LIÈGE université

www.uliege.be

Objectives of the visit

- Give life to the collaboration agreement through presentation, exchanges and discussion
- Addendum for specific projects to define the resources (human, lab, and budget)
- Collaboration can be used for project proposals

FRAMEWORK COLLABORATION AGREEMENT
REFERENCE KN 5999/EN
(THE "AGREEMENT")

BETWEEN: THE EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH ("CERN"), an Intergovernmental Organization having its seat at Geneva, Switzerland, duly represented by Katy Foraz, Head of the Engineering Department,

AND: THE UNIVERSITY OF LIÈGE ("ULIÈGE"), a public higher-education and research institution of Wallonia having its seat at Liège, Belgium, duly represented by Anne-Sophie Nyssen, Rector of the University of Liège,

Hereinafter "Party" and collectively "Parties".

CONSIDERING:

That CERN, an Intergovernmental Organization, is a leading global laboratory in particle physics, providing for collaboration of a pure scientific and fundamental character, with participation by scientific institutes from all over the world;

That ULiège is an international research university with a strong scientific expertise in many fields of fundamental science and related areas;

That the Parties wish to conclude this Agreement in order to provide for a foundation in various areas of scientific collaboration including, but not limited to collaboration in the fields of machine learning applied to physics and experimental design, advanced mechanical systems / precision mechatronics, optical testing, numerical modelling of electromagnetic fields, sustainable geological and civil engineering;

The mutual benefit that the Parties would derive from collaboration between them;

AGREE AS FOLLOWS:

Article 1
Purpose

This Agreement establishes the framework for collaboration between the Parties in particle physics and fundamental research and related areas, including engineering, machine learning applied to physics and experimental design, advanced mechanical systems / precision mechatronics, optical testing, numerical modelling of electromagnetic fields, sustainable geological engineering, vacuum and cryogenics, and in any other area of mutual interest. The implementation of this Agreement by the Parties shall be subject to the availability of resources at the Parties. The Parties shall use the results of their collaboration for non-military purposes only.

Article 2
Project(s)

2.1 Each Party's contribution to a specific collaboration ("Project"), including, where applicable, the required resources, the duration of the activities and any deliverables, milestones, acceptance procedures and the management of the Project shall be set out in an Addendum to this Agreement. The Project shall be subject to the provisions of this Agreement, varied, where applicable, through the provisions of the Addendum.

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Article 12
Amendments

Any amendment to this Agreement shall be made in writing and signed by the authorized representatives of the Parties.

Signed on by the authorized representatives of:

The European Organization for Nuclear Research (CERN)	The University of Liège
DocuSigned by: Katy Foraz	DocuSigned by: Anne-Sophie Nyssen
Katy Foraz	Anne-Sophie Nyssen
Head of the Engineering Department	Rector of the University of Liège
Signed on: 16.04.2024	Signed on: 15.05.2024

11 Faculties

Human Sciences

- **Philosophy and Letters**
- **Law, Political Science and Criminology**
- **Social Sciences**
- **HEC Management School - ULiège**
- **Architecture**
- **Psychology, Speech and Langage Therapy and Education**

