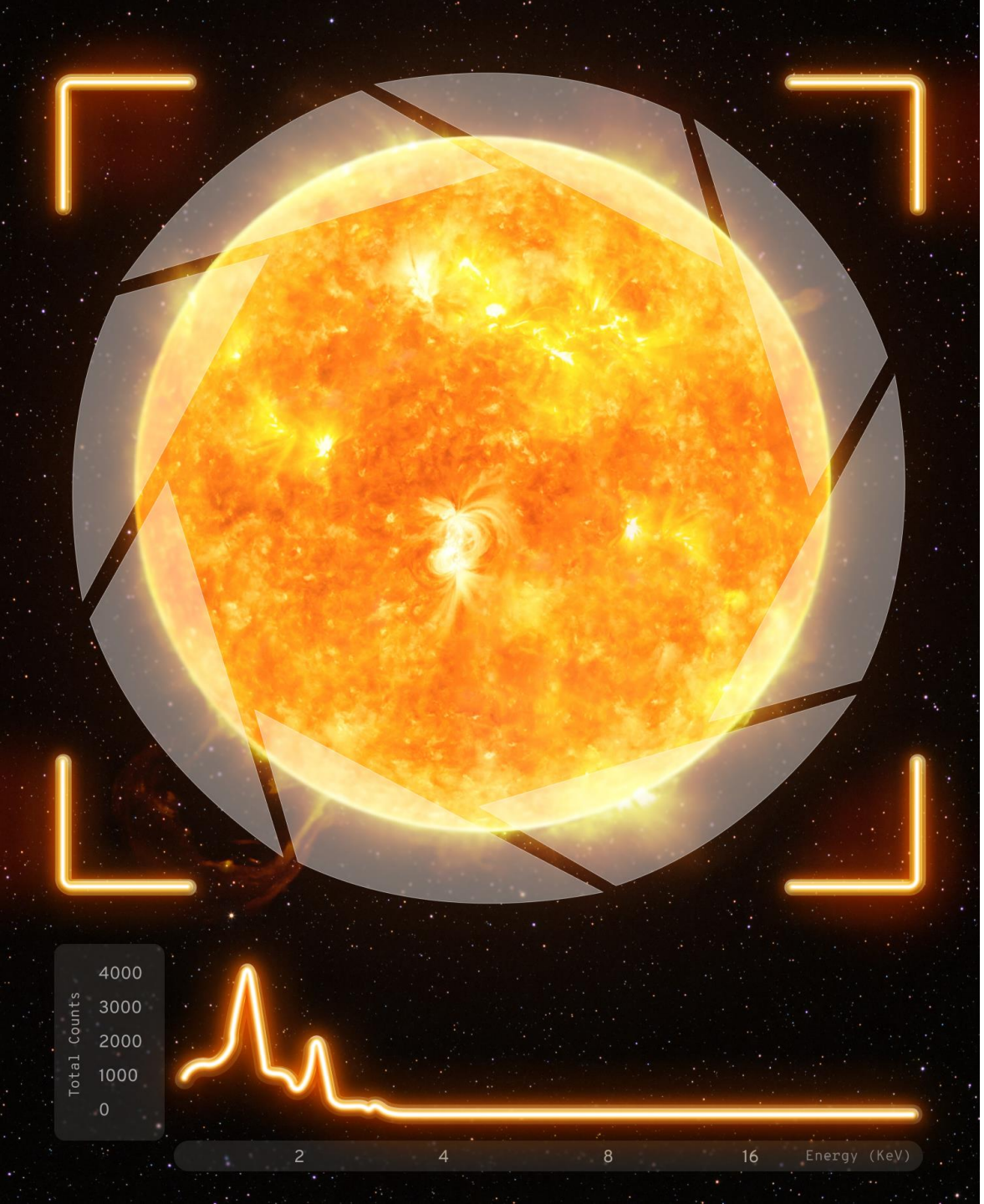
www.insta.com

INSTA



FINLAND

ACTIONABLE INSIGHTS FROM COMPLEX DATA

OUR SOLUTIONS

Space Weather instruments for LEO and Deep Space missions. The first X-ray Flux Monitor for CubeSats (XFM-CS) for ESA, that was built in a 1.5 year record time, is currently operating on-board the SUNSTORM LEO-mission of ESA. Next version of the XFM is being developed for use in a deep space platform of NOAA/NASA, and more solutions for space weather purposes will be available in near future.

BENEFITS

XFM-CS provides giant leap of performance, dynamic range, and data information value in X-ray monitoring of the Sun for Space Weather forecasting and services. The combination of high quality spectrum and flux data enables reliable estimates of space Weather effects, and high quality science.

COMPETITIVE ADVANTAGE

Improved/new:

- Digital broadband energy channel definition
- Order of magnitude improvement of speed and low pile-up with very high count rate
- Low background noise enables spectroscopic analysis at extremely low count rates
- Produces high-quality spectroscopic data for science of X-ray solar corona

COMPANY

ISAWARE provides situational awareness solutions based on advanced AI, and innovative space instruments for Space Weather and astrophysics research. Our team possesses significant experience in science, space technology, and information technology.

David Leal Martínez, CEO
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www.isaware.fi

isaware

FINLAND

MECHANICAL SOLUTIONS FOR THE AEROSPACE INDUSTRY

OUR SOLUTION

Keymet specializes in manufacturing of mechanical components for the Aerospace industry. Our production is optimized for lightweight aluminum components such as transponder boxes, ultralight aluminum boxes for satellites, panels and boxes for Airplanes and Helicopters.

COMPETITIVE ADVANTAGES

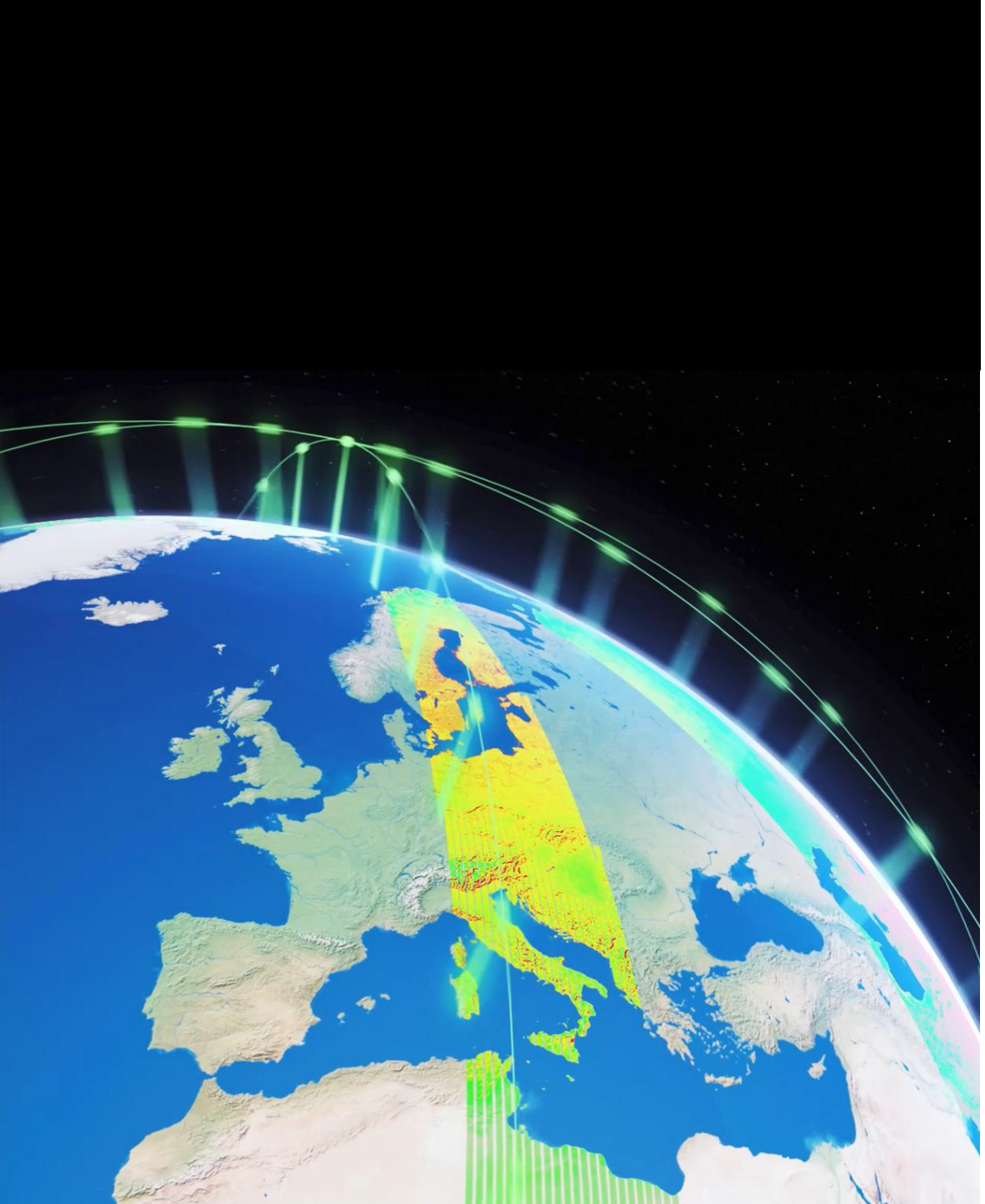
Our competitive advantage is the focus on complex aluminum products and the availability of both sheet metal and machining techniques as well as surface treatment and product marking possibilities. The long value chain enables full quality control and ready-made solutions. To support the manufacturing, we are using the newest and most accurate production machinery.

