



Thales Research & Technology

www.thalesgroup.com

OPEN



Profile

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Collective intelligence for a safer world

Whenever critical decisions need to be made, Thales has a role to play. In all its markets (aerospace, space, ground transportation, defence and security) **Thales solutions help customers to make the right decisions at the right time and act accordingly.**

World-class technology, the combined expertise of **62,000 employees** and operations in **56 countries** have made Thales a key player in keeping the public safe and secure, guarding vital infrastructure and protecting the national security interests of countries around the globe.



Employees

62,000

(workforce under management at 31 Dec. 2015)



Global presence

56

countries



Self-funded R&D*

2015

707

million euros

* Does not include therefore R&D undertaken with external funding.



Revenues in 2015

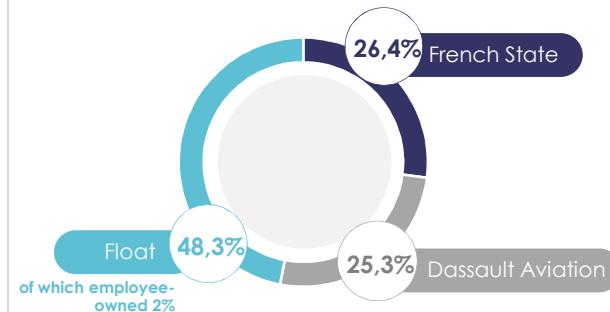
14 billion euros

A balanced revenue structure

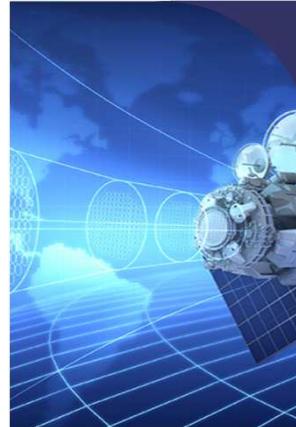


Shareholders

(at 31 December 2014)



Mission statement



**WHEREVER SAFETY AND SECURITY ARE CRITICAL, THALES DELIVERS.
TOGETHER, WE INNOVATE WITH OUR CUSTOMERS
TO BUILD SMARTER SOLUTIONS. EVERYWHERE.**

Markets we serve

DUAL MARKETS Military & Civil



AEROSPACE



SPACE



GROUND
TRANSPORTATION



DEFENCE



SECURITY

TRUSTED PARTNER FOR A SAFER WORLD

Thales Global Presence (per country)



Global leadership

N°1
worldwide



Payloads
for telecom satellites



Air Traffic Management



Sonars



Security for interbank
transactions

N°2
worldwide



Rail signalling systems



In-flight entertainment
and connectivity



Military tactical
radiocommunications

N°3
worldwide



Commercial avionics



Civil satellites



Military surface radars

€14
billion
in revenues

THALES

A strategy guided by innovation

Long Term vision

➤ **R&D = ~20 % of revenue**

➤ **Key technical domains**

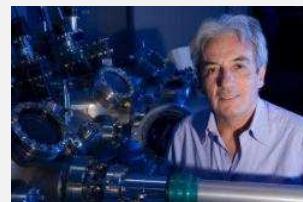
- Complex Systems
- Hardware (or sensor technology)
- Software
- Algorithms and decision aid

➤ **Open research**

- A Network of International laboratories
- Cooperation with universities and public research laboratories throughout the world

➤ **Product policy**

- Reducing development cycles
- Lowering risks



ALBERT FERT
scientific director of the CNRS-Thales "Unité Mixte de physique" and Physics Nobel prize in 2007.



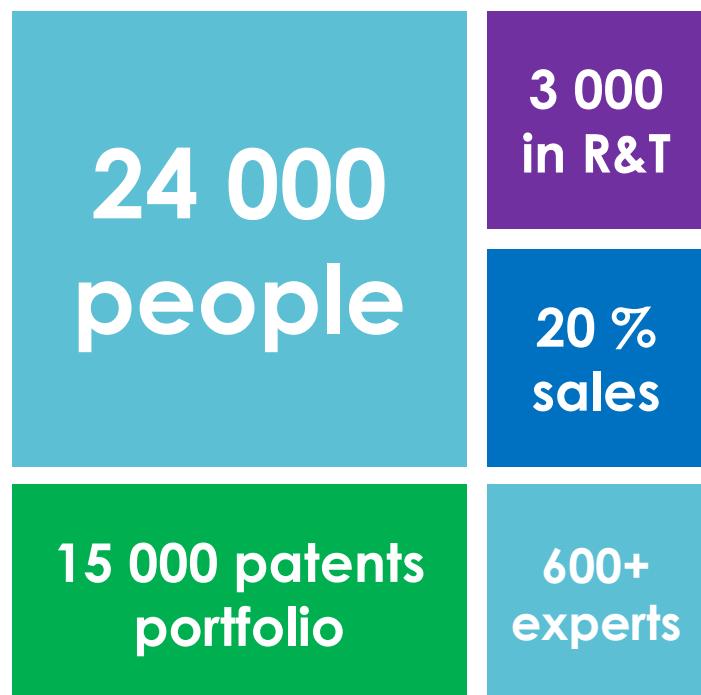
25 000 people dedicated to technical activities in the group of which **70 %** are engineers.

