

L'Instrumentation Spatiale @ CNRS nucléaire et particules

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- 1- Pourquoi du spatial @ CNRS Nucléaire et Particules ?
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- 2- Les projets majeurs
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- 3- Des exemples de contributions techniques

dans tous les projets, partenariat avec CNRS Terre et Univers, souvent également avec le CEA (plus rarement l'ONERA)

Pourquoi du spatial à l'institut ?

DIRECTIONS ADJOINTES SCIENTIFIQUES

Physique des Particules



Directeur Adjoint Scientifique
Laurent VACAVENT

Physique Nucléaire et Physique Hadronique



Directrice Adjointe Scientifique
Marcella GRASSO

Astroparticules et Cosmologie



Directeur Adjoint Scientifique
Nicolas LEROY

Accélérateurs et Technologies



Directeur Adjoint Scientifique
Arnaud LUCOTTE

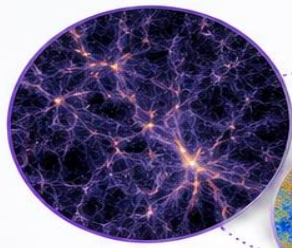
Nucléaire pour le bénéfice de la société



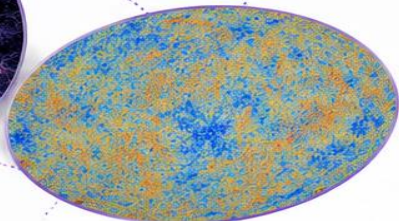
Directeur Adjoint Scientifique
Jacques MARTEAU



Étude de la composition et de l'évolution de l'Univers



Matière noire et énergie noire



Fond diffus cosmologique et inflation

LES SUJETS D'ÉTUDE



Matière noire



Énergie noire



Inflation cosmique



Ondes gravitationnelles



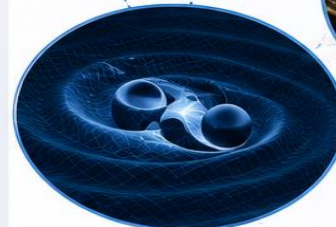
Rayons cosmiques & Astronomie gamma



Neutrinos



Étude des phénomènes violents de l'Univers



Ondes gravitationnelles



Rayons cosmiques et astronomie gamma

Des instruments **au sol**
pour la profondeur et la précision

Observer l'Univers sur toutes les échelles
et avec tous les messagers

Des **satellites** pour accéder
à l'inobservable et couvrir le ciel



COMPLEMENTARITÉ SOL-ESPACE



LES + DE L'ESPACE



Accès à tout le ciel / grandes échelles



Pas d'atmosphère

- bruit de photon réduit,
- pas d'effet d'opacité,
- toutes les bandes de fréquences sont accessibles,
- conditions d'observation stables



Bruit sismique réduit



LES + DU SOL



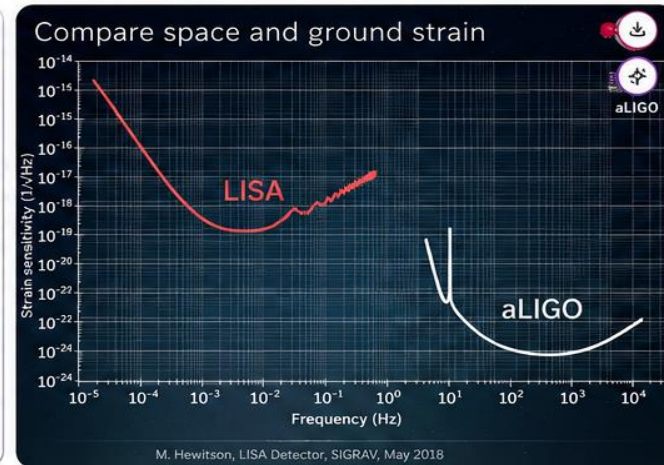
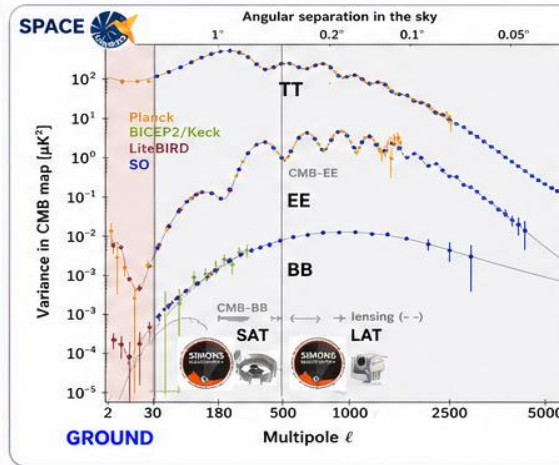
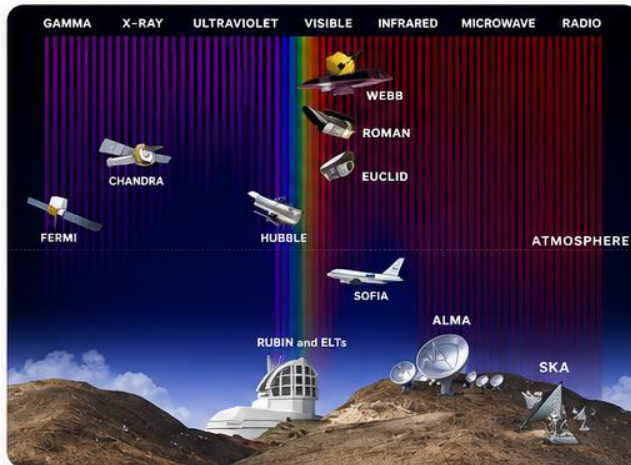
Accès aux petites échelles
(taille des télescopes)