OUR COMPANY

Our Vision is to be the best and most modern company in our field in Scandinavia. Keymet is located in Ostrobothnia, Finland. The company is founded 1986 and employs 35 persons.

Mikael Lillvik, CEO
mikael.lillvik@keymet.fi, +358 50 357 6269
www.keymet.fi

KEYMET



FINLAND

REVEALING EARTH INSIGHTS USING HYPERSPECTRAL NANOSATELLITES SOLUTIONS

OUR SOLUTION

Near real-time, high fidelity hyperspectral data services and analytics with our proprietary satellite constellation.

BENEFITS

- Hyperspectral reveals details that other cameras cannot, e.g. crop health and type
- Multiple daily observations anywhere in the world
- Full end-user services from raw satellite data using AI and deep learning
- Fast delivery: From observation to operational insights in two hours

COMPETITIVE ADVANTAGE

100 hyperspectral satellites constellation for superior coverage and data quality

- Our Green Data® platform revolutionizes the Earth Observation data services resulting in 100x cost savings
- Highly experienced team - 100% mission success, including ESA's most ambitious small satellite missions

COMPANY

Kuva Space is a global new-space data products and services provider working to solve some of the world's pressing issues - climate change, food security and safety.

SERVICES

We deliver actionable and timely spaceborne data products and services using machine learning capabilities for the environmental, finance, insurance, and defence sectors.

Jarkko Antila
Jarkko.antila@kuvaspace.com
https://kuvaspace.com/

KUVA SPACE

KUVASPACE.COM

FINLAND

SIMULATION ENABLED R&D SERVICES

OUR SOLUTION

Future mobile and satellite communication networks are getting more advanced, but also more complex. Analyzing such advanced technologies, networks and/or deployments require detailed radio network simulators. Magister Solutions provides system simulation and R&D services targeted for development and optimization of future mobile and satellite communication networks, such as 5G and 6G.

CUSTOMER BENEFIT

Simulations assist in product and technology development, prototyping, parameter and algorithm optimization, standardization support, etc, before actual devices or networks exist. Magister SimLab simulation service packages our simulation capabilities for our customers.

COMPETITIVE ADVANTAGE

Magister Solutions has a long history related to design and development of wireless/mobile technologies and system simulators, and providing simulation supported R&D services for leading telecom and SatCom stakeholders.

COMPANY

Magister Solutions is Finnish SME specializing in network simulation tools and R&D services related to future mobile and satellite communication systems.

Jani Puttonen,
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www.magister.fi

MAGISTER SOLUTIONS

FINLAND

REPLICATING HUMAN SENSES FOR AUTOMATION

OUR SOLUTION
MarshallAI offers a comprehensive tool suite for replicating human sensing and building situational awareness. The platform enables organizations to deploy military-grade machine vision solutions for automation without writing a single line of code. Challenging custom solutions can be deployed in mere hours in addition to dozens of pre-existing applications ready off-the-shelf.

CUSTOMER BENEFIT
Customers can utilize vision and audio-based automation for their needs without costly and time-consuming R&D projects using existing hardware. Solutions for eg. automatically detecting and classifying drones or other intruders are readily available.

COMPETITIVE ADVANTAGE
MarshallAI enables all phases of AI powered machine vision development from data acquisition, initial model training, application configuration and deployment to semi-automatic model fine-tuning. Working automation can be deployed quickly even for novel applications and with limited datasets.

COMPANY
MarshallAI is a machine vision company based in Turku building machine vision based automation solutions for Smart Security and Smart City environments.

Marcus Nordström, CEO
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https://marshallai.com/

MARSHALL AI

FINLAND

EXPERT SERVICES FOR COMPONENT MANUFACTURING

OUR SOLUTION

Mectalent develops and manufactures customized solutions from individual components to large functional entities. We offer technical product development services, such as thermal and mechanics simulations, mechanical, electronics and automation design. We manufacture components that meet the most demanding precision mechanics needs as well as do assemblies and equipment manufacturing.

COMPETITIVE ADVANTAGE

We harness our extensive expertise to the competitive advantage of our partners. Our knowledge of the latest technologies helps us dive in our partner's operating environment. Thus, we are able to take into account the regulatory requirements and industry standards during product development and manufacturing as well as identify and avoid the risks and challenges that may arise.

COMPANY

For 40 years, Mectalent has been top expert in product development, precision mechanics and demanding equipment manufacturing for the most forward-thinking industries. We are part of the Finnish COR Group.

Matti Ojala, Sales Director
matti.ojala@mectalent.com, +358 40 581 6235
www.mectalent.com

mectalent

FINLAND

HEAR, DON'T GUESS

OUR SOLUTION
Using machine-learning algorithms, we measure, record, and analyze sound and vibration signal. We design, plan, and implement signal processing software, and algorithms for commercially available systems. Situational awareness for autonomous and remotely controlled machines Monitoring of industrial processes, public areas and transportation (airport, highway, railway, waterway).

CUSTOMER BENEFIT
We have the only system in the market that brings intelligent sound sensing and detection for remote-operated or fully autonomous work machines and vehicles.

COMPETITIVE ADVANTAGE
How sound analysis and detection can create value Know-how of the science behind the technologies The state-of-the-art solutions for sound analysis systems Risk free investment for knowledge in your product development We would like to help you to achieve your goals.

COMPANY
Meluta is a growth-oriented company specializing in signal processing, ML, AI. Our deep knowledge is on sound and vibration, also on sensor fusion related to the situational awareness, remote operation and communication audio dsp.

Markku Salmela, Founder, Business Lead
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www.meluta.fi

MELUTA

FINLAND

GAIN WIRELESS SYSTEMS SITUATIONAL AWARENESS

OUR SOLUTION
Our company specializes in real-time local monitoring of wireless networks at different kinds of physical sites. With our Wise product family, you can get real-time information about what kind of transmissions and devices are moving in your infrastructure. We have designed our sensor portfolio to meet different customer needs with optimal detection performance for each application.

CUSTOMER BENEFIT
Our customers receive real-time data and its visualization from their time-critical wireless systems. This helps them optimize their processes, pinpoint the bottlenecks, and security risks, and reduces downtime when problems occur. Our system future-proofs our customer's processes.

COMPETITIVE ADVANTAGE
Our systems information is based on our own hardware and software development. This allows us to develop new applications and data analytics for the system constantly. Since our business model is based on SaaS-Hybrid we can ensure steady turnkey service to our clients.

COMPANY
Missing-Link Oy was established in 2015 to answer today's modern cyber treads due to the growing usage of wireless connections at critical infrastructure. Today Missing-Link has a wide sensor product portfolio to fit different needs in the market.

Vihtori Lehtonen, Chairman of the Board
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www.missing-link.fi

Missing-Link
Wireless Security Solutions

FINLAND

BUILD YOUR NETWORK ON CUSTOMER'S TRUE NEEDS

OUR SOLUTION
Netradar helps telecom operators and government agencies running mission critical services to identify poor mobile experience and assist them to focus their investments in places where it matters the most to their customers. Netradar software based end-to-end solution helps our customers to collect network performance data directly from mobile handsets.

CUSTOMER BENEFIT
Netradar promise to our customers is simple, the data collected with Netradar is fully owned and controlled by our customers. With the insights derived from the Netradar solution, a true competitive advantage can be built by serving customers better.

COMPETITIVE ADVANTAGE
Netradar solution generates 1000x more data than any legacy solution – this in turn enables fast decision making. Netradar patent pending technology delivers data which is actionable and has features not available from anybody else such as network capacity, anomaly- and indoor detection.

COMPANY
Netradar is a technology company. We do not crowdsource data from 3rd party apps, and we do not sell data. Our solution is in use by tier-1 telecom operator groups and government agencies running mission critical services.

Jukka Hieta, Sales Director
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www.netradar.com

Netradar

FINLAND

SOLUTIONS FOR A NEW AGE OF DIGITAL AWARENESS

OUR SOLUTIONS
Nokia helps government agencies and cities use broadband networks and digital technologies to improve efficiency of first responders and to make faster, more informed decisions.
Our solution comprises hi-performance mission-critical wireless broadband networks, IoT and cognitive analytics platforms turning data into insights, video group communications, drones and an integrated operations center to provide 360-degree situational awareness, automate intelligence and enhance multi-agency cooperation.

CUSTOMER BENEFIT
- Detects incidents faster
- Helps get a better understanding of the situation, leveraging multimedia and IoT insights
- Enables quicker, more informed decision-making to act faster and more efficiently

COMPETITIVE ADVANTAGE
Nokia is unique in its ability to bring an end-to-end, high-performance mission-critical networking infrastructure as a turn-key solution to governments and cities that want to deploy private communications services that greatly enhance the situational awareness and safety of their first responders and citizens.

COMPANY
Our services range from networks to software and services to devices. Our clients are communications service providers, industries, the public sector and consumers.

SERVICES
Nokia's expertise encompasses mission-critical broadband networking, platforms, systems and applications to ensure reliable, high-performance rich-media communications for public safety environments.

