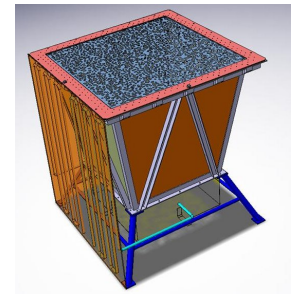
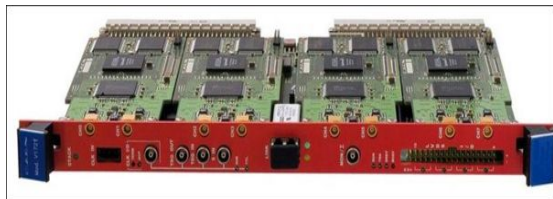


APC Assesement Technical Departments

Ch.Olivetto
Technical Director
olivetto@apc.univ-paris7.fr





Technical Department Assessment Presentation Layout

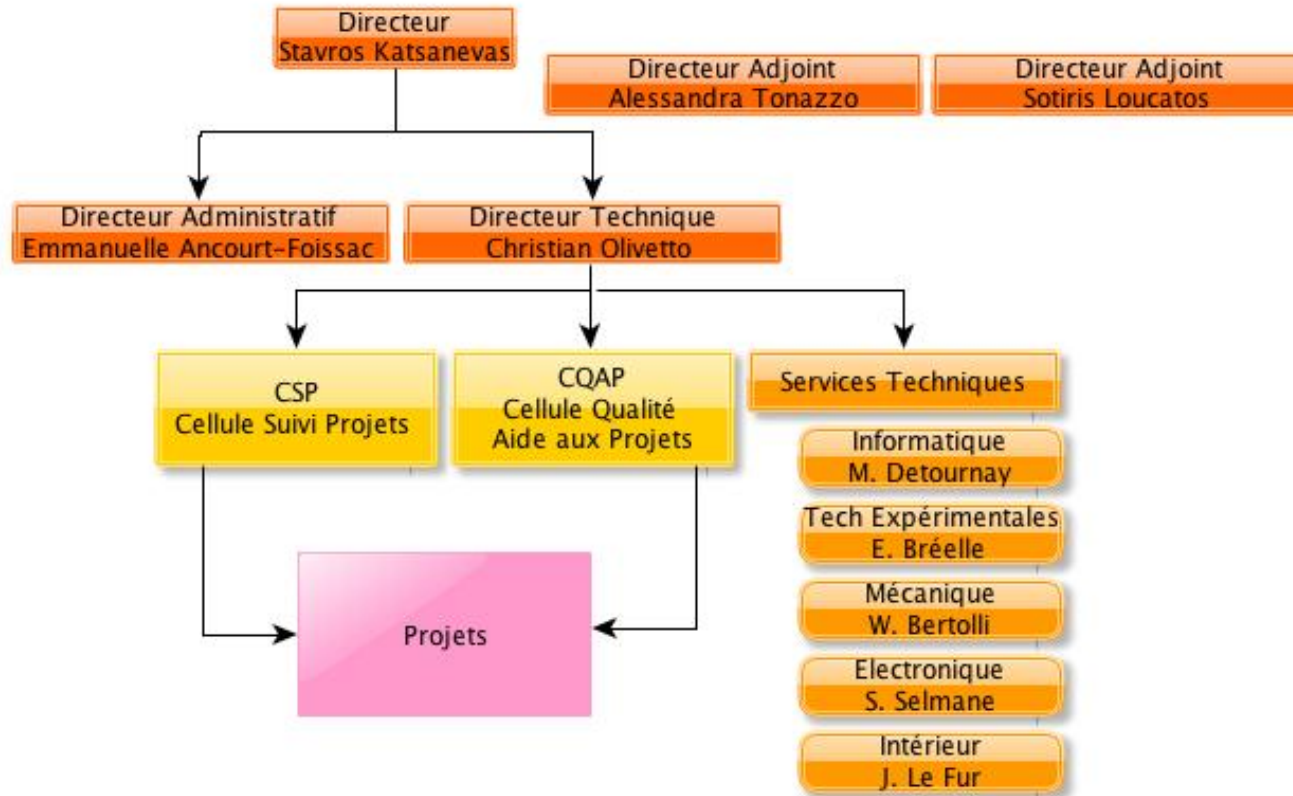


This presentation of technical departments can be described like:

- ✓ Organisation of Technical Departments
- ✓ Main rules of organisation
- ✓ Information Technology Department
- ✓ Instrumentation Department
- ✓ Mechanical Department
- ✓ Electronics Department
- ✓ AQ team and project support
- ✓ Conclusions



Technical Department Assessment Organisation



- ✓ Organisation in five technical departments and one cell Quality Assurance




Technical Department Assessment Organisation



The technical skills are based on efficient organisation and clearly comprehensible :

- ✓ Matrix structure: Project/Department (we are affected to one department, we participate to one or two projects)
- ✓ One specific technical domain (Mechanical, Elec, Instr, Software)
- ✓ Tranverse structure for Quality Assurance
- ✓ The hierarchic role and responsabilities of Department Manager
- ✓ The coordination role and responsabilites of Project Manager
- ✓ Activity and affectation indicators
- ✓ The role and aim of CSP review



Organisation and structures creates confidence to government agencies and institutions



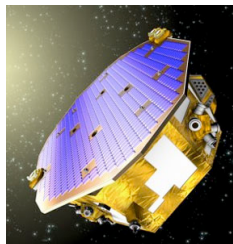
Technical Department Assessment Information Technology Department



The major achievements



- ✓ PLANCK: Software Infrastructure responsible for CCIN2P3 porting (40 external, 48 internal librairies, 86 dataprocessing packages) developped in 5 languages. Server PostgreSQL), 130 Tb data, 12 Mhours CPU per year.
 - ✓ PLANCK Level 2: data analysis with parallel computing expertise, development (in MPI language and librairies), raw data volume >125 Gb/bolometer X 50.
 - ✓ PLANCK Level 3: responsable for SMICA pipeline which is the leading method for component separation. 11 international methodes, selection of 4 by PLANCK (SMICA leading)
-
- ✓ LISA PATHFINDER: Involvement in data analysis, parallel monte-carlo MARKOV chain for parameters search, methods operationnal.
 - ✓ LISA PATHFINDER: software infrastructure responsable at FAcE, including real time exercices on simulated data, to improve of total process of data traitement in preparation of real data. (20 scientists hosted)





