

A composite image showing particle tracks on the left and a cosmic nebula on the right. The particle tracks are colorful lines (orange, yellow, red) with blue dots at their ends, radiating from a central point. The cosmic background is a dark space filled with stars and a large, colorful nebula in shades of orange, red, and purple.

Sonder les infinis : des particules au cosmos

A green-tinted photograph of a modern building with a curved facade and large windows, likely the Subatech facility.

Subatech 2024/2025
Gines MARTINEZ, Director



Subatech in few words



**NUCLÉAIRE
& PARTICULES**



IN2P3

Institut national de physique nucléaire
et de physique des particules

Subatech



Institut Mines-Télécom

IMT Transfert



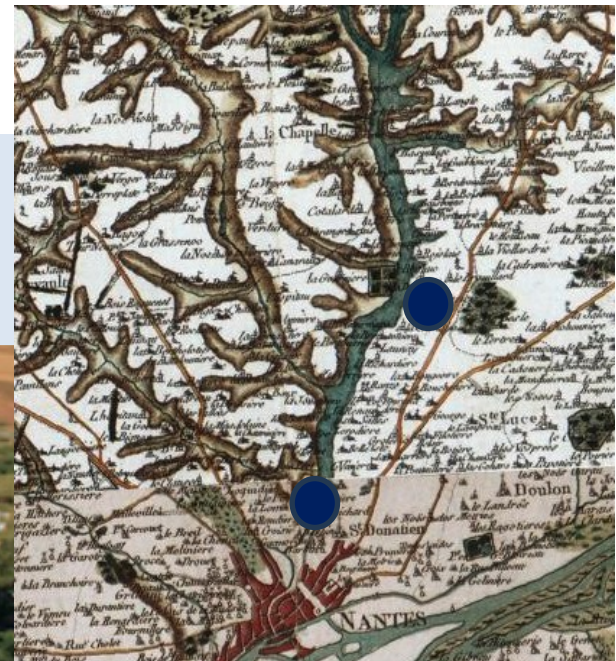
IMT Atlantique

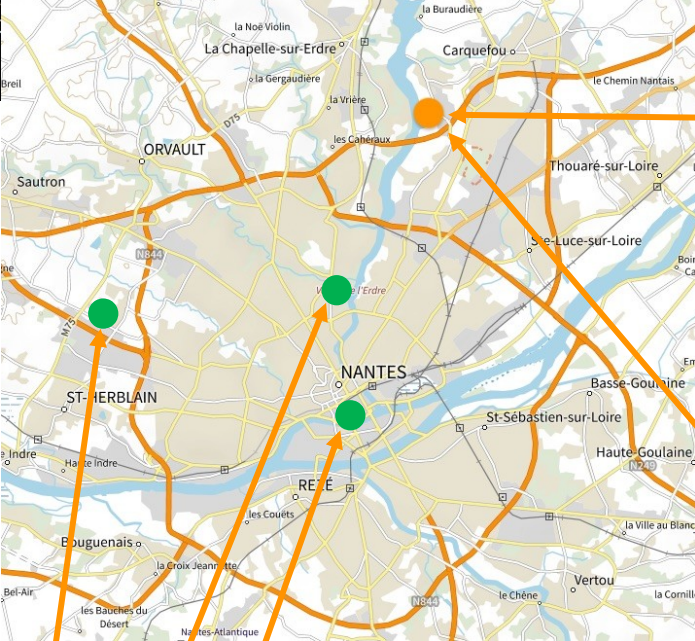
Bretagne-Pays de la Loire
École Mines-Télécom