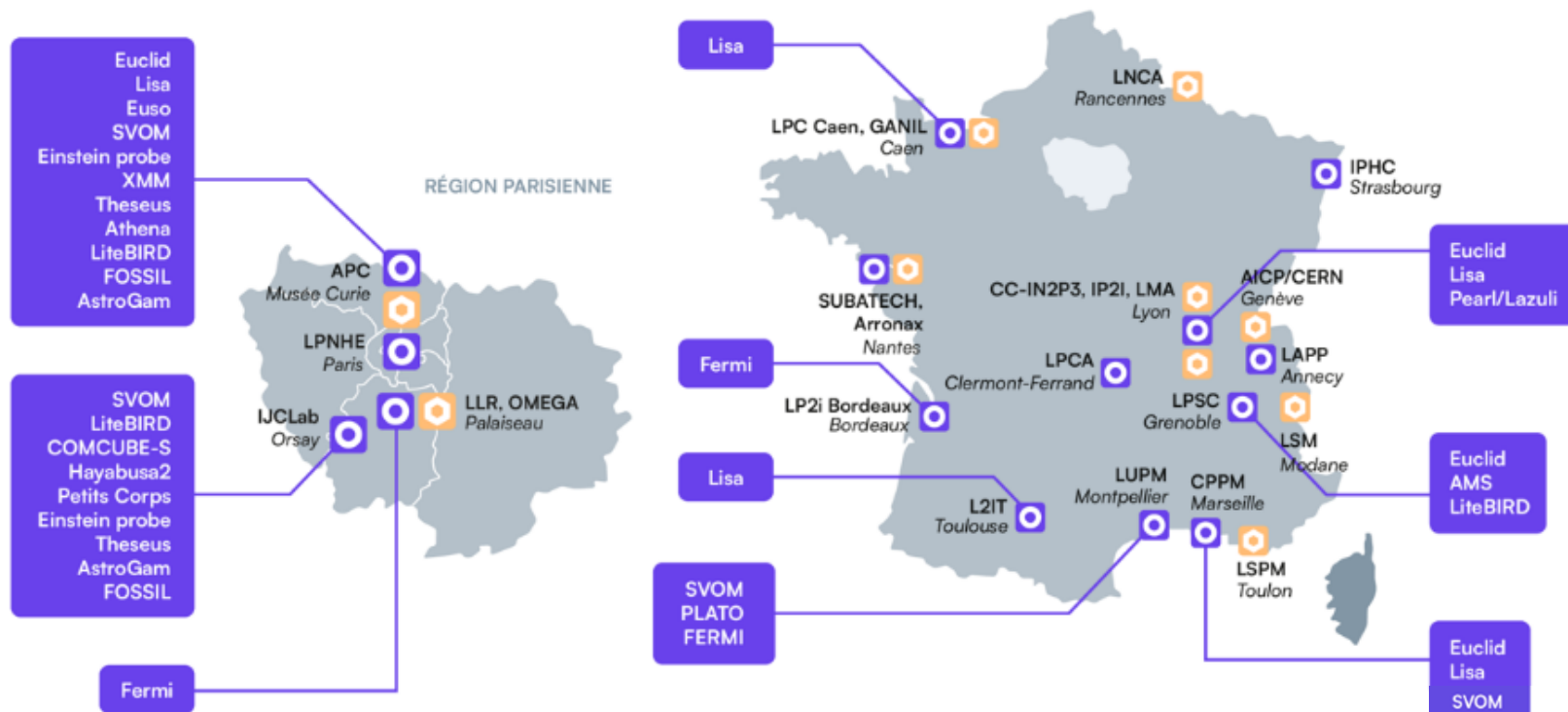
de détecteurs + élevé



Accessibilité, maintenance, upgrade