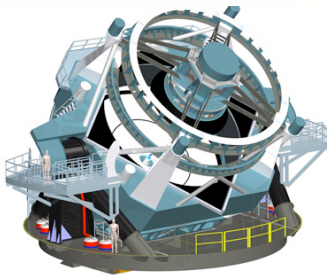
Technical Department Assessment Information Technology Department



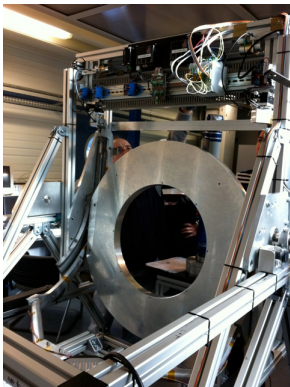
The major achievements



- ✓ AUGER south and North: complete responsibility of real-time software development for central board and GPS timing interface for data time stamp and communication. This development is essential for the reliability of the 1660 tanks experiment in Argentina.



- ✓ LSST Camera Control System (CCS) controls and coordinates the various camera subsystems software (Filter Exchanger, Shutter, Refrigeration, Power management).



- ✓ LSST Framework software development in JAVA for all exchange and control of all subsystems between them and with databases. Concept of APC chosen by international collaboration and central position development.

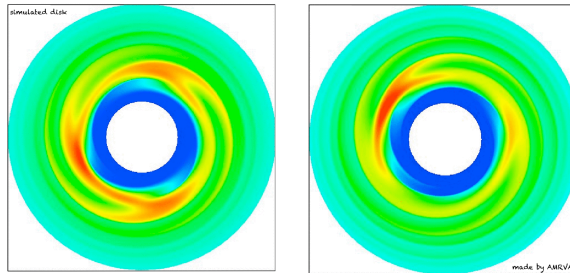


Technical Department Assessment Information Technology Department

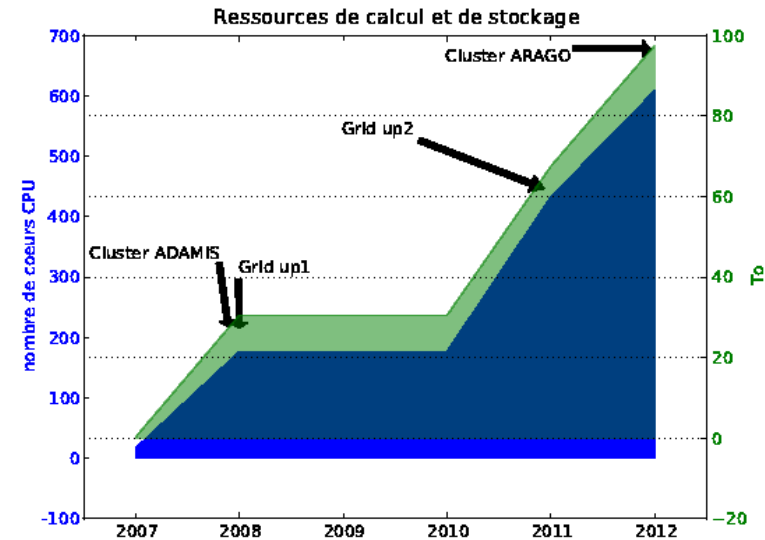
The major achievements



FACe François ARAGO computing center
For AstroPhysic experiment with project
Support to simulate and to analyse all
Scientist datas.



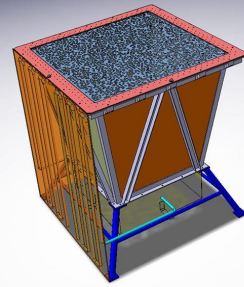
Magneto-Hydro-Dynamic numerical
Simulation with high 160 CPUs, 150 Gb
RAM, 4000 hours performed on FACe
cluster



Computing grid implementation
Computer farms with servers,
Software and storage of datas



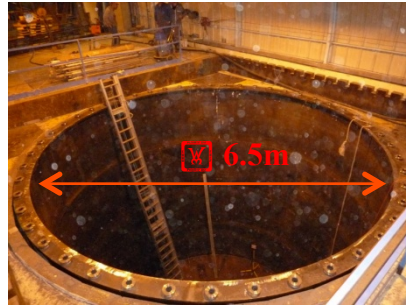
Technical Department Assessment Mechanical Department



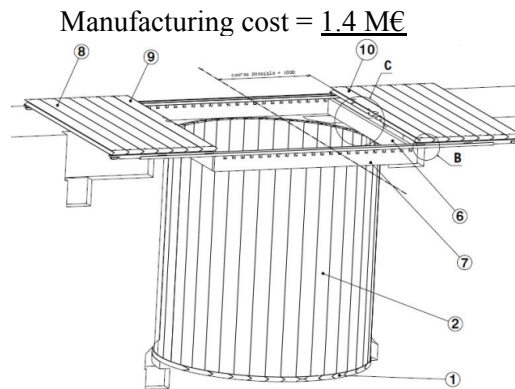
The major achievements

Far detector :

- steel tank of 240m³ of liquid scintillator + 350T steel shielding (150 mm thick)
- airtight lid to prevent contamination from oxygen
- strong constraints from restrictive space inside cave
→ integration process = vessel floating on water to adjust its height to allow welding
- several interfaces : nested vessels, PMT, cabling, filling pipes, calibration

