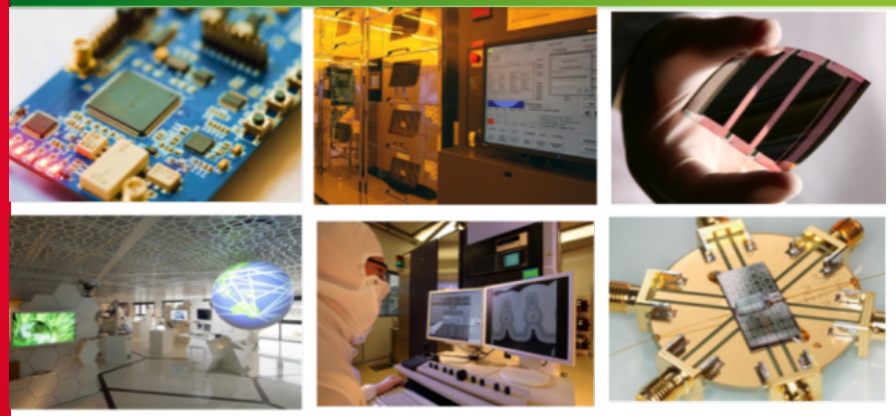
DE LA RECHERCHE À L'INDUSTRIE

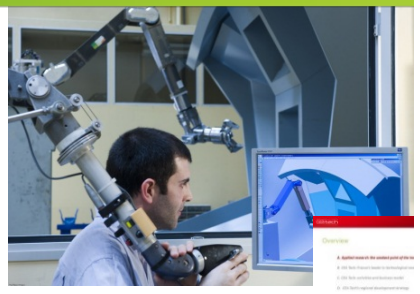
cea

www.cea.fr



From a national lab to an innovation campus

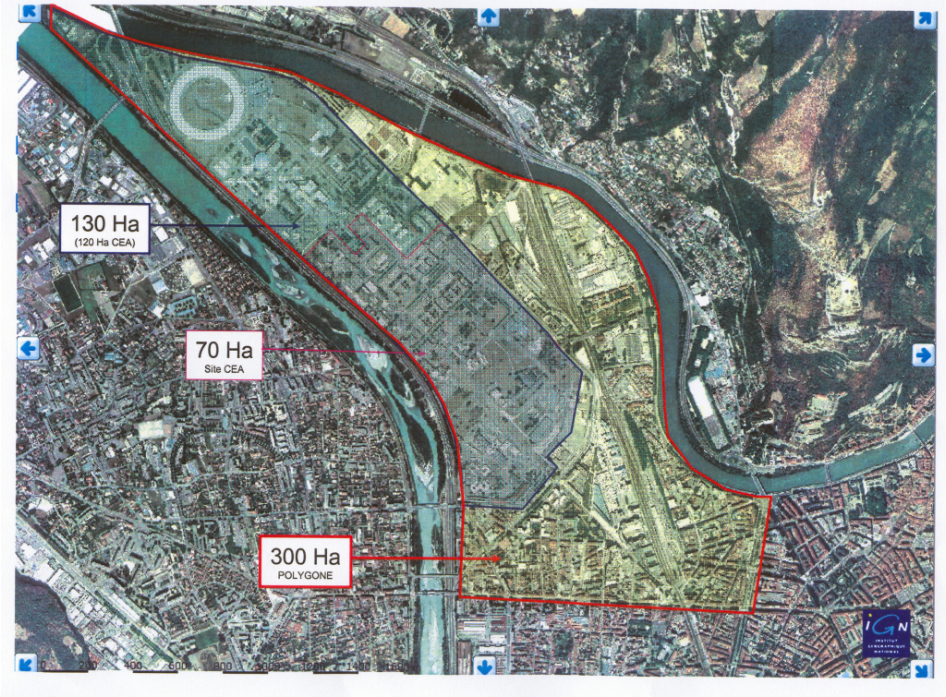
Jean-Charles GUIBERT,
Advisor to the CEO of CEA
Chairman of MINATEC



A long history of innovation structures in GRENOBLE

RTO INSTITUTE CAMPUS CAMPUS++

1950 1970 1990 2010



CEA : France's largest national lab / leader in technological research

Alternative Energies and Atomic Energy Commission

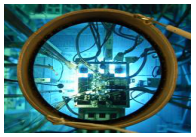
Technologies

Defense Security

Military Applications Division (DAM)

Staff: 4,500

Nuclear Energy



Nuclear Energy Division (DEN)

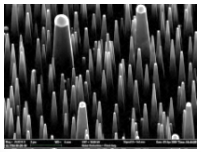
Staff: 4,500

Key Enabling Technologies

Technological Research Division (DRT)

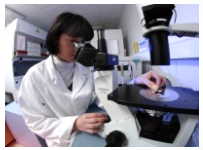
Staff: 4,500

Science



Fundamental Research

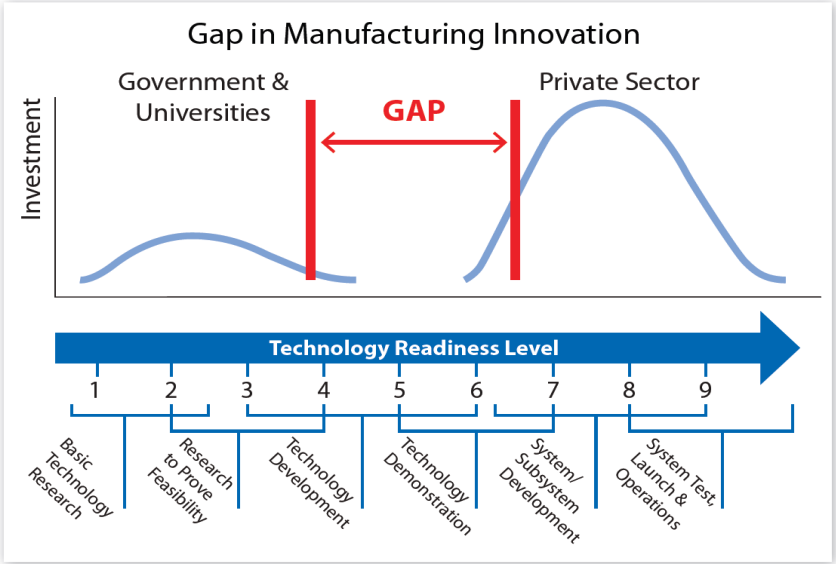
Materials Sciences Division
Life Sciences Division



- Human ressources **16,000**
- **10** Research centers
- Budget: **€ 4,7 Bn**
- Scientific publications: **4,740**
- **4,674** Patent families in portfolio (2012)
- **701** Priority patents delivered
- **157** Innovative high-tech start-ups since 1972
- **53** Joint research units

