



NUCLÉAIRE
& PARTICULES

Institut national de physique nucléaire
et de physique des particules
IN2P3

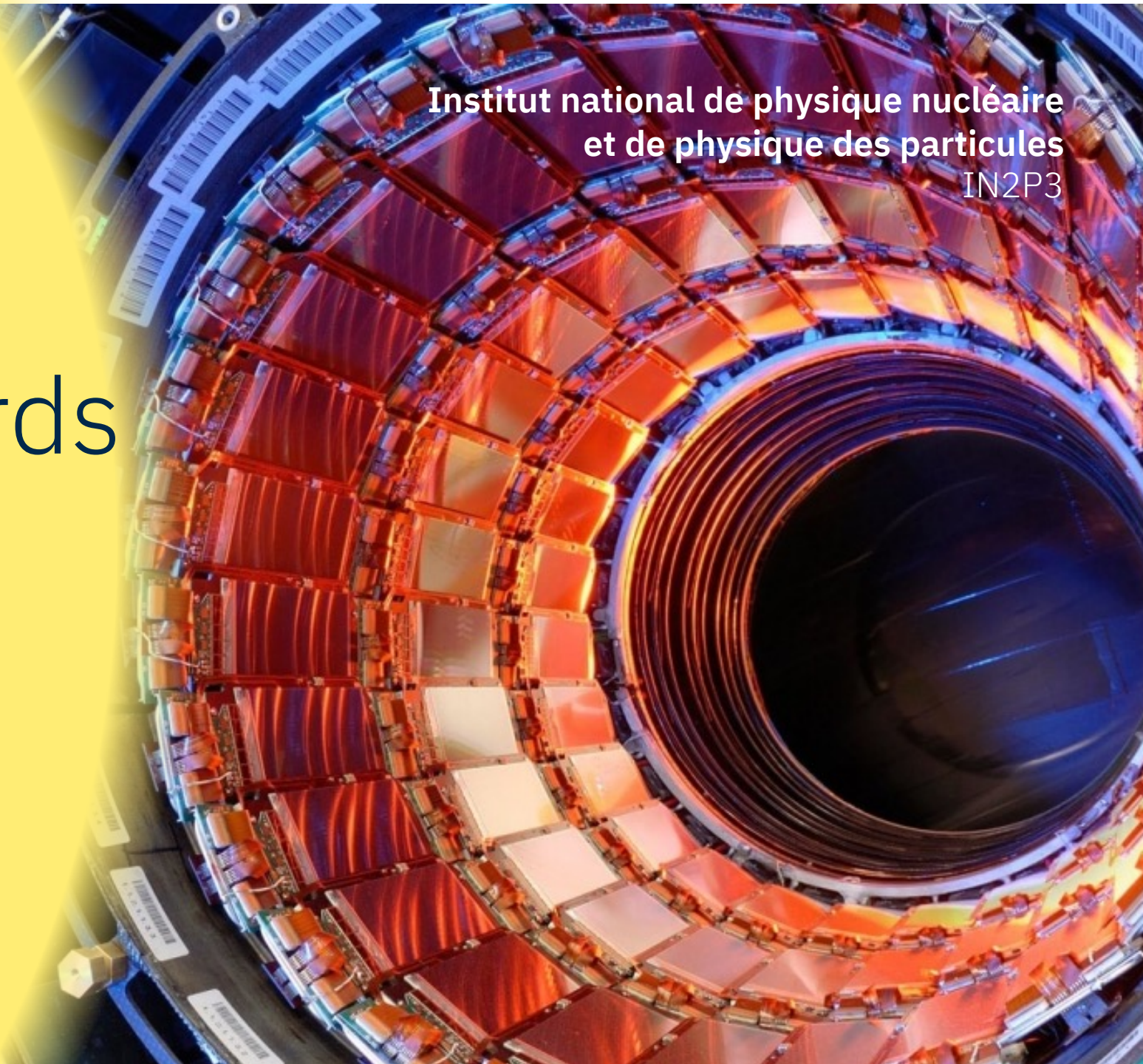
Welcoming words from IN2P3

FJPPN/FKPPN 2025 Workshop in Nantes

Laurent Vacavant

Scientific Director for Particle Physics

→ 15/05/2025



Welcome to the FJPPN/FKPPN 2025 workshop

In Nantes

Building on the success of the previous workshops, e.g. recently:



Daejeon 2024



Tokyo 2023



Jeju 2019

Looking forward to interesting talks and lively discussions... which started yesterday already



FJPPN & FKPPN

International Research Networks

FJPPL & FKPPN : **success stories since respectively 2006 and 2008**

Very fruitful collaborations, seeding larger cross-participations in several projects

Structures adapted in 2023 to follow evolution of CNRS international tools

- TYL/FJPPL replaced by 2 different structures
 - a network : FJPPN International Research Network
 - *network with many partners/institutions*
 - *funding of collaborative research projects*
 - an actual lab : TYL International Research Laboratory

- FKPPN became :
 - a network : FKPPN International Research Network
 - *network with many partners/institutions*
 - *funding of collaborative research projects*

Toshiko Yuasa Lab – International Research Lab

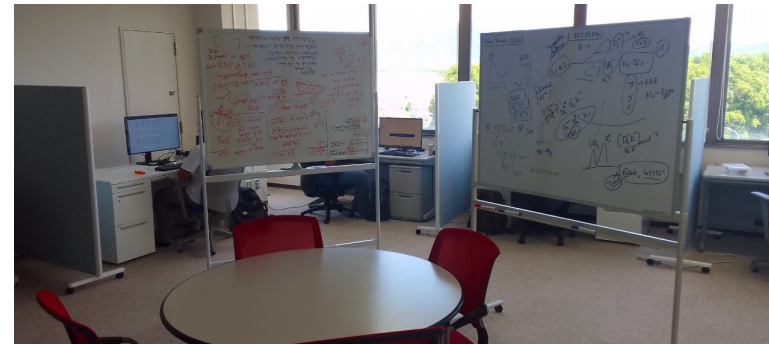
CNRS/IN2P3 & KEK

Launched in 2023 at the workshop

Joint lab from KEK and CNRS, in KEK (Tsukuba) premises

*To foster scientific exchanges on all our research topics
(with a focus on **particle physics & accelerator physics, Belle-II**)*

- Hosts IN2P3 scientists for long stays at KEK
- Liaison with IN2P3 & CNRS Office for NE Asia (Jacques Maleval)
- Currently between 2-5 people, plus guests
- Directors : Karim Trabelsi, Shoji Hashimoto
- (see *Karim's talk*)