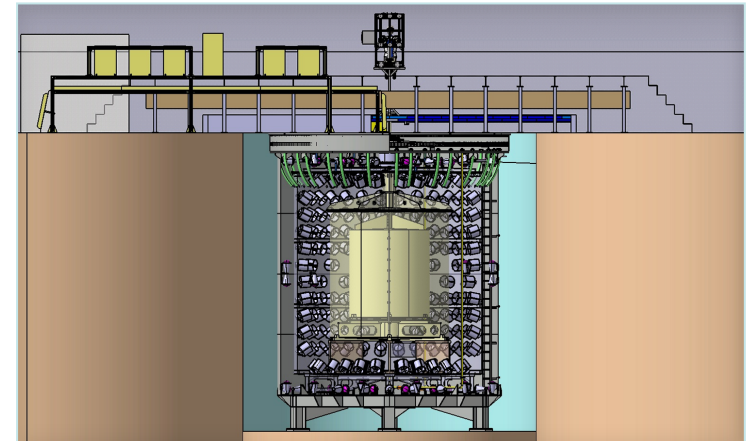


white reflective paint

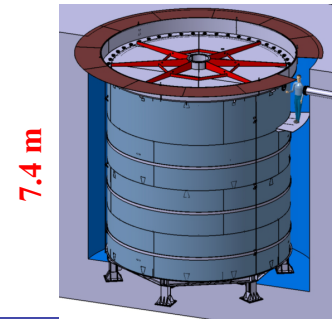


Near detector, similar to the far detector except that :

- shielding is done by 1m of water surrounding the detector (except on top)
- tank made of stainless steel , elevated on a steel stand
- stand designed very stiff to prevent any deflection (< 1mm) of the bottom under the 45T of pressure from buoyancy



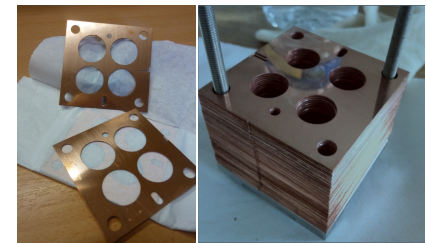
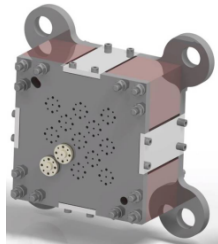
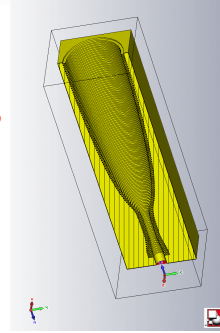
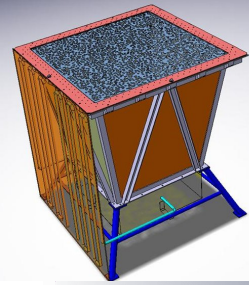
Near detector Veto vessel
(manufacturing process
started on january, 7th)



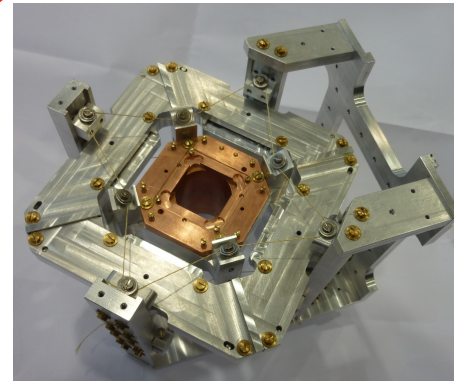
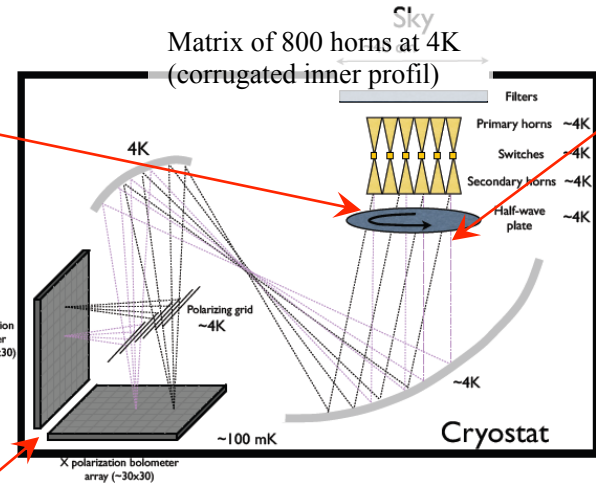


Technical Department Assessment Mechanical Department

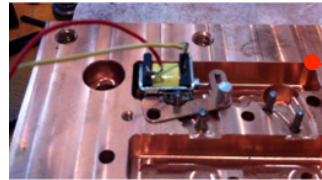
The major achievements



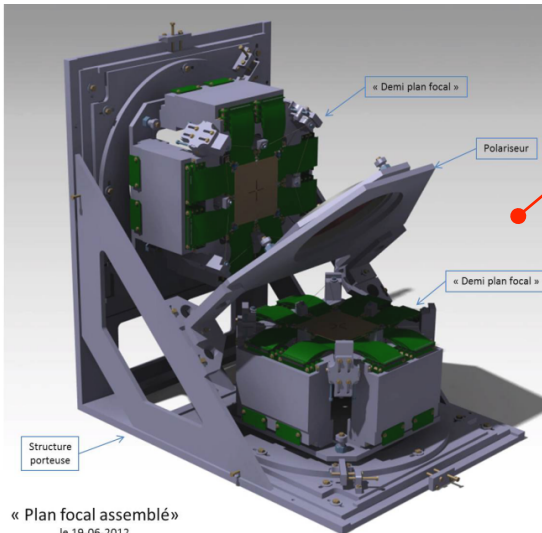
R&D on horn manufacturing :
prototype of 4 horns matrix from n
manufacturing process
cost decreased 800 € → 200 € / ho



Mechanical support for bolometers array :
proof of concept which allowed to cool
down 23x23 bolometers down to 100 mK

