



NUCLÉAIRE
& PARTICULES

Institut national de physique nucléaire
et de physique des particules
IN2P3

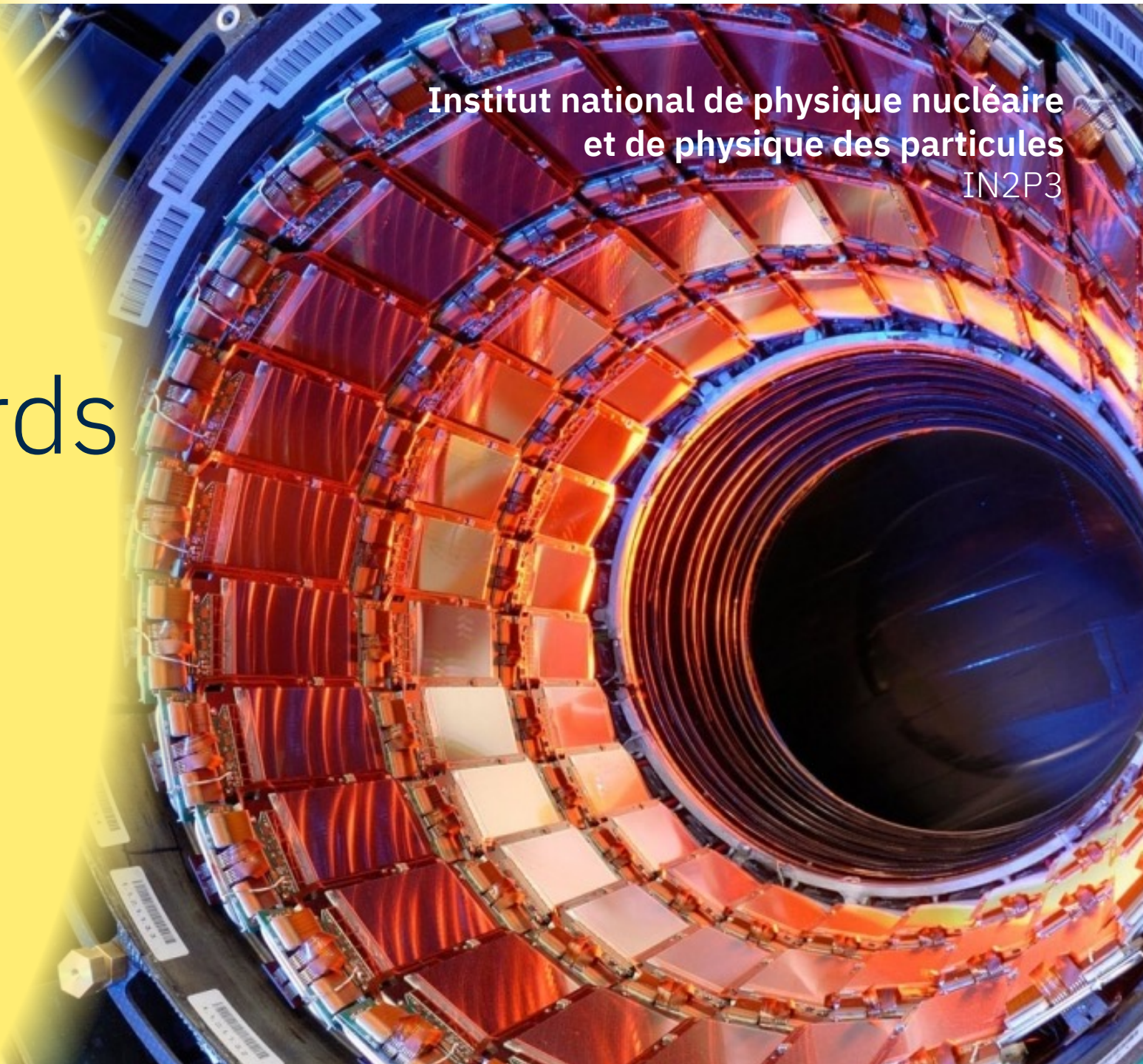
Welcoming words from IN2P3

FCPPN 2025 Workshop in Qingdao

Laurent Vacavant

Scientific Director for Particle Physics

→ 22/07/2025



Welcome to the FCPPN 2025 workshop

In Qingdao

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

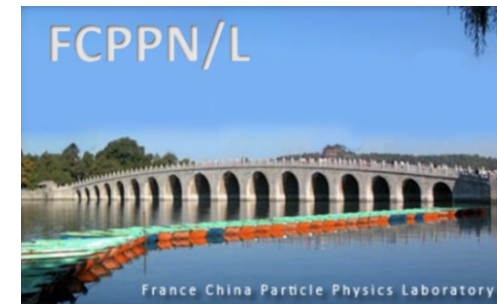


Zhuhai 2023



Bordeaux 2024

Looking forward to interesting talks and lively discussions... which started yesterday already
Thanks to Shandong University @ Qingdao for hosting us



FCPPN

International Research Network

FCPPN/L : a success story since 2007

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

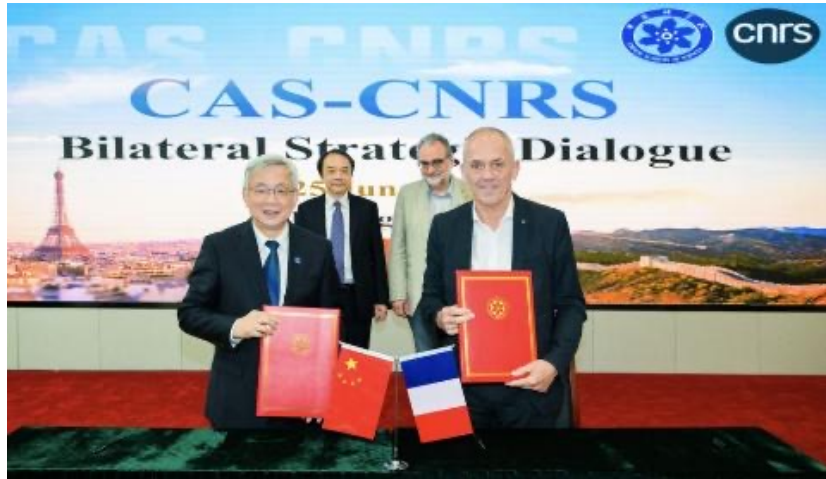
Structures adapted in 2023 to follow evolution of CNRS international tools