UMR 6457 (since 1994)
Located at IMT Atlantique
Campus de Nantes

**Nantes
Université**

Pôle Sciences et Technologie
UFR Science et Techniques





UFR Sc & Tc



XEMIS2

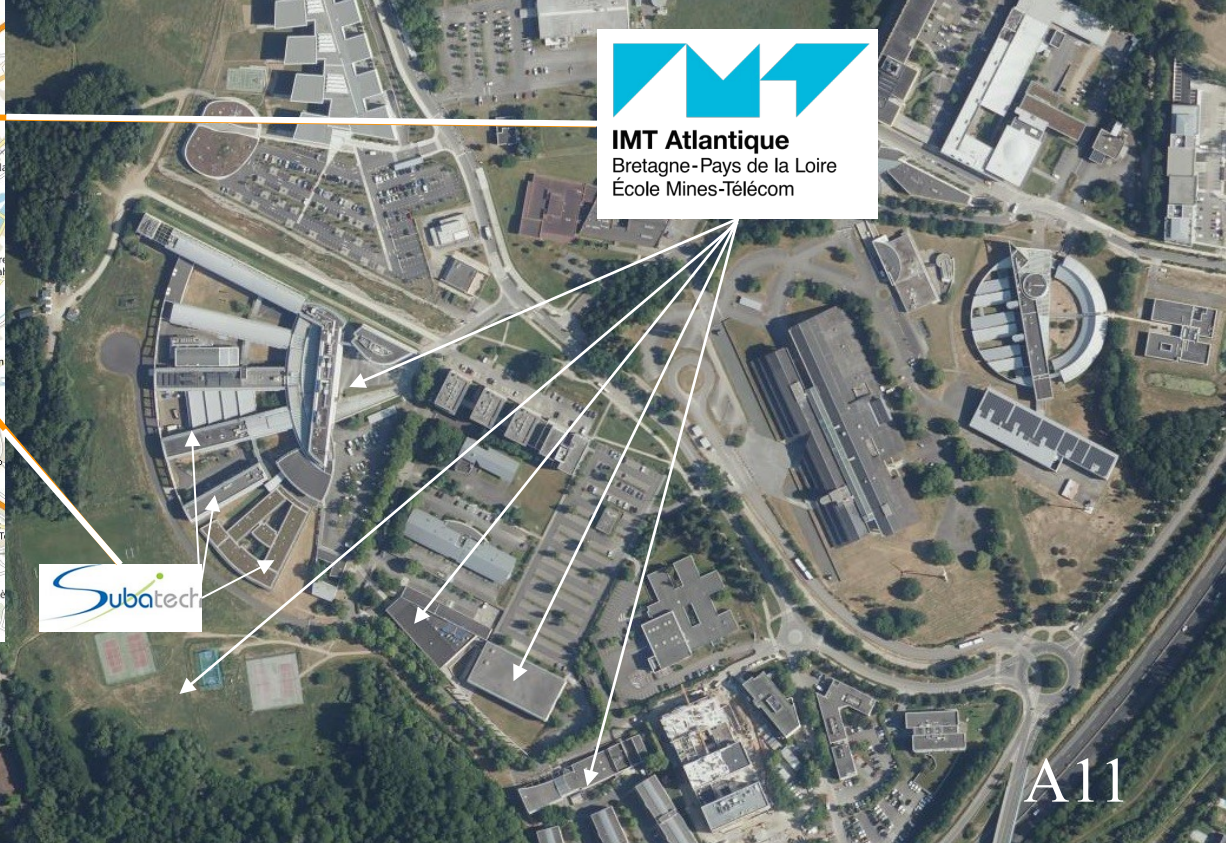


2024

Erdre
River



Bretagne- Pays de la Loire
École Mines-Télécom

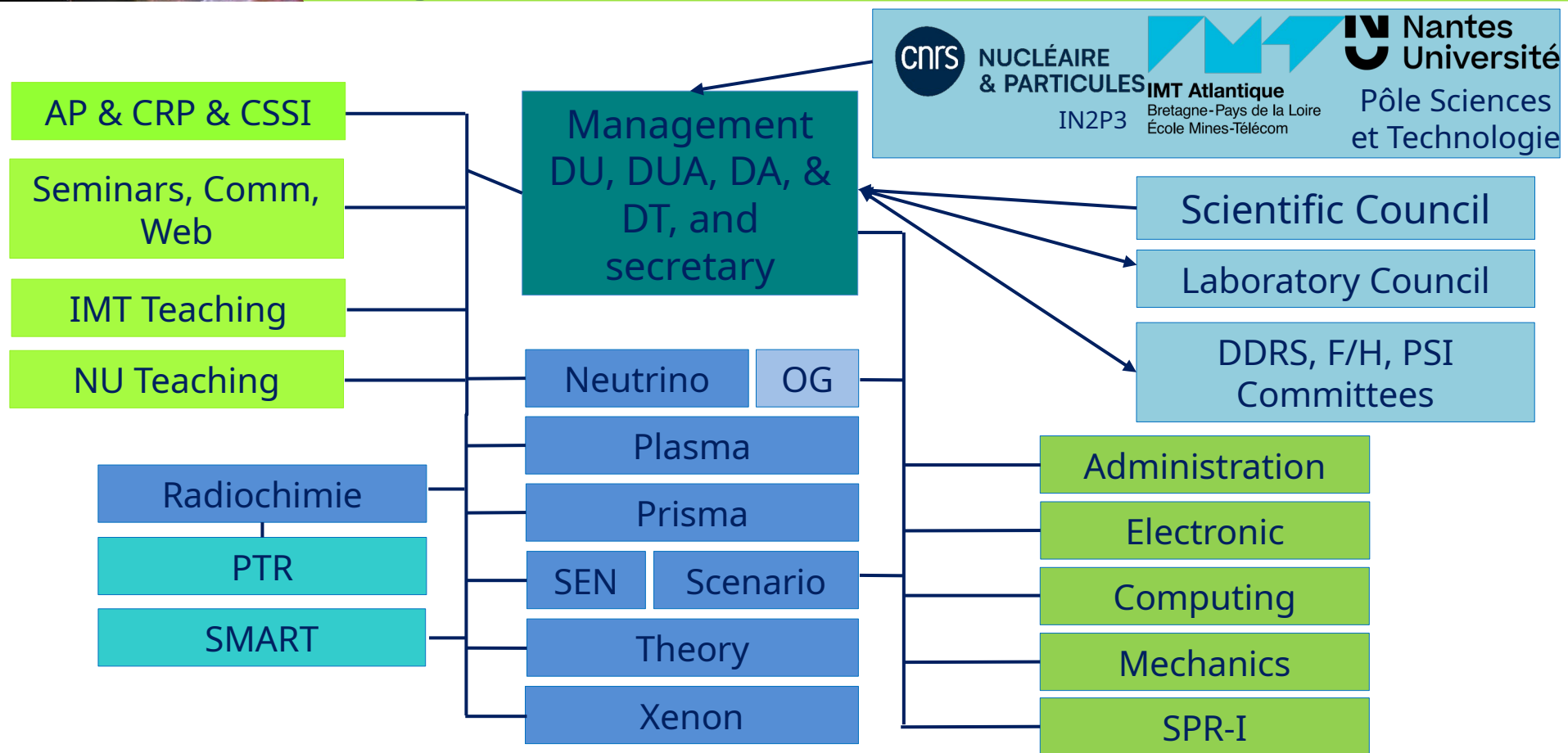


A11

Total surface of Subatech about 7350 m² (1126 m² experimental area, 800 m² mechanical workshop, 560 m² + 320 m² radiochemistry laboratory and SMART, including 590 m² ZRR)



Organisation





Human Ressources

On May 1st 2025:

188 personnels

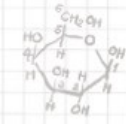
63 C & EC (22 CNRS, 18 NU, 21 IMT Atlantique, 2 AR ICO) among them 5 émérites
+ 1 CDD Chaire Prof Junior