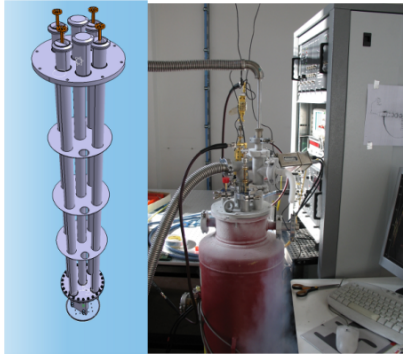


R&D on switch for
calibration, working at 4K

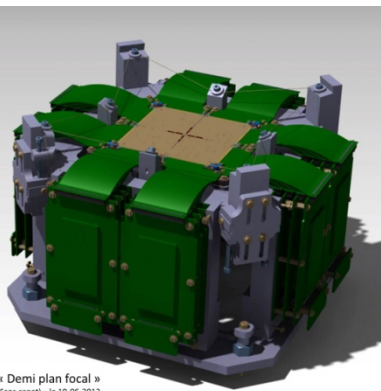


« Plan focal assemblé »
le 19-06-2012

Preliminary study of focal planes mechanical
support at 100 mK for QUBIC instrument
Focal plane size = 1024 pixels ; 56 x 56 mm²



Sample holder to test
orthomode transducer in
operation at 4K

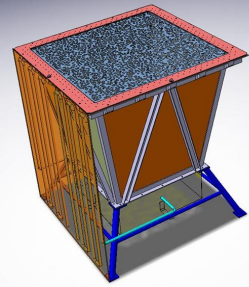


« Demi plan focal »
(Sans capot) - le 19-06-2012

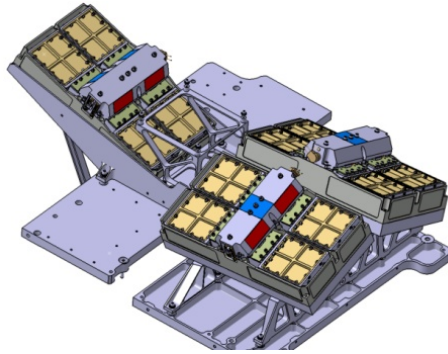
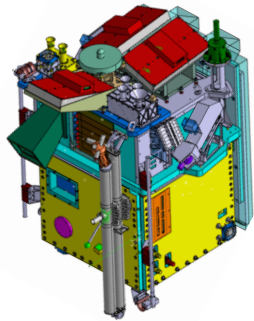


Technical Department Assessment Mechanical Department

The major achievements

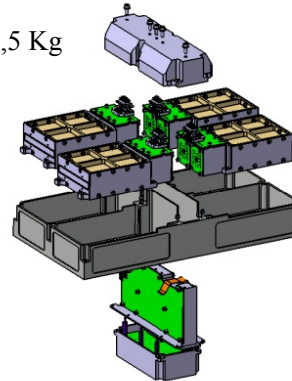


■ Taranis / XGRE

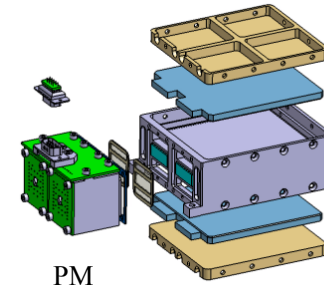


1 module XGRE

5,5 Kg



1 unité de détection



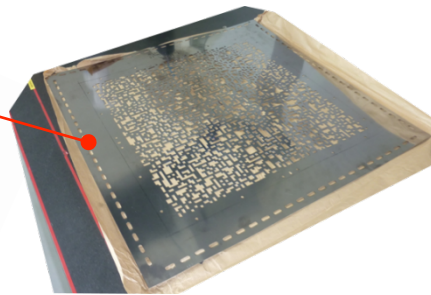
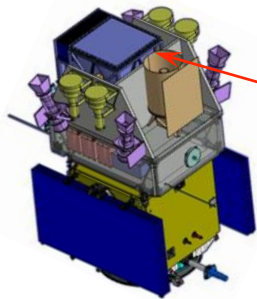
PM



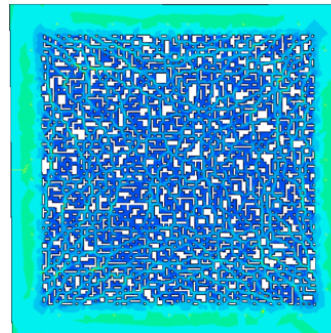
5

■ SVOM/ECLAIRs

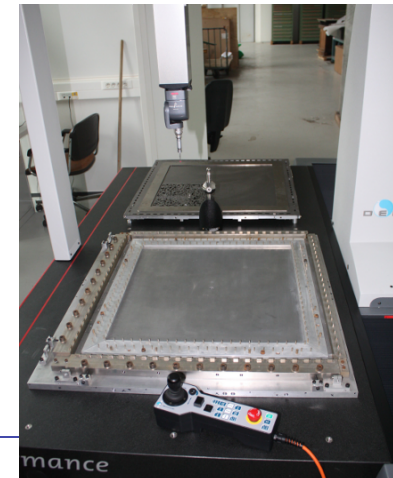
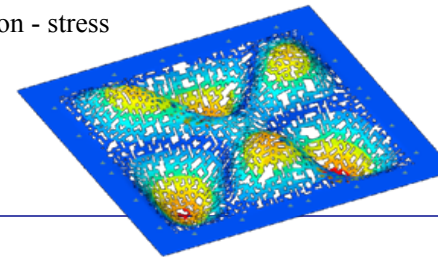
Coded mask



Mask prototype



FEA simulation - stress



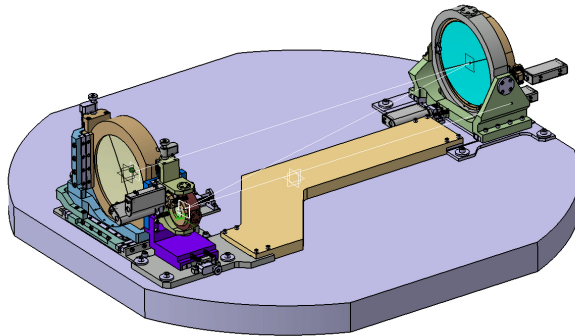
Mask frame on coordinate measuring

- 1st self-supporting mask of 540 x 540 mm² aperture
- made of tantale / tungsten (2.5%) alloy, foil 0.6mm thick
- 4000 holes randomly placed ; pattern cut by laser
- around 40 different patterns simulated to find the one with the best strength
- flatness ensured by pre-tensing the mask on its frame