Omar Almutar, Account Manager
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www.nokia.com/networks/industries/public-safety/

NOKIA

FINLAND

SATELLITE GROUND STATION SERVICES

OUR SOLUTION
NorthBase owns and operates satellite ground stations on X, S, UHF and VHF bands in Finland. The northern location provides excellent visibility especially to LEO satellites on polar orbit. Our own ground stations are located in Tampere and Muonio, first being our HQ city and the latter residing in Finnish Lapland, well north of the arctic circle. Global coverage is assured by our partner network.

CUSTOMER BENEFIT
When using our ground stations the satellite operator does not need to invest in own ground station network. Alternatively, we can complement the client's network with our antenna which is at 68-degree north latitude. We can offer both shared capacity or dedicated antennas.

COMPETITIVE ADVANTAGE
NorthBase operates from Finland which is known for its high technology and data security together with transparency and political stability. Our location is technically optimal as our visibility to polar orbit satellites is excellent. We are an agile startup with existing resources and more coming.

COMPANY
We are 100% Finnish owned company with transparent, secure and flexible Ground Station as a Service (GSaaS) services.

Tommi Rasila, Founder
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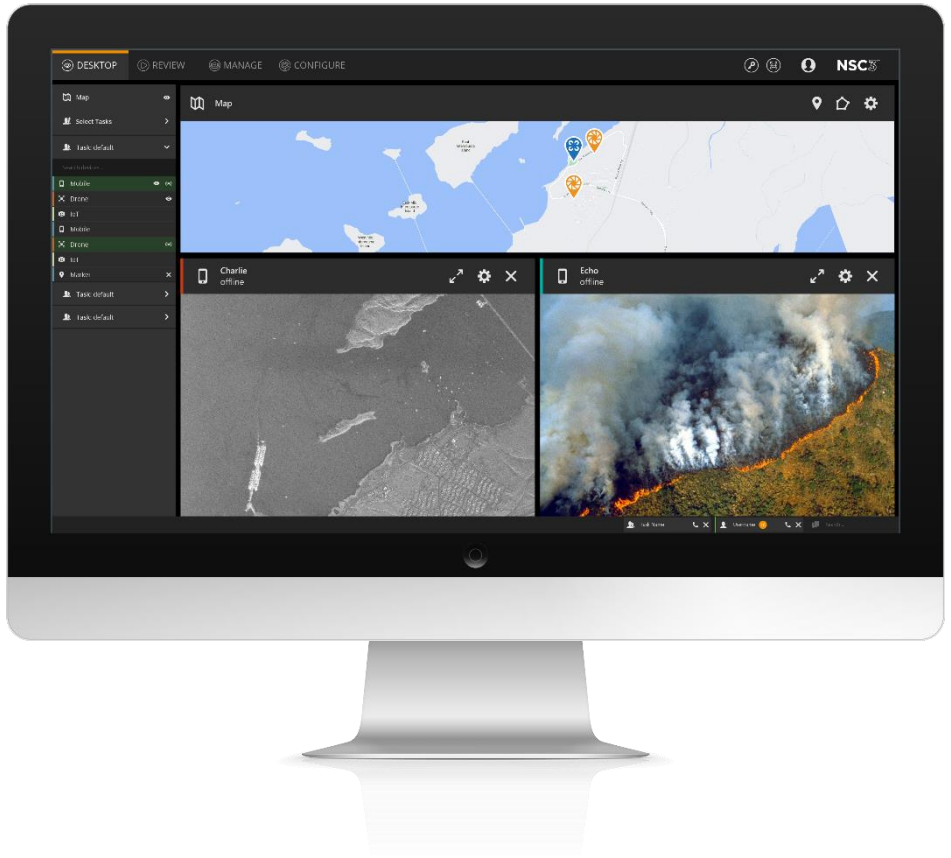
www.northbase.fi

NORTHBASE

FINLAND

VISUAL SITUATIONAL AWARENESS WHEN A SECOND IS A LIFETIME



OUR SOLUTION

NSC3™ enables real time video and data streaming from various devices like dashcams, drones, bodycams, smart glasses, surveillance cameras, mobile phones and satellites to enhance situational awareness. Stream and store secured live video and data to operators in the Field and in Control rooms

Any data source in NSC3™ can be run through the analytics engine and all detections are returned to user in real time. NSC Valor™ provides the engine to run existing or custom developed data models in user friendly manner.

COMPETITIVE ADVANTAGE

We provide a mission-proven, easily deployed and easy-to-use situational awareness platform for public safety operators and industry. Stream data from commercial off-the-shelf devices easily and securely.

Always have real-time images on view, even in poor network conditions with our patented low latency video transfer technology.

NSC Valor™ enables analytics for the real time video feeds and images.

COMPANY

The products and services of NSION Technologies form one of the most competitive and compelling mobile solution portfolios for situational awareness.

NSION Technologies delivers an automated highly secured true real-time video and data sharing platform NSC3™ and an analytics platform NSC Valor™.

Jani Marjamaa, Solutions Manager
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www.nsiontec.com/

NSION
TECHNOLOGIES

FINLAND

AGILE ALD SOLUTIONS

PICOSUN® P-1000 ultra-large scale batch ALD reactor for coating PCBAs, electronic components, and machinery parts.

OUR SOLUTION

Picosun's ALD (Atomic Layer Deposition) technology is the most advanced thin film coating method of today. Ultra-thin, pinhole-free ALD coatings combine unmatched uniformity and conformality with superior film quality and digital repeatability of the process. Hermetic ALD encapsulation protects e.g. PCBAs and electronic components against the challenging conditions of space. ALD coating also prevents COTS degassing and can protect against ATOX.

COMPETITIVE ADVANTAGE

ALD offers several advantages over traditional coating methods. With ultra-thin but high quality ALD films, the desired functionality can be achieved with much thinner layer compared to conventional methods, which saves costs and materials. ALD coatings do not increase the mass or dimensions of the coated object and the components stay re-workable after the coating is applied. As a gas-phase coating method with moderate process temperatures, ALD is optimal also for sensitive components and devices.

COMPANY

Picosun is the leading supplier of ALD thin film coating technology for microelectronics, aerospace, medical, and other industries. Picosun offers you the state-of-the-art thin film coating solutions for IC components, MEMS, LEDs, sensors, medical devices and implants, PCBAs, electronic components, and machinery parts, with the leading process quality, agile and innovative equipment design, and the most comprehensive after-sales support and services. Picosun is part of Applied Materials, Inc.

Marko Pudas
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www.picosun.com/

picosun
AN APPLIED MATERIALS COMPANY

FINLAND

DEVELOP EMBEDDED SOFTWARE FOR A MISSION-CRITICAL SYSTEM

OUR SOLUTION

Qt offers a unique software suite for the design, development, testing, validation, and operation of applications and services. Present since its inception in major space agency programs, Qt Group supports many players in the space industry in the US and Europe in the development of downstream applications that take advantage of Earth observation or positioning data, digital twins, connected objects to satellite communications networks, and real-time systems applications.

CUSTOMER BENEFITS

- **Reduced time-to-market:** The cycle of Prototyping – Development – Testing – Deployment is faster and more efficient with Qt.
- **Scalable Solution:** Qt is a cross-platform framework compatible with a multitude of operating systems and hardware.
- **Lower total cost of ownership (TCO):** Fewer resources needed and quicker time to market means a lower total cost of ownership and faster revenue recognition.

COMPETITIVE ADVANTAGE

The only company offering an integrated toolchain for embedded GUI development.

COMPANY

Qt Group (Nasdaq Helsinki: QTCOM) is a global software company with a strong presence in more than 70 industries and is the leading independent technology behind millions of devices and applications. Qt is used by major global companies and developers worldwide, and the technology enables its customers to deliver exceptional user experiences and advance their digital transformation initiatives.