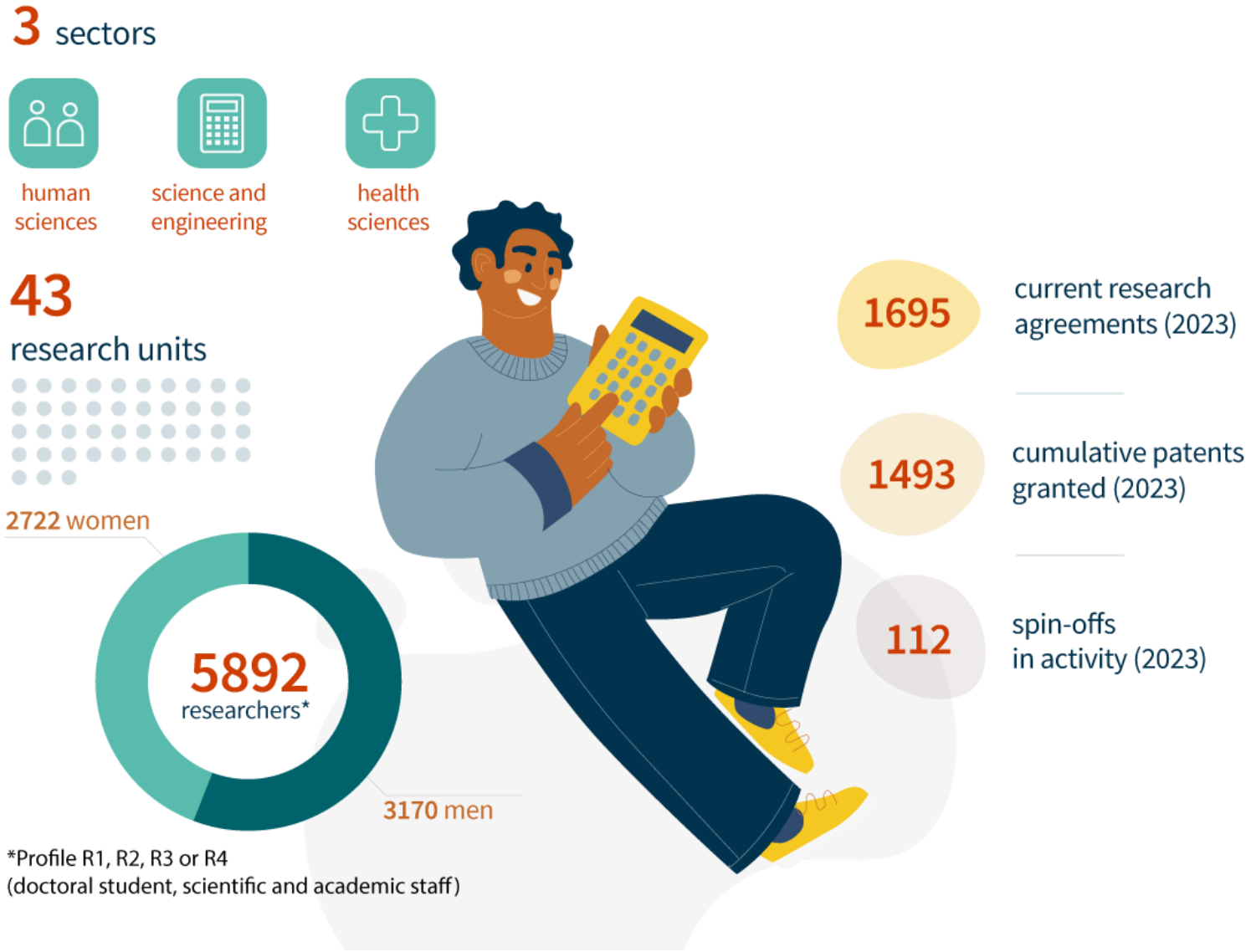
Sciences and Technology

- **Gembloux Agro-Bio Tech**
- **School of Engineering**
- **Sciences**

Health Sciences

- **Medicine**
- **Veterinary Medicine**

Research at ULiège



The University of Liège promotes excellent, multidisciplinary research.
It is involved in fundamental research, in regional development programmes, in the Wallonia-Brussels Federation and in Europe. Take a look at the 43 research units within the institution.

Source : Radius - Rapport 2023 Tittan-RISE | Infographie : Aurélie Peché

Key figures in Research

226.5 MiO € annual research budget

39% of the budget comes from research agreements

1685 current research agreements

49%
Foreign nationality

105
EC Projects*

15
ERC Projects financed

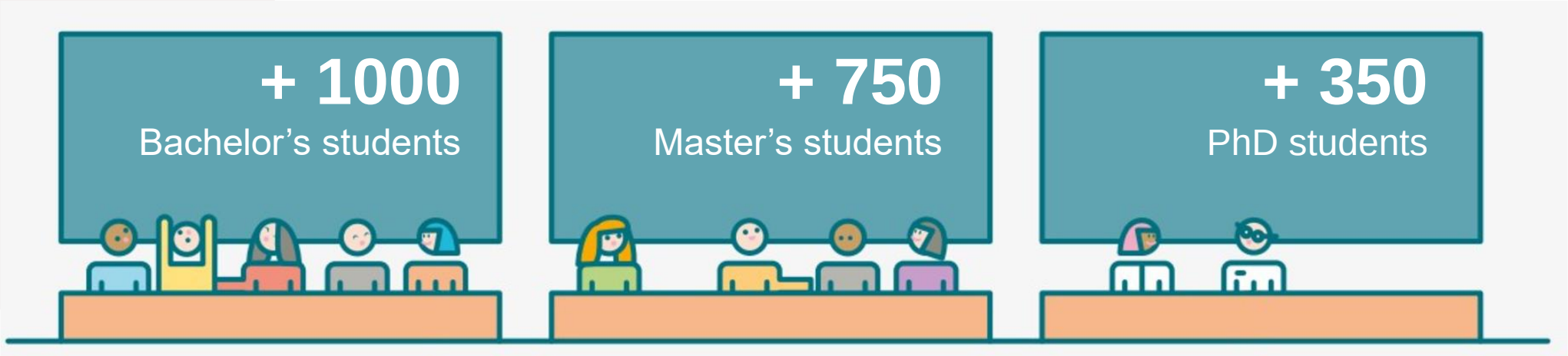
**Current EU-funded framework programs*
(FP7 - H2020 - Horizon Europe - Partnerships)

LIÈGE université
Sciences Appliquées

www.fsa.uliege.be

School of Engineering and Computer Science

Students & staff



+ 100
Academics

+ 100
Administrative staff
and technicians

+ 300
Research staff

+ 250
External cooperators
and experts

Education

3 Undergraduate (BSc.) Programs (180 credits – 3 years) **:**
Engineering – Architectural Engineering - Computer Science

14 Graduate (MSc.) Programs (120 credits – 2 years) **:**

Aerospace eng. - **Biomedical** eng. –
Computer Science / and eng. - **Data Science** / and eng.
Electrical eng. – **Energy** eng. - Eng. **Physics**

Architectural eng. - **Chemical & Materials** eng. –
Civil eng. - **Mechanical** eng.
Geology & Mining eng.