ILANCE – International Research Lab

CNRS/IN2P3 & U. Tokyo

Launched in 2021

Joint lab from U. Tokyo and CNRS, in U Tokyo Kashiwa campus

*To foster scientific exchanges on all our research topics
(with a focus on **neutrino physics, astrophysics**
& **cosmology**)*

- Hosts IN2P3 scientists for long stays at U Tokyo
- Liaison with IN2P3 & CNRS Office for NE Asia
- Currently half a dozen people, plus 10-20 guests
- Directors : Michel Gonin, Takaaki Kajita



Second International Conference on the Physics of the two Infinities

Scientific Advisory Committee

Masaki Ando (Tokyo)
Matteo Barsuglia (Paris)
Cédric Cerna (Chicago)
Mamoru Doi (Tokyo)
Josquin Errard (Paris)
Armand Fiasson (Annecy)
Michel Gonin (Tokyo)
Katsuki Hiraide (Tokyo)
Tetiana Hrynova (Annecy)
Masaya Ishino (Tokyo)
Yoshitaka Itow (Tokyo)
Takaaki Kajita (Tokyo)
Kotaro Kohno (Tokyo)
Yusuke Koshio (Okayama)
Kumiko Kotera (Paris)
Jia Liu (Tokyo)
Tomotake Matsumura (Tokyo)
Toshinori Mori (Tokyo)
Tsuyoshi Nakaya (Kyoto)
Shoichi Ogio (Tokyo)
Guillaume Patanchon (Tokyo)
Sebastien Peirani (Tokyo)
Benjamin Quilain (Tokyo)
Nicolas Regnault (Paris)
Naohito Saito (Tsukuba)
Hiroyuki Sekiya (Tokyo)
Yves Sirois (Palaiseau)
Karim Trabelsi (Tsukuba)
Patrice Verdier (Lyon)
Jun'ichi Yokoyama (Tokyo)

17 – 21 November 2025
Hongo Campus Tokyo

Main Topics

The Primordial Universe
Particle Physics
The Dark Universe
Astrophysics
Gravitational Waves
Neutrinos
High Energy Astrophysics
AI and Machine Learning



CNRS Nucléaire & Particules / IN2P3

One of the 10 Institutes of CNRS, with a specific national mission

Mission : to coordinate research in nuclear physics, particle physics, and astroparticle physics

COORDINATES

national research programs
and French participations in
major infrastructures

OPERATES

research units, mostly in partnership
with universities and/or research
organizations

EXPLORES

the physics of the two infinities :
from elementary particles to
cosmology

Links with society :

DEVELOPS

associated technologies,
applications and interdisciplinary
research

PROVIDES

expertise, teaching, training

Areas of research

@ IN2P3

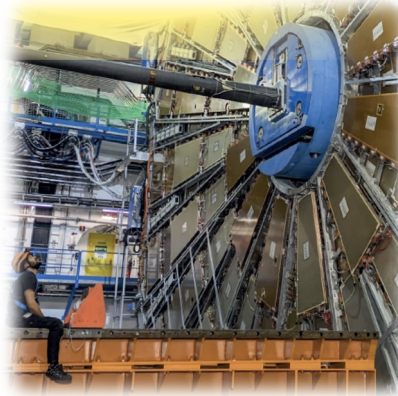
Explore fundamental physics

Lead research on contemporary scientific challenges

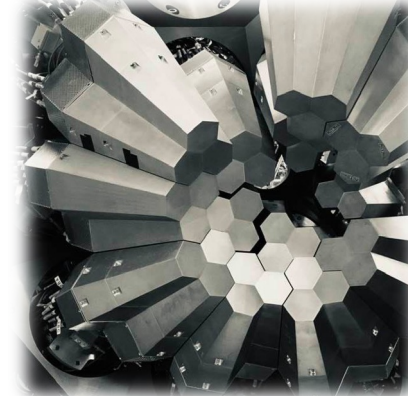
Valorize technology for society & industry

in synergy with other institutes from CNRS and other research organizations in France and worldwide

Particle Physics



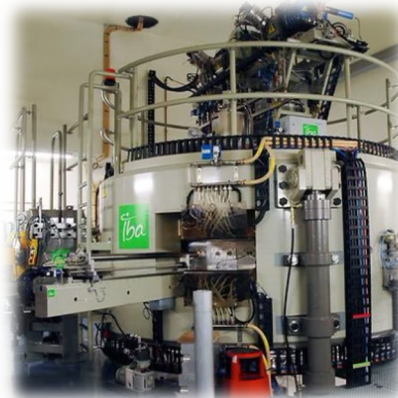
Hadronic & Nuclear Physics



Astroparticles & Cosmology



Nuclear sciences for Society



Accelerators & Technologies



Data science & Computing



IN2P3 key figures

15+7

laboratories, jointly operated
with universities

including 7 with foreign universities

30 + 10

research programs
+ animation
groups (GDR/IRN)

1 000 (600 CNRS)

staff scientists & faculties

10

support units & interdisciplinary
research platforms

50

international
research
agreements

1 500

engineers, techs and admins

300

post-docs

90 M€

annual budget
(w/o salaries)