Juha Varelius, CEO
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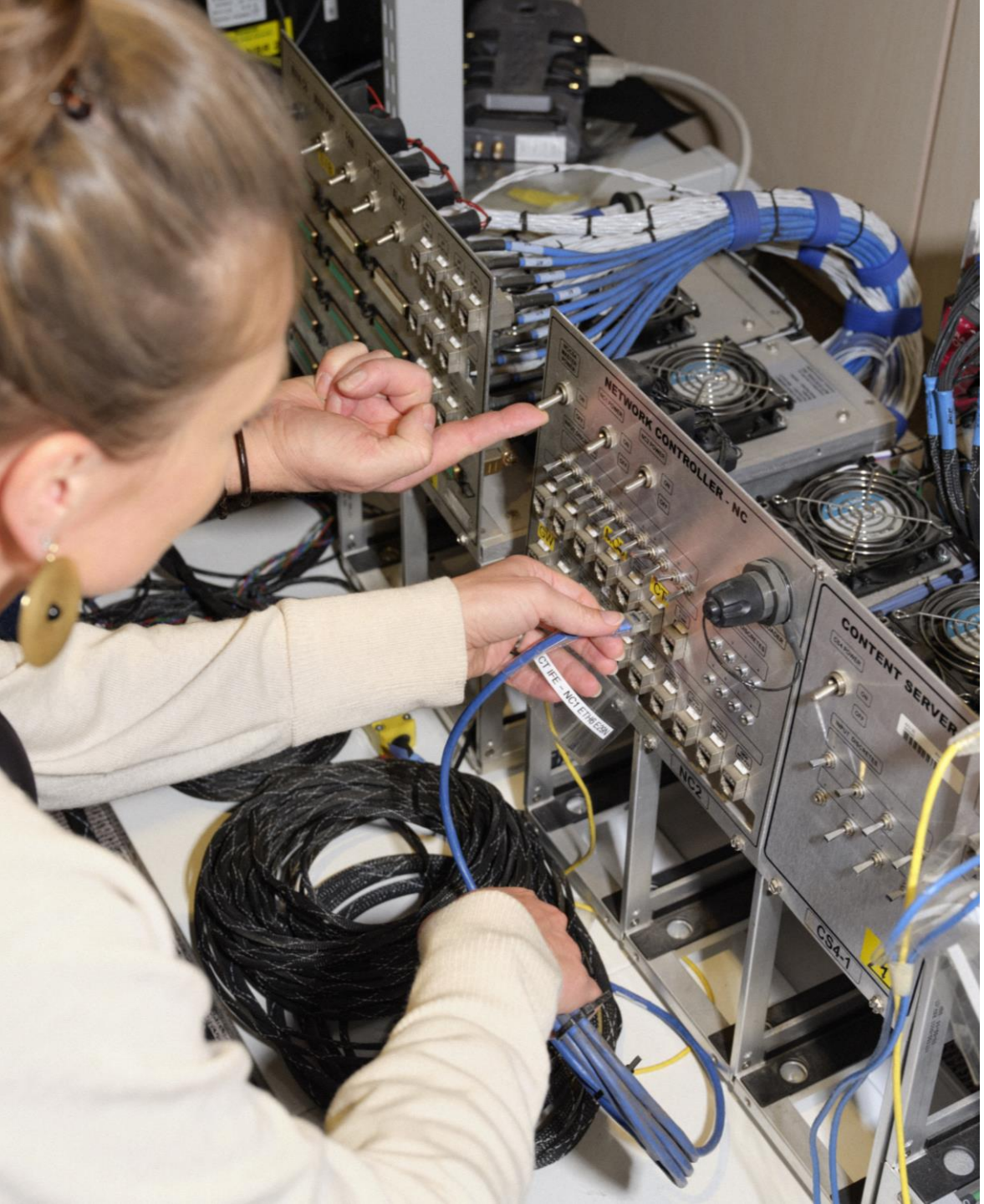

FINLAND

SOFTWARE DESIGN & SERVICES FOR IMPACT

OUR SOLUTION
We are a global technology consultancy that designs, builds and scales transformative digital products for today's most forward-thinking companies. Whether it's using AI to reduce flight emissions, taking shipping supply chains from the sea into the cloud, or fueling the finale of Game of Thrones, we make essential services work, better and better.

CUSTOMER BENEFIT
Our user centric and agile approach helps us to understand user needs and to optimize time to successful and measurable impact.

COMPETITIVE ADVANTAGE
We combine user-centric design with deep technology know-how, including ML/AI, and domain expertise from telecommunications, aviation, space systems and services, defence & security and more.

COMPANY
Reaktor is a strategy, design, and technology partner for forward-thinking companies and societies. We have offices in Finland, Sweden, Netherlands, Portugal, USA and Japan and provide our services globally.

Juha-Matti Liukkonen
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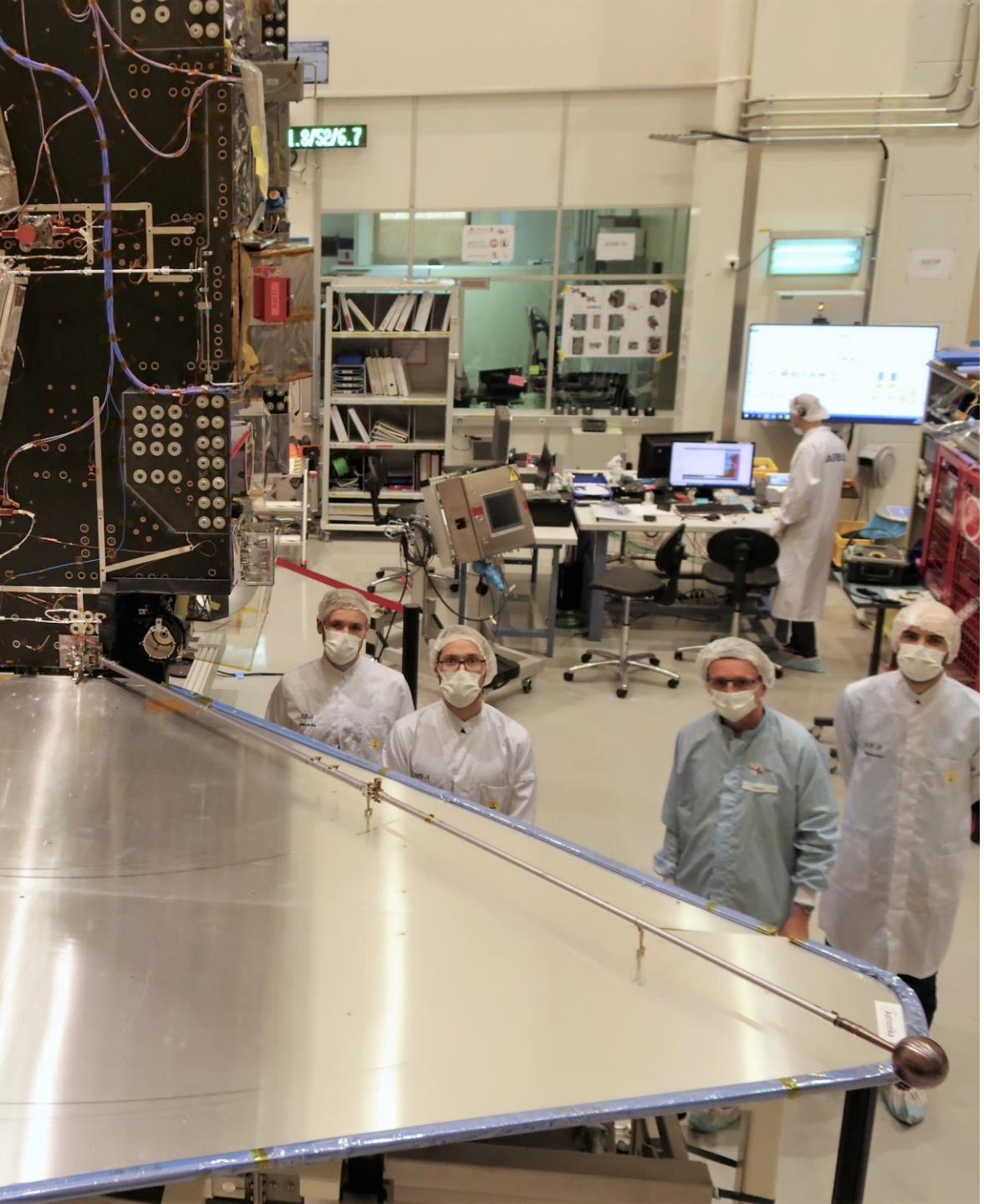
Reaktor



FINLAND

SOFTWARE DESIGN & SERVICES FOR IMPACT

OUR SOLUTION
Machine and equipment engineering, instrumentation and automation engineering, strength calculations.

CUSTOMER BENEFIT
Our services cover everything from pre-engineering to implementation and maintenance; understanding the customer's procedures as well as safety and environmental aspects.

COMPETITIVE ADVANTAGE

- Project deliveries - tailored project scopes.
- Engineering services - safe industrial solutions.
- Expert services - sustainable technical expertise.

COMPANY
Rejlers Finland is part of the global Rejlers AB company. Our customers operate in the areas of Industry, Buildings, Energy and Infrastructure. The company, established by the Rejler family in 1942, employs 2,500 people in Finland, Sweden, Norway and UAE.

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www.rejlers.fi

REJLERS

FINLAND

SOFTWARE-DEFINED MEO AND GEO SATELLITES

OUR SOLUTION

ReOrbit provides software-defined small satellites for MEO and GEO missions to supply the growing societal demand for connectivity and digitisation. Our vision is to redefine space, by bringing a paradigm-shift to the satellite industry and transform the traditional single-use satellites into autonomous, reconfigurable, and networked systems, thus enabling a new generation of space applications.

BENEFIT

We provide customers with lower cost of space-infrastructure, higher flexibility, faster development cycles than current players on the space market.

COMPETITIVE ADVANTAGE

We are dynamic, fast and customer-oriented with a unique software-based solution, at the forefront of the satellite industry.

COMPANY

ReOrbit is a newspace company founded in 2019 with headquarters in Helsinki. Our team comes with an extensive background from the space industry. We are growing fast organically based on a rigorous customer pipeline.

Sethu Suvanam
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www.reorbit.space

reorbit

FINLAND

EU MANUFACTURER OF GNSS REPEATERS

OUR SOLUTION
Our customers include a wide range of users who need GNSS signal reception or time synchronization. Users like telecom, public safety, defense, transport, airlines, logistics and companies manufacturing, selling and servicing GNSS systems, receivers, terminals and services.

CUSTOMER BENEFIT
We keep the fix alive with our GNSS repeater products and provide with the RF Over Fiber solutions stabile, secure easy to connect signal connections for any satellite signal transmission as well as for Network Time Protocol use cases.