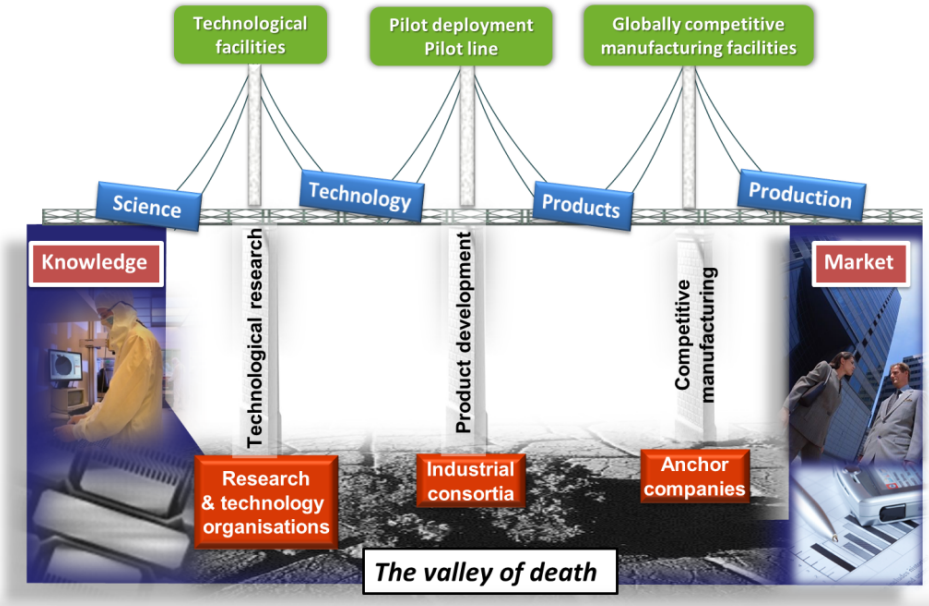
- *Mission DAM : France's national **security independence***
- *Mission DEN : France's **energy independence***
- *Mission DRT : French business' **economic competitiveness***

CEA Tech: France's leader in technological research



Source: AMP Steering Committee

European " three pillars bridge "to pass across the "valley of death"



Technology Readiness Levels (TRLs)

1. Basic principles observed	2. Technology concept formulated	3. Experimental proof of concept	4. Technology validation in lab.	5. Technology validation in relevant environment	6. Demonstration in relevant environment	7. Demonstration in operational environment	8. System complete and qualified	9. Successful mission operations	10. Mass Production

GAP

Pump priming
25%
5–10 years

Technology transfer
75%
1–3 years

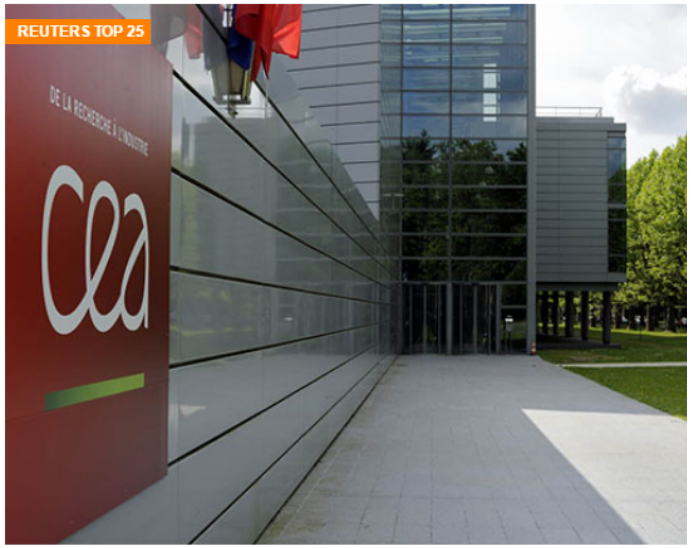
The World's Most Innovative Research Institutions

CEA is topping the list of Research Institutions WW (Reuters in 2016)

Technology | Tue Mar 8, 2016 12:36pm EST

The World's Most Innovative Research Institutions

BY DAVID EWALT



1 - CEA	**Score : 206**	**France**
2 - Fraunhofer Society	Score: 202	Germany
3 - Japan Science & Technology Agency	Score: 201	Japan
4 - U.S. Department of Health & Human Services	Score: 193	USA
5 - National Center for Scientific Research	**Score: 189**	**France**
6 - Korea Institute of Science & Technology	Score: 183	South Korea
7 - National Institute of Advanced Industrial Science & Technology	Score: 182	Japan
8 - U.S. Department of Energy	Score: 179	USA
9 - Agency for Science, Technology & Research	Score: 175	Singapore
10 - French Institute of Health & Medical Research	**Score: 175**	**France**
11 - Helmholtz Association	Score: 157	Germany
12 - U.S. Department of Veterans Affairs	Score: 157	USA
13 – RIKEN	Score: 146	Japan
14 - National Research Council Canada	Score: 139	Canada
15 - Max Planck Society	Score: 137	Germany
16 - Chinese Academy of Sciences	Score: 135	China
17 - Pasteur Institute International Network	**Score: 135**	**France**
18 - National Institute for Materials Science	Score: 132	Japan
19 - United States Navy	Score: 123	USA
20 - Commonwealth Scientific & Industrial Research Organisation	Score: 119	Australia
21 - Spanish National Research Council	Score: 114	Spain
22 - Academia Sinica	Score: 106	Taiwan
23 - United States Army	Score: 100	USA
24 - National Aeronautics and Space Administration	Score: 99	USA
25 - Russian Academy of Sciences	Score: 98	Russia


MINATEC®
MINATEC
innovation campus
Education Research Industry

CEA-Leti institute is the heart of MINATEC campus

Technology research on micro and nanotechnologies

leti

cea

Research & Technology Institute founded in 1967

Director : Dr Marie-Noëlle Semeria

1700 collaborators
250+ PhD & post-docs
40 nationalities

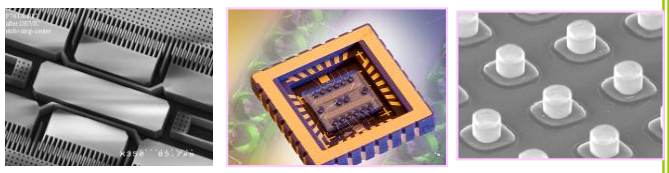
2200 patent families
40 % under licensing

300+ industry partners
50 start-ups

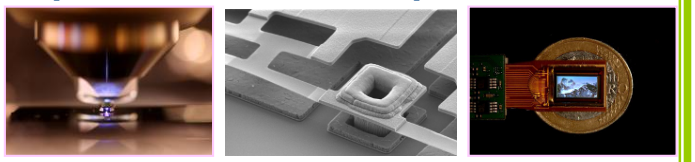
8 000m² clean rooms
For 200 and 300mm wafer fab, operated 24/7

Microelectronics on silicon

Microsystems on silicon

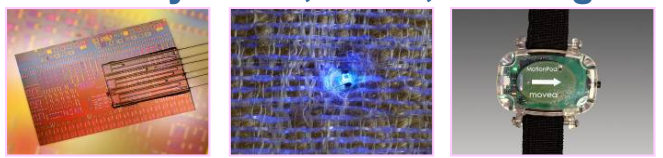


Optoelectronics components



Systems for biology & health

Smart systems, Telco, IT design



MINATEC campus based on the triple helix concept : Education – Research - Industry

