

# VTT in space

## New solutions for global challenges

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# VTT – beyond the obvious

VTT is one of the leading research, development and innovation organizations in Europe. We help our customers and society to grow and renew through applied research. The business sector and the entire society get the best benefit from VTT when we solve challenges that require world-class know-how together and translate them into business opportunities.

## Our vision

A brighter future is created through science-based innovations.

## Our mission

Customers and society grow and renew through applied research.

## Strategy

Impact through scientific and technological excellence.

Established in

**1942**

Owned by

Ministry of  
Economic  
Affairs and  
Employment

**268 M€**

Net turnover and  
other operating  
income (VTT  
Group 2018)

**2,049**

Total of personnel  
(VTT Group  
31.12.2018)

**31%**

Doctorates and  
Licentiatees  
(VTT Group  
2018)

**44%**

from abroad  
(VTT Group  
2018)

# Deep knowledge across technologies and co-operation globally

- Several world's first or smallest satellite instruments in space
- 50 top international space researchers
- World class in-house qualification and testing facilities
- Participation in missions in areas of Earth observation, deep space and NewSpace
- Working with key partners: ESA, NASA (JPL), Jaxa (Japan)

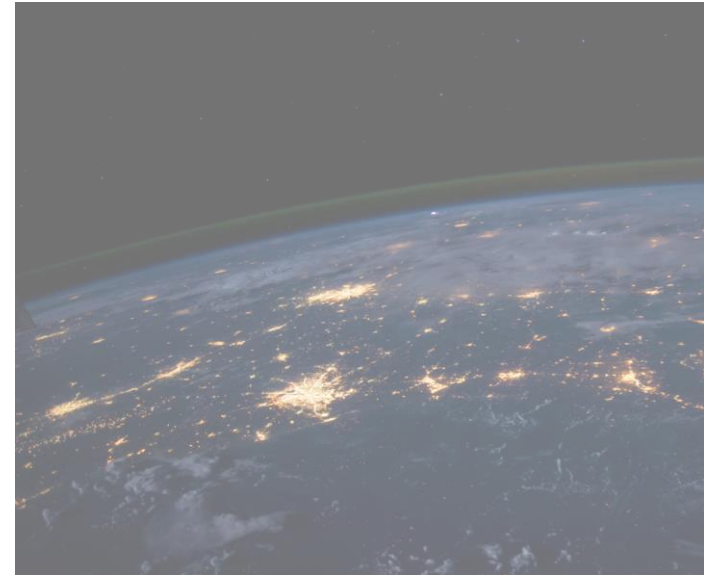


Photo by NASA on Unsplash

# New solutions for global challenges

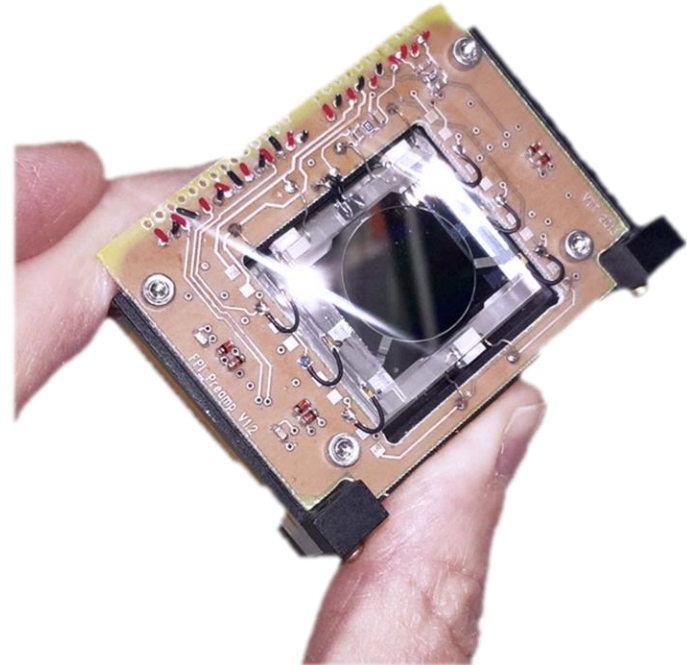
- The world's first hyperspectral cameras for nanosatellites provide new solutions for climate action and resource sufficiency
- The leading edge communication technologies support the future human missions to Mars and beyond
- The world's most sensitive radio receiver reveals more precise information about the origin of universe