20 M€

yearly for very large
research infrastructures

450

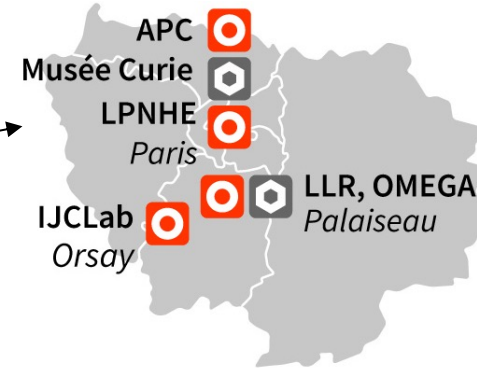
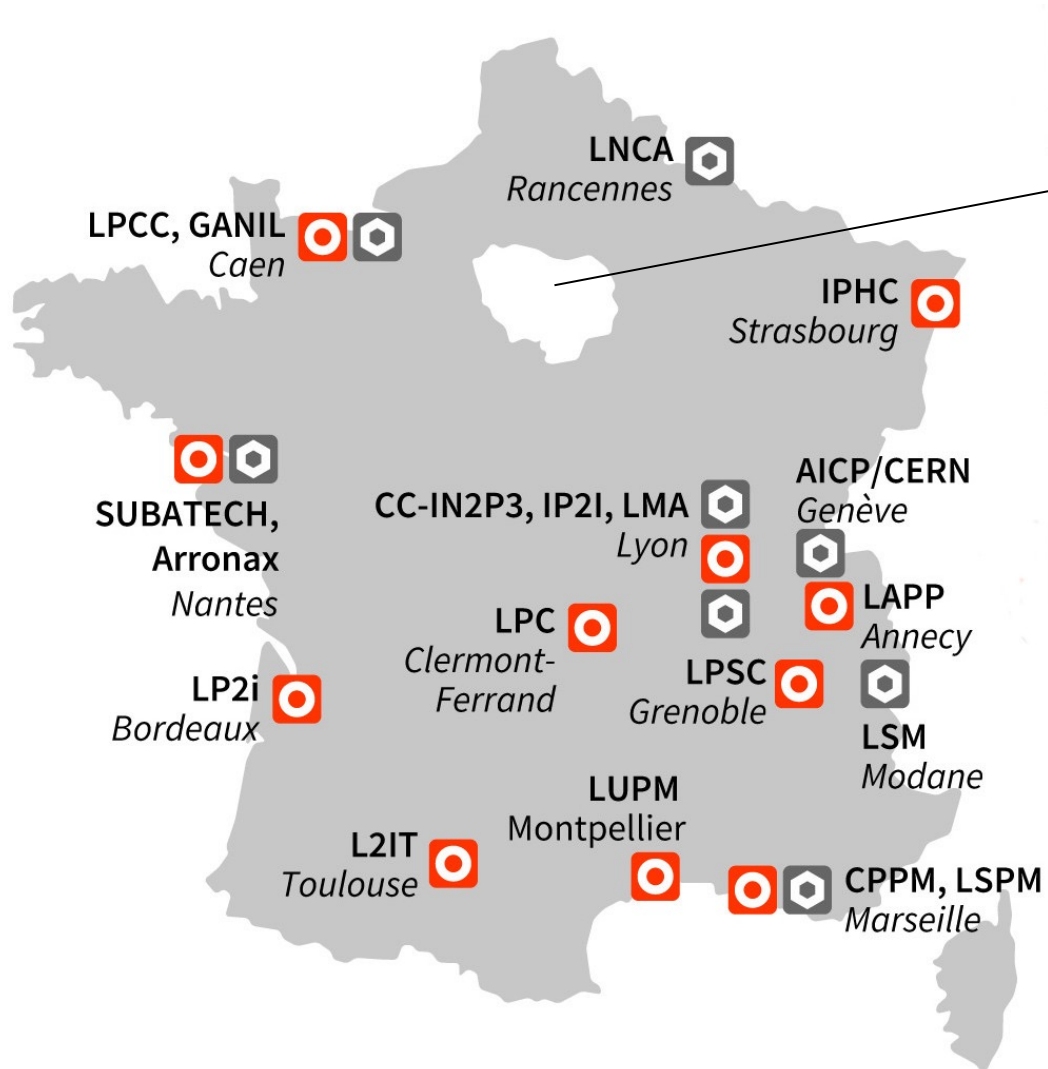
PhD students