Education

1,400 people

- *Attractivity*
- *Skills for the future*

Research

2,400 people

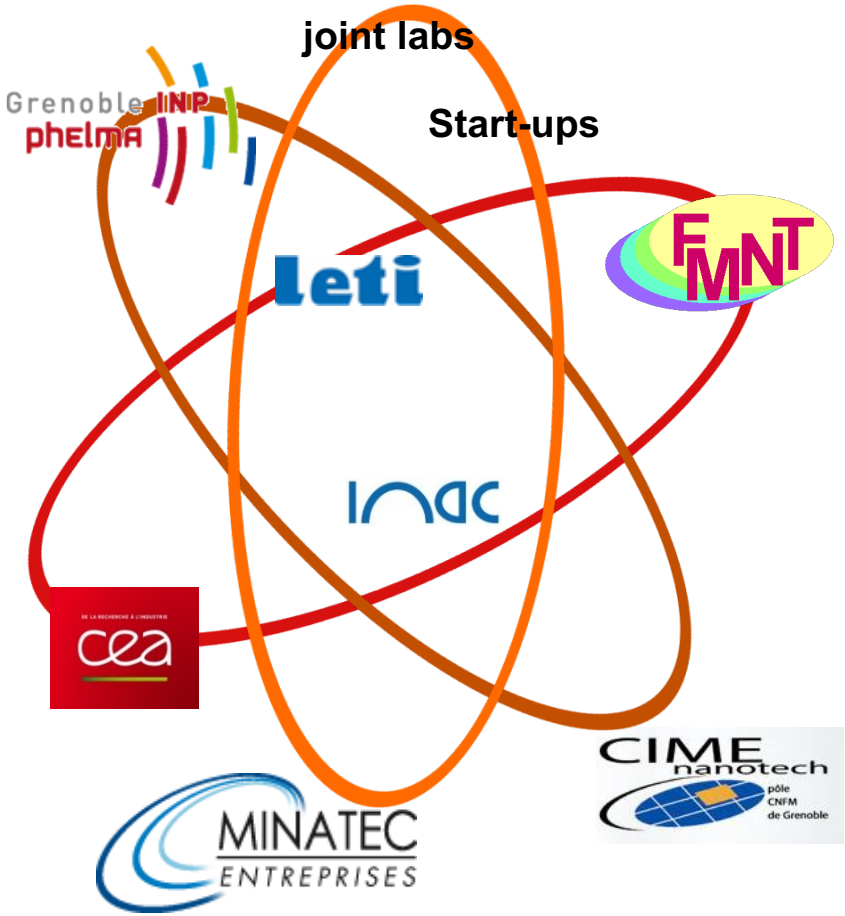
560 PhDs & post-docs

- *Interdisciplinarity*
- *Creativity*
- *Technology transfer*

Industry

600 people

- *Technology transfer*
- *Industrial partnerships*
- *Jobs creation*

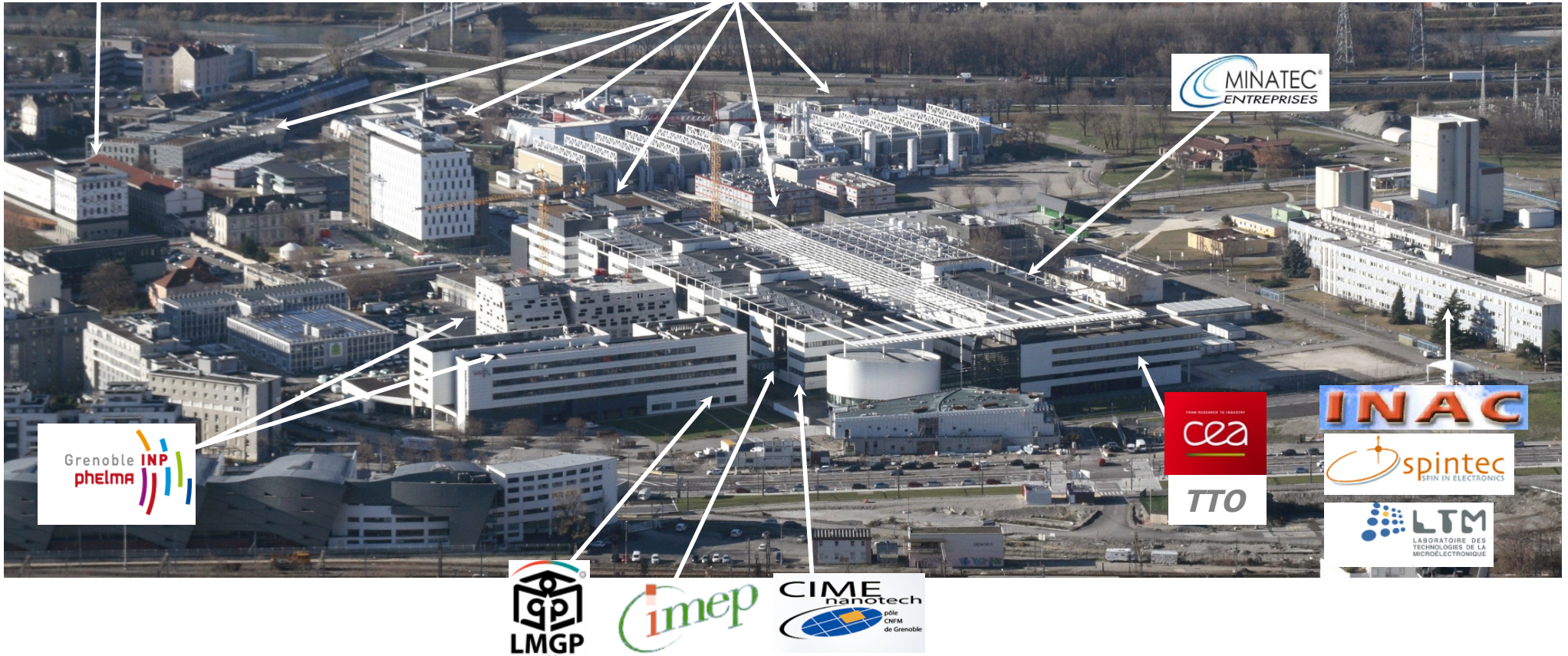


MINATEC®

- *>3000 research staff*
- *>1000 students*
- *Annual Budget 350 M€*

  Industry & contracts >60%
- *13 000m² cleanrooms*
- *400 graduates MS/PhD*
- *1600 scientific publications /year*
- *350 new patents /year*
- *20 joint laboratories*
- *10 start-up /year*
- *Operated by the* cea

MINATEC® campus – wwide unique facilities for higher education and research



Education – PHELMA Engineering School

- Part of Grenoble INP group
- 1200 students
- 350 graduate engineers each year
- 150 professors
- First European Master in micro-nanotechnologies (time share with EPFLausanne & Politecnico de Torino)
- Phelma 2 : two new buldings planed for Sept.2015 (8000 m2)