6 PhD Programs

International Education

Cti
Commission
des titres d'ingénieur

European
Accreditation
of Engineering
Programmes
EUR-ACE®

eit RawMaterials

+ 200 Active Erasmus partners in **20** countries

3 International Erasmus Mundus Programs :

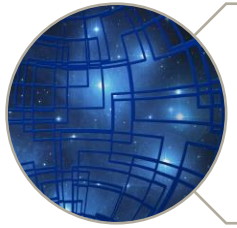
AMIR	Advanced materials and innovative recycling
EMERALD	Georesources engineering
EMSHIP +	Design of Ships and Offshore Structures

A vibrant student life

4 Departments / Research Units

Aerospace & Mechanical Engineering

Chemical Engineering



Electrical Engineering and Computer Sc.

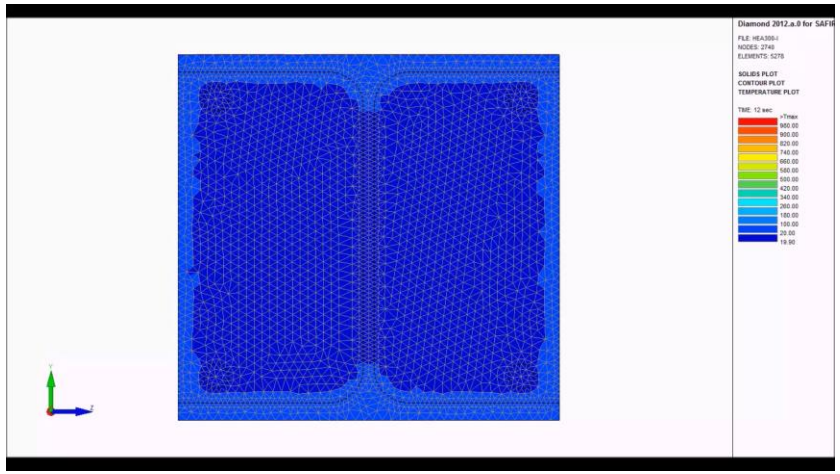
Urban & Environmental Engineering

Experimental facilities

Clean room
Neuromorphic engineering
Electromagnetic compatibility
Wind tunnel
Hydraulics
Fire testing
Structural testing
(…)

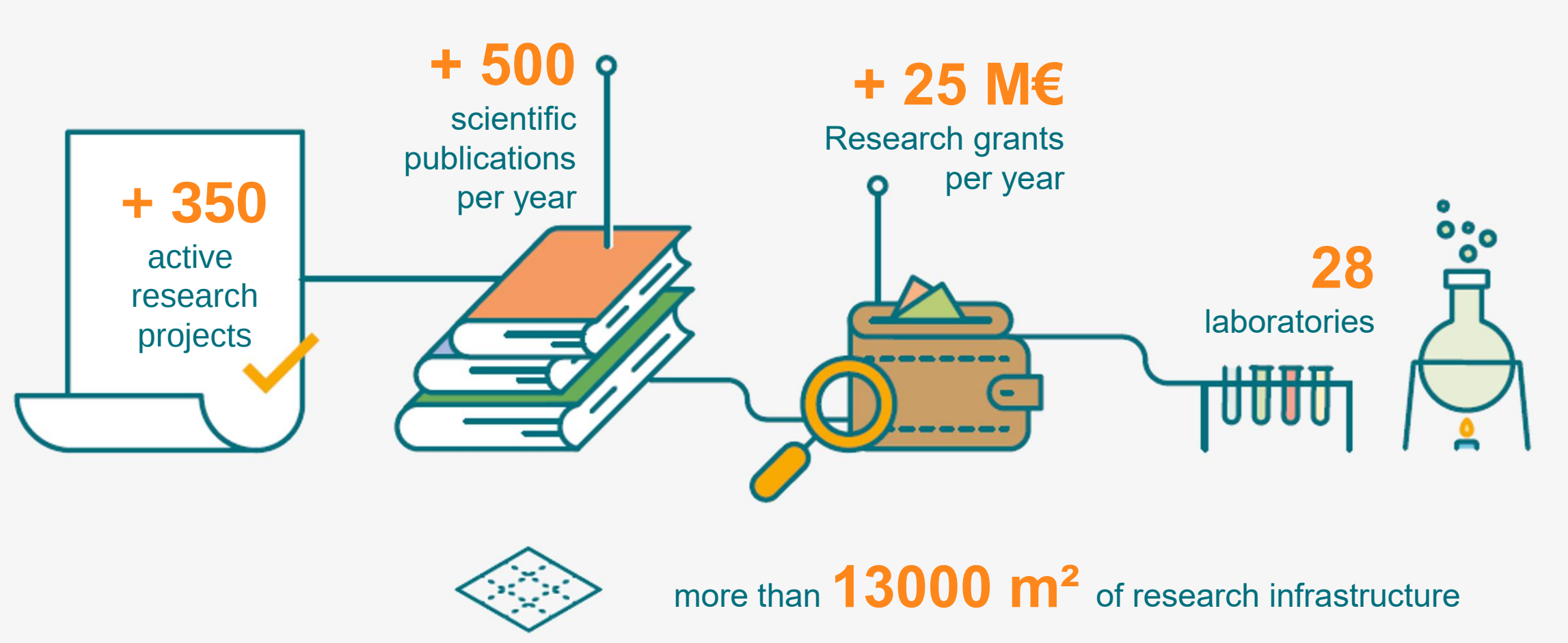
SAFIR	Fire resistance
Samcef	Mechanical virtual prototyping
Metafor	Large deformation of solids
Gmsh	Mesh generator
Onelab	Finite Element Multiphysics
WOLF	River hydrology and flooding
Cytomine	Biomedial image analysis
Scikit	Machine learning