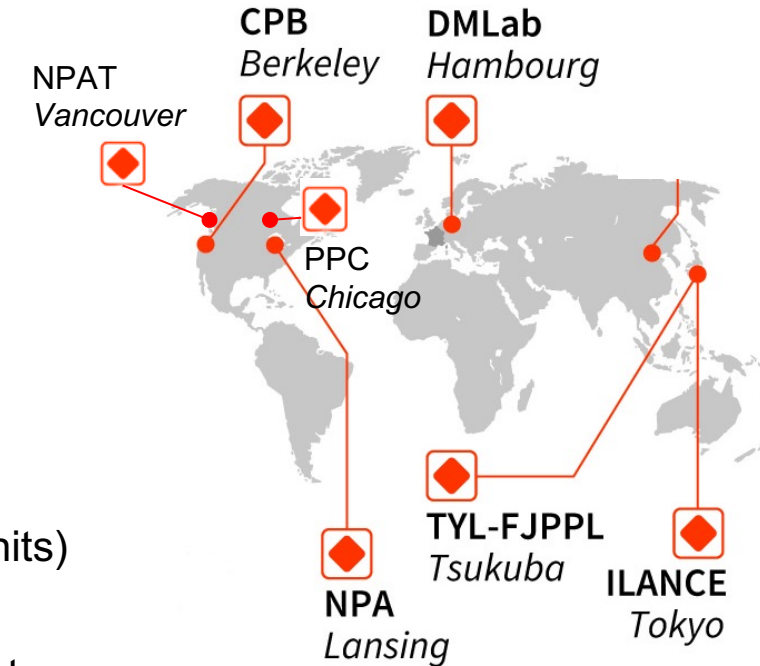
© CERN

IN2P3: a distributed lab

Across France... and also abroad

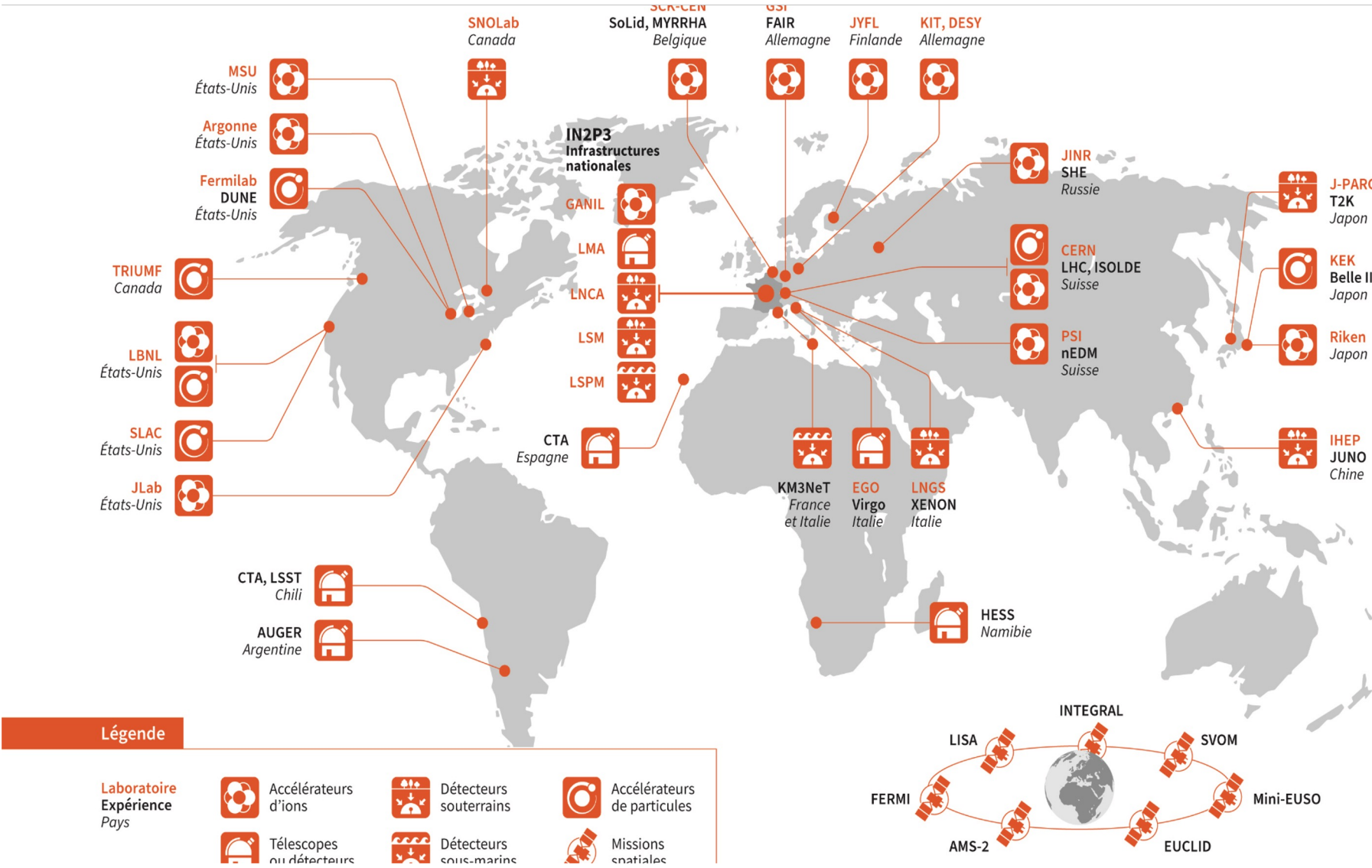
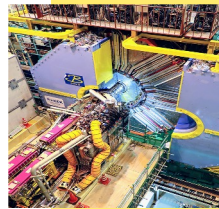
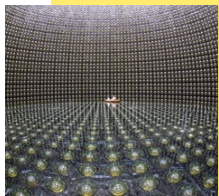
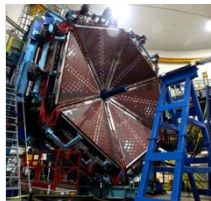
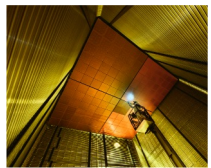


- 15 labs (joint research units) w/ major FR universities
- 10 infrastructure / support units
- 7 labs abroad w/ foreign universities: UC Berkeley, U Chicago, U Tokyo, MSU, Helmholtz, KEK, TRIUMF



Worldwide (+) research infrastructures

With IN2P3 involvements



Particle Physics Portfolio

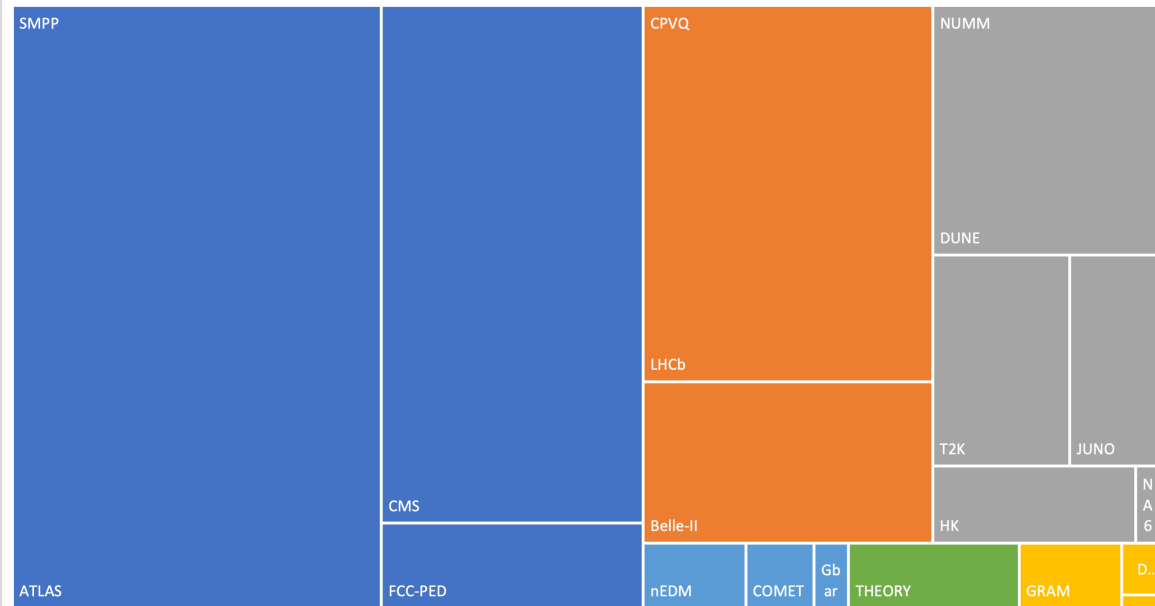
@ IN2P3

- 5 scientific programs, 32 master-projects
- 50 research teams in 15+3 labs
- 300 permanent physicists: 230 CNRS, 70 faculties
- 200 on contract: 70 postdocs, 130 PhD students
- 300 engineers & technicians working on PP projects