COMPETITIVE ADVANTAGE
European manufacturer specialized through its products to support any use case that needs reliable solutions. being a Finnish company the R&D and support functions is always close to serve your needs.

COMPANY
Finland based marketing, sales, R&D and manufacturing company. Our presence is worldwide through our distribution network enabling local presence everywhere.

Simo Ruoko
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https://www.gps-repeating.com

ROGER™
GPS repeater

FINLAND

SASKEN SATELLITE EXPERTISE

OUR SOLUTION

Sasken has developed portable LTE based satellite terminal product family to its Global customer. Product family consist of mobile satellite terminal, handset, vehicular terminal, and active array antenna. To support mass production, Sasken developed production testers for both board level and final assembled product testing. Sasken has all needed R&D capabilities in-house like large Satimo antenna chamber, mechanics and environmental testing labs.

CUSTOMER BENEFIT

Sasken had a complete ownership of both Software and Hardware design and delivery. Sasken offering enabled customer to create full product family, production testers, test automation system in one-stop-shop.

COMPETITIVE ADVANTAGE

Sasken created world's first LTE over satellite communication product family. Turnkey R&D development of full product family and production test automation systems prepared customer to mass production in manufacturing.

COMPANY

Sasken is a specialist in Product Engineering and Digital Transformation R&D services. For over 30 years, Sasken has transformed the businesses of 100+ Fortune 500 companies, powering more than a billion devices through its services and IP.

Juha Istolahti, Sales Director
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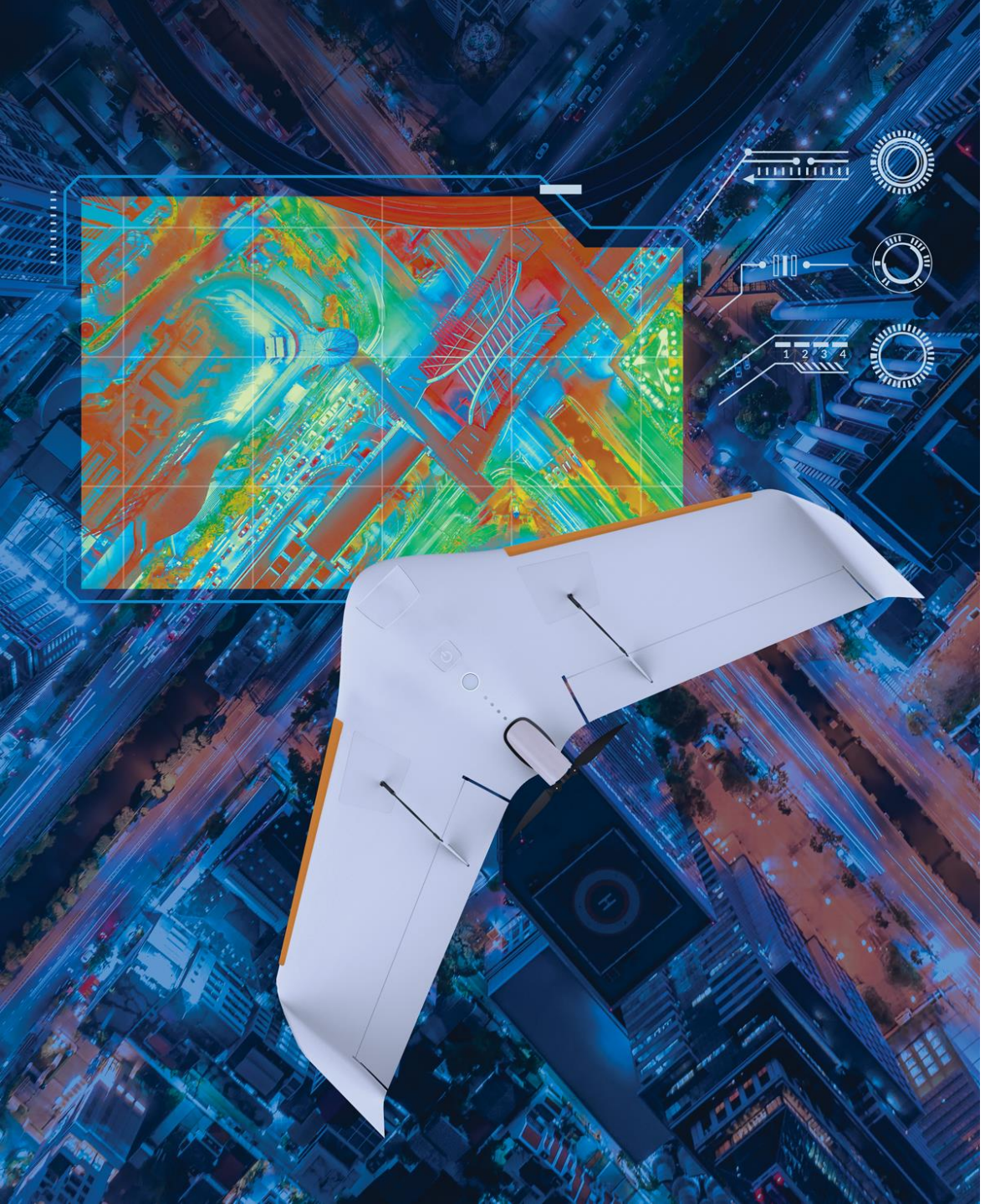
SASKEN



FINLAND

POSITIONING SOLUTIONS FOR TODAY AND TOMORROW

OUR SOLUTION

Septentrio designs and manufactures multi-frequency multi-constellation GPS/GNSS positioning technology for demanding applications. At the core of our receivers is the latest GNSS technology delivering reliable cm-level positioning. Our receivers are known for their outstanding performance, high level of security and resilience in challenging environments.

CUSTOMER BENEFIT

Our goal is to find the ideal high-accuracy positioning solution for your technology or application. Our Open technology, various interfaces, drivers, APIs and intuitive software help you to easily and efficiently integrate GNSS solutions, reducing implementation and deployment times.

COMPETITIVE ADVANTAGE

Featuring unmatched anti-jamming and anti-spoofing technology, Septentrio receivers operate reliably even under intense radio interference, which grounds other commercial receivers or sets them on the wrong track.

COMPANY

Septentrio provides positioning solutions for industrial applications such as robotics, construction, survey and mapping, scientific, reference networks, maritime, logistics and UAVs among others. Headquarters in Belgium and an R&D center in Finland.

Stefan Söderholm, General Manager
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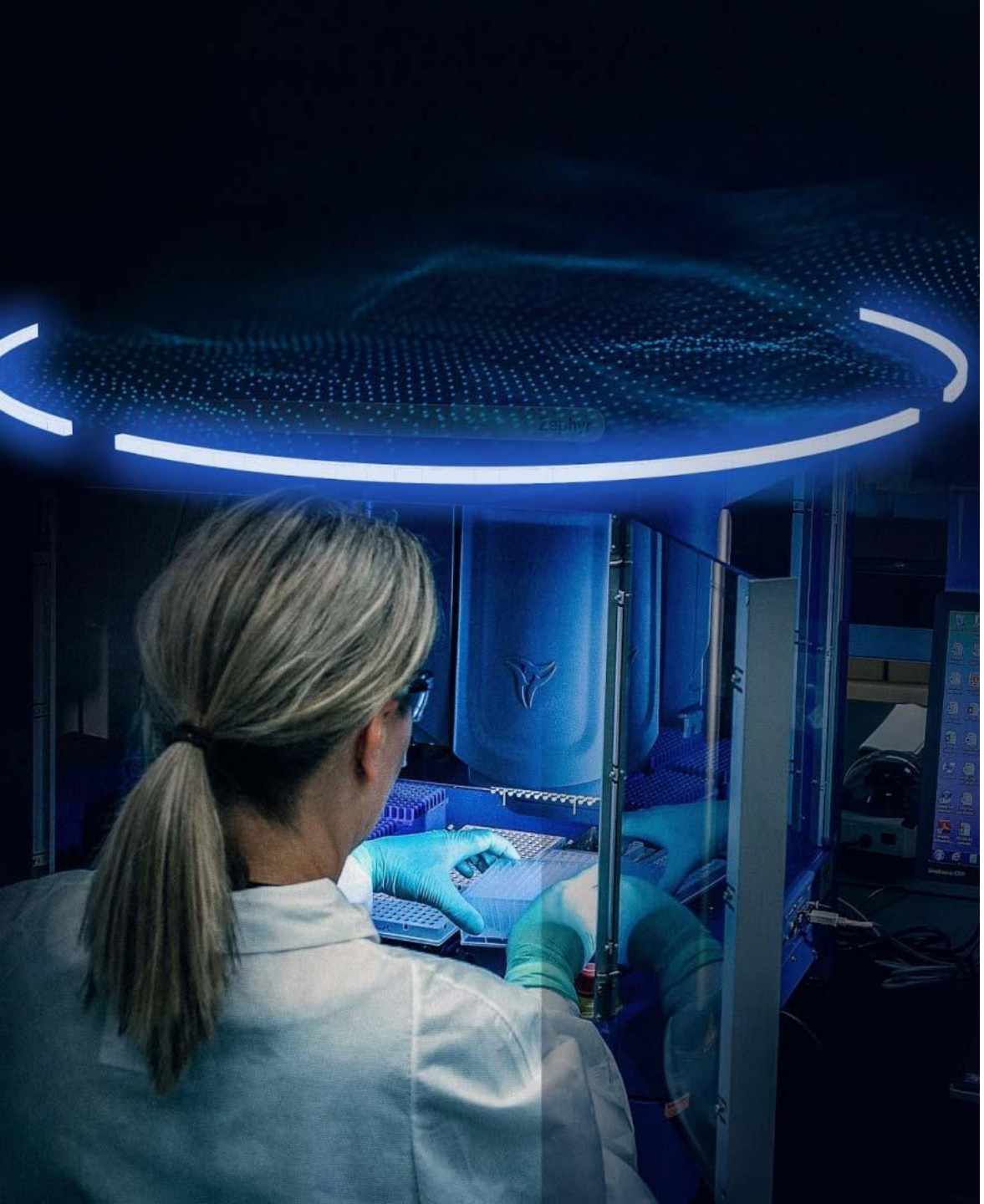
septentrio



FINLAND

LARGEST PRIVATE AI LAB IN THE NORDICS

OUR SERVICES

We connect leading AI scientists with real-world problems and help companies succeed in building cutting-edge AI.