75 IT (52 CNRS dont 2 apprentis, 8 IMT Atlantique, 5 NU, 10 IMT Transfert)

7 post-docs (4 CNRS, 3 NU)

43 PhD (14 CNRS, 15 IMT Atlantique, 4 NU, 10 others)

Scientific Axis of Subatech



$$E = -\frac{1}{4} \epsilon_0 \hbar^2 \pi^2 \phi^2 + \hbar c + \frac{1}{2} \mu_B \hbar^2 \phi^2 + \hbar c + \frac{1}{2} \mu_B \hbar^2 \phi^2 + \hbar c$$

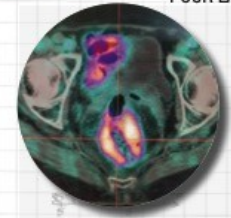
at point 1.2 bar



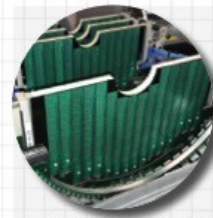
NUCLÉAIRE
POUR L'ÉNERGIE
ET L'ENVIRONNEMENT



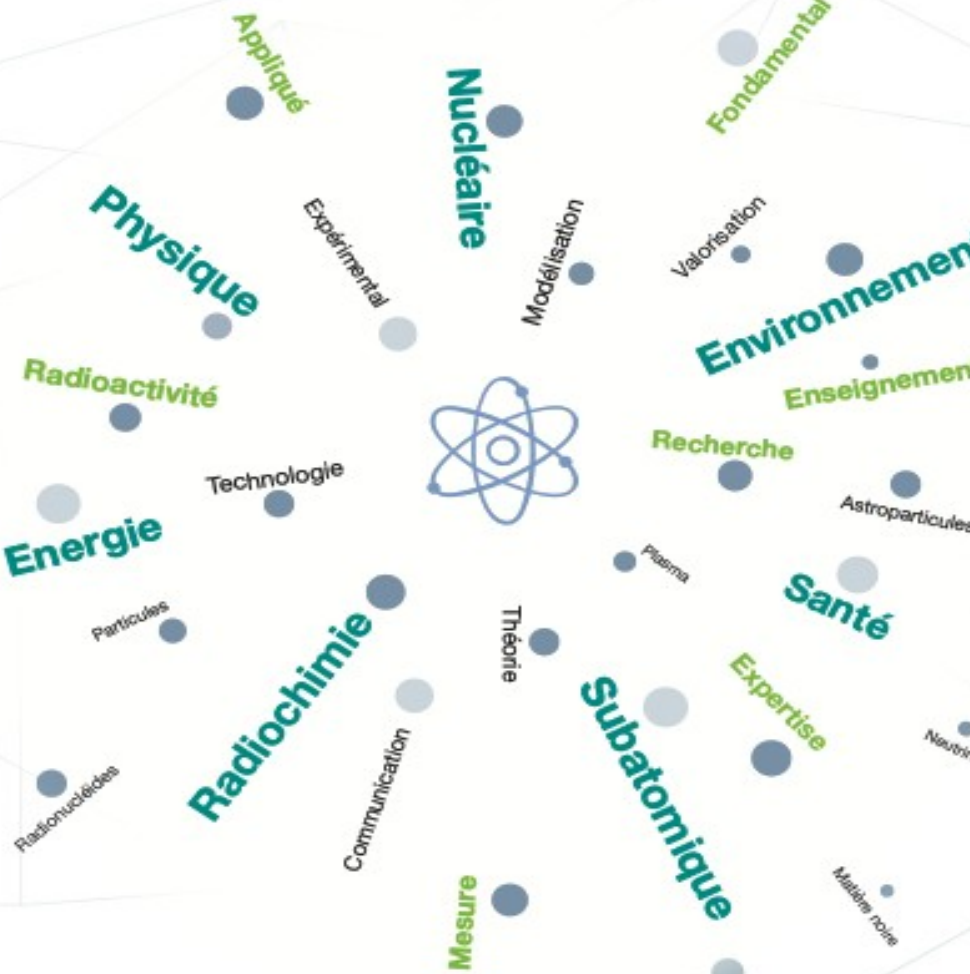
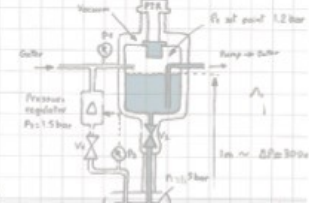
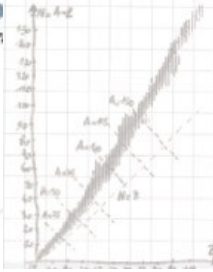
LES DEUX
INFINIS