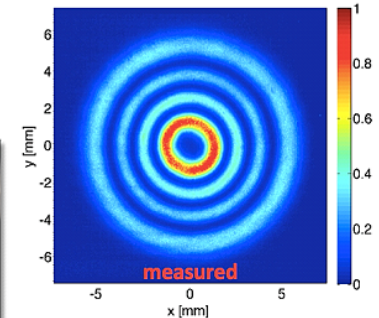
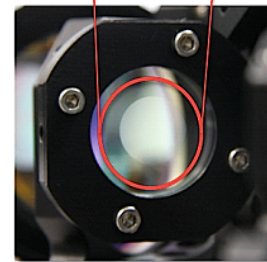
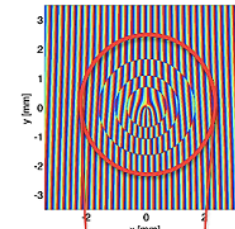
Technical Department Assessment Instrumentation Department

The major achievements

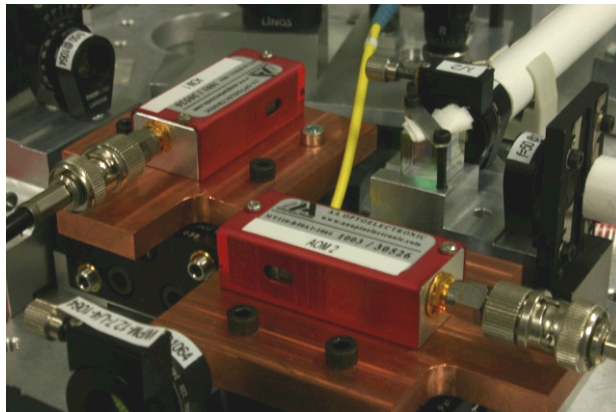


Advanced Virgo

Responsability of design, realisation and integration validation of telescopes of Avirgo project Virgo



LG33 wave generation ofr decrease thermal noise on lens- Interferomter on table



eLISA/NGO

Simulation of propagation and annyling different noise (laser, doppler effect, electronics) for LOT (LISA on table project)

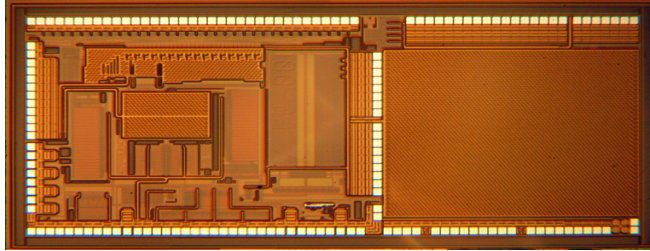
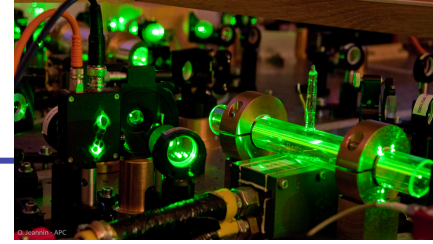


Laser stabilisation on iodine molecule to decrease frequency noise for LISA/NGO

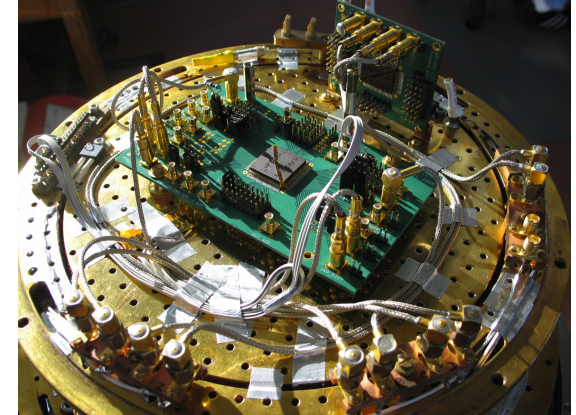
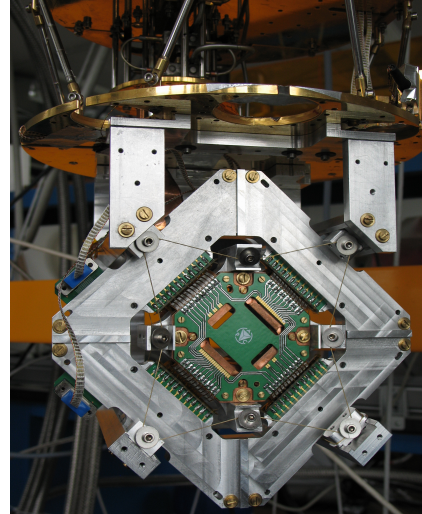


Technical Department Assessment Instrumentation Department

The major achievements



APC is involved in the development of cryogenic (77 K, 4 K, 300 mK) electronic devices for the readout of superconducting sensors



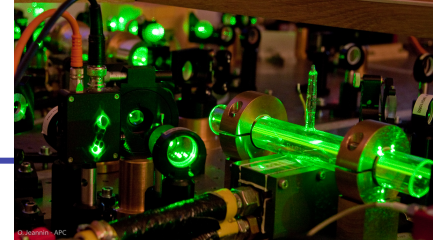
The BRAIN experiment prototype
Of Cosmic Background Radiation
With bolometers, cryo ASICS
Working a 300 millikelvin