Invent today tomorrow's products

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Research & Development: a key asset

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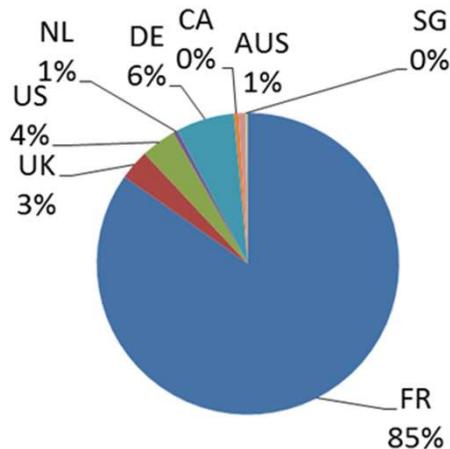
| Wide range of technical domains covered, from physics to systems

| Supporting the 5 vertical markets of the group

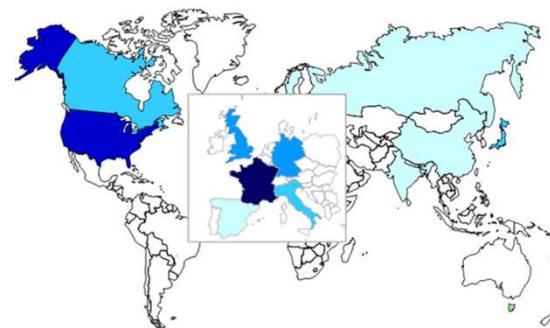
- Defence
- Security
- Avionics
- Space
- Transports

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Intellectual Property : A key asset



- 15,000 Active Patents & app.
- 4200 Patent Families
- 400 Initial filings / year
- Ranked 10th by INPI (applications)
- Top100 Reuters innovators (11/2015)



Freedom to operate

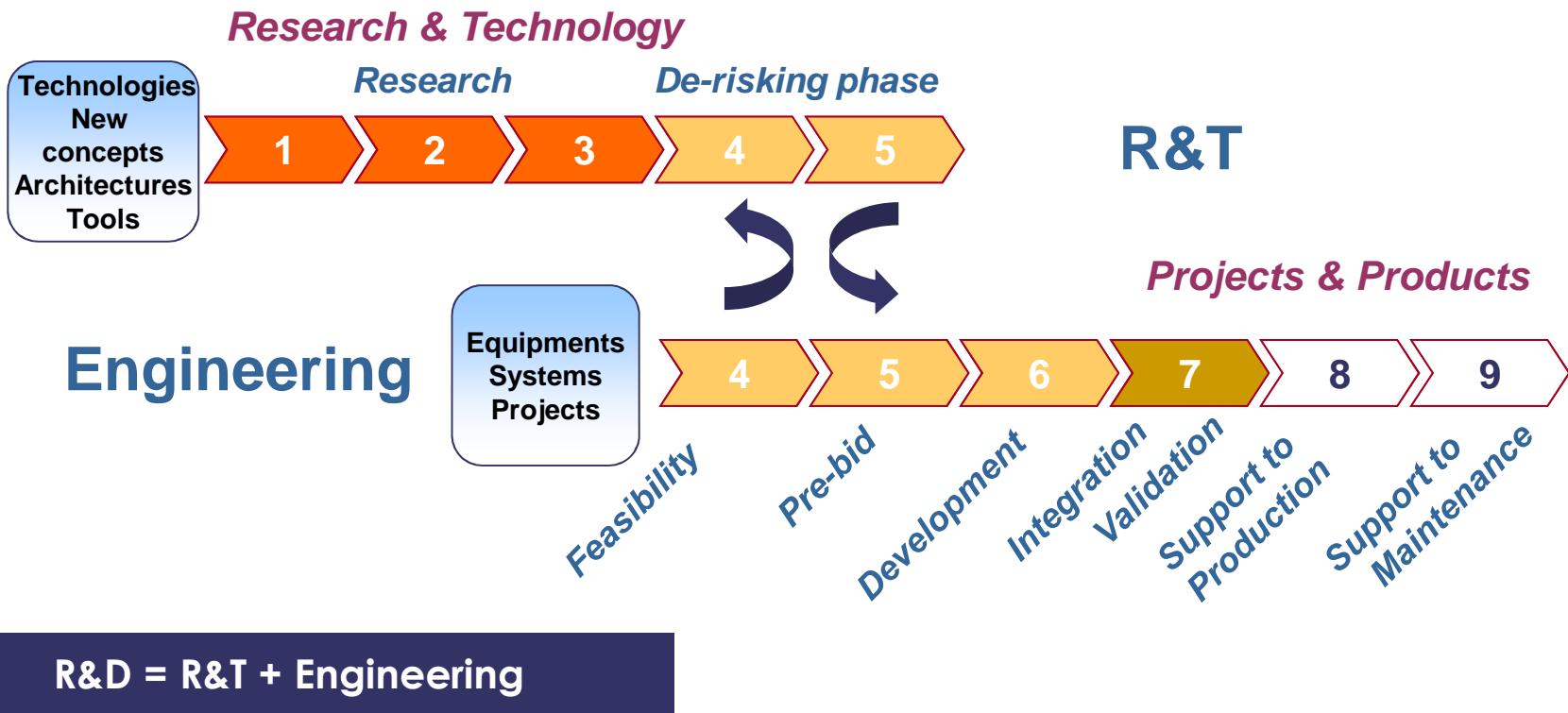
Product Market shares

Valorisation outside Thales domain

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Research & Development Scope

