

2014-2018 : LLR Technical Activities

Marc Anduze – T.D. (anduze@llr.in2p3.fr)

on behalf of the Technical Departments



General organisation



Effectif total : 102 pers.

Chercheurs permanents :	29
* Chercheurs émérites :	3
CDD chercheurs :	13
Doctorants :	17
IT permanents :	37
CDD IT :	4
Apprentis :	1
Stagiaires :	1



LA PHYSIQUE

PCR : T. Mueller

LES SERVICES TECHNIQUES

Correspondant Formation : F. Gastaldi
 Correspondant Valorisation : T. Bizat
 AP : M. Anduze / A. Khaled

Physique des particules au LHC-pp (CMS)	Physique des ions lourds-LHC (CMS & LHCb)	Collisionneur e+e-	Astronomie Gamma	Physique des neutrinos	Applications BioMédicales Geant4	Applications laser plasma	Service Administratif	Service Informatique	Service Mécanique	Service Électronique & Instrumentation
Resp. Y. Srois F. Beaudette P. Busson C. Charlot C. Ochando R. Salerno (Cern) J.B. Sauvan A. Zabi (Cern) A. Zghiche (Cern) P. Mine* A. Lobanov G. Ortona C. Amendola M. Bonanomi D. Giljanovic C. Martin-Perez M. Prvan J. Rembser T. Sculac	Resp. F. Fleuret ; R. G. de Cassagnac F. Arléo V. Balagura M. Nguyen E. Gonzalez I. Kucher J. Martin-Blanco E. Maurice B. Diab G. Falmagne F. Garcia A. Stahl Leiton	Resp. V. Boudry V. Balagura J.C. Brient H. Videau* A. Lobanov O. Korostyshevskyi	Resp. S. Fegan D. Bernard P. Bruel D. Horan M. de Naurois G. Fontaine* S. Caroff C. Trichard J. Muller J. Valverde	Resp. M. Gonin O. Drapier B.A. Marguerite T. Muller P. Paganini S. Dolan S.El Hedri A. Coffani Q. Huang O. Volcy	Resp. M. Verderi C. Thiebaux B. Boyer	Resp. A. Specka M. Khojayan F. Massimo I. Zemzemi	Resp. T. Bizat A. Bagayoko S. Delhaye M. Frayssinet F. Jacquemin S. Pieyre M.T Théodora	Resp. G. Grasseau E. Becheva A. Beck L. Bernardi A. Chiron P. Hennion M. Lastes F. Magniette A. Sartirana I. Semeniouk F. Thiant J. Tugler T. Cottrel P.A. Ferrer L. Haouaoussa	Resp. A. Cauchois M. Anduze A. Bonnemaïson E. Edy G. Fayolle O. Ferreira H. Khaled P. Manigot T. Pierre-Émile M. Roy	Resp. F. Gastaldi Y. Geerebaert M. Louzir J. Nanni T. Romanteau R. Guillaumat L. Pacheco



Technical Departments

Technical departments consist of all technical staff. Nobody is attached to a specific project. Departments respond positively to all requests according to specific skills of Engineers and Technicians (IT).

□ Technical staff (nov 2018) :