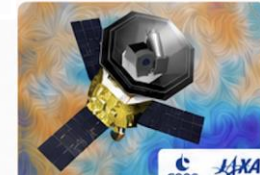
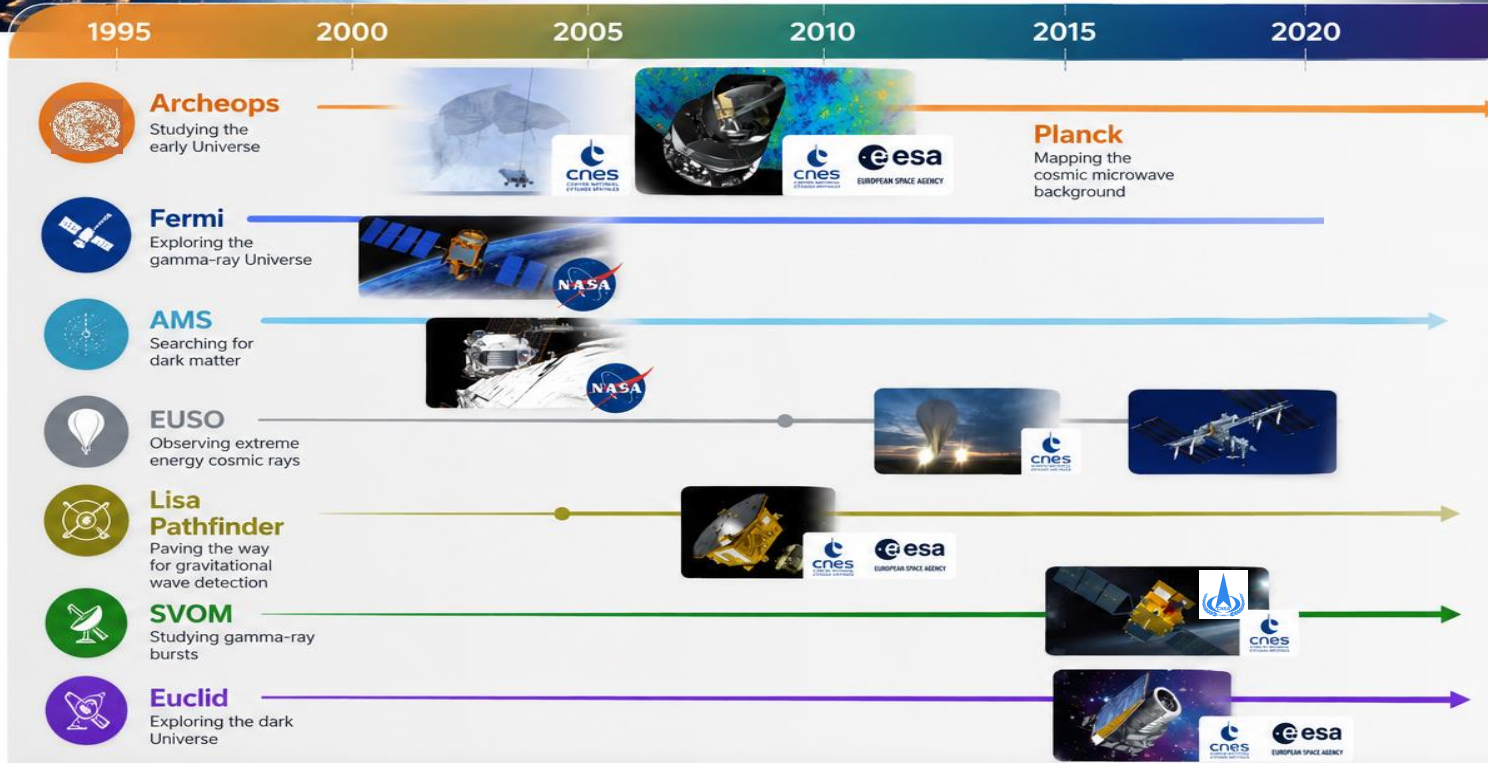