- Initial training
- Professional training

PHysics

ELectronics

MAterials

Training platform : CIME Nanotech - MINATEC Nanolab

MINATEC® Nanolab

CIME nanotech pôle CNFM de Grenoble

- 2500m² platform dedicated for training activities
- 700m² cleanrooms
- 10M€ initial investment
- Annual budget: 3M€ (1M€ running costs)
- 1800 students studied on the platform in 2012

- Dedicated actions for high school

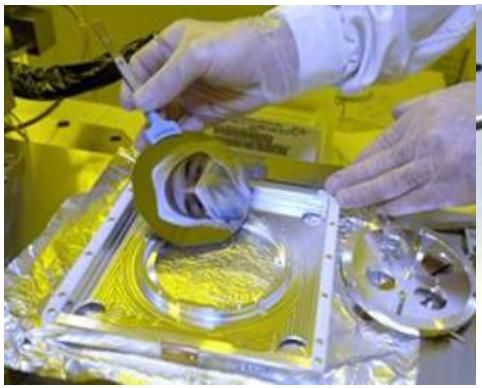
NANO@SCHOOL

- Training for local and foreign companies

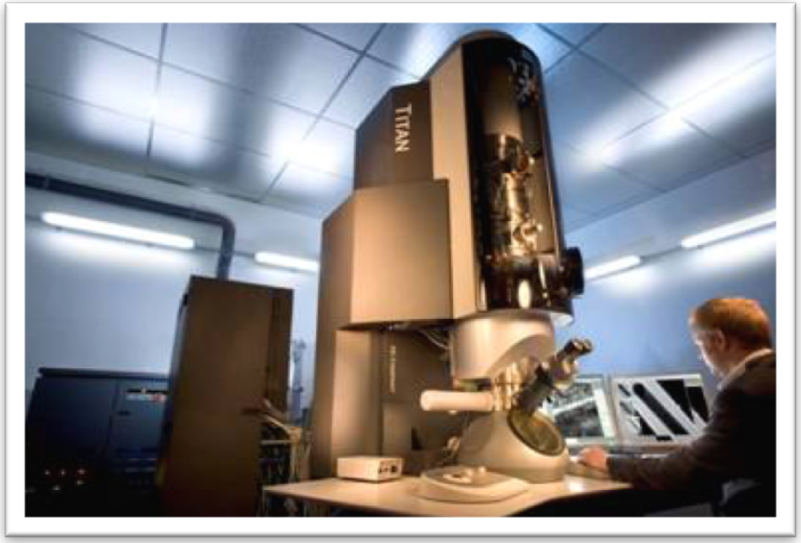
Research – Upstream research Platform

- 3 partners, 4 organisms (CEA, CNRS, Grenoble INP, UJF)
- 700m² & permanent staff of 14 people
- In 2013 : 170 running projets & 300 users

- Methods and equipment facilities for lithography, deposition or etching enabling integration of nano-objects and nano-materials or patterning of thin layers in the nanometric range.
- Flexibility and ease of access : an original management and administration system run by the INAC and the FMNT
- The operating overheads of the PTA are supported by the user laboratories.




Research – Nanocharacterization platform



A unique in-line & off-line platform in Europe

- 100 people
- 1500m² cleanrooms
- 3M€/yr investments
- 40 heavy equipments
- 80 in-line equipments (from 100 to 300mm)
- Cooperation with eqt suppliers (Titan from FEI)

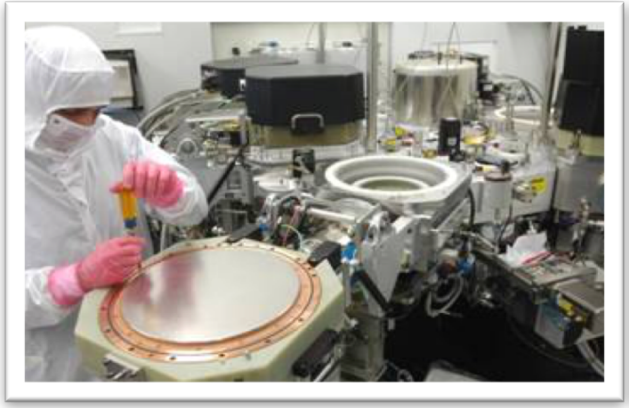
- Research team on characterization
- Close to large research infrastructures (Synchrotron, neutrons,..)
- Collaboration with both upstream and technological research teams

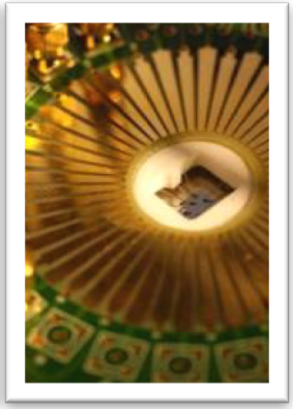
Technological Research: Nanotec 300 & MEMS 200 PF

“More Moore & 3D 300 platform” / “More than Moore 200 platform”

Observation and measurements of the ultimate properties of synthesized materials in devices or systems versatile nanoscale

- Activity : proof of concept, prototyping, pre-production => from process step to packaging
- A platform operated by Leti
- >100 people
- Initial investissement (2006): 15M€
- 24/7 operation
- Equipment sharing with start-ups
- Industrial partnerships & international cooperation with fundamental research labs (Cambridge, ALS) or applied research (IMEC) and industrials (STMicroelectronics, OMICRON)





Industrial R&D labs on-site

A dedicated building for industrial partners

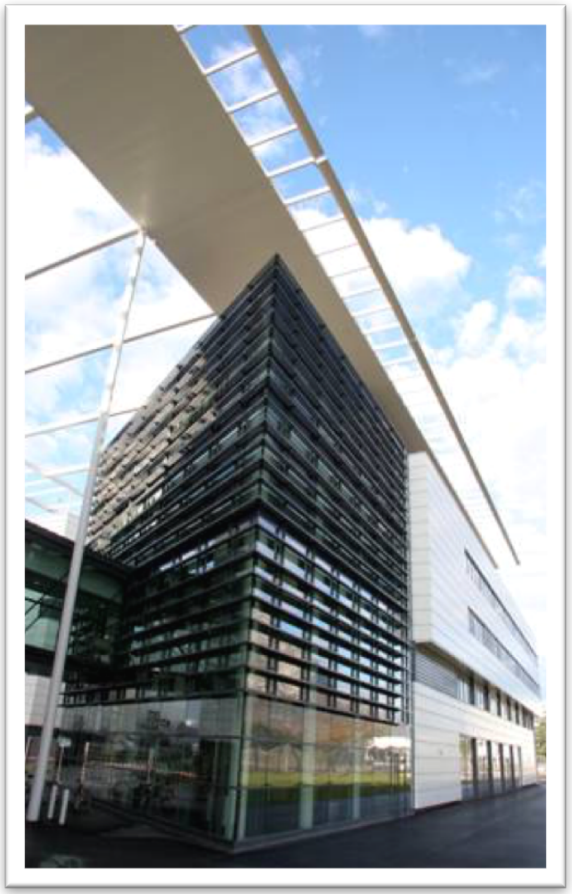
Offices, laboratories and cleanrooms to rent

