

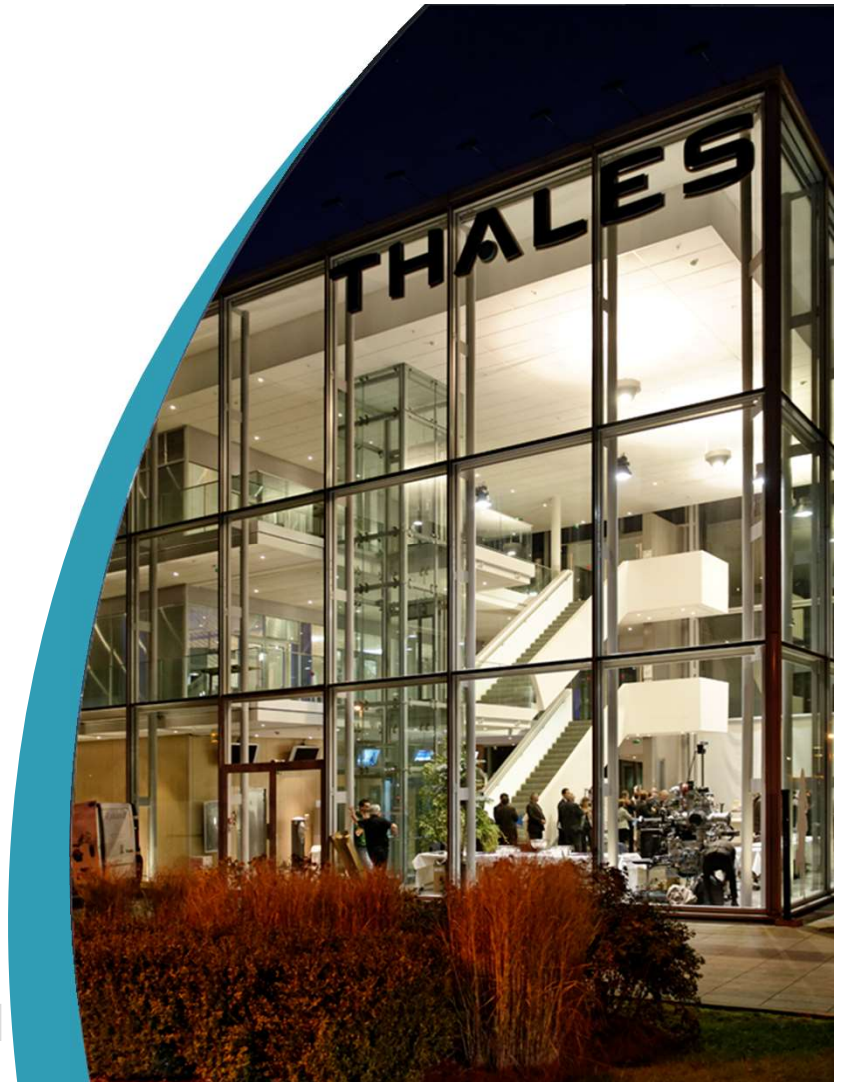


Thales Research & Technology

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November 2020

www.thalesgroup.com

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Thales group Overview

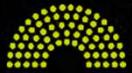
Over **83,000**
employees 

68 
Countries
Global presence

1 bn € 
Self-funded R&D*
* Does not include externally financed R&D

Sales in 2019 
19 bn €

Our Customers' Big Ambitions Make the World Go Round



GOVERNMENTS



INSTITUTIONS



CITIES



COMPANIES



Thales's Mission



Digital Identity and Security



Defence and Security



Aerospace



Space



Ground Transportation

We help customers master decisive moments by providing the right information at the right moment

Key Digital Technologies



Thales: A Research and Development Powerhouse



Albert Fert

Scientific director of the CNRS/Thales joint physics unit and winner of the **2007 Nobel prize in physics.**



"Nature" magazine ranks regularly Thales within the « **100 companies most remarkable for high quality science** » Since 2013



Expertise in a uniquely broad range of technical domains, from science to systems, applied across businesses.



