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STAR
Space sciences, Technologies and Astrophysics Research

CSL
CENTRE SPATIAL DE LIÈGE

Thermo-mechanical laboratory of CSL

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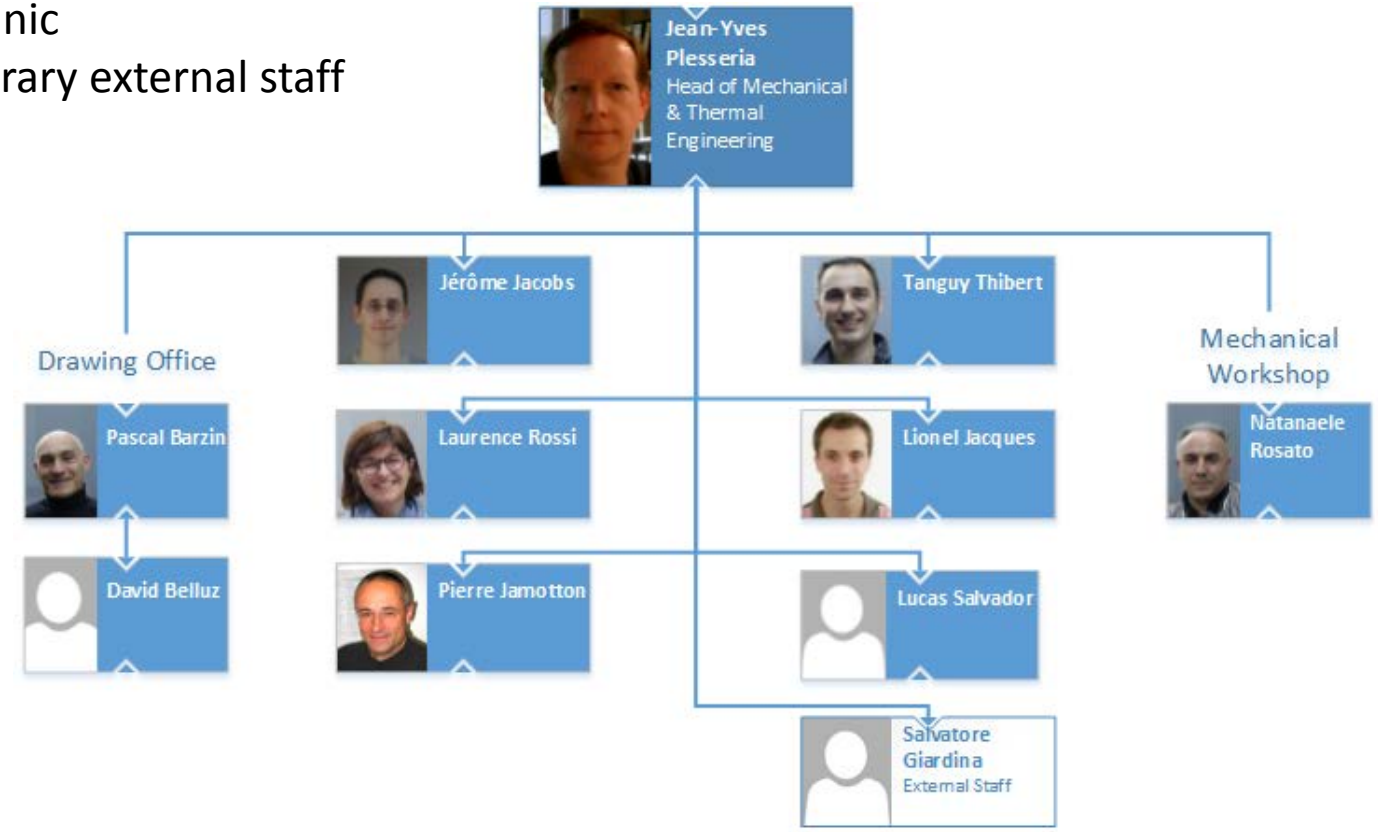
Plan

- Overall structure and staff
- Resources
- Activities
- Current projects
- Prospectives

Overall structure and staff

- 7 engineers (1PhD)
- 2 CAD designer
- 1 mechanic
- 1 temporary external staff



Resources

- Mechanical workshop
  - Milling tool
  - Turning tools
  - Drilling tools
  - Bending tools
  - Cutting tools
- Cryogenics workshop
  - Cryostats
  - Dewar
- Generic tools for measurement and mounting
  - Length measurement tools
  - Torque wrenches with calibrators
  - Weights and scales
  - Classical tools
- Softwares
  - Solidworks + simulation
  - Esatan
  - Altair Hyperworks (in the frame of a PhD)
  - Openfoam (free)
  - CABARET (ball bearing analysis ESA)
  - ESACRACK (fatigue analysis ESA)
  - Spenvis (radiation environment analysis)