CUSTOMER BENEFIT

As a trusted AI partner, we assure that companies stay competitive at a time when AI is globally being widely adopted.

COMPETITIVE ADVANTAGE

State-of-the-art AI expertise

- Deep and specialized AI expertise, a unique ability to attract and keep world-class AI talent

Trusted AI partner

- Trusted advisor with a service mindset and flexible working model for a unique customer experience

End-to-end capability

- With expertise spanning the tech stack and operations, realize the best outcome and maximum value

COMPANY

Silo AI is the largest private AI lab in the Nordics – a trusted AI partner that brings competitive advantage to product R&D. We build AI-driven solutions and products to enable smart devices, autonomous vehicles, industry 4.0, and smart cities. Silo AI provides its customers a unique access to world-class AI expertise, as well as the Silo OS infrastructure to speed up AI development and deployment. Established in 2017, Silo AI is on a mission to build a European flagship AI company with offices currently in Finland, Sweden, Denmark, and Switzerland.

Pertti Hannelin, VP Business Development
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www.silo.ai

SILO AI

FINLAND

HIGH-PERFORMANCE WEATHER FORECASTING

OUR SOLUTION
Skyfora offers next-generation weather technology, ultralight weather instruments and forecasts based on artificial intelligence.

BENEFIT
With climate change making weather more extreme and less predictable than before, accurate high-resolution data are central for the safety and smooth operations of businesses and society.

COMPETITIVE ADVANTAGE
Skyfora's cutting-edge technology offers disruptive ways to hugely increase the accuracy and resolution of weather data. Skyfora has 5 patents granted or pending.

COMPANY
Skyfora consists of experienced heavyweight professionals in atmospheric science, artificial intelligence, weather instrument engineering and business development.

Svante Henriksson
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https://skyfora.com/

SKYFORA

FINLAND

FEEDING ASTRONAUTS FAR, FAR FROM HOME

OUR SOLUTION

Solar Foods uses gas fermentation technology to produce single-cell protein called Solein®. Its production disconnects food production from agriculture, i.e. from fertile land use and photosynthesis without the need for agricultural raw material inputs. Main ingredients are CO2 and H2. Solein® is a naturally occurring hydrogen oxidizing bacteria that is nutritionally close to dried soy and meat.

BENEFIT

Solein is nutritionally close to dried soy or meat, and provides all the necessary micronutrients needed for a healthy meal. As it can be grown without the need of agriculture, the technology is particularly well suited for human space exploration - food production en-route, or on Moon or Mars.

COMPETITIVE ADVANTAGE

Advantages over

- Conventional (pack&go): weight, launch cost, shelf-life
- Plant-derived proteins: resource-intensive, agriculture-constrained, water-intensive
- Algae: cost, palatability, taste
- insects: production complications, palatability, acceptability.

COMPANY

Solar Foods is a food technology company on a mission to revolutionize global food production. The way humanity is feeding itself is putting our planet at risk. Solar Foods has found the next step in the evolution of our food system.

Arttu Luukanen
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www.solarfoods.fi

SOLAR FOODS

FINLAND

ENABLING LOCATION INTELLIGENCE

OUR SOLUTION

Spatineo has a high expectancy in providing standardized resilience geospatial APIs, scalable infrastructures for data sharing, and usage of satellite data, and we offer high-level data analytics and data science services.

CUSTOMER BENEFIT

Our customers get the full benefits of interoperable, efficient and robust geospatial web services when working with Spatineo. We deliver fast and robust MVPs and build long-lasting solutions with expertise and international experience.

COMPETITIVE ADVANTAGE

Spatineo is a pioneer in location-based data modelling, and we've built some of the most robust services in the geospatial industry. We are a long-standing AWS technology partner, and we've also been developing some of the standards of the geospatial industry (OGC, INSPIRE, ISO).

COMPANY

Spatineo has helped businesses and public organizations over 10 years to utilize spatial data better. We have become one of the leading Finnish experts in geospatial information processing.

Oskari Häkkinen, CEO
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www.spatineo.com

Spatineo

FINLAND

SPECIM - SPECTRAL IMAGING MADE EASY

OUR SOLUTION

Specim is the leading global supplier of hyperspectral imaging solutions. We offer the broadest range of hyperspectral cameras, imaging spectrographs, software systems, and accessories for industrial and research applications and airborne.

CUSTOMER BENEFIT

Specim is a trusted partner with superb quality and cost-efficient products and support. With our strategy, "Spectral imaging made easy," our customers can rely on our technology and products' scalability, fast and accurate information, and a high return on investment.

COMPETITIVE ADVANTAGE

Specim has developed the first hyperspectral cameras that meet the requirements of industrial machine vision in terms of speed and accuracy while remaining the perfect solution for scientific research & development and governmental projects.

COMPANY

We are an international team of +80 experts. With the headquarter in Finland, sales offices in the US, China, and Germany, and a worldwide partner network, we operate all around the world. Specim has been a part of Konica Minolta's Group since 2020.

Katja Lefevre, Application Engineering Manager
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www.specim.com

specim
A Konica Minolta Company

FINLAND

DEFENSIVE CYBERSECURITY SOLUTIONS

OUR SOLUTION

- Zero Trust (ZT) solutions for managing privileged access and credentials with a passwordless and keyless approach
- Secure Access for Operational Technology (OT) and critical infrastructure
- Defend your long-term critical secrets with quantum-safe cryptography (QSC) against the quantum threat

CUSTOMER BENEFIT

1. Mitigate risks of permanent credentials, stay compliant, & automate tasks
2. Secure your mainframes, servers, sites, and data centers
3. Protect and encrypt your confidential and classified data
4. Build your security together: you, us, and our vast global partner network

COMPETITIVE ADVANTAGE

We have 5,000+ customers worldwide, including 40 percent of Fortune 500 companies and major organizations in the Finance, Government, Retail, and Industrial segments. Our products have been proven in use for over +25 years and are built to stand in the future.

COMPANY

SSH Communications Security is a defensive cybersecurity company with a mission to secure critical data and communications between systems, automated applications, and people. The company's shares (SSH1V) are listed on Nasdaq Helsinki.

Lauri Koponen, Communications Manager
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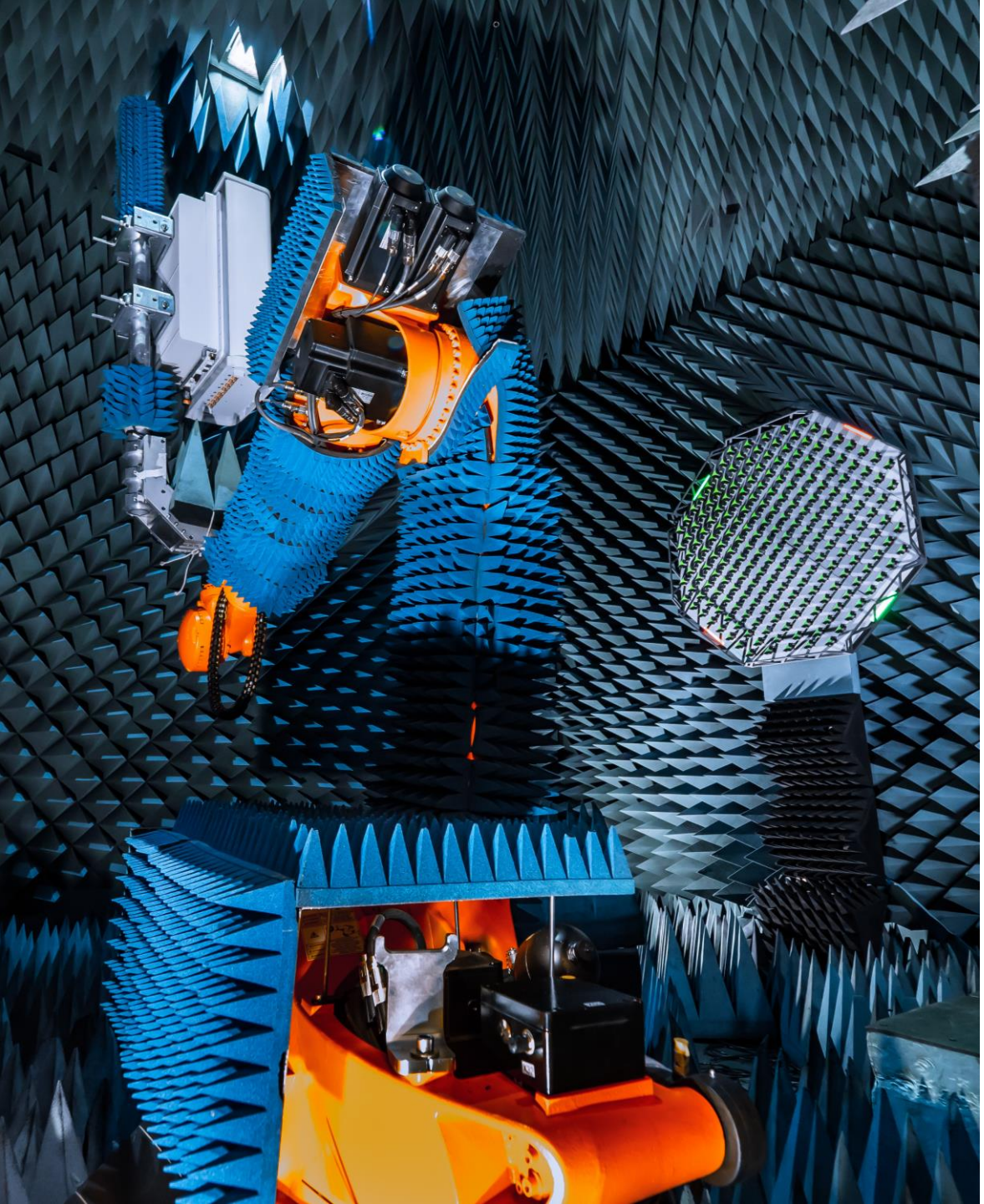
SSH