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

- Under reflection : a lab ?
 - *an actual international lab in China*
 - *in the premises of IHEP Beijing offices*
 - *to host a few IN2P3 physicists*
 - *for long stays (1 year or more)*
 - *neutrinos (JUNO, KM3Net, ...)*
 - *cosmic gamma rays, dark matter*
 - *future colliders & detectors*

Recent exchanges CAS - CNRS

A vivid and strong collaboration



➤ Signature of the FCPPN agreement on June 24, 2024 at CAS HQ

Antoine PETIT a reçu le 10 juin 2025 HOU Jianguo, Président de l'Académie des sciences de Chine (CAS), dans le cadre du troisième dialogue stratégique entre la CAS et le CNRS

Juin 17, 2025 | Evènements



Particle physics was among the 4 topics discussed, w/ presentation of FCPPN

A prestigious new CNRS Fellow Ambassadeur

Yifang Wang



Nos recherches ▾

Nos innovations ▾

Nos défis ▾

Le

VOTRE PROFIL ▾

LE CNRS SUR LE WEB



ANNUAIRE



Accueil > Actualité

Neuf nouveaux fellow-ambassadeurs au CNRS

25 avril 2025

INSTITUTIONNEL

Le programme de « fellow-ambassadeurs » du CNRS accueille neuf nouvelles personnalités prestigieuses de la recherche mondiale, au service de la communauté scientifique et de la notoriété de l'organisme.

Avec cette nouvelle cohorte, le programme « fellow-ambassadeurs » du CNRS prend son rythme de croisière. Créé en 2023 dans la tradition des éminents « visiting professors » au sein du milieu académique, ce dispositif permet à d'éminentes personnalités de la recherche mondiale de se faire représentantes de l'organisme et de dynamiser la recherche française.

Ces chercheurs et chercheuses prestigieux, invités sur proposition des 10 instituts du CNRS, s'engagent ainsi à passer au moins un mois par an, pendant trois ans, dans un ou plusieurs laboratoires en France. En particulier, ils pourront prendre un rôle d'accompagnement, de manière plus spontanée, pour les jeunes scientifiques et doctorants qui n'auraient peut-être pas eu l'occasion de les rencontrer en colloque.

A - / A +

Partager ce contenu



Imprimer



Yifang Wang, physique des particules, Chine



© Yifang Wang

Yifang Wang est considéré comme l'un des scientifiques chinois les plus éminents pour ses contributions exceptionnelles à la physique des particules. Il est professeur à l'Institut de physique des hautes énergies (IHEP) de Pékin, qu'il a dirigé entre 2011 et 2024. Il a notamment proposé et conçu l'expérience d'oscillation des neutrinos de Daya Bay en Chine, qui a mesuré pour la première fois en 2012 un paramètre fondamental de la physique des neutrinos : [l'angle de mélange](#) θ_{13} . Ce paramètre donne la probabilité qu'un neutrino électronique oscille vers un neutrino d'une autre saveur. Il dirige aujourd'hui [l'expérience JUNO](#), qui prolonge l'expérience de Daya Bay à une échelle beaucoup plus grande et avec une précision décuplée. Pour cette expérience, à laquelle le CNRS contribue, il a développé des photomultiplicateurs innovants pour détecter les très faibles signaux lumineux produits par les rares interactions entre les neutrinos et JUNO. Lauréat de nombreux prix nationaux et internationaux (dont le *Fundamental Physics Breakthrough Award* 2016), il est membre de l'Académie des sciences de Chine et, en avril 2024, a été admis comme membre international de l'Académie des sciences des États-Unis.

Note: 30-year celebration of CNRS Office in Beijing – 3-5 nov

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

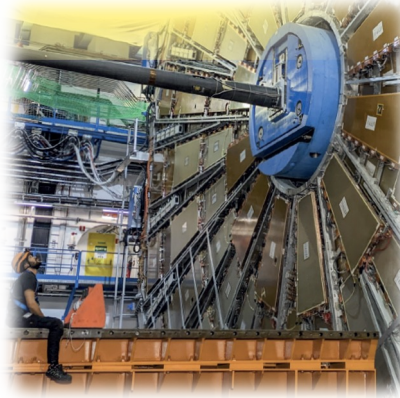
Explore fundamental physics

Lead research on contemporary scientific challenges

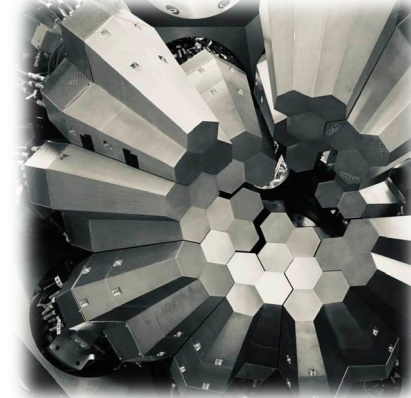
Valorize technology for society & industry