35 IT [49]₂₀₁₀

with - 26 CNRS [38]₂₀₁₀

- 10 X [11]₂₀₁₀

+ 4 non-permanent positions [1]₂₀₁₀

+ 4 future recruitments

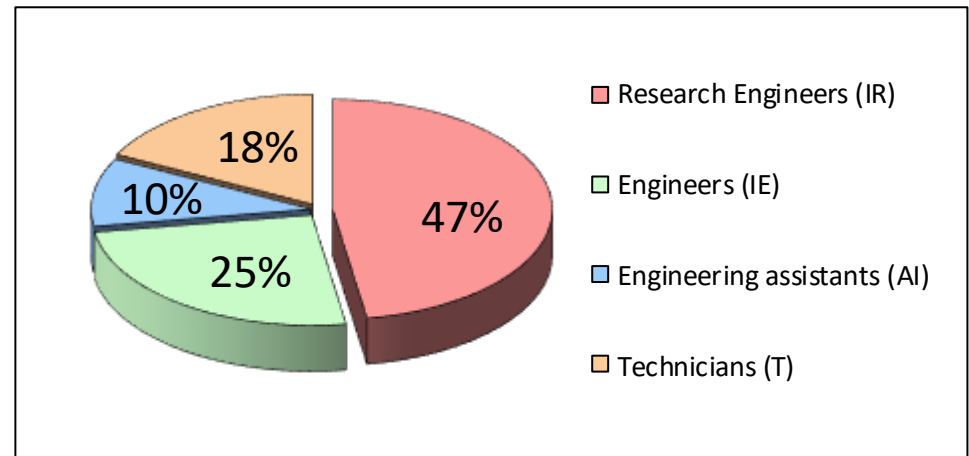
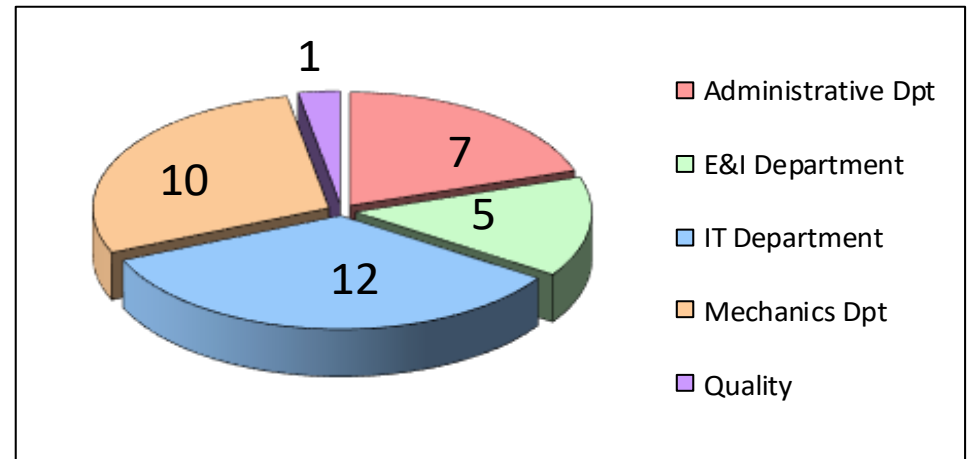
□ Distribution of IT per rank :

82% Category A :

Studies and Project management

18 % Category B :

Construction and Services





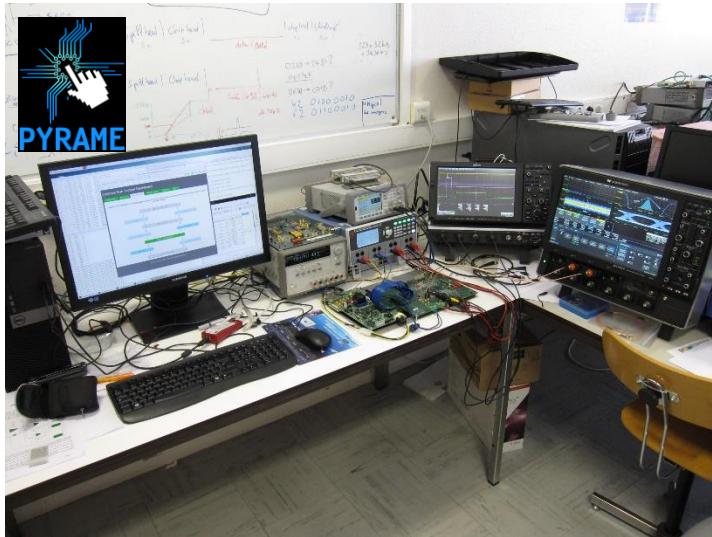
Equipments and Facilities



**Mechanics Workshop
and mounting hall**
Prototypes construction
(all projects)



ISO7 & ISO6 Cleanrooms
(33 m² + 35 m²):
Prototypes Integration
(all projects)



PYRAME software
Generic DAQ
(all projects)