(…)

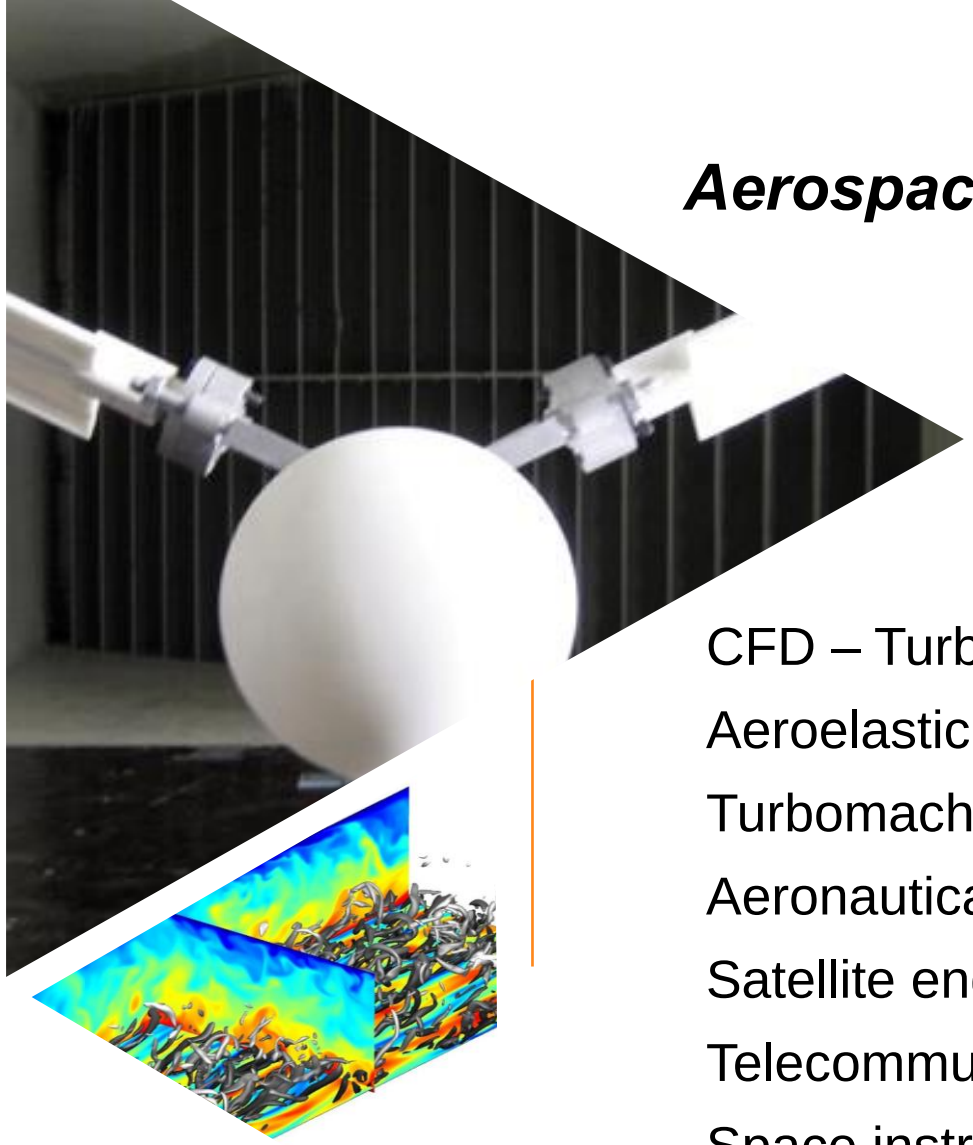


/software / applications

Research figures



A large network of industrial partners



Aerospace engineering

CFD – Turbulent flows

Aeroelasticity