An extensive intellectual property portfolio of **20,500 patents.**

30000+
in R&D

3 000
in R&T

800
experts

THALES Patent Portfolio: key elements

THALES (Worldwide) Now

More than 6000 alive
patent families
(inventions)

More than 20500
alive patents &
applications

427
(incl Gemalto's 2018 filings)
initial filings
in 2018

THALES in the Top 100 GLOBAL INNOVATORS

Thomson-Reuters /Clarivate Analytics
2012, 2013, 2015, 2016, 2017, 2018, 2019



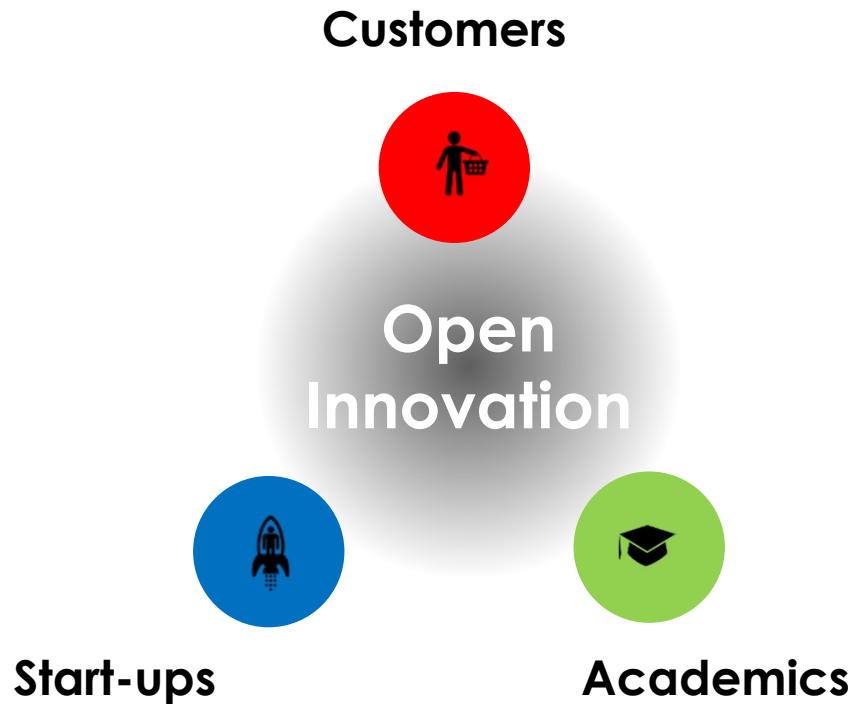
- Volume
- Success
- Globalisation
- Influence

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Open Innovation

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Thales Research & Technology

A worldwide network

5 TRT

France, UK,
Netherlands, Canada,
Singapore

400 R&T
staff

50 PhD
students

20% of
Group
R&T
activity

10 joint
labs

Excellence

- External recognition
- Senior experts

Partnerships

- Embedded at the heart of innovation ecosystems
- Joint laboratories

High visibility

- Strongly present within national & European R&D networks



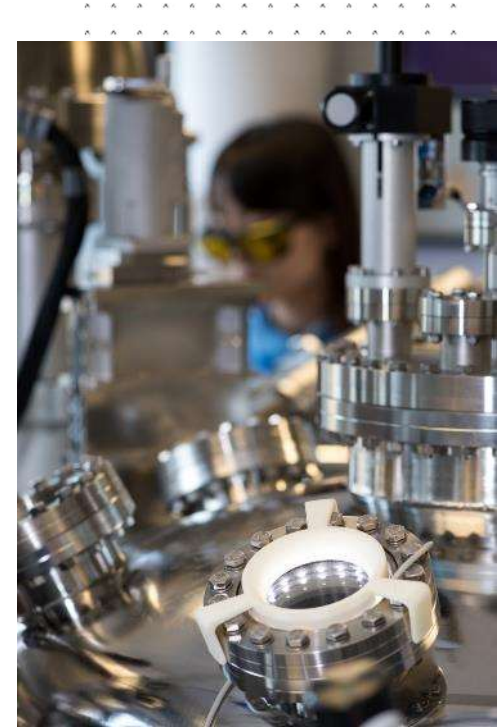
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Thales Research & Technology