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

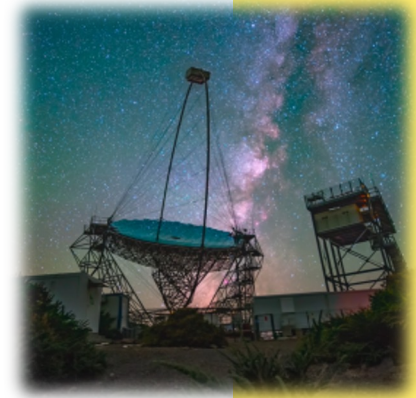
Particle Physics



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

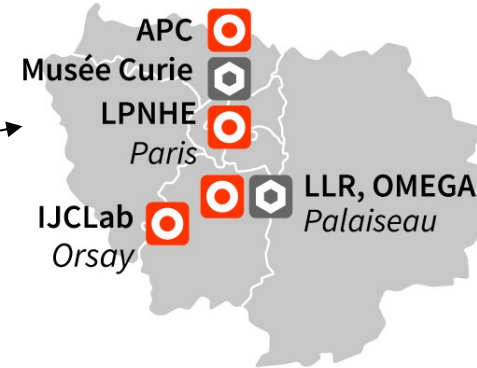
PhD students



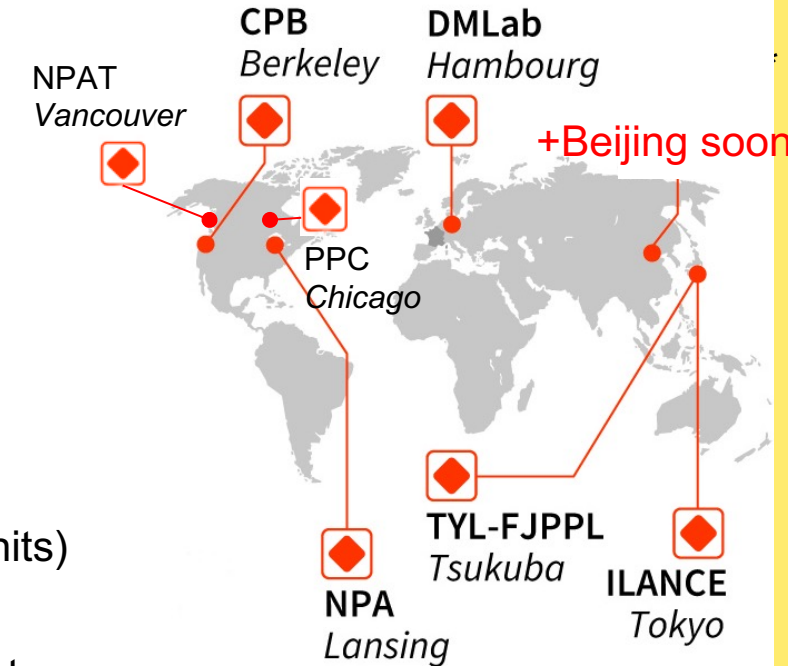
© CERN

IN2P3: a distributed lab

Across France... and also abroad

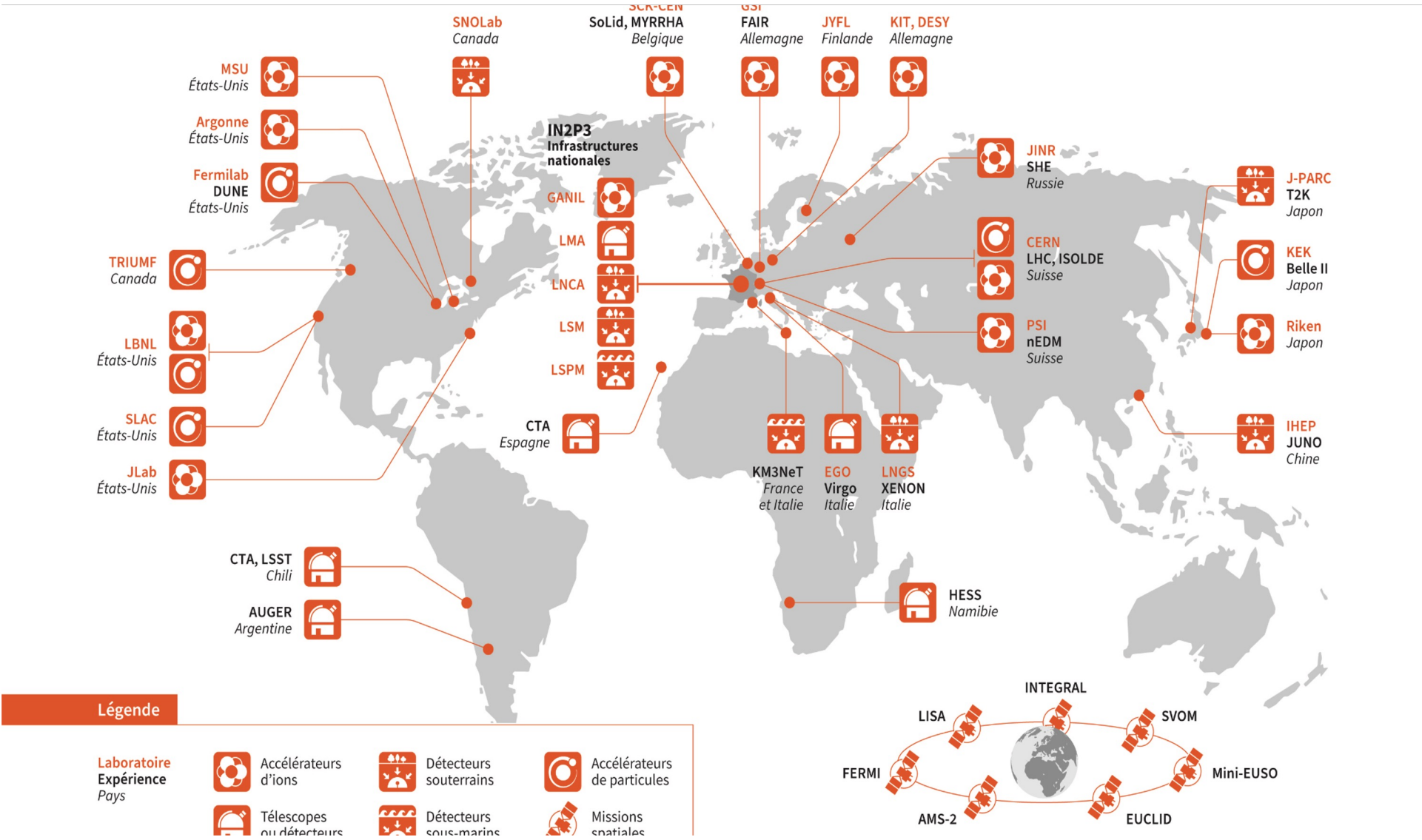
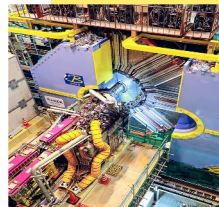
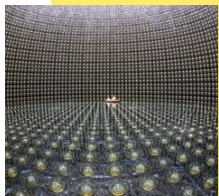
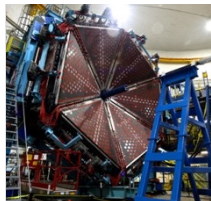
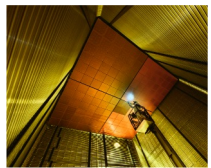