FINLAND

VERKOTAN

OUR SOLUTION

We offer services for wireless performance testing. These include passive and active antenna performance testing, including accredited 5G active beamforming antenna performance testing, accredited and pre-compliance over-the-air (OTA) device testing, accredited specific absorption rate (SAR) testing and RF exposure evaluations. We also provide tailored new test systems and solutions & consulting.

CUSTOMER BENEFIT

Verkotan’s strategy is to provide value beyond standard test results. We utilise our multi-decade expertise to help our customers to concentrate on the right set of tests, improve the entire solution performance, or even develop an entirely new test method.

COMPETITIVE ADVANTAGE

Verkotan's competitive advantage is based on the deep expertise of its personnel in the radio frequency testing. Verkotan's fully owned, in-house developed and highly flexible testing software enables to develop new tests and modify existing tests according to customer needs.

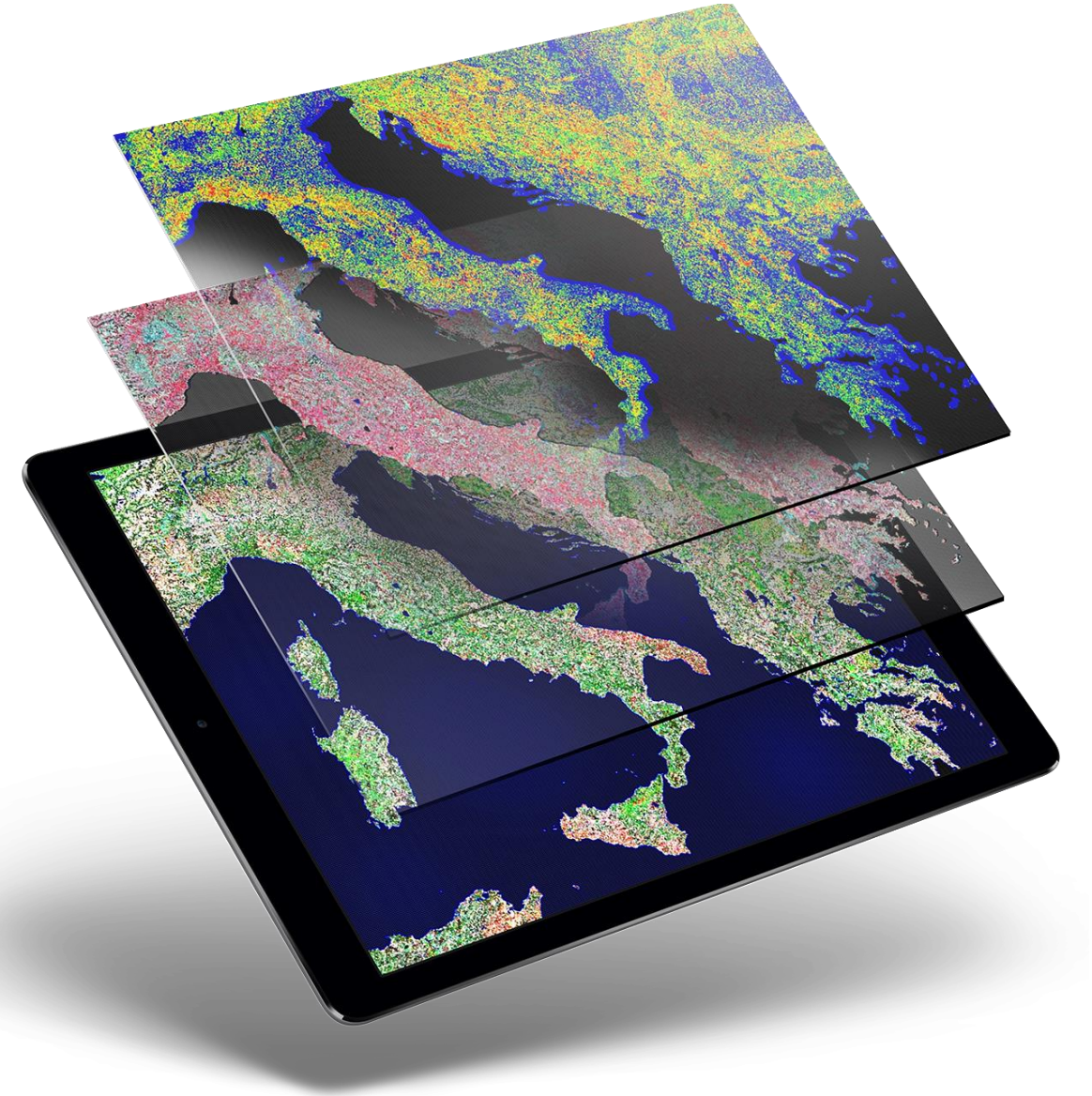
COMPANY

Verkotan has been established 2014 and is located in Oulu. We have over 200 customers from over 25 different countries and four continents. Verkotan serves companies from start-ups up to Tier 1 mobile device and telecom manufacturers & operators.

Kari Komonen, CEO
kari.komonen@verkotan.com, +358 40 500 1241
www.verkotan.com

Verkotan

FINLAND



RESHAPE YOUR VIEW ON THE WORLD

OUR SOLUTION
Terramonitor is developing the world's most dynamic and comprehensive satellite data-based mapping and analyzing platform. Our AI-based solution automates the satellite data acquiring and processing chain to deliver user-ready data for our customers. Our mission is to enable easy access to Space Data for all businesses.

Our product portfolio consists of visual products like constantly updating maps, GIS data in user-ready forms or statistical tables and system integration products for further processing by our customers.

COMPETITIVE ADVANTAGE
Our products can be integrated into any system thru common mapping protocols, standardized data formats or via API.

Joni Norppa
joni.norppa@terramonitor.com
www.terramonitor.com/

Terramonitor

FINLAND

SPACE-PROOF TECHNOLOGY

OUR SOLUTION

Vaisala is a global leader in weather, environmental and industrial measurements. Building on over 80 years of experience, Vaisala provides observations for a better world, with space-proof technology exploring also Mars, and beyond. Technological innovations and the persistent curiosity to explore the world around us have characterized Vaisala from the very beginning, reaching from land to space. Vaisala’s innovative technology in onboard the NASA’s Mars rovers Curiosity and Perseverance, in collaboration with Finnish Meteorological Institute (FMI). Vaisala's sensor technologies are utilized in space exploration due to their extreme accuracy, durability, and stability which are vital due to the extreme environmental conditions in space. Vaisala's maintenance free sensors can withstand extreme heat and cold and are highly tolerant of turbulence and vibration of the space travel.

COMPANY

Based on that same technological know-how, we provide reliable, accurate and innovative measurement products and solutions that enable better decision-making, increased productivity, and improved safety and quality. Customers all over the world and in a multitude of industries use our measurement solutions. Everywhere from forecasting weather and making sure it is safe for your flight to take off, to staying ahead of power outages or monitoring incubators for vaccine development, you can find Vaisala’s premium measurement solutions in action.

Headquartered in Finland, Vaisala employs approximately 1,850 professionals worldwide and is listed on the Nasdaq Helsinki stock exchange.