NUCLÉAIRE
POUR LA SANTÉ

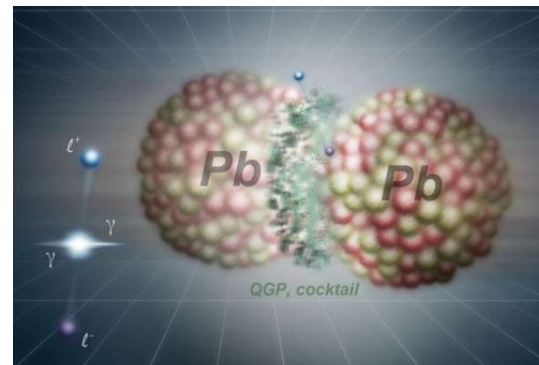
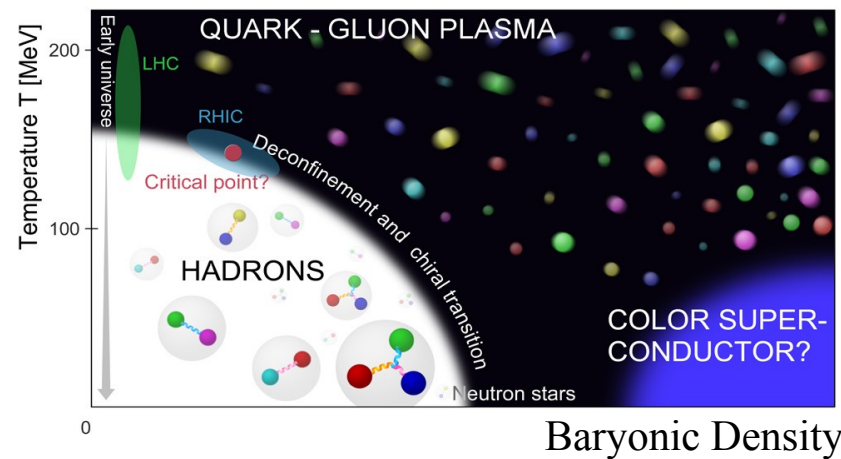


TECHNOLOGIES ASSOCIÉES





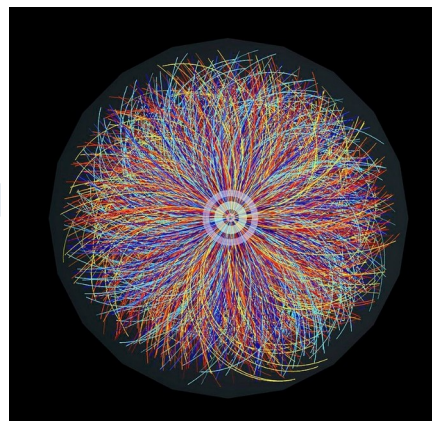
Hadronic Matter Phase Diagram



ALICE@LHC



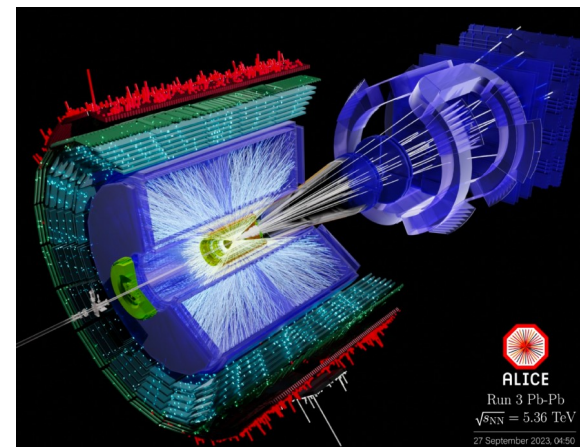
2015-2020 : ALICE upgrade project
2013-2018 : leaded by Subatech



$$E = mc^2$$

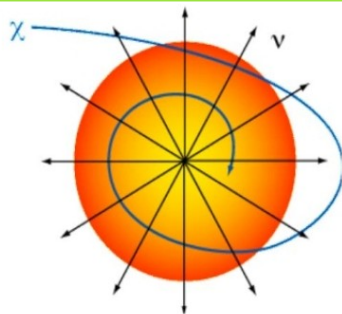
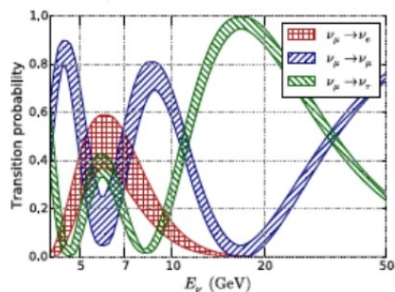


Thousands
of tracks

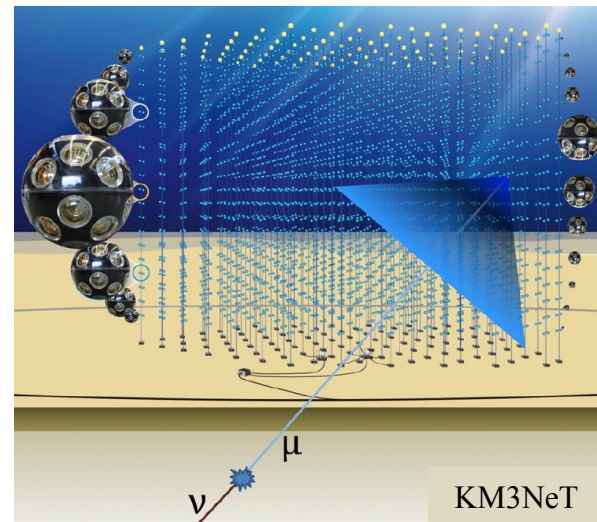




Neutrino Properties & Neutrino Messenger



Neutrino Telescope using Cherekov light



Low Energy
 $\text{MeV} < E_\nu < 100 \text{ GeV}$

Medium Energy
 $10 \text{ GeV} < E_\nu < 1 \text{ TeV}$

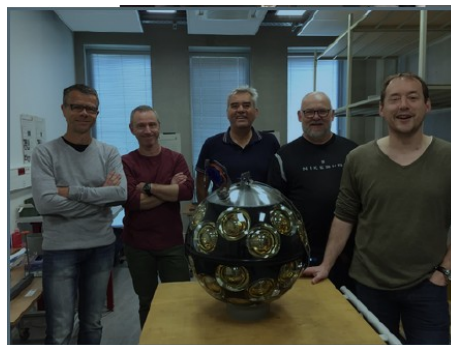
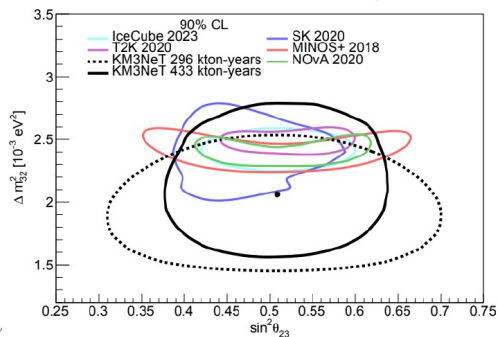
High Energy
 $E_\nu > 1 \text{ TeV}$