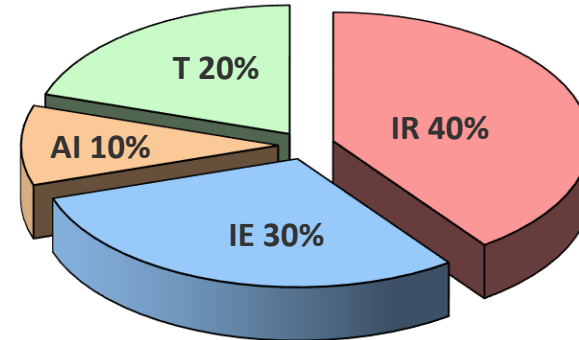
Data Center (aile 0)
LHC Computing Grid - Tier2
Clusters HPC/GPU
(all projects)



Mechanics department

□ **Staff: 10 people [15]₂₀₁₀**

4 IR, 3 IE, 1 AI, 2 T
(+ IR 2019, AI 2018, X AI 2019)



□ **Main skills:**

- **Studies and construction of Physics Particles detectors using a global approach:**
Detector design using CAD and FE software (static, dynamic, thermal analysis), prototype definition and construction (LLR mechanics workshop), integration and commissioning (testbeams, experimental site) ;
- **Expertise in carbon composite structures** (study and fabrication)
- **New fabrication processes : water jet cutting, 3D printing** (Fablab with 6 3D printers)



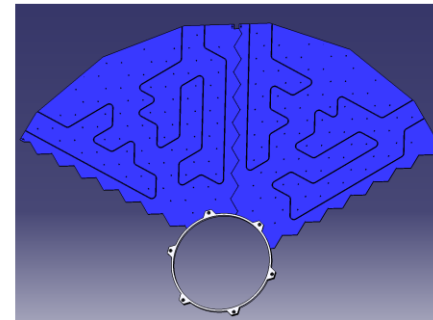
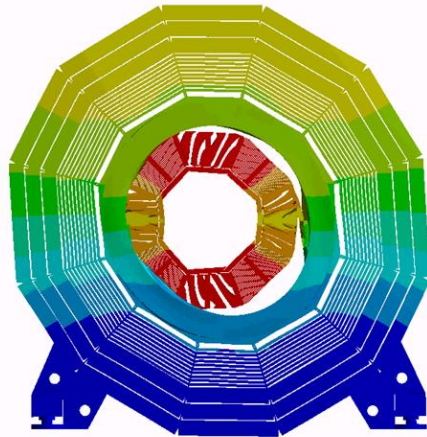
Mechanics department

In charge of 9 projects (2014-2018):

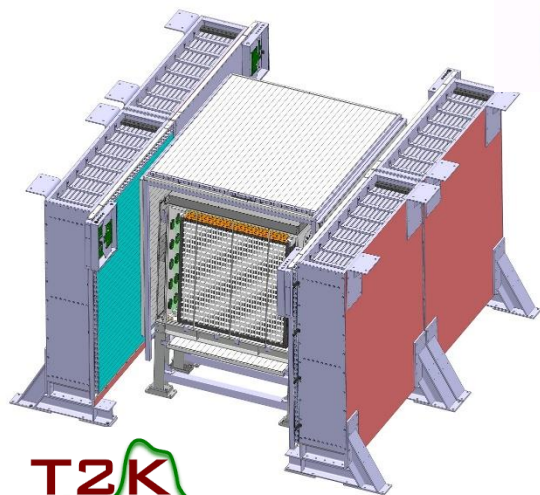
CMS-HGCAL , CALICE-ILD, GALOP, CTA NectarCAM, T2K-WAGASCI, PEPITES, HARPO, HESS I&II