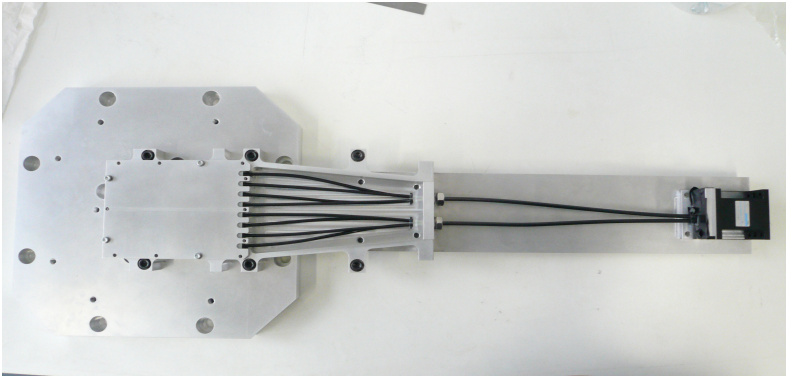


Technical Department Assessment Instrumentation Department

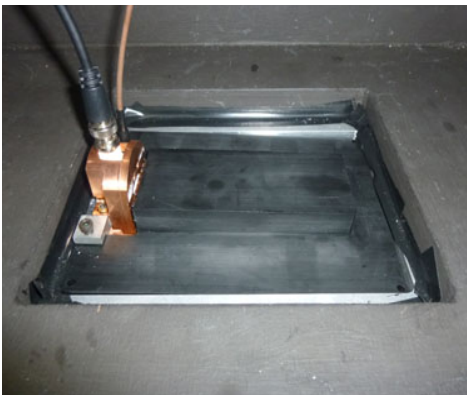
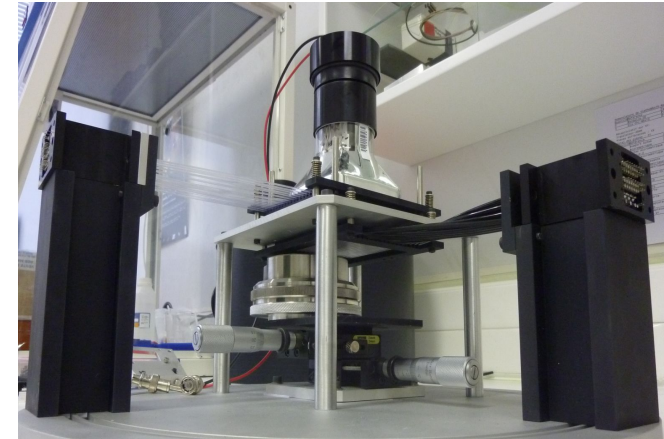
The major achievements



PHEN-X

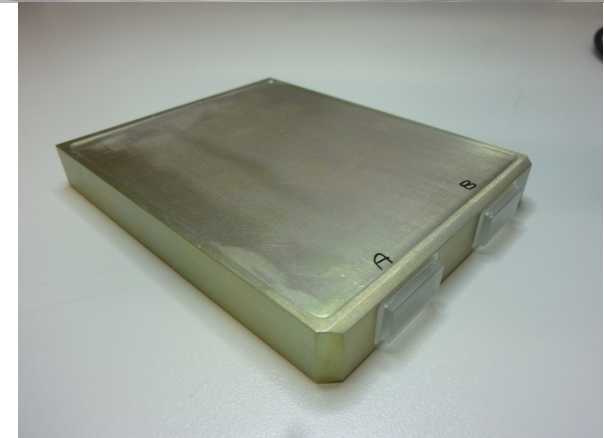


SIMBOL-X



ASTRO-H

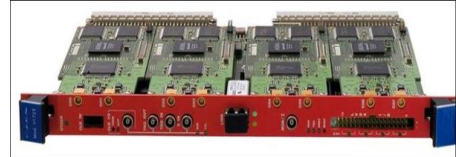
Spectro-imager systems
Integrated crystals like
BGO, LaBr3 with detectors
Multianode PMT, APD, SiPM
Characterisation and integration
With success



TARANIS



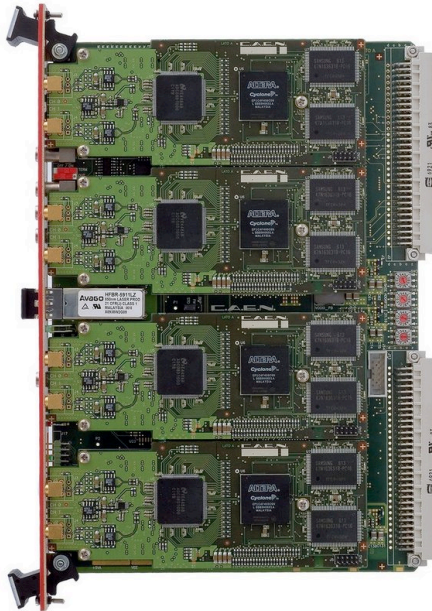
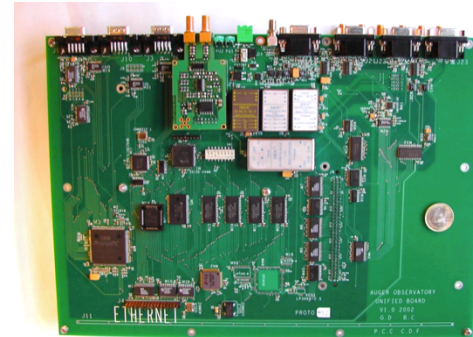
Technical Department Assessment Electronics Department



The major achievements

Main electronics board of the 1660 local station with complete acquisition, digitalisation and telecommunication for the total detector of cosmic rays.

This production more than 1800 boards has been designed in order to improve reliability
Results: < 99.4 % operationnal any time



Fast Digitalisation Board (500MHZ for 8 channels) or (1GHz for 4 channels).

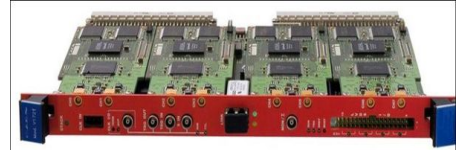
These boards are the heart of acquisition control system for Dchooz experiment.

Specific and optimized firmware of FPGA control board for Dchooz.