- ➔ **In permanent contact with research teams**
- ➔ **Access to common MINATEC facilities**

Technology Transfer – « Maison MINATEC »

A unique gathering in Europe

150 people involved in technology transfer activities in micro&nanotechnologies



- Research trends: Observatory for Micro-Nanotechnologies (OMNT)
- Strategic Marketing
- Competitive Intelligence / benchmark
- Networking and projects: Minalogic Cluster office, SEMI
- Patents: engineers, lawyers
- Technology transfers and contracts
- Investments – Start-ups

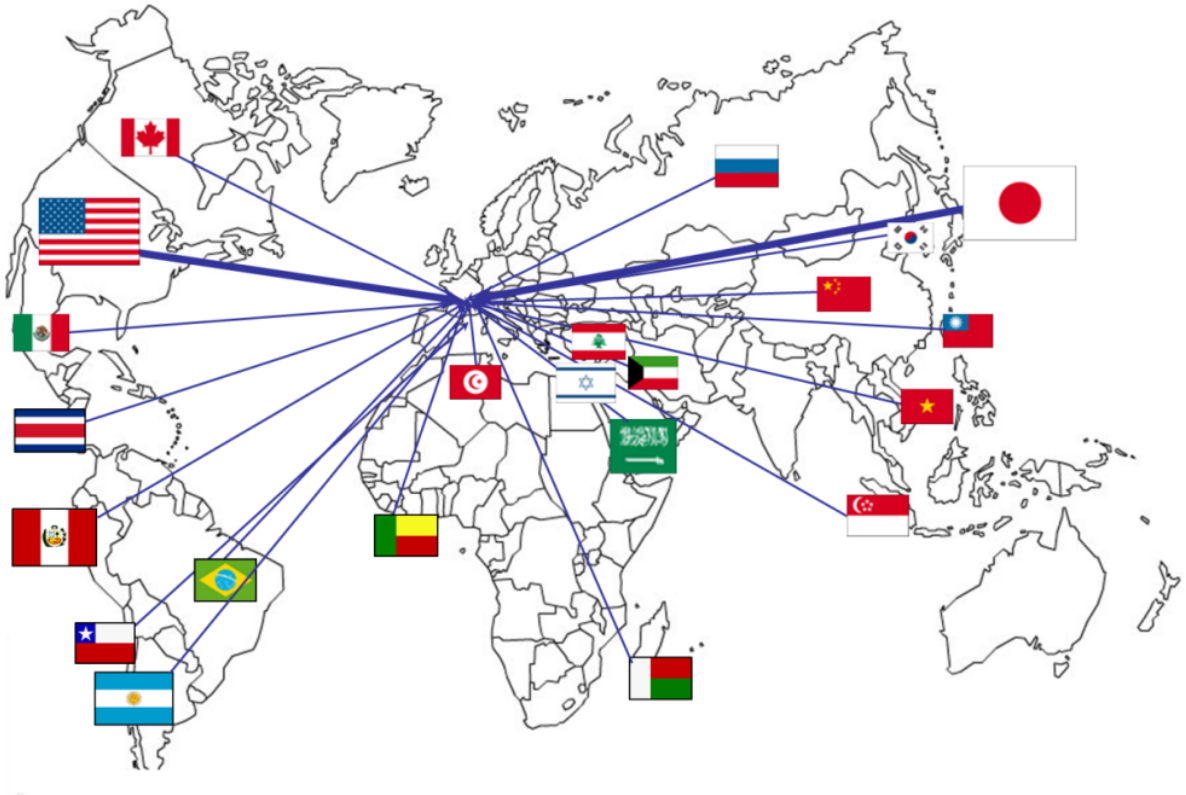
Weekly visitors and multiple events

1 official team visiting MINATEC /week

Maison MINATEC

2014 – 2015 – 2016

- 100 official delegation (ministers, president of university and research organisation).)
- 798 visitors as individuals



- 346.390 participants to events since 2007
- 1.215 conferences and events
- 5.540 meetings
- 142 PhD and post-docs defense

GIANT | HIGH LEVEL FORUM
Leading Innovation Ecosystems

cea WEDNESDAY, JUNE 24, 2015
leti Days

nanoSAFE'16

ESONN'2015
European School On Nanosciences & Nanotechnologies

PARVIS DES SCIENCES

HERCULES
European School

MINATEC

The 3 pillars of attractivty

- ✓ Research staff platform → how much ? engineers, technicians, PhD ? International ? Master students available on site ?
- ✓ Equipments platform→ Investment capacity along last years? Unique ? Maintenance ? 24/7 operation for industry support ? Sharing cost model with start-up ?
- ✓ Intellectual property platform→ Investment capacity along last years? portfolio size ? In-house dedicated staff ? Strong management strategy ? Seen as an advertising tool or as a cost ?

The 3 requests from customers

- ✓ **How to achieve customer goals → Project management ? Reporting ? ISO certified ? Results guaranteed ? SWOT analysis culture ?**
- ✓ **Business model → existing one ? Full cost per person per activity per year ? How much to cover for the customer ? 50, 80, 100, 120 % ? Cost for national and international customers ?**
- ✓ **Intellectual property access → Background access included in program cost ? Foreground proprietary rules ? Licence fee calculation ? Rules for exclusive or non exclusive licence ?**


MINATEC®
Large part of MINATEC activity is dedicated to develop science and technology and transfer to industry or create future industry through start-up
Education Research Industry

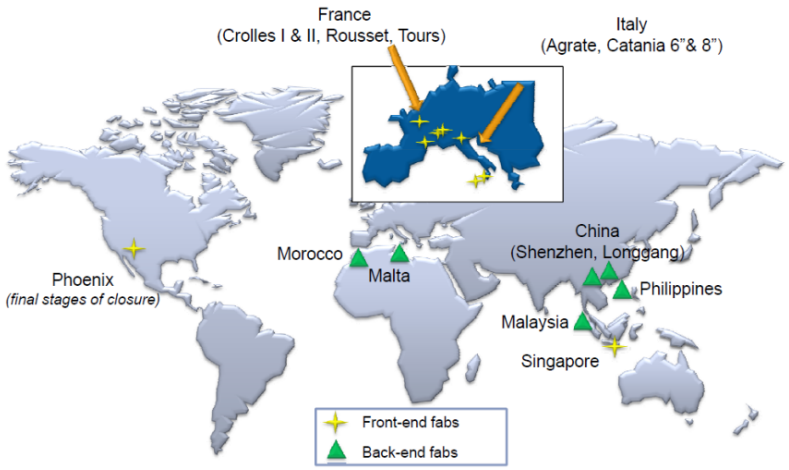
STMicroelectronics // A world leader in providing the semiconductor solutions

/. 1972- Leti EFCIS

/. 1982 : EFCIS absorbed by THOMSON
/.Created as SGS-THOMSON Microelectronics in June 1987, from merger of SGS Microelettronica (Italy) and Thomson Semiconducteurs (France)
/. Renamed STMicroelectronics in May 1998