Neutrino oscillation parameter and mass hierarchy

Indirect Dark Matter

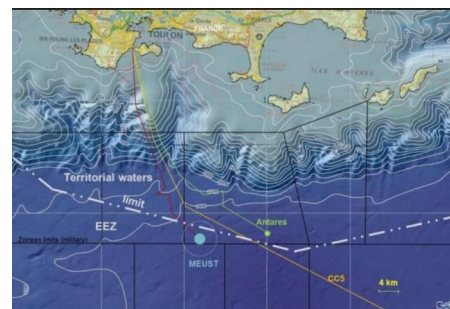
ν from the Universe

2023 : Oscillation results
KM3NeT/ORCA6 Preliminary



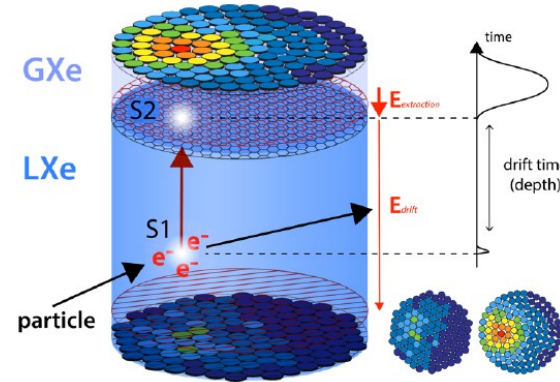
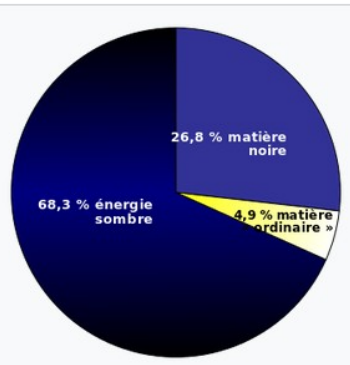
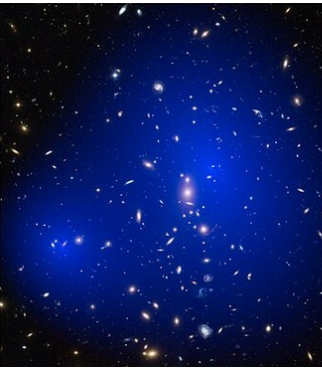
Subatech Laboratory

Production of DOM in Subatech.
Quality process



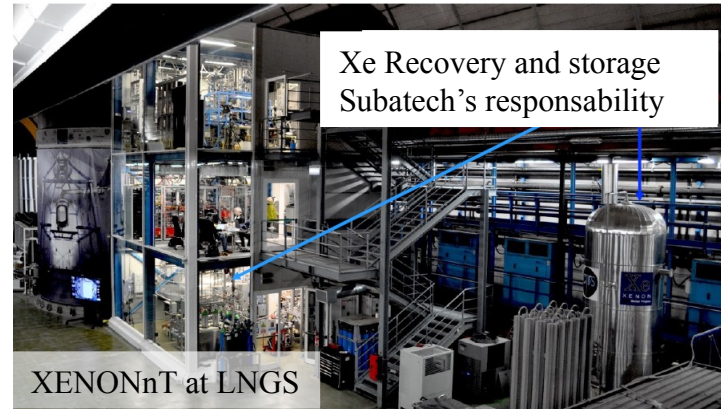
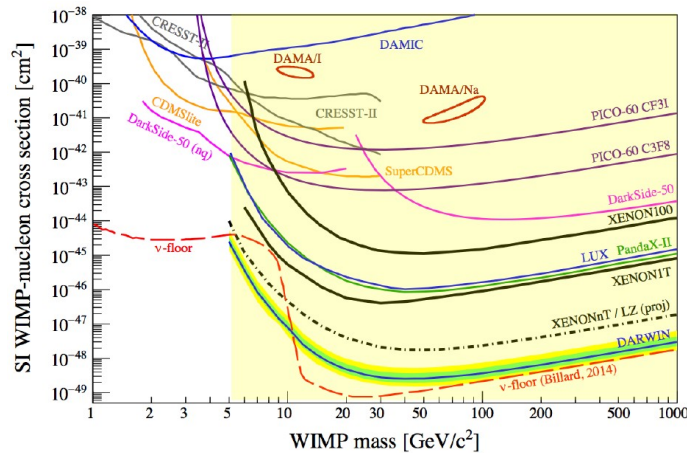


Direct Research of Dark Matter



Detection of the recoil energy deposited by a particle of unknown nature (WIMP) in a time projection chamber filled with noble gas (Xenon)

Mastery of new techniques associated with subatomic physics (nuclear and particles).