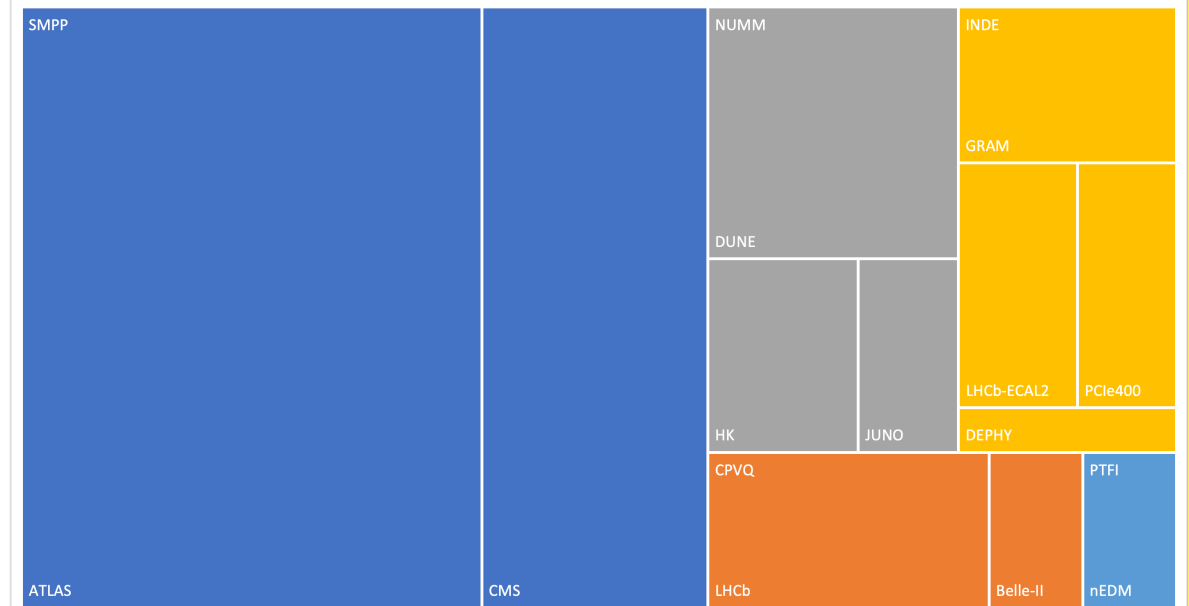
ETP 2024 - CH

■ SMPP ■ CPVQ ■ NUMM ■ INDE ■ PTFI ■ THEORY



ETP 2024 - IT

■ SMPP ■ CPVQ ■ NUMM ■ INDE ■ PTFI ■ THEORY



ATLAS & CMS Phase 2 Upgrades

Major investissement – strong involvement of IN2P3 labs

Déclenchement/acquisition
<https://cds.cern.ch/record/2285584>

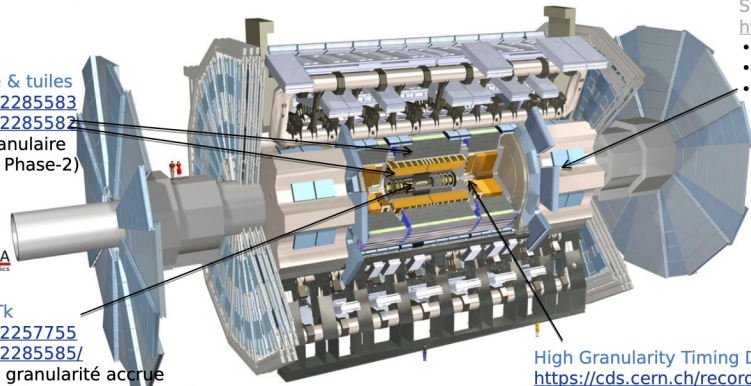
Calorimètres argon liquide & tuiles
<https://cds.cern.ch/record/2285583>
<https://cds.cern.ch/record/2285582>

- Nvle électronique + granulaire à 40 MHz (Phase-1 & Phase-2)



Nouveau trajectographe ITk
<https://cds.cern.ch/record/2257755>
<https://cds.cern.ch/record/2285585/>

- Pixels et micropistes Si, granularité accrue
- Couverture longitudinale étendue de $\eta \approx 2.5$ à 4



Système à muons (Phase 1 & 2)
<https://cds.cern.ch/record/2285580>

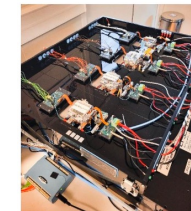
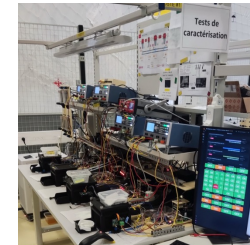
- Nvle électronique
- Nvles chambres internes
- Nvles petites roues NSW



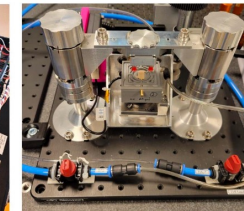
High Granularity Timing Detector

<https://cds.cern.ch/record/2719855>
<https://cds.cern.ch/record/2623663>

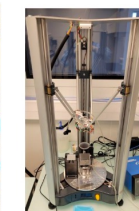
- Diodes LGAD, couverture $2.4 \leq \eta \leq 4$



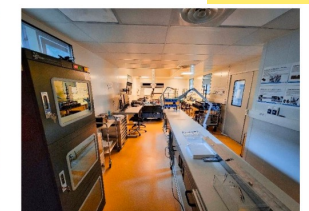
Banc QC électrique et thermique



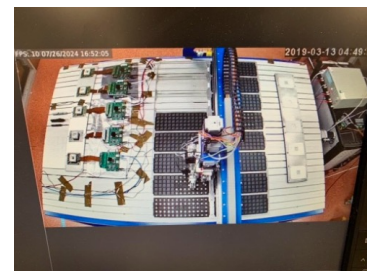
Outil de collage



Robot de dépôt



Aménagement salle blanche



L1-Trigger/HLT/DAQ (L1 TDR Q1 2020, HLT DAQ TDR Q2 2021)

<https://cds.cern.ch/record/2283192>
<https://cds.cern.ch/record/2283193>

- Traces en L1 à 40 MHz
- PFlow-like, 750 kHz en sortie
- HLT en sortie à 7.5 kHz

High Granularity Calorimeter Endcap
<https://cds.cern.ch/record/2293646>

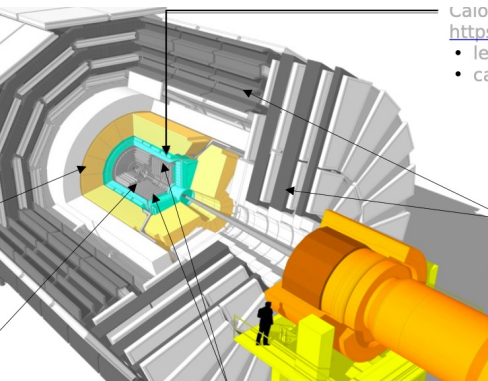
- gerbes 3D & info temporelle précise
- Si, Scint+SiPM dans Pb-W/SS