(Etude et Fabrication de Circuits Intégrés Spéciaux)

Manufacturing Locations



A world leader in providing the semiconductor solutions

- Approximately 45,000 employees including ST-Ericsson (Dec.31, 2014)
- 2014 revenue: $7.40 billion
- Advanced R&D centers in 10 countries &11 main manufacturing sites
- Corporate Headquarters: Geneva, Schwtz
- Global presence with sales offices all around the world
- Public since 1994 - shares traded on New York Stock Exchange (NYSE: STM), Euronext Paris, and Borsa Italiana

- Among the world's largest semiconductor companies
- A leading Integrated Device Manufacturer serving all electronics segments
- A leading technology innovator (around 8,700 R&D researchers, ~24,000 patents)
- Key strengths in Multimedia Convergence, Power Applications and Sensors
- Rich, balanced portfolio (ASICs, Application-Specific Standard Products and Multi-Segment Products)
- A pioneer and visionary leader in sustainability

SOITEC // #1 wwide for SOI

/. 1992 DRT-Leti

/. André-Jacques Auberton-Hervé & Jean-Michel Lamure
Ingeneers from CEA-Leti, found SOITEC in 1992

Soitec

French international industrial leader in the generation and production of semiconductor materials for extreme performance, in the heart of electronics and energy challenges

- Staff 2012 : > 1600 personnes
- Revenue 2010/2011 : 500 M€
- Common lab CEA Leti-Soitec from 1991

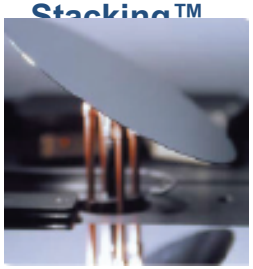
Smart Cut™

Transfer of thin layers of materials from a donor substrate to another substrate

Smart Stacking™

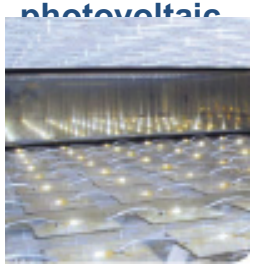
Transfer of very thin layers of partially or fully processed wafers onto other wafers

III-V Epitaxy Stacking™



Epitaxy Grow epitaxial layers on gallium arsenide (GaAs). Enables stacking of multiple layers

Concentrating photovoltaic



III-V based multi-junction solar cells + concentrating optics

International partners

Soitec
Producteurs et fournisseurs industriels
Leti Universités
Région grenobloise

ARM
imec
Fraunhofer ISE Cluster de Dresde
→ Europe

IBM
GLOBALFOUNDRIES
ISO industry consortium
Plus de 30 leaders mondiaux de l'industrie
Johnson Controls
→ Monde

MINATEC

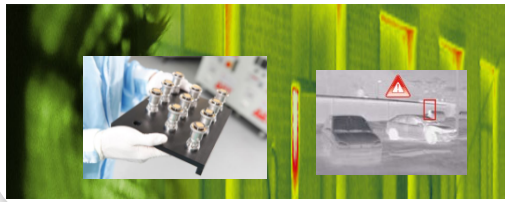
Education Research Industry

cea

ULIS

SOFRADIR-EC

1986 - 2001
700 personnes



(cooled) Infrared detectors

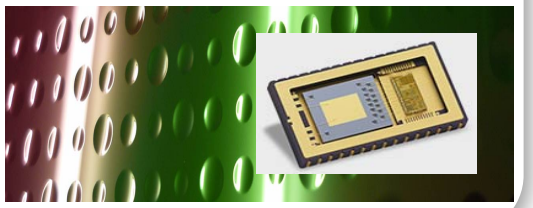
Soitec

1992
> 1200 personnes

SOI generation & production

tronics

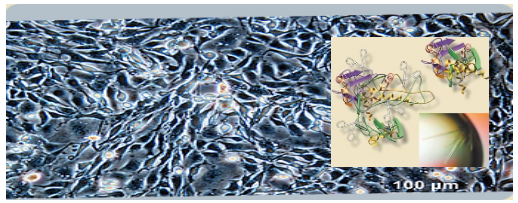
1997
80 personnes



1st foundry to offer MEMS on SOI

PX'Therapeutics
The Protein'eXpert group

2000
50 personnes



Proteins bioproduction

CROCUS Technology
Blossoming future

2004
80 personnes

Magnetoresistant semiconductors

ImmunID Technologies

2004
20 personnes

Diagnostics

MICROOLED

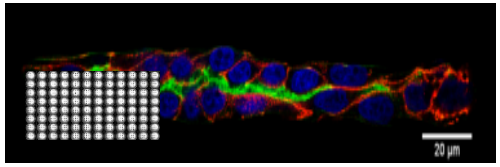
2007
30 personnes

Camera and camcorder viewfinder
Photograph : Jan Tyler and MICROOLED

Miniature OLED displays

CYTOO
CELL ARCHITECTS

2008
30 personnes



Physiological Cell-Based Assays

KALRAY

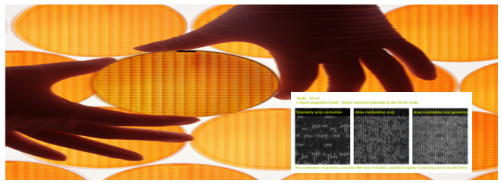
2008
60 personnes

Programmable multiprocessor circuits

movea
Acquired by InvenSense
2009
50 personnes

Motion sensing & data fusion

aselta
NANOGRAPHICS
2009
30 personnes



Software for SUB-32 NM lithography

fluoptics
2009
15 personnes

fluorescence imaging solutions for real time guided surgery

PROLLiON
RILCEN
2009
35 personnes

Lithium-ion battery systems

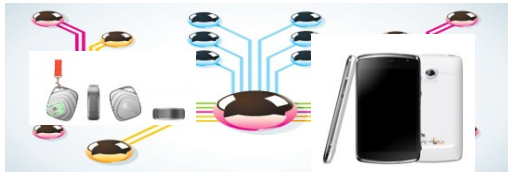
isorg
2010
30 personnes

Organic and printed electronics

ethera
Breathe Safely
2010
25 personnes

Diagnostic kits for indoor air quality (formaldehyde)

Be Spoon
We position
2010
10 personnes



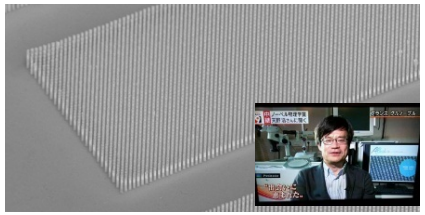
Precision location technology

Symbio FCell
2010
25 personnes

high power Fuel Cell System

ST Micoelectronics

Aledia — 2011 — 42 personnes

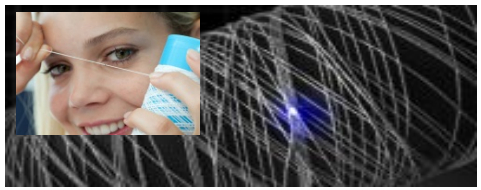


High-power LEDs

APIX Analytical Pixels — 2011 — 15 personnes

Multigas analysis

Primo1D The E-Thread Company — 2013 — 10 personnes

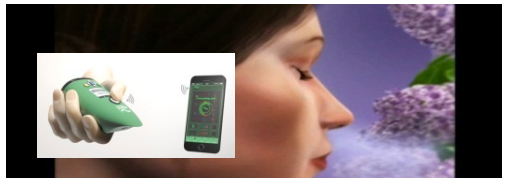


Integrated electronics in thread

avalun — 2013 — 15 personnes

Blood test (pocket lab)