Nuclear for Energy and Environment

National leadership. Unique *"plateau technique"*

Environment & Nuclear

Materials under radiation and nuclear wastes

Molecular modelling

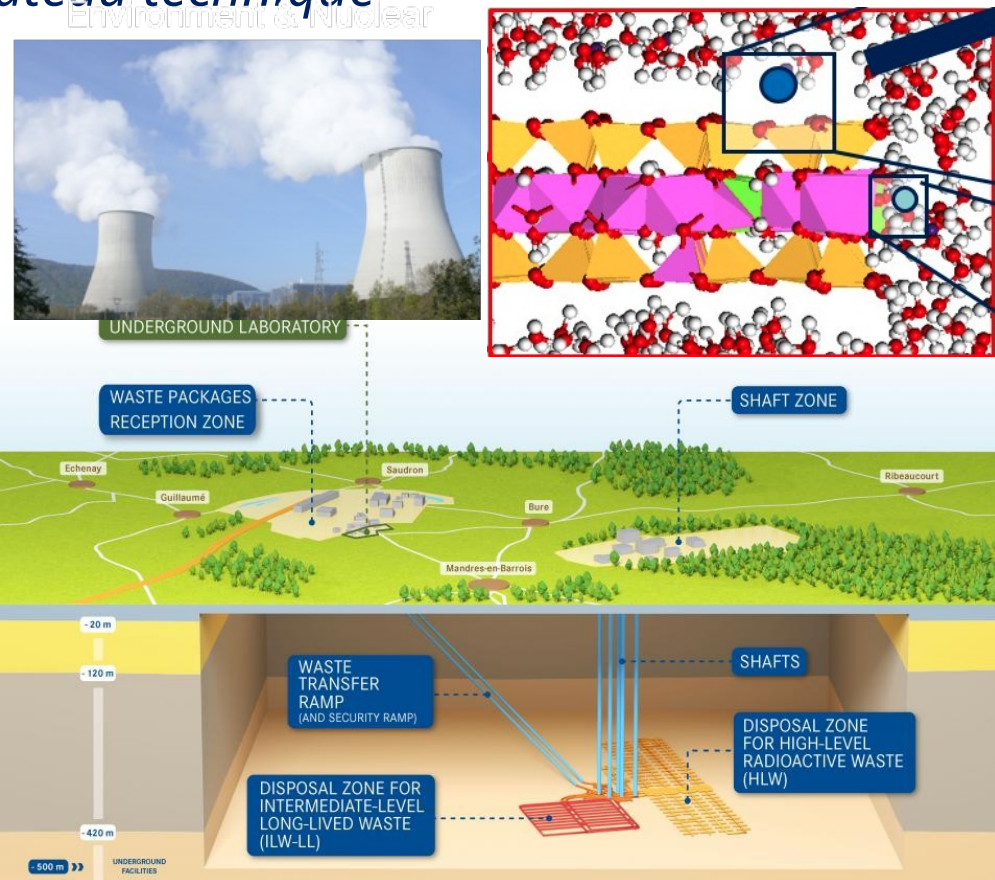
Nuclear data

Nuclear reactors

Scenario

Radionuclides in environment

Implied teams : Radiochimie, SEN, Scenario. LabCom Tesmarac.





Nuclear for Health

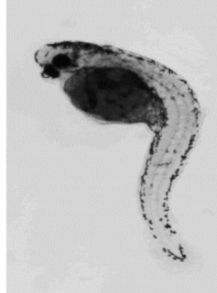
Very rich local ecosystem

New radionuclides for health

Irradiation of small animals

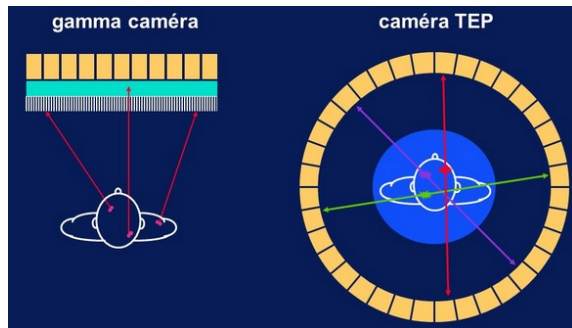
Instrumentation for health :
Medical imaging

Main concerned teams : Prisma,
Radiochimie and Xenon.