- 15 labs (joint research units) w/ major FR universities
- 10 infrastructure / support units
- 7 labs abroad w/ foreign universities:
UC Berkeley, U Chicago, U Tokyo, MSU, Helmholtz, KEK, TRIUMF



Worldwide (+) research infrastructures

With IN2P3 involvements



Particle Physics Portfolio

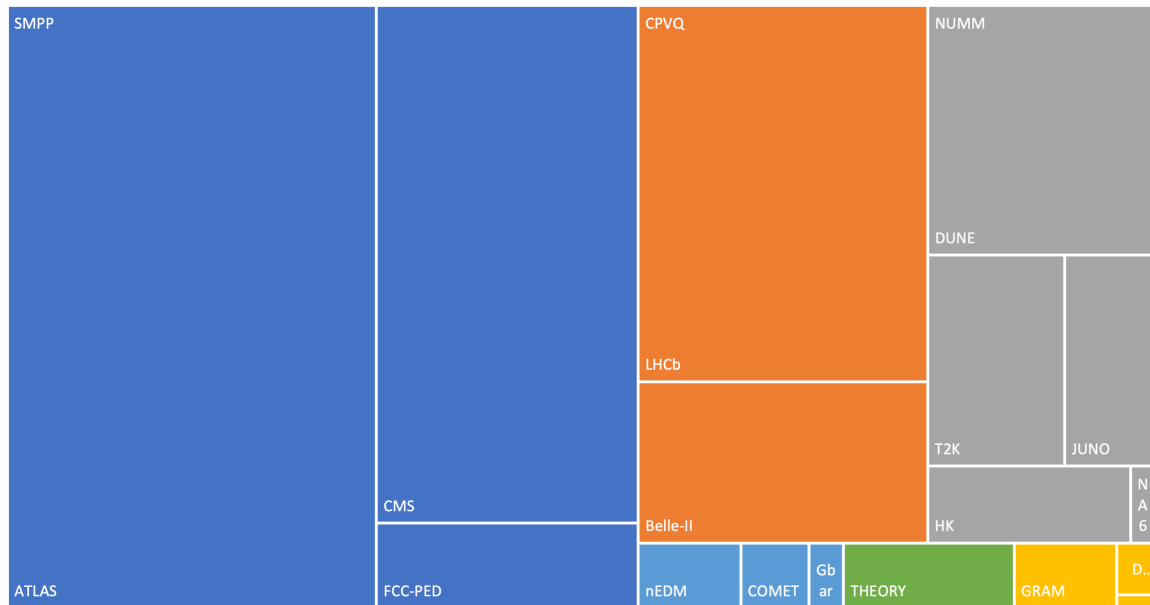
@ IN2P3

- 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



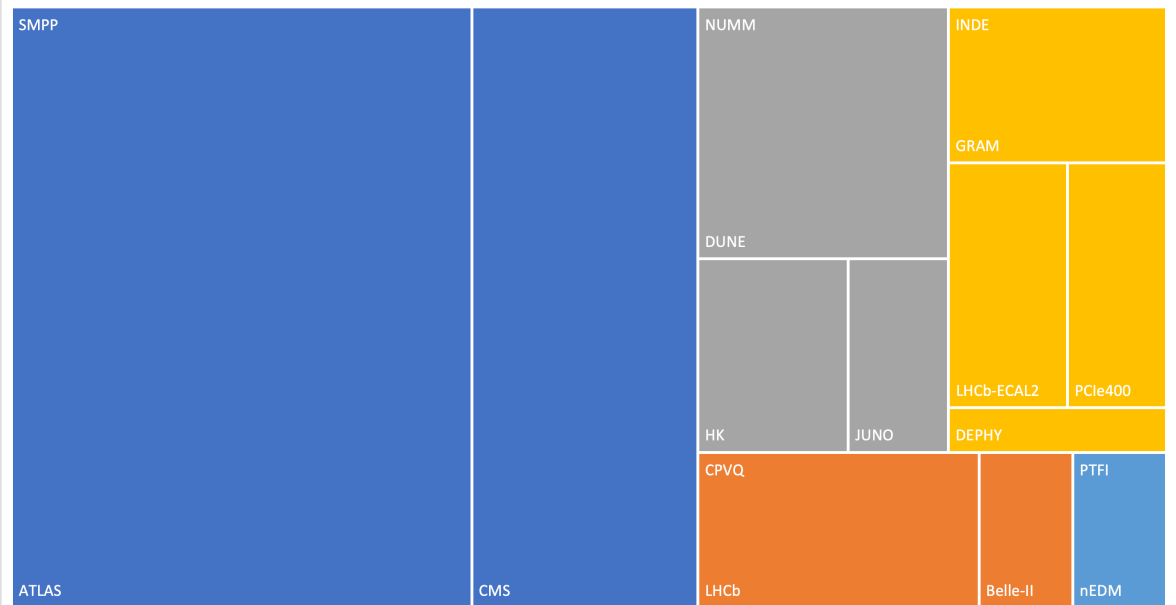
ETP 2024 - CH

■ 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>

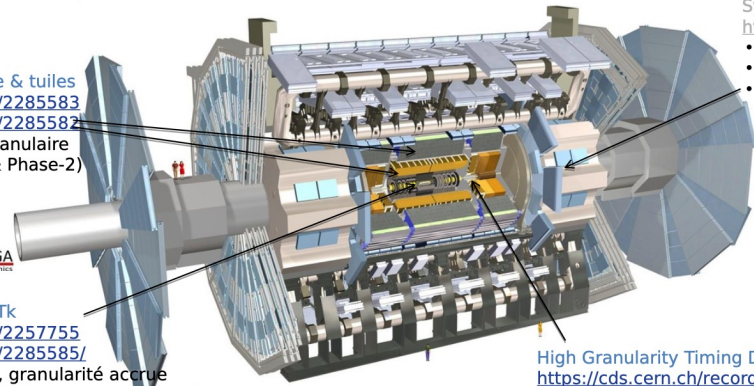
Calorimètres argon liquide & tuiles
<https://cds.cern.ch/record/2285583>
<https://cds.cern.ch/record/2285582>

- Nvile 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>

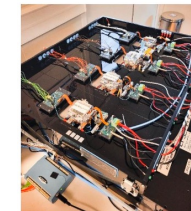
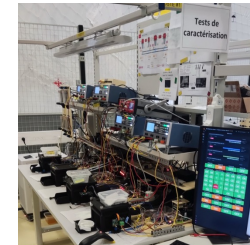
- Nvile électronique
- Nviles chambres internes
- Nviles petites roues NSW



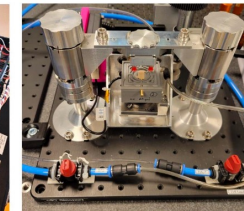
High Granularity Timing Detector

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

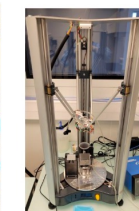
- Diodes LGAD, couverture $2.4 \leq \eta \leq 4$



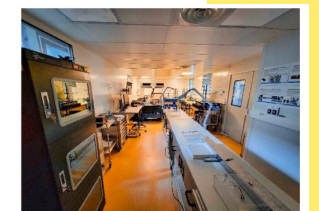
Banc QC électrique et thermique



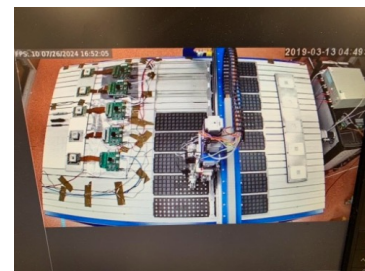
Outil de collage



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>

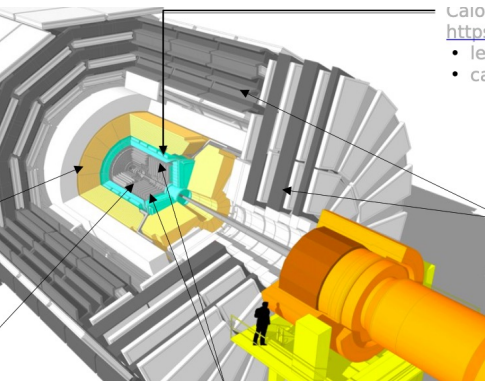
- gerbes 3D & info temporelle précise
- Si, Scint+SiPM dans Pb-W/SS