Activities (1)

- Mechanical design
- Thermal design
- Mechanism design
- Mechanical analyses:
  - FEM (modelling and computation sub-contracted, interpetation-reporting CSL)
  - Bearing analysis
  - Fatigue analyses
- Thermal analyses (ESATAN)
- Radiation analyses (Spenvis, FastRad)
- System engineering
- Assembly, Integration and Verification
  - Qualification (including process qualification)
  - Verification

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Activities (2)

- Ground support equipment:
  - Thermal (thermal tent design)
  - Mechanical (alignment jigs, containers, handling jigs, mechanical support)
  - Vacuum systems
- Cryogenic design:
  - Mechanical, thermal design in cryogenic condition (down to 4K)
  - Cryostats and test equipment for cryogenic tests (down to 4K)
  - Cryo cooler
  - Cryogenic fluids science
- Additive manufacturing:
  - Adaptation for space use
  - Test and qualification of demonstrators
- Cubesat:
  - Participation in system design
  - Participation in technologies development
- Manufacturing
  - Small workshop for support and small works

Current projects (1)

- Science projects (flight instruments)
  - CHEOPS: design, procurement and qualification of the Baffle and Cover Assembly (THM: all except straylight model)
  - Athena X-IFU: design of the filter assembly holder (cryogenic condition) (THM: all)
  - Proba3-ASPIICS: Prime for the realisation of the full instrument (THM: mechanical and thermal design and analyses)
  - Plato: Preparation of AIV (alignment FPA-telescope + testing) (THM: Design and analyses of opto-mechanical part of the alignment system + flight fixation analyses)
  - Solar Orbiter EUI: Supply of the Extreme UV instrument (THM: mechanical and thermal design)
- Science projects (GSE)
  - EUCLID preparation: Preparation of test facility for EUCLID (THM: thermal test facility design)
  - JUICE Wide Range Thermal Facility: Design of a thermal test facility for rapid cycling in wide thermal range (THM: thermal and mechanical design of the facility, control systems)
- Human Spaceflight projects
  - VMU MkII: supply of a the Video Monitoring Unit for Colombus module (THM: mechanical design, AIV)

Current projects (2)

- Earth observation projects (flight instruments)
  - Sentinel-2 MSI: Supply of calibrated flight diffuser for FM1 to FM4 (THM: manufacturing process control)
  - Sentinel-3 OLCI: Supply of calibration mechanism and calibrated diffusers for FMA to FMD (THM: all except optical calibration)
  - Sentinel-4 UVN: Supply of calibration mechanism and calibrated diffusers for FMA to FMD (THM: all except optical calibration)
  - MetOp 3MI: On ground calibration (THM: mechanical and thermal design of the calibration facility)
  - MTG BTA: Thermal design and test of the Telescope Assembly (THM: thermal design and analyses)
- Earth observation projects (ground support equipment)
  - MTG Gesta: Supply of a OGSE (THM: mechanical design, gas cell fluid design)
- Technology projects:
  - DEVAM: Development and test of additive manufactured parts (THM: All)
  - ACCUTHERM: Development of phase change thermal systems (THM: All)
  - SPCS: Stirling Power Converter System: Development of the thermal containement system of the heat load including security system (THM: all)