R&D, R&T and engineering definition based on Technology Readiness Levels (TRL)



Key Technical Domains

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Technologies

Hardware

- Analog
- Digital
- Mechanics & thermal
- Specific areas

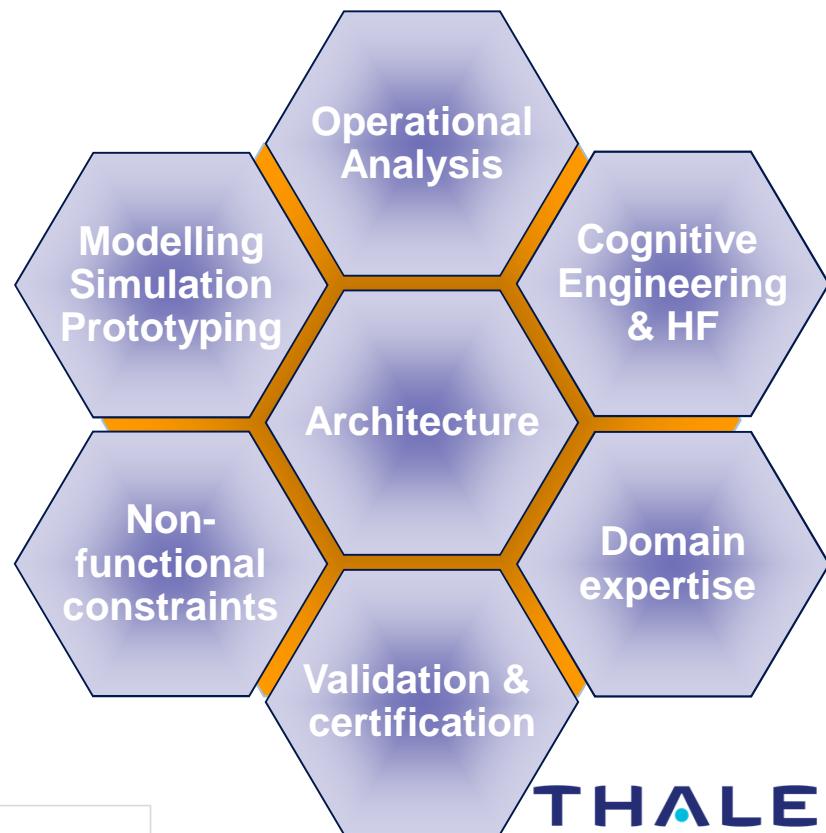
Software

- Internet Based Technologies
- Middleware
- Modeling
- Computing

Processing

- Signal processing
- Information analysis & decision

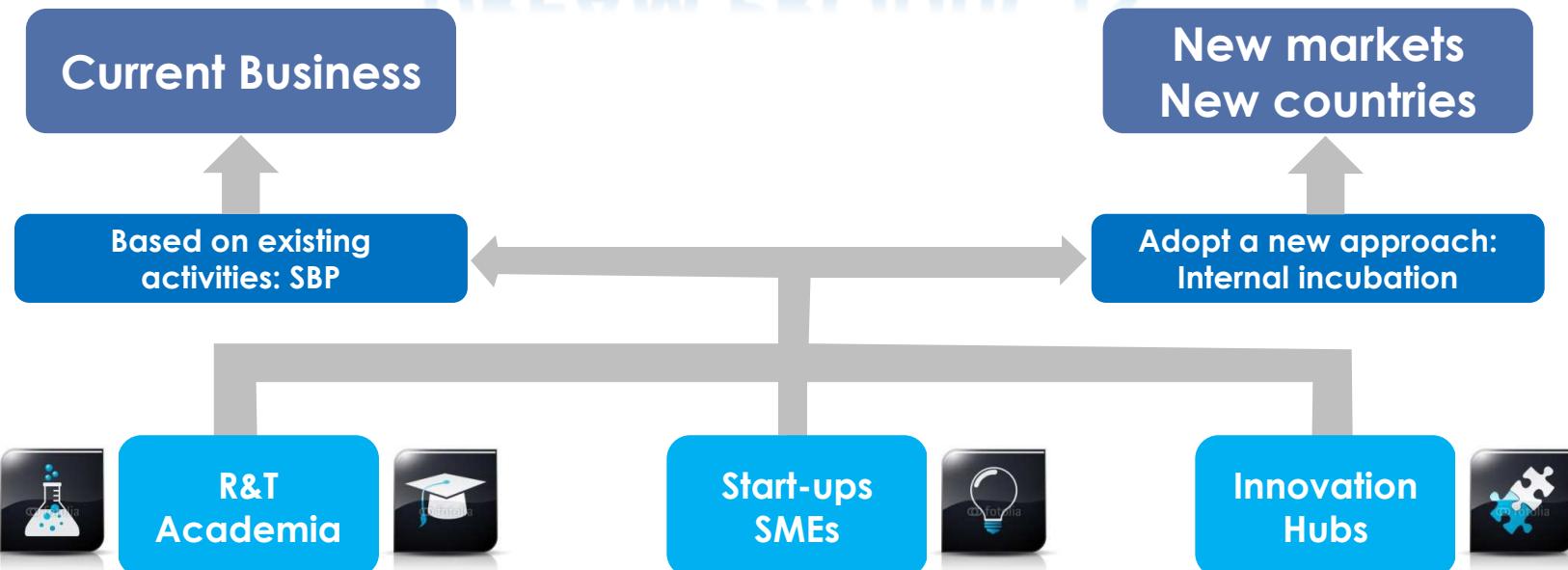
Systems



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Innovation Strategy: market focus

DREAM PRODUCTS



- ◆ **New concepts & technologies**
- ◆ **Capturing R&T from universities**

- ◆ **Innovation Hotspots**

- ◆ **Co-innovating with the customers**

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Working with start-ups & SMEs



I All type of interactions explored

- Scouting
 - Incubation
 - Acceleration
 - Partnerships
 - Common projects
 - Investment
 - M&A



Co-innovation with the customers



- | The concept of “innovation hub” widely deployed
- | Working together with the customers and their ecosystem
- | Located where are customers are



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Cooperation with research institutions

tout ou servés.