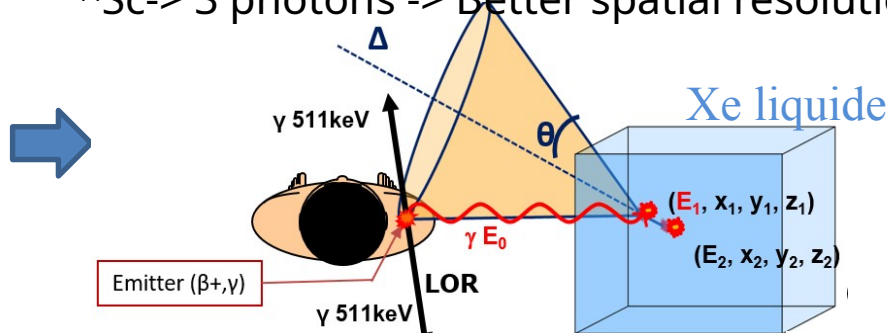




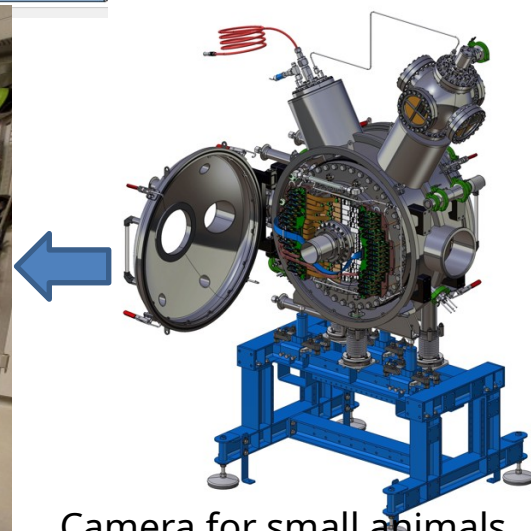
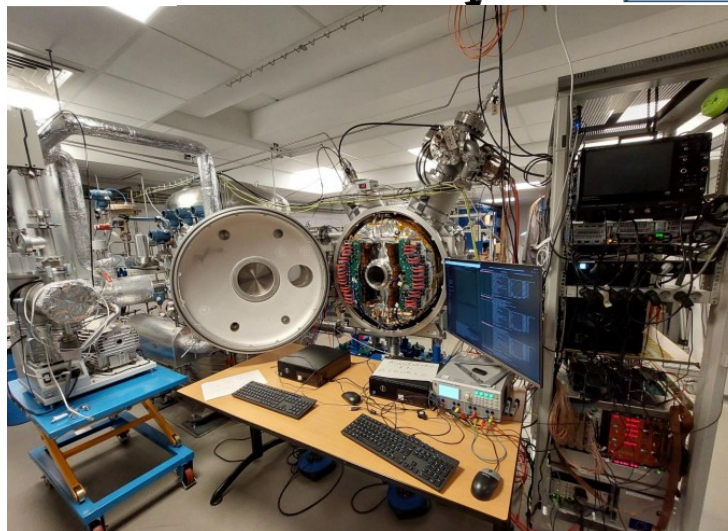
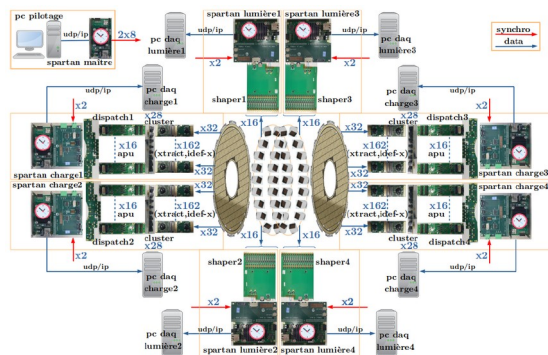
Nuclear for Health : The Xemis2 camera



$^{44}\text{Sc} \rightarrow 3 \text{ photons} \rightarrow$ Better spatial resolution evt by evt



Hot Xe flowing right now



A Particle Physics Detector

Camera for small animals



Associated technologies

Mastering technologies

Mechanics, electronic and computing for research

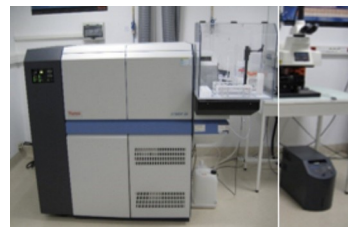
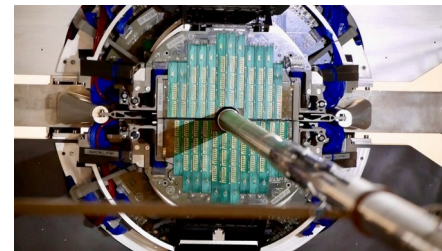
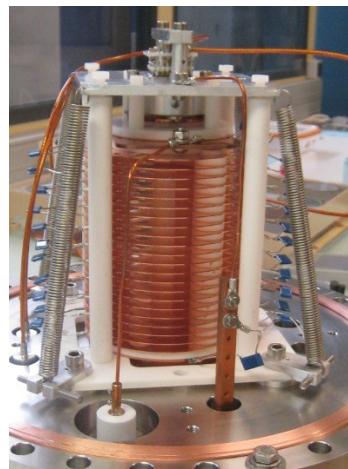
New technologies of *ionising* detection

Techniques in radiochemistry

Ion beam analysis

Measurement of radioactivity in environment

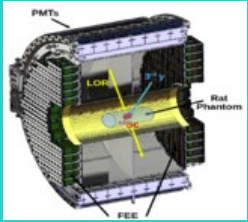
Technical services, research teams and
SMART



Infrastructures and platforms



- **SMART** : Platform for the measurement of radioactivity in the environment created in 1994, 14 staff (1 CNRS, 11 IMT Transfert, 2 IMT Atlantique). Valorisation / Visibility / Neutrality. About 42 (over 49) ASN (Autorité de Sécurité Nucléaire) authorizations for the measurement of radionuclides in the environment. Cofrac Accreditation since 1998.



- **Installation XEMIS2@CIMA (CHU)**. Infrastructure ready in CHU since 2020. Commissioning in 2024. Photon-positron Emission Tomography of small animals using new radionuclides (^{44}Sc). Collaboration CRCINA, CHU, Arronax, LS2N (Nantes), LATIM (Brest) and Subatech.



- **Radiochemistry Laboratory (PTR)**. Unique Laboratory in the local & regional context. ASN authorisation of active sample analysis. Nuclear metrology, isotopic/element analysis, spectroscopic analysis etc.