A key role for Thales

- Identification of technological breakthroughs which can impact future business of Thales
- Development key technologies (advanced materials, devices and concepts)
- Implementation of functional demonstrators (jointly with Thales GBUs)



Thales Research & Technology France

Key Figures

- TRT permanent research staff : 240
- 40+ PhDs
- 50 invention disclosures, 35 patents / year
- 50+ scientific publications / year
- Clean rooms : 4 000 m²
- > 200 characterization & process main equipments
- 1 Nobel Prize, 3 European Research Council projects (ERC)
- 80 French or European on-going collaborative research projects

TRT Fr Research Activities are certified :

- ISO 9001 V2015 (Quality),
- ISO 14001 V2015 (Environment),
- OHSAS 18001 (Health & Security).



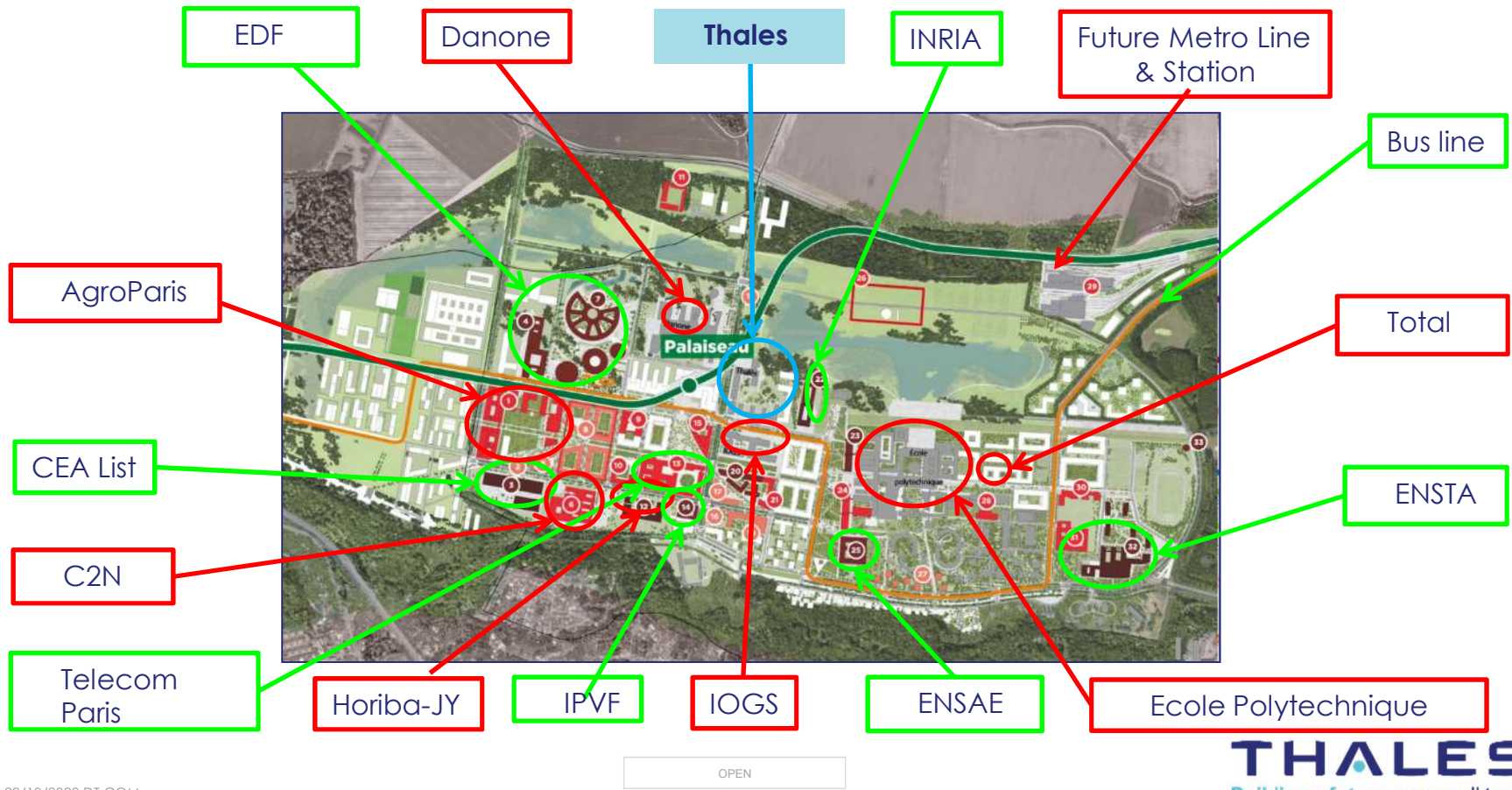
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Paris-Saclay on going expansion (East side)