ILD
*Dynamic analysis
(earthquake)*



CMS-HGCAL
*Design and
Prototypes
(cooling system)*

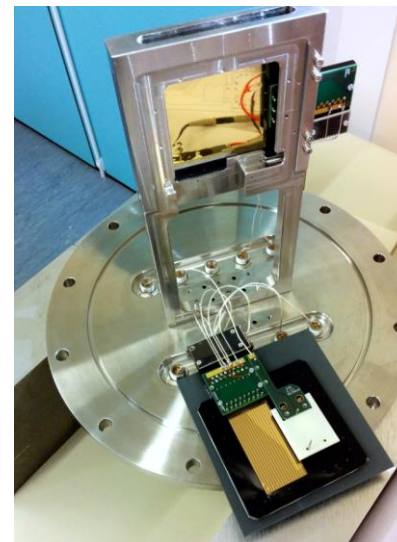


T2K
Wagasci実験

T2K -WAGASCI
Design - CAD model



PEPITES
*Design and
Prototypes*

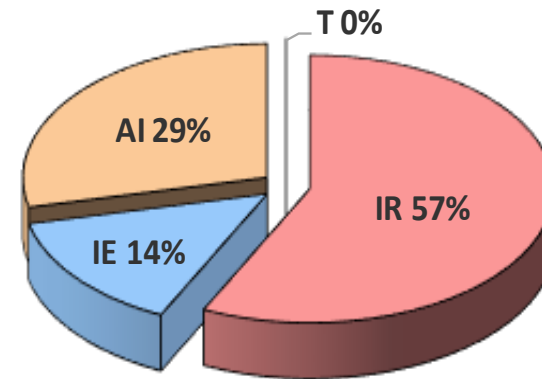




Electronics and Instrumentation department

□ *Staff: 7 people (+3 online) [13]₂₀₁₀*
4 IR, 1 IE, 2 AI (+ X IE 2019)

□ *Main skills:*



- **Characterization of Silicon and Scintillator detectors using several set-up :** laser test bench (pico-second UV or IR laser), SiPM / PM test bench (T°C / RH climatic chamber, pulsed light source, 36 channels) and a P2IO platform: Captinnov
- **Design of complex trigger algorithms on FPGA system (firmware)**
- **General approach for “controlling” a detector : from the sensor to the DAQ system:**
using internal generic tools **Pyrame** : fast prototyping framework for online systems. It provides basic blocks (called modules) of control-command or data acquisition, easily adaptable to most OMEGA chips

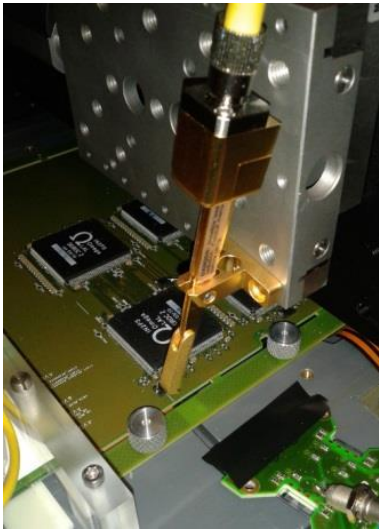


Electronics and Instrumentation department

In charge of 9 projects (2014-2018):

CMS-upgrades Ph1&2 , CTA NectarCAM, CALICE-ILD , PEPITES, JUNO, GALOP, HARPO, Instrumentation & DAQ multi-projects

CALICE
*Silicon wafer
characterization*



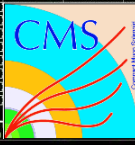
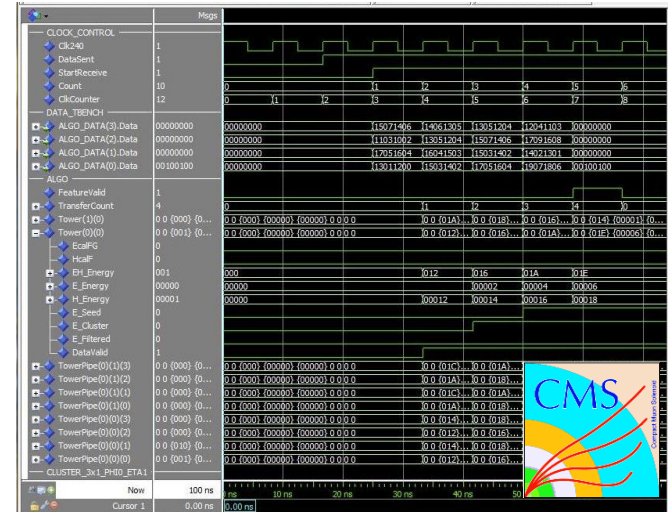
ILD
*Long Slab testbeam
(DESY)*