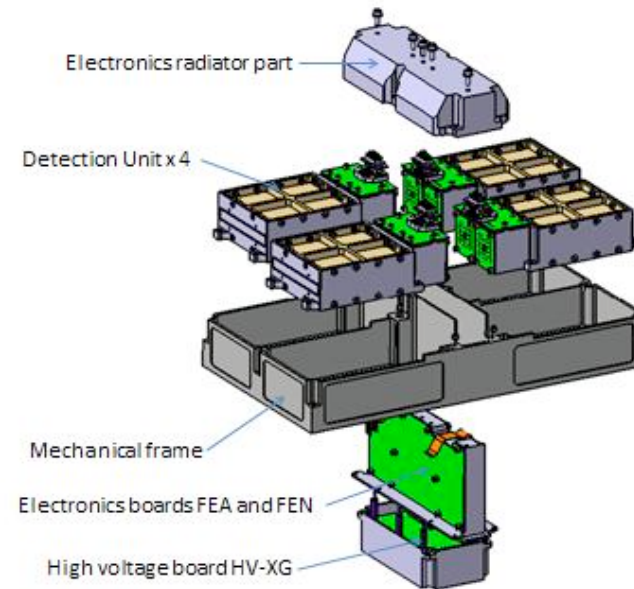
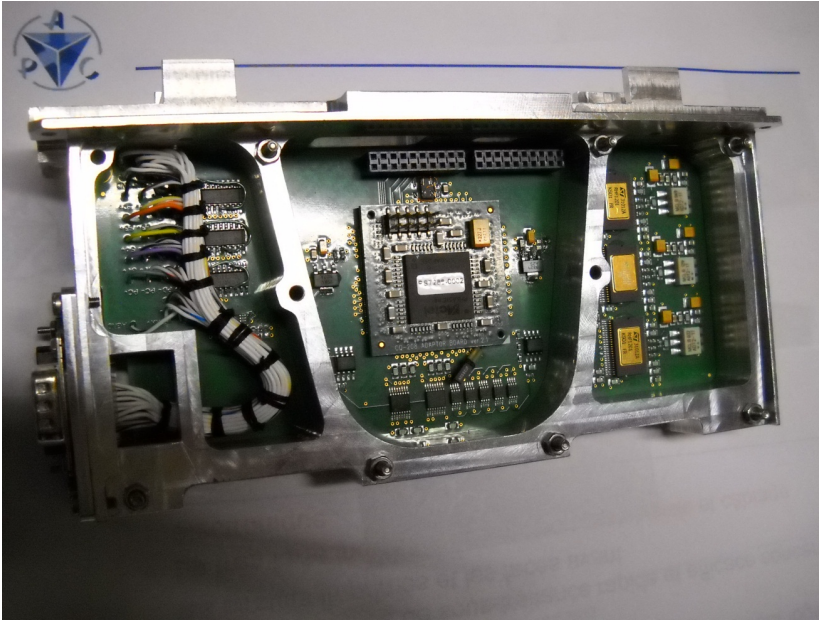
Board production under license with CAEN company.



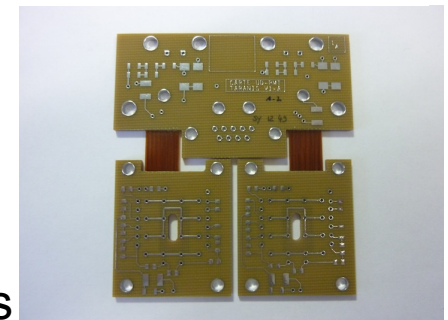
Technical Department Assessment Electronics Department



The major achievements

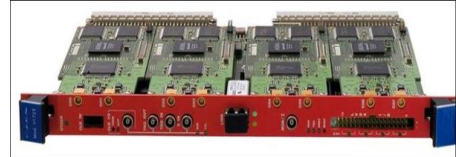


Embedded Electronics for satellite space experiment
ECSS rules of conception for CAD design in close
Conception with mechanical design.
Numerical FPGA RadHard components for software and
Hardware
Analog design with EMC constraints and qualified components

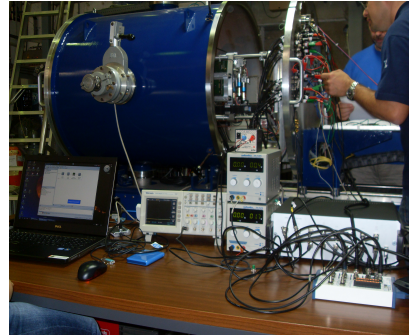




Technical Department Assessment Electronics Department

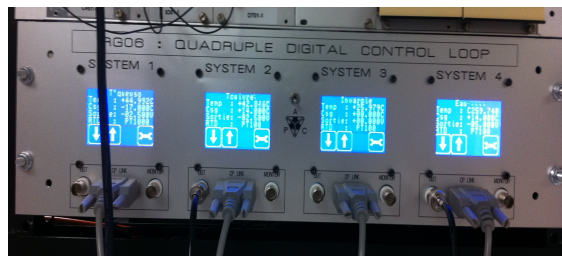


The major achievements

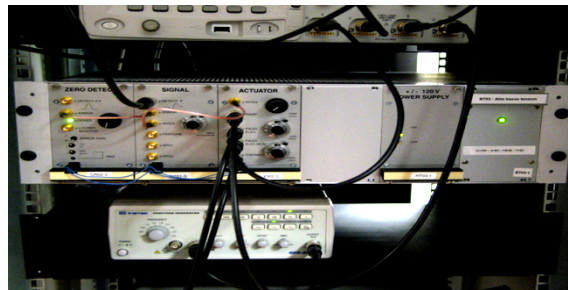


ASIC qualification process for
Space experiment utilisation and
Integration.

Qualifications for MAROC ASIC
For total dose and heavy ions
SET and Latch Up scenarios

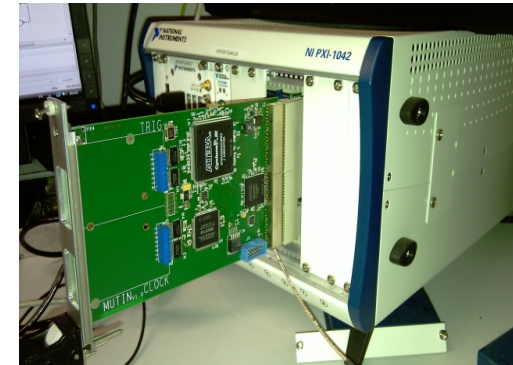


Quatre modules RG06 intégrés dans
un rack 3U 19 pouces



Baie électronique
d'asservissement
d'un Laser Nd/YAG

Laser control loop and temperature loop
Stabilisation $< .01^{\circ}\text{C}$ and numerical delay
Hardware for LOT facility (LISA/NGO)



Central Trigger and clock distribution
For CTA project, the proposal of
APC is the reference solution with
a Time stamp $< 1\text{ns}$ and Telescopes
Trigger on optical fibers support



Technical Department Assessment Quality Assurance CQAP



The major achievements

The quality activities are transversal and applicable inside all the laboratory services and projects. The generic quality assurance tasks concerns the redaction and the implementation of the Quality Manual, procedures, and templates.