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 $\eta \approx 3$



Beam Radiation Instr. and Luminosity,
 Common Systems and Infrastructure

<https://cds.cern.ch/record/002706512>
 Precision Proton Spectrometer

MIP Timing Detector

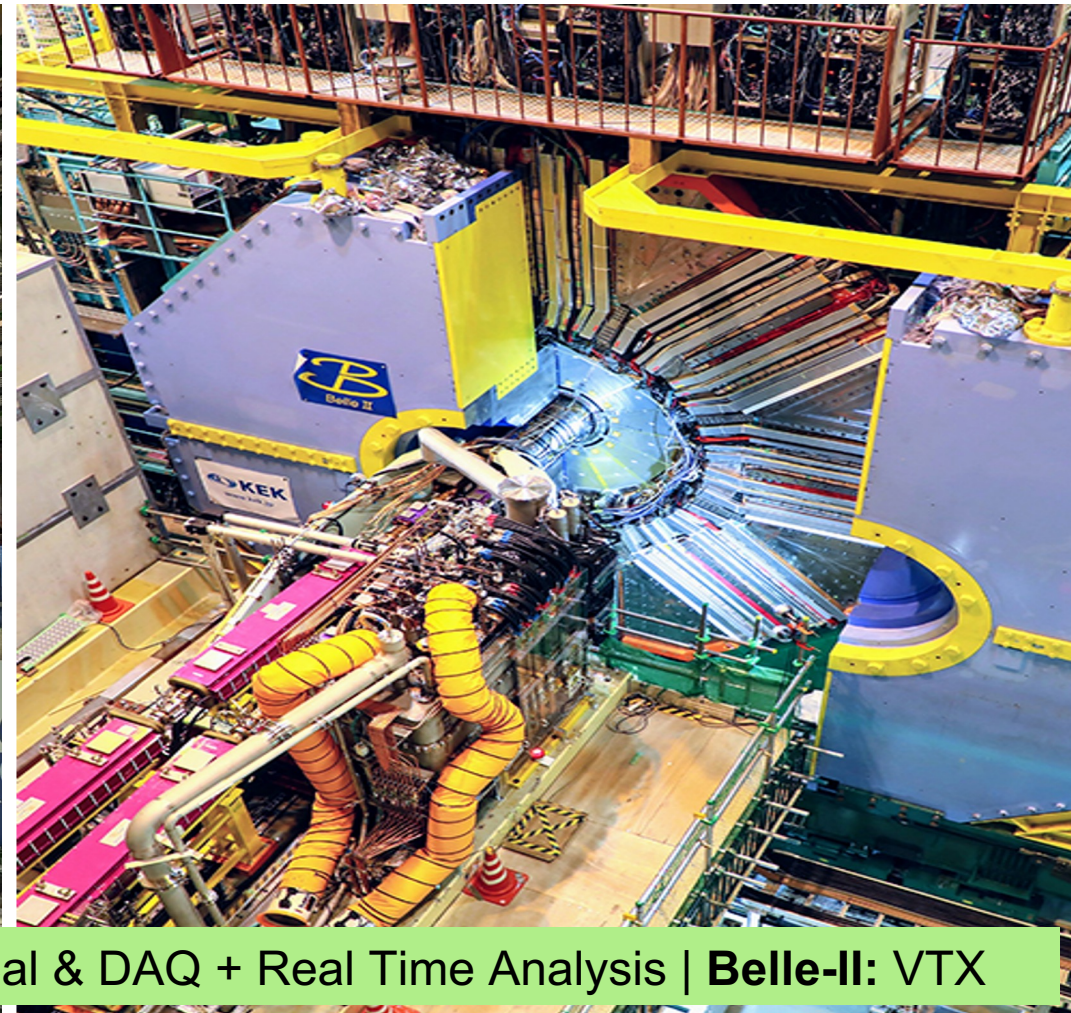
<https://cds.cern.ch/record/2296612>

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



LHCb @ CERN/LHC et Belle-II @ SuperKEKB

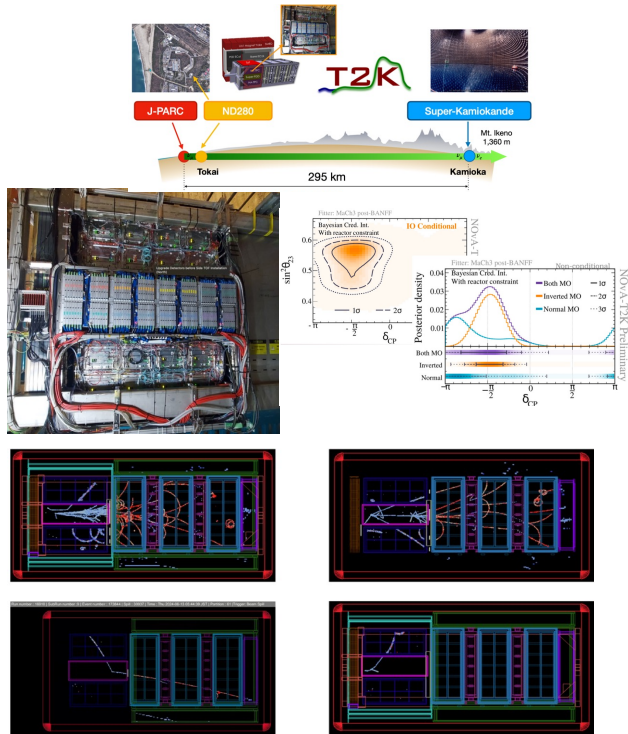
Flavour physics, CPV in the quark sector



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

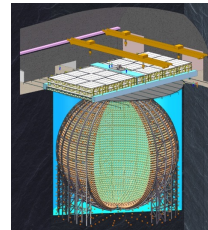