**50+ strategic
partnerships**

20+
common
langs

200
PhD

5 TRT

MIT
Media
lab

- | A long lasting culture of partnership with research organisations
 - | Exploring new concepts and disruptive technologies



The network of Thales Research & Technology – a Group asset

tout ou
servés.

5 TRT
France, UK,
Netherlands, Canada,
Singapore

400 R&T
staff

50 PhD
students

20% of
Group
R&T
activity

10
common
labs

Ce docu
partie, ni

Excellence

- External recognition
- Senior experts

Partnerships

- Embedded at the heart of innovation ecosystems
- Common laboratories

High visibility

- Strongly present within national & European R&D networks



Thales Research & Technology

An international network of research laboratories ...

Excellence

External recognition
~500 researchers ~200 PhDs

Partnerships

Common laboratories
Labs located close to / on campuses

High visibility

*Strongly present within
national & European R&D networks*

... strongly contributing to the overall competitiveness and attractiveness of the Group

France

Palaiseau



UK

Reading



Netherlands



Delft

Singapore



Canada

Quebec



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Thales Research & Technology - France

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**TRT permanent
research staff**
230

**On site
>500p**

**40
PhDs**

**Nobel Prize
Médailles CNRS
12 senior experts**

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In the heart of the Saclay Technology Cluster,
TRT France is home also to the

- SIX Thérisis Lab
- Joint laboratory with CNRS (UMR 137)
- Vision Lab (common laboratory with CEA/LIST)
- III-V Lab (GIE with NOKIA and CEA/LETI)

Interacting with all Thales GBUs

Key areas of excellence

- Photonics
- III-V semiconductor components
- Physics
- Decision aid and optimisation
- Video analytics and processing
- Cyber security
- Embedded systems



Thales Research & Technology - France



Thales Research & Technology - Palaiseau

A place of innovative research...

- TRT France
 - 550 researchers: Thales & Partners
 - 40 PhD
- Common laboratories
 - CNRS, CEA, NOKIA, UPMC
- Competitiveness cluster
 - System@tic
- GBU R&T teams
 - Common Innovation Platforms

... closely located to and interacting with

- Ecole Polytechnique, University Paris Sud 11/ Paris Saclay, Supelec, Institut d'Optique Graduate School, Institut Télécom, Nanoninnov, CNRS, CEA, ONERA, Synchrotron Soleil ...