Trajectographe

<https://cds.cern.ch/record/2272264>

- pixels & pistes Si, granularité
- capacité déclenchement L1
- couverture étendue à $\eta \approx 3.8$



Calorimètres tonneaux
<https://cds.cern.ch/record/2283187>

- lecture ECAL granulaire à 40 MHz avec temps
- cartes digitales ECAL & HCAL



Système à muons

<https://cds.cern.ch/record/2283189>

- Nveau GEM/RPC $1.6 < \eta < 2.4$
- couverture étendue à $\eta \approx 3$



MIP Timing Detector

<https://cds.cern.ch/record/2296612>

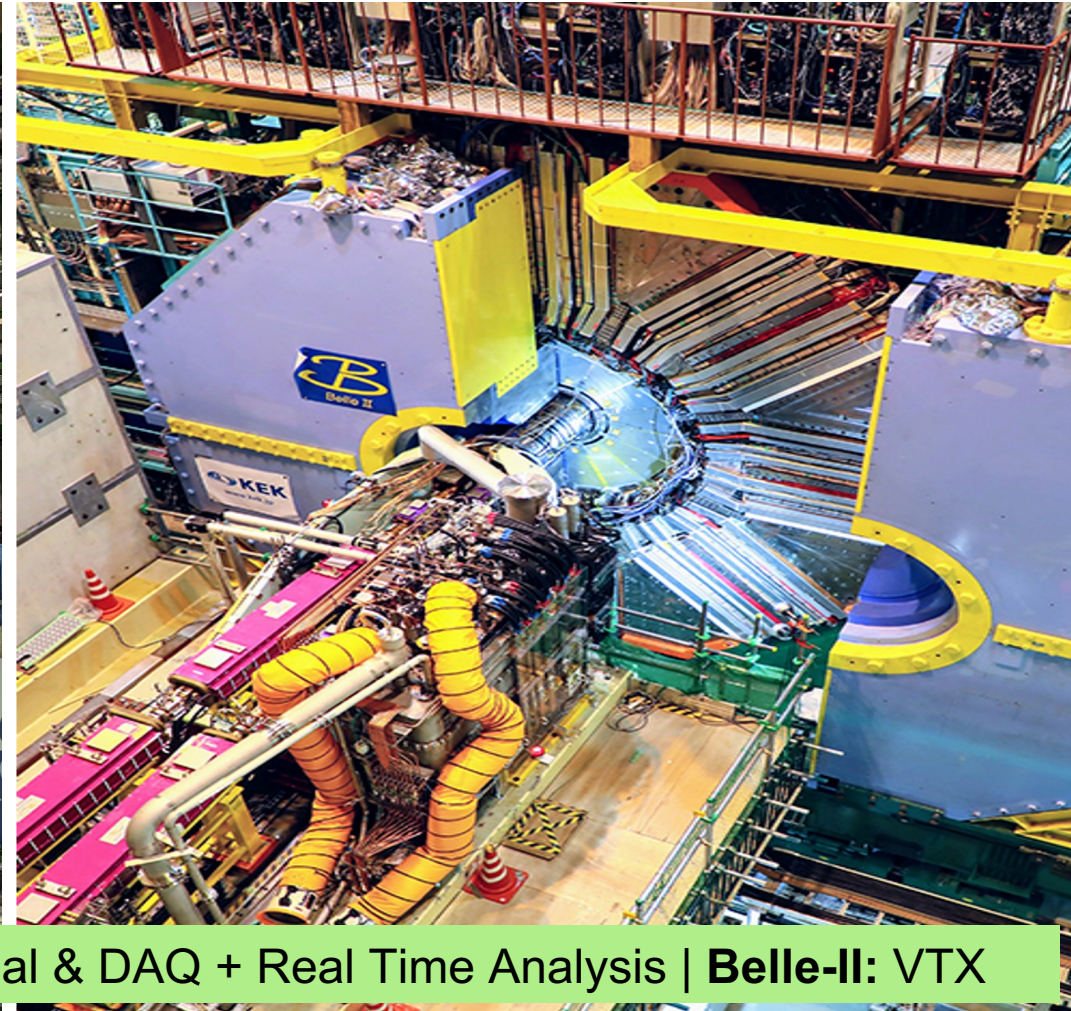
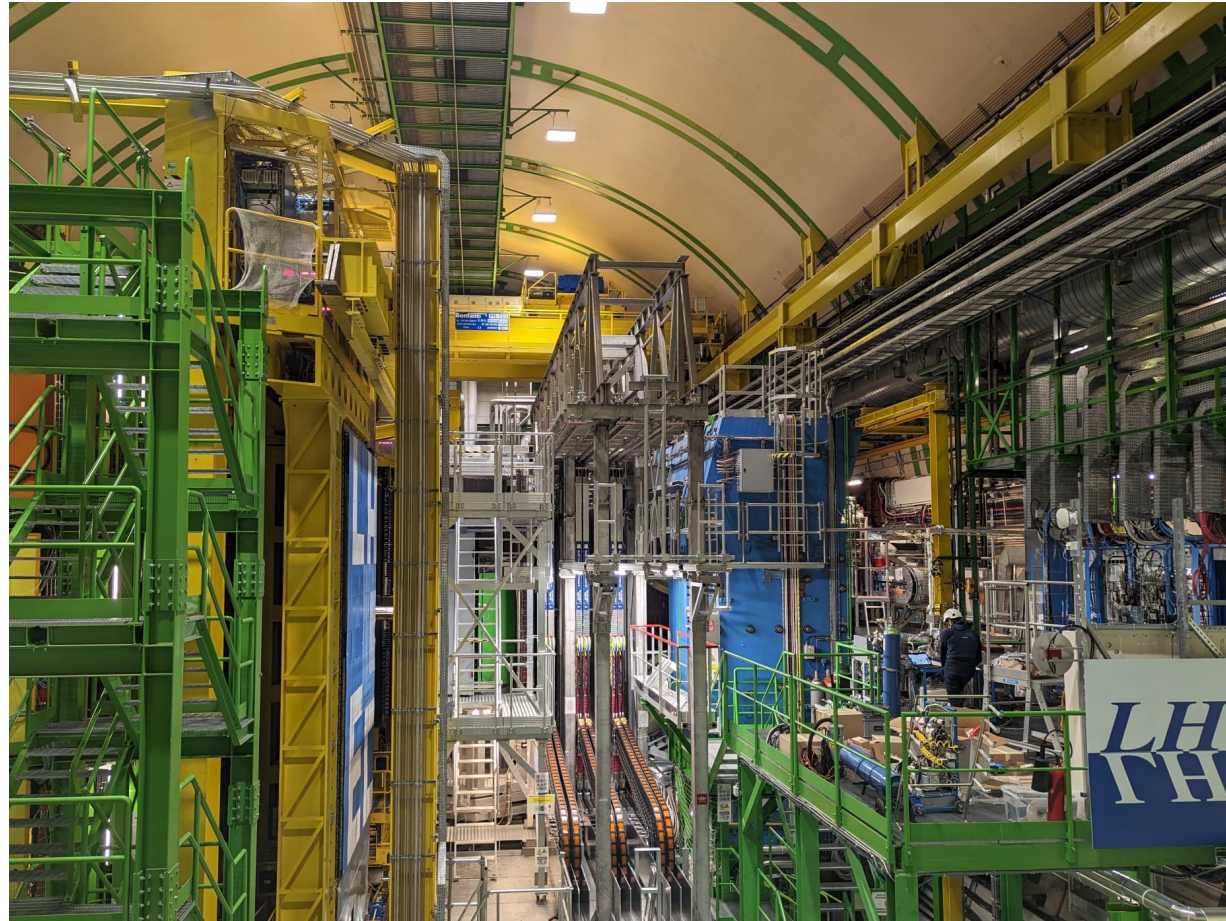
- Barrel layer: Crystals + SiPMs
- Endcap layer: Low Gain Avalanche Diodes