ARYBALLE Technologies — 2014 — 6 personnes

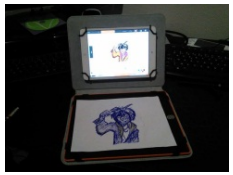


Olfactory & Gustatory Nano Biosensors

enerbee motion makes sense — 2014 — 15 personnes

energy harvesting

iskn — 2014 — 20 personnes



new digitizing technology

EXAGAN Accelerate Power Transition — 2014 — 5 personnes

power components made from gallium nitride on silicon

eVaderis — 2014 — 5 personnes

microcontrollers

The 3 high level KPI for such campus

- ✓ International visibility → is Grenoble in premier league ? Do Thomson Reuters rankings have a real impact ? and is MINATEC or France attractive enough for students, researchers, industry, investors?

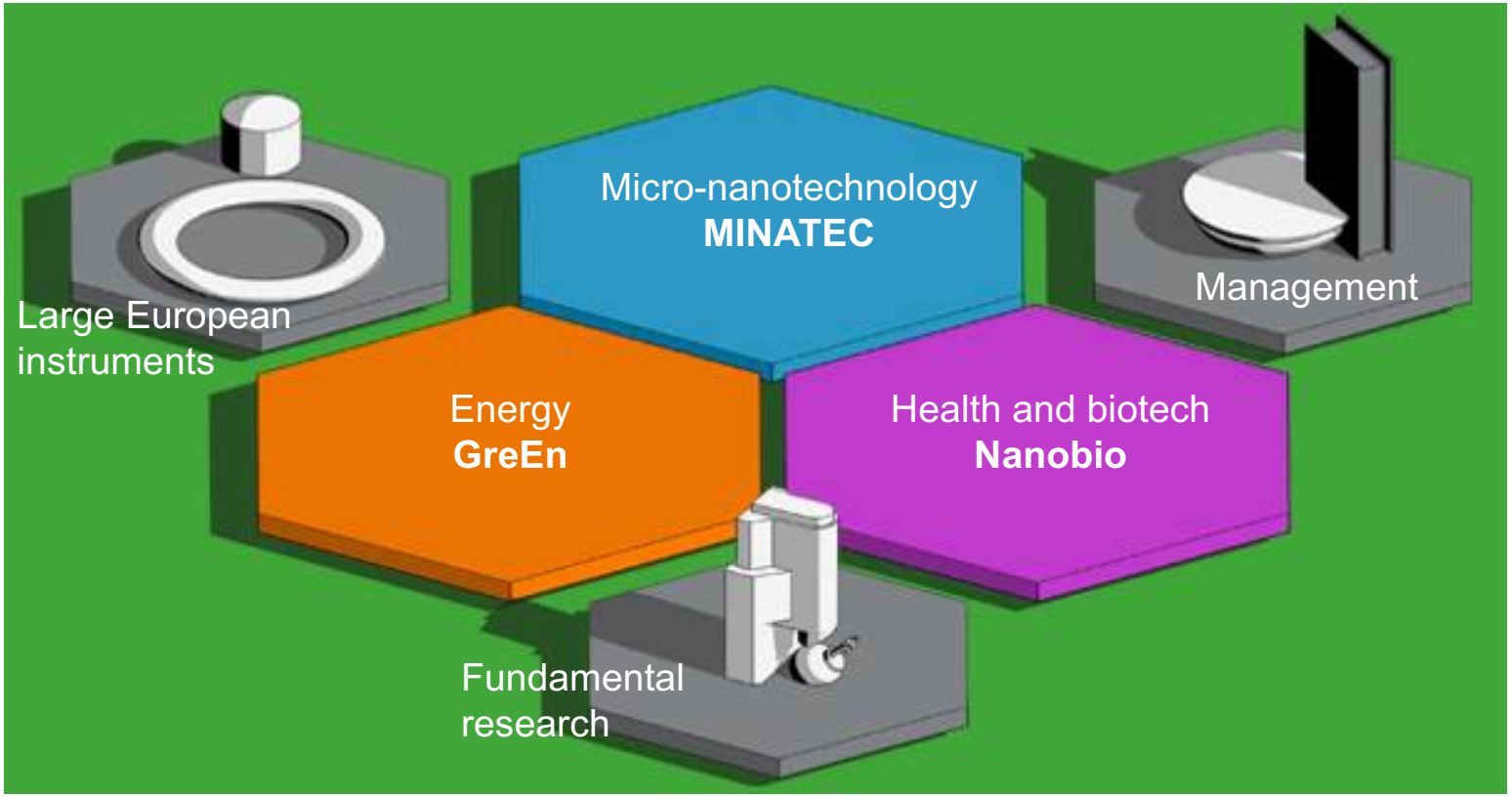
- ✓ Ecosystem generation and development → strength and commitment of collaborations and interactions between the different entities from education, research and industry?

- ✓ Economic impact → has been estimated at €4 Billion per year, on the research area; over € 12 Billion annually for Grenoble. Questions on the exact calculations and who is able to calculate?