Neutrino Physics

Several complementary programs, running or in preparation



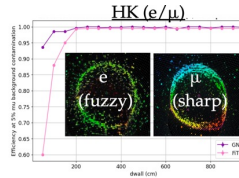
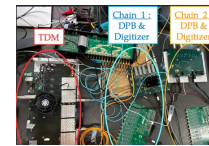
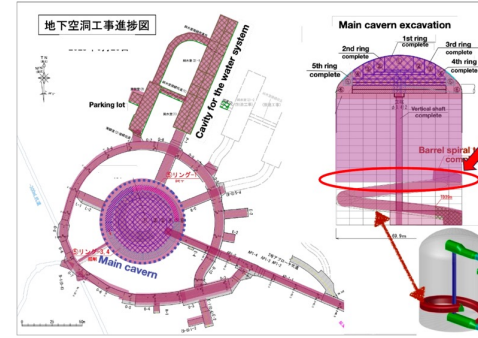
T2K:

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



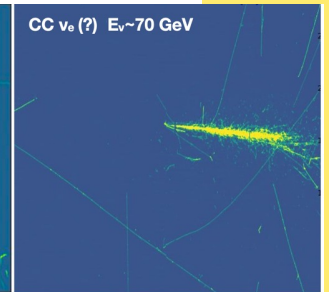
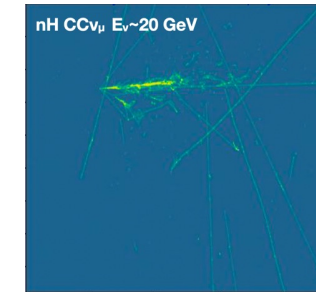
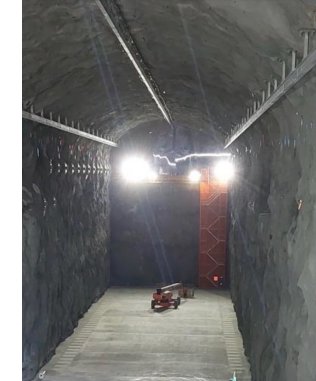
JUNO:

- 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

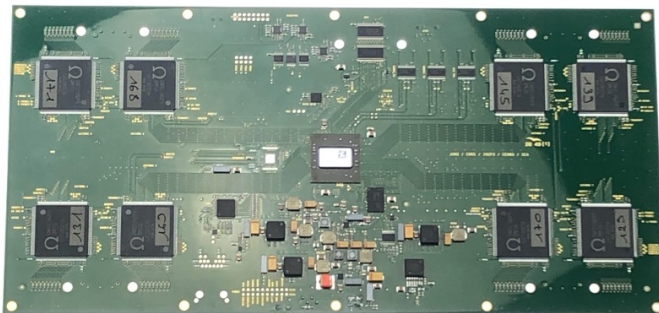
JUNO: IN2P3 contributions to SPMTs

Very exciting times, looking forward to first physics !