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TRT-France at a glance

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Joint Labs

- UMR 137
CNRS
- LCTL
LUMIN
- Nanocarb
LPICM
- Formal Lab
CEA LIST
- SINCLAIR
EDF, TOTAL
- Therisis
Thales SIX
- Vision Lab
CEA LIST



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TRT France Labs : Information Science & Technologies

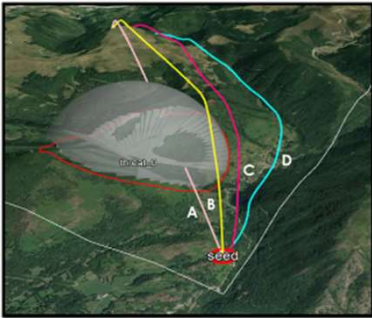
Key Areas of Excellence

- Determinism & safety for critical system
- Embedded Cyber Security
- Embedded High performance computing
- Low power @ IoT and Edge
- Neural networks and learning algorithms
- Engineering tools for safety and trustable AI
- Formal methods
- Explainable AI
- Semantic information fusion and knowledge mining
- Abductive analysis and reasoning
- Optimization
- Decision aid

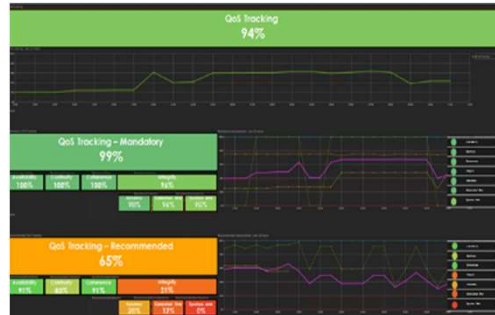


TRT France Labs : Information Science & Technologies

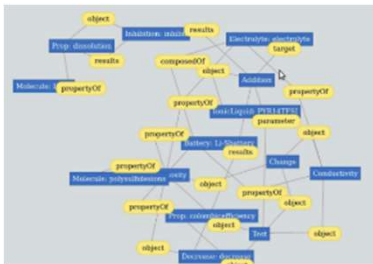
Research topic examples



AI for Optimisation path planning&synchronization



Use of Myriad to assess ATM tracker performances



AI for exploitation of complex knowledge



Methodologies&Tools for Trustable AI

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Low power@edge computing experimentation



Embedded AI : Design of Thales Neural Processor V1

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TRT France Labs : Technology & Measurement

Key Areas of Excellence

- Materials Modelling & Engineering
- Materials Chemistry
- Micro & Nano Technologies
- Energy & Thermal Management
- Smart Optics & Photonics
- Antenna & Novel RF Concepts
- Multi-Scale & Multi-Physics Modelling
- Failure Analysis
- Reliability Assessment
- Heterogeneous integration