MINATEC®
What’s next ?
Education Research Industry

Vision : 6 centers of excellence

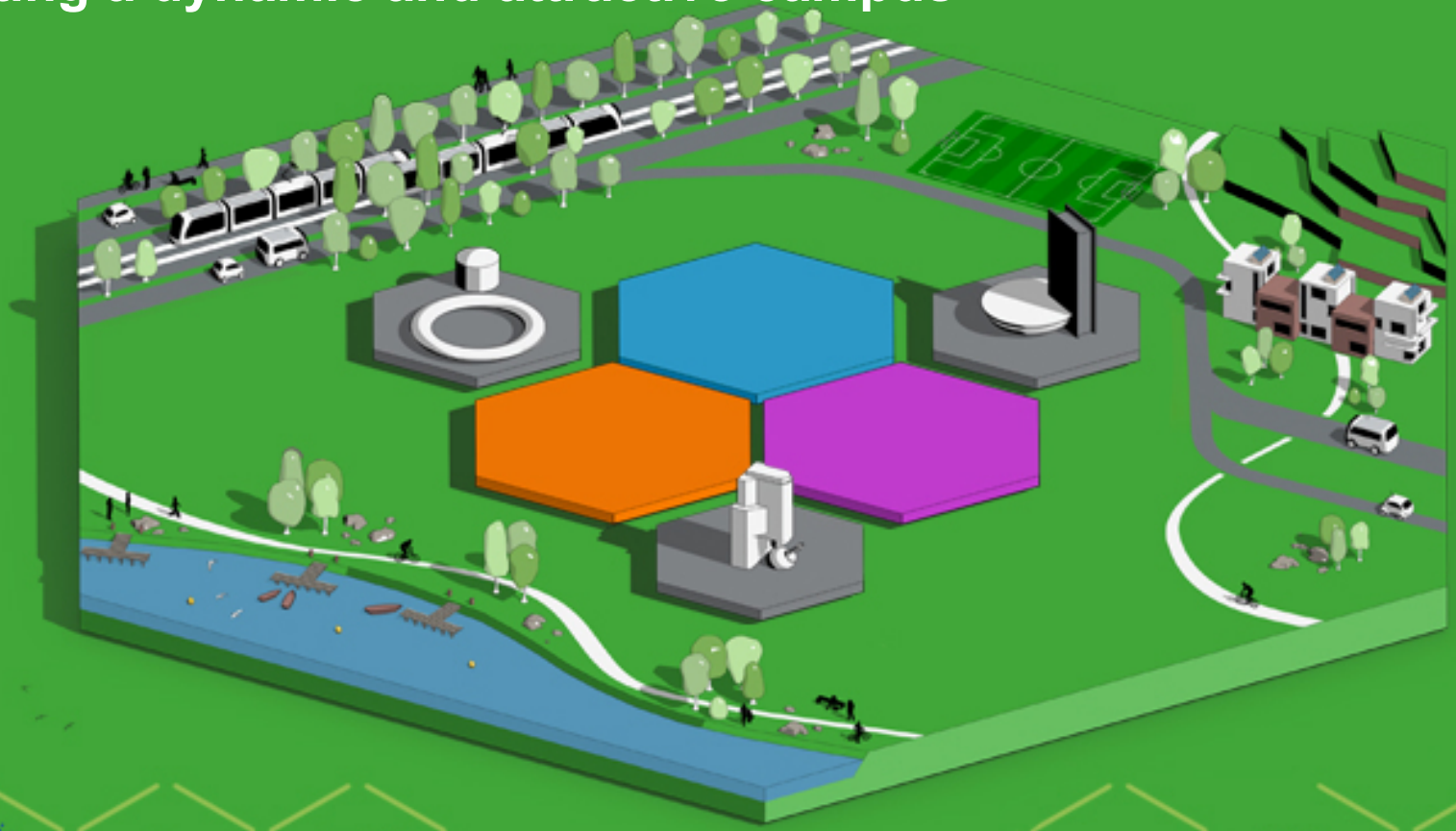
GIANT
INNOVATION CAMPUS



GIANT

GIANT's vision, an ambitious urban transformation

Creating a dynamic and attractive campus



ESRF
cnrs
ill NEUTRONS FOR SCIENCE
cea
SMTC
LA METRO
VILLE DE GRENOBLE
EMBL
GRENOBLE ECOLE DE MANAGEMENT
INP
isère CONSEIL GÉNÉRAL
RhôneAlpes Région

Key figures

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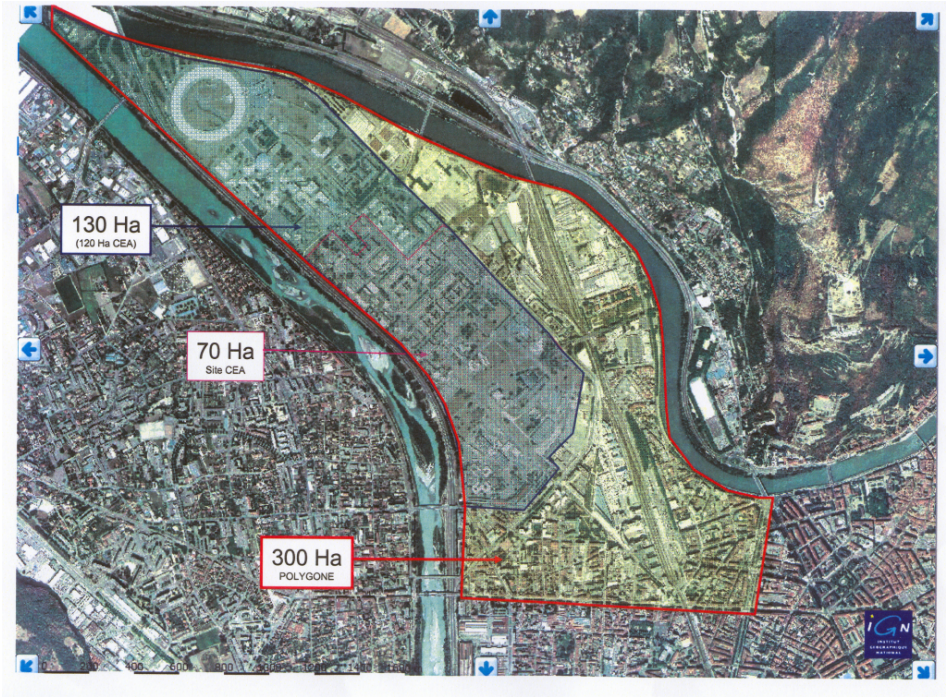

Annual budget : 1 B€

CapEx : 150 M€

10 000 researchers
10 000 students
10 000 industrial jobs
10 000 residents

> 5 000 publications per year
> 500 patents per year

Investing in technology infrastructure

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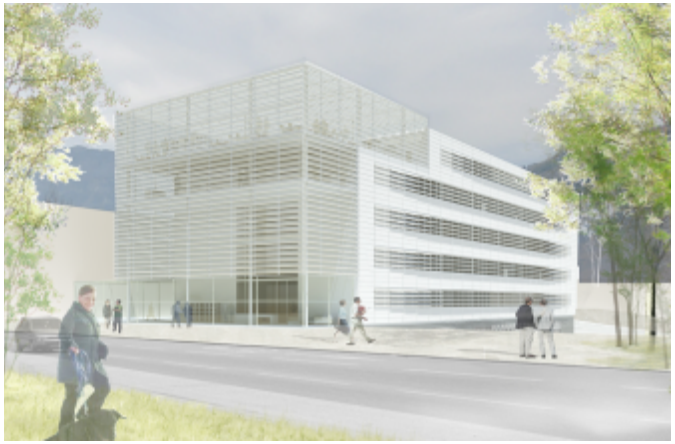
Structural biology institute

Synchrotron upgrade

Photonics building

Nanosafety platform

Energy school



Science building

Nanoelectronics school

CLINATEC

20 M€

Nanosafety platform

17 M€

Open Innovation center

A new urban area…

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Illustrations AECDP

…Environment friendly

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- A model for smart city development
- Carbon neutral, energy autonomous district, no fossil fuel consumption

Local energy generation

Solar, hydraulic, biomass



Smart buildings and grid

Very low energy buildings,
Smart electrical grids, low temperature heating/cooling loop


Electrical mobility

Mobility pass, hydrogen mobility,
Mobility pavillion



GIANT: Coupled to a huge urban development project

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Merci pour votre attention