Photo by Greg Rakozy on Unsplash

# Leading edge key technologies

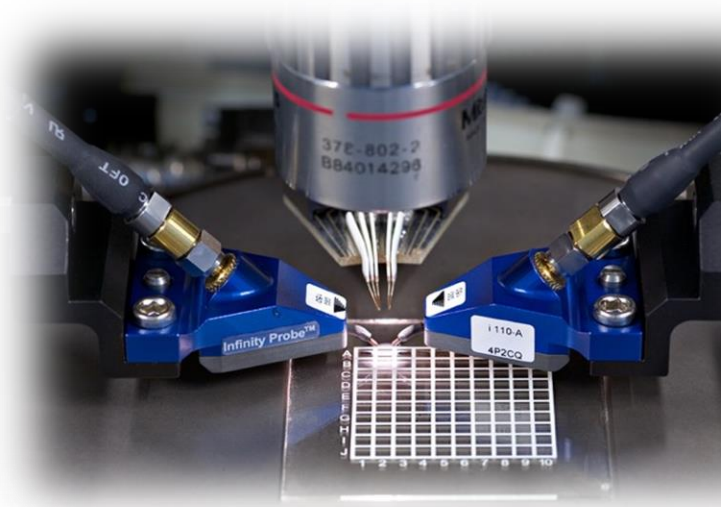
- Sensors, imaging and data analysis
- Instruments for nano-satellites, e.g. Hyperspectral cameras
- Millimetre wave technology
- Radio and RF technology
- Dynamic spectrum management and 5G applied to space
- Analysis methods for Sentinel and other Earth observation data





# Antennas and RF components

- Our innovations minimise product size while maintaining the best possible radio performance and reliability
- From early phase concept research and development to final product optimisations
- On-wafer and antenna characterisation services through MilliLab
- In the area of millimetre wave technology, we work in close collaboration with ESA and NASA



# World class testing facilities

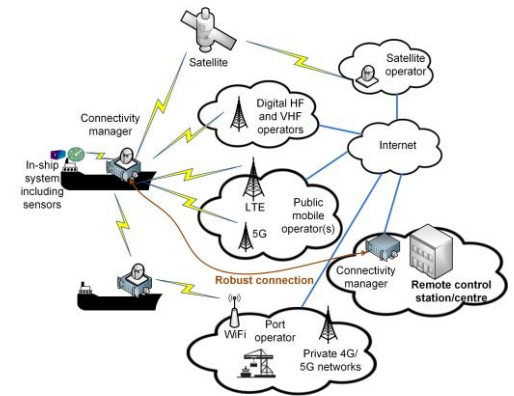
For device and service modelling, characterisation, measurements and testing as well as in research and development

- MilliLab ESA External Laboratory
- 5G Test Network
- Clean room facilities (e.g. Fabrication facilities)
- Radiation testing facility – hot lab
- Robotics and virtual reality
- Network of testing partners



# Future topics/offerings for the next missions

- RF component, module and subsystem qualification and testing services
- Instruments for EO and science missions (radiometers, spectral imagers)
- Earth observation data analysis for forestry applications, biocarbon monitoring
- Technologies for cubesats, ~100 kg small sats, and high altitude platforms (HAPS)
- RF EGSE equipment for missions (RF SCOE, RF Suitcase)
- Feasibility and concept studies related to satellite/terrestrial integration, dynamic spectrum management, and cybersecurity
  - Satellite systems simulations/emulations





# VTT's references for space technologies

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# Space mission references 1/2

## ▪ Earth observation

- MetOp-SG next generation meteorological satellites
- ALTIUS to monitor distribution and evolution of stratospheric ozone
- ESA Sentinel mission data analysis

## ▪ Deep space

- NASA/ESA Cassini scientific mission to Saturn
- ESA Planck mission observing cosmic microwave background radiation
- Euclid measuring acceleration of the universe



# Space mission references 2/2

## ▪ NewSpace

- Aalto-1 hyperspectral imager for nanosatellites (CubeSat)
- Picasso VISION hyperspectral imager in CubeSat to retrieve vertical profiles of ozone and temperature via Sun occultation
- AIDA/HERA asteroid impact mission including CubeSat with hyperspectral imager
- Reaktor Hello World CubeSat platform for future Earth orbit and deep-space missions with infrared hyperspectral imager on-board
- W-Cube propagation characteristics of radio channel at W-band