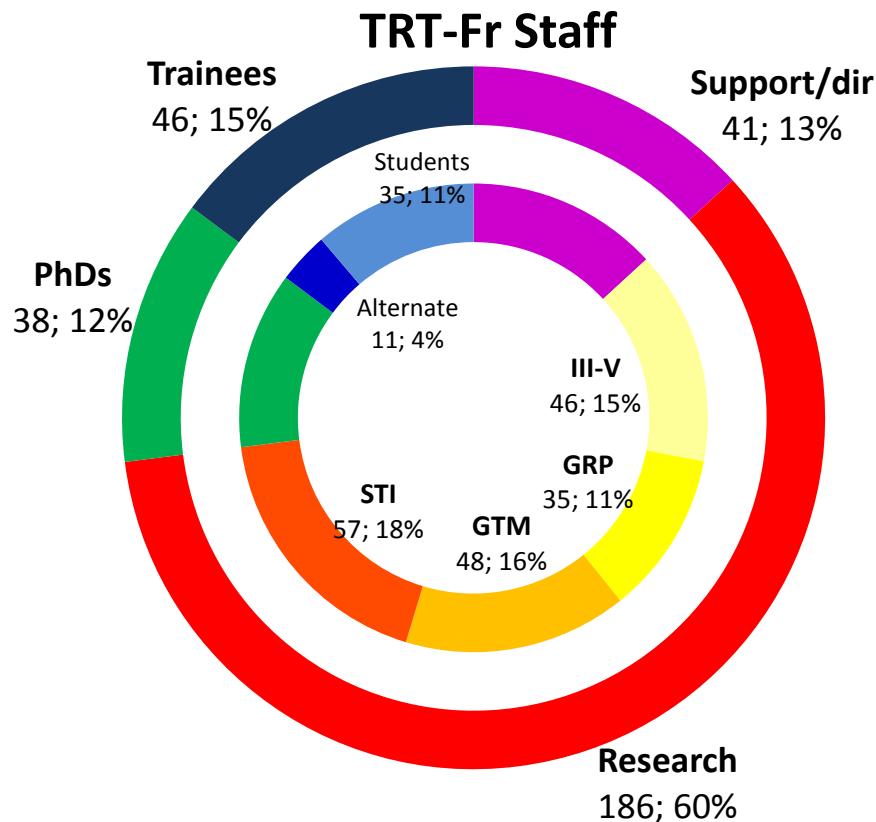


TRT – France in numbers

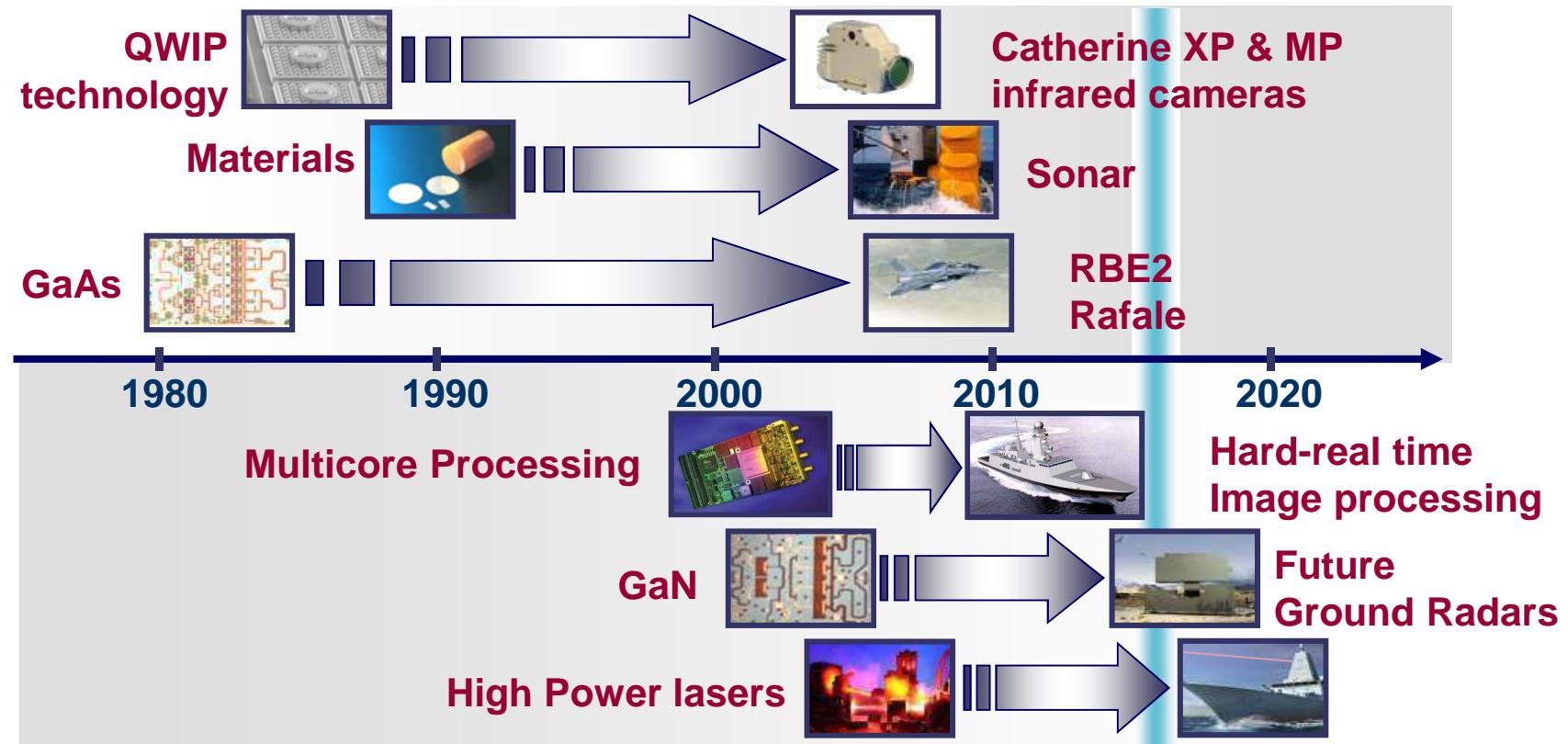
1. **240 permanent research Staff + 40 on-going thesis + 11 alternate training**
2. **35 patents / year and 50+ scientific publications / year**
3. **Contributions in 2014 to 18 initial gates and 14 main gates**
4. **Participation to 10 demonstrators at Thales 2014 InnovDays**
5. **1 Nobel prize, 3 ERCs, 2 Thales PhD prize (out of 3) in 2014, 1 DGA PhD prize in 2014**
6. **24 "Journées de Palaiseau" in 2014**
7. **3700 m² clean rooms, 200 characterization & process main equipments**
8. **Common labs with CNRS, Ecole Polytechnique, IOGS, CEA, ...**
9. **80 French or European on-going collaborative research projects**
10. **9 "Parole de Chercheurs" Conferences in 2014**

TRT in Numbers

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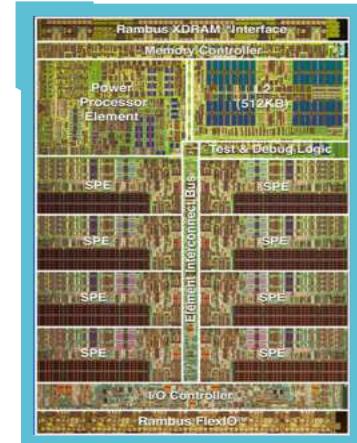
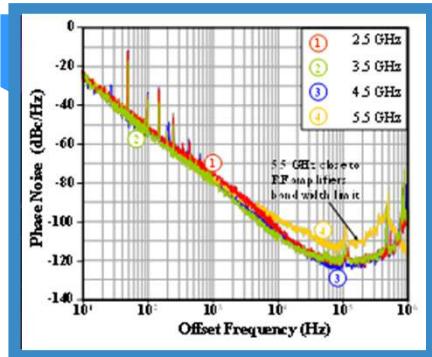
Inventing future products