Turbomachinery

Aeronautical structures

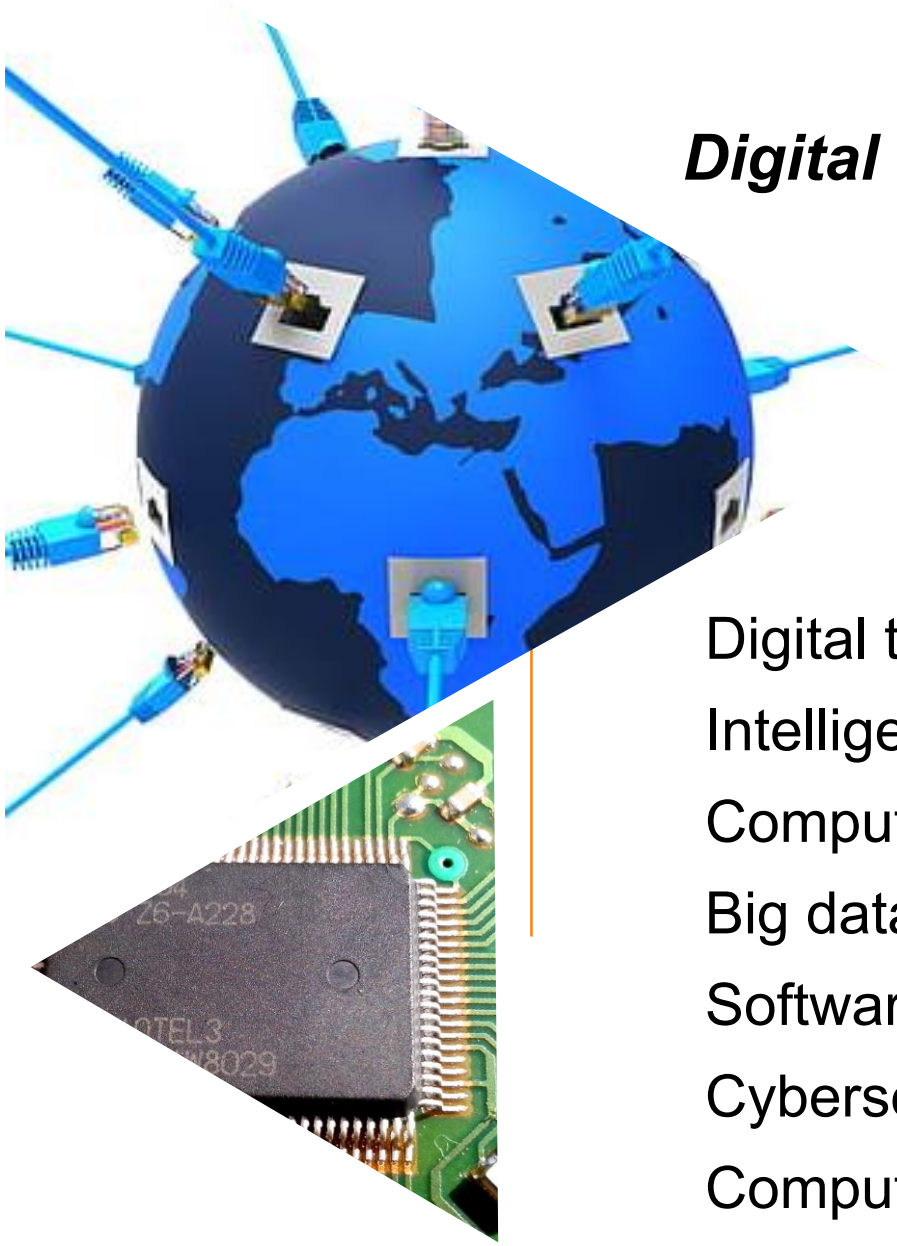
Satellite engineering

Telecommunication

Space instrumentation

Gravitational Wave Detectors

(…)