Space related projects in our laboratories



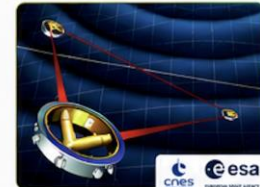
INVOLVEMENT SINCE THE 90'S

Over 30 years of collaboration



LiteBIRD

Mapping the cosmic microwave background



LISA

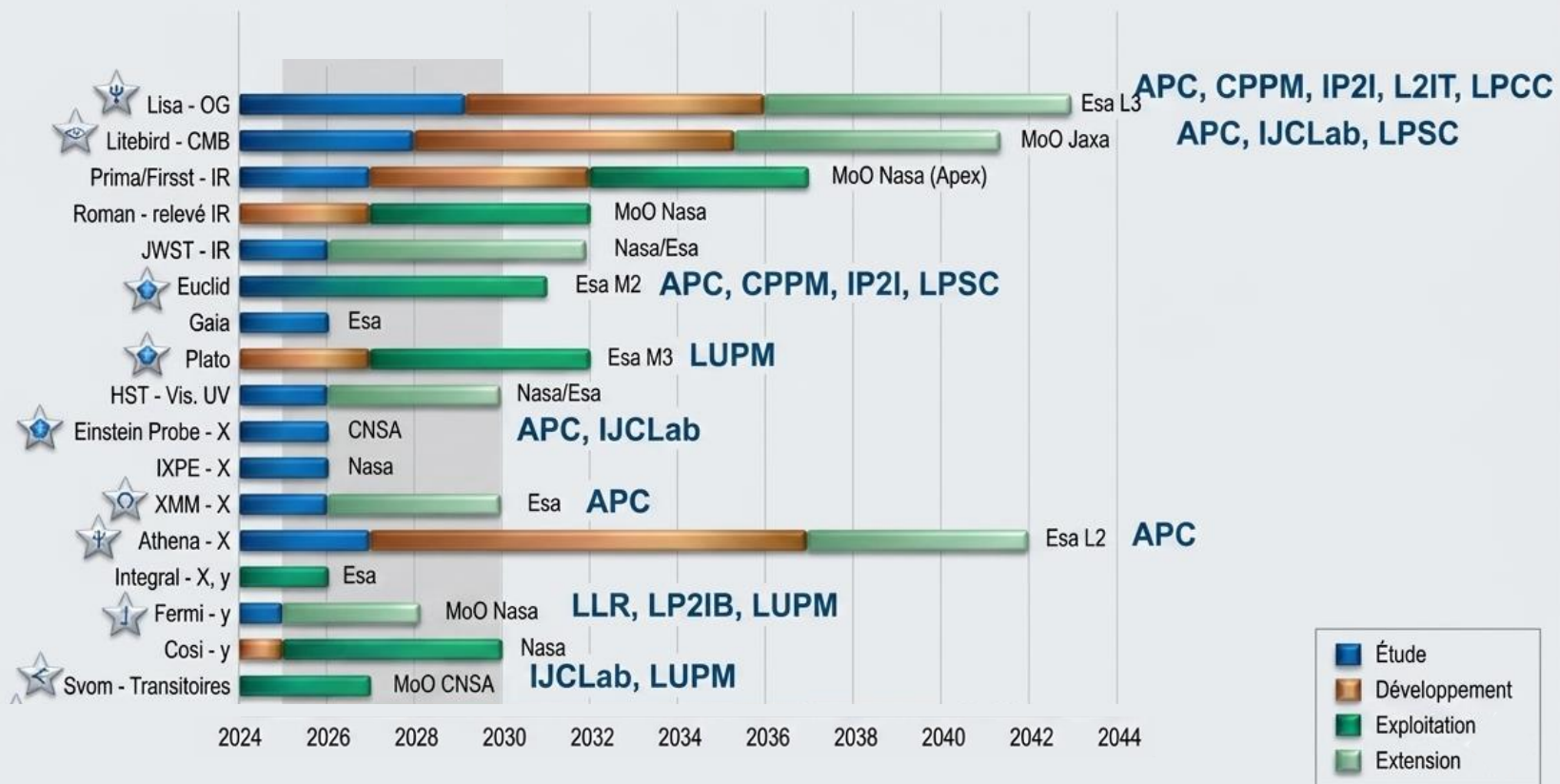
Detecting gravitational waves from space