Key factors : Long-term Vision, Independence

LES

TRT-France : a wide set of competences



GIE III-V Lab : NOKIA - CEA LETI - THALES

Physics Research Activity

Technology & Characterization Research Activity

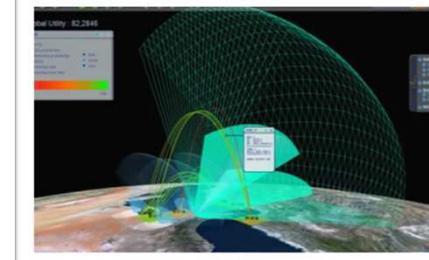
Information science & technologies Research Activity

TRT Fr Research Activities on Palaiseau site are certified :
Quality Management Systems : ISO 9001, Health and Safety Assessment : OHSAS 18001
Environmental Management : ISO 14001

Information Science & Technologies Research Activity

Reasoning & analysis in complex systems

- Cyber-information analysis technics, fusion, situation understanding, big data analytics, cybersecurity, rich internet applications.



Decision & optimization

- Formalisms and algorithms – decision support, combinatorial optimization.



Corporate communications – Mars 2015

System software engineering

- Advanced methods and tools.

Critical Embedded Systems

- Methods, tools and architectures for safe & secure embedded systems.

High performance computing architecture

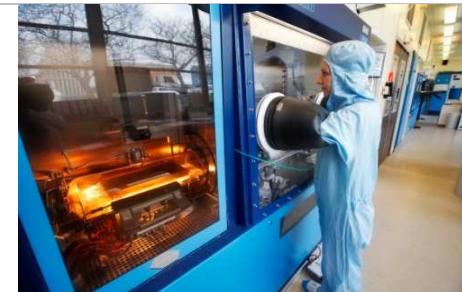
- Intensive computing architecture, algorithm architecture codesign.

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GIE III-V Lab : NOKIA - CEA LETI - THALES

Development of key technologies for systems and components

- Securing Thales strategic supply chain
- Preparing differentiating technology breakthroughs
- Enabling system level SWAP (Size Weight And Power) reduction



Micro-electronic technologies

- GaN HEMT radio-frequency & microwave power technology
- InP high frequency ADCs (Analog Digital Converters) and drivers



Opto-electronic technologies

- Broadband opto-microwave sources and detectors
- Silicon Photonics
- High luminance micro-displays
- High power solid state lasers

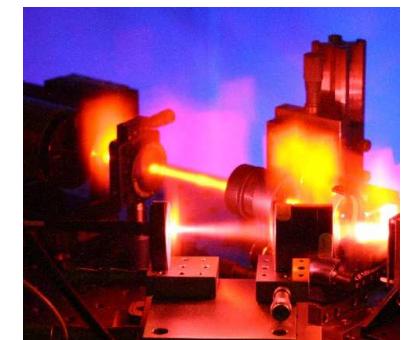
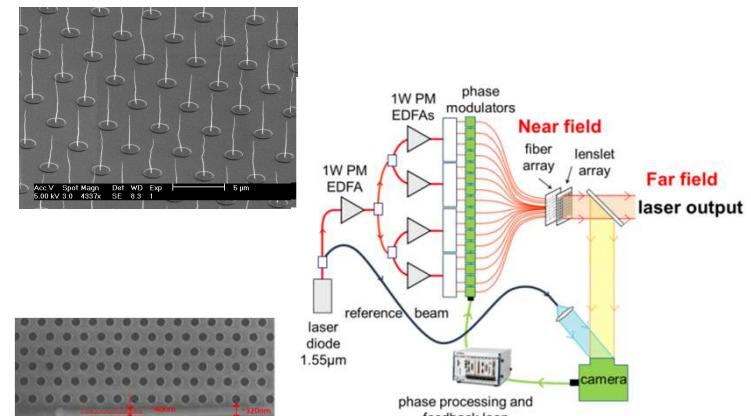
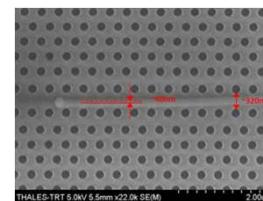
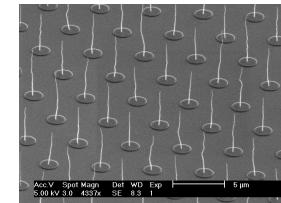


Physics Research Activity

- | Nanomagnetism and spintronics
- | HighTc superconductors for filters sensors and oscillators
- | THz techniques

- | Carbon Nano Tubes for field emission (RF and Xrays)
- | Applied quantum physics
(cold atoms on chip, magnetometry...)
- | Photonic crystal based structures and nano-lasers

- | Fiber based sensors, lasers and processing architectures
- | Optoelectronic processing of microwave signals
- | Optoelectronic oscillators
- | Laser Sources (high power, fiber based, OPOs, for RF applications,...)
- | Lidars & Active Imaging



Technology & Characterization Research Activity

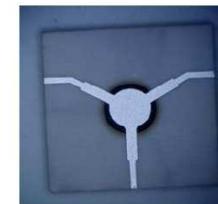
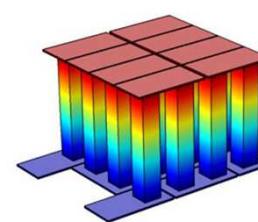
COMPONENTS AND TECHNOLOGICAL DEMONSTRATORS

- Smart optics, Novel Antennas, 3D-printing, RF MEMS ...
- Advanced simulation, modelling, design & characterization ...