Digital technology and IT

Digital twins

Intelligent robotics

Computer vision

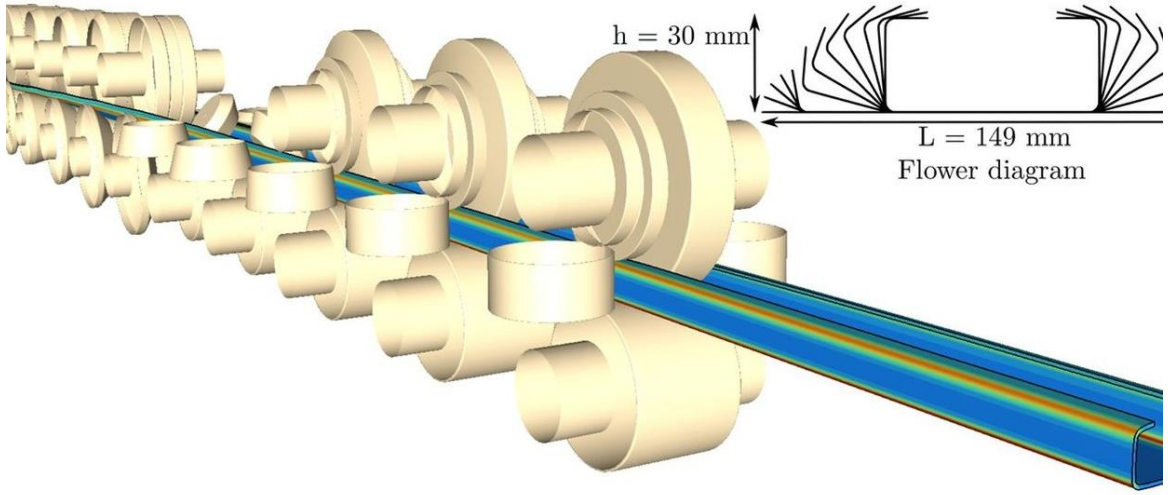
Big data - AI

Software reliability

Cybersecurity

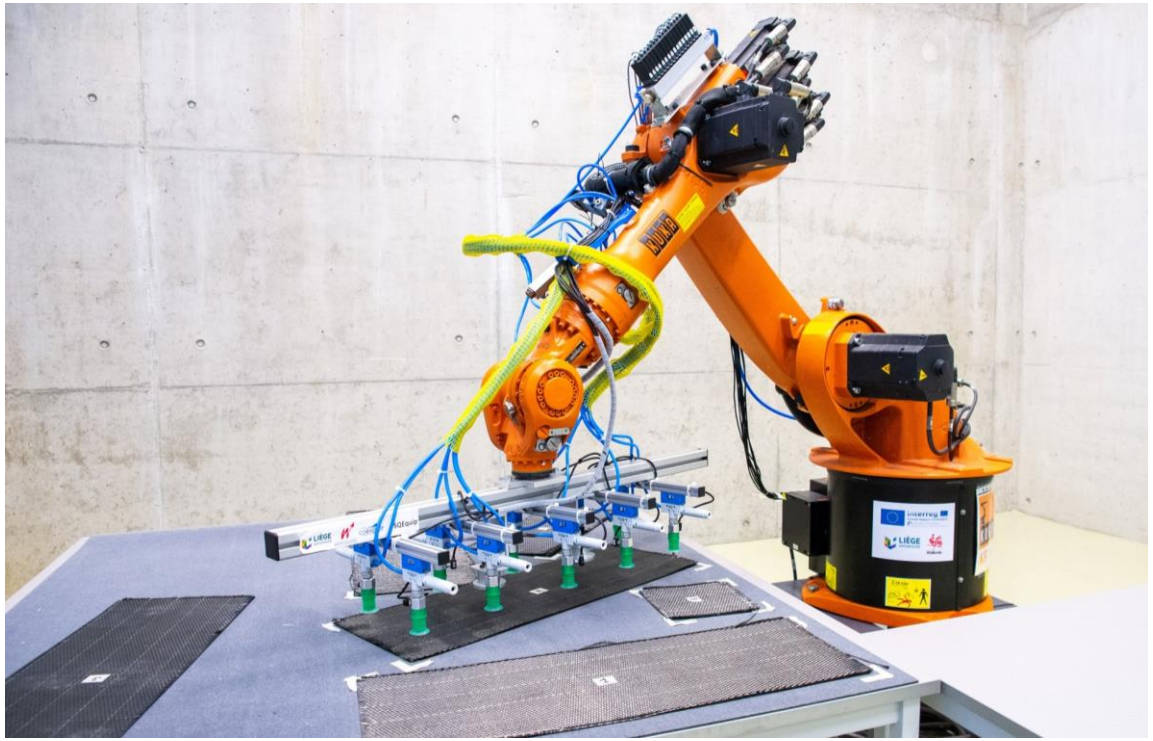
Computer Network

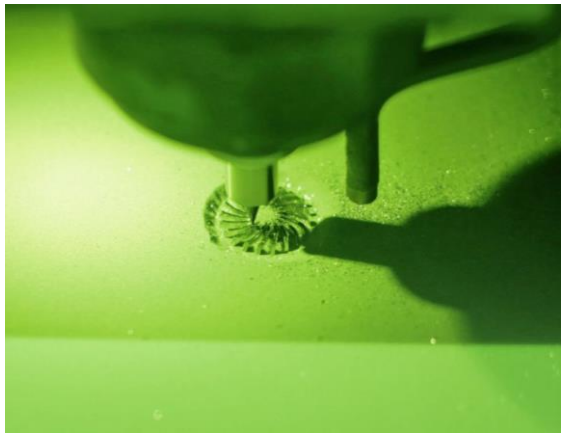
Embedded systems

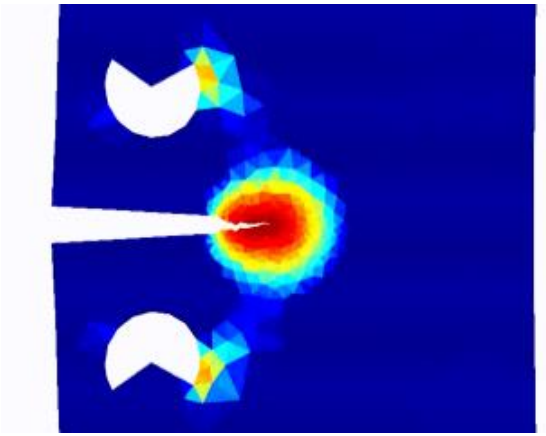


Materials and manufacturing

Additive manufacturing
Material science
Nanostructured materials
Life Cycle Analysis
Non-linear computational mechanics
Fracture mechanics
Robotics and automation…
(…)