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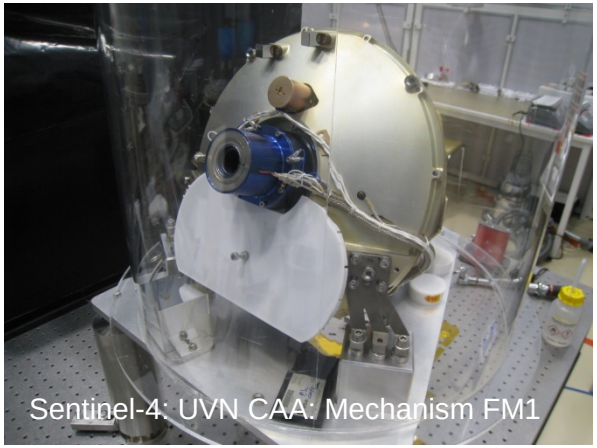
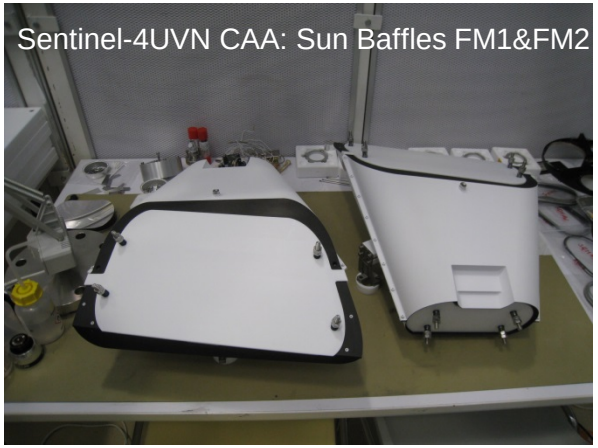
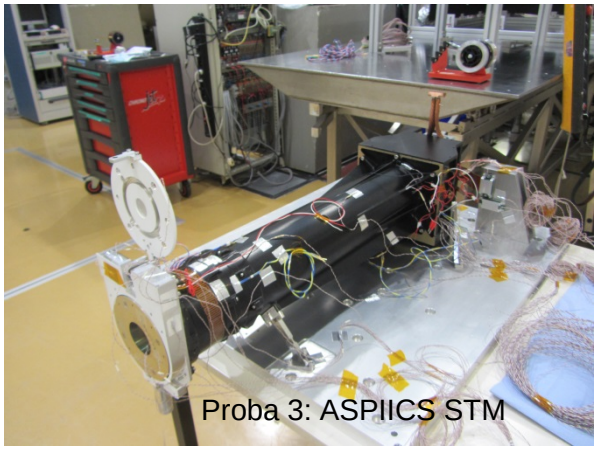
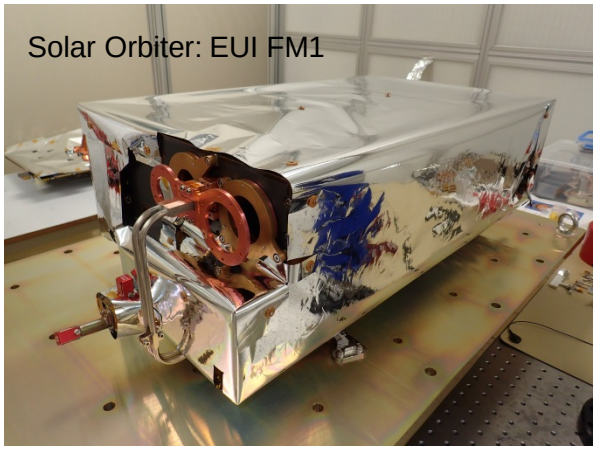
Current projects (3)