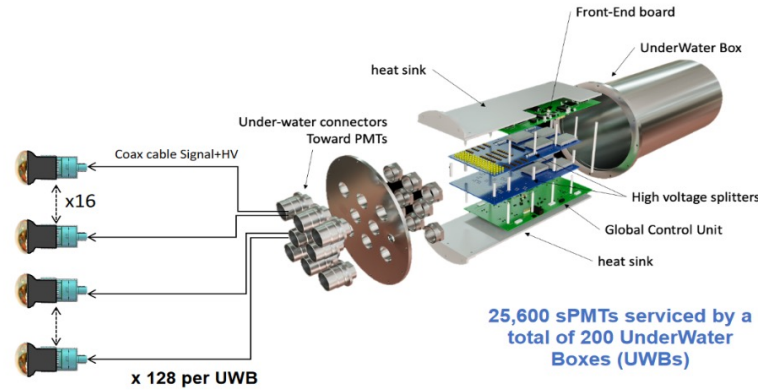
25600 SPMTs (3 inches) in between of the 17612 Large PMTs (20 inches)



ABC Front-End cards with OMEGA CATIROC



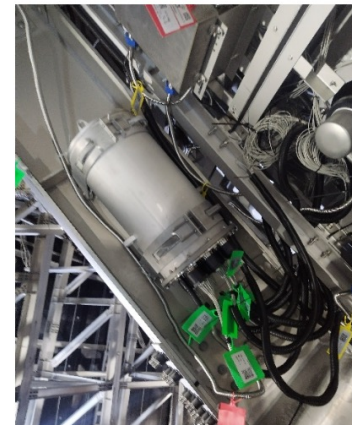
25600 SPMTs serviced by a total of 200 UnderWater Boxes



Connectors from Axon company



UnderWater box installation on site



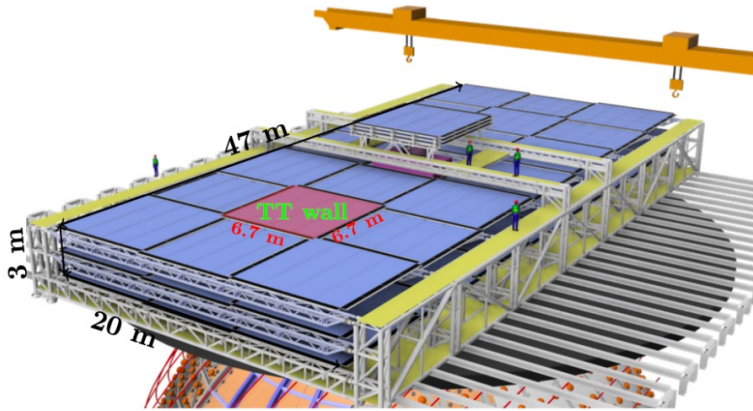
- CATIROC chip design, manufacturing and testing.
- Design of the Asics Battery Card : front-end board
 - Optimisation of the Printed Circuit Board
 - Mechanical and thermal measurements of the ABC card.
- Mass testing of the ABC cards :
 - Acceptance, calibration, packaging
- Joint developpement of the SPMT cables with AXON.
- ABC firmware and synchronisation

(slide: C. Jollet)

JUNO: IN2P3 contributions to TopTracker

Very exciting times, looking forward to first physics !

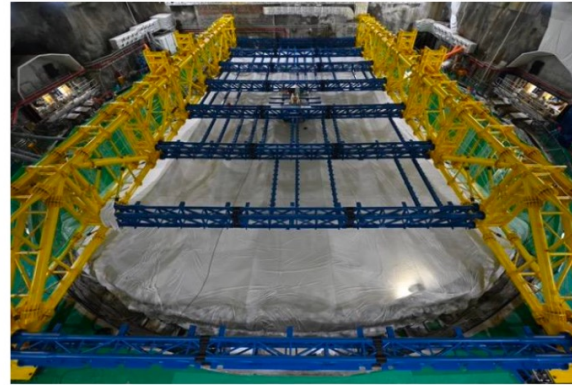
Tracker on the top of the Central Detector to improve the muon track reconstruction.



3 layers of TT. Each layer is made of 20 walls. Each wall is made of 4 vertical and 4 horizontal modules. Each module is made of 64 scintillator strips.



Solid Bridge on top of JUNO to install TT



Electronic card of
1 TT module



- TT module constructed in IPHC for the OPERA
- Electronic block diagram:
 - Front-End Board (MAROC from OMEGA)
 - Read-Out Board
 - Concentrator Board (tested at IPHC)
 - Global Trigger Board
- Test of the whole electronic chain (IPHC)
- Firmware
- Tests and installation on site.

(slide: C. Jollet)