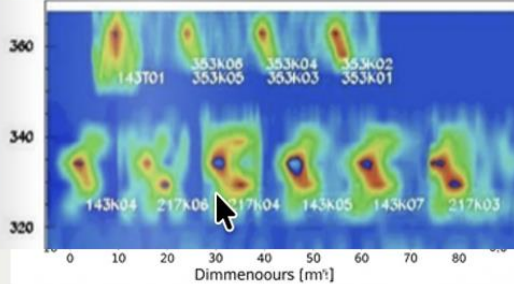
New Athena

Exploring the hot and energetic Universe

Missions prioritaires A&A avec participation de l'institut



ARCHEOPS

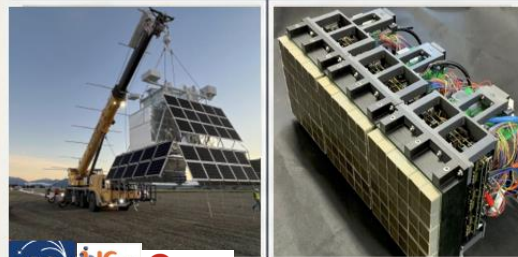


- Ground and in-flight calibration
- Pointing reconstruction using star sensor data

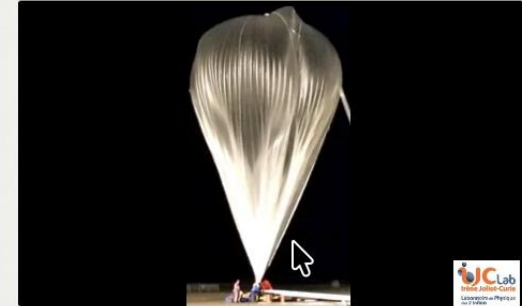


EUSO

Electronics for the UV camera
Integration and analysis for
UHECR above the
atmosphere



COCOTE



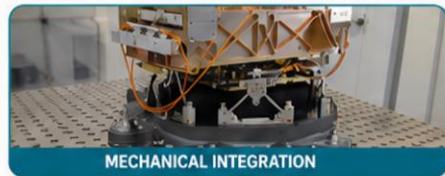
- Qualification of gamma detectors for space
- Monitoring of atmospheric gamma emission between 0.5 and 29 km

Activities spanning all kinds of contributions

For Today !



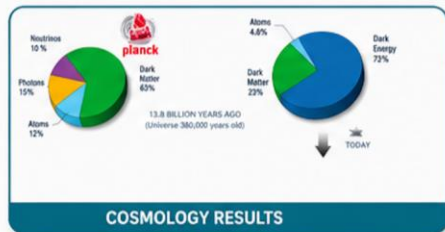
RECEPTION & QUALITY CONTROL



MECHANICAL INTEGRATION



TESTS & CALIBRATION



COSMOLOGY RESULTS

01



INSTRUMENTAL DELIVERIES

Reception of components and instruments, quality control and preparation for integration.

02



INTEGRATION, CALIBRATION

Assembly of sub-systems, integration and calibration of detectors and electronics.

03



DATA ANALYSIS AND SIMULATIONS

Processing of data, performance studies and validation through simulations.