- **Mechanical workshop**. Large equipment which are unique in



Local, regional, national & international ecosystem

The two infinities



Energy and environment



Subatech Laboratory



Health



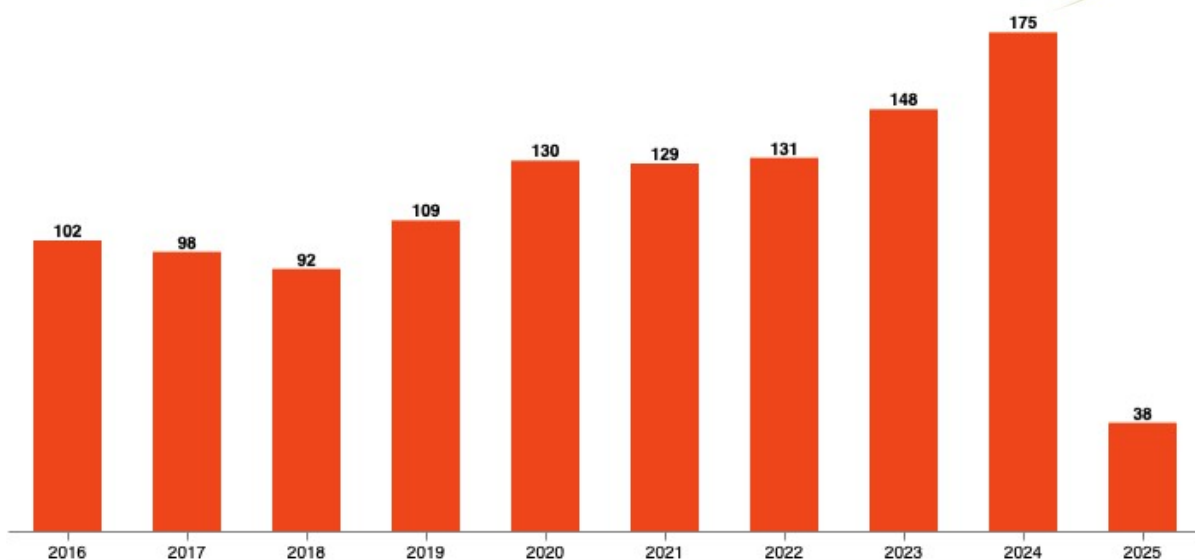
Associated technologies



Production Scientifique Subatech

LODEX IN2P3 : <https://publications-2409.in2p3.lodex.fr> Mathieu Grivès IN2P3 (mathieu.grives@cnrs.fr)

Année



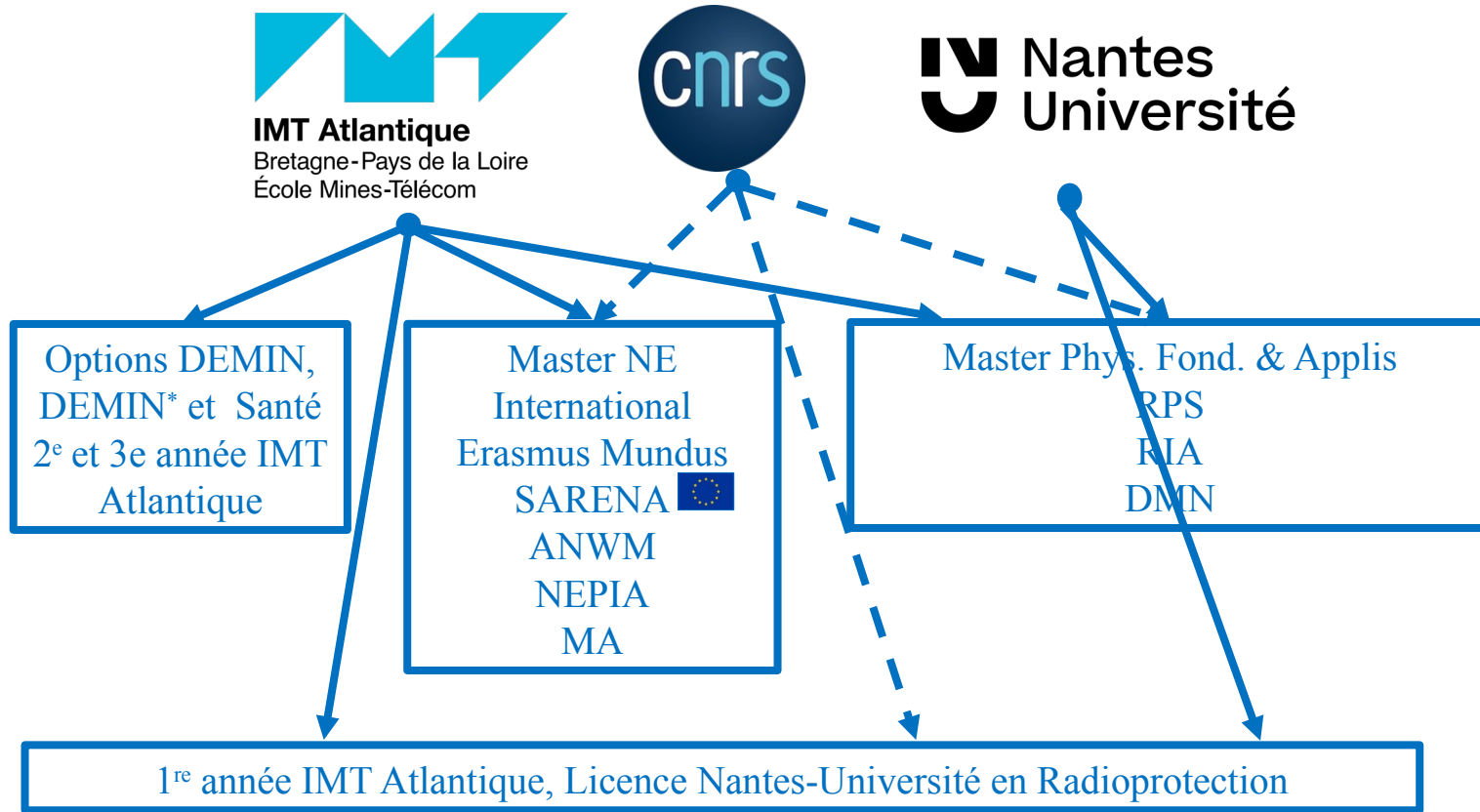
Published articles with
Subatech affiliation

2024/2025 data not
consolidated yet
In particular for the
oral presentation in
conferences.

On April 2025



Teaching in NU and IMT Atlantique



Congres, Workshops ... summary 2023



QCD MASTER CLASS
SAINT-JACUT-DE-LA-MER, FRANCE



Of course, visiting
researchers to
Subatech are
welcome!

Migration 2023



Atelier "Technologies de réacteurs et cycles associés: transitions vers le futur" GDR SciNÉE