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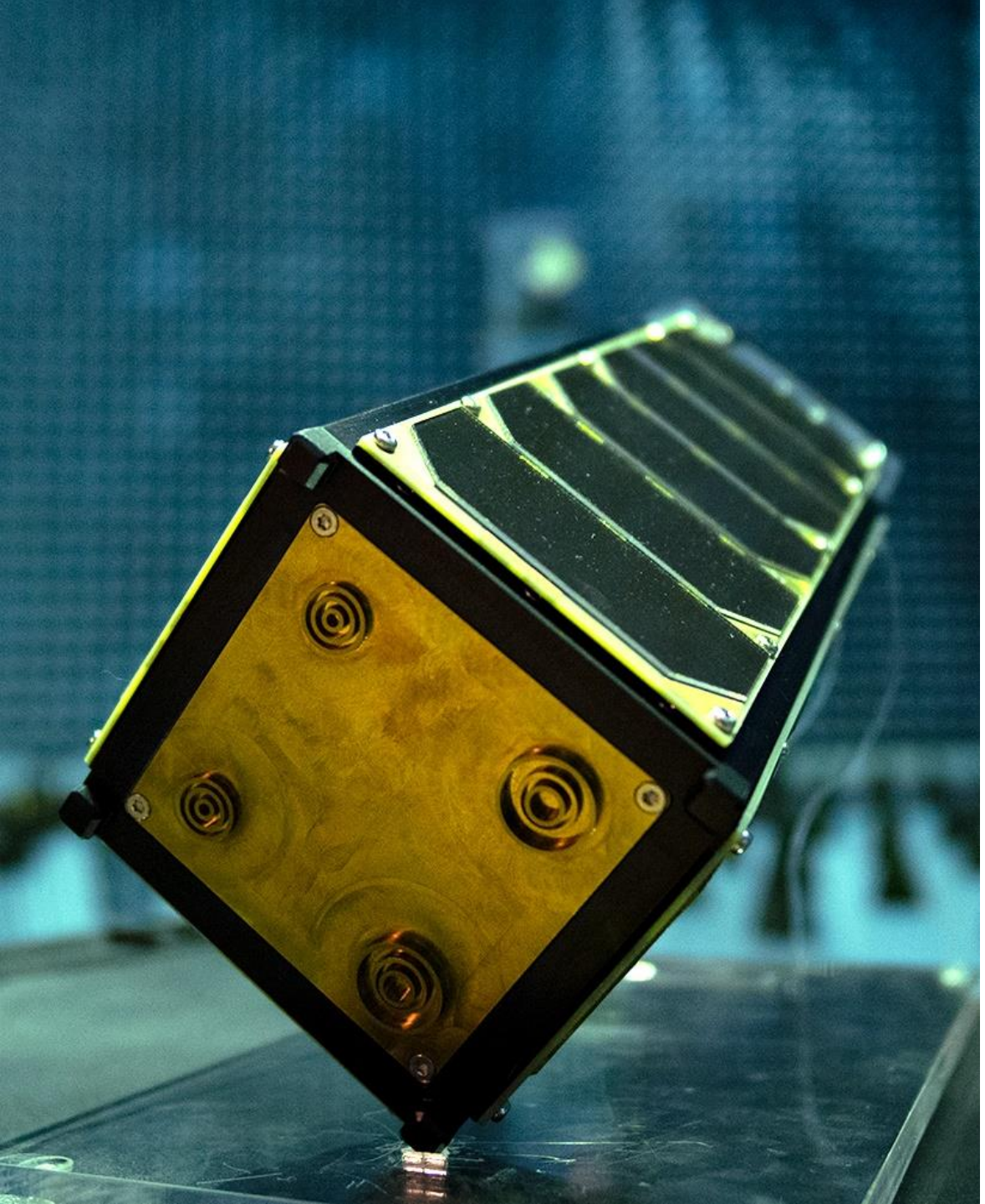
www.vaisala.com

VAISALA



FINLAND

R&D SERVICES FOR SPACE TECHNOLOGIES

OUR SOLUTION

VTT develops imaging sensors, small satellite platforms, communication HW and services for satellite imagery analytics. We promote technology integration by developing solutions for integrating communication technologies in space and terrestrial networks. Airborne systems, e.g. drones and high-altitude platforms (HAPS) will be parts of the integrated system.

CUSTOMER BENEFIT

We help you throughout the development and deployment of satellite systems, including integrated non-terrestrial and terrestrial networks. We can support your satellite R&D investment road map and help manage risks by providing better understanding of what is possible.

COMPETITIVE ADVANTAGE

VTT has decades of experience in developing space based science instruments, earth observation solutions and communication technologies. We offer you the entire development cycle from innovation to payload qualification.

COMPANY

VTT is a visionary research, development and innovation partner. We drive sustainable growth, tackle the biggest global challenges, and turn them into growth opportunities. We are at the sweet spot where innovation and business come together.

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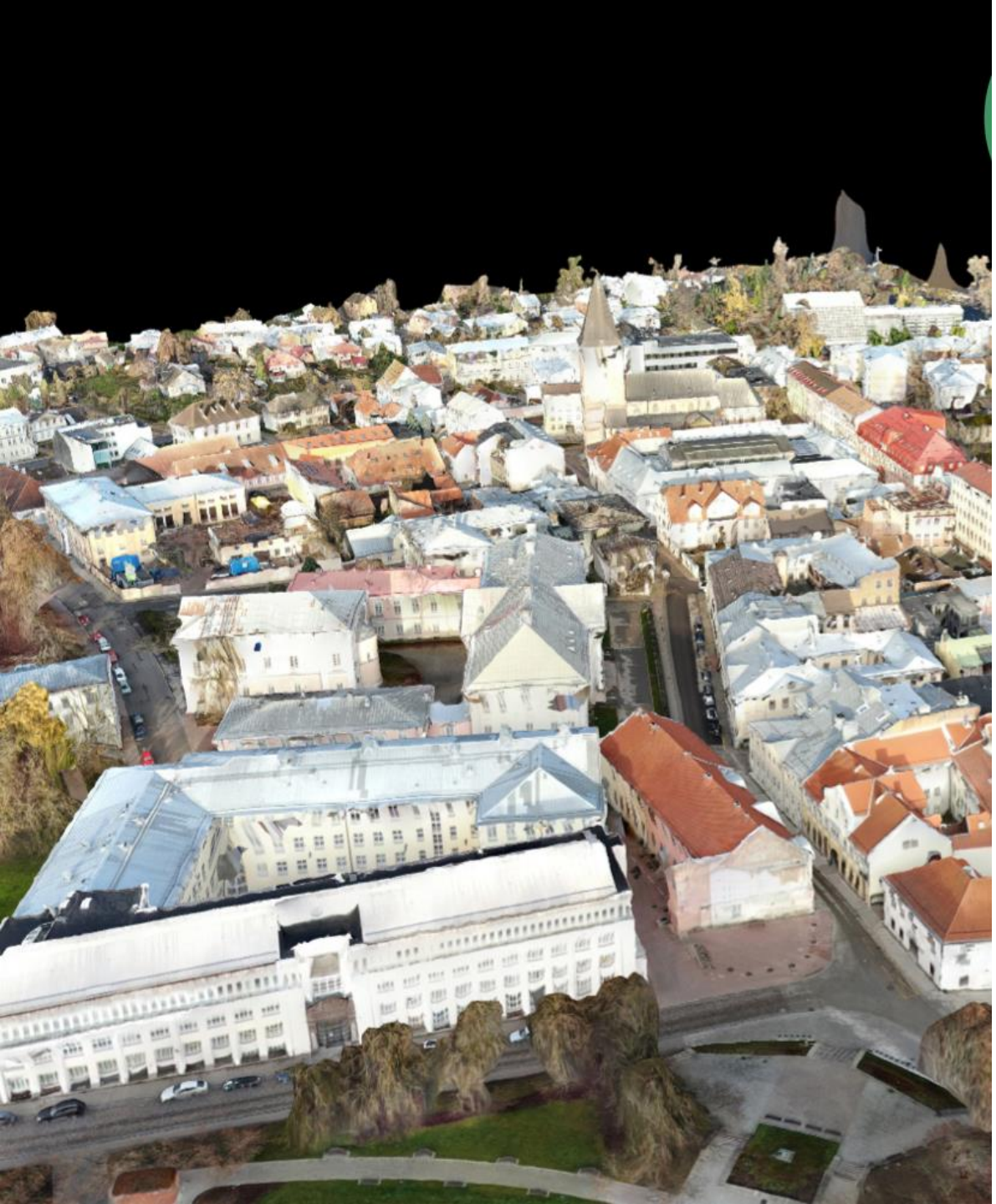
VTT



FINLAND

ZERO GRAVITY

OUR SOLUTION

We are building next generation software for smart cities & smart mobility based on satellite & drone imagery data, data fusion and AI to model close to real time urban area state. We combine earth observation data technologies with comprehensive analytic dashboards to provide a full picture of urban, environmental, mobility states of cities. Our mission is to help building sustainable cities and communities by means of satellite data and increase awareness towards climate change by our product. Main customer groups are smart cities, insurance, smart energy companies.

CUSTOMER BENEFIT

- Digital twin based on data fusion from satellite & drone data
- Making smart city data FAIR: findable, accessible, interoperable, reusable
- Facilitate the transformation towards designing carbon neutral urban spaces
- Provide a situation picture for smart cities&urban spaces based on analytics on satellite & drone data

COMPETITIVE ADVANTAGE

- Paying clients
- High-tech team with PhDs and more than 10 years of software development and data science together with business expertise
- 3 developed satellite data Apps in 2018 that won top prizes from international space tech programming competitions
- We finished European Space Agency (ESA) business incubation program (BIC) on 30th of April 2020.

Olga Bodet, CEO
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ZERO GRAVITY

FINLAND

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