04

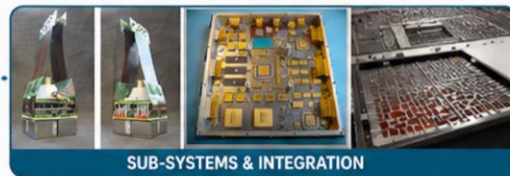


SCIENTIFIC RESULTS

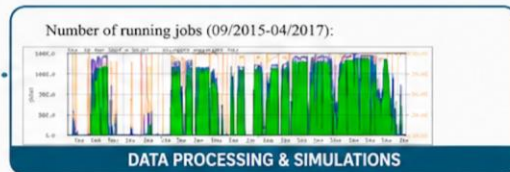
- Astroparticles
- Cosmology



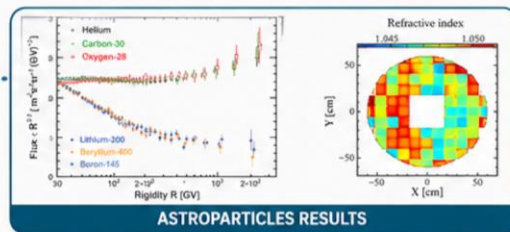
ELECTRONICS & DETECTOR COMPONENTS



SUB-SYSTEMS & INTEGRATION



DATA PROCESSING & SIMULATIONS



ASTROPARTICLES RESULTS

Some examples of instrumental contributions

I have tried to avoid overlap with the upcoming presentations

AMS

- LUPM MONTPELLIER**
 - Système d'échantillonnage
- LPSC GRENOBLE**
 - Électronique front-end
 - Intégration PMT. Caractérisation du plan radiateur.
- LAPP ANNECY**
 - Système de collection de lumière. Électronique Front-end.



Planck

- TRAITEMENT**
 - Data Processing Unit (DPU) : development and construction of the Planck-HFI DPU.
- ELECTRONICS FOR CRYOGENY**
 - Electronics for the sorption cooler (SCE-20K)
 - Electronics for 100mK dilution valve control (DCE)
 - Control command (SCE-20K) (soft & validation tests)
 - Cryo-harness (SCE-50K)



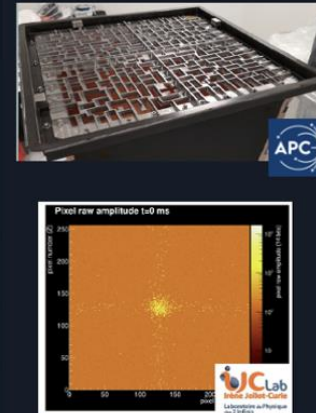
FERMI/LAT

- DESIGN**
 - Carbon fiber structure
 - Crystal wrapping
 - Photodiode bonding
- FABRICATION**
 - Metrology and vibration tests
 - 24 structures



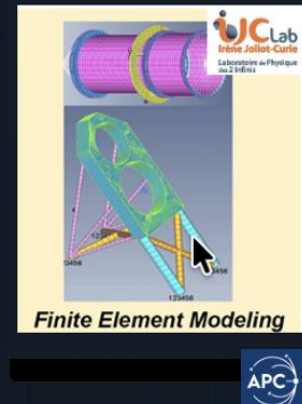
SVOM

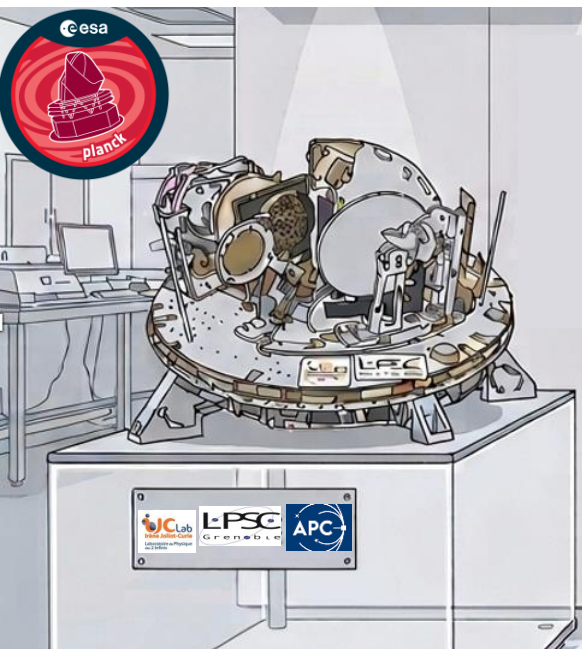
- MATÉRIEL**
 - Coded mask
- LOGICIEL**
 - On-board software



