CSL – Centre Spatial de Liège (BE)

... space is our inspiration

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CSL: Centre Spatial de Liège

- Research Centre of University of Liege
- Test Centre for ESA and Industry
- Staff: ~ 85
  60 % engineers & scientists
What we do?

- Space instrumentation (development)
- Advanced technologies
- Space environment Tests (payloads)
What we do?

Space environment
Tests
(for payloads)

Clean environment
Vacuum
Low temperatures (cryogenics)
Vibrations
Space environment Tests (payloads)

**Clean rooms**
- 10,000 class clean room (ISO 7 or M 5.5 in SI)
- 100 class available locally (ISO 5 or M 3.5 in SI)

**Lifting capabilities**
- up to 10 T cranes
- with 12 m clearance under hook

**Vacuum Chambers**
- -> 250 m3
- 10^{-6} - 10^{-7} mbar
- 4K (pts 0.1 K)

**Vibrations**
- 2 shakers, on 3 axis under cryogenic and vacuum conditions (down to 15K)
- Frequencies : 5-3000 Hz
- Accelerations : 200 kN (200 G / 100 Kg)
- Maximum weight : 1.2 T

*Planck satellite in test*
Examples (tests)

Herschel telescope

Herschel Telescope
Ø 3.5 m, 200 kg, SiC
Optical verification in cryogenic environment

Aladin for ADMS-Aeolus
What we do?

Space instrumentation (development)
Space Instruments : System Engineering

- Mission definition
- Instruments architecture
- Requirement engineering
- Design & Engineering analyses
- Contractor follow-up
- AIV
- ...

The Extreme Ultraviolet Imager is a suite of 3 EUV telescopes that will fly onboard the Solar Orbiter mission and will observe the Sun in 4 bandpasses.
Space Instruments: Mechanisms

Door mechanisms

Mechanisms operating in extreme environment (4K)

Mechanism design

Scan mirror
Space Instruments: Electronics

- **Detectors**
- **Processor & software**
- **Power conditioning**
- **EGSE**
- **Detector controllers**
- **Mechanism drivers**
Space Instrumentation (development)

SOHO-EIT (1995)


INTEGRAL – OMC (2002)

STEREO – HI (2006)
Twin instruments

COROT (2006)

Herschel – PACS (2009)

PROBA 2 – SWAP - LYRA (2009)

Some missions …
Space Instruments

- EIT (SOHO, 1995)
- OM (Newton, 1999)
- OMC (INTEGRAL, 2002)
- SWAP (PROBA-2)
- FUV-SI (IMAGE, 2000)
- HI (STEREO, 2006)
- COROT Baffle & Cover (2006)
- PACS Cryo mechanism (Herschel)

[Images of space instruments]
What we do?

Advanced technologies

Electromagnetic modeling and Signal Analysis
[SAR: Synthetic Aperture Radar]

Surfaces
Micro & Nano Engineering

Smart Sensors

Solar Energy
Synthetic Aperture Radar (SAR) Image Data Processing

SAR = active, microwave radar imaging technique providing high-resolution images of the Earth and planetary surfaces, independently of solar illumination (ie day and night) and cloud cover (ie in all weather). Contrary to classical visible-light imagery, extensive processing, referred to as aperture synthesis, focusing, or reconstruction, is required to convert the raw image into an intelligible image.
Optical metrology on space optics

Planck Mirrors: measurements ni cryogenic conditions

Mirror characterization from X-ray to sub-mm range

XMM-Newton cylindrical mirrors
3 x 58 shells
Surfaces – Micro & Nano engineering

Micro-structuration
direct laser writing

Laser ablation

Ion beam figuring

Space coatings

Surface metrology
Optical Metrology

3-D metrology machine

Total Station with Distance-metre

Triangulation: videogrammetry

Holographic camera

Holographic and IR interferometry

Stereo correlation
Solar Energy

Space Experiment
PROBA 2

Low solar concentration
with reflectors

High solar concentration
Topics that we are interested in

**Space technology**
- Technologies for European non-dependence
- Independent access to space
- In-Orbit demonstration / validation (IOD/IOV)
- Bottom-up space technologies at low TRL

**Earth Observation**
- EO applications
- Use of Copernicus Sentinel Data
- Reprocessing and calibration of space-based data
- Land and Climate change monitoring
- Technological development

**Space Exploration**
- Life support, habitat management
- Sample curation

**Protection of European assets in and from space**
- Space Weather
- Passive Space Debris mitigation
THANK YOU FOR YOUR ATTENTION