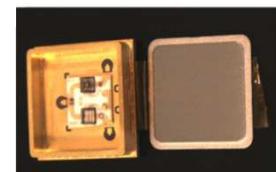
CHEMISTRY AND MULTIFUNCTIONAL MATERIALS

- Polymers & thermal interface materials ...
- High performance ferrites & Supercapacitors ...



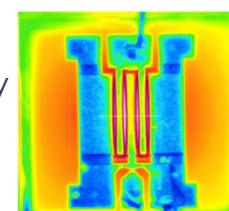
TECHNOLOGICAL PLATFORM

- Micro & Nano fab. , Nano-imprint, Plasma Etching, X-RAY Diffraction
- AUGER & RAMAN Spectroscopy, AFM, Ellipsometry & Profilometry...



INDUSTRIAL PROCESSES AND TECHNOLOGY ANALYSIS

- GaN technologies, DSM, active and passive components, reliability
- ISO 17025 certification , COFRAC ...

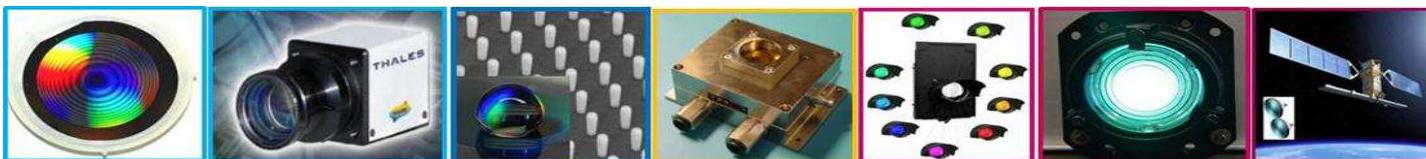


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Technology and Characterization Research Activity

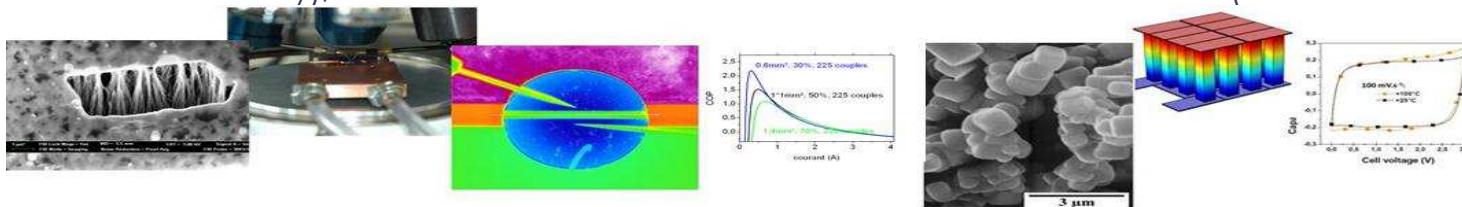
COMPONENTS AND TECHNOLOGICAL DEMONSTRATORS LAB

- Research activities and associated work needed to implement new device concepts or advanced technologies in functional demonstrators for future integration in Thales products lines
- Activity fields: Microwave and antennas, optics and imaging, lighting and detection



CHEMISTRY AND MULTIFUNCTIONAL MATERIALS LAB

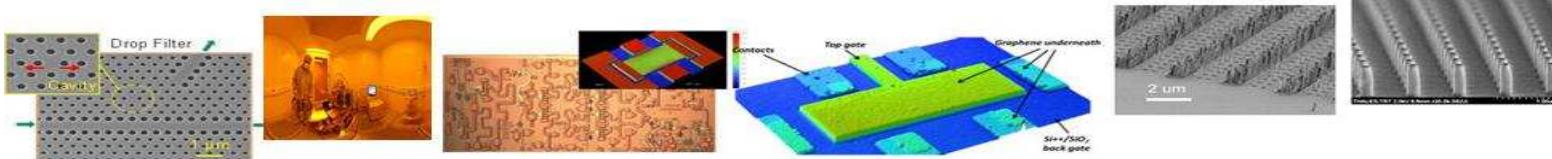
- Design, formulation, synthesis, characterization and evaluation of new functional materials (organics, ceramics, composites); System modeling, device characterization...
- Activity fields: circulators, power sources (magnetic materials), energy storage, supercapacitors (materials for electrochemistry), Thermal interface materials and thermoelectric materials (materials for thermal applications)