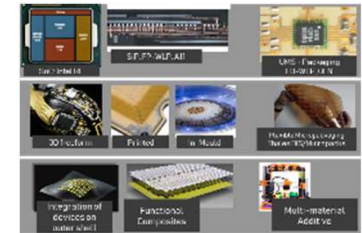
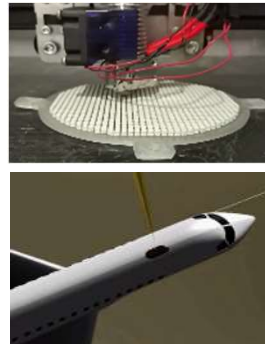
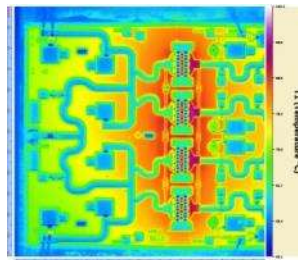
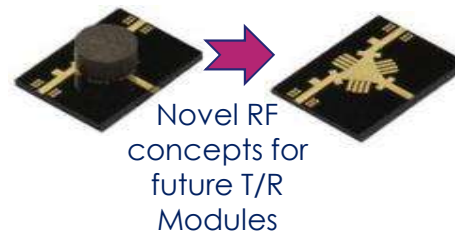
The « LATPI » Laboratory is accredited ISO 17025 V2017 by the French Committee for Accreditation COFRAC



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TRT France Labs : Technology & Measurement

Research topic examples



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TRT France Labs : Physics

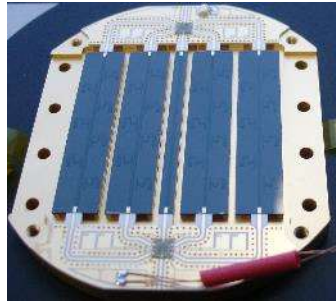
Key Areas of Excellence

- Nanomagnetism & Spintronics
- Superconductors & hybrid materials
- Functional oxides & nanoelectronics
- Neuromorphic computing
- Novel 2D material based RF & optoelectronic components
- Carbon nanotubes (X-ray and RF sources)
- Quantum sensing for navigation, timing and RF processing
- Microwave signal processing based on optoelectronic, nano-electronic and nano-phonic architectures
- Fiber-based sensing and PIC-based architectures for sensing, navigation and processing
- Laser sources, Lidars & active imaging



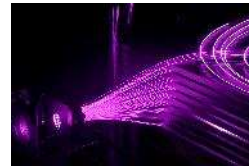
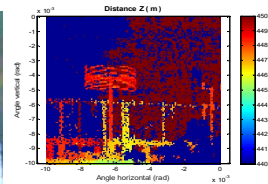
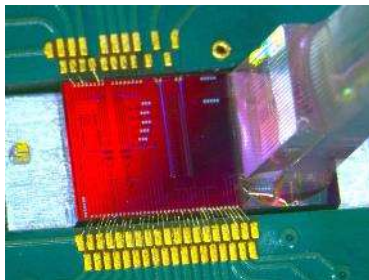
TRT France Labs : Physics

Research topic examples

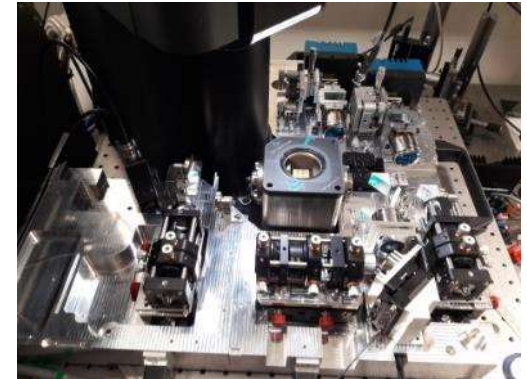


Ultra-compact X-ray sources using nanomaterials (CNTs)

High resolution microwave signal processing using superconducting technologies



Photonic Integrated Circuits is a multipurpose breakthrough : coherent lidar, RF processing, high power lasers, gyros, hydrophones,...