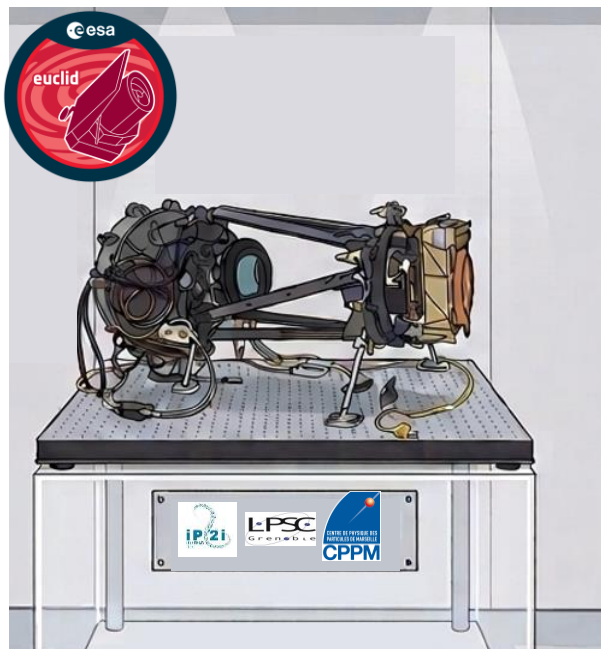
LiteBIRD

- STRUCTURE**
 - Mechanical structure
 - Mechanical structure design and optimisation
- MODÉLISATION**
 - Finite Element Modeling
 - System thermal modelling

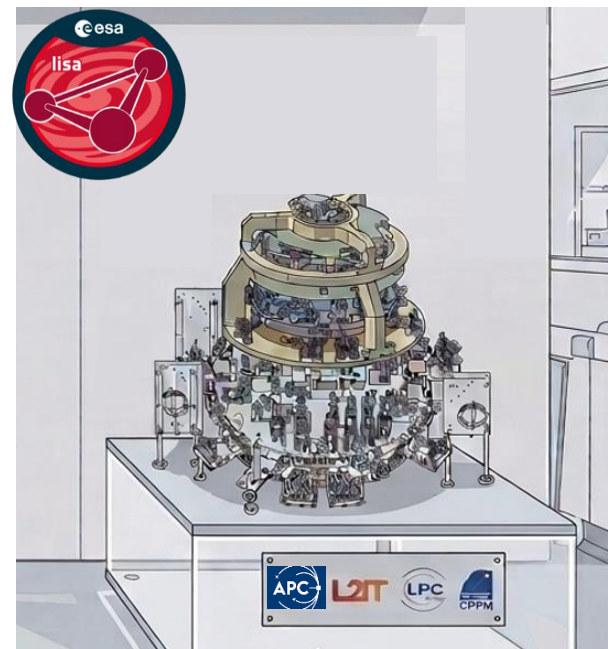




- Optical leakage and time response measurements + polarized source
- Time synchronization of calibration data
- Contribution to the control-command system and electro-tech of Saturne...



- Integration of the NISP focal plane
- Characterization, and verification of detector performances
- spectroscopic calibration, and optical characterization of the NISP instrument...



- IDS (Detection Interferometric System)
- Beams Simulator
 - Optical simulations
 - Prototyping and design in optics/control command...

But also a lot of other rich activities !

Nuclear Electric Propulsion



Rocketroll: nuclear-electric spacecraft study

European approach to **nuclear electric propulsion**

GT#4 – Workshop on the **impact of space activities in the upper atmosphere** COSPACE

Agnostic dust collection in the upper atmosphere

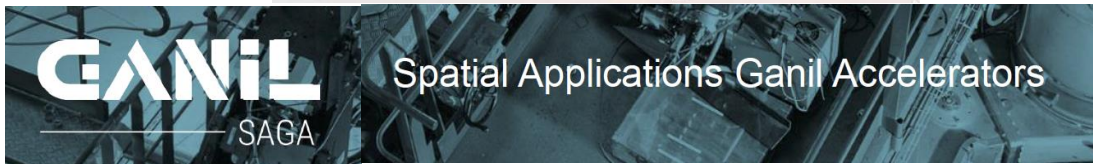


Study of **return samples** to understand the formation of the solar system with dedicated instrumentation on specific platforms eg. MOSAIC

+ irradiation experiments to simulate the formation of the tracks and rim in different minerals



Irradiation Testing Facilities



Spatial Applications Ganil Accelerators



Increase **irradiation testing capabilities** for electronic components and subsystems for industry and academia



Today's special > focus on specific contributions



Merci Aurélia !



Développement de détecteurs TES haute sensibilité pour les instruments d'observation millimétrique polarimétrique de...
Timothée Tollet

LISA

Hubert Halloin

Amphithéâtre, LPSC Grenoble

14:52 - 15:04

COMCUBE-S : un essaim de CubeSats pour l'astronomie gamma

Vincent Tatischeff

Amphithéâtre, LPSC Grenoble

15:09 - 15:21

Caractérisation de détecteurs infrarouges sur la plateforme PICA

Aurelia Secroun

Amphithéâtre, LPSC Grenoble

15:26 - 15:38