CMS-HGCAL
*HGROC chip
test bench*



CMS-HGCAL
*Trigger algorithm
simulations*





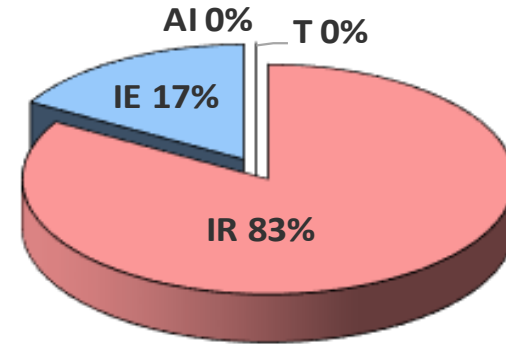
Information Technology Department

□ **Staff: 12 people [17]₂₀₁₀**

10 IR, 2 IE,

□ **Main skills:**

- **Administration of Computing facilities:**
LHC Grid (T2 GRIF), HPC, GPU's with « container » technology (cloud technology)
- **HPC (High Performance Computing) expertise:**
development of new algorithm to take advantage of massively parallel platforms (>10 kcores – distributed memory – National & European Computing Centers)
- **GPU/ AI developments:** first experiments with Deep Learning models (Convolutional Neural Networks) for shower identification and localization in high granularity Calorimeters (HGCal, ...)





Information Technology Department

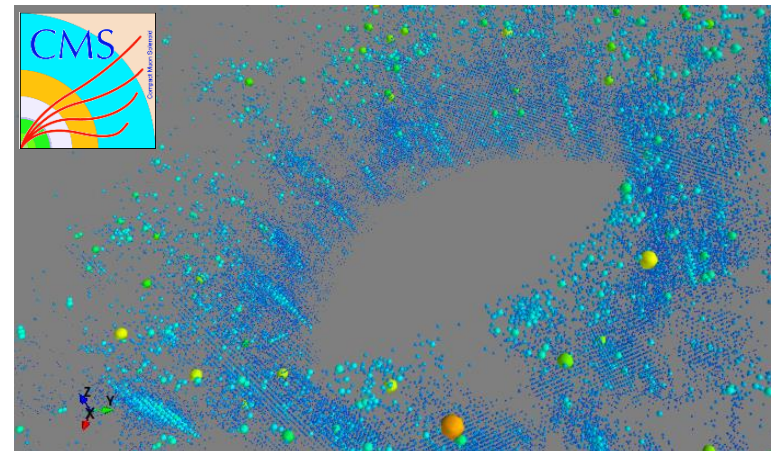
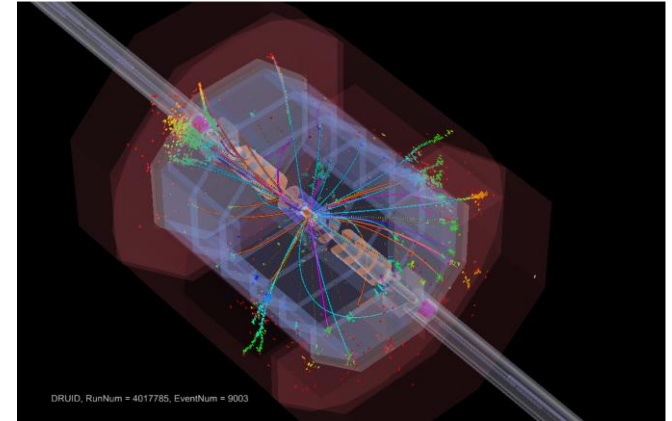
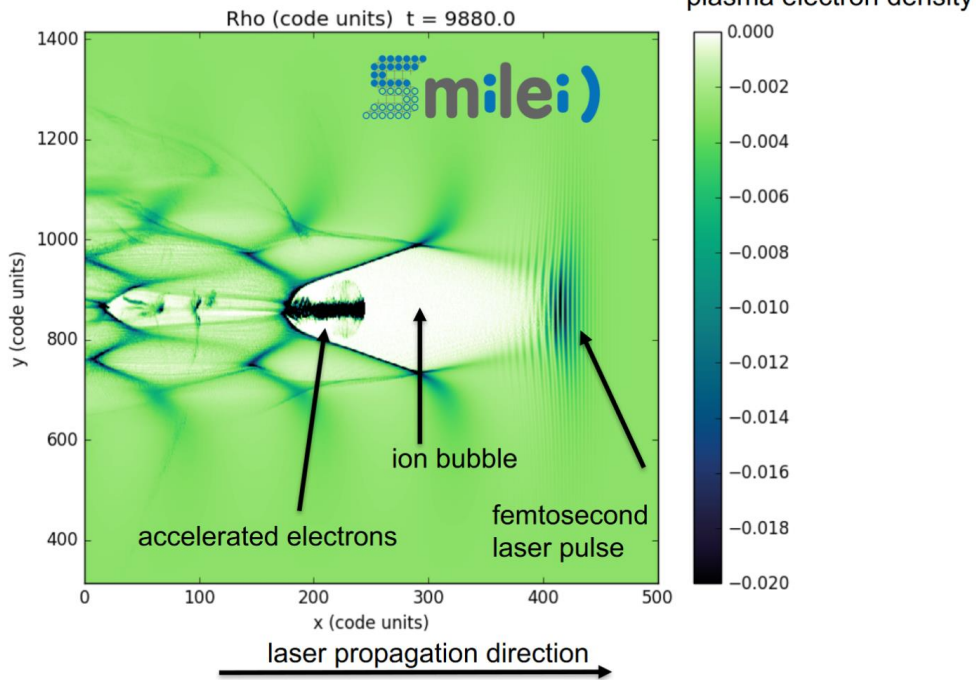
In charge of 6 projects (2014-2018):