Urban and Environmental engineering

Building and engineering structures

Materials and resource efficiency

Resilient city

Risk and environmental engineering

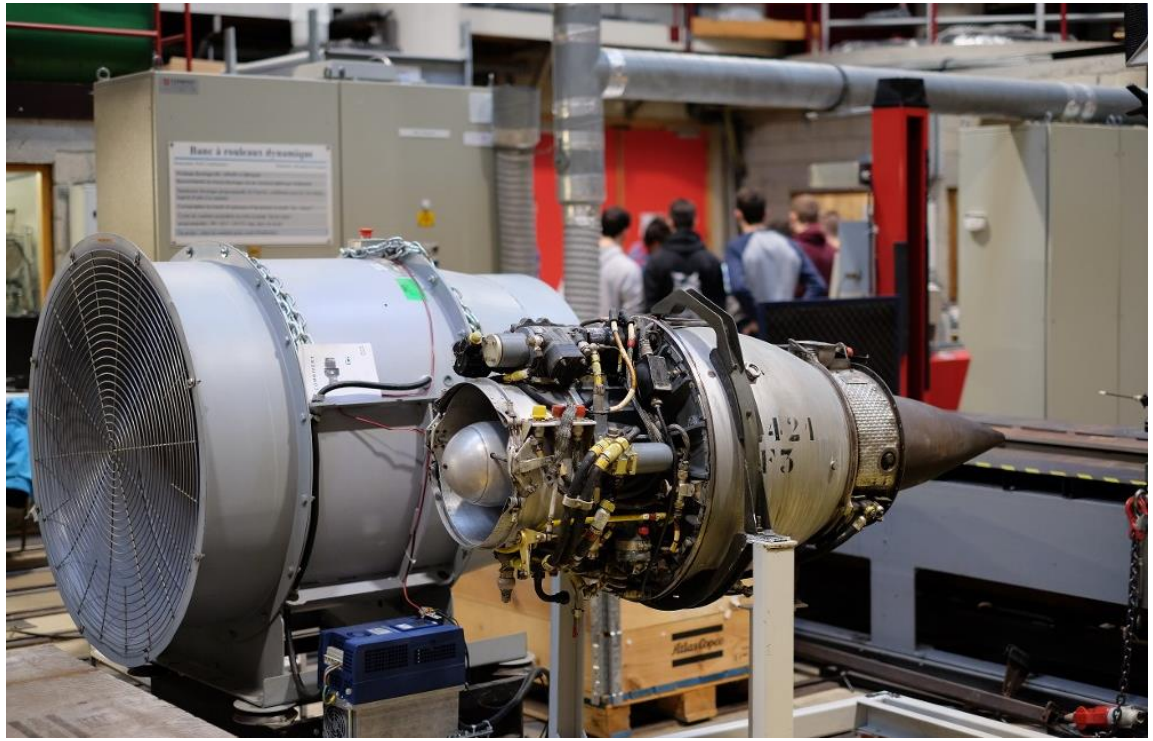
Water resources

Fire engineering

Urban planning

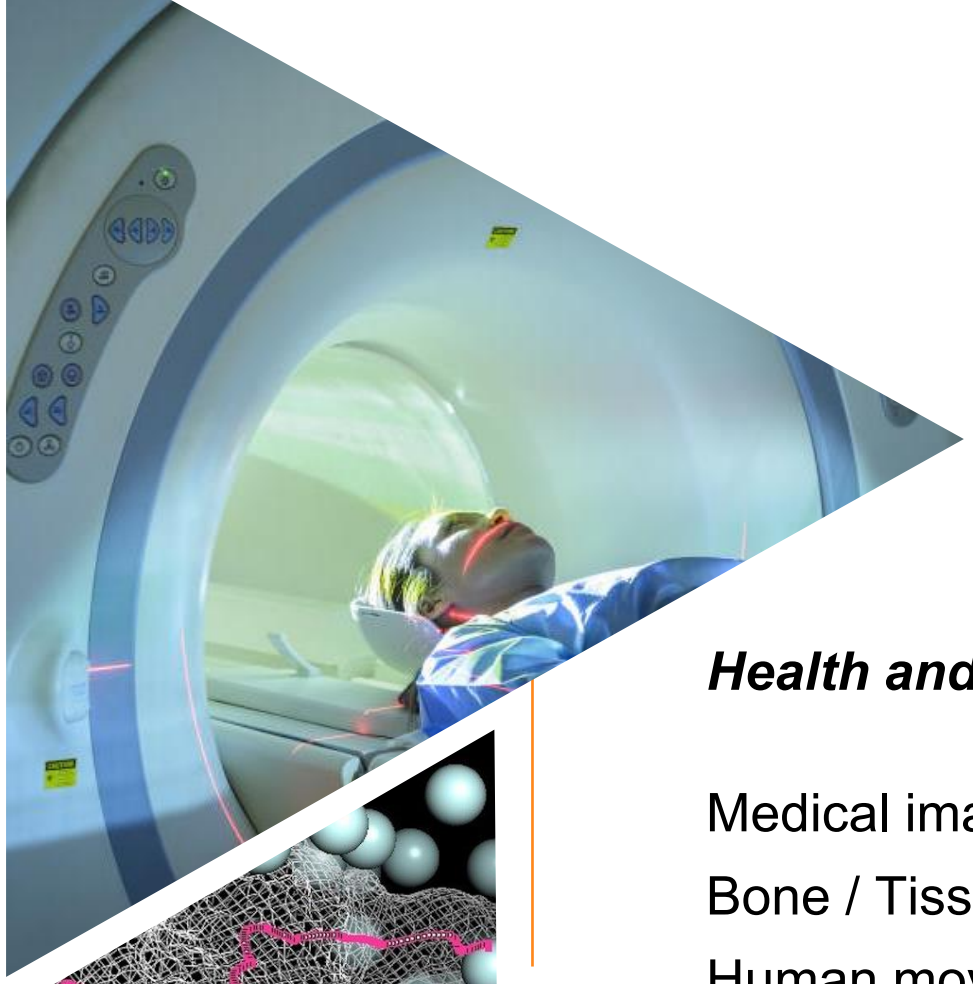
Mobility

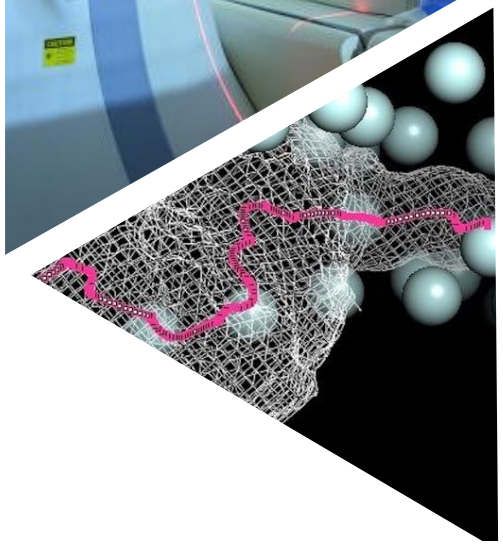
…



Energy

Power generation
Electricity network
Smart grids
Wind energy
Fuel cells
Energy storage
Carbon capture
…