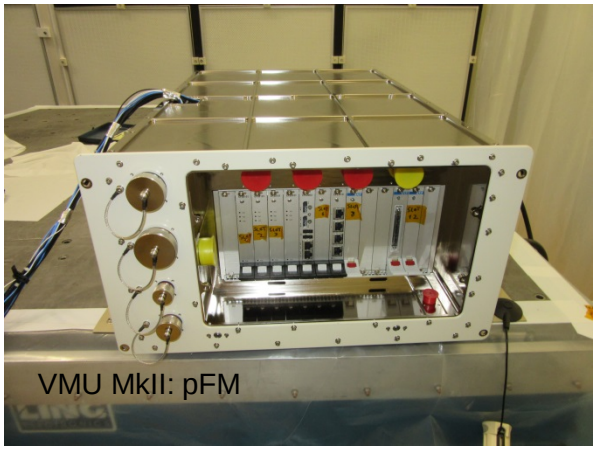

CHEOPS: BCA FM


Sentinel-4: UVN CAA: Mechanism FM1


Sentinel-4UVN CAA: Sun Baffles FM1&FM2


Proba 3: ASPIICS STM


Solar Orbiter: EUI FM1


VMU MkII: pFM

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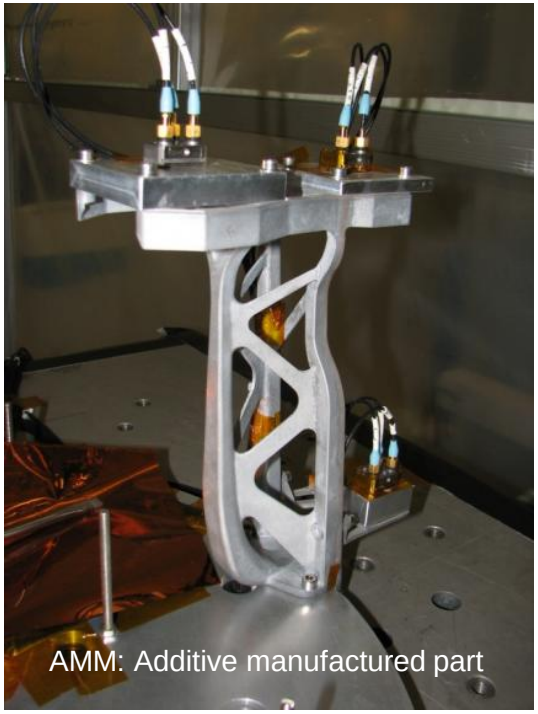
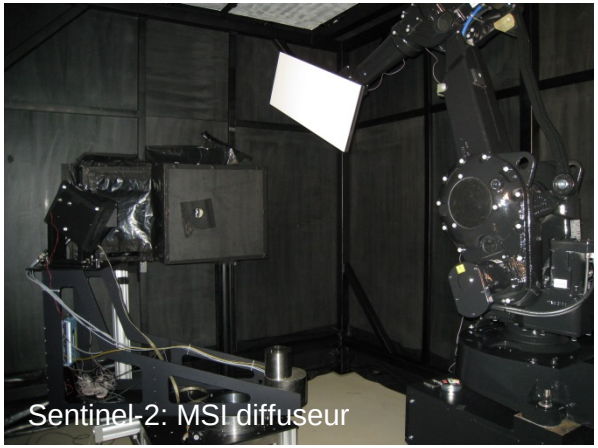
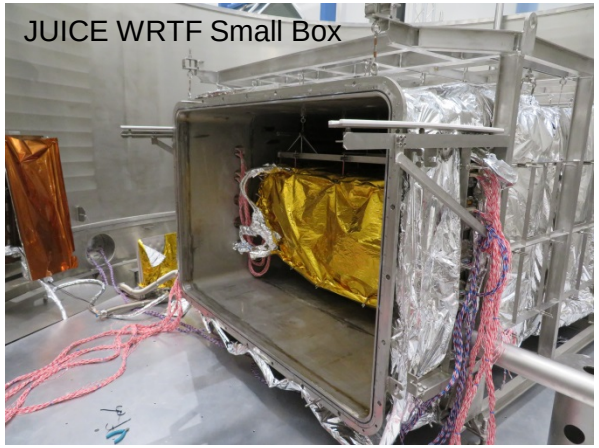
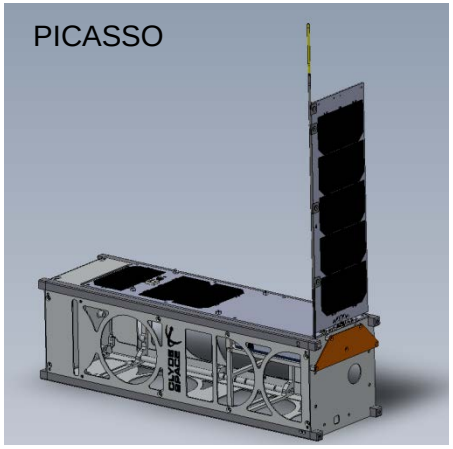
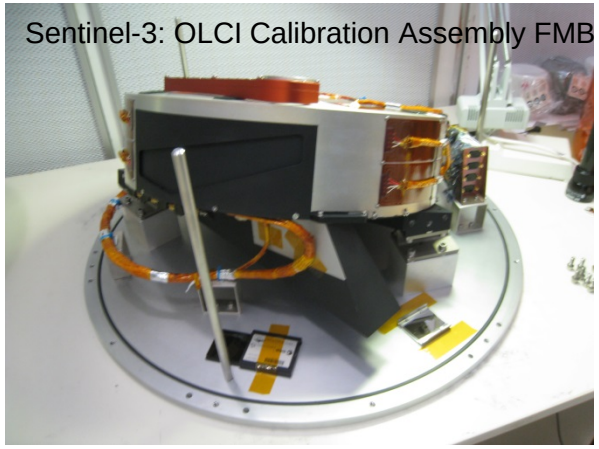
Current projects (4)


AMM: Additive manufactured part


Sentinel-2: MSI diffuseur


JUICE WRTF Small Box


PICASSO


Sentinel-3: OLCI Calibration Assembly FMB

Prospective

- Maintain and re-inforce our current expertise's
- Re-increase cryogenic activities
  - We have large competences, lot of hardware
  - But less projects for the moment
- Stay up to date with additive manufacturing
  - We will not manufacture ourselves (in close future) but we want to be able to implement AM parts in our future projects
  - This requires:
    - Developing AM in the way we need it
    - Upgrade our « design philosophy » to adapt to AM
    - Upgrade our « manufacturing » control to adapt to AM
    - Develop new technologies taking advantage of AM
- Be a driver for the development of cubesat
  - No series manufacturing planned
  - Need to develop technologies to enhance the performances of CubeSat's
    - Deployment (optics, solar panels…)
    - Thermal systems (phase change systems…)