Technology and characterization research group

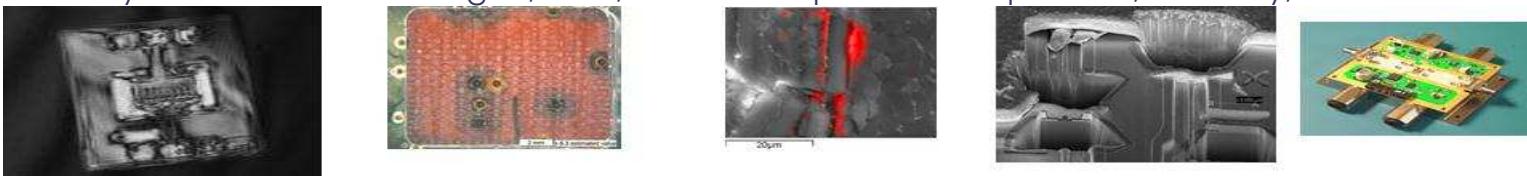
TECHNOLOGY AND ADVANCED CHARACTERIZATION LAB

- Complete process portfolio for demonstrators realization, process optimization and pre-industrialization New materials, and technological bricks, new characterization methods in the field of micro and nanotechnologies
- Activity fields: MEMS & NEMS RF & microsystems, integrated devices, III-V materials, micro and nano structuration, nanoelectronics, precision optics and polishing ...



INDUSTRIAL PROCESSES AND TECHNOLOGY ANALYSIS LAB

- Expertise on components, boards, devices and equipments for THALES GBUs: technological evaluations, failure analysis, reliability tests...
- Activity fields: GaN technologies, DSM, active and passive components, reliability, ...



TRT wordcloud

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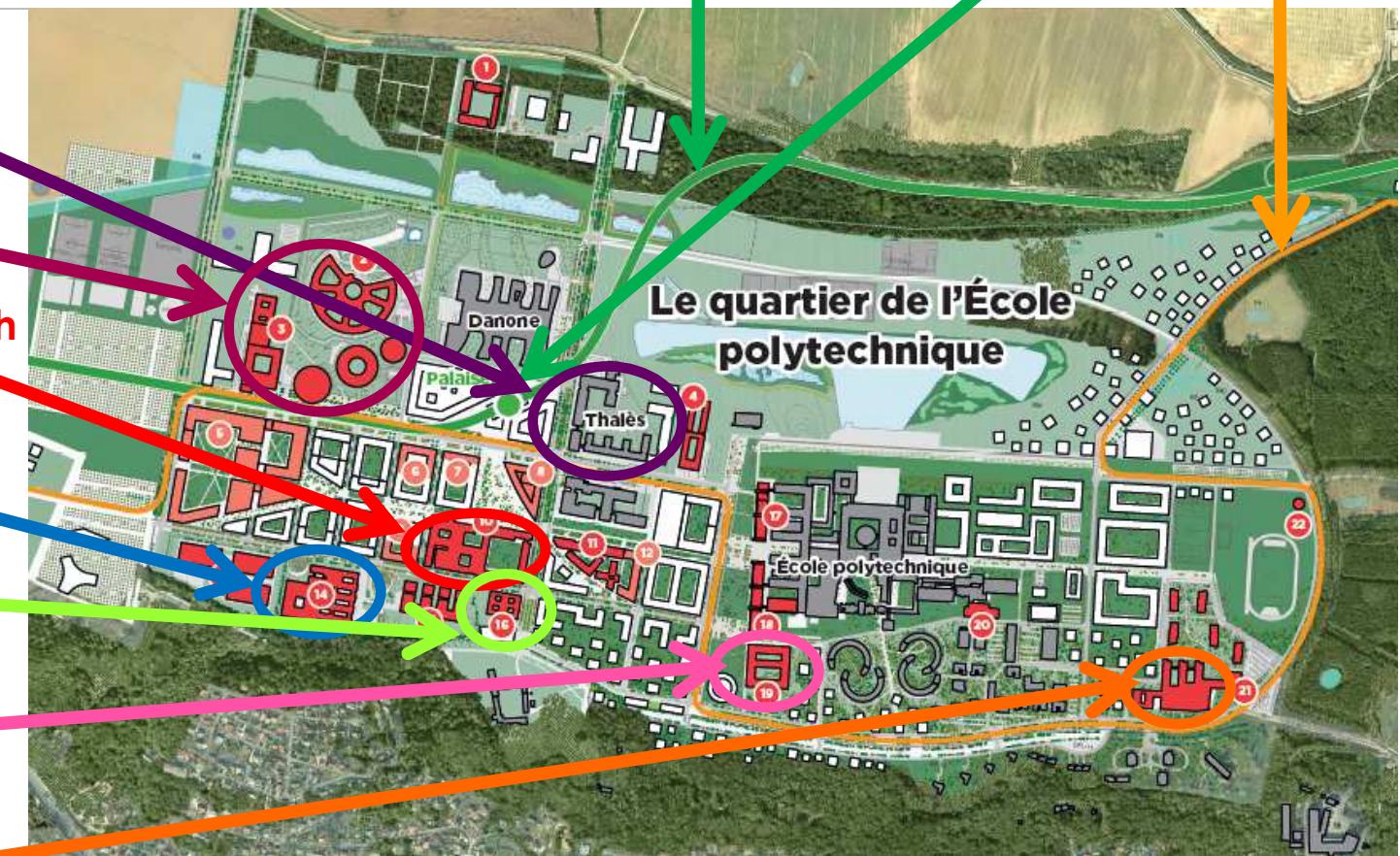


Paris-Saclay on going expansion

Future Metro Line & Station

Bus line

- | Thales
- | EDF
- | Telecom ParisTech
- | C2N
- | IPVF
- | ENSAE ParisTech
- | ENSTA ParisTech



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THANK YOU
&
Any QUESTIONS ...



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