CMS-HGCAL, CMS, HARPO, GALOP, CALICE-ILD, LHC Grid



ILD events simulations (Mokka)

HPC (GALOP) : laser-plasma acceleration simulations



HGCAL events simulations



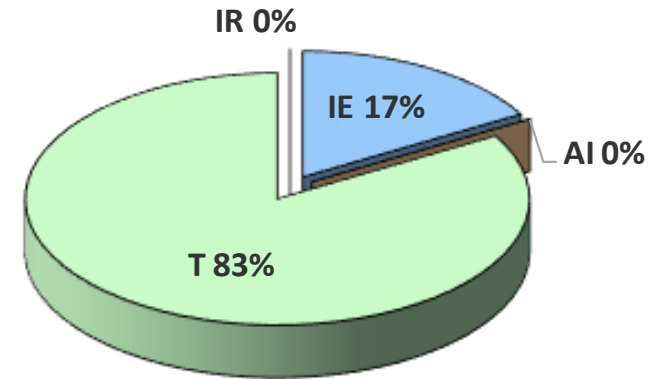
Administrative and finance Dpt

□ **Staff: 6 people [6]₂₀₁₀**

1 IE, 5 T (+ IE 2019)

□ **Main skills:**

- **Administrative and financial control:**
 - ~ 30 recruitment processes /year
 - ~ 500 missions for 300k€ /year
 - ~ 600 orders for 900 k€ /year
- **Support for the events organisation (conferences, workshops...)**
- **Expert group for supporting the answers for financial proposals (ANR, ERC, Marie Curie, labex...)**