Beam Radiation Instr. and Luminosity,
 Common Systems and Infrastructure
<https://cds.cern.ch/record/002706512>
 Precision Proton Spectrometer

LHCb @ CERN/LHC et Belle-II @ SuperKEKB

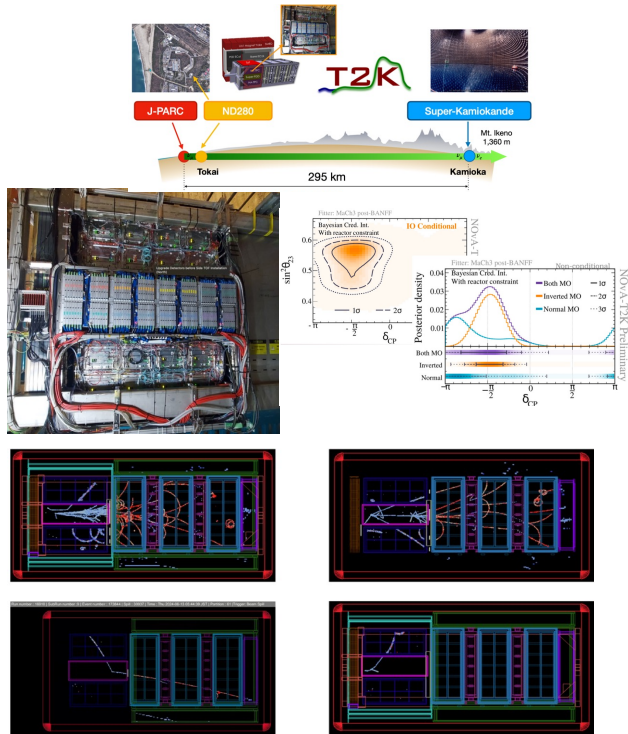
Flavour physics, CPV in the quark sector



Considering Upgrades in both cases: LHCb: PicoCal & DAQ + Real Time Analysis | Belle-II: VTX

Neutrino Physics

Several complementary programs, running or in preparation



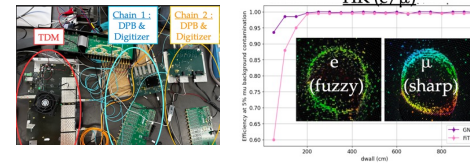
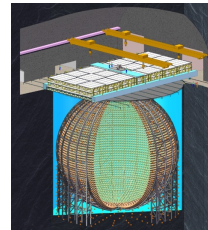
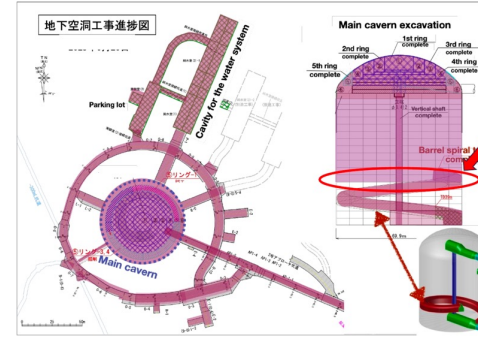
T2K:

- recent upgrade of ND280
- ramp-up of beam power
- improvement of systematic errors
- update of CPV analysis
- combinations (Nova, etc)



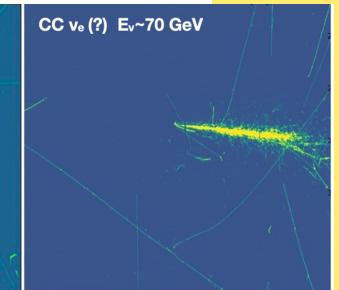
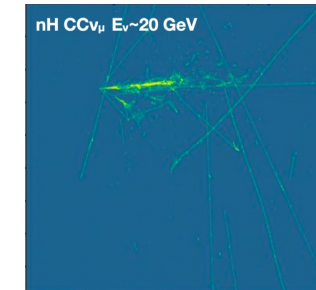
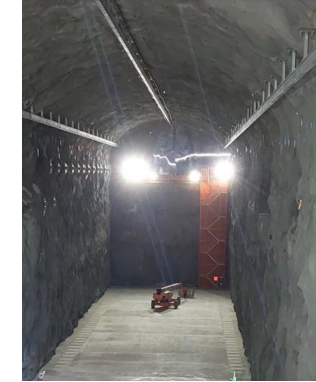
JUNO:

- electronics of sPMT
- TopTracker (installation on-going)
- detector being filled up
- test run this Fall



HK:

- time generation & distribution
- tests of digitization electronics @ CERN
- innovative algorithms
- computing
- MoU signed last October



DUNE:

- key player for FD #1 with LAr Vertical Drift TPC: TDE, HVS, CRP, PDS
- construction on-going, completed by mid-2027
- ProtoDUNE-VD @ CERN