More neutrino physics

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

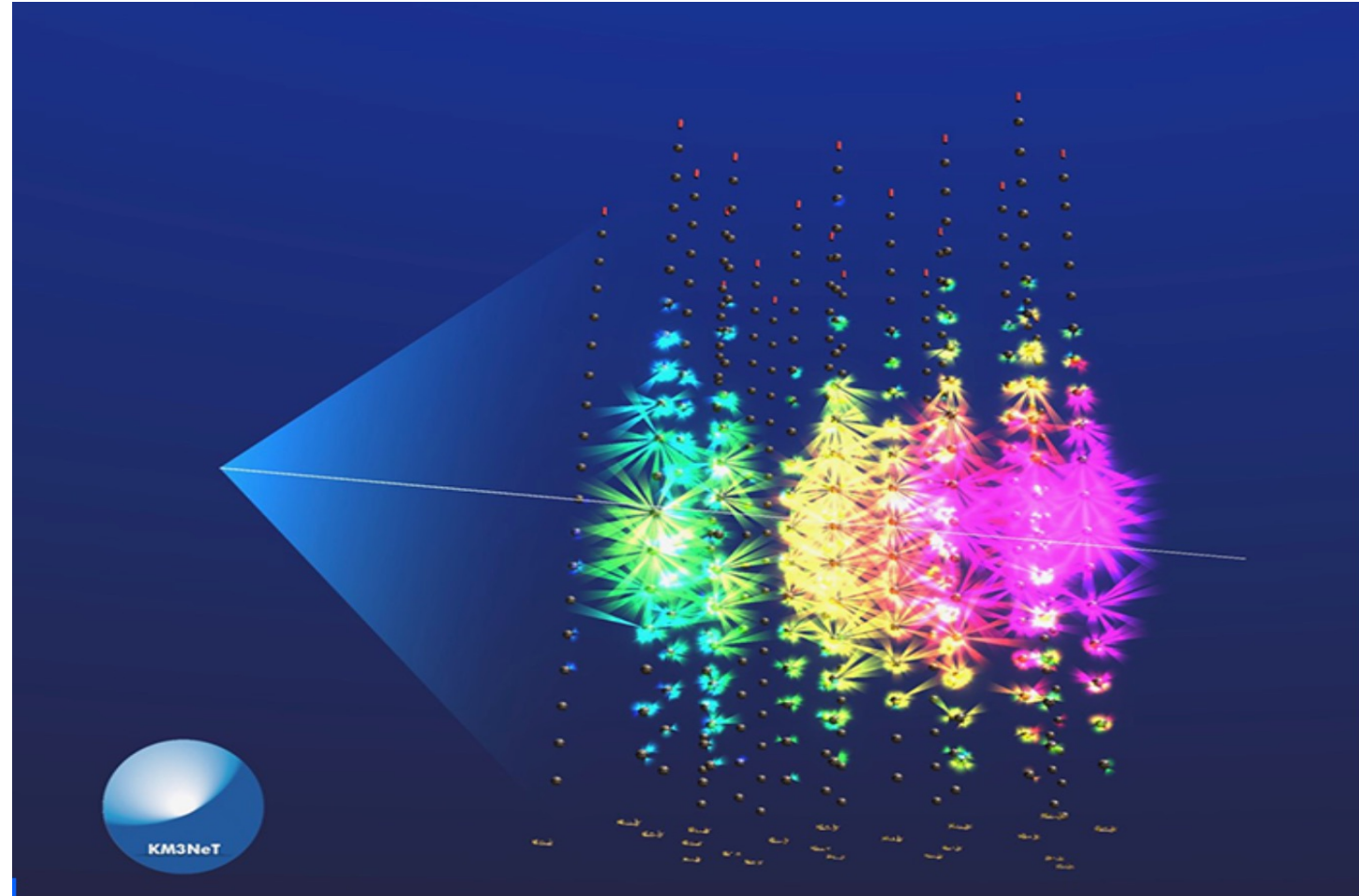
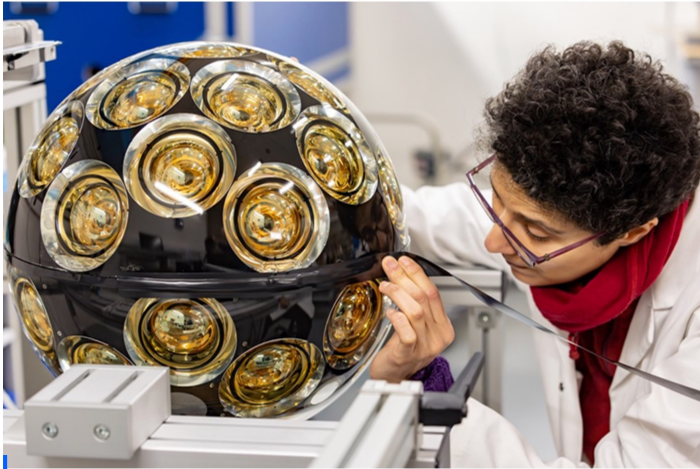


Illustration de l'événement KM3-20230213A. Le détecteur est représenté par 21 lignes de détection composées de 18 modules optiques (boules noires et jaunes). Chaque cône coloré indique qu'un module optique a détecté de la lumière. La taille des cônes est proportionnelle à l'intensité du signal lumineux 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

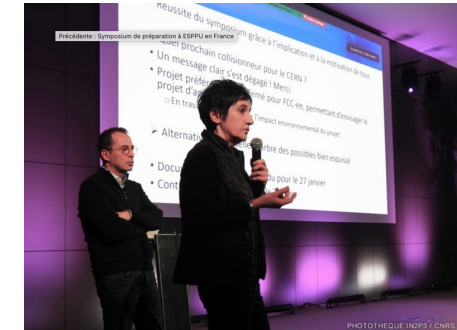


Symposium of the FR HEP community (20-21/01/2025): pictures

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

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

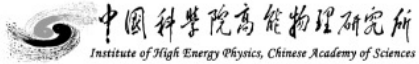
Very successful symposium in Venice last June !!



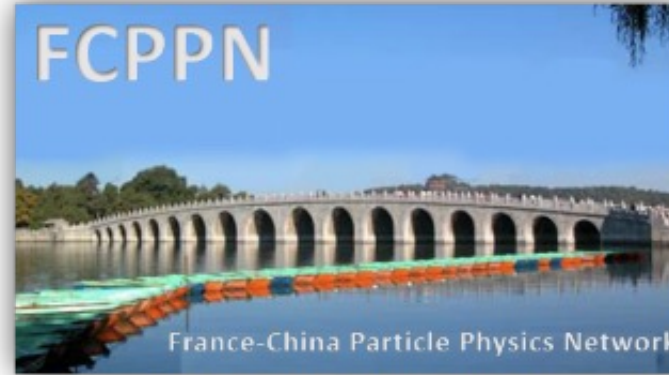
crédits photos:
G. Boudoul
A. Carneau



Let's enjoy this 16th workshop & our collaboration !



National Astronomical Observatories
Chinese Academy of Sciences



Thanks for the support
of French Embassy in
Beijing (MEAE)