Health and biomedical engineering

Medical imaging

Bone / Tissue engineering

Human movement analysis

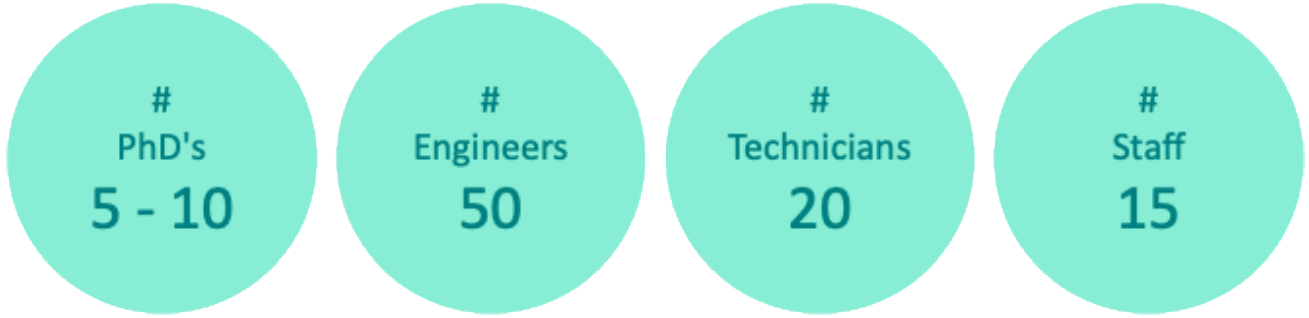
Neuroengineering

Sensors

Microfluidics

Centre Spatial de Liège (CSL)

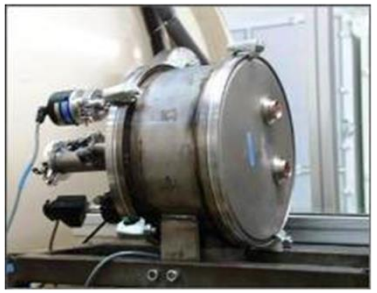
- **As a Center of Applied Research and Scientific Institute part of the Liege University, CSL is represented by 3 programs : Space Instrumentation, Technology Partnerships and Tests**
- **CSL main missions**
  - Design, development, integration of payload systems / subsystems
  - Calibration of instruments on the ground and in flight
  - Qualification and environmental testing mainly in the fields of vacuum (thermal and cryogenic), and vibratory
  - Technology partnership to enrich CSL domains of expertise (Microfabrication / sensors development / Additive Manufacturing based on surface engineering, …)



Spotlight: Space Environment Tests: Vacuum chambers

- **Organises, prepares and operates all tests at CSL**
- **FOCAL: Facilities for Optical CAlibration at Liège**
  - 6 chambers: equipped with primary and turbo pumping system + FOCAL 7
  - Cryogenic pumping available
  - Optical bench on seismic device allowing ground vibration decoupling

6 CHAMBERS



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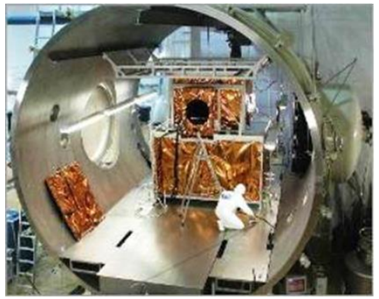
Focal 1.5

Focal 2

Focal 3

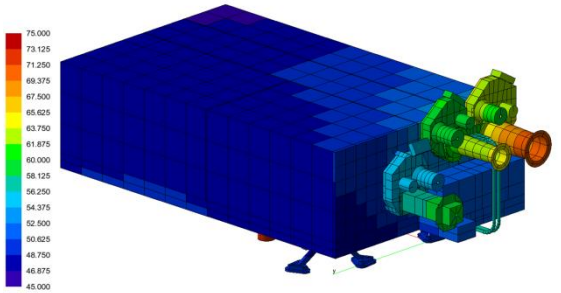


Focal 5

Focal 6.5

Spotlight: Thermal & Mechanical

- **Techniques mastered**
  - Thermal control
  - Optimization of thermal efficiency
  - Customized expertise for space condition simulation (from 5K to 400 K)
  - Cryogenics
    - Design of cryogenic instruments
    - Design of cryogenic set-ups for tests
    - Operation and maintenance of helium refrigeration systems
  - ESATAN-TMS and CSL in house software
  - Mechanical design
  - Mechanism design and development



CSL Main Partners

LIÈGE université
Sciences Appliquées

Thanks
www.uliege.be