More neutrino physics

Detection of the most energetic neutrino (220 PeV) by KM3Net (ORCA FR + [ARCA IT](#))

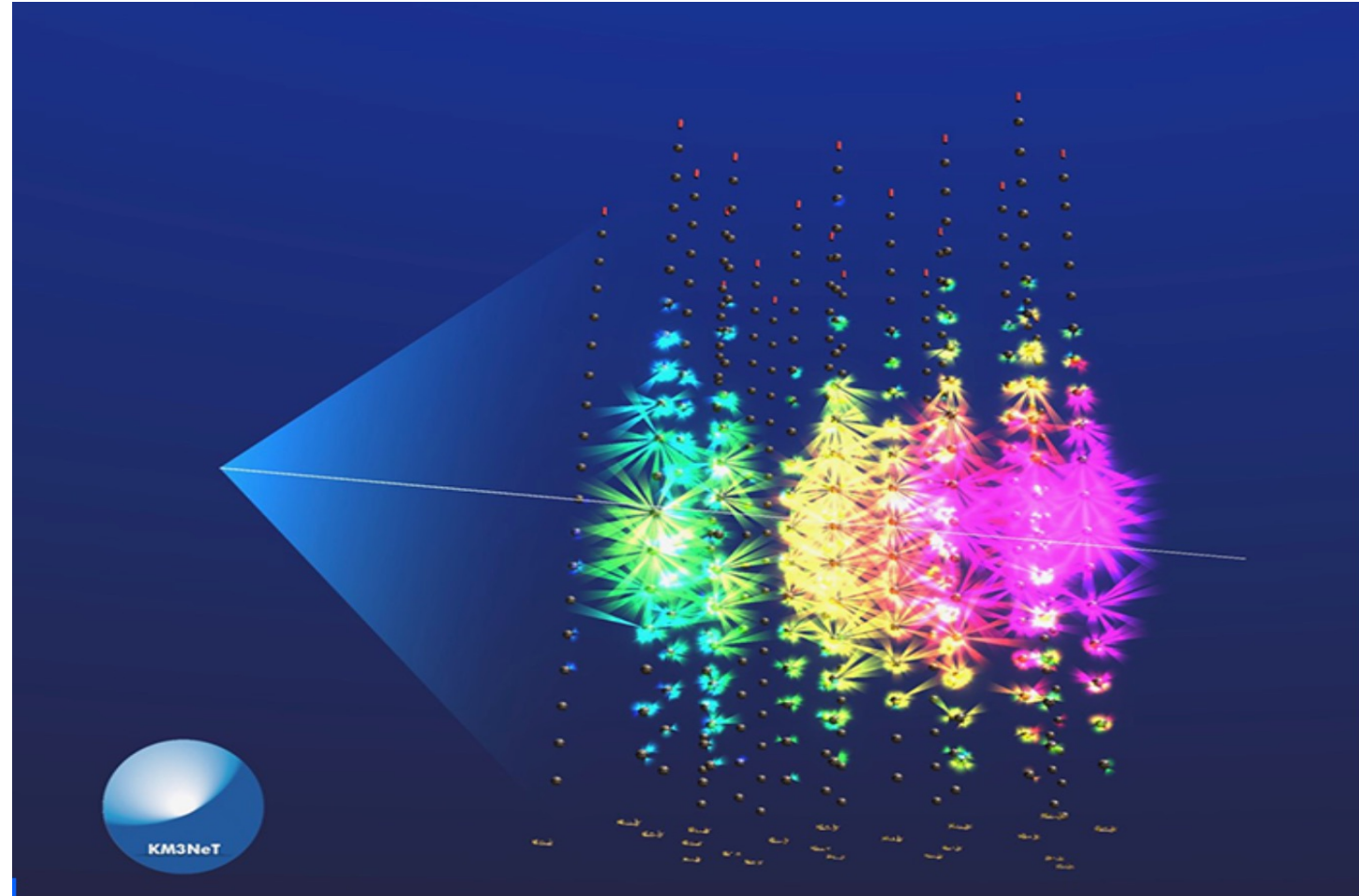
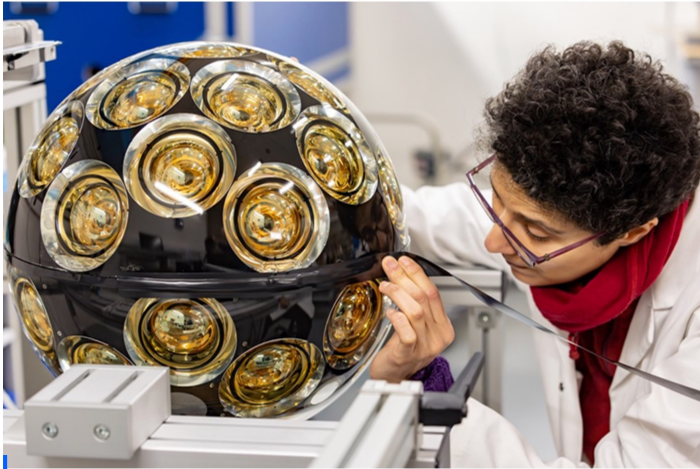
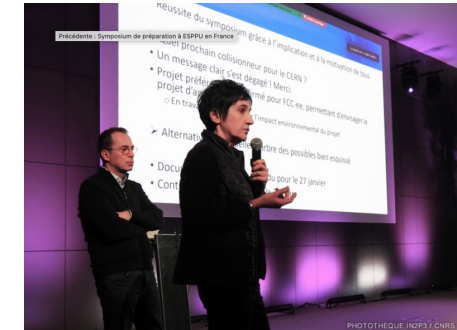


Illustration de l'événement KM3-20230213A. Le détecteur est représenté par 21 lignes de détection composées de 18 modules optiques (boules noires et jaunes). Chaque cône coloré indique qu'un module optique a détecté de la lumière. La taille des cônes est proportionnelle à l'intensité du signal lumineux détecté et la couleur correspond à sa durée (de violet vers le bleu). La ligne blanche symbolise la trajectoire du neutrino et le grand cône bleu représente le sillage de la lumière tcherenkov. © P. Coyle, CNRS, Collaboration KM3Net.

ESPP 2026: update of European Strategy



Symposium of the FR HEP community (20-21/01/2025): pictures

FR contribution: <https://indico.cern.ch/event/1439855/contributions/6461414/>

Next flagship project: strong consensus for FCC + many other topics discussed

crédits photos:
G. Boudoul
A. Carneau