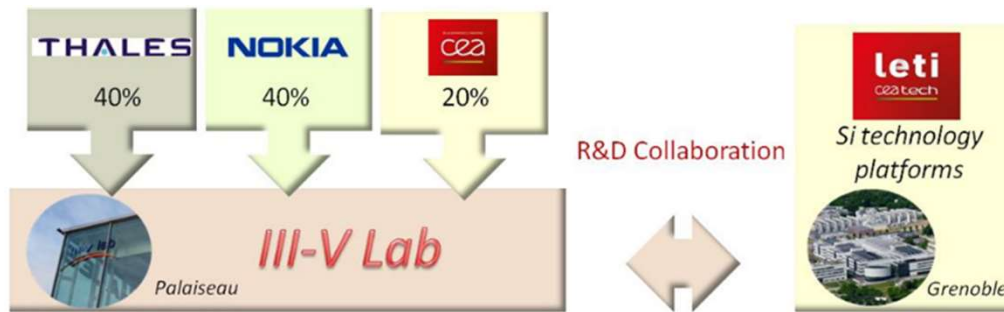


Quantum-based ultimate RF spectrum analysis with 100 % P.O.I

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TRT France Labs :

III-V Lab a strategic cooperation for III-V semiconductors industrial research



III	IV	V
B	C	N
Al	Si	P
Ga	Ge	As
In	Sn	Sb
Tl	Pb	Bi

Industrial ecosystem



III - V elements
in the Mendeleïev table

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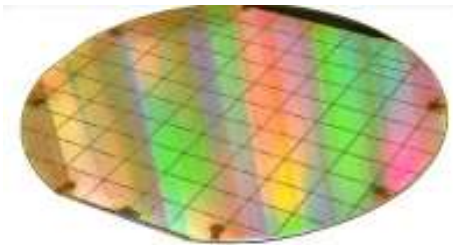
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Key Areas of Excellence

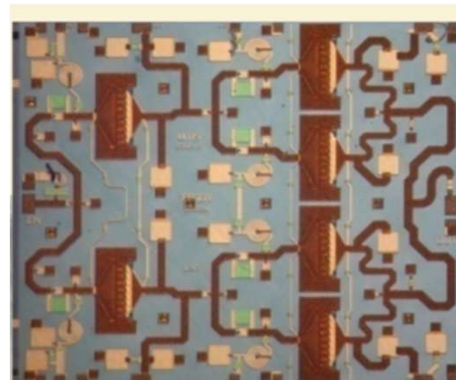
- Opto-electronics & Silicon Photonics
 - Advanced Infrared photo-detection systems
 - Microwave photonics signal processing
 - Laser pumping
 - Next generation optical-fibre communication networks
 - Data communication systems
- Micro-electronics
 - GaN power amplifiers for radars, electronic warfare and wireless communication systems
 - Ultra-fast digital and mixed signal InP circuits



Research topic examples



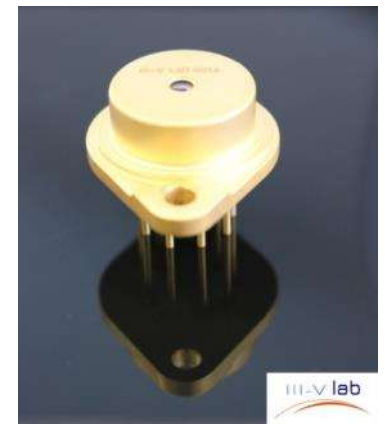
Focal plane array for infrared camera



High power amplifier for radar based on GaN technology



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Laser diode for atomic clock

Research & Technology : Green impact



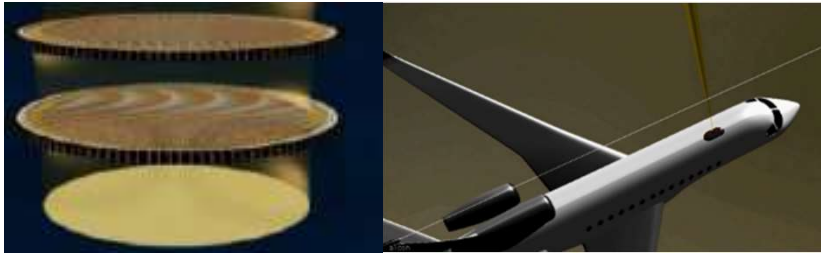
Optimisation of aerial and maritime trajectories



Rail and road traffic optimisation

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Research & Technology : Green impact



Smaller antennas (Quantum technologies, 3D printing)



Artificial nanoneurons, reduction by 100 of the AI power consumption



Supercapacitors, alternatives to critical materials, Power efficient components

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