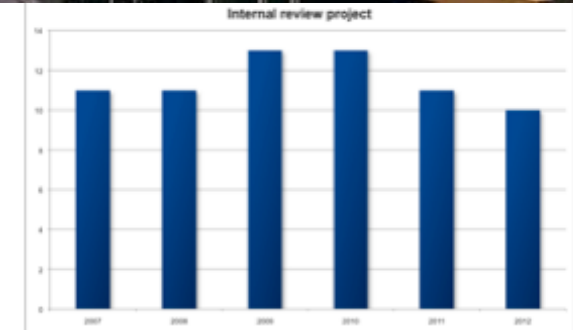
Each project is analysed by internal review comity, this committee review one project on monthly basis, give recommendations and propose a percentage shares for human ressources



In order to help and facilitate the work of project manager, a complete list of applicables documents with template, example and explanation of documentation needs for space or terrestrial projects



PROJET TARANIS		
PHASE: B	ENTITE : XORE	RÉFÉRENCE TÂCHE : 2.1a
INTITULE DE LA TÂCHE : ingénierie – Management des senseurs XGRE		
DATE DE DEBUT : Janvier 2009	Page : 1/1	
DATE DE FIN : Juin 2009	Edition : 1.0	
DUREE : 6 mois		
LABORATOIRE: APC		
RESPONSABLE : François Lebrun/Christian Olivetto PAYS : France		
ENTREES NECESSAIRES : Objets scientifiques liés à l'instrument ; Spécifications de la mission (techniques, environnementales) ; Tous les DA du projet		
DESCRIPTION DETAILLEE DE LA TÂCHE : Management : - Gestion du projet, Gestion des crédits, Gestion du personnel ; - Manager l'AQAP (voir fiche spécifique 2.1a) ; - Validation de la documentation technique produite (DCI, DD, rapports de tests...) ; - Manager l'étude et la simulation thermique (voir fiche spécifique 2.3) ; - Manager les essais environnementaux (voir fiche 2.5a) ; - Manager les réalisations équipement de test et des étalonnages ; - Participation aux revues ; - Manager les réalisations containers de transport des senseurs XGRE 1, 2 et 3. Ingénierie : - Conception d'ensemble ; - Synthèse des études pour l'établissement du DCI senseurs XGRE ; - Etablissement des matrices de conformité aux divers DA du projet - Revue des surveillances bord et sol nécessaires à la préservation de l'intégrité de XGRE ;		



69 project review (CSP) in APC
between 2007 and 2012

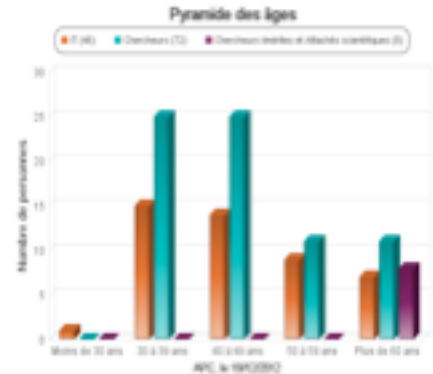
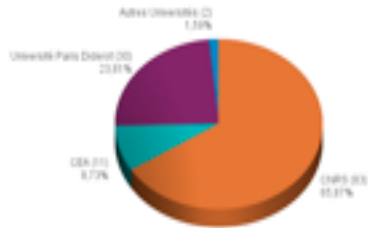


Technical Department Assessment Quality Assurance CQAP



The major achievements

Personnel permanent APC par organisme - 19/12/2012



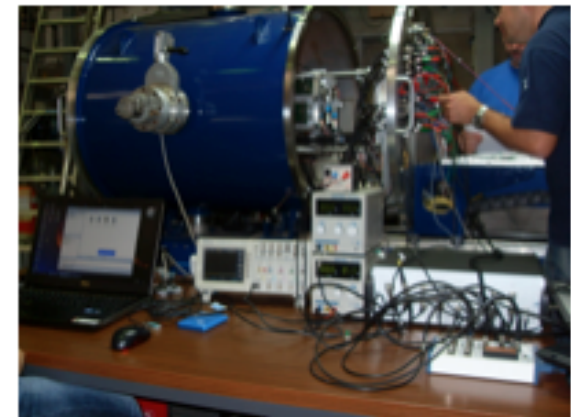
Complete Data-Base processus in Order to produce all indicators, graphics In field of Human Ressources, projects, Financial, Admin, prospective studies. EDMS system admin. The Document and Information Manager provide training and assistance to researchers using the OAI compliant system called HAL

Charts from APC "Indicateurs" Database

A specific and unique competence in the field of RadHard qualification of ASIC or commercial electronics components.

Complete processus under ECSS and space agencies quality assurance policy.

Control process and rules of electronics components utilisation for space project (ITAR, component selection, derating rules, reliability)



UCL Radiation tests



Technical Department Assessment Conclusions



- ✓ The technical departments of APC proved in last 5 years their capacities to take responsibilities in international collaboration with success.
- ✓ Engineers and Technicians improves continuously their skills in space or terrestrial experiments
- ✓ In difficult context of stability (or decrease) appointments, the technical departments were able to adapt but for the future the consolidation of permanent situation is a priority
- ✓ The employed project collaborators is a problem in order to keep knowledge and expertises but it's also a chance for permanent staff
- ✓ Technical Departments have gained a very good understanding of project management for space projects.