Quality Engineer

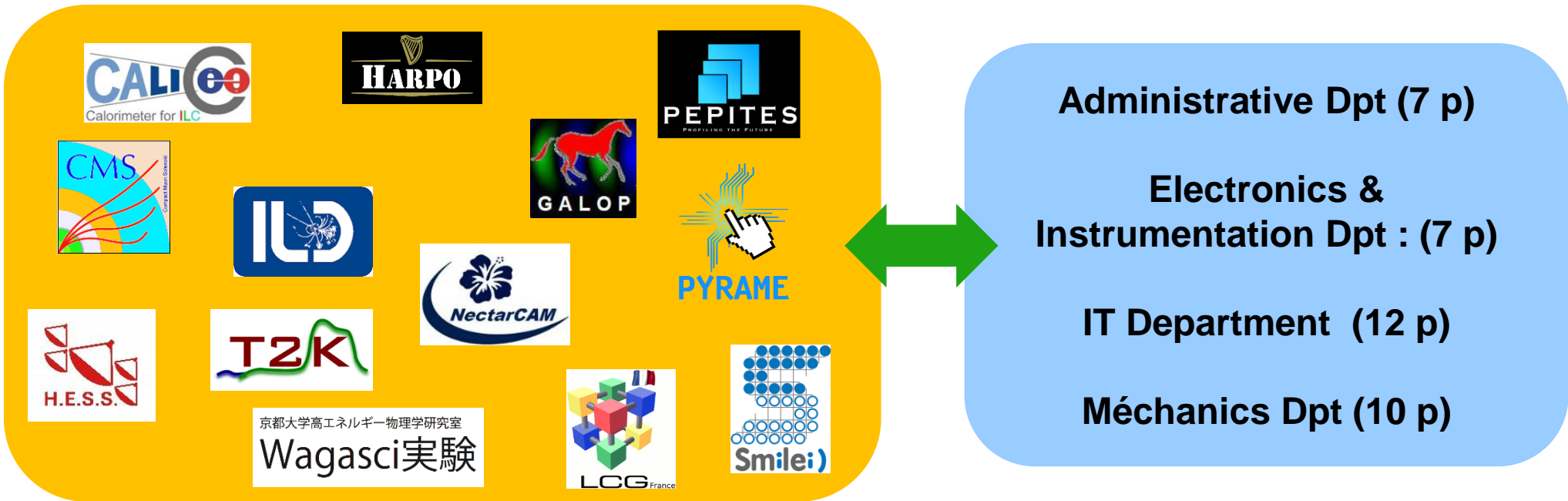
□ Main roles:

- **For projects: product assurance quality**
 - Coordination of quality processes
 - projects manufacturing readiness reviews
 - Documentation tools
 - Management of non-conformance procedures
- **For the laboratory : Quality approach implementation**
 - Improved internal processes: Internal audits of departments and follow-up of procedures put in place
 - Support for reviewing internal tools (procedure sheets, welcome booklet ...)
 - GED ATRIUM structure management for projects & LLR



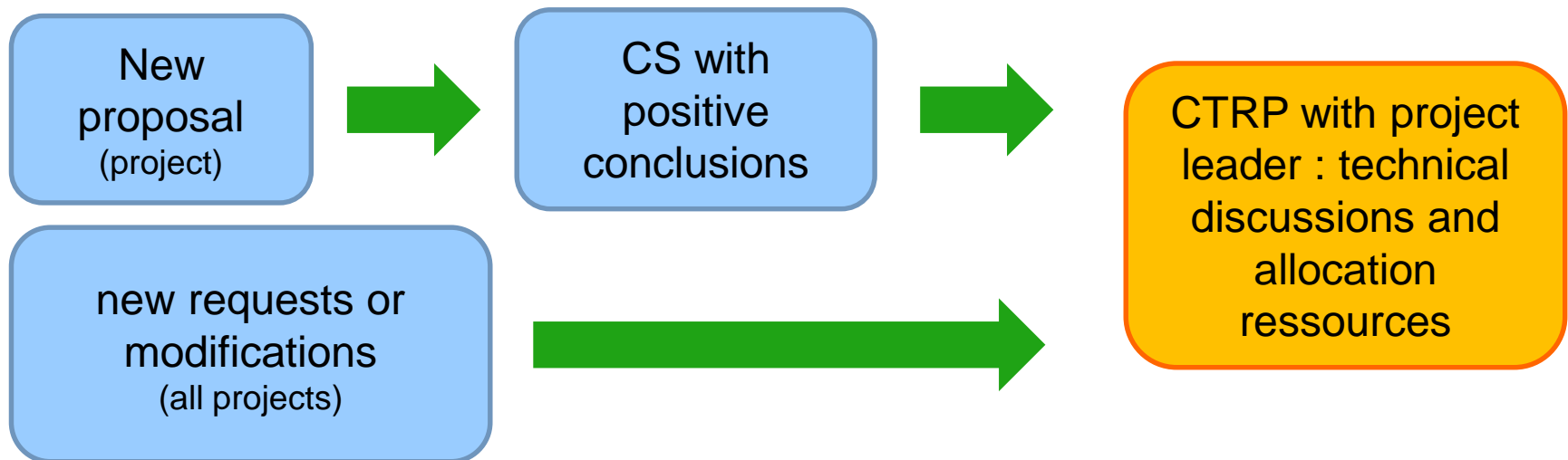
Allocation of resources

- Allocate human technical resources according to needs and milestones of all projects
- Proposal by LLR Codir of light project reviews in order to have better visibility and a better allocation over time :
“Technical Committee for Project Reviews” (CTRP)



Steps:

- 1) **New proposal** (Physicists) is discussed with the **Scientific Council (CS)**
- 2) **If positive conclusions**, proposal to organise a CTRP where the project leader will introduce all technical plans and needs;
(Organisation of CTRP for **new requests or modifications** for an existing technical project too)
- 3) **Conclusions** and **allocation** of human resources according to skills and availabilities





CTRP le **09/2011** : ANR CALIIMAX + AIDA



CTRP le **12/2012** : UPGRADES PHASE I

CTRP le **06/2017** : UPGRADES PHASE II – HGICAL

CTRP le **01/2018** : HGICAL partie mécanique

CTRP le **04/2018** : HGICAL partie trigger



CTRP le **06/2011** : MST CAM + DUMMY CAMERA DESY

CTRP le **12/2012** : Contrat Régional GATE

CTRP le **02/2015** : NectarCAM

CTRP le **05/2016** : NectarCAM



CTRP le **09/2016** : WAGASCI

CTRP le **12/2017** : WAGASCI



CTRP le **11/2017** : PEPITES



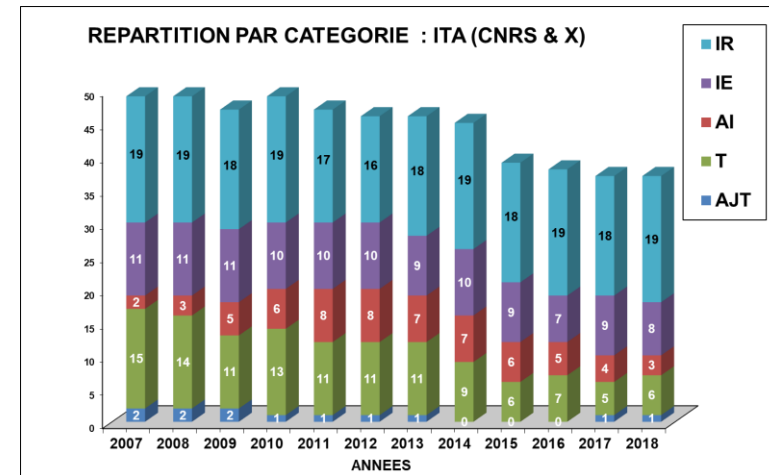
CTRP le **12/2017** : GALOP

CTRP le **10/2018** : GALOP phase1



A view for the future ...

- **LLR technical departments have unique expertise @IN2P3 :**
composite materials, HPC, generic DAQ Pyrame, water jet cutting process, AI/GPU algorithms, complex trigger algorithms
- **Try to stabilize or increase human resources in order to continue supports for all future design and construction projects**
(specially for technicians)
- **Projects : Plan for future is already full**



PROJETS	2018	2019	2020	2021	2022
CMS - HGAL mechanics	Engineering Mechanical prototype and final cassettes qualified (mechanics)			Pre-production	
CMS - events	HPC algorithm, events reconstructions, GPU/AI Algorithm (IT)				
CMS - HGAL trigger	back-end algorithms (électrons/photons et taus) and beamtest (Electronics & IT)			Pre-production	
CTA - NectarCam	Qualification Model (QM) construction and Industrialisation processes (mechanics)			Production camera (x 24)	
ILD	ILD ECAL SiW concept and validation (mechanics & Electronics & IT)			construction	
T2K	Upgrades (Electronics)				
HK	Detector design (Electronics & IT)				
GALOP	Spectrometer design with 2 steps (mechanics & IT)		Commissioning (1PW & 4PW beams)	Develop a two stage Laser Plasma Accelerator (mechanics & IT)	
PEPITES	propotype design & validation (mechanics & Electronics & IT)		construction		